



## QUEENSLAND URBAN UTILITIES

### *SP044 Lytton Road East Brisbane*

Contract : C1011-045 Order No: C1314-146

Job Number : 43402225

## ELECTRICAL INSTALLATION

### *OPERATIONS and MAINTENANCE MANUAL*

#### INSTALLATION BY:

SJ Electric Group(Qld) Pty Ltd  
19 Elliot Street  
Albion Qld 4010

Telephone: 07 3256 1522 Fax: 07 3256 1533

# 1. General

## 1.1 General Workplace Health and Safety

- The Workplace Health and Safety Act (2011) sets out the laws about Workplace Health and Safety for all workplaces, workplace activities and specified high risk plant. The Electrical Safety Act (2002) sets out the laws covering electrical safety. Nothing in this document is designed, in any way, to undermine the authority of the Acts.
- All reasonable care must always be taken to ensure the plant is without risk to the health and safety of personnel operating and maintaining plant and equipment.
- Employers have an obligation to ensure the workplace health and safety of all personnel at work.
- It is employer responsibility to ensure that all persons entering or working on the premises use appropriate personal protective equipment.
- Personal protective equipment includes gloves, safety glasses, hard hats, ear protection, safe foot ware and, where necessary, specialist protective clothing for hazardous areas.
- Any item of equipment should always be isolated before maintenance or repairs commence to ensure that inadvertent operation of the item does not result in risk to the health and safety of any person.
- Where the item is isolated, any total or partial shutdown should not allow a hazardous situation to be created.
- Where the item cannot be isolated, another person should be stationed at the controls of the item and an effective means of direct communication should exist between the persons carrying out the maintenance and the person at the controls.

## General Operating Principles

- All persons working the premises must be qualified Electrical Engineers or electrical trades persons capable of performing the required tasks competently. All personnel must also be familiar with plant and equipment.
- Adequate information, instruction, training and supervision must be provided to enable personnel to perform work without risk to health and safety.
- Work in an orderly way.
- Plan work in advance to avoid hazardous situations.
- Warn others of any hazards.
- Make inquiries before starting work, particularly on any unfamiliar installation or equipment.
- Before any work begins ensure that any instructions received or given are fully understood.
- Concentrate on the task on hand.
- Do not distract others or allow yourself to be distracted by foolish actions.
- Work from a safe and convenient position that provides a maximum working space that you do not have to over reach, you cannot slip, trip or stumble and so endanger yourself and others.
- Keep the working area tidy and free of unwanted materials and equipment.
- Use insulated tools where possible.
- Inspect tools and equipment regularly and ensure that any necessary maintenance is carried out.
- Keep yourself in good health.
- Do not work if ill or over tired, to the extent that your concentration, movement or alertness is affected. Illness or fatigue can endanger yourself and others.

## 1.2 Project Overview

Contract C1011-045 Order No: C1314-146 was for the manufacture and testing of six (6) new sewage pump station switchboards at various locations and the relocation of an existing switchboard at Rosebeery Parade, Woodend.

Equipment provided by SJ Electric ensures safe and efficient operation of the pump station. Equipment supplied and installed by SJ Electric includes: -

- Switchboards
- Field Wiring

The switchboard incorporates the latest technology in motor control, power monitoring, and instrumentation. It is important engineers, technicians and operators are familiar with the equipment installed before attempting any adjustments, modifications or maintenance.

The following Sections of this manual contain a comprehensive description of all equipment supplied, by SJ Electric. It is recommended that this manual be referred to before carrying out any work on any equipment.

### 1.3 Plant Maintenance

To ensure proper operation of the plant the following should be observed: -

- The plant should be kept clean and tidy at all times. Not only is this of aesthetic value, it extends equipment life.
- Check that all plant and equipment is operating correctly. Correctly operating equipment promotes overall plant efficiency.
- All items and areas of equipment should be cleaned regularly.

#### **WARNING**

- **Avoid directly hosing any drive motor or electrical item.**

- All maintenance, service, modifications and significant deviations from Normal operating conditions should be recorded in the Plant Service Log
- After a month of operation, check the tension of all bolts associated with the plant and thereafter periodically. Bolted connections on painted surfaces can loosen due to thinning of the paint underneath the bolt head-bearing surface. Motor mounting bolts and other bolted connections subjected to vibration should be periodically checked for loosening.

#### **WARNING**

- **Before starting work on any item ensure that the power supply is isolated, tagged off, and the item cannot be started.**

- The importance of preventative maintenance cannot be over-emphasized. Regular maintenance and suitable care of the equipment will ensure a long and reliable service life of the equipment.
- Many stoppages can be avoided by following the recommended maintenance procedures. Do not wait until you hear the grinding of equipment that has broken down. If you see any item wearing down, replace it, before it causes damage to other associated items.

## Preventive Maintenance

Maintenance procedures recommended to extend switchboard life are outlined as follows: -

- Switchboard exterior should be regularly wiped down with a solvent base cleaner such as "Spray & Wipe". This will ensure longevity of the powder-coated surface.
- Accessible areas like distribution boards and motor starter panels should be cleaned with a vacuum cleaner to remove dust and foreign matter.
- PLC panels should be maintained as dust free as possible. Dusting with a dry rag is recommended - taking care not to allow dust inside the I/O modules or processor.
- When removing or installing PLC modules care should be taken to ensure that power is turned off to the rack before modules are removed or installed.
- Connections and efficient operation of circuit breakers, contactors and isolators should be checked every 12 months - especially where connected to busbars.
- Busbar connections should be checked every 12 months.
- Globes for indicator lights should be checked on a weekly basis with any faulty lamps replaced.
- Cubicle Fans Filter should be inspected and cleaned frequently.

## 1.4 Electrical Control System

### General Description

The switchboards are manufactured from 3mm aluminium and are suitable for location outdoors; the switchboards have been designed by QUU and contain several separate sections including:

- Incoming Section.
- Motor Starter Section.
- Distribution Section.
- RTU Section.

## 1.5 Control and Monitoring System.

The control and monitoring of the system is performed by the Queensland Urban Utilities telemetry system and was not included in this contract.

# 2. Manufacturers Technical Data

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Circuit Breaker
<b>Location:</b>	Power Distribution
<b>Model Numbers:</b>	various
<b>Manufacturer:</b>	Terasaki
<b>Supplier:</b>	NHP Pty Ltd 16 Riverview Place Murarrie (07) 3909 4999

**NHP**

# CIRCUIT BREAKER PRODUCTS PRICE LIST 2013

## CPB



MINIATURE CIRCUIT  
BREAKERS (MCBs) **01**

PANELBOARDS,  
LOADCENTRES  
& MCB CHASSIS **02**

MOULDED CASE  
CIRCUIT BREAKERS  
(MCCBs) **03**

CHASSIS ASSEMBLIES  
(MCCBs) **04**

TRANSFER SWITCHES  
& CONTROLLERS  
(MCCBs) **05**

TEMBREAK 1,  
TO 400 A / 1000 V  
(MCCBs) **06**

AIR CIRCUIT  
BREAKERS (ACBs)  
& ARC DETECTION  
SYSTEMS **07**

EARTH LEAKAGE  
RELAYS **08**

TECHNICAL  
REFERENCE **09**



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The Terasaki Electric Company, Japan, was founded in 1923 in the industrial city of Osaka. In its early beginnings it started with the manufacture of air circuit breakers. Terasaki later expanded its operations in the late 40s when they entered the marine industry manufacturing a complete line of moulded case circuit breakers.

Terasaki is world famous for its installations of marine switchgear, including air and moulded case circuit breakers in a majority of the world's ocean-going marine vessels.

Terasaki has developed systems beyond basic switchgear requirements for guidance and monitoring of ships on the high seas.

Terasaki is very proud of its achievements in this area, proving that quality and reliability of Terasaki products is recognised where service conditions are sometimes arduous and severe.

In the 1960s Terasaki expanded their production facilities to enable them to enter the industrial market as well as continuing to expand within the well established marine business. Terasaki have a total of four factories throughout Japan, mainly in the Osaka area, as well as affiliated companies in the UK, Malaysia, Spain, Italy, Finland, Sweden, Brazil and China.

Terasaki were the pioneers and the first circuit breaker company to introduce current limiting circuit breakers to the world in 1963 utilising the contact repulsion principle, which was first introduced in the TL range of moulded case circuit breakers.

NHP was appointed sole agent for Terasaki products in Australia in 1979 and in New Zealand in 1999. From that time until now, NHP has established Terasaki products as a standard in the market.



Prices shown in published catalogues or price lists are recommended selling prices only and there is no obligation on the part of any reseller to maintain the same prices. Prices are subject to change without notice and all orders are accepted by the Company on the condition that they will be invoiced at the prices ruling at the date of despatch.

Prices are nett unless otherwise stated, are shown in Australian Dollars, are valid only for sales within Australia and are subject to GST.

Products offered for sale in this pocket book are subject to our standard Conditions of Sale, applicable at the date the order is placed. NHP standard Conditions of Sale can be viewed on our website at <http://ecat.nhp.com.au> or by requesting a copy from any NHP office.

NHP has a policy of continuous product improvement and we reserve the right to alter any product at any time without notice. All detail is subject to change without notice and should be confirmed at the time of purchase. All price lists and quotations are issued on an Errors & Omissions Excepted basis (E&OE).

**Miniature circuit breakers (MCBs) and acc.**

Safe-T MCBs, Din-T MCBs Din-T6, 10, 10H and 15, Din-Safe RCDs and safety switches, Din-T MCB accessories. Surge diverters, contactors and time switches.

1

**Panelboards, loadcentres and accessories**

Insulated and metal loadcentres, general purpose, multi-purpose and premier panelboards, busbar chassis and fuses.

2

**Tembreak 1 and 2****Moulded Case Circuit Breakers (MCCBs)**

Thermal magnetic and electronic type MCCBs, earth leakage switches, DC and plug-in MCCBs.

3

**Chassis assemblies for the TemBreak range**

Temway XA / XB, PXB, XB SS and XC series, chassis to suit 125 - 250 AF MCCBs, terminal covers and HC high current chassis.

4

**MCCB transfer switches and controllers**

Manual, basic and automatic transfer switches, logic panels, transfer switch options and accessories.

5

**TemBreak 630 A - 1600 A and 1000 V mining MCCBs**

Thermal-magnetic and electronic MCCBs, 1000 V mining MCCBs and MCCB isolating switches.

6

**Air Circuit Breakers and Arc detection relays**

Standard air circuit breakers, main power circuit terminals, overcurrent relays and serial communication options. Arc detection relays.

7

**Earth leakage relays**

Surface mounting type TZS, DIN rail mounting type RD3A and RD1B, panel mounting type RD1DF, RD1EP, RD3E2 and RD1G2 and mining earth leakage relays.

8

**Technical reference**

MCB, MCCB general technical information, motor starting tables, DC applications, discrimination (selectivity) cascading, Type '1' and '2' co-ordination data. Electronic MCCB setting details.

9

This price list catalogue is segregated into sections. A guide to the contents of each section is situated at the front of the price list catalogue, and the first page of each section has its own index for easier product selection.

A product listing index is situated at the front of this price list.

Each page has a bold section number for prompt page location and is identified by both its section number and its page number eg. 1-16 signifies this is section 1 page 16. All **catalogue numbers** are bold and shaded.

**All prices are in \$AUS (exclusive of GST)**

Prices for equipment fitted with coils, apply to standard voltages only. Non-standard voltages shown are available on request at additional cost.

An alphanumeric index by catalogue number is located at the rear of the price list catalogue. Items prefixed **I** in the alphanumeric index are available on indent only. These items are not stocked and will be brought in only on a customer request, the item can not be returned for credit. For more information on indent items please contact NHP customer service. Items prefixed **A** in the alphanumeric index are assembled to customer order/ requirements.

Current NHP standard conditions of sale apply to this price list catalogue.

The prices in this price list catalogue are recommended prices only (exclusive of GST) and there is no obligation on resellers to comply with the recommendation.

Product group
DIN-T Miniature circuit breakers

1

**Din-T6**

2-in-1 Double the capacity of your load centre

Page contents

- 6 kA 'C' curve
- Standard AS/NZS 60898
- Approval No. NSW24783
- Current range 2 - 40 A
- C curve tripping characteristics
- Saves up to 50 % space
- DIN rail mounting
- General purpose light and power



1P + 1P      3 Pole

Curve types: C (5 - 10 in)

1 pole + 1 pole			2 pole		
Single module width (18 mm)			Single module width (18 mm)		
In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCBD61102C	182.00	2	DTCBD6202C	171.00
4	DTCBD61104C	182.00	4	DTCBD6204C	171.00
6	DTCBD61106C	182.00	6	DTCBD6206C	171.00
10	DTCBD61110C	182.00	10	DTCBD6210C	171.00
16	DTCBD61116C	182.00	16	DTCBD6216C	171.00
20	DTCBD61120C	182.00	20	DTCBD6220C	171.00
Must be same phase.			25	DTCBD6225C	171.00
			32	DTCBD6232C	171.00
			40	DTCBD6240C	171.00

3 pole			4 pole		
Double module width (36 mm)			Double module width (36 mm)		
In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCBD6302C	275.00	2	DTCBD6402C	390.00
4	DTCBD6304C	275.00	4	DTCBD6404C	390.00
6	DTCBD6306C	275.00	6	DTCBD6406C	390.00
10	DTCBD6310C	275.00	10	DTCBD6410C	390.00
16	DTCBD6316C	275.00	16	DTCBD6416C	390.00
20	DTCBD6320C	275.00	20	DTCBD6420C	390.00
25	DTCBD6325C	275.00	25	DTCBD6425C	390.00
32	DTCBD6332C	275.00	32	DTCBD6432C	390.00
40	DTCBD6340C	275.00	40	DTCBD6440C	390.00

**Notes:** 16 mm tunnel terminals.  
 Not suitable for chassis mounting.  
 Compatible with NHP Terasaki auxiliaries and accessories.

1 - 16 NHP Sales 1300 NHP NHP  
www.nhp.com.au
GST not included
Price schedule 'T1'

Cat. No. of product is shown next to the applicable price. The catalogue numbers are bold and shaded for quick identification.

Section and page number e.g. section 1, page 16.

Illustrative photographs or diagrams indicative of products available (not necessarily to scale)

Recommended list price (exclusive of GST)

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## National Manufacturing and Distribution Centre

NHP prides itself on being able to provide customers with tailored solutions that suit their individual needs. Whilst we have significant stockholdings and expertise at all our locations throughout Australia and New Zealand, the purpose of our National Manufacturing and Distribution Centre in Laverton, Melbourne is to develop these solutions through manufacturing, assembly, servicing and design and engineering.



### SIZE

Warehouse 7,000 m<sup>2</sup>

Manufacturing 5,000 m<sup>2</sup>

### STAFF

270+ Employees

### OPERATING HOURS

6.00am - 11.30pm, Monday-Friday

### STOCKHOLDING

- 45,000+ line items (20,000 stocked)

- Approximately \$70 M



### ITEM THROUGHPUT

- Approximately 5,500 per day (6,000 lines throughout Australasia)

NHP NATIONAL MANUFACTURING AND DISTRIBUTION CENTRE

### FACTS

- Orders released for picking before 3.00 pm are despatched the same day.
- The Supply Chain team strives to achieve 95 % customer service based on an 'on time in full, first time' measurement.



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Scan the QR code to view our Concept Express video



## Creating a sustainable future

Adopting emerging technologies to support sustainable practices

A major push towards more sustainable practices by many in the industrial electrical industry is today clear for all and a major focus at NHP is to provide sustainable solutions for our customers as well as throughout our own operations.

In 2010 we designed and constructed our very own Sustainability Centre - located at our existing National Manufacturing and Distribution Centre in Laverton, Melbourne.

Housing cutting-edge technology and equipment enabling research & development and testing, the Centre aids investigation into ways to effectively introduce and manage sustainable practices. Sustainable technologies within the centre include:

- A horizontal axis wind generator
- Solar photo-voltaic systems
- Grid interactive systems
- Off-grid hybrid systems
- Dual axis solar tracker, and
- Energy Management & control systems

NHP are also proud participants in the Victorian Government's electric vehicle trial which will provide valuable insights to assist in future business planning, as well as help the wider community understand the process, timelines and barriers for transitioning to electric vehicle technologies in the future.

These initiatives highlight our commitment to sustainable practices across all facets of the workplace. Our aim is to remain at the forefront of the industry, as leaders in providing alternative energy solutions for commercial and industrial applications.

Working closely with Melbourne University, RMIT University and Victoria University, NHP is also proud to educate young electrical engineers in this growing and important industry sector.



ONE OF NHP'S ELECTRIC CARS ON DISPLAY AT THE SUSTAINABILITY CENTRE IN LAVERTON, MELBOURNE



To assist customers in finding what they want, we have classified our extensive product range into the following categories.

1. Market Categories

**AUTOMATION SYSTEMS**

The automation system relies on information from the field to control the process. NHP's switching and sensing suite of products cover all field sensing requirements including standard and hazardous area applications.



*Rockwell Software*



**SPECTRUM CONTROLS**

**WAGO**

**ESA**

**MITSUBISHI**

**CARLO GAVAZZI**

**POWER DISTRIBUTION & PROTECTION**

Most processes, even if automated, still require some manual control and NHP provides a complete range of control products and systems for this purpose.



**ALLEN-BRADLEY**

**ERICO**

**WOHNER**

**MOTOR CONTROL & DRIVES**

Divided into two distinct product ranges, NHP's plugs and sockets provide solutions for a wide range of applications and are available in a wide range of amperages and pin configurations.



**AUCOM**

**SANTERNO**

**GHISALBA**

**MICROELETTRICA**

**POWER QUALITY**

NHP offer a large variety of quality safety products that meet international standards, with products ranging from emergency stop switches, light curtains, and safety monitoring relays all the way up to fully integrated safety PLC systems and SIL3 rated Safety Critical Shutdown systems.



**ELECTRONICON**

**BELUK**

**ENCLOSURES & CLIMATE CONTROL**

NHP has a complete range of mild steel, stainless and plastic enclosure options in a variety of IP ratings and configurations including modular switchboard systems.

To complement NHP's enclosure systems, a wide range of climate control solutions are also available.



**TERMINATION & WIRING SYSTEMS**

NHP has a wide range of screw and screw-less terminals, terminal accessories (such as a DIN rail and jumper pins), cable ducting and pre-wired cable looms for Allen Bradley automation systems which significantly reduces labour intensive wire termination.



**SIGNALLING DEVICES**

With an extensive range of audible and visual signalling devices, NHP provides solutions for hundreds of applications, be it general safety warning, process control, fire or evacuation.



**TIMERS & CONTROL RELAYS**

NHP offers a range of control relays and timers that can be used in conjunction with a conventional automation system to switch higher loads or in stand alone applications where the only basic single function control is required.



**FIELD SWITCHING & SENSING**

The automation system relies on information from the field to control the process. NHP's switching and sensing suite of products cover all field sensing requirements including standard and hazardous area applications.



**CARLO GAVAZZI**  
**STEUTE**

**PLUGS & SOCKETS**

Divided into two distinct product ranges, NHP's plugs and sockets provide solutions for a wide range of applications and are available in a wide range of amperages and pin configurations.



**PROCONNECT**

**OPERATOR CONTROL DEVICES**

Most processes, even if automated, still require some manual control and NHP provides a complete range of control products and systems for this purpose.



**ELEKTRA**  
**SPOHN + BURKHARDT**  
**TER**

**SAFETY PRODUCTS**

NHP offer a large variety of quality safety products that meet international standards, with products ranging from emergency stop switches, light curtains, and safety monitoring relays all the way up to fully integrated safety PLC systems and SIL3 rated Safety Critical Shutdown systems.



**HAZARDOUS AREA  
EQUIPMENT**

NHP provided a world class range of hazardous area equipment for explosive environments including light fittings, enclosures and terminal boxes, control stations and intrinsically safe automation products.



**WAGO  
STEUTE  
ALLEN-BRADLEY**

**METERING**

Energy Metering is the essential component to understanding your energy consumption and power quality. NHP has a complete range of energy meters and power quality analysers to meet the most demanding of applications.



**RENEWABLE ENERGY  
PRODUCTS**

NHP offers a large selection of products and solutions tailored towards renewable energy applications including Solar and Wind.



**SERVICES & TRAINING**

NHP has a wide range of services including technical support, field service and maintenance contracts, repair services and training.



## 2. Application Classes

### HAZARDOUS AREA EQUIPMENT

When servicing important industries such as the oil and gas, petrochemical and grain handling there is no room for complacency. At NHP our aim is to provide a world class range of hazardous area equipment for the hazardous market which includes light fittings, terminal boxes, control stations and an extensive suite of automation products. NHP has been in this field for many years and has acquired a comprehensive knowledge on explosion protection products, so wherever explosive atmospheres are prevalent, NHP can provide the safest solution.



WAGO

STEUTE

ALLEN-BRADLEY

### PROCESS CONTROL

Like the principles which drive the process industry, NHP is committed to delivering products of continuous quality to assist our customers in achieving process optimisation. Encompassing a wide range of industries including oil refining, petrochemicals, water and sewage treatment, food processing, and pharmaceuticals, the NHP process control product portfolio offers complete system integration.

### SAFETY

For any industrial application, the safety of employees and the general population is of major importance. NHP has a long history in the safety industry and can be a trusted destination for all your safety application needs. NHP offer a large variety of quality products that meet all relevant international standards, with products ranging from simple emergency stop switches, to light curtains, safety monitoring relays all the way up to fully integrated safety PLC systems. Our product range extends further into SIL3 rated Safety Critical Shutdown systems.



STEUTE

KATKO



*Rockwell Software*

### 3. Application Solutions

#### ENERGY MANAGEMENT

NHP can provide Energy Management Metering and Software solutions that monitor and record energy information so operators can identify consumption trends and take corrective actions. Real-time measurements of these electrical parameters, such as voltage variations or distortions, may have alarm thresholds set to warn managers if preset limits are reached. These real-time measurements also allow site managers to anticipate overload conditions that could, for example, trip a circuit breaker. NHP can provide a wide range of products to complement any Energy Management Solution.

#### SUSTAINABILITY

With an increasing focus on the state of global warming and the requirement to decrease our carbon footprint, the use of sustainability is becoming a popular phenomenon. Our partnerships with many of the industries best suppliers from around the world means that NHP offer a large selection of products and solutions tailored towards renewable energy applications including Solar and Wind. From high DC rated protection and switching devices, solar panel control and monitoring products through to a range of inverters and power factor correction, NHP has an extensive offering.



# HOM ON THE

With NHP's Price Lists available for download online, you can now access product information anytime, anywhere!



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latest NHP catalogues and price lists.

WEB



## Information at your fingertips

The latest NHP and industry news is never far away through NHP's communications technology platforms

With technology constantly evolving, so too are the ways in which we communicate and at NHP we recognise that what works today, will not necessarily work tomorrow. In line with this approach, NHP ensures it remains at the cutting edge of new communication platforms to ultimately provide timely, relevant and most of all valuable information to our customers.

By utilising the latest platforms such as smart phone and tablet technology (complete with a range of iTunes and Android compatible Apps), the social networking revolution, Quick Response (QR) codes, and much more, NHP are able to share the right messages in the right ways – the ways that our customers want to receive them.



Please scan the QR code to view our corporate website.



Scan the QR code to view our new interactive pulp and paper website



Everything you ever need to download for your Apple or Android device is located in the one convenient location. Scan the QR code to view NHP's mobile content



Scan the QR code to subscribe to NHP Connect

## Events

Setting the industry standard for events

While NHP is renowned for providing quality products and service to our customers, we also know how to put on a great event.

Be it a customer function, new product launch, a road show or training and seminars, NHP looks to provide an event that will not only get people interested in coming along, but also to keep them entertained and informed from when they arrive.

With a dedicated Events team that prides itself on customer satisfaction, whether it be hands-on and interactive displays, informative speakers, quality training, giveaways, competitions and much more, NHP's events will always leave you wanting more.



## NHP Electrical Engineering Products



**NHP NATIONAL MANUFACTURING AND DISTRIBUTION CENTRE**

NHP Electrical Engineering Products (NHP) specialises in motor control, power distribution and automation systems.

NHP offers the Australasian market the complete industrial electrical and automation solutions package. As authorised distributors for Rockwell Automation and their Allen-Bradley® products in our designated areas of Australia and throughout all of New Zealand, NHP is partnered with the leading global provider of industrial automation solutions and switchgear components.

An Australian owned company, NHP is committed to serving the Australasian industry with quality products and customer support. This is achieved through a 1000+ strong team which is distributed across 25 branches and 24 regional locations throughout Australia and New Zealand.

While NHP stock an impressive 45,000+ line items, we are much more than a component supplier. NHP source the highest quality products from leading global suppliers, and customise these into solutions for the local Australian and New Zealand markets, providing a complete fit to purpose systems and solutions service.

At NHP we have a strong customer focus and we look to provide the right product and product solutions for our customers' requirements and applications, all at a competitive price. We value and care for our customers and support them by offering personalised service and assistance to meet their every need and demand. Our customers can have 100% confidence in our ability to support them when, where and how it is needed.

Put simply, NHP is 'easy to do business with'.



Please scan the QR code to view our corporate presentation.



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"Corporate DNA"  
The NHP Value Proposition





CORP-PROJECTS-ADS-CPB

## THINK MAJOR PROJECTS. THINK NHP.

When it comes to Major Projects, our staff involvement is always driven by long term results, actively seeking to support you with the right product and technical solutions before, during and after project completion.

### Major Projects Team

No matter what the project, from the initial stages of concept design, through to post-commissioning and future upgrades, NHP's Major Projects Team is there to see the project through together with you - our customer.

Our quality people have a diverse reach across Australia and New Zealand and their vast industry experience is sure to be there for you when you need it.

Think Major Projects. Think NHP.

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#### Terasaki

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## Miniature circuit breakers and accessories (MCBs)

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## Miniature circuit breakers Safe-T & Din-T



Miniature Circuit Breakers	Safe-T	DIN-T6	Din-T10
<b>Standard (AS/NZS) <sup>1)</sup></b>	3111 / 2184 <sup>2)</sup>	60898	60898
<b>No. poles &amp; module width</b>			
1P	25 mm	18 mm	18 mm
2P	50 mm	36 mm	36 mm
3P	75 mm	54 mm	54 mm
4P	100 mm	-	72 mm
<b>Mounting</b>	Clip tray	DIN rail	DIN rail
<b>Current ratings</b>	6 A - 100 A	2 A - 63 A	0.5 A - 63 A
<b>Short circuit rating (kA)</b>	6 kA	6 kA	10 kA
<b>Curve types</b>	General	C & D	B, C & D
<b>Rated AC voltage 1P/2,3,4P</b>	240/415 V	240/415 V	240/415 V
<b>Rated DC voltage</b>	250 V -2P 5 kA	48 V 1P 110 V 2P	48 V 1P 110 V 2P
<b>Sealable in ON-Off position</b>	No	Yes	Yes
<b>Trip-free mechanism</b>	Yes	Yes	Yes
<b>Centre trip position</b>	Yes	No	No
<b>Padlock facility- non captive</b>	Yes	Yes	Yes
<b>Padlock facility- captive</b>	Yes	Yes	Yes
<b>Busbar connection- On-top</b>	Fork	Pin	Pin
<b>Busbar connection- OFF-bottom</b>	Fork	Fork/Pin	Fork/Pin
<b>Terminal size- On-top</b>	-	35 mm <sup>2</sup>	35 mm <sup>2</sup>
<b>Terminal size- OFF-bottom</b>	-	35 mm <sup>2</sup>	35 mm <sup>2</sup>

**Notes:** <sup>1)</sup> UL listed MCB refer to NHP.

<sup>2)</sup> AS only.



Din-T15	Din-T10H	Din-T 2-in-1	Din-T DC	Din-T Easy-Fit
60947-2	60947-2	60898	60898	60898
18 mm	27 mm	18 mm	18 mm	18 mm
36 mm	54 mm	18 mm	36 mm	-
54 mm	81 mm	36 mm	-	54 mm
72 mm	108 mm	36 mm	81 mm	-
DIN rail	DIN rail	DIN rail	DIN rail	DIN rail
0.5 A - 63 A	80 A-125 A	2 A-40 A	0.5 A-63 A	6 A-63 A
15 kA - 50 kA	10 kA	6 kA	6 kA T15	6 kA
C	C & D	C	B & C	C
240/415 V	240/415 V	240/415 V	240/415 V	240/415 V
48 V 1P 110 V 2P	125 V 2P 250 V 4P	-	250 V 1P 500 V 2P 880 V 4P	-
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
No	No	No	No	No
Yes	Yes	Yes	Yes	Yes
Yes	Yes	No	Yes	No
Pin	Pin	Pin	Fork/Pin	-
Fork/Pin	Pin	Pin	Fork/Pin	Pin
35 mm <sup>2</sup>	70 mm <sup>2</sup>	16 mm <sup>2</sup>	35 mm <sup>2</sup>	4 mm <sup>2</sup> 6 A-20 A 35 mm <sup>2</sup> 25 A - 63 A
35 mm <sup>2</sup>	70 mm <sup>2</sup>	16 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>

## Miniature circuit breakers Safe-T & Din-T



Residual Current Devices	Safe-T SRCB	Din-Safe DSRCD	Din-Safe DSRCBS
<b>Standard (AS/NZS) <sup>1)</sup></b>	3111 /3190 <sup>2)</sup>	61008	61009
<b>No. poles &amp; module width</b>	1P + N - 25 mm	2P - 36 mm, 4P - 72 mm	1P + N - 18 mm
<b>Mounting</b>	Clip tray	DIN rail	DIN rail
<b>Current ratings</b>	10 A, 16 A, 20 A	40 A, 63 A, 80 A, 100 A & 125 A	6 A, 10 A, 16 A, 20 A, 25 A & 32 A
<b>Trip sensitivity</b>	10 mA & 30 mA	30 mA, 100 mA, 300 mA, 500 mA	30 mA
<b>Sensitivity type</b>	AC	AC, A, AI, S & B	AC & A
<b>Short circuit rating (kA)</b>	6 kA	Inc -10 kA MCB or fuse backup	6 kA
<b>Curve types</b>	General	-	B & C
<b>Rated AC voltage</b>	240 V	240 V/415 V	240 V
<b>Sealable in ON-Off position</b>	No	Yes	Yes
<b>Trip-free mechanism</b>	Yes	Yes	Yes
<b>Centre trip position</b>	Yes	No	No
<b>Padlock- non captive</b>	No	Yes	Yes
<b>Padlock- captive</b>	Yes	No	No
<b>Busbar connection- On-top</b>	Fork	Pin	-
<b>Busbar connection- OFF-bottom</b>	Fork	Fork/Pin	Pin
<b>Terminal size- On-top</b>	-	50 mm <sup>2</sup>	16 mm <sup>2</sup>
<b>Terminal size- OFF-bottom</b>	-	50 mm <sup>2</sup>	35 mm <sup>2</sup>

**Notes:** <sup>1)</sup> UL listed MCB refer to NHP.

<sup>2)</sup> AS only.



Din-Safe DSRCBH	Din-Safe DSRCB	Din-Safe DSRCB-P	Din-Safe DSRCM	Din-Safe Easy-fit
61009	61009	61009	3190 <sup>2)</sup>	61008
1P + N - 18 mm	2P - 36 mm	2P - 36 mm	1P + N, 3P & 3P + N	2P - 36 mm, 4P - 72 mm
DIN rail	DIN rail	DIN rail	DIN rail	DIN rail
6 A, 10 A, 16 A, 20 A, 25 A, 32 A & 40 A	6 A, 10 A, 16 A, 20 A, 25 A, 32 A & 40 A	6 A, 10 A, 16 A, 20 A, 25 A, 32 A & 40 A	32 A, 63 A	40 A, 63 A
10 mA & 30 mA	10 mA & 30 mA	10 mA & 30 mA	30 mA, 100 mA & 300 mA	30 mA
A	AC & A	AC & A	AC	AC
10 kA	10 kA	10 kA	-	Inc - 10 kA MCB or fuse backup
C	C	C	-	-
240 V	110 V/240 V	110 V/240 V	240 V/415 V	240 V/415 V
Yes	Yes	Yes	No	Yes
Yes	Yes	Yes	Yes	Yes
No	No	No	No	No
Yes	Yes	Yes	No	Yes
Yes	Yes	Yes	No	No
-	Pin	-	-	-
Fork/Pin	Fork/Pin	Fork/Pin	-	Pin
25 mm <sup>2</sup>	25 mm <sup>2</sup>	25 mm <sup>2</sup>	32 A- 16 mm <sup>2</sup> 63 A- 25 mm <sup>2</sup>	50 mm <sup>2</sup>
35 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>	-	50 mm <sup>2</sup>

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## Safe-T series 6-100 A

### 6 kA

- Standard AS 3111 AS 2184 <sup>1)</sup>
- Approval No. V99347
- UL 489 fluorescent switching duty <sup>1)</sup>
- Lloyd's register
- Current range 6 -100 A 1, 2, 3 and 4 pole
- Clip-tray mounting. Suits CT type busbar chassis
- General purpose light and power distribution

### Technical data

**Interrupting capacity:** 6 kA at 250 V AC (sym) 1 pole  
 6 kA at 400 V AC (sym) 2 & 3 pole  
 5 kA at 125 V DC 2 pole

**Thermal setting:** Fixed (40 °C)

**Magnetic setting:** Fixed

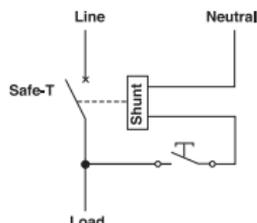
**Tropic proofed:** Standard

### Shunt Trip - Coil rating

Voltage (V)	Current peak (A)
120-440 V AC	4.88 (440 V)
48-250 V DC	2.32 (250 V)

### Warnings

Short time rated coil.  
 Coil burnout will result if coil remains energised.



Shunt trip wiring diagram



**Notes:** <sup>1)</sup> Fluorescent light switching duty – UL 489  
 All Safe-T MCBs are by design suitable for fluorescent light switching duty as per the requirements of UL 489 issued by Underwriters Laboratories (USA). Performance standards to regularly switch banks of fluorescent lights ON and OFF require the MCB to withstand the higher inrush current (up to 30 times normal rating). If the MCB cannot withstand this inrush current, contact erosion and excess temperature rise will be experienced. Safe-T MCBs have been designed to withstand this type of duty. (Refer NHP)  
 Backup fuse data, refer to page 9 - 10. Accessories, refer to page 1 - 9.

## Safe-T series 6-100 A

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Amp rating	Cat. No.	1 pole Price \$	Cat. No.	2 pole Price \$
6	SAFET6106	61.50	SAFET6206	190.00
10	SAFET6110	61.50	SAFET6210	190.00
16	SAFET6116	61.50	SAFET6216	190.00
20	SAFET6120	61.50	SAFET6220	190.00
25	SAFET6125	61.50	SAFET6225	190.00
32	SAFET6132	61.50	SAFET6232	190.00
40	SAFET6140	61.50	SAFET6240	190.00
50	SAFET6150	61.50	SAFET6250	190.00
63	SAFET6163	61.50	SAFET6263	190.00
80	SAFET6180	138.00	SAFET6280	355.00
100	SAFET61100	138.00	SAFET62100	355.00
63	SAFET6163NA <sup>2)</sup>	65.50	SAFET6263NA <sup>2)</sup>	164.00
100	SAFET61100NA <sup>2)</sup>	103.00	SAFET62100NA <sup>2)</sup>	220.00

Amp rating	Cat. No.	3 pole Price \$	Cat. No.	3P + N <sup>1)</sup> Price \$
6	SAFET6306	225.00	SAFET6406	315.00
10	SAFET6310	225.00	SAFET6410	315.00
16	SAFET6316	225.00	SAFET6416	315.00
20	SAFET6320	225.00	SAFET6420	315.00
25	SAFET6325	225.00	SAFET6425	315.00
32	SAFET6332	225.00	SAFET6432	315.00
40	SAFET6340	225.00	SAFET6440	315.00
50	SAFET6350	225.00	SAFET6450	315.00
63	SAFET6363	225.00	SAFET6463	315.00
80	SAFET6380	405.00	SAFET6480	495.00
100	SAFET63100	405.00	SAFET64100	495.00
63	SAFET6363NA <sup>2)</sup>	200.00	SAFET6463NA <sup>2)</sup>	285.00
100	SAFET63100NA <sup>2)</sup>	285.00	SAFET64100NA <sup>2)</sup>	440.00

- Notes:** <sup>1)</sup> Neutral pole is switched but does not provide overcurrent or short circuit protection.  
<sup>2)</sup> NA – Non-Auto MCB without overcurrent or short circuit protection, suitable for main switch.  
 Refer page 9 - 10 for back-up fuse data. Accessories refer page 1 - 9.

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## Safe-T series 6-100 A fitted with shunt trip

Amp rating	Cat. No.	1 pole Price \$	Cat. No.	2 pole Price \$
6	SAFET6106SHT	190.00	SAFET6206SHT	325.00
10	SAFET6110SHT	190.00	SAFET6210SHT	325.00
16	SAFET6116SHT	190.00	SAFET6216SHT	325.00
20	SAFET6120SHT	190.00	SAFET6220SHT	325.00
25	SAFET6125SHT	190.00	SAFET6225SHT	325.00
32	SAFET6132SHT	190.00	SAFET6232SHT	325.00
40	SAFET6140SHT	190.00	SAFET6240SHT	325.00
50	SAFET6150SHT	190.00	SAFET6250SHT	325.00
63	SAFET6163SHT	190.00	SAFET6263SHT	325.00
80	SAFET6180SHT	270.00	SAFET6280SHT	475.00
100	SAFET61100SHT	270.00	SAFET62100SHT	475.00
63	SAFET6163NASHT <sup>2)</sup>	184.00	SAFET6263NASHT <sup>2)</sup>	285.00
100	SAFET61100NASHT <sup>2)</sup>	225.00	SAFET62100NASHT <sup>2)</sup>	350.00

Amp rating	Cat. No.	3 pole Price \$	Cat. No.	3P + N <sup>1)</sup> Price \$
6	SAFET6306SHT	350.00	SAFET6406SHT	440.00
10	SAFET6310SHT	350.00	SAFET6410SHT	440.00
16	SAFET6316SHT	350.00	SAFET6416SHT	440.00
20	SAFET6320SHT	350.00	SAFET6420SHT	440.00
25	SAFET6325SHT	350.00	SAFET6425SHT	440.00
32	SAFET6332SHT	350.00	SAFET6432SHT	440.00
40	SAFET6340SHT	350.00	SAFET6440SHT	440.00
50	SAFET6350SHT	350.00	SAFET6450SHT	440.00
63	SAFET6363SHT	350.00	SAFET6463SHT	440.00
80	SAFET6380SHT	540.00	SAFET6480SHT	630.00
100	SAFET63100SHT	540.00	SAFET64100SHT	630.00
63	SAFET6363NASHT <sup>2)</sup>	335.00	SAFET6463NASHT <sup>2)</sup>	425.00
100	SAFET63100NASHT <sup>2)</sup>	425.00	SAFET64100NASHT <sup>2)</sup>	560.00

### Operation

For remote tripping of Safe-T MCB (1 to 4 poles), manual resetting of MCB required. Inline shunt trip requires no extra pole spaces; refer to page 1 - 10 for connection diagram.

### Application

Emergency stop and isolation of industrial socket outlets.

- Notes:** <sup>1)</sup> Neutral pole is switched but does not provide overcurrent or short circuit protection.  
<sup>2)</sup> NA – Non-Auto MCB without overcurrent or short circuit protection, suitable for main switch.

Backup fuse data, refer to page 9-10.

Accessories to suit Safe-T MCBs, refer to page 1 - 9.

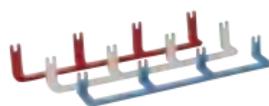
## Safe-T series

### Options, hardware and accessories

Description		Cat. No.	Price \$
Handle lock	Yellow	TAA5LY <sup>1)</sup>	3.30
Padlock attachment	1 pole	TKB50SGL <sup>1)</sup>	21.20
	3 pole	TKC50SG <sup>1)</sup>	21.20
Padlock attachment kits (captive)	12 pack and resin	SAFETLCK 12 <sup>1)</sup>	159.00
	24 pack and resin	SAFETLCK 24 <sup>1)</sup>	210.00
Tunnel terminal	35 mm <sup>2</sup> Safe-T (6-63 A)	7T1ST <sup>1)</sup>	13.00
	70 mm <sup>2</sup> Safe-T (80-100 A)	7T2ST <sup>1)</sup>	15.60
T-off plastic caps		TH250TOPC	0.60
Pole fillers		SAFETPF	1.80
Clip-tray (per 12 pole pieces)		TDB50SG12	20.20
Link bar (1 phase)	18 pole	LB18	27.00
Link bar (3 phase) 120 A	12 pole	LB3PH12	153.00
	18 pole	LB3PH18	215.00



3 phase wiring harness



3 phase link bars



1 phase link bar



Tunnel terminals



TAA5LY



TKC50SG Locking attachments

**Notes:** <sup>1)</sup> Doesn't suit SRCB.

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## Safe-T series (RCBO)

### Single pole width residual current circuit breakers

- Standard AS 3111 AS 3190
- Approval No. N15251
- Current rating: 10, 16 and 20 A
- Voltage 240 V AC 50/60 Hz (not suitable for 415/440 V)
- Short circuit protection 6000 A
- Earth leakage protection 30 mA and 10 mA



#### Operation

Safe-T single pole width residual current circuit breakers offer overload, short circuit and earth leakage protection in a single module width unit.

Mounting arrangements are identical to those throughout the Safe-T MCB range utilising the NHP clip-tray mounting system in panelboards and loadcentres.

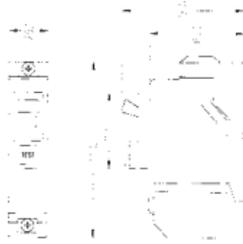
Amp rating	No. of poles	Modules	Trip sensitivity (mA)	Cat. No. <sup>1)</sup>	Price \$
10	1	1	30	<b>SRCB 1030</b>	<b>325.00</b>
16	1	1	30	<b>SRCB 1630</b>	<b>325.00</b>
20	1	1	30	<b>SRCB 2030</b>	<b>325.00</b>
10	1	1	10	<b>SRCB 1010</b>	<b>360.00</b>
16	1	1	10	<b>SRCB 1610</b>	<b>360.00</b>
20	1	1	10	<b>SRCB 2010</b>	<b>360.00</b>

\* For other current ratings or for 3 phase, refer to ELR relay page 1-11.

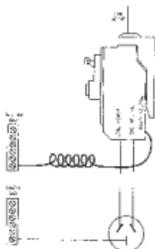
#### Accessories

Description	Cat. No.	Price \$	
Padlock attachment kit (captive)	12 pack and resin 24 pack and resin	<b>SRCBLCK 12</b> <b>SRCBLCK 24</b>	<b>275.00</b> <b>450.00</b>
Adaptor kit	Eaton, Cutler-Hammer (Quicklag)	<b>SRCBWA</b>	<b>26.40</b>
	Heinemann	<b>SRCBHA</b>	<b>26.40</b>

#### Dimensions (mm)



#### Connection diagram



Adaptors - allows SRCB to be fitted to Heinemann and Eaton chassis



Padlock attachment kit

**Notes:** <sup>1)</sup> Neutral not switched.

**Nuisance tripping may be experienced in VFD and motor starting applications, refer NHP.**

## Safe - T series (ELR) Earth leakage relay



- Standard AS 3190
- Approval No. N15380
- NHP clip-tray mounting (CT chassis)

### Application

The ELR is identical in width to the single pole Safe-T MCB. The ELR is clip-tray mountable alongside the Safe-T MCB when fitted to the CT chassis, as found in the CST/CPS series panelboards.

When the ELR is combined with a Safe-T MCB fitted with a shunt trip, the resulting combination offers overload, short circuit and earth leakage protection and can be retrofitted into an existing installation or installed in a new installation.

**Suitable for commercial and industrial applications.**

### Test function

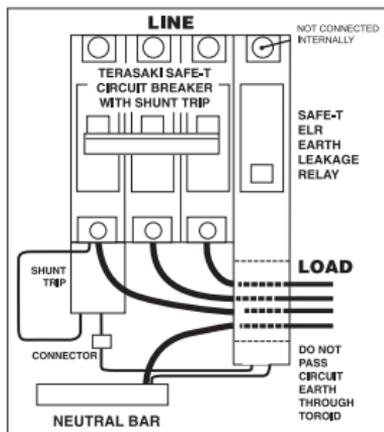
A test button is provided on the unit to functionally test the detection and tripping circuits.

It is recommended a functional test be performed monthly.

No. of Poles	Sensitivity (mA) <sup>1)</sup>	Voltage (AC)		Cat. No.	Price \$
1	10	240	50/60 Hz	<b>ELR24010</b>	<b>590.00</b>
1	30	240	50/60 Hz	<b>ELR24030</b>	<b>590.00</b>
1	100	240	50/60 Hz	<b>ELR240100</b>	<b>590.00</b>
1	300	240	50/60 Hz	<b>ELR240300</b>	<b>590.00</b>
1	30	415-440	50/60 Hz	<b>ELR44030</b>	<b>590.00</b>

### Technical data

- Operation: Instantaneous
- Frequency: 40-60 Hz
- Output ratings: I peak 8 A,  
I average 0.5 A
- Toroid window: 4 x 35 mm<sup>2</sup>  
(aperture diameter 35 mm)
- Dimensions: H = 152 mm  
W = 25 mm  
D = 60 mm
- Weight: 0.16 kg



**Notes: Nuisance tripping may be experienced in VFD and motor starting applications, refer NHP.**

## Din-T series

### General features

#### Advantages of the Din-T series miniature circuit breakers

- Short circuit breaking capacity of 6, 10 and 15 kA at 415 V AC
- Increased rating up to 63 kA when backed up with HRC fuses (Refer page 9 - 10)
- Rated current range from 0.5 A to 125 A
- Silver graphite contacts
- Input connection by lifting cage terminal with capacity of up to 35 mm<sup>2</sup> giving fast and practical connection
- Output terminals offer finger and hand protection with a capacity of up to 35 mm<sup>2</sup>
- Snap fixing with two stop locations, for normal DIN rail mounting
- Approval number N17481
- Conforms to AS/NZS 60898 and AS 60947-2 as applicable

#### Brief description

The Din-T series miniature circuit breakers have inverse time delayed thermal and instantaneous magnetic trips and are suitable for mounting in distribution boards or in switchgear panels and consumer units.

#### Operation

Protection against overheating of electrical conductors, excess currents due to overload, short circuit or earth fault.

#### Application

In switching, control, distribution and measurement systems for domestic, commercial and industrial installations.

#### Tripping characteristics

##### Thermal release

In case of overload, the release is initiated by a bi-metal strip. Standards AS/NZS 60898 and AS 60947 define the range of release for specific overload values. Reference ambient temperatures are 30 °C and 40 °C for the respective standards.

##### Magnetic release

In case of short circuit, an electromagnet with plunger ensures instantaneous tripping. AS/NZS 60898 describes the characteristics for the following curve types:

Curve Type	Test current	Application
B	3 - 5 x I <sub>n</sub>	Resistive loads
C	5 - 10 x I <sub>n</sub>	Protection of general distribution loads - lighting - socket outlets - motors etc.
D	10 - 20 x I <sub>n</sub>	Protection of circuits having high inrush transient currents - high inertia motor starting - transformers - welders

## Din-T series General features

### Handle

Sealable and padlockable with quick-make and quick-break type mechanism. The handle is sealable in ON and OFF position. Due to the free-tripping mechanism, the MCB contacts open through overload or short circuit even when the handle is sealed in the ON position on all types.

### Input terminal ('OFF' side)

Box terminal with lifting screw for copper and aluminium conductors: maximum capacity 1 x 35 mm<sup>2</sup> or 2 x 16 mm<sup>2</sup>.

When unscrewing the screw, the head lifts; however, on pushing the screw head, the box terminal opens. This system enables the MCBs to be linked with a cable and fork or pin type bus comb. The MCB is delivered with a half open box terminal and a lifted screw head.

### Output terminal ('ON' side)

Box terminal with captive terminal screw for copper and aluminium conductors: max. 1 x 35 mm<sup>2</sup> or 2 x 16 mm<sup>2</sup>.

The box terminals are always delivered in the open position. Output terminal screw has IP 20 protection against direct finger contact by standard design.

### Arc chamber

Contains arc extinction plates, (de-ionising type) designed to break up and dissipate the arc which is generated during interruption of all types of faults.

### Electromagnet

Operating the plunger which opens the contacts instantaneously.

### Arc magnetic blowout system

Short circuit currents do not flow through the bi-metal but are directed by the blowout magnet in such a way that the arc is transferred to a special arc runner, therefore taking the bi-metal out of the circuit, which ensures the thermal trip characteristics remain unchanged after an MCB has been exposed to a fault current.

- This combination of the electromagnet (with a plunger rapidly opening the contacts), the blowout magnet and the arc chamber, results in an extremely high short circuit breaking capacity, and very low let through energy.

### Catalogue Number construction for Din-T MCBs (6, 10, 10H and 15)

**DTCB - XX - X - XX - X**

Product series code Din-T Circuit Breaker	Short circuit capacity (A)		Polarity	Current (A)		CurveType
	6	10000		05	0.5	
10	10000	1	1 pole	01	1	B 3 In - 5 In
10H	10000	2	2 pole	02	2	C 5 In - 10 In
15	15000	3	3 pole	03	3	D 10 In - 20 In
DC	6000	1N	1P + N	04	4	
D6	6000	4	3P + N	06	6	
E6	6000	11	1P + 1P	10	10	
				13	13	
				Etc		

## Din-T6 Series 2-63 A

### 6 kA 'C' curve

- Standard AS/NZS 60898
- Approval No. N17481
- Current range 2-63 amps 1, 2 and 3 pole
- Sealable and lockable handle
- DIN rail mounting
- Padlockable in OFF position
- Suits CD, NC or GB chassis
- General purpose light, power and motor starting



### Curve type: C (5 – 10 In) Single pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6102C	37.00	20	DTCB6120C	37.00
4	DTCB6104C	37.00	25	DTCB6125C	37.00
6	DTCB6106C	37.00	32	DTCB6132C	37.00
10	DTCB6110C	37.00	40	DTCB6140C	37.00
13	DTCB6113C	37.00	50	DTCB6150C	37.00
16	DTCB6116C	37.00	63	DTCB6163C	37.00

### Double pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6202C	131.00	20	DTCB6220C	131.00
4	DTCB6204C	131.00	25	DTCB6225C	131.00
6	DTCB6206C	131.00	32	DTCB6232C	131.00
10	DTCB6210C	131.00	40	DTCB6240C	131.00
13	DTCB6213C	131.00	50	DTCB6250C	131.00
16	DTCB6216C	131.00	63	DTCB6263C	131.00

### Triple pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6302C	166.00	20	DTCB6320C	166.00
4	DTCB6304C	166.00	25	DTCB6325C	166.00
6	DTCB6306C	166.00	32	DTCB6332C	166.00
10	DTCB6310C	166.00	40	DTCB6340C	166.00
13	DTCB6313C	166.00	50	DTCB6350C	166.00
16	DTCB6316C	166.00	63	DTCB6363C	166.00

**Notes: The LINE-side is the OFF or bottom of the MCB, and connects to CD, NC or GB chassis tee-offs.**

Suitable for the following side mounted accessories:

- AUX/ALM switches – refer page 1 - 40
- Shunt trip and UVT Trip – refer page 1 - 39
- Clip-on RCD module and Din-Safe-M module- refer page 1 - 32
- Din-T terminals and accessories – refer page 1 - 50

## Din-T6 Series 2-63 A

### 6 kA 'D' curve

- Standard AS/NZS 60898
- Approval No. N17481
- Current range 2-63 amps 1, 2 and 3 pole
- Sealable and lockable handle
- DIN rail mounting
- Padlockable in OFF position
- Suits CD, NC or GB chassis
- Motor starting and transformer applications



### Curve type: D (10 – 20 In) Single pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6102D	51.00	20	DTCB6120D	51.00
4	DTCB6104D	51.00	25	DTCB6125D	51.00
6	DTCB6106D	51.00	32	DTCB6132D	51.00
10	DTCB6110D	51.00	40	DTCB6140D	54.50
13	DTCB6113D	51.00	50	DTCB6150D	54.50
16	DTCB6116D	51.00	63	DTCB6163D	54.50

### Double pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6202D	153.00	20	DTCB6220D	153.00
4	DTCB6204D	153.00	25	DTCB6225D	153.00
6	DTCB6206D	153.00	32	DTCB6232D	153.00
10	DTCB6210D	153.00	40	DTCB6240D	164.00
13	DTCB6213D	153.00	50	DTCB6250D	164.00
16	DTCB6216D	153.00	63	DTCB6263D	164.00

### Triple pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6302D	215.00	20	DTCB6320D	215.00
4	DTCB6304D	215.00	25	DTCB6325D	215.00
6	DTCB6306D	215.00	32	DTCB6332D	215.00
10	DTCB6310D	215.00	40	DTCB6340D	225.00
13	DTCB6313D	215.00	50	DTCB6350D	225.00
16	DTCB6316D	215.00	63	DTCB6363D	225.00

**Notes:** The LINE-side is the OFF or bottom of the MCB, and connects to CD, NC or GB chassis tee-offs.

Suitable for the following side mounted accessories:

- AUX/ALM switches – refer page 1 - 40
- Shunt trip and UVT Trip – refer page 1 - 39
- Clip-on RCD module and Din-Safe-M module- refer page 1 - 32
- Din-T terminals and accessories – refer page 1 - 50

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## Din-T6

2-in-1 Double the capacity of your load centre

### 6 kA 'C' curve

- Standard AS/NZS 60898
- Approval No. NSW24783
- Current range 2 - 40 A
- C curve tripping characteristics
- Saves up to 50 % space
- DIN rail mounting
- General purpose light and power



1P + 1P

3 Pole

### Curve type: C (5 – 10 In)

#### 1 pole + 1 pole

Single module width (18 mm)

#### 2 pole

Single module width (18 mm)

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCBD61102C	182.00	2	DTCBD6202C	171.00
4	DTCBD61104C	182.00	4	DTCBD6204C	171.00
6	DTCBD61106C	182.00	6	DTCBD6206C	171.00
10	DTCBD61110C	182.00	10	DTCBD6210C	171.00
16	DTCBD61116C	182.00	16	DTCBD6216C	171.00
20	DTCBD61120C	182.00	20	DTCBD6220C	171.00
			25	DTCBD6225C	171.00
			32	DTCBD6232C	171.00
			40	DTCBD6240C	171.00

Must be same phase.

#### 3 pole

Double module width (36 mm)

#### 4 pole

Double module width (36 mm)

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCBD6302C	275.00	2	DTCBD6402C	390.00
4	DTCBD6304C	275.00	4	DTCBD6404C	390.00
6	DTCBD6306C	275.00	6	DTCBD6406C	390.00
10	DTCBD6310C	275.00	10	DTCBD6410C	390.00
16	DTCBD6316C	275.00	16	DTCBD6416C	390.00
20	DTCBD6320C	275.00	20	DTCBD6420C	390.00
25	DTCBD6325C	275.00	25	DTCBD6425C	390.00
32	DTCBD6332C	275.00	32	DTCBD6432C	390.00
40	DTCBD6340C	275.00	40	DTCBD6440C	390.00

**Notes:** 16 mm tunnel terminals.  
 Not suitable for chassis mounting.  
 Compatible with NHP Terasaki auxiliaries and accessories.

## Din-T DC Series 0.5-63 A

### 6 kA 'C' curve

- Standard AS/NZS 60898
- Approval No. NSW 24265
- Current range 0.5 - 63 A 1P and 2P
- C curve tripping characteristic
- DC Voltage 250 V 1P, 500 V 2P
- AC Voltage 230 V 1P, 400 V 2P
- Sealable and lockable handle
- DIN rail mounting
- Suit CD, NC and GB chassis
- Industrial applications



1 Pole



2 Pole

### Operation

Din-T DC MCBs are equipped with a permanent magnet which aids arc extinguishing under fault conditions, making this range of MCBs suitable for voltages up to 250 V DC (1 pole), 500 V DC (2 pole) and 880 V DC (4 pole). Din-T DC 1P and 2P MCBs are also suitable for AC voltages. Polarity labeling must be respected due to the permanent magnet in the MCB.

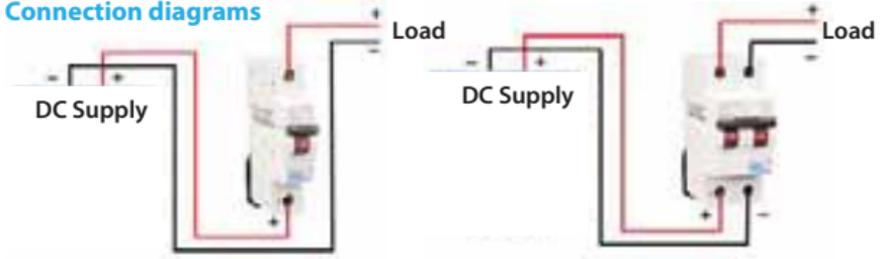
### Curve type: C (5 - 10 I<sub>n</sub>)

#### Single pole

#### Double pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
0.5	DTCBDC105C	126.00			
1	DTCBDC101C	126.00	1	DTCBDC201C	265.00
2	DTCBDC102C	126.00	2	DTCBDC202C	265.00
4	DTCBDC104C	126.00	4	DTCBDC204C	265.00
6	DTCBDC106C	126.00	6	DTCBDC206C	265.00
10	DTCBDC110C	126.00	10	DTCBDC210C	265.00
16	DTCBDC116C	126.00	16	DTCBDC216C	265.00
20	DTCBDC120C	126.00	20	DTCBDC220C	265.00
25	DTCBDC125C	126.00	25	DTCBDC225C	265.00
32	DTCBDC132C	126.00	32	DTCBDC232C	265.00
40	DTCBDC140C	126.00	40	DTCBDC240C	265.00
50	DTCBDC150C	126.00	50	DTCBDC250C	265.00
63	DTCBDC163C	126.00	63	DTCBDC263C	265.00

### Connection diagrams



## Din-T DC Series 0.5-63 A

### 6 kA 'B' curve

- Standard AS/NZS60898
- Approval No. NSW 24265
- Current range 10 - 63 A 4P
- B curve tripping characteristic
- DC Voltage 880 V 4P (1000 V PV systems)
- Sealable and lockable handle
- DIN rail mounting
- **Industrial applications**



### Operation

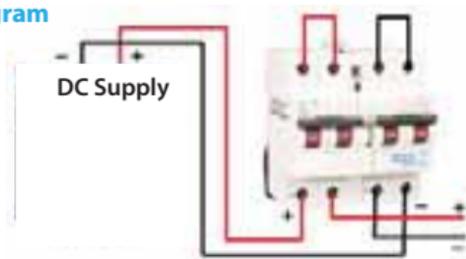
Din-T DC MCBs are equipped with a permanent magnet which aids arc extinguishing under fault conditions, making this range of MCBs suitable for voltages up to 250 V DC (1 pole), 500 V DC (2 pole) and 880 V DC (4 pole). Din-T DC 1P and 2P MCBs are also suitable for AC voltages. Polarity labeling must be respected due to the permanent magnet in the MCB.

### Curve type: B (3 – 5 I<sub>n</sub>)

### Four pole

In (A)	Cat. No.	Price \$
10	DTCBDC410B	580.00
16	DTCBDC416B	580.00
20	DTCBDC420B	580.00

### Connection diagram



### Notes: Suitable for the following side mounted accessories:

- AUX/ALM switch – refer page 1 - 40
- Shunt trip – refer page 1 - 39
- UVT trip – refer page 1 - 39
- Clip-on RCD module – refer page 1 - 32
- Din-T terminals and accessories – refer page 1 - 50

## Din-T10

### Series 6-63 A

1

#### 10 kA 'B' curve

- Standard AS/NZS 60898
- Approval No. N17481
- Current range 6 - 63 A 1, 2, and 3 pole
- Sealable and lockable handle
- DIN rail mounting
- Padlockable in OFF position
- Suits NC, CD or GB type chassis
- Resistive load applications

Great  
for long  
cable runs  
(Carpark  
lighting)



#### Curve type: B (3 - 5 I<sub>n</sub>)

##### Single pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
6	DTCB10 1 06B	66.50	6	DTCB10 2 06B	188.00
10	DTCB10 1 10B	66.50	10	DTCB10 2 10B	188.00
16	DTCB10 1 16B	66.50	16	DTCB10 2 16B	188.00
20	DTCB10 1 20B	66.50	20	DTCB10 2 20B	188.00
25	DTCB10 1 25B	66.50	25	DTCB10 2 25B	188.00
32	DTCB10 1 32B	66.50	32	DTCB10 2 32B	188.00
40	DTCB10 1 40B	78.50	40	DTCB10 2 40B	194.00
50	DTCB10 1 50B	91.00	50	DTCB10 2 50B	220.00
63	DTCB10 1 63B	109.00	63	DTCB10 2 63B	230.00

##### Triple pole

In (A)	Cat. No.	Price \$
6	DTCB10 3 06B	220.00
10	DTCB10 3 10B	220.00
16	DTCB10 3 16B	220.00
20	DTCB10 3 20B	220.00
25	DTCB10 3 25B	220.00
32	DTCB10 3 32B	220.00
40	DTCB10 3 40B	230.00
50	DTCB10 3 50B	305.00
63	DTCB10 3 63B	365.00

**Notes: The LINE-side is the OFF or bottom of the MCB, and connects to NC, GB or CD chassis tee-offs.**

A range of UL standard MCBs is available on indent (Ref DTCBUL10...C)

Suitable for the following side mounted accessories:

- AUX/ALM switch - refer page 1 - 40
- Shunt trip and UVT trip - refer page 1 - 39
- Clip-on RCD module - refer page 1 - 32
- Din-T terminals and accessories - refer page 1 - 50

## Din-T10

### Series 0.5 - 63 A

1

#### 10 kA 'C' curve

- Standard AS/NZS 60898
- Approval No. N17481
- Current range 0.5 - 63 A 1, 2, 3 and 4 pole
- Sealable and lockable handle
- DIN rail mounting
- Padlockable in OFF position
- Suits NC, CD or GB chassis
- General purpose light, power and motor starting



#### Curve type: C (5 - 10 I<sub>n</sub>)

##### Single pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
0.5	DTCB10 1 05C	58.50	0.5	DTCB10 2 05C	179.00
1	DTCB10 1 01C	58.50	1	DTCB10 2 01C	179.00
2	DTCB10 1 02C	58.50	2	DTCB10 2 02C	179.00
4	DTCB10 1 04C	58.50	4	DTCB10 2 04C	179.00
6	DTCB10 1 06C	58.50	6	DTCB10 2 06C	179.00
10	DTCB10 1 10C	58.50	10	DTCB10 2 10C	179.00
13	DTCB10 1 13C	58.50	13	DTCB10 2 13C	179.00
16	DTCB10 1 16C	58.50	16	DTCB10 2 16C	179.00
20	DTCB10 1 20C	58.50	20	DTCB10 2 20C	179.00
25	DTCB10 1 25C	58.50	25	DTCB10 2 25C	179.00
32	DTCB10 1 32C	58.50	32	DTCB10 2 32C	179.00
40	DTCB10 1 40C	58.50	40	DTCB10 2 40C	179.00
50	DTCB10 1 50C	58.50	50	DTCB10 2 50C	179.00
63	DTCB10 1 63C	58.50	63	DTCB10 2 63C	179.00

##### Triple pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
0.5	DTCB10 3 05C	215.00			
1	DTCB10 3 01C	215.00	1	DTCB10 4 01C	255.00
2	DTCB10 3 02C	215.00	2	DTCB10 4 02C	255.00
4	DTCB10 3 04C	215.00	4	DTCB10 4 04C	255.00
6	DTCB10 3 06C	215.00	6	DTCB10 4 06C	255.00
10	DTCB10 3 10C	215.00	10	DTCB10 4 10C	255.00
13	DTCB10 3 13C	215.00	13	DTCB10 4 13C	255.00
16	DTCB10 3 16C	215.00	16	DTCB10 4 16C	255.00
20	DTCB10 3 20C	215.00	20	DTCB10 4 20C	255.00
25	DTCB10 3 25C	215.00	25	DTCB10 4 25C	255.00
32	DTCB10 3 32C	215.00	32	DTCB10 4 32C	255.00
40	DTCB10 3 40C	215.00	40	DTCB10 4 40C	265.00
50	DTCB10 3 50C	215.00	50	DTCB10 4 50C	280.00
63	DTCB10 3 63C	215.00	63	DTCB10 4 63C	290.00

## Din-T10 Series 0.5 - 63 A

### 10 kA 'D' curve

- Standard AS/NZS 60898
- Approval No. N17481
- Current range 0.5 - 63 A 1, 2, 3 and 4 pole
- Sealable and lockable handle
- DIN rail mounting
- Padlockable in OFF position
- Suits NC, CD or GB type chassis
- Motor starting and transformer applications



### Curve type: D (10 - 20 I<sub>n</sub>)

#### Single pole

In (A)	Cat. No.	Price \$	Double pole	In (A)	Cat. No.	Price \$
0.5	DTCB10 1 05D	66.50	0.5	DTCB10 2 05D	188.00	
1	DTCB10 1 01D	66.50	1	DTCB10 2 01D	188.00	
2	DTCB10 1 02D	66.50	2	DTCB10 2 02D	188.00	
4	DTCB10 1 04D	66.50	4	DTCB10 2 04D	188.00	
6	DTCB10 1 06D	66.50	6	DTCB10 2 06D	188.00	
10	DTCB10 1 10D	66.50	10	DTCB10 2 10D	188.00	
13	DTCB10 1 13D	66.50	13	DTCB10 2 13D	188.00	
16	DTCB10 1 16D	66.50	16	DTCB10 2 16D	188.00	
20	DTCB10 1 20D	66.50	20	DTCB10 2 20D	188.00	
25	DTCB10 1 25D	66.50	25	DTCB10 2 25D	188.00	
32	DTCB10 1 32D	66.50	32	DTCB10 2 32D	188.00	
40	DTCB10 1 40D	84.50	40	DTCB10 2 40D	205.00	
50	DTCB10 1 50D	109.00	50	DTCB10 2 50D	230.00	
63	DTCB10 1 63D	133.00	63	DTCB10 2 63D	255.00	

#### Triple pole

In (A)	Cat. No.	Price \$	Four pole	In (A)	Cat. No.	Price \$
0.5	DTCB10 3 05D	220.00	0.5	-		
1	DTCB10 3 01D	220.00	1	-		
2	DTCB10 3 02D	220.00	2	-		
4	DTCB10 3 04D	220.00	4	DTCB10 4 04D	265.00	
6	DTCB10 3 06D	220.00	6	DTCB10 4 06D	265.00	
10	DTCB10 3 10D	220.00	10	DTCB10 4 10D	265.00	
13	DTCB10 3 13D	220.00	13	DTCB10 4 13D	265.00	
16	DTCB10 3 16D	220.00	16	DTCB10 4 16D	265.00	
20	DTCB10 3 20D	220.00	20	DTCB10 4 20D	265.00	
25	DTCB10 3 25D	220.00	25	DTCB10 4 25D	265.00	
32	DTCB10 3 32D	220.00	32	DTCB10 4 32D	265.00	
40	DTCB10 3 40D	230.00	40	DTCB10 4 40D	280.00	
50	DTCB10 3 50D	305.00	50	DTCB10 4 50D	365.00	
63	DTCB10 3 63D	365.00	63	DTCB10 4 63D	550.00	

## Din-T10H Series 80-125 A



### 10 kA 'C' Curve 7.5 kA 'D' Curve

- Standard AS/NZS 60947 - 2
- Current range 80 - 125 A 1, 2, 3 and 4 pole
- Module width = 27 mm
- DIN rail mounting
- Suits NCH or CDH hybrid type chassis
- Industrial applications

### Curve type: C (5 – 10 I<sub>n</sub>) Single pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
80	DINT10H180C	128.00	80	DINT10H280C	330.00
100	DINT10H1100C	151.00	100	DINT10H2100C	350.00
125	DINT10H1125C	189.00	125	DINT10H2125C	470.00

### Double pole

### Triple pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
80	DINT10H380C	400.00	80	DINT10H480C	700.00
100	DINT10H3100C	400.00	100	DINT10H4100C	700.00
125	DINT10H3125C	590.00	125	DINT10H4125C	1040.00

### Four pole

### Curve type: D (10 – 20 I<sub>n</sub>) Single pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
80	DINT10H180D	182.00	80	DINT10H280D	355.00
100	DINT10H1100D	182.00	100	DINT10H2100D	400.00
125	DINT10H1125D	210.00	125	DINT10H2125D	530.00

### Double pole

### Triple pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
80	DINT10H380D	455.00	80	DINT10H480D	780.00
100	DINT10H3100D	455.00	100	DINT10H4100D	780.00
125	DINT10H3125D	650.00	125	DINT10H4125D	1140.00

### Four pole

**Notes:** The LINE-side is the OFF or bottom of the MCB, and connects to NCH or CDH chassis tee-offs.

Din-T10H MCBs do not fit NC or CD chassis with 18mm pole pitch.

All poles include overcurrent and short circuit protection.

Suitable for the following side mounted accessories:

- AUX/ALM switch – refer page 1 - 40
- Shunt trip – refer page 1 - 39
- Din-T terminals and accessories – refer page 1 - 50

## Din-T15 Series 6 - 63 A

### 15 kA, 20 kA, 25 kA, 50 kA 'C' curve

- Standard AS/NZS 60947 - 2
- Current rating 6 - 63 A 1, 2, 3 and 4 pole
- Sealable and lockable handle
- DIN rail mounting
- Suits NC or CD type chassis
- Industrial applications



### Curve type: C (5 - 10 In) Single pole

Single pole			Double pole		
In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
6	DTCB15 1 06C	150.00	6	DTCB15 2 06C	270.00
10	DTCB15 1 10C	150.00	10	DTCB15 2 10C	270.00
13	DTCB15 1 13C	150.00	13	DTCB15 2 13C	270.00
16	DTCB15 1 16C	150.00	16	DTCB15 2 16C	270.00
20	DTCB15 1 20C	150.00	20	DTCB15 2 20C	270.00
25	DTCB15 1 25C	150.00	25	DTCB15 2 25C	270.00
32	DTCB15 1 32C	150.00	32	DTCB15 2 32C	270.00
40	DTCB15 1 40C	150.00	40	DTCB15 2 40C	270.00
50	DTCB15 1 50C	150.00	50	DTCB15 2 50C	270.00
63	DTCB15 1 63C	150.00	63	DTCB15 2 63C	270.00

### Triple pole

### Four pole

Triple pole			Four pole		
In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
6	DTCB15 3 06C	420.00	6	DTCB15 4 06C	490.00
10	DTCB15 3 10C	420.00	10	DTCB15 4 10C	490.00
13	DTCB15 3 13C	420.00	13	DTCB15 4 13C	490.00
16	DTCB15 3 16C	420.00	16	DTCB15 4 16C	490.00
20	DTCB15 3 20C	420.00	20	DTCB15 4 20C	490.00
25	DTCB15 3 25C	420.00	25	DTCB15 4 25C	490.00
32	DTCB15 3 32C	420.00	32	DTCB15 4 32C	490.00
40	DTCB15 3 40C	420.00	40	DTCB15 4 40C	490.00
50	DTCB15 3 50C	420.00	50	DTCB15 4 50C	490.00
63	DTCB15 3 63C	420.00	63	DTCB15 4 63C	490.00

### Short circuit capacity

In (A)	No. poles	Voltage (V)	Icu (kA)
6-25	1	240	25
	2-4	240/415	50/25
32-40	1	240	20
	2-4	240/415	40/20
50-63	1	240	15
	2-4	240/415	30/15

**Notes: The LINE-side is the OFF or bottom of the MCB, and connects to chassis.**  
Ics = 50 % Icu.

1

## Din-T6

### Easy-Fit MCB and RCCBs – Tool-free connection

#### 6 kA 'C' curve

- Standard AS/NZS 60898
- Approval No. NSW 24783
- Current range 2 - 63 A
- C curve tripping characteristic
- Cable clamping technology
- Line side- Plug in or screw in busbar comb
- Load side- Screw-less cable connection up to 20 A
- DIN rail mounting
- General purpose light and power



#### Curve type: C (5 – 10 I<sub>n</sub>)

#### Single pole

#### Triple pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
6	DTCBE6106C <sup>1)</sup>	40.50	6	DTCBE6306C <sup>1)</sup>	166.00
10	DTCBE6110C <sup>1)</sup>	40.50	10	DTCBE6310C <sup>1)</sup>	166.00
16	DTCBE6116C <sup>1)</sup>	40.50	16	DTCBE6316C <sup>1)</sup>	166.00
20	DTCBE6120C <sup>1)</sup>	40.50	20	DTCBE6320C <sup>1)</sup>	166.00
25	DTCBE6125C <sup>2)</sup>	40.50	25	DTCBE6325C <sup>2)</sup>	166.00
32	DTCBE6132C <sup>2)</sup>	40.50	32	DTCBE6332C <sup>2)</sup>	166.00
40	DTCBE6140C <sup>2)</sup>	40.50	40	DTCBE6340C <sup>2)</sup>	166.00
50	DTCBE6150C <sup>2)</sup>	40.50	50	DTCBE6350C <sup>2)</sup>	166.00
63	DTCBE6163C <sup>2)</sup>	40.50	63	DTCBE6363C <sup>2)</sup>	166.00

#### Din-Safe RCD

- Standard AS/NZS 61008
- Approval No NSW 17482
- Current range 40 - 63 A
- 2 pole and 4 pole configurations
- 30 mA sensitivity
- Cable clamping technology
- Line side- Screw terminal
- Load side- Screw terminal or plug in busbar comb
- DIN rail mounting



No. poles	Trip sens.	Amp rating	Voltage	Cat. No.	Price \$
2P (1P+N)	30 mA	40 A	240 V	DSRCDE24030	250.00
		63 A	240 V	DSRCDE26330	285.00
4P (3P+N)	30 mA	40 A	240/415 V	DSRCDE44030	335.00
		63 A	240/415 V	DSRCDE46330	360.00

**Notes:** <sup>1)</sup> Screw-less cable clamping 'load-side' connection.

<sup>2)</sup> Screw 'load-side' connection.

Double pole and 'D' Curve available on request.

## Din-Safe Safety switches (RCCB)

- Standard AS/NZS 61008
- Approval No. N17482
- Current ratings 40, 63, 80 and 100 A
- 2 and 4 pole configuration
- Accepts Din-T side mounting accessories
- Handle sealable and padlockable

High immunity type



No. poles	Trip sens.	Amp rating	Voltage	Cat. No.	Price \$
2P (1P+N)	30 mA	40 A	240 V	<b>DSRCD24030</b>	<b>240.00</b>
		63 A	240 V	<b>DSRCD26330</b>	<b>265.00</b>
		80 A	240 V	<b>DSRCD28030</b>	<b>295.00</b>
	100 mA	40 A	240 V	<b>DSRCD240100</b>	<b>290.00</b>
		80 A	240 V	<b>DSRCD280100</b>	<b>355.00</b>
	300 mA	40 A	240 V	<b>DSRCD240300</b>	<b>330.00</b>
80 A		240 V	<b>DSRCD280300</b>	<b>370.00</b>	
4P (3P+N)	30 mA	40 A	415 V	<b>DSRCD44030</b>	<b>315.00</b>
		63 A	415 V	<b>DSRCD46330</b>	<b>335.00</b>
		80 A	415 V	<b>DSRCD48030</b>	<b>375.00</b>
		100 A	415 V	<b>DSRCD410030</b>	<b>560.00</b>
	100 mA	40 A	415 V	<b>DSRCD440100</b>	<b>340.00</b>
		63 A	415 V	<b>DSRCD463100</b>	<b>425.00</b>
		80 A	415 V	<b>DSRCD480100</b>	<b>475.00</b>
	300 mA	100 A	415 V	<b>DSRCD4100100</b>	<b>560.00</b>
		40 A	415 V	<b>DSRCD440300</b>	<b>370.00</b>
		100 A	415 V	<b>DSRCD4100300</b>	<b>560.00</b>
	500 mA	100 A	415 V	<b>DSRCD4100500</b>	<b>570.00</b>

### High immunity type

2P (1P+N)	30 mA	40 A	240 V	<b>DSRCD24030AI</b>	<b>290.00</b>
		63 A	240 V	<b>DSRCD26330AI</b>	<b>335.00</b>
4P (3P+N)	30 mA	40 A	415 V	<b>DSRCD44030AI</b>	<b>350.00</b>
		63 A	415 V	<b>DSRCD46330AI</b>	<b>435.00</b>

### Selective type (40 ms delay)

2P (1P+N)	100 mA	63 A	240 V	<b>DSRCD263100S</b>	<b>365.00</b>
	300 mA	63 A	240 V	<b>DSRCD263300S</b>	<b>400.00</b>
4P (3P+N)	100 mA	63 A	415 V	<b>DSRCD463100S</b>	<b>445.00</b>
		100 A	415 V	<b>DSRCD4100100S</b>	<b>610.00</b>
	300 mA	63 A	415 V	<b>DSRCD463300S</b>	<b>510.00</b>
		100 A	415 V	<b>DSRCD4100300S</b>	<b>620.00</b>

**Notes:** 30 mA tripping characteristics: 0.5 x Δn = no tripping, 1 x Δn = T ≤ 300 mS, 2 x Δn = T ≤ 150 mS, 5 x Δn = T ≤ 40 mS

1

## Din-Safe Safety switches (RCCB)

- Standard AS/NZS 61008
- Approval No. N17482
- Current ratings 40, 63, 80 and 100 A
- 2 and 4 pole configuration
- Accepts Din-T side mounting accessories
- Handle sealable and padlockable

High immunity type



### Type A RCD

No. poles	Trip sens.	Amp rating	Voltage	Cat. No.	Price \$
2P (1P+N)	30 mA	40 A	240 V	DSRCD24030A	265.00
		63 A	240 V	DSRCD26330A	340.00
		80 A	240 V	DSRCD28030A	400.00
	100 mA	40 A	240 V	DSRCD240100A	365.00
		80 A	240 V	DSRCD280100A	365.00
4P (3P+N)	30 mA	40 A	415 V	DSRCD44030A	375.00
		63 A	415 V	DSRCD46330A	395.00
		100 A	415 V	DSRCD410030A	630.00
	100 mA	63 A	415 V	DSRCD463100A	445.00
		80 A	415 V	DSRCD480100A	560.00

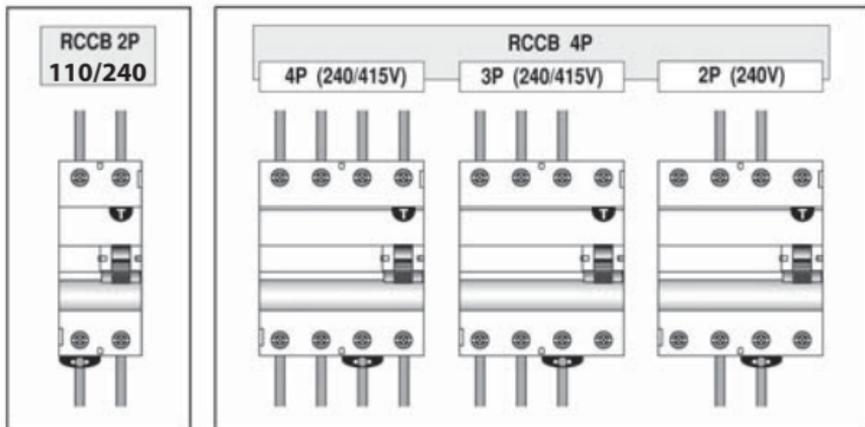
### Type B

4P (3P+N)	30 mA	63 A	240 V	DSRCD46330B	2780.00
	100 mA	63 A	240 V	DSRCD463100B	2780.00
	500 mA	125 A	415 V	DSRCD4125500B	2780.00
	300 mA	63 A	415 V	DSRCD463300BS <sup>1)</sup>	2780.00

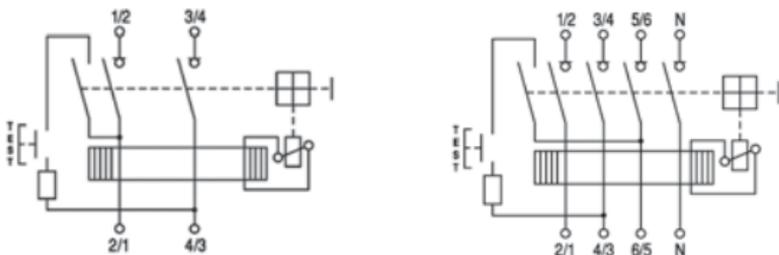
**Notes:** <sup>1)</sup> Selective type.  
 30 mA tripping characteristics: 0.5 x Δn = no tripping, 1 x Δn = T ≤ 300 mS,  
 2 x Δn = T ≤ 150 mS, 5 x Δn = T ≤ 40 mS

## Din-Safe Safety switches (RCCB)

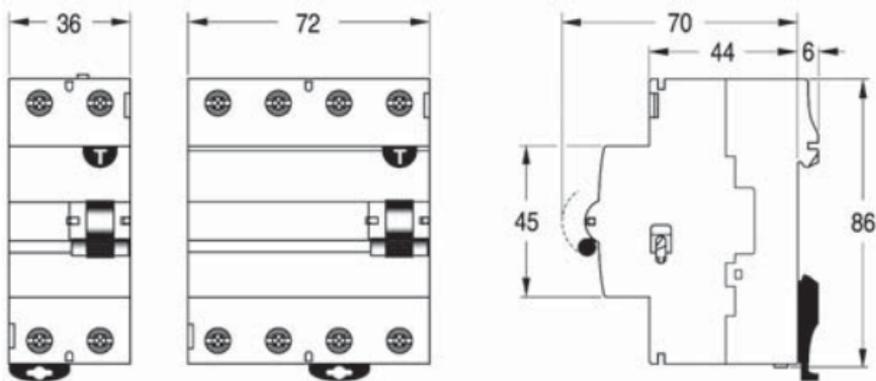
### Connection details



### Circuit diagrams



### Dimensions (mm)



1

## Din-Safe

### Compact single pole width residual current circuit breaker (RCBO) Same dimensions as a standard MCB

#### 6 kA

- Standard AS/NZS 61009
- Approval No. NSW24576
- Current range 6 - 32 A
- C curve tripping characteristic
- Short circuit, overcurrent and earth leakage protection
- Sensitivity 30 mA
- DIN rail mounting
- Dual DIN clip
- Suits NC, CD and GB chassis
- Suitable for loadcenters and panelboards
- General purpose light and power



#### Curve type: C (5 – 10 In)

Trip sens.	No. of poles	Voltage	Short circuit cap.	In (A)	Cat. No. <sup>1)</sup>	Price \$
30 mA	1 pole	240 V AC	6 kA	6	DSRCBS0630C	320.00
				10	DSRCBS1030C	320.00
				16	DSRCBS1630C	320.00
				20	DSRCBS2030C	320.00
				25	DSRCBS2530C	320.00
				32	DSRCBS3230C	320.00

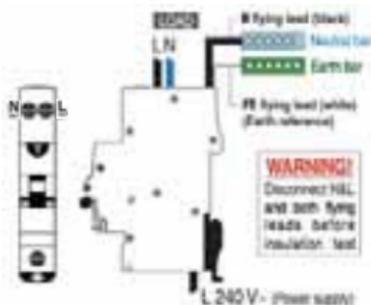
#### Curve type: B (3 – 5 In)

Trip sens.	No. of poles	Voltage	Short circuit cap.	In (A)	Cat. No. <sup>1)</sup>	Price \$
30 mA	1 pole	240 V AC	6 kA	6	DSRCBS0630B	320.00
				10	DSRCBS1030B	320.00
				16	DSRCBS1630B	320.00
				20	DSRCBS2030B	320.00
				25	DSRCBS2530B	320.00
				32	DSRCBS3230B	320.00

#### Dimensions (mm)



#### Connection diagram



**Notes:** <sup>1)</sup> Insert 'A' at end of part number for Type A RCD e.g. DSRCBS-20-30-CA.  
**Nuisance tripping may be experienced in VFD and motor starting applications, refer NHP.**

## Din-Safe

### Single pole width residual current circuit breaker (RCBO)

#### 10 kA

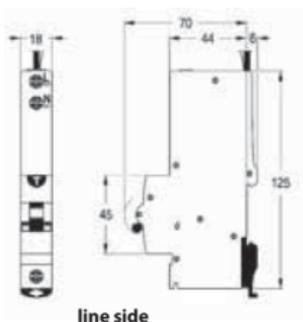
- Standard AS/NZS 61009
- Approval No. N17482
- One module wide (18 mm)
- Short circuit, overcurrent and earth leakage protection
- Short circuit capacity 10 kA
- Sensitivity 10 and 30 mA
- Suits NC, CD or GB chassis
- Type 'A' RCD



#### Curve type: C (5 – 10 In)

Trip sens.	No. of poles	Voltage	Short circuit cap.	In (A)	Cat. No. 1)2)	Price \$
30 mA	1 Pole	240 V AC	10 kA	6	DSRCBH0630A	310.00
				10	DSRCBH1030A	310.00
				16	DSRCBH1630A	310.00
				20	DSRCBH2030A	310.00
				25	DSRCBH2530A	310.00
				32	DSRCBH3230A	310.00
				40	DSRCBH4030A	310.00
10 mA	1 Pole	240 V AC	10 kA	6	DSRCBH0610A	400.00
				10	DSRCBH1010A	400.00
				16	DSRCBH1610A	400.00
				20	DSRCBH2010A	400.00
				25	DSRCBH2510A	400.00
				32	DSRCBH3210A	400.00
				40	DSRCBH4010A	400.00

#### Dimensions (mm)



#### Connection diagram



**Notes:** The LINE-side is the OFF or bottom of the MCB, and connects to chassis tee-offs.

- 1) Neutral not switched.
  - 2) Will not accept Din-T side mounting accessories.
- 30 mA tripping characteristics:  $0.5 \times I\Delta n = \text{no tripping}$ ,  $1 \times I\Delta n = T \leq 300 \text{ ms}$   
 $2 \times I\Delta n = T \leq 150 \text{ ms}$ ,  $5 \times I\Delta n = T \leq 40 \text{ ms}$

Nuisance tripping may be experienced in VFD and motor starting applications refer NHP.

## Din-Safe MCB (RCBO)



### 10 kA MCB without Pigtail (RCBO)

- Standard AS/NZS 61009
- Approval No. N17482
- Switched neutral
- Suits 3 P+N NC or GB chassis or special CD chassis
- Suits loadcenters

Din-Safe MCB is a combined MCB/RCD providing overload, short circuit and earth leakage protection in the one integral unit.

### Curve type: C (5 – 10 I<sub>n</sub>)

#### Type AC RCD

Trip sens.	No. of poles	Voltage (AC)	Phase	In (A)	Cat. No.	Price \$
30 mA	2 Pole	110/240	1 P+N	6	DSRCB0630	275.00
				10	DSRCB1030	275.00
				16	DSRCB1630	275.00
				20	DSRCB2030	275.00
				25	DSRCB2530	275.00
				32	DSRCB3230	275.00
				40	DSRCB4030	275.00

#### Type A RCD

Trip sens.	No. of poles	Voltage (AC)	Phase	In (A)	Cat. No.	Price \$
30 mA	2 Pole	110/240	1 P+N	10	DSRCB1030A	285.00
				16	DSRCB1630A	285.00
				20	DSRCB2030A	285.00
				25	DSRCB2530A	285.00
				32	DSRCB3230A	285.00
				40	DSRCB4030A	285.00
10 mA	2 Pole	110/240	1 P+N	6	DSRCB0610A	285.00
				10	DSRCB1010A	285.00
				16	DSRCB1610A	285.00
				20	DSRCB2010A	285.00
100 mA	2 Pole	110/240	1 P+N	10	DSRCB10100A	305.00
				16	DSRCB16100A	305.00
				20	DSRCB20100A	305.00

**Notes:** 30 mA tripping characteristics: 0.5 x I<sub>Δn</sub> = no tripping, 1 x I<sub>Δn</sub> = T ≤ 300 mS  
2 x I<sub>Δn</sub> = T ≤ 150 mS, 5 x I<sub>Δn</sub> = T ≤ 40 mS

## Din-Safe MCB (RCBO)

### 10 kA MCB with Pigtail (RCBO)

- Standard AS/NZS 61009
- Approval No. N17482
- Un-switched neutral
- Suits NC, CD or GB chassis

Complete with revised terminal configuration and neutral pigtail, will fit standard Din-T 3 ph chassis.



### Curve type: C (5 – 10 I<sub>n</sub>)

### Type AC RCD

Trip sens.	No. of poles	Voltage (AC)	Phase	I <sub>n</sub> (A)	Cat. No.	Price \$
30 mA	2 Pole	110/240	1P+N	6	DSRCB0630P	280.00
				10	DSRCB1030P	280.00
				16	DSRCB1630P	280.00
				20	DSRCB2030P	280.00
				25	DSRCB2530P	280.00
				32	DSRCB3230P	280.00
				40	DSRCB4030P	280.00

**Notes:** 30 mA tripping characteristics: 0.5 x I<sub>Δn</sub> = no tripping, 1 x I<sub>Δn</sub> = T ≤ 300 mS  
 2 x I<sub>Δn</sub> = T ≤ 150 mS, 5 x I<sub>Δn</sub> = T ≤ 40 mS

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## Din-Safe-M

### Add-on earth leakage modules

- Standard AS/NZS 3190
- Approval No N11974
- Current ratings 32 and 63 amps
- Sensitivity  $I\Delta n$  30, 100 and 300 mA
- Suits Din-T6, 10 and 15
- Can identify trip is either earth leakage or overload/short circuit



#### Tripping characteristics

0.5 x $I\Delta n$	no tripping
1 x $I\Delta n$	$t \leq 300$ ms
5 x $I\Delta n$	$t \leq 40$ ms

#### Din-Safe-M modules to suit Din-T6, 10 and 15

No. of poles <sup>1)</sup>	Sensitivity	MCB rating <sup>3)</sup>	Width mods. <sup>2)</sup>	Cat. No. <sup>1)</sup>	Price \$
1P+N <sup>4)</sup>	30 mA	32 A	2	DSRCM32301PN	435.00
		63 A	2	DSRCM63301PN	550.00
	100 mA	32 A	2	DSRCM321001PN	455.00
		63 A	2	DSRCM631001PN	570.00
	300 mA	32 A	2	DSRCM323001PN	510.00
		63 A	2	DSRCM633001PN	620.00
3P	30 mA	63 A	3	DSRCM63303P	590.00
		100 mA	63 A	3	DSRCM631003P
	30 mA	32 A	2	DSRCM32303PN	495.00
		63 A	3	DSRCM63303PN	580.00
	100 mA	32 A	2	DSRCM321003PN	580.00
		63 A	3	DSRCM631003PN	640.00
300 mA	32 A	2	DSRCM323003PN	580.00	
	63 A	3	DSRCM633003PN	640.00	

#### Din-Safe-M space requirements

Type	Without MCB fitted neutral not switched	MCB fitted neutral not switched	MCB fitted neutral switched
1P + N 32/63 A	2 modules (36 mm)	3 modules (54 mm)	4 modules (72 mm)
3P + N 32 A	2 modules (36 mm)	5 modules (90 mm)	6 modules (108 mm)
3P + N 63 A	3 modules (54 mm)	6 modules (108 mm)	7 modules (126 mm)
3P 63 A	3 modules (54 mm)	6 modules (108 mm)	N/A

- Notes:**
- 1) 1P+N and 3P+N type supply neutral connected by 'pigtail' cable.
  - 2) Dimensions of Din-Safe-M unit only; add MCB width for total installed width.
  - 3) 'MCB rating' refers to the max. MCB rating the module can be fitted to.
  - 4) 1P + N suitable for 415 V 2P applications.  
Not suitable for Din-T10H MCBs.

## Din-Safe-M

### Modules to be combined with Din-T MCBs

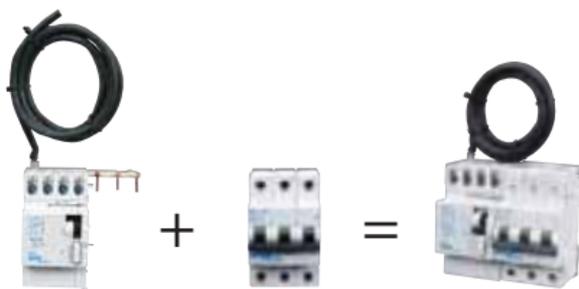
#### Operation

The combined Din-T MCB/Din-Safe-M earth leakage module has two operating toggles which indicate the reason for the trip action taking place.

- When an overload or short circuit occurs the Din-T MCB will operate. In this case the Din-Safe-M toggle will remain in the ON position.
- If an earth leakage fault occurs both toggles will move to the OFF position. In order to reset the MCB the Din-Safe-M unit must be reset first.
- In both instances – if the cause of the trip operation has not been rectified, a trip operation will occur as soon as the MCB is turned to the ON position. The trip free mechanism of the MCB ensures that a successful trip operation takes place even when the toggle is held in the ON position.

#### Assembly

- Place the MCB and Din-Safe-M unit on a flat surface. Be sure that both the MCB and the Din-Safe-M toggles are in the ON position.
- Slide the two units towards each other inserting the connecting bars or links into the MCB tunnel terminal, ensuring no undue pressure is applied to the metal tripping pin of the Din-Safe-M unit.
- Push in the connecting clips, locking the unit together.
- Check that the MCB trips when the toggle on the Din-Safe-M is moved to the OFF position.
- Tighten the busbar connections between the MCB and the Din-Safe-M and fit the insulating cover supplied.
- If the pigtail and N connections are reversed, the breaker will trip as soon as load is energised. Reset Din-Safe-M module before switching MCB 'ON'.
- In the case of a three phase 3 wire system (no neutral) use 3 phase models. 3P+N models will operate satisfactorily but test button will only function if neutral pigtail is connected.



- Din-Safe-M modules are an earth leakage module only. To complete the functional unit a Din-T6, Din-T10 or Din-T15 MCB must be added as shown.

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## Din-Safe-M

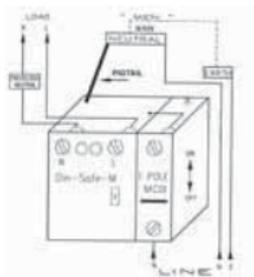
### Modules to be combined with Din-T MCBs

#### Testing

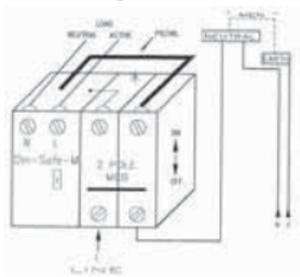
The MCB/Din-Safe-M combination must be connected with the line conductors to the LINE side (OFF/Bottom side) of the MCB and the load conductors connected to the Din-Safe-M terminals. The MCB/Din-Safe-M combination must be tested with the supply connected before connecting the load. First switch the Din-Safe-M unit 'ON' then the MCB. When the test button is pressed, both handles should trip. It is recommended that the test button is operated periodically to test the detection and tripping functions of the combined unit.

- Both 1P+N and 3P+N models have a neutral pigtail connection. 3P modules have no neutral connection at all.

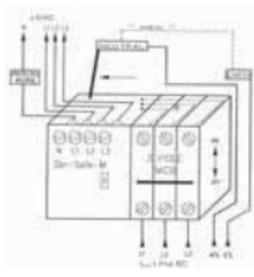
**Din-Safe-M 1P+N with 1 pole MCB (neutral not switched)**



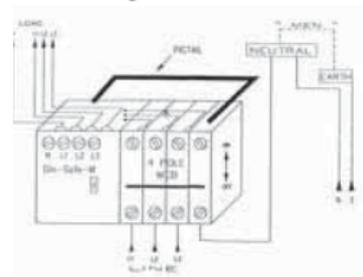
**Din-Safe-M 1P+N with 2 pole MCB switching active and neutral**



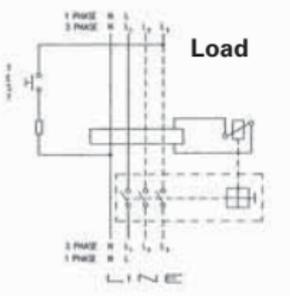
**Din-Safe-M 3P+N with 3 pole MCB (neutral not switched)**



**Din-Safe-M 3P+N with 4 pole MCB switching active and neutral**



#### Connection diagram



## Accessories

### Mounting of add-on devices onto MCBs, RCCBs and RCBOs

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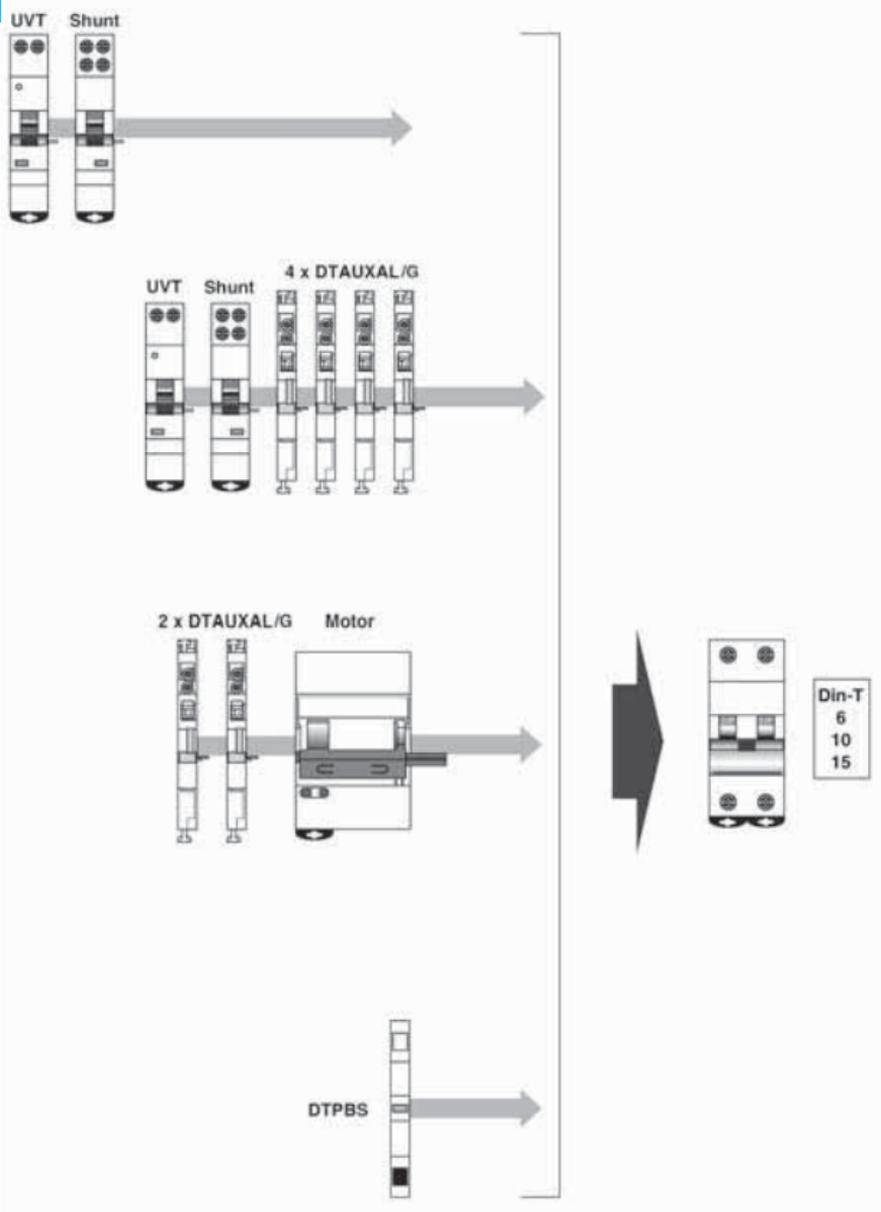
Type/Description	Din-T, DC, 6, 10, 15	Din-T 10H	DSRCB, DSRCD	DSRCM	DINTMS	Change -over switch
<b>DTAUXAL</b> Signal or AUX contact	L - R	-	R	R	L - R	L - R
<b>DTAUXALG</b> Signal or AUX contact, gold	L - R	-	R	R	L - R	L - R
<b>DINT10HHS</b> Signal or AUX + AUX contact	-	R	-	-	-	-
<b>DTPBS</b> Panelboard switch	L - R	-	R	-	-	-
<b>DINTSHT</b> Shunt trip	-	L	-	-	-	-
<b>DTSHT</b> Shunt trip	L - R	-	R	R	-	-
<b>DTUVT</b> Undervoltage trip	L - R	-	R	R	-	-
<b>DTMD</b> Motor operator	L - R	-	R	R	-	-

L = Left mounting    R = Right mounting

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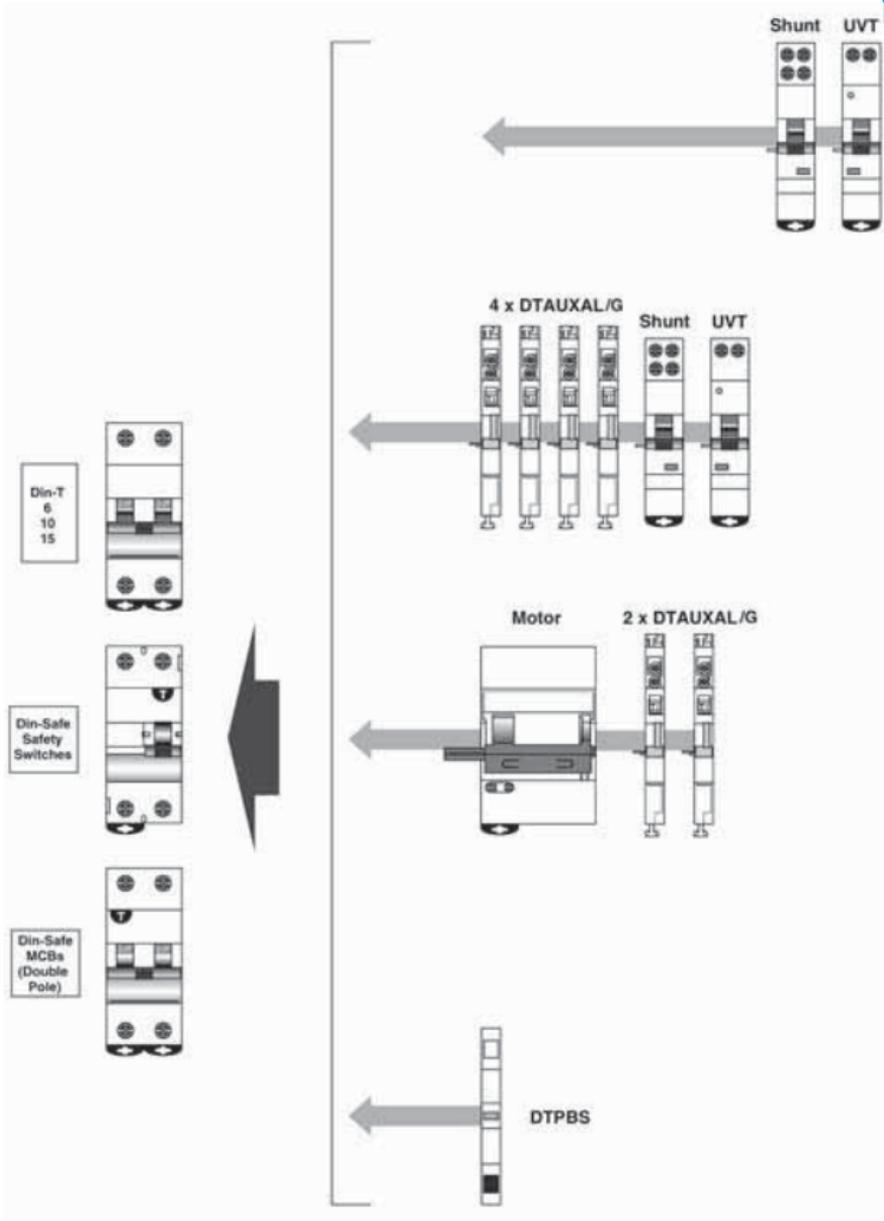
## Accessories

### Mounting on the left-hand side



**Notes:** The above accessories will not fit to Din-T10H MCBs.  
Shunts and auxiliaries, refer to pages 1 - 39 and 1 - 40.

## Accessories Mounting on the right-hand side



**Notes:** DSRCBH and DSRCBS - Single pole RCD/MCB will not accept side mounted accessories.  
DINTMS - Main switches will accept side mounting auxiliary contacts only.

## Din-TMS 63-100 A Main switch DIN rail mount



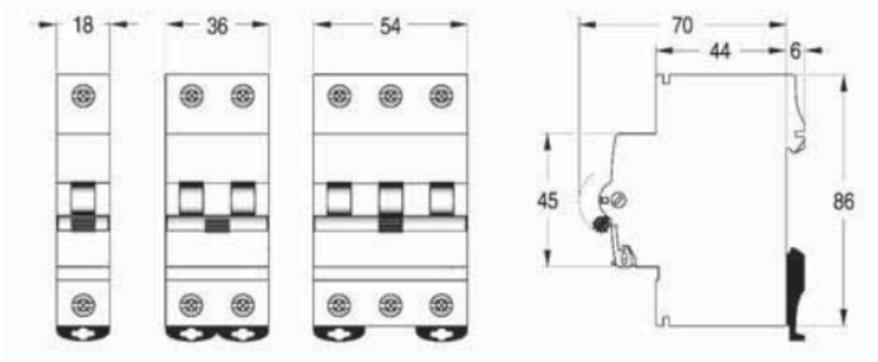
- Standard IEC 60947-3
- Double-break contacts
- Padlockable handle
- Handle sealable in ON and OFF position
- DIN rail mount
- Suits NC, CD or GB type chassis

Din-T main switches have the same profile as Din-T MCBs and are suitable for use as a main switch (isolator) in loadcentres and distribution boards

No. of poles	Rated current (A)	Cat. No.	Price \$
1	63	DINTMS631	42.00
	80	DINTMS801	45.00
	100	DINTMS1001	48.00
2	63	DINTMS632	56.00
	80	DINTMS802	67.00
	100	DINTMS1002	75.00
3	63	DINTMS633	86.50
	80	DINTMS803	102.00
	100	DINTMS1003	115.00

63 A - 100 A  
 side mounts to  
 NC chassis  
 63 A - 80 A side  
 mounts to  
 CD chassis

### Dimensions (mm)



**Notes:** AUX/ALM switch, refer to page 1 - 40.

The LINE-side is the OFF or bottom of the isolator, and connects to NC or CD chassis tee-offs.

## Din-T

### Shunt and undervoltage trip

#### Din-T shunt trip

- Couples to left or right side of MCB
- Modular width – 18 mm
- Busbar cavity both ends
- Field assembly
- Continuously rated
- Terminals for remote indication

#### Operation

The shunt trip makes it possible to remotely switch the MCB by energising C1 & C2 terminals of the shunt trip.



DTSHT 110415V

#### Shunt trip - Din-T6, 10 & 15

Rated voltage	Current rating	Operating time (ms)	Cat. No.	Price \$
110 to 415 V AC	110 V - 0.3 A	10	DTSHT110415V	158.00
110 to 125 V DC	240 V - 0.6 A	4		
	415 V - 1.0 A	2		
24 to 60 V AC	24 V - 1.0 A	10	DTSHT2460V	158.00
24 to 48 V DC	48 V - 2.0 A	4		

#### Shunt trip - Din-T 10H

Rated voltage	Current rating	Operating time (ms)	Cat. No. <sup>1)</sup>	Price \$
110 to 415 V AC	110 V - 0.3 A	10	DINTSHT110415U	164.00
110 to 125 V DC	240 V - 0.6 A	4		
	415 V - 1.0 A	2		
24 to 60 V AC	24 V - 1.0 A	10	DINTSHT2460U	164.00
24 to 48 V DC	48 V - 2.0 A	4		

#### Din-T undervoltage trip <sup>2)</sup>

- Couples to left or right side of MCB
- Modular width – 18 mm
- Busbar cavity both ends
- Field assembly

The Din-T UVT trips the MCB when the operating voltage threshold is lower than 0.5 x Un. Adjustable time delay up to 300 ms eliminates nuisance tripping.



DTUVT240VAC

Rated voltage	Cat. No.	Price \$
230 V AC	DTUVT240VAC	171.00
12 V AC/DC	DTUVT12VDC	171.00
24 V AC/DC	DTUVT24VDC	171.00

Power loss 3 VA

**Notes:** <sup>1)</sup> Shunt fits to left side of Din-T10H MCBs only.

<sup>2)</sup> UVT does not suit Din-T10H MCBs.

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## Din-T

### Auxiliary contacts for MCBs

- Suitable for Din-T 6, 10 & 15
- Suitable for 2P RCBO and 2P & 4P RCCB <sup>1)</sup>3)
- Stack up to 4 units left or right side <sup>2)</sup>
- Field fittable, includes all fitting accessories
- Includes busbar cavity for chassis mounting
- Changeover contact
- Current rating 5 A



DTAUXAL

#### Din-T auxiliary contact - Din-T 6, 10, 15, DSRCBH, DSRCB

Contact function	Contact material	Module width	Cat. No.	Price \$
H or S	Silver	0.5	DTAUXAL	102.00
H or S	Gold	0.5	DTAUXALG	123.00

'H' = auxiliary switch 'S' = alarm switch

#### Din-T auxiliary contact - Din-T10H

Contact function	Contact material	Module width	Cat. No.	Price \$
H+H/S	Silver	0.5	DINT10H - HS <sup>2)</sup>	114.00

#### Din-T auxiliary contact - DSRCBS

Contact function	Contact material	Module width	Cat. No. <sup>3)</sup>	Price \$
H	Silver	0.5	DSRCBSAX	102.00
H or S	Silver	0.5	DSRCBSAXAL	114.00
H or S	Gold	0.5	DSRCBSAXALG	125.00

- Notes:**
- <sup>1)</sup> DTAUXAL type contact fits right side only on 2P RCBO and 2/4P RCCB.
  - <sup>2)</sup> Auxiliary contacts for Din-T10H MCBs are not stackable and fit to right side only.
  - <sup>3)</sup> Fit right hand side only.

## Din-T

### Motor operator for MCBs

#### Din-T motor operator DTMD

- Suitable for Din-T 6, 10 & 15
- Suitable for 2P RCBO and 2P & 4P RCCB
- Field fittable, includes all fitting accessories
- Fits left or right side of device
- Padlockable in the OFF position
- Manual operation is possible



DTMD240VAC

Rated voltage	Module width	Cat. No.	Price \$
240 V AC	3	DTMD240VAC	660.00

#### Technical

Rated voltage Un	240 V AC
Impulse to switch ON/OFF	>50 ms
Closing time	500 ms
Opening time	200 ms
Electrical endurance	10,000 ops
Terminal capacity	2.5 mm <sup>2</sup>
Weight	380 g

**Notes:** DTMD240VAC fits right side only on 2P RCBO and 2/4P RCCB.  
DTMD240VAC is not suitable for use with Din-T10H MCBs.

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## DIN mount housing to suit 22.5 mm devices

- DIN rail mount
- Mounts 22.5 mm panelmount devices
- Suitable for loadcentres and panelboards



Holder is DIN rail mounted, and is designed to allow mounting of 22.5 mm panelmount devices in loadcentres and Concept family of panelboards. Ideal for mounting pilot lights, pushbuttons and key selector switches.

Description	Cat. No.	Price \$
Holder DIN profile suit 22.5 mm devices	<b>M22IVS</b>	<b>23.40</b>

### Panelboard switch (DTPBS)

The panelboard switch coupled to a main device is intended to switch off any 2 - 63 A MCB in case the front cover of the enclosure is removed. It is a mechanical safety device, which reduces the risk of electric shock in case of manipulation of the panelboard.

The panelboard switch can easily be coupled either to the right or left-hand side of the main device, according to the instructions below.

No. modules wide <sup>1)</sup>	Cat. No.	Price \$
0.5	<b>DTPBS</b>	<b>59.00</b>

### Kilowatt hour meters

- 8 Digit LCD
- Displays - Total active energy
  - Total reactive energy
  - Partial active energy
  - Partial reactive energy
  - Power demand
  - Maxium demand (power)
- Active energy: Class 1
- Input current 1 A or 5 A CT



CE4D04A2

No. modules wide <sup>1)</sup>	Cat. No. <sup>2)</sup>	Price \$
KWH meter DIN 4 module	<b>CE4DT 14A2</b>	<b>560.00</b>
KWH meter DIN 4 module (CUMMS)	<b>CE4DT 14A6</b>	<b>640.00</b>

**Notes:** <sup>1)</sup> 'DTSP' - 0.5 module width spacer available if required when DTPBS used.  
<sup>2)</sup> CE4DT Price Schedule 'Y8'.

## Busbar comb Din-T MCBs

### Current rating 100 A

#### Pin type busbars



No. of poles	1 Phase <sup>1)</sup> Cat. No.	Price \$	3 Phase Cat. No.	Price \$
8 Way	IBC108P	10.60	-	
12 Way	IBC112P	17.80	ICL123	49.00
15 Way	IBC115P	21.20	ICL153	61.00
18 Way	IBC118P	29.60	ICL183	72.50
21 Way	IBC121P	36.00	ICL213	94.50
55 Way	IBC155P	77.50	-	
57 Way	-		ICL573	225.00

Pin type busbar	Cat. No.	Price \$
1P+N 56 Way pin type busbar comb	ICL562	128.00
1P+N 6 Way pin type busbar comb	ICL62	18.20
1P+N 10 Way pin type busbar comb	ICL102	26.00
3P+Aux 56 Way pin type busbar comb	ICL563A <sup>2)</sup>	200.00
3P+N 56 Way pin type busbar comb	ICL564	255.00



Fork type busbar	Cat. No.	Price \$
56 Way 1 phase fork type busbar comb	ICL561F	78.00
57 Way 3 phase fork type busbar comb	ICL573F	230.00

End caps	Cat. No.	Price \$
1P end cap to suit IBC style buscomb	IBCEC1	2.00
2P and 3P end cap to suit ICL style buscomb	ICLEC23 <sup>3)</sup>	4.00
3P+N end cap to suit ICL style buscomb	ICLEC4 <sup>3)</sup>	4.00



ICL123



ICLTOC  
T-off cap (strip of 5)



ICL573F

- Notes:**
- <sup>1)</sup> IBC busbar combs come complete with endcaps.
  - <sup>2)</sup> 16 x 3 MCB connections and 16 x 9 mm spaces (AUXs).
  - <sup>3)</sup> ICL end caps do not suit IBC busbar combs.

# 1 Din-T Modular changeover switch

- Standard IEC 60669 - 1
- Handle sealable and lockable in ON or OFF position
- Terminal protection IP 20
- Captive terminal screws with cross head



### Without OFF I - II

In (A)	No. of Poles	No. of Modules	Connection	Cat. No.	Price \$
32	1	1		DTCS3212	47.50
32	2	1		DTCS3222	71.50

### With OFF I - O - II

In (A)	No. of Poles	No. of Modules	Connection	Cat. No.	Price \$
32	1	1		DTCS3213	59.00
32	2	1		DTCS3223	83.00

## Din-T Pushbuttons and pilot lights

- Modular size
- DIN rail mounting
- Terminal protection IP 20
- Contacts, 16 A @ 250 V AC



Description	No. of Poles	No. of Modules	Contacts	Cat. No.	Price \$
Pushbutton	2	1	N/O + N/C	DTPB11	35.50
Pushbutton illuminated	1	1	N/O	DTPB10L <sup>1)</sup>	54.00
Pilot light base	1	1		DTPLB <sup>2)</sup>	25.40
Lamp 240 V neon	-	-		DTPLL240	3.60
Lamp 24 V (filament)	-	-		DTPLL24	3.60
Lens red	-	-		DTPLLRD	3.30
Lens green	-	-		DTPLLGR	3.30
Lens orange	-	-		DTPLLOR	3.30
Lens clear	-	-		DTPLLCL	3.30

**Notes:** <sup>1)</sup> Order lens separately. 240 V lamp built-in and cannot be changed.

<sup>2)</sup> Order lens and lamp separately.

## MCB LOCKING SOLUTIONS - LockDIN™

**NHP**

The miniature circuit breaker locking solution  
for NHP DIN-T circuit breakers.

POWER PROTECTION



The first comprehensive system for safe  
and secure locking of DIN miniature circuit  
breakers (MCBs)

- Designed specifically for the mining industry
- Easy to install and retrofit to existing Concept•Premier and Concept•TOUGH panelboards
- Can be used with DINsafe RCBOs
- Accepts 2.5 - 6.5 mm padlocks, hasps and scissor arrangements
- Can only be used with the NHP DIN-T range
- Can be used with 1, 2 and 3 pole DIN-T MCBs



## LOCK DIN™

1

Din-T lockdogs provide a captive locking attachment for Din-T MCBs and RCDs.

The system is designed to be used in conjunction with Concept Premier and Concept Tough Panelboards. If a switchboard is being specifically designed to accommodate the new LOCK DIN™, then extra depth is required between escutcheon and door to accommodate the padlocks being used on site.

The LOCK DIN™ is designed to be clipped onto the line side of the MCB. This requires the line terminal screw to be tightened before installation. The escutcheon cut out needs to be increased by 16 mm over the line terminal to allow for the extended profile of the MCB with the LOCK DIN™ fitted.



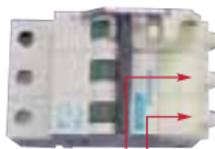
DTLLA



DTLLB



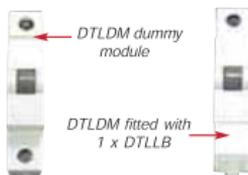
MCB in ON Position.  
Non lockable.



2 x DTLLB for a 3 pole MCB  
The use of 1 x DTLLA



MCB in OFF Position.  
Can be locked.

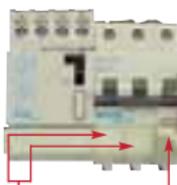


DTLDM dummy module

DTLDM fitted with 1 x DTLLB



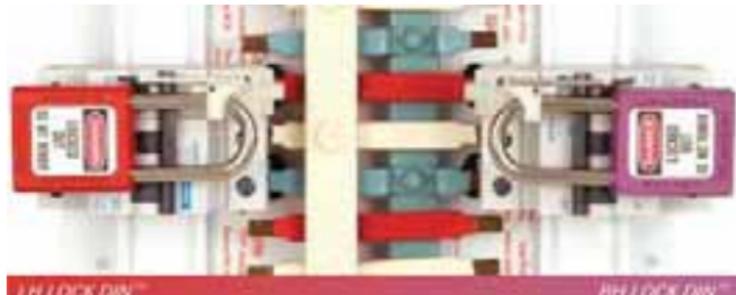
1 x DTLDM



2 x DTLLB 1 x DTLLA

## LOCK DIN™

Description	Cat. No.	Price \$
<b>Locking devices</b>		
LH locking assembly for MCBs and single pole RCBOs	<b>DTLLA</b>	<b>51.00</b>
RH locking assembly for MCBs and single pole RCBOs	<b>DTLLARH</b>	<b>51.00</b>
LH locking assembly for 2 pole RCBOs	<b>DTLLAB</b>	<b>51.00</b>
RH locking assembly for 2 pole RCBOs	<b>DTLLABRH</b>	<b>51.00</b>
Locking assembly for DINT-10H MCB	<b>DTLLA10H</b>	<b>61.00</b>
12 pack LH locking assembly for MCBs and single pole RCBOs	<b>DTLLABULK</b>	<b>570.00</b>
12 pack RH locking assembly for MCBs and single pole RCBOs	<b>DTLLARHBULK</b>	<b>570.00</b>
<b>Pole fillers and blanking devices</b>		
12 pack locking blank for MCBs and single pole RCBOs	<b>DTLLB</b>	<b>12.00</b>
Locking blank for DSRCM (add on RCCB), 3 pole MCBs	<b>DTLCM</b>	<b>4.70</b>
Dummy MCB (for total touch protection)	<b>DTLDM</b>	<b>12.00</b>
12 pack pole filler (extended length to suit 63 mm cutout)	<b>DTLPF</b>	<b>12.00</b>
<b>Escutcheons and labels</b>		
Concept premier escutcheon size 1 24 way to suit LockDIN	<b>CPPE5100DTL</b>	<b>210.00</b>
Concept premier escutcheon size 2 48 way to suit LockDIN	<b>CPPE5200DTL</b>	<b>250.00</b>
Concept premier escutcheon size 3 60 way to suit LockDIN	<b>CPPE5300DTL</b>	<b>290.00</b>
Concept premier escutcheon size 4 84 way to suit LockDIN	<b>CPPE5400DTL</b>	<b>330.00</b>
Concept premier escutcheon size 5 96 way to suit LockDIN	<b>CPPE5500DTL</b>	<b>375.00</b>
Concept tough escutcheon size 2 48 way to suit LockDIN	<b>CTES248RDCOLD</b>	<b>570.00</b>
Concept tough escutcheon size 3 96 way to suit LockDIN	<b>CTES396RDCOLD</b>	<b>670.00</b>
Centre escutcheon label 1 - 48	<b>LABLE148DT</b>	<b>22.80</b>
Centre escutcheon label 49 - 96	<b>LABLE4996DT</b>	<b>22.80</b>



## Meter Isolator LOCK DIN™

1

The Lockable Meter Isolator from NHP utilises the captive locking system known as LOCK DIN™. LOCK DIN™ has been designed for safe and secure captive locking of Terasaki DIN-T MCBs. When you combine LOCK DIN™ with a sealable enclosure and Terasaki MCB you have a complete system suitable for meter isolation and supply capacity/ service protection. <sup>1)</sup>

### DTPC Complete kits include: enclosure, MCB and LOCK DIN™

No. of poles	Amps	kA	Curve	Cat. No.	Price \$
<b>Enclosure type - DTPC (2 pole)</b>					
1 pole	63 kA	6 A	C	DTPC2LDCB	109.00
			D	DTPC2LDCBV	109.00
<b>Enclosure type - DTPC (4 pole)</b>					
3 pole	63 kA	6 kA	C	DTPC4LDCB	250.00
		10 kA	D	DTPC4LDCBV	540.00

### ILC Complete kits include: enclosure, MCB and LOCK DIN™

No. of poles	Amps	kA	Curve	Cat. No.	Price \$
<b>Enclosure type - ILC (4 pole)</b>					
1 pole	63 kA	6 A	C	ILC4SLDCB1P	156.00
			D	ILC4SLDCB1PD	161.00
	80-125 A	10 kA	C	ILC4SLDCB_1P <sup>2)</sup>	365.00
			D	ILC4SLDCB_1PD <sup>2)</sup>	440.00
3 pole	63 A	6 kA	C	ILC4SLDCB3P	290.00
		10 kA	D	ILC4SLDCB3PD	300.00
	80-125 A	10 kA	C	ILC4SLDCB_3P <sup>2)</sup>	950.00
			D	ILC4SLDCB_3PD <sup>2)</sup>	1020.00



**Notes:** <sup>1)</sup> As the service and installations rules vary from region to region please consult these to check suitability.

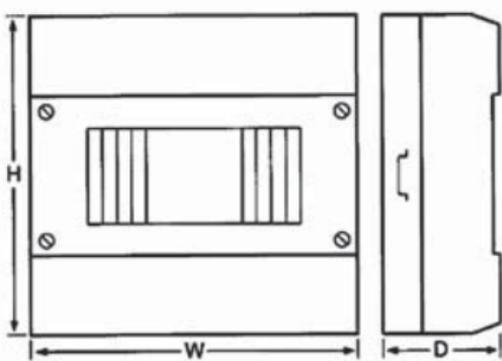
<sup>2)</sup> Insert 80, 100 or 125 for required amp rating.

## Meter Isolator LOCK DIN™

### Enclosures only, to suit meter isolator

To suit	Enclosure type	Cat. No.	Price \$
1 P MCB <63 A	DTPC (2 pole)	<b>DTPC2LD</b>	<b>19.20</b>
1-3 P MCB <63 A	DTPC (4 pole)	<b>DTPC4LD</b>	<b>23.40</b>
1-3 P MCB <63 A	ILC (4 pole)	<b>ILC4SLD</b>	<b>71.50</b>
1-3 P MCB 80-125 A	ILC (4 pole)	<b>ILC4SLD10H</b>	<b>77.00</b>
2 P RCBO 6-40 A	DTPC ( 2 pole)	<b>DTPC2LDRCBO</b>	<b>19.80</b>

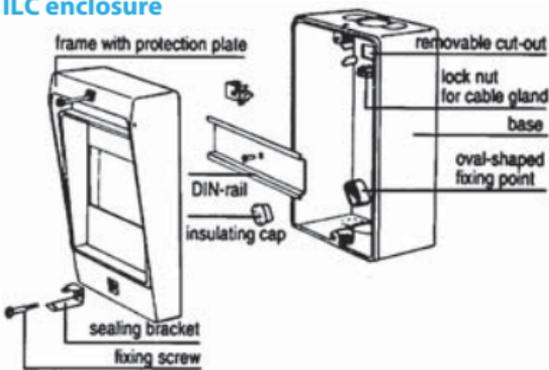
### DTPC enclosure



### Dimensions (mm)

No. of poles	Height	Width	Depth
2 pole	139	51	61
4 pole	139	88	61

### ILC enclosure



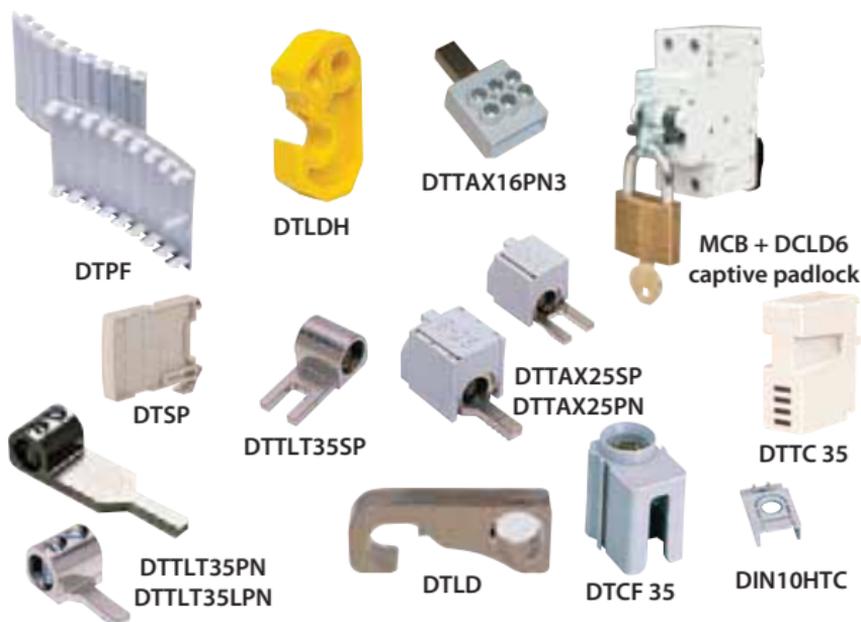
### Dimensions (mm)

No. of poles	Height	Width	Depth
4 pole	175	90	100

## Din-T series MCBs Accessories

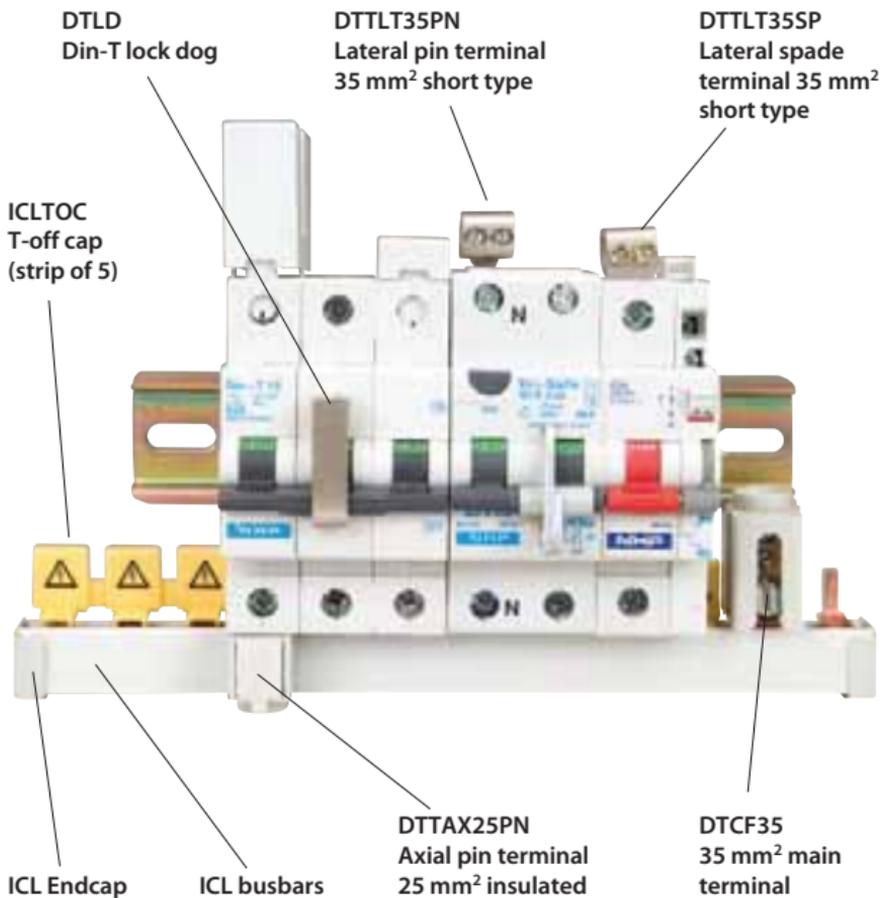
1

Description	Cat. No.	Price \$
Lateral pin terminal 35 mm <sup>2</sup> (short type)	DTTLT35PN	10.80
Lateral pin terminal 35 mm <sup>2</sup> (long type)	DTTLT35LPN	10.80
Din-T lock dog (Non-captive)	DTLD	23.00
Din-T lock dog captive (LOCK DIN) Refer page 1 - 46	-	
Din-T lock dog captive (1 - 4 pole) <sup>1)</sup>	DCLD6	57.00
Din-T lock dog to suit DINT10H	DTLDH	30.50
Lateral spade terminal 35 mm <sup>2</sup> (short type)	DTTLT35SP	10.80
Axial spade terminal 25 mm <sup>2</sup> (insulated)	DTTAX25SP	10.80
Axial pin terminal 25 mm <sup>2</sup> (insulated)	DTTAX25PN	10.80
Axial pin terminal 50 mm <sup>2</sup> (insulated)	DTTAX50PN	18.20
3 way neutral link suit RCCB	DTTAX16PN3	19.40
35 mm <sup>2</sup> main terminal	DTCF35	17.60
185 mm <sup>2</sup> main terminal	NEB185	88.00
Pole filler (1 strip of 4 poles, 8 x 9 mm segments)	DTPF	4.30
Busbar comb Refer page 1 - 43	-	
End cap (strip offs) (T-off cap)	ICLTOC	4.60
1/2 module spacer (9 mm wide)	DTSP	4.40
Din-T terminal cover 5 mm	DTTC5	4.70
Din-T terminal cover 35 mm	DTTC35	16.60
Din-T 10H terminal cover	DINT10HTC	5.40
Din-T 1P RCBO terminal cover	DSRCBHTC	7.50



**Notes:** <sup>1)</sup> Suitable for padlock hasp size 4.5 to 6.5 mm.

## Din-T series MCBs Accessories



## Din-T Series contactors

1

- Standard AS/NZS 60947.4.1
- Voltage 240/415 V AC
- Silent operated magnetic drive
- Integrated surge suppression
- Switch position indicator
- DIN rail mount



### Application

Din-T contactors are electromagnetically controlled switches used to control single or multiphase high power loads while the control itself can be low power. Applications include switching and control of lighting equipment, heating, ventilation, pumps, heat pumps and other equipment.

### Features

Except for the 20 A version, all Din-T contactors have DC coils, resulting in noise-free silent operation. As all DC coil contactors have an internal diode rectifier bridge they can be operated by both DC and AC power supplies. The built-in varistor protects the coil against an overvoltage of up to 5 kV. The switch position of contacts is visible via a flag indicator on the front of the contactor.

Current lth	Contact config.	Coil volts	No. of Mods.	Cat. No.	Price \$
20 A	1 NO / 1 NC	240 V AC	1	DTC2011240	151.00
20 A	2 N/O	24 V AC	1	DTC202024	151.00
20 A	2 N/O	240 V AC	1	DTC2020240	151.00
20 A	2 N/C	240 V AC	1	DTC2002240	151.00
24 A	4 N/O	12 V AC/DC	2	DTC244012	175.00
24 A	4 N/O	240 V AC/DC	2	DTC2440240	175.00
24 A	4 N/C	240 V AC/DC	2	DTC2404240	175.00
24 A	4 N/O	24 V AC/DC	2	DTC244024	175.00
40 A	4 N/O	24 V AC/DC	3	DTC404024	310.00
40 A	4 N/O	240 V AC/DC	3	DTC4040240	310.00
63 A	4 N/O	24 V AC/DC	3	DTC634024	430.00
63 A	4 N/O	240 V AC/DC	3	DTC6340240	430.00

### Din-T hour run counter

- DIN rail mounting
- Synchronous motor drive
- 99,999.99 hours
- Permanent visual display non-resettable
- Protection IP 20



No. Modules	Voltage	Cat. No. <sup>1)</sup>	Price \$
2	230 V AC	DTHR	131.00

Notes: <sup>1)</sup> Cannot be reset.

## Din-T Series contactors

### Technical data

Type	DTC20	DTC24	DTC40	DTC63
Rated continuous current $I_{th}$	20 A	24 A	40 A	63 A
<b>AC 1/AC 7a switching of heaters</b>				
Rated operational current $I_e$ <sup>1)</sup>	20 A	24 A	40 A	63 A
Rated output AC 1 240 V 1 $\phi$ 415 V 3 $\phi$	4 kW –	5.3 kW 16.0 kW	8.7 kW 26.0 kW	13.3 kW –
<b>AC 3/AC 7b switching of motors</b>				
Rated operational current $I_e$ <sup>1)</sup>	9 A	9 A	22 A	30 A
Rated output AC 3 240 V 1 $\phi$ 415 V 3 $\phi$	1.3 kW –	1.3 kW 4.0 kW	3.7 kW 11.0 kW	5.0 kW 15.0 kW
<b>AC 5a switching of electric discharge lamp controls <sup>2)</sup> (uncompensated)</b>				
Rated operational current $I_e$ <sup>1)</sup>	8 A	10 A	30 A	44 A
<b>AC 5b switching of incandescent lamps <sup>2)</sup></b>				
Rated operational current $I_e$ <sup>1)</sup>	6 A	7 A	15 A	22 A
<b>Switching on capacity</b>				
$\cos_\phi = 0.95$ at 220-230 V 1 phase	100 A	–	–	–
$\cos_\phi = 0.65$ at 380-400 V 3 phase	–	90 A	220 A	300 A
<b>Switching off capacity</b>				
$\cos_\phi = 0.95$ at 220-230 V 1phase	80 A	–	–	–
$\cos_\phi = 0.65$ at 380-400 V 3phase	–	72 A	176 A	240 A
Ohmic loss per contact $I_n$	1.0 W	1.5 W	3.0 W	6.0 W
<b>Endurance and mechanical switching</b>				
Max. switching frequency at AC 1/AC 7a	300 h	300 h	300 h	300 h
Max. switching frequency at AC 3/AC 7b	600 h	600 h	600 h	600 h
Mechanical service life	106	106	106	106
Electrical service life at AC 1/AC 7a	150,000	150,000	150,000	150,000
Electrical service life at AC 3/AC 7b	150,000	500,000	170,000	240,000
Terminal capacity max.	1x10 mm <sup>2</sup>	2x4 mm <sup>2</sup>	1x25 mm <sup>2</sup>	2x10 mm <sup>2</sup>
<b>Magnetic control system</b>				
Control voltage range	85...110 % x $U_n$			
Rated operating frequency	50 / 60 Hz		DC, 40...450 Hz	
Operating temperature range	-22 °C to +55 °C <sup>3)</sup>			
Max. pull-in coil power loss	8 VA/5 W	4 VA/4 W	5 VA/5 W	65 VA/65 W
Max. holding coil power loss	3.2 VA/1.2 W	4 VA/4 W	5 VA/5 W	4.2 VA/4.2 W
Switching on delay	9...12 ms	<40 ms	<40 ms	<40 ms
Switching off delay	10...12 ms	<40 ms	<40 ms	<40 ms
Terminal capacity max.	1 x 4 mm <sup>2</sup> or 2 x 2.5 mm <sup>2</sup>			

- Notes:** <sup>1)</sup> When parallel switching 2 current paths the rated current  $I_e$  will be multiplied by 1.6.  
<sup>2)</sup> For additional lamp switching data refer to NHP.  
<sup>3)</sup> If several contactors are mounted side by side in a row fit a half-module spacer (Cat. No. DTSP) between every second contactor.

## Din Series contactors



- Standard AS/NZS 60947.4.1
- Voltage 240/415 V AC
- Switch position indicator
- DIN rail mount

### Application

Din contactors are electromagnetically controlled switches used to control single or multiphase high power loads while the control itself can be low power. Applications include switching and control of lighting equipment, heating, ventilation, pumps, heat pumps and other equipment.

Current I <sub>th</sub>	Contact config.	Coil volts	No. of Mods.	Cat. No.	Price \$
20 A	2 N/O	24 V AC	1	DTC202024L	78.00
20 A	2 N/O	240 V AC	1	DTC2020240L	78.00
25 A	4 N/O	12 V AC/DC	2	DTC254012L	98.50
25 A	4 N/O	240 V AC/DC	2	DTC2540240L	98.50
25 A	4 N/C	240 V AC/DC	2	DTC2504240L	98.50
40 A	4 N/O	240 V AC/DC	3	DTC4040240L	235.00
63 A	4 N/O	240 V AC/DC	3	DTC6340240L	260.00

### Technical data

Type	DTC20...L	DTC25...L	DTC40...L	DTC63...L
Rated continuous current I <sub>th</sub>	20 A	25 A	40 A	63 A
<b>AC 1/AC 7a switching of heaters</b>				
Rated operational current I <sub>e</sub>	20 A	25 A	40 A	63 A
Rated output kW	4	5.4	8.4	13
<b>AC 7b</b>				
Rated operational current I <sub>e</sub>	7 A	8.5 A	15 A	25 A
Rated output kW	1.2	1.5	2.4	3.8
<b>Switching on capacity (A)</b>				
AC 1/7a cos $\phi$ 0.8 U <sub>e</sub> 1.05	30	37.5	60	94.5
AC 7b cos $\phi$ 0.45 U <sub>e</sub> 1.05	160	200	320	504
<b>Performance</b>				
AC 1/7a cos $\phi$ 0.8 U <sub>e</sub> 1.05	20	25	40	63
AC 7b cos $\phi$ 0.45 U <sub>e</sub> 0.17	4	5.4	8.4	13
<b>General</b>				
Terminal capacity mm <sup>2</sup>	6	10	25	25
Control voltage range 85 - 110% x U <sub>n</sub>				
Frequency 50 Hz				
Rated insulation voltage 500 V				
Pick up time 50 mS				
Mechanical life >3x10 <sup>4</sup>				
Electrical life >1x10 <sup>5</sup>				

## Din-T Impulse switch



### Din-T impulse switch

- Standard IEC 60669-2-2
- Visual indication of contact position
- Manual or electrical operation
- Terminal protection IP 20
- 16 A 240 V AC contact rating

### Function

Impulse switches are electromechanical switches used to control medium power loads while the control itself remains low power. The device switches between 2 stable positions each time a brief pulse is required to switch positions. The device can also be switched manually.

Diagram	Coil Voltage	No. of poles	No. of mods.	In	Cat. No. <sup>1)</sup>	Price \$
	12 V AC	1	1	16 A	DTIS1012VAC	66.00
	24 V AC	1	1	16 A	DTIS1024VAC	66.00
	48 V AC	1	1	16 A	DTIS1048VAC	66.00
	240 V AC	1	1	16 A	DTIS10240VAC	66.00
	12 V DC	1	1	16 A	DTIS1012VDC	66.00
	24 V DC	1	1	16 A	DTIS1024VDC	66.00
	12 V AC	2	1	16 A	DTIS2012VAC	96.00
	24 V AC	2	1	16 A	DTIS2024VAC	96.00
	48 V AC	2	1	16 A	DTIS2048VAC	96.00
	240 V AC	2	1	16 A	DTIS20240VAC	96.00
	12 V DC	2	1	16 A	DTIS2012VDC	96.00
	24 V DC	2	1	16 A	DTIS2024VDC	96.00
	12 V DC	2	1	32 A	DTIS123212VDC	187.00
	12 V AC	2	1	16 A	DTIS1112VAC	96.00
	24 V AC	2	1	16 A	DTIS1124VAC	96.00
	48 V AC	2	1	16 A	DTIS1148VAC	96.00
	240 V AC	2	1	16 A	DTIS11240VAC	96.00
	12 V DC	2	1	16 A	DTIS1112VDC	96.00
	24 V DC	2	1	16 A	DTIS1124VDC	96.00
	12 V DC	2	1	32 A	DTIS113212VDC	187.00

### Add on power contact <sup>2)</sup>

Diagram	Coil Voltage	No. of poles	No. of mods.	In	Cat. No. <sup>1)</sup>	Price \$
		2	1	16 A	DTIS2NO	83.00
		2	1	16 A	DTIS2CO	83.00
		2	1	32 A	DTIS132PWR	187.00

**Notes:** <sup>1)</sup> When stacking in rows ensure adequate ventilation, insert spacer (DTSP) every second device.

<sup>2)</sup> Only suitable for 32 A DTIS.  
32 A unit available - refer NHP.

## Sprecher + Schuh CA 8 contactors

### Features

- Ideally suited for heating, lighting, hot water and storage heating applications
- Small size (2.5 pole width), panel or DIN rail mounting
- Contactors can be mechanically interlocked
- Large range of snap-on accessories <sup>1)</sup>
- Conforms to AS/NZS 60947 with world-wide approvals



Contactor CA 8-5

### Maximum current ratings (amps) at 415 volts

Cat. No. <sup>1)</sup>	CA 8-5-10_AC <sup>2)</sup>			CA 8-9-10_AC <sup>2)</sup> [CA 8-12-10_AC <sup>2)</sup> ]			4-POLE CA 8-9-M40_AC	
Price \$ <sup>3)</sup>	99.50			113.00 [137.00]			143.00	
<b>Heating loads AC 1</b>	2 Pole Parallel		3 Pole Parallel	2 Pole Parallel		3 Pole Parallel	4 Pole Parallel	
Amps per phase 40 °C (A)	20	34	50	20	34	50	20	64
Amps per phase 60 °C (A)	16	27	40	16	27	40	16	51
<b>Lighting loads</b>								
Tungsten per phase (A)	4	-	-	7	-	-	7	-
Fluorescent 40 °C (A)	18	30	45	18	30	45	18	57
Fluorescent 60 °C (A)	14.5	24	35	14.5	24	35	14.5	45
<b>Motor loads</b>								
Amps 415 volt AC 3	5.3			9.0 [12]			9.0	
kW @ 60 °C	2.6			4.5 [6.1]			4.5	

### Emergency lighting test unit

		Cat. No.	Price \$
Standard switch operated emergency lighting test unit	reset - test	ELTS <sup>4)</sup>	235.00
Key operated emergency lighting test unit	reset - test	ELTK <sup>4)</sup>	250.00



ELTS



ELTK

- Notes:** <sup>1)</sup> For further information refer to Part A Section 1 Price List Catalogue.  
<sup>2)</sup> Supplied with 1 N/O auxiliary contact. For 1 N/C auxiliary contact specify 01 instead of 10 when ordering.  
<sup>3)</sup> Price is for standard AC coil voltage. Specify voltage when ordering  
<sup>4)</sup> Cat. No. ELTS and ELTK use Price Schedule 'A4'

## DIN rail mounted surge diverters - Electrical network

1

### Features:

- Compact size
- Status indication (via flag)
- DIN rail mounting
- Thermal disconnection
- Remote indication (via volt free contact)



PSC series



PSM series

### PSC Series

The PSC pluggable range consists of Class 1+2 (according to IEC 61643-11) surge protective devices (lightning arrestor) (10/350  $\mu$ s) and surge protector (8/20  $\mu$ s) with low  $U_p$  (protection of downstream equipments) for single-phase and three-phase electrical power networks.

These units are ideal for protection of service entrances and distribution panels in areas exposed to lightning activity or externally generated heavy transients.

No. of phases	$I_{imp}$	$I_{max}$	Connection	$I_N$	$U_c$	$U_p$	Cat. No.
1P	12.5 kA	65 kA	L-N	20 kA	275 V	$\leq 1.3$ kV	CPTPSC1-12/230IR
1P	25 kA	65 kA	N-PE	25 kA	255 V	$\leq 1.5$ kV	CPTPSC1-25N
1P	25 kA	100 kA	L-N	25 kA	275 V	$\leq 1.3$ kV	CPTPSC1-25/230IR
1P	50 kA	65 kA	N-PE	50 kA	255 V	$\leq 1.5$ kV	CPTPSC1-50N
1P	100 kA	100 kA	N-PE	50 kA	255 V	$\leq 1.5$ kV	CPTPSC1-100N
1P+N	12.5 kA	65 kA	L+N-PE	20 kA	275 V	$\leq 1.3$ kV	CPTPSC2-12/230IR <sup>1)2)3)</sup>
1P+N	25 kA	100 kA	L+N-PE	25 kA	275 V	$\leq 1.3$ kV	CPTPSC2-25/230IR <sup>1)2)3)</sup>
3P+N	12.5 kA	65 kA	L+L+L+N-PE	20 kA	440 V	$\leq 1.3$ kV	CPTPSC4-12/400IR <sup>1)2)3)</sup>
3P+N	25 kA	100 kA	L+L+L+N-PE	25 kA	440 V	$\leq 1.3$ kV	CPTPSC4-25/400IR <sup>1)2)3)</sup>

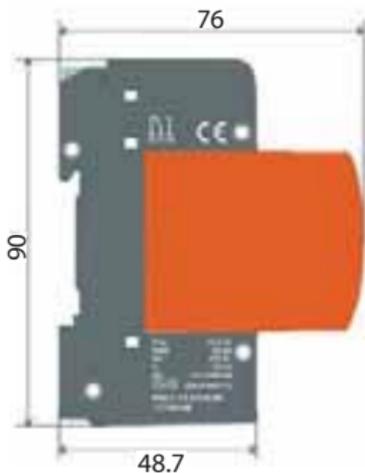
Accessories	For use with	Cat. No.
Replacement module - limp 12.5 kA	CPTPSC1-12/230IR, CPTPSC2-12/230IR & CPTPSC4-12/400IR	CPTPSC-12-230MOD
Replacement module - limp 25 kA	CPTPSC1-25/230IR, CPTPSC2-25/230IR & CPTPSC4-25/400IR	CPTPSC-25-230MOD

- Notes:**
- <sup>1)</sup>  $U_p$  listed above is between L-N. The  $U_p$  between N-PE is  $\leq 1.5$  kV.
  - <sup>2)</sup>  $U_c$  listed above is between L-N. The  $U_c$  between N-PE is 255 V.
  - <sup>3)</sup>  $I_{imp}$  listed above is between L-N. The  $I_{imp}$  between N-PE is 25 kA
  - <sup>4)</sup>  $I_{imp}$  listed above is between L-N. The  $I_{imp}$  between N-PE is 50 kA.
  - <sup>5)</sup>  $I_{imp}$  listed above is between L-N. The  $I_{imp}$  between N-PE is 100 kA.

1

## DIN rail mounted surge diverters - Electrical network

### Dimensions (mm)



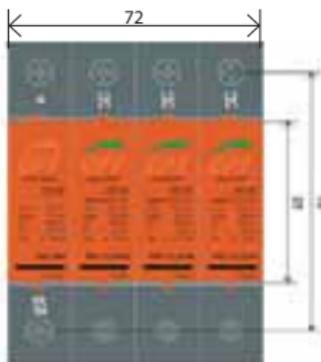
All PSC series



CPTPSC112230IR  
CPTPSC125N  
CPTPSC150N



CPTPSC125230IR  
CPTPSC1100N  
CPTPSC212230IR



CPTPSC412230IR  
CPTPSC225230IR



CPTPSC425400IR

**Notes:** CPTPSC425400IR dimensions are H x W x D (mm): 90 x 155 x 76.

## DIN rail mounted surge diverters - Electrical network

### PSM Series

The PSM pluggable range consists of Class 2 (according to IEC) surge protective devices designed for protection against transient overvoltages in single-phase and three-phase electrical power networks.

These units are ideal for protection of distribution and branch panels, electronic equipment etc.

No. of phases	$I_{max}$	Connection	$I_N$	$U_c$	$U_p$	Cat. No.
1 P	20 kA	L-N	10 kA	275 V	< 1.4 kV	<b>CPTPSM1- 20/230 IR</b>
1 P	20 kA	N-PE	10 kA	255 V	< 1.5 kV	<b>CPTPSM1- 20N</b>
1 P	40 kA	L-N	20 kA	275 V	< 1.3 kV	<b>CPTPSM1- 40/230 IR</b>
1 P	40 kA	N-PE	20 kA	275 V	< 1.5 kV	<b>CPTPSM1- 40N</b>
1 P+N	20 kA	L+N-PE	10 kA	275 V	< 1.4 kV	<b>CPTPSM2- 20/230 IR <sup>1) 2)</sup></b>
1 P+N	40 kA	L+N-PE	20 kA	275 V	< 1.3 kV	<b>CPTPSM2- 40/230 IR <sup>1) 3)</sup></b>
3 P+N	20 kA	L+L+L+ N-PE	10 kA	440 V	< 1.4 kV	<b>CPTPSM4- 20/400 IR <sup>1) 2)</sup></b>
3 P+N	40 kA	L+L+L+ N-PE	20 kA	440 V	< 1.3 kV	<b>CPTPSM4- 40/400 IR <sup>1) 3)</sup></b>

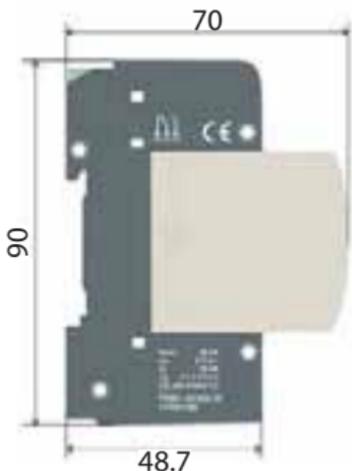
Accessories	For use with	Cat. No.
Replacement module - I <sub>max</sub> 20 kA	CPTPSM1-20/230IR, CPTPSM2- 20/230IR & CPTPSM4-20/400IR	<b>CPTPSM-20-230MOD</b>
Replacement module - I <sub>max</sub> 40 kA	CPTPSM1-40/230IR, CPTPSM2- 40/230IR & CPTPSM4-40/400IR	<b>CPTPSM-40-230MOD</b>

**Notes:** <sup>1)</sup>  $U_p$  listed above is between L-N. The  $U_p$  between N-PE is  $\leq 1.5$  kV.  
<sup>2)</sup>  $U_c$  listed above is between L-N. The  $U_c$  between N-PE is 255 V.  
<sup>3)</sup>  $U_c$  listed above is between L-N. The  $U_c$  between N-PE is 265 V.

1

## DIN rail mounted surge diverters - Electrical network

### Dimensions (mm)



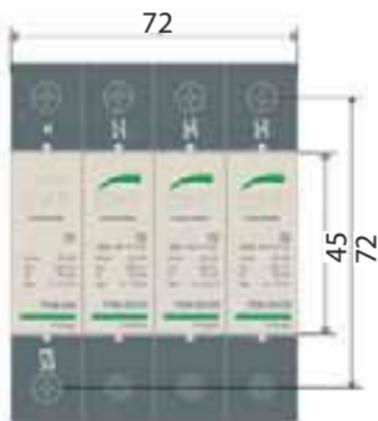
All PSM models



1P PSM models

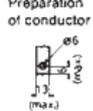
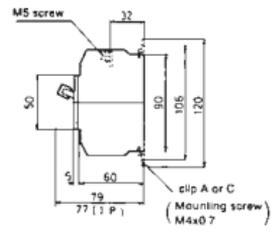
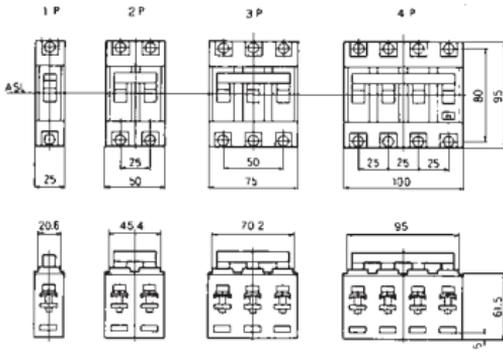


1P+N PSM models

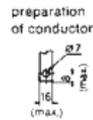
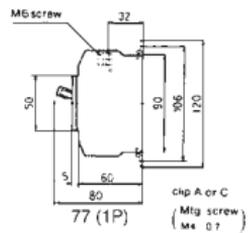
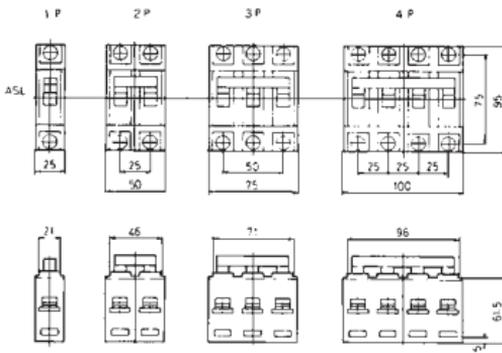


3P+N PSM models

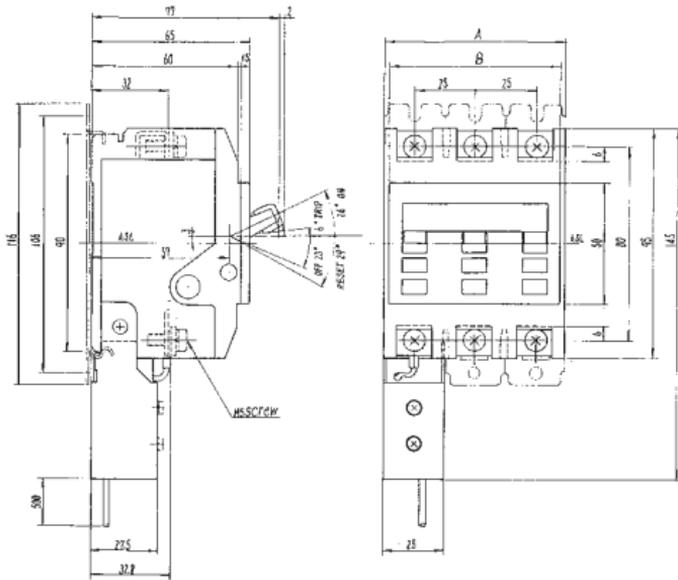
### Safe-T (6-63 A) MCBs



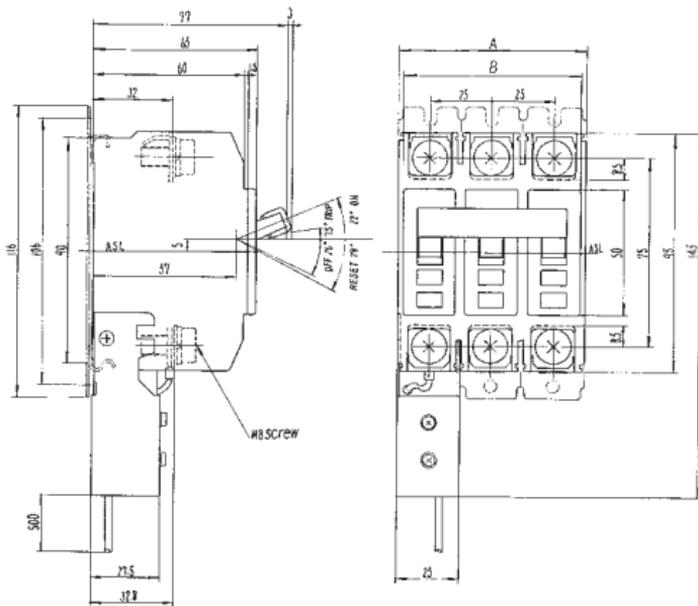
### Safe-T (80-100 A) MCBs



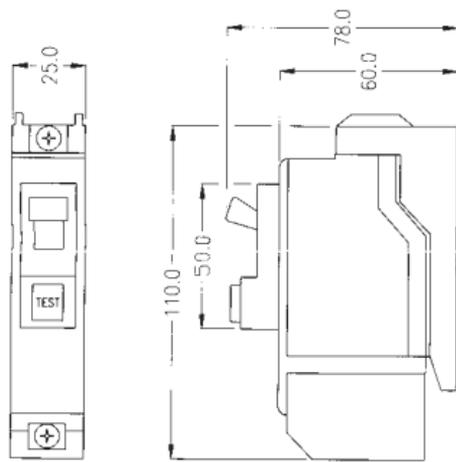
Safe-T (6-63 A)



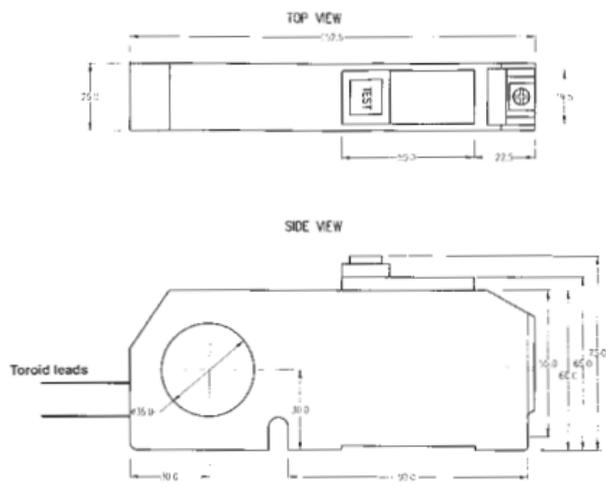
Safe-T (80-100 A)



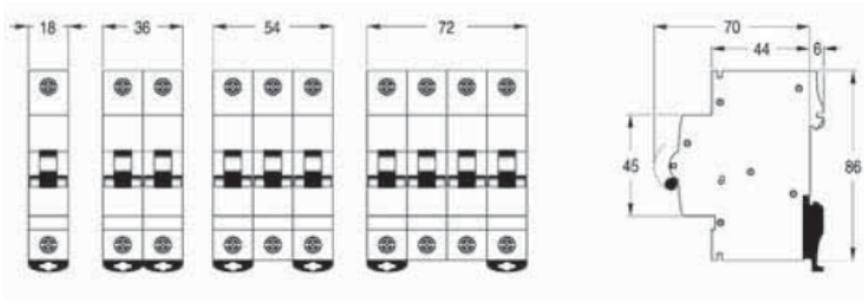
**Safe-T (SRCB) RCBO**



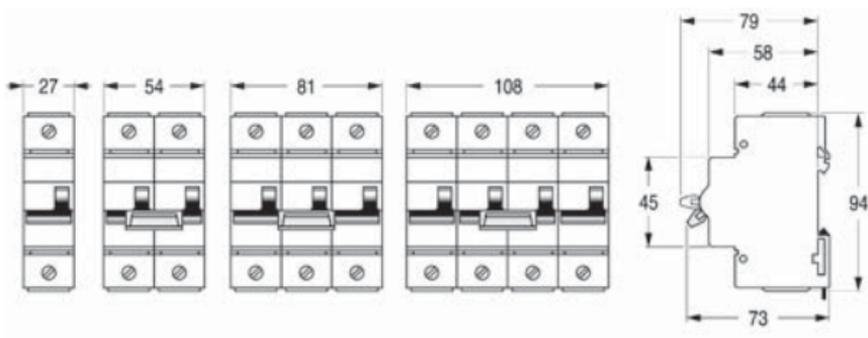
**Safe-T (ELR) earth leakage relay**



### Din-T 6, 10, 15 / Din-T DC - MCBs

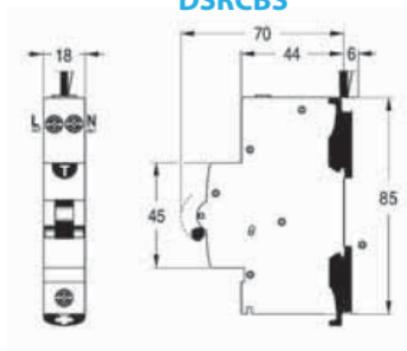
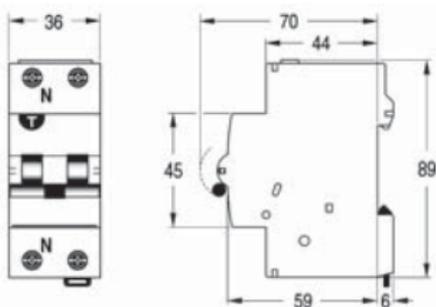


### Din-T 10H - MCBs



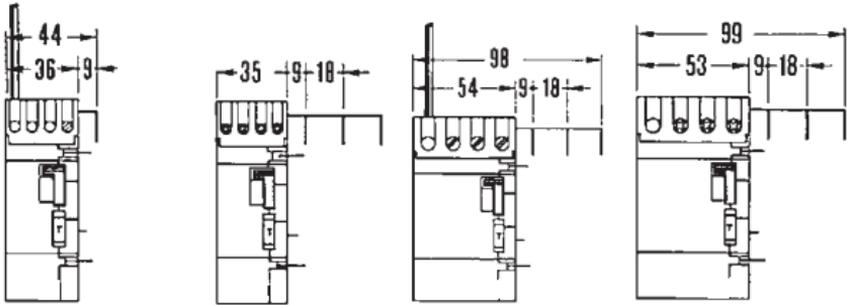
### Din-Safe - 2 P RCBO

### DSRCBS



**Din-Safe - Add-on earth leakage module**

**1 P + N (32 & 63 A)    3 P + N (32 A)    3 P + N (63 A)    3 P (63 A)**



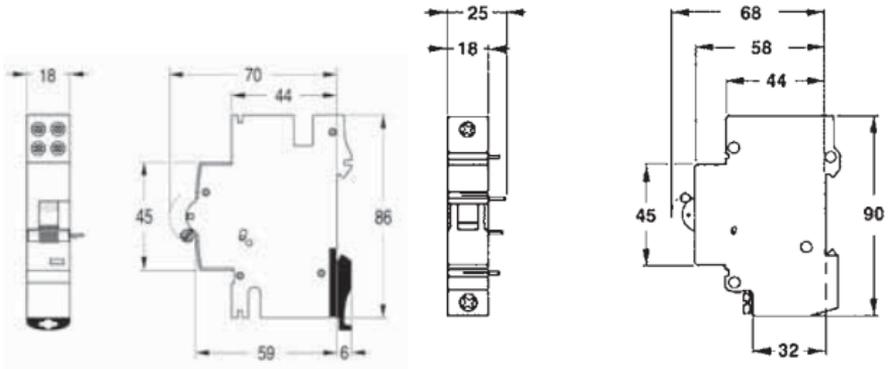
**Din-T shunt trip**

To suit:

**Din-T 6, 10, 15, Din-T DC**

To suit:

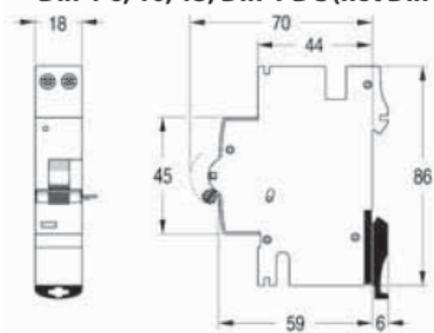
**Din-T 10H**



**Din-T undervoltage trip**

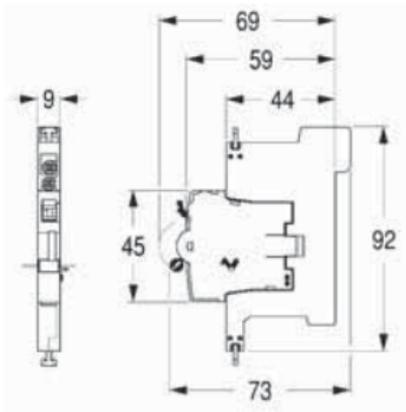
To suit:

**Din-T 6, 10, 15, Din-T DC (not Din-T10H)**



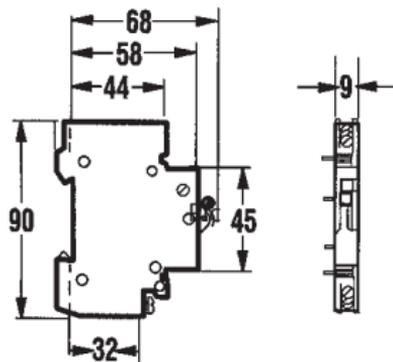
### Auxiliary contacts for MCBs

Din-T 6, 10, 15, Din-T DC

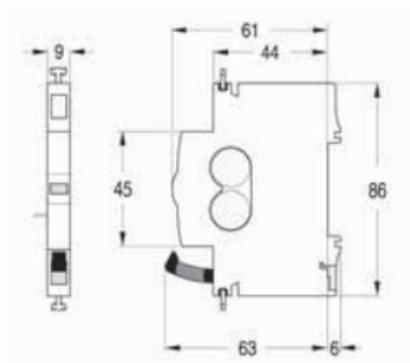
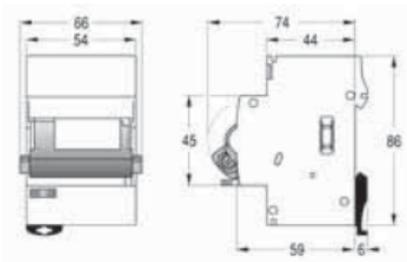


Din-T - motor operator

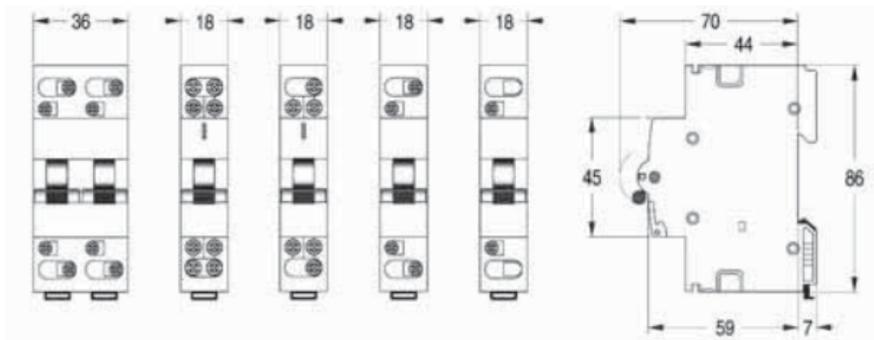
Din-T 10H



Din-T - panelboard switch

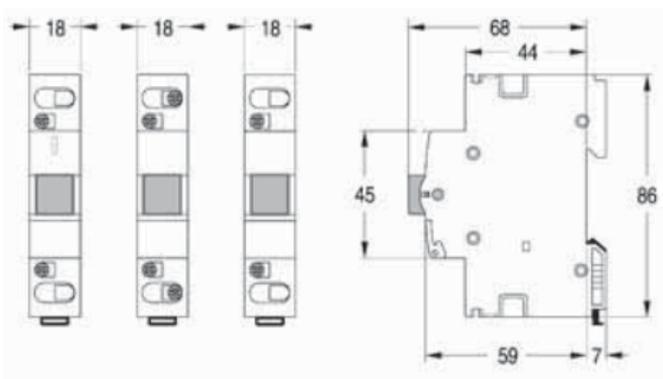


### Din-T - changeover switch

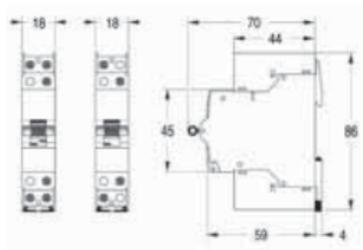




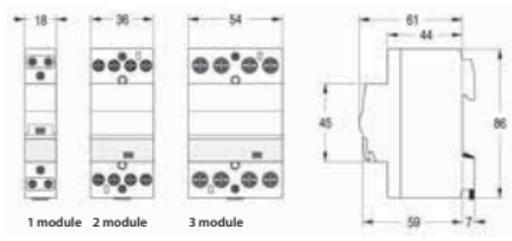
**Din-T - pushbutton**



**Din-T - impulse switch**



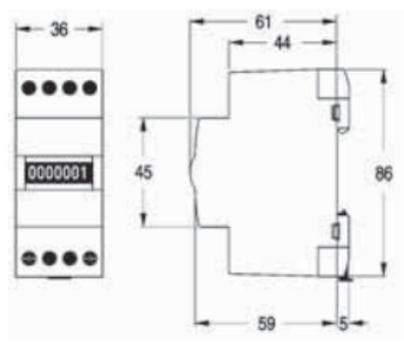
**Din-T - contactor**



**Din-T - Pilot light**



**Din-T - hour run counter**



## Time switches Talento range

1

- Digital & Analogue
- 24 hr, 7 day and yearly programming
- 17.5 mm wide and standard DIN housing
- 1, 2 and 4 channel flexibility
- Economical synchronous operation and quartz precision with reserve
- Manual override
- Pulse switching capability (TAL 471,472 PLUS)
- Energy saving ASTRO function (TAL 791 PLUS)



TAL111MINI



TAL371  
MINI PLUS



TAL371 PRO

### Specifications

Supply voltage: 220 - 240 V 50 Hz  
Contact rating: 16 A / 240 V AC 1  
(resistive load)

\* Other voltages available, contact NHP.

### Analogue 24 hr & 7 day - 16 A rating (resistive load)

Pro-gramme	Reserve	Min. switch time	Contact	Cat. No.	Price \$
24 hr	-	30 min	1 N/O	TAL111MINI	102.00
24 hr	-	30 min	1 C/O	TAL111	105.00
24 hr	50 hr	30 min	1 N/O	TAL211MINI	151.00
24 hr	150 hr	30 min	1 C/O	TAL211	200.00
7 day	-	3 hr	1 C/O	TAL171	148.00
7 day	150 hr	3 hr	1 C/O	TAL271	215.00

### Digital 24 hr, 7 day & yearly (resistive load)

Programme	Reserve	Min. switch time	No. of memory loca-tions	Contact	Cat. No.	Price \$
24hr/7 days	3 yrs	1 min	50	1 C/O	TAL371MP240VAC	145.00
24hr/7 days	3 yrs	1 min	70	1 C/O	TAL371PRO	210.00
24hr/7 days	3 yrs	1 min	70	2 C/O	TAL372PRO	330.00
24hr/7 days	3 yrs	1 min	100	1 C/O	TAL471PRO	270.00
24hr/7 days	3 yrs	1 min	100	2 C/O	TAL472PRO	390.00
Astro	3 yrs	Daylight Switch		1 C/O	TAL791PRO	430.00
Yearly	3 yrs	1 sec	800	2 C/O	TAL892PLUSTOP	760.00
Yearly	3 yrs	1 sec	800	4 C/O	TAL892PLUSTOP AND TALCEPLUSTOP	760.00
						365.00

## Panelboards, Loadcentres and accessories Busbar chassis assemblies

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## Pole covers

### Safe-T and Din-T

#### Safe-T pole covers

- Standard AS/NZS 3132
- Degree of protection IP 30
- Surface mounting
- Colour – Black
- Supplied complete with clip tray



Pole capacity	Cat. No.	Price \$
1	SAFE-TPC1	18.20
3	SAFE-TPC23	32.50

#### Dimensions (mm)

Pole capacity	H	W	D
1	160	30	64
3	160	80	64

#### Price schedule 'T1'

#### Din-T pole covers for Din-T series MCBs

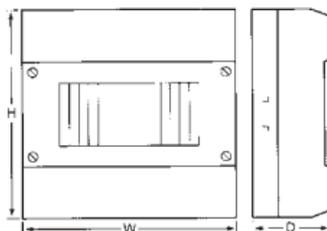
- Standard AS/NZS 3132
- Suits Din-T6, 10, 10H, 15 MCBs and associated DIN equipment
- Made from high impact resistant material
- Degree of protection IP 30
- Surface mounting
- Colour – Grey
- 2 and 4 way lead sealable



Capacity	Cat. No. <sup>1)</sup>	Price \$
1 Pole	CSPC1	7.30
2 Pole	DTPC2	13.00
4 Pole	DTPC4	16.80
6 Pole	DTPC6	31.50
8 Pole	DTPC8	41.00
1 Pole (Suits 1P MCB with LockDIN)	DTPC2LD	19.20
3 Pole (Suits 3P MCB with LockDIN)	DTPC4LD	23.40

#### Dimensions (mm)

Pole capacity	H	W	D
1	130	32	62
2	139	51	61
4	139	88	61
6	165	140	72
8	198	200	72



**Notes:** <sup>1)</sup> Will not accept DSRCBH single pole RCDs.

## Insulated loadcentres

### ILC series

- Standard AS/NZS 3132
- Suits Din-T6, 10, 10H, 15 MCBs and associated DIN equipment
- Made from high impact resistance material
- Comprehensive cable entry facilities at top, bottom, sides and rear
- Modern consumer unit designed with an attractive styling for new buildings, replacing old units, or adding extensions



2

#### Ordering details

Pole capacity	Cat. No.	Price \$
4	ILC 4S	65.50
8	ILC 8S	79.00
1-3 (Suits <63 A Din-T MCB with Lockdin)	ILC4SLD	71.50
1-3 (Suits 80-125 A Din-T MCB with Lockdin)	ILC4SLD10H	77.00

#### Optional accessories

Description	Cat. No.	Price \$	
Comb type busbars	REFER PAGE	1 - 43	
Main switches	REFER PAGE	1 - 38	
Earth and neutral bar kit	4 x 10 mm <sup>2</sup>	ILC 4EN	27.00
	2 x 16 mm <sup>2</sup> + 8 x 10 mm <sup>2</sup>	ILC 8EN	31.00
Lead sealing bracket	ILCSB	3.60	

#### Technical data

- Maximum load 120 amp
- Maximum operating voltage 415 V AC
- Degree of protection IP 43
- Material: self-extinguishing halogen-free polystyrene
- Colour: Base: Grey RAL 7035  
Door: Clear

#### Dimensions (mm)

Cat. No.	H	W	D
ILC 4S	175	90	100
ILC 8S	175	170	120

**Notes:** Earth and neutral kit ordered separately.  
Bus comb ordered separately.  
Will not accept DSRCBH single pole RCDs.

## Insulated loadcentres

### DIN-T – surface mount

2

- Standard AS/NZS 3439-3
- Suits NHP Din-T MCBs and associated DIN equipment
- Surface mount
- Degree of protection IP 40
- Split earth neutral bars
- Removable earth and neutral bar support
- Transparent or white door
- Door hinged at the top
- Supplied complete with Buscomb



#### Ordering details

Pole cap.	No. of rows	Neutral bar	Earth bar	Trans. door Cat. No.	White door Cat. No.	Price \$
8	1	4/4	8	<b>CSB08ST</b>	<b>CSB08SW</b>	<b>67.50</b>
12	1	5/3/3	12	<b>CSB12ST</b>	<b>CSB12SW</b>	<b>78.00</b>
18	1	9/3/3/3	18	<b>CSB18ST</b>	<b>CSB18SW</b>	<b>119.00</b>
24	2	10/3/3/3/3	24	<b>CSB24ST</b>	<b>CSB24SW</b>	<b>156.00</b>
36	3	12/12/12	36	<b>CSB36ST</b>	<b>CSB36SW</b>	<b>197.00</b>

#### Dimensions

Pole capacity	Width (mm)	Height (mm)	Depth (mm)
8	185	200	94
12	256	200	97
18	363	220	97
24	269	326	97
36	306	473	102

## Insulated loadcentres

### DIN-T – flush mount

- Standard AS/NZS 3439-3
- Suits NHP Din-T MCBs and associated DIN equipment
- Flush mount
- Degree of protection IP 40
- Split earth neutral bars
- Removable earth and neutral bar support
- Transparent or white door
- Door hinged at the top
- Supplied complete with Buscomb



#### Ordering details

Pole cap.	No. of rows	Neutral bar	Earth bar	Trans. door Cat. No.	White door Cat. No.	Price \$
12	1	5/3/3	12	CSB12FT	CSB12FW	78.00
18	1	9/3/3/3	18	CSB18FT	CSB18FW	119.00
24	2	10/3/3/3/3	24	CSB24FT	CSB24FW	156.00
36	3	12/12/12	36	CSB36FT	CSB36FW	197.00

#### Metal backing plate long

Pole capacity	Cat. No.	Price \$
12	CSB12FMPL	37.00
18	CSB18FMPL	37.00
24	CSB24FMPL	42.00
36	CSB36FMPL	42.00

#### Dimensions

Pole capacity	Description	Width (mm)	Height (mm)	Depth (mm)
12	Base	270	211	66
12	Cover	304	246	29
18	Base	380	232	76
18	Cover	412	267	29
24	Base	270	304	76
24	Cover	305	358	29
36	Base	308	470	76
36	Cover	342	503	29

#### Flush enclosure - cut out dimensions (mm)

Enclosure type	Width	Height
12 way	259	199
18 way	365	213
24 way	259	311
36 way	296	458

## Insulated loadcentres

### Din-Modula 150 series

2

- Standard AS/NZS 3439.3
- Suits Din-T6, 10, 10H & 15 MCBs and associated DIN equipment
- IP 40 protection rating
- Totally insulated
- Maximum 100 amp load
- 150 mm centre distance between DIN rails with 30 mm behind the mounting frame
- The range consists of 36, 54 and 72 pole enclosures
- Neutral and earth bars rated at 100 amps



These enclosures have generous 150 mm wiring space between and 30 mm behind equipment rails. The removable mounting frame serves to ease cabling and wiring greatly. Din-Modula 150 is designed for indoor use and to accept the Din-T 6, 10, 10H and 15 MCB range, time switches, contactors and main switches.

#### Technical data

- Material: Base: Grey impact resistant polystyrene  
Door: Clear polycarbonate
- Halogen free

#### Ordering details

No. of rows	Pole cap.	Neutral bar	Earth bar	Surface Cat. No. <sup>1)</sup>	Price \$
2	36	1 x 18	1 x 18	<b>DM15036</b>	<b>305.00</b>
3	54	2 x 18	1 x 24	<b>DM15054</b>	<b>440.00</b>
4	72	2 x 18	1 x 36	<b>DM15072</b>	<b>580.00</b>

#### Optional accessories

Description	Cat. No.	Price \$
Neutral 19-36	<b>DM150NAA</b>	<b>39.50</b>
Neutral 37-54	<b>DM150NAB</b>	<b>72.50</b>
Neutral 55-72	<b>DM150NAC</b>	<b>72.50</b>
Locking device	<b>DM150LD</b>	<b>46.00</b>
Coupling kit	<b>DM150JK</b>	<b>23.40</b>

#### Dimensions (mm)

Cat. No.	H	W	D
<b>DM15036</b>	450	355	142
<b>DM15054</b>	600	355	142
<b>DM15072</b>	750	355	142

**Notes:** <sup>1)</sup> Will not accept DSRCBH single pole RCDs.  
Neutral bar extension kits must be ordered separately.  
When flush mount required order separately by description.

## Insulated loadcentres MCE weatherproof series

- Suits Din-T6, 10, 10H, 15 and DC MCBs
- Suits DSRCBS 1P and DSRCB 2P RCBOs
- IP 65 - IK 08
- Maximum 120 A load
- Totally insulated
- Base polycarbonate, RAL 7035
- Cover polycarbonate, transparent
- UV resistant UL508
- 5 and 9 pole
- Pre-punched knockouts



The MCE weatherproof enclosure was designed to meet the tough demands of Australia's environment. The MCE is ideal for roof mounted applications such as used in solar (photovoltaic) applications.

### Ordering details

No. of rows	Pole capacity	Cat. No.	Price \$
1	5	MCEPCN5MFM	88.00
1	9	MCEPCN9MFM	140.00

No earth or neutral bars

### Dimensions (mm)

Pole capacity	H	W	D
5	200	116	105
9	200	190	105

## Insulated loadcentres

### Din-Modula weatherproof series

2

- Standard AS/NZS 3439.3
- Suits Din-T6, 10, 10H & 15 MCBs
- IP 55-IK07 protection
- Maximum 120 amp load
- Padlocking possible
- Door changeable left or right side
- Totally insulated
- Halogen free



The Din-Modula weatherproof was designed with maximum flexibility in mind.

Using the connection set, two or more enclosures can be joined together – maintaining the IP protection rating. A further feature of flexibility is that of the adjustable height DIN rail. Grey impact resistant polystyrene base and clear polycarbonate door.

Din-Modula weatherproof was designed for use with the Din-T 6, 10, 10H and 15 MCB range in wet area applications, out of direct sunlight. Split neutral and earth bars are provided. For accessories, **refer to page 1 - 43 & 1 - 50.**

#### Accessories

- Circuit identification labels
- Split neutral and earth bars
- Weatherproof sealing caps for mounting screws
- Pole fillers
- Locking bracket to suit a padlock
- Connection set-for joining enclosures together at extra cost
- 125 mm DIN rail centres

#### Ordering details

No. of rows	Pole cap.	Neutral bar	Earth bar	Cat. No.	Price \$
1	12	8/4	8	DMWP12	220.00
2	24	18/6	18	DMWP24	280.00
3	36	24/12	18	DMWP36	370.00

#### Optional accessories

Description	Cat. No.	Price \$
Locking device	DMWPLD	28.00
connection set	DMWPCS	13.00

#### Dimensions (mm)

Pole capacity	H	W	D
12	250	285	138
24	375	285	138
36	500	285	138

## Metal loadcentres

### NLC loadcentres for 'Din-T' MCBs

- Suits Din-T6, 10, 10H & 15 MCBs and associated DIN equipment
- 1 mm zinc annealed steel
- Polyester powder coated N42 grey
- Earth and neutral bars provided
- Circuit schedule labels provided
- DIN rail fitted
- IP 30 (IP 40 with door)
- Commercial and light industrial applications



#### Ordering details

Pole cap.	Surface mount enclosure <sup>4)</sup>	Price \$	Flush <sup>1)</sup> escutcheon	Price \$	Door <sup>1) 2)</sup>	Price \$
	Cat. No.		Cat. No.		Cat. No.	
8	NLC8S	141.00	NLC8FE	27.40	LD6/8	67.50
12	NLC12S	164.00	NLC12FE	35.50	LD9/12	67.50
15	NLC15S	187.00	NLC15FE	35.50	LD12/15	78.00
18	NLC18S	205.00	NLC18FE	41.50	LD15/18	78.00
21	NLC21S	215.00	NLC21FE	45.50	LD18/21	83.00
24	NLC24S	275.00	-		LD24	109.00

Load center supplied standard as base and escutcheon. Door and flush escutcheon supplied as optional extras.

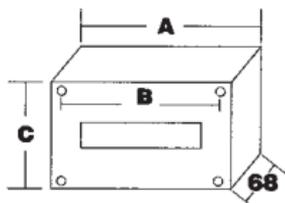
Earth and neutral bars – 2 x 25 mm<sup>2</sup>, remaining 16 mm<sup>2</sup>

#### Options and accessories

Description	Cat. No.	Price \$
Locking kit includes bracket and fasteners (CL001)	DSLK	30.50
Fitting of Din-T MCB single pole	ADD EACH	1.90
Fitting of Din-T MCBs two and three pole	ADD EACH	1.90
NSW Public Works Department E1 type lock	ADD	380.00

#### Dimensions (mm)

Pole cap.	A <sup>3)</sup>	B	C <sup>3)</sup>
8	268	192	245
12	343	267	245
15	418	342	245
18	493	417	245
21	568	492	245
24	693	549	245



- Notes:**
- <sup>1)</sup> Doors and flush escutcheons supplied loose.
  - <sup>2)</sup> Door has provision for lock. Lock kit ordered separately.
  - <sup>3)</sup> Dimensions 'A' and 'C' increased by 50 mm when flush mounted. With door depth = 98 mm.
  - <sup>4)</sup> Accepts DSRCBH single pole RCDs.

## Metal loadcentres

### TLC loadcentres for 'Safe-T' MCBs

2

- Suitable for Safe-T MCBs and Safe-T RCDs
- 1 mm zinc annealed steel
- Polyester powder coated N42 grey
- Earth and neutral bars provided
- Circuit schedule labels provided
- MCB clip tray fitted
- IP 30 (IP 40 with door)
- Australian made
- Commercial and light industrial applications



#### Ordering details

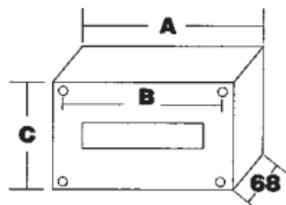
Pole cap.	Surface mount enclosure <sup>2)</sup>	Price \$	Door <sup>1)</sup>	Price \$
	Cat. No.		Cat. No.	
6	<b>TLC6S</b>	126.00	<b>LD6/8</b>	67.50
12	<b>TLC12S</b>	164.00	<b>LD12/15</b>	78.00
18	<b>TLC18S</b>	205.00	<b>LD18/21</b>	83.00

#### Options and accessories

Description	Cat. No.	Price \$
Safe-T pole fillers	<b>SAFETPF</b>	1.80
Locking kit includes bracket and fasteners (CL001)	<b>DSLK</b>	30.50
Fitting of Safe-T MCB 1, 2 and 3 pole	<b>ADD</b>	1.90
DIN mount adaptor for time clock and contactors	<b>TLCDMA</b>	33.00
NSW Public Works Department E1 type lock	<b>ADD</b>	380.00

#### Dimensions (mm)

Pole cap.	A	B	C
6	268	192	245
12	418	342	245
18	568	492	245



- Notes:** <sup>1)</sup> Doors supplied loose.  
<sup>2)</sup> Accepts DSRCBH single pole RCDs.

## NHP – The panelboard innovators

### CONCEPT

The NHP CONCEPT family range of panelboards keeps a common and attractive appearance throughout the range.

### CONCEPT

#### The economical panelboard:

The 'CONCEPT' panelboard is designed for those wanting a visually attractive, economical panelboard, but also offering a robust enclosure with an excellent range of standard features. This type of panelboard is designed to be stocked nationally as an 'off the shelf' panelboard.

### CONCEPT•PLUS

#### The multipurpose panelboard:

For those wanting an 'off the shelf' panelboard which offers a large range of features and options. The CONCEPT•PLUS is a multipurpose panelboard that offers among its many features: indoor rated panelboard with dust seal option, six modular sizes, and accessory boxes that can be added to extend the height or width of the panelboard. CONCEPT•PLUS panelboards are available for either DIN or NEMA (Safe-T) MCCBs.

### CONCEPT•PREMIER

#### The premium panelboard:

The CONCEPT•PREMIER panelboard range has all the features of CONCEPT•PLUS, but also includes important additional features, such as a greater box depth, weatherproof rating, the option of stainless steel enclosures, a floor mounting plinth, plus others.

CONCEPT•PREMIER panelboards are available for Safe-T, Din-T, 125 A and 250 A MCCBs or combinations thereof.

### CONCEPT•TOUGH

#### The heavy-duty panelboard:

The CONCEPT•TOUGH panelboard range has all the features of CONCEPT•PREMIER plus more, the CONCEPT•TOUGH has an increase in depth, width and material thickness for extra strength. The increase in depth allows the use of a wider range of padlock/locking facilities on isolators and circuit breakers between the door and escutcheon. This extra depth also allows larger accessory items to be mounted below the escutcheon such as contactors and change-over switches. The CONCEPT•TOUGH has a vast amount of wiring space and very generously sized glandplate entry and exit points due to the extra width. This package is all put together in a rigid 2 mm fully welded construction for those extra tough applications.



## Quick reference table

2

Features and options	CONCEPT	CONCEPT-PLUS
<b>Circuit Breaker Types</b>	Din-T	Din-T / Safe-T
<b>Enclosure Details &amp; Accessory Spacing</b>		
Width	485 mm	585 mm
Depth	151 mm	185 mm
IP Rating	IP 40	IP 42 <sup>1)</sup>
Material	1 mm	1.6 mm
Pole capacity	24 - 60	18 - 96
Colours available (doors)	Grey & Orange	Grey & Orange
Spare DIN rail - rail mounting space	12 Poles	18 Poles
Largest contactor under PB escutcheon	CA 7-43	CA 7-85
Largest contactor in accessory module	-	CA 6-180
<b>Main Switches, Busbars, Earth &amp; Neutral Bars</b>		
STD Main switch rating	160 A or 250 A	160 or 250 A standard
Maximum main switch sizes available	250 A	400 A
Dual Earth & Neutral bars	-	-
Lock type on door (keylock)	Flush	Flush
Chassis type	Din chassis	NC - GB - CT
<b>Common Features</b>		
Horizontal DIN rail	✓	✓
Knockouts for MCBs & accessories	✓	✓
Door reversible RHS to LHS	✓	✓
Door hinged independent of escutcheon	✓	✓
<b>Optional Accessories &amp; Features</b>		
Emergency lighting kits – option	✓	✓
Split chassis – option	✓	✓
Special colours – option	✓	✓
Rain & dust hood	-	-
Custom 'modular' assemblies – option	-	✓
Accessory / header boxes – option	-	✓
Brass or aluminium gland plates – option	-	✓
Removable gland plates – standard	-	✓
Can fit MCCBs – option	-	✓
Fault current limiter DIN fuses – option	-	✓
Flush surround kits – option	✓	✓
Hinged escutcheon	-	optional
Dust seal	-	optional
Floor mounting plinth – option	-	✓
Wall mounting brackets – option	-	-
'3 point locking' door – on Lge encl. <sup>2)</sup>	-	-
Stainless steel enclosure – option	-	-

**Notes:** For a more complete listing of accessory details refer to accessory pages relating to individual panelboards.

<sup>1)</sup> Dust seal option - IP52B.

<sup>2)</sup> On large enclosures ≥ 1000 mm.

## Quick reference table

Features and options	CONCEPT-PREMIER	CONCEPT-TOUGH
<b>Circuit Breaker Types</b>	Din-T / Safe-T/ 125 & 250 A MCCBs	Din-T / Safe-T/ 125 & 250 A MCCBs
<b>Enclosure Details &amp; Accessory Spacing</b>		
Width	640 mm	800 mm
Depth	240 mm	300 mm
IP Rating	IP 66	IP 66
Material	1.6 mm	2.0 mm
Pole capacity	18 - 96	18 - 96
Colours available (doors)	Grey & Orange	Grey & Orange
Spare DIN rail rail mounting space	18 Poles	18 Poles
Largest contactor under PB escutcheon	CA 6-180	CA 6-180
Largest contactor in accessory module	CA 6-420	CA 6-420
<b>Main Switches, Busbars, Earth &amp; Neutral Bars</b>		
STD Main switch rating	160 or 250 A standard	-
Maximum main switch sizes available	< 800 A	< 800 A
Dual Earth & Neutral bars	✓	✓
Lock type on door (keylock)	T-handle, flush (series 2)	Chrome plated LHandle
Chassis type	CD-NC-GB-XA-XB	CD-NC-GB-XA-XB
<b>Common Features</b>		
Horizontal DIN rail	✓	✓
Knockouts for MCBs & accessories	✓	✓
Door reversible RHS to LHS	✓	-
Door hinged independent of escutcheon	✓	✓
<b>Optional Accessories &amp; Features</b>		
Emergency lighting kits – option	✓	✓
Split chassis – option	✓	✓
Special colours – option	✓	✓
Rain & dust hood	✓	✓
Custom 'modular' assemblies – option	✓	✓
Accessory / header boxes – option	✓	accessory only
Brass or aluminium gland plates – option	✓	✓
Removable gland plates – standard	✓	✓
Can fit MCCBs – option	✓	✓
Fault current limiter DIN fuses – option	✓	✓
Flush surround kits – option	✓	-
Hinged escutcheon	standard	standard
Dust seal	standard	standard
Floor mounting plinth – option	✓	✓
Wall mounting brackets – option	✓	standard
'3 point locking' door – on Lge encl. <sup>1)</sup>	✓	✓
Stainless steel enclosure – option	✓	✓

**Notes:** For a more complete listing of accessory details refer to accessory pages relating to individual panelboards.

<sup>1)</sup> On large enclosures ≥ 1000 mm.

## CONCEPT

### The economical panelboard for Din-T MCBs

2

- Standard AS/NZS 3439-3
- Type tested busbar system
- Compact 160 A or 250 A main switch
- Door fitted independent of escutcheon
- Left or right hand door hinging
- Lockable door
- Australian made
- Commercial and industrial applications



#### Application

The Concept range is an economical panelboard designed for the commercial and light industrial sectors. It will accept Din-T circuit breakers and associated accessory devices.

#### Features

- Two-tone colour scheme, make a colour change by simply changing the door colour.
- The door is field changeable from right to left hinged and is totally independent of the escutcheon.
- Gloss white escutcheon has been dished to allow a wide range of accessories to fit under the door.
- Knockouts provided in the escutcheon for up to 12 modules of extra standard DIN rail equipment.
- Compact main switch with a 160 A or 250 A rating.
- Earth and neutral bars, circuit identification and schedule cards supplied.

#### Technical data

<b>Material type:</b>	1 mm steel
<b>Finish:</b>	Polyester powder coated
<b>Colour (AS 2700-1995):</b>	Base – charcoal gloss Door – N42 storm grey or X15 orange Escutcheon – bright white gloss
<b>Protection degree:</b>	IP 30 without door IP 40 with door, IP42 with rain hood
<b>Busbar ratings:</b>	250 A 20 kA for 0.2 seconds
<b>Main Switch:</b>	160 A 3 pole 415 V AC top mount 250 A 3 pole 415 V AC top mount

## CONCEPT

### The economical panelboard for Din-T MCBs



#### CONCEPT

##### Surface mount panelboard with grey door

Suits Din-T MCBs (DIN) refer to section one

Main switch	Pole cap.	Box size	Height (mm)	Cat. No.	Price \$
160 A	24	1	700	CON 24 M160 G	1190.00
	36	2	800	CON 36 M160 G	1300.00
	48	3	900	CON 48 M160 G	1400.00
	60	4	1000	CON 60 M160 G	1540.00
250 A	24	1	700	CON 24 M250 G	1400.00
	36	2	800	CON 36 M250 G	1500.00
	48	3	900	CON 48 M250 G	1620.00
	60	4	1000	CON 60 M250 G	1740.00

Width = 485 mm, Depth = 151 mm includes door. (Door = 20 mm)

#### CONCEPT

##### Surface mount panelboard with orange door

Suits Din-T MCBs (DIN) refer to section one

Main switch	Pole cap.	Box size	Height (mm)	Cat. No.	Price \$
160 A	24	1	700	CON 24 M160 O	1190.00
	36	2	800	CON 36 M160 O	1300.00
	48	3	900	CON 48 M160 O	1400.00
	60	4	1000	CON 60 M160 O	1540.00
250 A	24	1	700	CON 24 M250 O	1400.00
	36	2	800	CON 36 M250 O	1500.00
	48	3	900	CON 48 M250 O	1620.00
	60	4	1000	CON 60 M250 O	1740.00

Width = 485 mm, Depth = 151 mm includes door. (Door = 20 mm)

## CONCEPT

### The economical panelboard for Din-T MCBs

#### Accessories

Description	Cat. No.	Price \$
Split chassis kit (supplied loose)	<b>STKCD</b>	<b>119.00</b>
Emergency lighting kit <sup>1)</sup> (supplied loose)	Rotary control switch unwired	<b>CPELK1</b> 430.00
	Rotary control switch prewired	<b>CPELK1W</b> 445.00
	Key operated control switch unwired	<b>CPELK2</b> 495.00
Pole fillers (Din-T)	<b>DTPF</b>	<b>4.30</b>
Flush kit	SIZE 1 CON	<b>CONFK1</b> 285.00
	SIZE 2 CON	<b>CONFK2</b> 285.00
	SIZE 3 CON	<b>CONFK3</b> 285.00
	SIZE 4 CON	<b>CONFK4</b> 285.00
Spare Key (set of 2) CL001 x 2	<b>KEYCL001</b>	<b>7.80</b>
Spare Key (set of 2) 92268 x 2	<b>KEY92268</b>	<b>7.80</b>
Door lock	CL001	<b>CPDHANDLECL001</b> 36.50
	92268	<b>CPDHANDLE92268</b> 36.50
	NSW PWD ELOCK	<b>CPDHANDLEELOCK</b> 290.00
	Padlockable	<b>CPDHANDLEPADLCK</b> 78.00
	Non-lockable	<b>CPDHANDLENOLOCK</b> 36.50

**Notes:** <sup>1)</sup> Emergency lighting kits can be field fitted to Concept panelboards utilising horizontal DIN knockouts at top of board. Kits include control switch, timer, 24 A 4 Pole N/C contactor, labels and wiring diagram to complete control circuit which complies with AS 2293.1.

## CONCEPT•PLUS

### Multi-purpose panelboards for Din-T or Safe-T MCBs

- Standard AS/NZS 3439-3
- IP 42
- 6 modular sizes up to 96 poles
- Accessory module
- Type tested busbar chassis system
- Compact 250 A main switch
- Generous wiring room
- Removable gland plates
- Door fitted independent of escutcheon
- Flush door handle
- Left or right hand door hinging
- Commercial and industrial applications



#### Application

The Concept Plus range of panelboards provide a unique enclosure system for the NHP range of Din-T and Safe-T MCBs and associated accessory devices.

#### Features

- Two-tone colour scheme, make a colour change simply by changing the door colour
- The door is field changeable from right to left hinged and is totally independent of the escutcheon
- Gloss white escutcheon has been dished to allow a wide range of accessories to fit under the door
- Knockouts provided in the escutcheon for up to 18 modules of standard DIN rail equipment
- Removable gland plates aid on-site installation of cables
- New compact main switch with a fully enclosed rating of 160 A and 250 A
- Earth and neutral bars, circuit identification and schedule cards supplied standard

#### Technical data

<b>Material type:</b>	1.6 mm steel, polyester powder coated
<b>Colour (AS 2700-1995):</b>	Base - Charcoal gloss Door - N42 Storm grey or X15 orange Escutcheon - bright white
<b>Protection degree:</b>	IP 42 - with door (Dust seal option)
<b>Busbar ratings:</b>	SafeT - 250 A CT (355 A option) Din-T - 250 A NC (400 A option) Din-T - 250 A Grizz-Bar
<b>Main switch (options):</b>	Safe-T 100 A Non-auto (chassis mount CST) Din-T M/S 100 A (chassis mount CDT) 160 A 3 pole 415 V AC (top mount) 250 A 3 pole 415 V AC (top mount) 200 A MCCB (top mount)
<b>Neutral and earth bars:</b>	2 x 8 mm studs; tunnel terminals with 2 screws 10 kA 1 second.

## CONCEPT•PLUS 2

### Multi-purpose panelboards for Din-T MCBs

2



#### CONCEPT•PLUS 2

**Din-T – Surface mount with grey door**

Suits Din-T MCBs (DIN) refer to section one

Main switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	18	1	700	CDT 18G2	1090.00
	24	1	700	CDT 24G2	1190.00
	36	2	900	CDT 36G2	1300.00
	48	2	900	CDT 48G2	1460.00
	60	3	1100	CDT 60G2	1630.00
	72	4	1300	CDT 72G2	1780.00
	84	4	1300	CDT 84G2	2060.00
	96	5	1500	CDT 96G2	2390.00
	160 A	18	1	700	CDT 18M160G2
24		1	700	CDT 24M160G2	1440.00
36		2	900	CDT 36M160G2	1550.00
48		2	900	CDT 48M160G2	1710.00
60		3	1100	CDT 60M160G2	1880.00
250 A	18	1	700	CDT 18M250G2 <sup>1)</sup>	1460.00
	24	1	700	CDT 24M250G2 <sup>1)</sup>	1570.00
	36	2	900	CDT 36M250G2	1670.00
	48	2	900	CDT 48M250G2	1840.00
	60	3	1100	CDT 60M250G2	2000.00
	72	4	1300	CDT 72M250G2	2160.00
	84	4	1300	CDT 84M250G2	2440.00
	96	5	1500	CDT 96M250G2	2760.00

Width = 585 mm, Depth = 185 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switch supplied loose i.e. CDT18-M250-G2 = CDT18G2 + EVA3250H.

## CONCEPT•PLUS 2

### Multi-purpose panelboards for Din-T MCBs



### CONCEPT•PLUS 2

#### Din-T – Surface mount with orange door

Suits Din-T MCBs (DIN) refer to section one

Main switch	Pole cap.	Box size	Height (mm)	Cat. No.	Price \$
-	18	1	700	CDT 18O2	1090.00
	24	1	700	CDT 24O2 <sup>2)</sup>	1190.00
	36	2	900	CDT 36O2 <sup>2)</sup>	1300.00
	48	2	900	CDT 48O2 <sup>2)</sup>	1460.00
	60	3	1100	CDT 60O2 <sup>2)</sup>	1630.00
	72	4	1300	CDT 72O2	1780.00
	84	4	1300	CDT 84O2	2060.00
160 A	96	5	1500	CDT 96O2	2390.00
	18	1	700	CDT 18M160O2	1340.00
	24	1	700	CDT 24M160O2 <sup>2)</sup>	1440.00
	36	2	900	CDT 36M160O2 <sup>2)</sup>	1550.00
	48	2	900	CDT 48M160O2	1710.00
	60	3	1100	CDT 60M160O2 <sup>1)</sup>	1880.00
	250 A	18	1	700	CDT 18M250O2 <sup>1)</sup>
24		1	700	CDT 24M250O2 <sup>1)2)</sup>	1570.00
36		2	900	CDT 36M250O2 <sup>2)</sup>	1670.00
48		2	900	CDT 48M250O2 <sup>2)</sup>	1840.00
60		3	1100	CDT 60M250O2 <sup>2)</sup>	2000.00
72		4	1300	CDT 72M250O2 <sup>2)</sup>	2160.00
84		4	1300	CDT 84M250O2 <sup>2)</sup>	2440.00
	96	5	1500	CDT 96M250O2 <sup>1)2)</sup>	2760.00

Width = 585 mm, Depth = 185 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switch supplied loose i.e. CDT18-M250-O2 = CDT18O2 + EVA3250H.  
<sup>2)</sup> Enclosure with orange base replace "O" with "OO" e.g. CDT36OO2.

## CONCEPT•PLUS 2

### Multi-purpose panelboards for Din-T MCBs

**NEW**

2



Extra row  
horizontal  
DIN Rail  
24 Poles



### CONCEPT•PLUS 2

#### Din-T – Surface mount with grey door

Suits Din-T MCBs (DIN) refer to section one

Main switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	18	1	700	CDTE18G2	1190.00
	36	2	900	CDTE36G2	1400.00
	48	3	1100	CDTE48G2	1660.00
	72	4	1300	CDTE72G2	1890.00
	96	5	1500	CDTE96G2	2490.00
160 A	18	1	700	CDTE18M160G2	1440.00
	36	2	900	CDTE36M160G2	1650.00
	48	3	1100	CDTE48M160G2	1910.00
	72	4	1300	CDTE72M160G2	2140.00
	96	5	1500	CDTE96M160G2	2740.00
250 A	18	1	700	CDTE18M250G2	1560.00
	36	2	900	CDTE36M250G2	1770.00
	48	3	1100	CDTE48M250G2	2040.00
	72	4	1300	CDTE72M250G2	2260.00
	96	5	1500	CDTE96M250G2	2860.00

Width = 585 mm, Depth = 185 mm includes door. (Door = 20 mm)

**Notes:** NC 250 topfeed chassis  
24P horizontal DIN rail cut-out below chassis  
Made to order

## CONCEPT•PLUS 2

### Multi-purpose panelboards for Din-T MCBs

**NEW**



Extra row horizontal DIN Rail 24 Poles



2

### CONCEPT•PLUS 2

#### Din-T – Surface mount with orange door

Suits Din-T MCBs (DIN) refer to section one

Main switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	18	1	700	CDTE18O2	1190.00
	36	2	900	CDTE36O2	1400.00
	48	3	1100	CDTE48O2	1660.00
	72	4	1300	CDTE72O2	1890.00
	96	5	1500	CDTE96O2	2490.00
160 A	18	1	700	CDTE18M160O2	1440.00
	36	2	900	CDTE36M160O2	1650.00
	48	3	1100	CDTE48M160O2	1910.00
	72	4	1300	CDTE72M160O2	2140.00
	96	5	1500	CDTE96M160O2	2740.00
250 A	18	1	700	CDTE18M250O2	1560.00
	36	2	900	CDTE36M250O2	1770.00
	48	3	1100	CDTE48M250O2	2040.00
	72	4	1300	CDTE72M250O2	2260.00
	96	5	1500	CDTE96M250O2	2860.00

Width = 585 mm, Depth = 185 mm includes door. (Door = 20 mm)

**Notes:** NC 250 topfeed chassis  
24P horizontal DIN rail cut-out below chassis  
Made to order

## CONCEPT•PLUS 2

### Multi-purpose panelboards for Din-T MCBs

#### CONCEPT•PLUS 2

**Din-T – Surface mount with grey door**

**Suits DIN-T-MCBs (DIN) refer to section one**

100 - 160 A main switch = S160NJ3160 MCCB



Main switch	Pole cap.	Box size	Height (mm)	Cat. No.	Price \$
100 - 160 A <sup>1)</sup>	24	1	700	CDT24MCCB160G2	1800.00
	42	2	900	CDT42MCCB160G2	1990.00
	60	3	1100	CDT60MCCB160G2	2200.00
	78	4	1300	CDT78MCCB160G2	2600.00
	96	5	1500	CDT96MCCB160G2	2990.00

160 - 200 A main switch = E250NJ3250 MCCB

Main switch	Pole cap.	Box size	Height (mm)	Cat. No.	Price \$
160 - 200 A <sup>2)</sup>	24	1	700	CDT24MCCB200G2	1950.00
	42	2	900	CDT42MCCB200G2	2150.00
	60	3	1100	CDT60MCCB200G2	2350.00
	78	4	1300	CDT78MCCB200G2	2750.00
	96	5	1500	CDT96MCCB200G2	3150.00

Width = 585 mm, Depth = 185 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Factory set 160 A. Adjustable down to 100 A.

<sup>2)</sup> Factory set 200 A. Adjustable down to 160 A.

For 250 A refer NHP.

For orange door change "G" to "O" e.g. CDT24MCCB160O2 made to order.

# NC BUSBAR CHASSIS

Enclosed busbar distribution system for Din-T, MCBs and RCBOs.

**NHP**

POWER PROTECTION



PP/TERASAKI-CHASSIS-CPB

The Concept range of busbar chassis assemblies have been specifically designed for incorporating into the Concept family of panelboards

- Models from 6 to 108 poles
- Standard AS/NZS 3439.1
- 250 A and new 400 A rating
- Improved withstand ratings
- Retrofittable with CD chassis
- Improved form rating

**CONCEPT • PLUS** **CONCEPT • PREMIER**

**TERASAKI**  
Innovators in Protection Technology

## CONCEPT•PLUS 2

Multi-purpose panelboards  
for Din-T MCBs C/W isolation chassis

2

NEW  
Grizz-Bar  
Isolation  
chassis



### CONCEPT•PLUS 2

Din-T – Surface mount with grey door

Suits Din-T MCBs (DIN) refer to section one

Main switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$	
-	24	1	700	CDG 24G2	1550.00	
	36	2	900	CDG 36G2	1750.00	
	48	2	900	CDG 48G2	2010.00	
	60	3	1100	CDG 60G2	2320.00	
	72	4	1300	CDG 72G2	2550.00	
	84	4	1300	CDG 84G2	2990.00	
	96	5	1500	CDG 96G2	3400.00	
	160 A	24	1	700	CDG 24M160G2 <sup>1)</sup>	1750.00
		36	2	900	CDG 36M160G2 <sup>1)</sup>	1950.00
48		2	900	CDG 48M160G2 <sup>1)</sup>	2150.00	
60		3	1100	CDG 60M160G2 <sup>1)</sup>	2480.00	
250 A	24	1	700	CDG 24M250G2 <sup>1)</sup>	1910.00	
	36	2	900	CDG 36M250G2 <sup>1)</sup>	2110.00	
	48	2	900	CDG 48M250G2 <sup>1)</sup>	2370.00	
	60	3	1100	CDG 60M250G2 <sup>1)</sup>	2680.00	
	72	4	1300	CDG 72M250G2 <sup>1)</sup>	2850.00	
	84	4	1300	CDG 84M250G2 <sup>1)</sup>	3350.00	
	96	5	1500	CDG 96M250G2 <sup>1)</sup>	3750.00	

Width = 585 mm, Depth = 185 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switch supplied loose i.e. CDG18-M250-G2 = CDG18G2+EVA3250H

## CONCEPT•PLUS 2

### Multi-purpose panelboards for Din-T MCBs C/W isolation chassis



2

### CONCEPT•PLUS 2

#### Din-T – Surface mount with orange door

Suits Din-T MCBs (DIN) refer to section one

Main switch	Pole capacity	Box size	Height (mm)	Cat. No. <sup>2)</sup>	Price \$	
-	24	1	700	CDG 2402	1550.00	
	36	2	900	CDG 3602	1750.00	
	48	2	900	CDG 4802	2010.00	
	60	3	1100	CDG 6002	2320.00	
	72	4	1300	CDG 7202	2550.00	
	84	4	1300	CDG 8402	2990.00	
	96	5	1500	CDG 9602	3400.00	
	160 A	24	1	700	CDG 24M16002 <sup>1)</sup>	1750.00
		36	2	900	CDG 36M16002 <sup>1)</sup>	1950.00
48		2	900	CDG 48M16002 <sup>1)</sup>	2150.00	
60		3	1100	CDG 60M16002 <sup>1)</sup>	2480.00	
250 A	24	1	700	CDG 24M25002 <sup>1)</sup>	1910.00	
	36	2	900	CDG 36M25002 <sup>1)</sup>	2110.00	
	48	2	900	CDG 48M25002 <sup>1)</sup>	2370.00	
	60	3	1100	CDG 60M25002 <sup>1)</sup>	2680.00	
	72	4	1300	CDG 72M25002 <sup>1)</sup>	2850.00	
	84	4	1300	CDG 84M25002 <sup>1)</sup>	3350.00	
	96	5	1500	CDG 96M25002 <sup>1)</sup>	3750.00	

Width = 585 mm, Depth = 185 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switch supplied loose i.e. CDG18-M250-O2 = CDG18O2+EVA3250H  
<sup>2)</sup> Enclosure with orange base replace "O" with "OO" e.g. CDG36OO2.

## CONCEPT•PLUS 2

### Energy metering panelboards for Din-T MCBs

2

- Standard AS/NZS 3439-3
- Dual metering, separate light and power (Greenstar V3.0)
- kWh, kvarh
- RS 485 Comms or pulsed output
- Active energy class 1.0 or better
- Options - V, A, W, var, Hz, PF, THD, Admd
- Options - gas and water inputs
- Retro fit kits available
- IP 42
- Commercial and industrial applications



Improve your NABERS, GREENSTAR rating

#### Application

The Concept-Plus energy metering range of panelboards have been designed to meet the energy metering requirements of today's market.

#### CONCEPT•PLUS

##### 160 A Energy metering panelboards with grey door

CT connect meters rated 75 A for light circuits and 120 A for power circuits

Pole capacity	Box size	Light poles	Power poles	Main switch	Cat. No.	Price \$
36	1100 mm	12	24	160 A	CDM36M160G	3370.00
48	1300 mm	18	30	160 A	CDM48M160G	3530.00
60	1300 mm	18	42	160 A	CDM60M160G	3790.00

#### CONCEPT•PLUS

##### 250 A Energy metering panelboards with grey door

CT connect meters rated 120 A for light circuits and 200 A for power circuits

Pole capacity	Box size	Light poles	Power poles	Main switch	Cat. No.	Price \$
60	1300 mm	18	42	250 A	CDM60M250G	3890.00
72	1500 mm	24	48	250 A	CDM72M250G	4100.00
84	1500 mm	30	54	250 A	CDM84M250G	4410.00
96	1700 mm	36	60	250 A	CDM96M250G	4510.00

#### CONCEPT•PLUS

##### Retro fit energy metering kits with grey door

Main switch	Box size	Light	Power poles	Cat. No. 1)	Price \$
-	400 mm	-	250 A	CDMRFG	1610.00
250 A	600 mm	-	250 A	CDMRFSM250AG6	2020.00
250 A	600 mm	125 A	250 A	CDMRFDM250AG6	2750.00

Width = 585 mm, depth = 185 mm, includes (door = 20 mm)

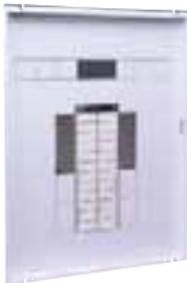
**Notes:** 1) Delete M160 and M250 if no main switch is required. Replace G with O for Orange door.

For other combinations or options refer to NHP.

**Metering boards are not suitable for utility metering.**

## CONCEPT•PLUS

### Multi-purpose panelboards for Safe-T MCBs



**CONCEPT•PLUS**  
**Safe-T – Surface mount with grey door**  
 Suits Safe-T-MCBs (NEMA) refer section one

Main switch	Pole cap.	Box size	Height (mm)	Cat. No.	No M/S Price \$
-	24	1	700	CST 24G	1300.00
	36	2	900	CST 36G	1410.00
	48	3	1100	CST 48G	1550.00
	60	4	1300	CST 60G	1710.00
	72	5	1500	CST 72G	1860.00
	96	6	1700	CST 96G	2490.00
160 A	24	1	700	CST 24M160G <sup>1)</sup>	1550.00
	36	2	900	CST 36M160G <sup>1)</sup>	1660.00
	48	3	1100	CST 48M160G <sup>1)</sup>	1790.00
	60	4	1300	CST 60M160G <sup>1)</sup>	1960.00
250 A	24	1	700	CST 24M250G <sup>1)</sup>	1670.00
	36	2	900	CST 36M250G <sup>1)</sup>	1780.00
	48	3	1100	CST 48M250G <sup>1)</sup>	1920.00
	60	4	1300	CST 60M250G <sup>1)</sup>	2090.00
	72	5	1500	CST 72M250G <sup>1)</sup>	2230.00
	96	6	1700	CST 96M250G <sup>1)</sup>	2860.00

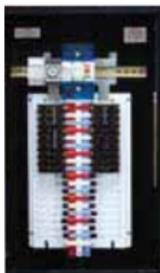
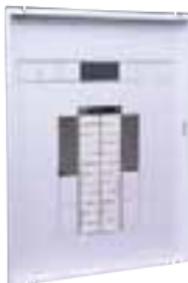
Width = 585 mm, Depth = 185 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switch supplied loose i.e. CST24M250G = CST24G + CST250MS.

## CONCEPT•PLUS

### Multi-purpose panelboards for Safe-T MCBs

2



#### CONCEPT•PLUS

**Safe-T – Surface mount with orange door**

Suits Safe-T-MCBs (NEMA) refer section one

Main switch	Pole cap.	Box size	Height (mm)	Cat. No.	No M/S Price \$
-	24	1	700	CST 240	1300.00
	36	2	900	CST 360	1410.00
	60	4	1300	CST 600	1710.00
	72	5	1500	CST 720	1860.00
	96	6	1700	CST 960	2490.00
160 A	24	1	700	CST 24M1600 <sup>1)</sup>	1550.00
	36	2	900	CST 36M1600 <sup>1)</sup>	1660.00
	60	4	1300	CST 60M1600 <sup>1)</sup>	1960.00
250 A	24	1	700	CST 24M2500 <sup>1)</sup>	1670.00
	36	2	900	CST 36M2500 <sup>1)</sup>	1780.00
	60	4	1300	CST 60M2500 <sup>1)</sup>	2090.00
	72	5	1500	CST 72M2500 <sup>1)</sup>	2230.00
	96	6	1700	CST 96M2500 <sup>1)</sup>	2860.00

Width = 585 mm, Depth = 185 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switch supplied loose i.e. CST24M2500 = CST240 + CST250MS.

## CONCEPT•PLUS 2

### Multi-purpose panelboards accessory modules

#### CONCEPT•PLUS 2 (Series 2)

##### Accessory modules with grey door <sup>1)</sup>

Box size	Height (mm)	Pole cap	Cat. No. with escutcheon	Price \$
0	400	24 (1 row 24 way)	CPACC24G2	790.00
0	400	48 (2 row 24 way)	CPACC48G2	810.00
H	600	72 (3 row 24 way)	CPACC72G2	880.00

Box size	Height (mm)	Cat. No. without escutcheon	Price \$
0	400	CPACCSOG2	740.00
H	600	CPACCSHG2	870.00

Box size	Height (mm)	Cat. No. with blank escutcheon	Price \$
0	400	CPACCSOGE2	740.00
H	600	CPACCSHGE2	870.00
1	700	CPACCS1GE2	900.00
2	900	CPACCS2GE2	1020.00
3	1100	CPACCS3GE2	1130.00
4	1300	CPACCS4GE2	1320.00
5	1500	CPACCS5GE2	1430.00
6	1700	CPACCS6GE2	1610.00

Width = 585 mm, Depth = 185 mm includes door. (Door = 20 mm)

Height (mm)	Cat. No.	Price \$
94 mm	CPBGTS1	46.50
194 mm	CPBGTS2	67.50
294 mm	CPBGTS3	88.00
494 mm	CPBGTSH	114.00
594 mm	CPBGTS4	145.00
994 mm	CPBGTS6	230.00

Gear trays for Concept Plus must be 100 mm shorter than enclosure size.

#### Earth and neutral bar kit to suit accessory module

No. of ways	Cat. No.	Price \$
24	CEN24	88.00
36	CEN36	95.00
48	CEN48	118.00
60	CEN60	144.00
72	CEN72	158.00
84	CEN84	193.00
96	CEN96	215.00

Includes 2 bars mounting supports and fasteners.

**Notes:** <sup>1)</sup> For orange enclosure replace G with O e.g. CPACC24G2 with CPACC24O2

## CONCEPT•PLUS

### Multi-purpose panelboards options and accessories

2

Description				Cat. No.	Price \$
<b>Top mount main switch kits (supplied loose)</b>	160 A	3 pole	CDT, CDG	<b>EVA3160H</b>	<b>305.00</b>
			CST	<b>CST160MS</b>	<b>305.00</b>
	250 A	3 pole	CDT, CDG	<b>EVA3250H</b>	<b>435.00</b>
			CST	<b>CST250MS</b>	<b>435.00</b>
IP 52B sealing kit (Charcoal Base)				<b>CPIP52G</b>	<b>210.00</b>
<b>Chassis mount</b>	80 A	3 pole	CDT	<b>DINTMS803</b>	<b>102.00</b>
	100 A	3 pole	CDT	<b>DINTMS1003</b>	<b>115.00</b>
	100 A	3 pole	CST	<b>SAFET63100NA</b>	<b>285.00</b>
			Size 1	<b>CPBFK1</b>	<b>300.00</b>
<b>Flush surround kit (supplied loose) (45 mm width)</b>			Size 2	<b>CPBFK2</b>	<b>300.00</b>
			Size 3	<b>CPBFK3</b>	<b>300.00</b>
			Size 4	<b>CPBFK4</b>	<b>300.00</b>
			Size 5	<b>CPBFK5</b>	<b>300.00</b>
			Size 6	<b>CPBFK6</b>	<b>300.00</b>
Dust door seal fits all box sizes				<b>CPDRUBBER</b>	<b>197.00</b>
Blue cover to suit 160 A and 250 A isolator				<b>1LS2VS</b>	<b>12.00</b>
Floor mount plinth (100 mm height) <sup>3)</sup>				<b>CPPLINTH</b>	<b>365.00</b>
<b>Gland plate options</b>					
Open end-cap (cut-out for cable entry)				<b>CPECS</b>	<b>104.00</b>
Steel gland plate (suits open end-cap)				<b>CPGPS</b>	<b>54.00</b>
Brass gland plate (suits open end-cap) (3 mm)				<b>CPGPB</b>	<b>220.00</b>
Aluminium gland plate (suits open end-cap) (3 mm)				<b>CPGPA</b>	<b>67.50</b>
<b>Emergency lighting kit (supplied loose)</b>					
Rotary control switch (unwired)				<b>CPELK1 <sup>1)</sup></b>	<b>430.00</b>
Rotary control switch (complete wired loom)				<b>CPELK1W <sup>1)</sup></b>	<b>445.00</b>
Key operated control switch (unwired)				<b>CPELK2 <sup>1)</sup></b>	<b>495.00</b>
		CL001	<b>CPDHANDLECL001</b>	<b>36.50</b>	
		92268	<b>CPDHANDLE92268</b>	<b>36.50</b>	
Door locks (suit Series 2)	NSW PWD E LOCK		<b>CPDHANDLEELOCK</b>	<b>290.00</b>	
	Pad lockable		<b>CPDHANDLEPADLCK</b>	<b>78.00</b>	
	Non lockable		<b>CPDHANDLENOLOCK</b>	<b>36.50</b>	
Spare key (set of 2)	CL001 x 2		<b>KEYCL001</b>	<b>7.80</b>	
	92268 x 2		<b>KEY92268</b>	<b>7.80</b>	
Escutcheon Hinge Kit <sup>2)</sup>				<b>CPESC</b>	<b>50.00</b>
White liner <sup>5)</sup>				<b>CPWIL_ <sup>4)</sup></b>	<b>83.00</b>

- Notes:** <sup>1)</sup> Emergency lighting kits can be field fitted utilising horizontal DIN knock-outs at top of board. Kits include control switch, timer, 24 A 4 P N/C contactor, labels and wiring diagram to AS 2293.1.  
<sup>2)</sup> Qty 1 required for size 1-4 enclosure, Qty 2 required for size 5-6 enclosure.  
<sup>3)</sup> Plinth is designed for bottom cable entry; if panelboard is freestanding additional support is required.  
<sup>4)</sup> Insert enclosure size, e.g. size 5 CPWIL5.  
<sup>5)</sup> White insert to transform interior of DB white without having to respray, 2 required per DB.

## CONCEPT•PLUS

### Multi-purpose panelboards options and accessories

#### Accessories

Description		Cat. No.	Price \$
External lighting kits (Time clock, contactor, bypass switch)	1 channel mini timer, 2 N/O 20 A contactor	CPEXTLKC	300.00
	1 channel, 2 N/O 20 A contactor	CPEXTLK1	395.00
	2 channel, 2 N/O 20 A contactor	CPEXTLK2	710.00
Split chassis kit (supplied loose)	CT250 A CST	STK250ND/TH	119.00
	CT355 A CST	STK300TH	119.00
Pole fillers	Din-T CDT	DTPF	4.30
	Safe-T CST	SAFE-TPF	1.80

2

#### Factory fitted options

Description	Cat. No.	Price \$
<b>Connection kits</b> 250 A MCCB to CD chassis	CD250CKT2	280.00
	200 A MCCB to NC chassis (Direct) NCKK200CP <sup>1)</sup>	182.00
	250 A MCCB to NC chassis (TAG) NCKK250CP <sup>1)</sup>	490.00
Support bracket to mount 250 MCCB	CPBS250	83.00
<b>Optional main switches</b>		
- 160 A DIN switch fuse	ISO3160SFH	500.00
- 250 A MCCB non-auto	S250NN3	500.00
- 250 A MCCB	S250NJ	1480.00
- 315 A S+S load-break	LE 73151753	1090.00
- 400 A MCCB non-auto	S400NN3	1650.00
<b>Feeder MCCB</b>		
- 125 A 3 pole	DINT10H3125C	590.00
- 160 A 3 pole	S160NJ3160	1080.00
<b>Fault current limiters</b>		
- 160 A DIN size 00	Refer NHP	-
- 200 A DIN size 1	Refer NHP	-
Load shedding / emergency power contactor	Refer NHP	-
kWh metering IME energy meters	Refer Page	1 - 42
<b>Cable duct (fitted)</b>		
- CDT ... max. 100 x 100 mm	Refer NHP	-
- CST ... max. 60 x 100 mm	Refer NHP	-
<b>Special colours (doors)</b>		
- Standard powder coat (per Interpon chart)	Refer NHP	-

**Notes:** <sup>1)</sup> Connection kit includes, connection tags, terminal covers and bracket.

## CONCEPT•PREMIER

### Suits Din-T and Safe-T MCBs, E125, S125 and S160, S250 MCCBs

2

- Standard AS/NZS 3439-3
- IP 66 rated enclosure
- 1.6 mm fully welded construction
- 316 Stainless steel option
- 7 modular sizes 600 mm to 2000 mm
- Very generous amount of wiring room
- Accessory module
- Type tested busbar/chassis system
- Removable gland plates (with gaskets)
- 3 point door locking on sizes 1000 mm and above
- T handle door lock
- Flush handle door lock (series 2)
- Australian made
- Commercial, industrial and heavy industrial applications



#### Application

The CONCEPT•PREMIER range of Panelboards provides a unique enclosure system for NHP Din-T and Safe-T MCBs and E125, S125 and S160, S250 MCCBs.

#### Features

- Two-tone colour scheme, make a colour change by simply changing the door colour
- The door is field changeable from right to left hinged and is totally independent of the escutcheon
- Gloss white hinged escutcheon has been dished to allow a wide range of accessories to fit under the door
- D handles fitted to the lift-off escutcheon to allow easy fitting and removal
- Knockouts provided in the escutcheon for up to 18 modules of standard DIN rail equipment (Din-T & Safe-T Panelboards only)
- Removable gland plates aid on-site installation of cable and trunking systems
- Compact main switch with a fully enclosed rating of 160 A and 250 A (Din-T and Safe-T Panelboards only)
- Mount up to a CA 6-170 contactor behind the escutcheon or a CA 6-420 in an accessory module without an escutcheon
- Dual earth and neutral bars, circuit identification and schedule cards supplied standard
- 30 % Larger gland plate opening in series 2

New series 2  
Available Mid 2013  
Flush door handle  
NC Chassis  
30 % larger  
Glandplate  
opening

## CONCEPT•PREMIER

### Suits Din-T and Safe-T MCBs, E125, S125 and S160, S250 MCCBs

#### Technical data

<b>Material type:</b>	1.6 mm steel, polyester powder coated 1.6 mm 316 Stainless steel option
<b>Colour</b>	Base – Charcoal gloss
<b>(AS 2700-1995):</b>	Door – N42 Storm Grey or X15 Orange (other colours refer NHP) Escutcheon – Bright white gloss
<b>Protection degree:</b>	IP 30 – without door IP 66 – with door
<b>Busbar ratings:</b>	SafeT - 250 A CT (355 A option) Din-T - 250 A CD (355 A option) Din-T - 250 A NC (400 A option) Din-T - 250 A GB S125 MCCB - 630 A XA (800 A option)
<b>Main Switch (options):</b>	Safe-T 100 A non-auto (chassis mount Safe-T) Din-T M/S 80/100 A (chassis mount Din-T) 160 A, 250 A, 400 A, 630 A, & 800 A 3 pole 415 V AC (top mount)
<b>Neutral and earth bars:</b>	Din-T & Safe-T Panelboards - (dual bars) 2 x 8 mm studs & 2 screw tunnel terminals (16 mm) MCCBs Panelboards - 2 x 10 mm studs, 8 x 8 mm studs & 1 screw tunnel terminals (35 mm)



## CONCEPT•PREMIER

The premium panelboard suits Din-T MCBs

2



### CONCEPT•PREMIER

Din-T – Surface mount with grey door

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	18	1	800	CPD 18G	1870.00
	24	1	800	CPD 24G	1970.00
	36	2	1000	CPD 36G	2180.00
	48	2	1000	CPD 48G	2310.00
	60	3	1200	CPD 60G	2540.00
	72	4	1400	CPD 72G	3100.00
	84	4	1400	CPD 84G	3620.00
	96	5	1600	CPD 96G	4250.00
	160 A	18	1	800	CPD 18M160G <sup>1)</sup>
24		1	800	CPD 24M160G	2220.00
36		2	1000	CPD 36M160G <sup>1)</sup>	2430.00
48		2	1000	CPD 48M160G <sup>1)</sup>	2560.00
60		3	1200	CPD 60M160G <sup>1)</sup>	2790.00
250 A	18	1	800	CPD 18M250G <sup>1)</sup>	2240.00
	24	1	800	CPD 24M250G <sup>1)</sup>	2340.00
	36	2	1000	CPD 36M250G <sup>1)</sup>	2550.00
	48	2	1000	CPD 48M250G	2690.00
	60	3	1200	CPD 60M250G <sup>1)</sup>	2920.00
	72	4	1400	CPD 72M250G <sup>1)</sup>	3480.00
	84	4	1400	CPD 84M250G <sup>1)</sup>	3990.00
	96	5	1600	CPD 96M250G <sup>1)</sup>	4630.00

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

- Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPD 24 M250 G = CPD 24G + CDT250MS.
- Larger main switches and other options and accessories available.
  - Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER

The premium panelboard suits Din-T MCBs



### CONCEPT•PREMIER

Din-T – Surface mount with orange door

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No. <sup>2)</sup>	Price \$
-	18	1	800	CPD 180	1870.00
	24	1	800	CPD 240	1970.00
	36	2	1000	CPD 360	2180.00
	48	2	1000	CPD 480	2310.00
	60	3	1200	CPD 600	2540.00
	72	4	1400	CPD 720	3100.00
	84	4	1400	CPD 840	3620.00
	96	5	1600	CPD 960	4250.00
	160 A	18	1	800	CPD 18M1600 <sup>1)</sup>
24		1	800	CPD 24M1600 <sup>1)</sup>	2220.00
36		2	1000	CPD 36M1600 <sup>1)</sup>	2430.00
48		2	1000	CPD 48M1600 <sup>1)</sup>	2560.00
60		3	1200	CPD 60M1600 <sup>1)</sup>	2790.00
250 A	18	1	800	CPD 18M2500 <sup>1)</sup>	2240.00
	24	1	800	CPD 24M2500 <sup>1)</sup>	2340.00
	36	2	1000	CPD 36M2500 <sup>1)</sup>	2550.00
	48	2	1000	CPD 48M2500 <sup>1)</sup>	2690.00
	60	3	1200	CPD 60M2500 <sup>1)</sup>	2920.00
	72	4	1400	CPD 72M2500 <sup>1)</sup>	3480.00
	84	4	1400	CPD 84M2500 <sup>1)</sup>	3990.00
	96	5	1600	CPD 96M2500 <sup>1)</sup>	4630.00

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPD 24 M250 O = CPD 240 + CDT250MS.

<sup>2)</sup> Enclosures with orange base replace "O" with "OO" e.g. CPD36OO.

- Larger main switches and other options and accessories available.

- Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER SS

The premium panelboard suits Din-T MCBs

2



### CONCEPT•PREMIER

**Din-T – Surface mount with stainless steel door**

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	18	1	800	CPD 18SS	6850.00
	24	1	800	CPD 24SS	6950.00
	36	2	1000	CPD 36SS	7890.00
	48	2	1000	CPD 48SS	7980.00
	60	3	1200	CPD 60SS <sup>2)</sup>	9050.00
	72	4	1400	CPD 72SS <sup>2)</sup>	10150.00
	84	4	1400	CPD 84SS <sup>2)</sup>	10320.00
	96	5	1600	CPD 96SS <sup>2)</sup>	11100.00
160 A	18	1	800	CPD 18M160SS <sup>1)</sup>	7160.00
	24	1	800	CPD 24M160SS <sup>1)</sup>	7240.00
	36	2	1000	CPD 36M160SS <sup>1)</sup>	8140.00
	48	2	1000	CPD 48M160SS <sup>1)</sup>	8290.00
	60	3	1200	CPD 60M160SS <sup>1)</sup>	9330.00
250 A	18	1	800	CPD 18M250SS <sup>1)</sup>	7310.00
	24	1	800	CPD 24M250SS <sup>1)</sup>	7420.00
	36	2	1000	CPD 36M250SS <sup>1)</sup>	8290.00
	48	2	1000	CPD 48M250SS <sup>1)</sup>	8460.00
	60	3	1200	CPD 60M250SS <sup>1)</sup>	9490.00
	72	4	1400	CPD 72M250SS <sup>1)</sup>	10480.00
	84	4	1400	CPD 84M250SS <sup>1)</sup>	10690.00
	96	5	1600	CPD 96M250SS <sup>1)</sup>	11400.00

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPD 24 M250 SS = CPD 24SS + CDT250MS.

<sup>2)</sup> Made to order.

- Stainless steel panelboards are fully assembled from stocked components.
- Larger main switches and other options and accessories available.
- Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER

The premium panelboard suits Din-T MCBs  
C/W isolation chassis

NEW  
Grizz-Bar  
Isolation  
chassis



2

### CONCEPT•PREMIER

Din-T – Surface mount with grey door

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	24	1	800	CPG 24G <sup>2)</sup>	2300.00
	36	2	1000	CPG 36G <sup>2)</sup>	2600.00
	48	2	1000	CPG 48G <sup>2)</sup>	2850.00
	60	3	1200	CPG 60G <sup>2)</sup>	3200.00
	72	4	1400	CPG 72G <sup>2)</sup>	3850.00
	84	4	1400	CPG 84G <sup>2)</sup>	4550.00
	96	5	1600	CPG 96G <sup>2)</sup>	5250.00
160 A	24	1	800	CPG 24M160G <sup>1)</sup>	2550.00
	36	2	1000	CPG 36M160G <sup>1)</sup>	2850.00
	48	2	1000	CPG 48M160G <sup>1)</sup>	3050.00
	60	3	1200	CPG 60M160G <sup>1)</sup>	3450.00
250 A	24	1	800	CPG 24M250G <sup>1)</sup>	2650.00
	36	2	1000	CPG 36M250G <sup>1)</sup>	2950.00
	48	2	1000	CPG 48M250G <sup>1)</sup>	3200.00
	60	3	1200	CPG 60M250G <sup>1)</sup>	3550.00
	72	4	1400	CPG 72M250G <sup>1)</sup>	4200.00
	84	4	1400	CPG 84M250G <sup>1)</sup>	4900.00
	96	5	1600	CPG 96M250G <sup>1)</sup>	5600.00

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPG 24 M250 G = CPG 24G + EVA3250H.

<sup>2)</sup> Made to order.

- Larger main switches and other options and accessories available.

- Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER

The premium panelboard suits Din-T MCBs  
C/W isolation chassis

2

NEW  
Grizz-Bar  
Isolation  
chassis



### CONCEPT•PREMIER

Din-T – Surface mount with orange door

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$	
-	24	1	800	CPG 240 <sup>2)</sup>	2300.00	
	36	2	1000	CPG 360 <sup>2)</sup>	2600.00	
	48	2	1000	CPG 480 <sup>2)</sup>	2850.00	
	60	3	1200	CPG 600 <sup>2)</sup>	3200.00	
	72	4	1400	CPG 720 <sup>2)</sup>	3850.00	
	84	4	1400	CPG 840 <sup>2)</sup>	4550.00	
	96	5	1600	CPG 960 <sup>2)</sup>	5250.00	
	160 A	24	1	800	CPG 24M1600 <sup>1)</sup>	2550.00
		36	2	1000	CPG 36M1600 <sup>1)</sup>	2850.00
48		2	1000	CPG 48M1600 <sup>1)</sup>	3050.00	
60		3	1200	CPG 60M1600 <sup>1)</sup>	3450.00	
250 A	24	1	800	CPG 24M2500 <sup>1)</sup>	2650.00	
	36	2	1000	CPG 36M2500 <sup>1)</sup>	2950.00	
	48	2	1000	CPG 48M2500 <sup>1)</sup>	3200.00	
	60	3	1200	CPG 60M2500 <sup>1)</sup>	3550.00	
	72	4	1400	CPG 72M2500 <sup>1)</sup>	4200.00	
	84	4	1400	CPG 84M2500 <sup>1)</sup>	4900.00	
	96	5	1600	CPG 96M2500 <sup>1)</sup>	5600.00	

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPG 24 M250 O = CPG 240 + EVA3250H.

<sup>2)</sup> Made to order.

- Larger main switches and other options and accessories available.

- Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER

The premium panelboard suits Din-T MCBs

400 A  
Chassis



Made to order



2

### CONCEPT•PREMIER

**Din-T – Surface mount with grey door**

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
	48	4	1400	CPD 48M400G	3300.00
400 A Isolator	60	5	1600	CPD 60M400G	3600.00
Socomec SLB400	72	5	1600	CPD 72M400G	4200.00
	84	6	1800	CPD 84M400G	4700.00
	96	6	1800	CPD 96M400G	5300.00
	48	4	1400	CPD 48M300G	3300.00
300 A Isolator	60	5	1600	CPD 60M300G	3600.00
Terasaki S400NN	72	5	1600	CPD 72M300G	4200.00
	84	6	1800	CPD 84M300G	4700.00
	96	6	1800	CPD 96M300G	5300.00
	48	4	1400	CPD 48MCCB300G	3800.00
300 A MCCB	60	5	1600	CPD 60MCCB300G	4100.00
Terasaki S400CJ	72	5	1600	CPD 72MCCB300G	4700.00
	84	6	1800	CPD 84MCCB300G	5200.00
	96	6	1800	CPD 96MCCB300G	5800.00

**Notes:** 400 NC chassis universal feed.

## CONCEPT•PREMIER 2

The premium panelboard suits Din-T MCBs

2

Series 2  
NC chassis  
flush handle



Available  
mid 2013



### CONCEPT•PREMIER

Din-T – Surface mount with grey door

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	18	1	800	CPD 18G2	1870.00
	24	1	800	CPD 24G2	1970.00
	36	2	1000	CPD 36G2	2180.00
	48	2	1000	CPD 48G2	2310.00
	60	3	1200	CPD 60G2	2540.00
	72	4	1400	CPD 72G2	3100.00
	84	4	1400	CPD 84G2	3620.00
160 A	96	5	1600	CPD 96G2	4250.00
	18	1	800	CPD 18M160G2 <sup>1)</sup>	2120.00
	24	1	800	CPD 24M160G2 <sup>1)</sup>	2220.00
	36	2	1000	CPD 36M160G2 <sup>1)</sup>	2430.00
	48	2	1000	CPD 48M160G2 <sup>1)</sup>	2560.00
250 A	60	3	1200	CPD 60M160G2 <sup>1)</sup>	2790.00
	18	1	800	CPD 18M250G2 <sup>1)</sup>	2240.00
	24	1	800	CPD 24M250G2 <sup>1)</sup>	2340.00
	36	2	1000	CPD 36M250G2 <sup>1)</sup>	2550.00
	48	2	1000	CPD 48M250G2 <sup>1)</sup>	2690.00
	60	3	1200	CPD 60M250G2 <sup>1)</sup>	2920.00
	72	4	1400	CPD 72M250G2 <sup>1)</sup>	3480.00
	84	4	1400	CPD 84M250G2 <sup>1)</sup>	3990.00
	96	5	1600	CPD 96M250G2 <sup>1)</sup>	4630.00

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

- Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPD 24 M250 G = CPD 24G + EVA3250H.
- Larger main switches and other options and accessories available.
  - Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER 2

The premium panelboard suits Din-T MCBs

Series 2  
NC chassis  
flush handle



Available  
mid 2013

2

### CONCEPT•PREMIER

Din-T – Surface mount with orange door

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	18	1	800	CPD 18O2	1870.00
	24	1	800	CPD 24O2	1970.00
	36	2	1000	CPD 36O2	2180.00
	48	2	1000	CPD 48O2	2310.00
	60	3	1200	CPD 60O2	2540.00
	72	4	1400	CPD 72O2	3100.00
	84	4	1400	CPD 84O2	3620.00
	96	5	1600	CPD 96O2	4250.00
160 A	18	1	800	CPD 18M160O2 <sup>1)</sup>	2120.00
	24	1	800	CPD 24M160O2 <sup>1)</sup>	2220.00
	36	2	1000	CPD 36M160O2 <sup>1)</sup>	2430.00
	48	2	1000	CPD 48M160O2 <sup>1)</sup>	2560.00
	60	3	1200	CPD 60M160O2 <sup>1)</sup>	2790.00
250 A	18	1	800	CPD 18M250O2 <sup>1)</sup>	2240.00
	24	1	800	CPD 24M250O2 <sup>1)</sup>	2340.00
	36	2	1000	CPD 36M250O2 <sup>1)</sup>	2550.00
	48	2	1000	CPD 48M250O2 <sup>1)</sup>	2690.00
	60	3	1200	CPD 60M250O2 <sup>1)</sup>	2920.00
	72	4	1400	CPD 72M250O2 <sup>1)</sup>	3480.00
	84	4	1400	CPD 84M250O2 <sup>1)</sup>	3990.00
	96	5	1600	CPD 96M250O2 <sup>1)</sup>	4630.00

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

- Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPD 24 M250 O = CPD 240 + EVA3250H.
- Enclosures with orange base replace "O" with "OO" e.g. CPD36OO.
  - Larger main switches and other options and accessories available.
  - Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER 2 SS

The premium panelboard suits Din-T MCBs

2

Series 2  
NC chassis  
flush handle



Available  
mid 2013

### CONCEPT•PREMIER

Din-T – Surface mount with stainless steel door

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	18	1	800	CPD 18SS2	6850.00
	24	1	800	CPD 24SS2	6950.00
	36	2	1000	CPD 36SS2	7890.00
	48	2	1000	CPD 48SS2	7980.00
	60	3	1200	CPD 60SS2 <sup>2)</sup>	9050.00
	72	4	1400	CPD 72SS2 <sup>2)</sup>	10150.00
	84	4	1400	CPD 84SS2 <sup>2)</sup>	10320.00
	96	5	1600	CPD 96SS2 <sup>2)</sup>	11100.00
160 A	18	1	800	CPD 18M160SS2 <sup>1)</sup>	7160.00
	24	1	800	CPD 24M160SS2 <sup>1)</sup>	7240.00
	36	2	1000	CPD 36M160SS2 <sup>1)</sup>	8140.00
	48	2	1000	CPD 48M160SS2 <sup>1)</sup>	8290.00
	60	3	1200	CPD 60M160SS2 <sup>1)</sup>	9330.00
	250 A	18	1	800	CPD 18M250SS2 <sup>1)</sup>
24		1	800	CPD 24M250SS2 <sup>1)</sup>	7420.00
36		2	1000	CPD 36M250SS2 <sup>1)</sup>	8290.00
48		2	1000	CPD 48M250SS2 <sup>1)</sup>	8460.00
60		3	1200	CPD 60M250SS2 <sup>1)</sup>	9490.00
72		4	1400	CPD 72M250SS2 <sup>1)</sup>	10480.00
84		4	1400	CPD 84M250SS2 <sup>1)</sup>	10690.00
	96	5	1600	CPD 96M250SS2 <sup>1)</sup>	11400.00

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPD 24 M250 SS2 = CPD 24SS2 + EVA3250H.

<sup>2)</sup> Made to order.

- Larger main switches and other options and accessories available.

- Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER 2

The premium panelboard suits Din-T MCBs  
C/W isolation chassis

Series 2  
NC chassis  
flush handle



Available  
mid 2013

2

### CONCEPT•PREMIER

Din-T – Surface mount with grey door

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	24	1	800	CPG 24G2 <sup>2)</sup>	2300.00
	36	2	1000	CPG 36G2 <sup>2)</sup>	2600.00
	48	2	1000	CPG 48G2 <sup>2)</sup>	2850.00
	60	3	1200	CPG 60G2 <sup>2)</sup>	3200.00
	72	4	1400	CPG 72G2 <sup>2)</sup>	3850.00
	84	4	1400	CPG 84G2 <sup>2)</sup>	4550.00
	96	5	1600	CPG 96G2 <sup>2)</sup>	5250.00
160 A	24	1	800	CPG 24M160G2 <sup>1)</sup>	2550.00
	36	2	1000	CPG 36M160G2 <sup>1)</sup>	2850.00
	48	2	1000	CPG 48M160G2 <sup>1)</sup>	3050.00
	60	3	1200	CPG 60M160G2 <sup>1)</sup>	3450.00
250 A	24	1	800	CPG 24M250G2 <sup>1)</sup>	2650.00
	36	2	1000	CPG 36M250G2 <sup>1)</sup>	2950.00
	48	2	1000	CPG 48M250G2 <sup>1)</sup>	3200.00
	60	3	1200	CPG 60M250G2 <sup>1)</sup>	3550.00
	72	4	1400	CPG 72M250G2 <sup>1)</sup>	4200.00
	84	4	1400	CPG 84M250G2 <sup>1)</sup>	4900.00
	96	5	1600	CPG 96M250G2 <sup>1)</sup>	5600.00

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPG 24 M250 G2 = CPG 24G2 + EVA3250H.

<sup>2)</sup> Made to order.

- Larger main switches and other options and accessories available.

- Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER 2

The premium panelboard suits Din-T MCBs  
C/W isolation chassis

2

Series 2  
NC chassis  
flush handle



Available  
mid 2013



### CONCEPT•PREMIER

Din-T – Surface mount with orange door

Suits Din-T MCBs (DIN) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$	
-	24	1	800	CPG 24O2 <sup>2)</sup>	2300.00	
	36	2	1000	CPG 36O2 <sup>2)</sup>	2600.00	
	48	2	1000	CPG 48O2 <sup>2)</sup>	2850.00	
	60	3	1200	CPG 60O2 <sup>2)</sup>	3200.00	
	72	4	1400	CPG 72O2 <sup>2)</sup>	3850.00	
	84	4	1400	CPG 84O2 <sup>2)</sup>	4550.00	
	96	5	1600	CPG 96O2 <sup>2)</sup>	5250.00	
	160 A	24	1	800	CPG 24M160O2 <sup>1)</sup>	2550.00
		36	2	1000	CPG 36M160O2 <sup>1)</sup>	2850.00
48		2	1000	CPG 48M160O2 <sup>1)</sup>	3050.00	
60		3	1200	CPG 60M160O2 <sup>1)</sup>	3450.00	
250 A	24	1	800	CPG 24M250O2 <sup>1)</sup>	2650.00	
	36	2	1000	CPG 36M250O2 <sup>1)</sup>	2950.00	
	48	2	1000	CPG 48M250O2 <sup>1)</sup>	3200.00	
	60	3	1200	CPG 60M250O2 <sup>1)</sup>	3550.00	
	72	4	1400	CPG 72M250O2 <sup>1)</sup>	4200.00	
	84	4	1400	CPG 84M250O2 <sup>1)</sup>	4900.00	
	96	5	1600	CPG 96M250O2 <sup>1)</sup>	5600.00	

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPG 24 M250 O2 = CPG 24O2 + EVA3250H.

<sup>2)</sup> Made to order.

- Larger main switches and other options and accessories available.

- Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER

### The premium panelboard suits Safe-T MCBs



2

#### CONCEPT•PREMIER

#### Safe-T – Surface mount with grey door

Suits Safe-T MCBs (NEMA) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$	
-	24	1	800	CPS 24G <sup>2)</sup>	2060.00	
	36	2	1000	CPS 36G	2260.00	
	48	3	1200	CPS 48G	2410.00	
	60	4	1400	CPS 60G	2580.00	
	72	5	1600	CPS 72G <sup>2)</sup>	3220.00	
	84	6	1800	CPS 84G <sup>2)</sup>	3720.00	
	96	6	1800	CPS 96G <sup>2)</sup>	4360.00	
	160 A	24	1	800	CPS 24M160G <sup>1)</sup>	2310.00
		36	2	1000	CPS 36M160G <sup>1)</sup>	2510.00
48		3	1200	CPS 48M160G <sup>1)</sup>	2660.00	
60		4	1400	CPS 60M160G <sup>1)</sup>	2830.00	
250 A	24	1	800	CPS 24M250G <sup>1)</sup>	2440.00	
	36	2	1000	CPS 36M250G <sup>1)</sup>	2640.00	
	48	3	1200	CPS 48M250G <sup>1)</sup>	2780.00	
	60	4	1400	CPS 60M250G <sup>1)</sup>	2960.00	
	72	5	1600	CPS 72M250G <sup>1)</sup>	3590.00	
	84	6	1800	CPS 84M250G <sup>1)</sup>	4100.00	
	96	6	1800	CPS 96M250G <sup>1)</sup>	4730.00	

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPS 24 M250 G = CPS 24G + EVA3250H.

<sup>2)</sup> Made to order.

- Larger main switches and other options and accessories available.

- Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER

### The premium panelboard suits Safe-T MCBs



2

#### CONCEPT•PREMIER

#### Safe-T – Surface mount with orange door

Suits Safe-T MCBs (NEMA) refer to section one

Main Switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	24	1	800	CPS 24O <sup>2)</sup>	2060.00
	36	2	1000	CPS 36O <sup>2)</sup>	2260.00
	48	3	1200	CPS 48O <sup>2)</sup>	2410.00
	60	4	1400	CPS 60O <sup>2)</sup>	2580.00
	72	5	1600	CPS 72O <sup>2)</sup>	3220.00
	96	6	1800	CPS 96O <sup>2)</sup>	4360.00
160 A	24	1	800	CPS 24M160O <sup>1)</sup>	2310.00
	36	2	1000	CPS 36M160O <sup>1)</sup>	2510.00
	48	3	1200	CPS 48M160O <sup>1)</sup>	2660.00
	60	4	1400	CPS 60M160O <sup>1)</sup>	2830.00
250 A	24	1	800	CPS 24M250O <sup>1)</sup>	2440.00
	36	2	1000	CPS 36M250O <sup>1)</sup>	2640.00
	48	3	1200	CPS 48M250O <sup>1)</sup>	2780.00
	60	4	1400	CPS 60M250O <sup>1)</sup>	2960.00
	72	5	1600	CPS 72M250O <sup>1)</sup>	3590.00
	96	6	1800	CPS 96M250O <sup>1)</sup>	4730.00

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> Main switches are supplied loose. i.e. CPS 24 M250 O = CPS 240 + EVA3250H.

<sup>2)</sup> Made to order.

- Larger main switches and other options and accessories available.

- Refer NHP for delivery confirmation regarding types with main switches.

## CONCEPT•PREMIER CPX

The premium panelboard

Suits E125, S125 MCCBs

Series 2  
Add 2 at end of  
Cat. No.  
Flush door handle  
30 % larger gland  
plate opening



The MCCB  
panelboard

2

### CONCEPT•PREMIER CPX

MCCB - Surface mount with grey door

Pole cap.	Box size	Height (mm)	Cat. No.	Price \$
18	2	1000	CPX18G <sup>1)</sup>	3680.00
24	2	1000	CPX24G <sup>1)</sup>	4100.00
36	3	1200	CPX36G <sup>1)</sup>	4460.00
42	4	1400	CPX42G	4880.00
48	4	1400	CPX48G	4930.00
60	5	1600	CPX60G	5290.00
72	6	1800	CPX72G	5710.00

### CONCEPT•PREMIER CPX

MCCB - Surface mount with orange door

Pole cap.	Box size	Height (mm)	Cat. No.	Price \$
18	2	1000	CPX18O <sup>1)</sup>	3680.00
24	2	1000	CPX24O <sup>1)</sup>	4100.00
36	3	1200	CPX36O	4460.00
42	4	1400	CPX42O	4880.00
48	4	1400	CPX48O	4930.00
60	5	1600	CPX60O	5290.00
72	6	1800	CPX72O	5710.00

### CONCEPT•PREMIER CPX

MCCB - Surface mount stainless steel

Pole cap.	Box size	Height (mm)	Cat. No.	Price \$
18	2	1000	CPX18SS	8560.00
24	2	1000	CPX24SS	8770.00
36	3	1200	CPX36SS	10220.00
42	4	1400	CPX42SS	11460.00
48	4	1400	CPX48SS	11670.00
60	5	1600	CPX60SS	13120.00
72	6	1800	CPX72SS	14270.00

Width = 640 mm, Depth = 240 mm includes door. (Door = 20 mm)

**Notes:** CPX panelboards are fully assembled from stocked components.  
Cat. No. refers to panelboard suitable for E125, S125 MCCBs.  
Refer to NHP for panelboard suitable for S160, S250 MCCBs.  
<sup>1)</sup> Units stocked.

## CONCEPT•PREMIER

### The premium panelboard options and accessories

#### Accessory modules

2

Box size	Height (mm)	Pole cap.	With escutcheon Cat. No. <sup>1)</sup>	Price \$
H	600	24	CPPACC24G	1030.00
H	600	48	CPPACC48G	1060.00

Box size	Height (mm)	Without escutcheon Cat. No. <sup>1)</sup>	Price \$
H	600	CPPACCG	950.00

Box size	Height (mm)	With blank escutcheon Cat. No. <sup>1)</sup>	Price \$
H	600	CPPACCGE	1020.00
1	800	CPPACCS1GE	1250.00
2	1000	CPPACCS2GE	1450.00
3	1200	CPPACCS3GE	1660.00
4	1400	CPPACCS4GE	1970.00
5	1600	CPPACCS5GE	2280.00
6	1800	CPPACCS6GE	2590.00
7	2000	CPPACCS7GE	2910.00

Width = 640 mm Depth = 240 mm includes door (Door = 20 mm)

#### Gear trays to suit Accessory Module

##### White mounting plate

Height (mm)	Cat. No.	Price \$
94	CPBGTS1	46.50
194	CPBGTS2	67.50
294	CPBGTS3	88.00
494	CPBGTSH	114.00
594	CPBGTS4	145.00
994	CPBGTS6	230.00

Gear trays for Concept Premier must be 200 mm shorter than enclosure size.

#### Earth and neutral bar kit to suit Accessory Module

No Ways	Cat. No.	Price \$
24	CEN24	88.00
36	CEN36	95.00
48	CEN48	118.00
60	CEN60	144.00
72	CEN72	158.00
84	CEN84	193.00
96	CEN96	215.00

Includes 2 bars, mounting supports and fasteners.

**Notes:** <sup>1)</sup> Replace "G" with "O" for orange door, replace "G" with "SS" for stainless steel.

## CONCEPT•PREMIER 2

### The premium panelboard options and accessories

Series 2 available mid 2013

#### Accessory modules

Box size	Height (mm)	Pole cap.	With escutcheon Cat. No. <sup>1)</sup>	Price \$
H	600	24	CPPACC24G2	1030.00
H	600	48	CPPACC48G2	1060.00

Box size	Height (mm)	Without escutcheon Cat. No. <sup>1)</sup>	Price \$
H	600	CPPACCG2	1030.00

Box size	Height (mm)	With blank escutcheon Cat. No. <sup>1)</sup>	Price \$
H	600	CPPACCGE2	1060.00
1	800	CPPACCS1GE2	1250.00
2	1000	CPPACCS2GE2	1450.00
3	1200	CPPACCS3GE2	1660.00
4	1400	CPPACCS4GE2	1970.00
5	1600	CPPACCS5GE2	2280.00
6	1800	CPPACCS6GE2	2590.00
7	2000	CPPACCS7GE2	2910.00

Width = 640 mm Depth = 240 mm includes door (Door = 20 mm)

**Notes:** <sup>1)</sup> Replace "G" with "O" for orange door, replace "G" with "SS" for stainless steel.

## CONCEPT•PREMIER

### The premium panelboard options and accessories

2

#### Options and accessories

Description	Cat. No.	Price \$
Emergency lighting kits	rotary control switch (unwired)	<b>CPELK1</b> 430.00
	rotary control switch (wired loom)	<b>CPELK1W</b> 445.00
	Key switch (unwired)	<b>CPELK2</b> 495.00
Flush kits (supplied loose) 45 mm width	Size H	<b>CPPFKH</b> 300.00
	Size 1	<b>CPPFK1</b> 300.00
	Size 2	<b>CPPFK2</b> 300.00
	Size 3	<b>CPPFK3</b> 300.00
	Size 4	<b>CPPFK4</b> 300.00
	Size 5	<b>CPPFK5</b> 300.00
	Size 6	<b>CPPFK6</b> 300.00
Weather-proof cover	Mild steel Single width	<b>CPPWC</b> 255.00
	Mild steel Double width	<b>CPPWCD</b> 415.00
	Stainless steel Single width	<b>CPPWCSS</b> 650.00
	Stainless steel Double width	<b>CPPWCDSS</b> 2390.00
Floor mounting plinth <sup>2)</sup> (100 mm)	Mild steel Single width	<b>CPPPLINTHS</b> 360.00
	Mild steel Double width	<b>CPPPLINTHD</b> 930.00
	Stainless steel Single width	<b>CPPPLINTHSSS</b> 1220.00
Wall mounting brackets	Mild steel	<b>CPPWBMS</b> 290.00
	Stainless steel	<b>CPPWB</b> 325.00
Weather-proof rainhood	Gland plates Brass 3 mm	<b>CPPGPB</b> 200.00
	Gland plates Brass 5 mm	<b>CPPGPB5</b> 375.00
	Gland plates Aluminium 3 mm	<b>CPPGPA</b> 67.50
	Gland plates Aluminium 6 mm	<b>CPPGPA6</b> 72.50
White liners <sup>1)</sup> 2 required per board	Size H	<b>CPPWILH</b> 150.00
	Size 1	<b>CPPWIL1</b> 150.00
	Size 2	<b>CPPWIL2</b> 150.00
	Size 3	<b>CPPWIL3</b> 150.00
	Size 4	<b>CPPWIL4</b> 150.00
	Size 5	<b>CPPWIL5</b> 150.00
	Size 6	<b>CPPWIL6</b> 150.00
Gland plate gasket	Series 1	<b>305.00001</b> 6.20
	Series 2	<b>TBA</b> POA

**Notes:** <sup>1)</sup> Transforms interior of board white without respray.

<sup>2)</sup> Plinth is designed for bottom cable entry, if panelboard is freestanding additional support is required.

## CONCEPT•PREMIER

### The premium panelboard

#### Options and accessories

#### Accessories

Description		Cat. No.	Price \$	
Top mount main switch kit (supplied loose)	160 A 3 pole	CPD	<b>CDT160MS</b> 305.00	
		CPG, CPS	<b>EVA3160H</b> 305.00	
	250 A 3 pole	CPD	<b>CDT250MS</b> 435.00	
		CPG, CPS	<b>EVA3250H</b> 435.00	
Blue cover to suit 160 A and 250 A isolator		<b>1LS2VS</b>	12.00	
Split chassis kits	CPD	CD chassis	<b>STKCD</b> 119.00	
	CPS	CT chassis 250 A	<b>STK250NDTH</b> 119.00	
	CPS	CT chassis 355 A	<b>STK300TH</b> 119.00	
Connection kits	250 A MCCB to CD chassis		<b>CD250CKT2</b> 280.00	
	200 A MCCB to NC chassis (Direct)		<b>NCCK200CPP</b> 187.00	
	250 A MCCB to NC chassis (TAG)		<b>NCCK250CPP</b> 500.00	
	400 A MCCB to NC chassis (TAG)		<b>NCCK400CPP</b> 590.00	
400 A SLB to NC chassis (TAG)		<b>NCCK4002CPP</b>	820.00	
Support bracket to mount S250		<b>CPPBS250</b>	83.00	
Pole Fillers	Din-T		<b>DTPF</b> 4.30	
	Safe-T		<b>SAFETPF</b> 1.80	
	S 125		<b>XAB2</b> 3.80	
	S 250		<b>XAB3</b> 3.80	
Door handles (T handle)	CL001		<b>CPPDCL001</b> 67.50	
	92268		<b>CPPD92268</b> 78.00	
Tee-off plastic caps	CD-Din-T		<b>CD250TOPC</b> 0.60	
	NC-Din-T		<b>NC250TOPC</b> 0.80	
	GB-Din-T		<b>GBTOC</b>	
	Safe-T		<b>TH250TOPC</b>	0.60
Spare Key (set of 2)	CL001		<b>KEYCL001</b> 7.80	
	92268		<b>KEY92268</b> 7.80	
NSW PWD E lock (series 1)		<b>CPPPWDNSW</b>	295.00	
Traffolite labelling available		<b>REFER NHP</b>	-	
Special paint colour		<b>REFER NHP</b>	-	
PVC wiring duct		<b>REFER NHP</b>	-	
kWh meter		<b>REFER PAGE</b>	-	
		<b>1 - 42</b>		

2

## CONCEPT•TOUGH

### The heavy-duty panelboard

#### Suits Din-T MCBs, E125, S125 and S160, S250 MCCBs

2

- Standard AS/NZS 3439.3
- IP 66 rated enclosure
- 2.0 mm fully welded construction
- 316 Stainless steel option
- 6mm Aluminium gland plates
- 4 modular sizes 500 mm to 2000 mm
- Very generous amounts of wiring room
- Type tested busbar/chassis system
- Removable gland plates (with gaskets)
- Lift-off hinged escutcheon
- Chrome hinges and door handle
- 3 point door locking
- Australian made
- Padlockable door handle
- Commercial, industrial and heavy industrial applications



#### Application

The CONCEPT•TOUGH range of Panelboards provides a unique enclosure system for NHP Din-T MCBs, E125, S125 and S160, S250 MCCBs.

#### Features

- The lift-off hinged door is totally independent of the escutcheon.
- Generous space between door and escutcheon to allow a wide range of accessories/locking facilities to fit behind the door.
- D handles fitted to the lift-off escutcheon to allow easy fitting and removal.
- Knockouts provided in the escutcheon for up to 18 modules of standard DIN rail equipment (Din-T Panelboards only)
- Removable gland plates aid on-site installation of cable and trunking systems.
- Compact main switch with a fully enclosed rating of 160 A and 250 A (Din-T Panelboards only).
- Large gland plates to allow for incoming/outgoing cables.
- Dual earth and neutral bars, circuit identification and two schedule cards supplied standard.
- 6 mm aluminum gland plate

## CONCEPT•TOUGH

### The heavy-duty panelboard

#### Suits Din-T MCBs, E125, S125 and S160, S250 MCCBs

#### Technical data

<b>Material type:</b>	2.0 mm steel, polyester powder coated 6 mm Aluminium gland plates 2.0 mm 316 Stainless steel option	
<b>Colour</b> <b>(AS 2700-1995):</b>	Base – Orange gloss / Charcoal gloss Door – X15 Orange or N42 Storm Grey (other colours refer NHP) Escutcheon – Bright white gloss	
<b>Protection degree:</b>	IP 40 – without door IP 66 – with door	
<b>Busbar ratings:</b>	Din-T Panelboards	- 250 A CD chassis (355 A option) - 250 A NC chassis (400 A option)
	S 125 MCCBs Panelboard	- 630 A (std), 36 kA for 1 second - 800 A (optional)
<b>Main switch</b> <b>(options):</b>	Din-T M/S 80/100 A (chassis mount Din-T) 160 A, 250 A, 400 A, 630 A & 800 A 3 pole 415 V AC (top mount)	
<b>Neutral and</b> <b>Earth bars:</b>	Din-T Panelboards - (dual bars) 2 x 8 mm studs & 2 screw tunnel terminals (16 mm) S 125 MCCBs Panelboard 2 x 10 mm studs, 8 x 8 mm studs & 1 screw tunnel terminals (35 mm) 400 A	

## CONCEPT•TOUGH

### The heavy-duty panelboard

#### Suits Din-T MCBs



2

### CONCEPT•TOUGH

#### Din-T - Surface mount orange

Pole capacity	Box size	Height (mm)	Cat. No. <sup>1)</sup>	Price \$
18	2	1000	CTD180	5910.00
24	2	1000	CTD240	6230.00
36	2	1000	CTD360	6540.00
48	2	1000	CTD480	6740.00
60	3	1500	CTD600	8090.00
72	3	1500	CTD720	8510.00
84	3	1500	CTD840	8920.00
96	3	1500	CTD960	9230.00

### CONCEPT•TOUGH

#### Din-T - Surface mount stainless steel-orange

Pole capacity	Box size	Height (mm)	Cat. No. <sup>1)</sup>	Price \$
18	2	1000	CTD185SO	20020.00
24	2	1000	CTD245SO	20230.00
36	2	1000	CTD365SO	20270.00
48	2	1000	CTD485SO	20580.00
60	3	1500	CTD605SO	24010.00
72	3	1500	CTD725SO	24320.00
84	3	1500	CTD845SO	24530.00
96	3	1500	CTD965SO	24730.00

Delete "O" for raw stainless enclosure e.g. CTD185S.

### CONCEPT•TOUGH

#### Accessory modules with orange doors

Pole capacity	Box size	Height (mm)	Cat. No. <sup>1)</sup>	Price \$
0	1	500	CTACCO	3990.00
24	1	500	CTACC24HO <sup>2)</sup>	4250.00
24	1	500	CTACC24O	4250.00

Width = 800 mm, Depth = 300 mm includes door. (Door = 20 mm)

**Notes:** <sup>1)</sup> CTD panelboard are fully assembled from stocked components.  
Correct box size when fitting 160 A or 250 A isolator.  
Made to order.

<sup>2)</sup> 24 pole horizontal on DIN Rail (18P suit lock DIN, 3P suit STD DIN).

## CONCEPT•TOUGH

### The heavy-duty panelboard

#### Suits E125, S125 MCCBs



### CONCEPT•TOUGH

#### MCCB - Surface mount with orange door

Main switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	18	2	1000	CTX18O	7420.00
	24	2	1000	CTX24O	7680.00
	36	3	1500	CTX36O	8140.00
	48	3	1500	CTX48O	8660.00
	60	3	1500	CTX60O	11050.00
	72	4	2000	CTX72O	11620.00
	400 A S400CJ	18	3	1500	CTX18M400O
24		3	1500	CTX24M400O	POA
36		3	1500	CTX36M400O	POA
48		4	2000	CTX48M400O	POA
60		4	2000	CTX60M400O	POA
72		4	2000	CTX72M400O	POA

### CONCEPT•TOUGH

#### MCCB - Surface mount stainless steel-orange

Main switch	Pole capacity	Box size	Height (mm)	Cat. No.	Price \$
-	18	2	1000	CTX18SSO	23290.00
	24	2	1000	CTX24SSO	23600.00
	36	3	1500	CTX36SSO	24120.00
	48	3	1500	CTX48SSO	24590.00
	60	3	1500	CTX60SSO	29620.00
	72	4	2000	CTX72SSO	30190.00

Width = 800 mm, Depth = 300 mm includes door. (Door = 20 mm)

Delete "O" for raw stainless steel enclosure e.g. CTX18SS.

**Notes:** Made to order.

CTX panelboards are fully assembled from stocked components.

Cat. No. refers to Panelboard suitable for E125, S125 MCCB.

Refer to NHP for Panelboard suitable for S160, S250 MCCB.

## Panelboard hardware to suit the CONCEPT family of panelboards with Din-T or Safe-T MCBs

### Earth and neutral bars - 165 A

No. tunnels	Numbering	Single screw Cat. No.	Price \$	Double screw Cat. No.	Price \$
18	1-18	TGPEN181S	55.00	TGPEN182S	57.00
24	1-24	TGPEN241S	65.50	TGPEN242S	67.50
30	1-30	-	-	TGPEN302S	83.00
36	1-36	-	-	TGPEN362S	93.50
42	1-42	-	-	TGPEN422S	93.50
48	1-48	-	-	TGPEN482S	98.50
60	1-60	-	-	TGPEN602S	135.00
72	1-72	-	-	TGPEN722S	161.00
84	1-84	-	-	TGPEN842S	197.00
96	1-96	-	-	TGPEN962S	235.00

Pole cap.	Numbering (odd/even)	Double screw odd numbers Cat. No.	Price \$	Double screw even numbers Cat. No.	Price \$
9	1-17 & 2-18	TGPEN92SODD	41.50	TGPEN92SEVE	41.50
18	1-35 & 2-36	TGPEN182SODD	62.50	TGPEN182SEVE	62.50
24	1-47 & 2-48	TGPEN242SODD	72.50	TGPEN242SEVE	72.50
30	1-59 & 2-60	TGPEN302SODD	88.00	TGPEN302SEVE	88.00
36	1-71 & 2-72	TGPEN362SODD	104.00	TGPEN362SEVE	104.00
42	1-83 & 2-84	TGPEN422SODD	114.00	TGPEN422SEVE	114.00
48	1-95 & 2-96	TGPEN482SODD	125.00	TGPEN482SEVE	125.00

165 A bars - 2 x M8 studs & 2 x 25 mm tunnel terminals, remainder 2 screw 16 mm terminals

### Earth and neutral bars - 300 A

No. tunnels	Numbering	Single screw Cat. No.	Price \$
18	1-18	CPEN18	88.00
24	1-24	CPEN24	101.00
36	1-36	CPEN36	130.00
48	1-48	CPEN48	140.00
60	1-60	CPEN60	171.00
72	1-72	CPEN72	192.00
84	1-84	CPEN84	225.00
96	1-96	CPEN96	265.00



## Panelboard hardware to suit the CONCEPT family of panelboards with Din-T or Safe-T MCBs



Pole capacity	Numbering (odd/even)	Double screw odd numbers Cat. No.	Price \$	Double screw even numbers Cat. No.	Price \$
9	1-17 & 2-18	CPEN9ODD	78.00	CPEN9EVE	78.00
18	1-35 & 2-36	CPEN18ODD	98.50	CPEN18EVE	98.50
24	1-47 & 2-48	CPEN24ODD	111.00	CPEN24EVE	111.00
30	1-59 & 2-60	CPEN30ODD	130.00	CPEN30EVE	130.00
36	1-71 & 2-72	CPEN36ODD	140.00	CPEN36EVE	140.00
48	1-95 & 2-96	CPEN48ODD	150.00	CPEN48EVE	150.00

300 A bars- 2 x M10 & 2 x M8 studs and 6 x 25 mm tunnel terminals, remainder 2 screw 16 mm terminals.

(Studs suitable for 2 x 185 mm lugs and 50 mm and 70 mm lugs)

### Earth and neutral bars - 400 A rated



Ways	(Hex head screws)	Tunnel terminals	Double screw even numbers Cat. No.	Price \$
8 way	2 x M10 & 8 x M8 studs	-	CPXEN8	109.00
12 way	2 x M10 & 8 x M8 studs	4 x 35 mm <sup>2</sup> tunnel term.	CPXEN12	140.00
18 way	2 x M10 & 8 x M8 studs	10 x 35 mm <sup>2</sup> tunnel term.	CPXEN18	250.00
36 way	3 x M10 & 8 x M8 studs	28 x 35 mm <sup>2</sup> tunnel term.	CPXEN36	320.00

### Extras

Description	Cat. No.	Price \$
Neutral bar extension - suits 165 A E/N bars - connection 2 x 185 mm lugs	NEB185	88.00
Neutral bar extension - 300 A - suits 165 A E/N	NEB335	88.00
Neutral bar mounting insulators (pair)	TGPINS	8.90
Neutral bar insulated support (each)	CPBMN	4.20
A4 Schedule card	CPSCHEDULECARD	3.00
Schedule card holder (plastic)	CPSCHEDULEHOLD	13.00
Touch-up paint <b>charcoal</b> spray can 150 g	392.00001	46.50
Touch-up paint <b>grey</b> spray can 150 g	392.35554	46.50
Touch-up paint <b>orange</b> spray can 150 g	392.35555	46.50
Touch-up paint <b>bright white</b> spray can 150 g	392.00002	46.50

## NC Chassis

### Concept Panelboard busbar chassis assemblies for Din-T MCBs



New Enclosed Busbar System

2

- Standard AS/NZS 3439-1
- Current rating 250 A and 400 A
- Encapsulated busbar (no insulation coating required)
- Withstand rating 250 A / 25 kA 0.1s (20 kA 0.3s)
- Withstand rating 400 A / 30 kA 0.1s (25 kA 0.3s)
- Busbar direct connect to 160 A & 250 A switch
- Top and bottom feed standard (top feed only pictured)
- Tee-offs 50 % capped
- IP 20 (maintained when fitted with 160 A & 250 A switch)
- IP 20 Connection kits to 250 A MCCB
- Interchangeable with CD chassis

#### Application

The Concept range of busbar chassis assemblies have been specifically designed for incorporation into the Concept family of panelboards, providing a secure mounting platform and connection system for the NHP Din-T range of MCBs. The busbars are fully enclosed therefore not requiring an insulated coating for electrical isolation. The new NC chassis are type tested and are mounted on a box section steel pan, powdercoated white.

#### CONCEPT Din-T - 250 chassis

##### Suits Din-T MCBs (18 mm pole pitch)

Pole capacity	Cut-out length (mm)	Pan height (mm) <sup>2)</sup>	Cat. No. <sup>1)</sup>	250 A Price \$
12	111	134	NC212/183U	200.00
18	165	188	NC218/183U	225.00
24	219	242	NC224/183U	280.00
30	273	296	NC230/183U	310.00
36	327	350	NC236/183U	350.00
42	381	404	NC242/183U	380.00
48	435	458	NC248/183U	425.00
54	489	512	NC254/183U	475.00
60	543	566	NC260/183U	495.00
72	651	674	NC272/183U	660.00
78	705	728	NC278/183U	780.00
84	759	782	NC284/183U	850.00
96	867	890	NC296/183U	990.00

**Notes:** <sup>1)</sup> For top fed chassis delete "U" and replace with "TF" e.g. NCTF212183TF  
<sup>2)</sup> Add 40 mm for flared busbar at top and 56 mm for bottom of chassis.  
 For split chassis, order special chassis or order two top fed chassis and mount bottom chassis upside down and fit new label. See accessories for Cat. No.  
 OFF (line) side of MCB connects to chassis tee-off.  
 Combinations other than those listed above can be special ordered refer to NHP.

## NC Chassis

### Concept Panelboard busbar chassis assemblies for Din-T MCBs

#### CONCEPT Din-T - 400 A chassis

##### Suits Din-T MCBs (18 mm pole pitch)

Pole capacity	Cut-out length (mm)	Pan height (mm) <sup>2)</sup>	Cat. No. <sup>1)</sup>	400 A Price \$
12	111	134	NC412/183U	375.00
18	165	188	NC418/183U	425.00
24	219	242	NC424/183U	480.00
30	273	296	NC430/183U	540.00
36	327	350	NC436/183U	580.00
42	381	404	NC442/183U	620.00
48	435	458	NC448/183U	710.00
54	489	512	NC454/183U	750.00
60	543	566	NC460/183U	790.00
72	651	674	NC472/183U	930.00
78	705	728	NC478/183U	1000.00
84	759	782	NC484/183U	1090.00
96	867	890	NC496/183U	1250.00
108	975	998	NC4108/183TF	1380.00

2

#### CONCEPT Din-T - 250 A chassis 4P

##### Suits Din-T 2P RCBOs (18 mm pole pitch)

Pole capacity	Cut-out 'C' length (mm)	Pan height (mm) <sup>2)</sup>	Cat. No. <sup>1)</sup>	250 A Price \$
24	219	242	NC224/184U	430.00
36	327	350	NC236/184U	520.00
48	435	458	NC248/184U	630.00
60	543	566	NC260/184U	750.00
72	651	674	NC272/184U	980.00

Chassis colours - Red, Black, White, Black, Blue, Black

#### CONCEPT Din-T - 250 A chassis 3P+N

##### Suits Din-T 4P MCBs (18 mm pole pitch)

Pole capacity	Cut-out 'C' length (mm)	Pan height (mm) <sup>2)</sup>	Cat. No. <sup>1)</sup>	250 A Price \$
24	219	242	NC224183PNU	430.00
48	435	458	NC248183PNU	630.00
72	651	674	NC272183PNU	980.00
96	887	890	NC296183PNU	1330.00

**Notes:** <sup>1)</sup> For top fed chassis delete "U" and replace with "TF" e.g. NCTF212183TF

<sup>2)</sup> Add 40 mm for flared busbar at top and 56 mm for bottom of chassis.

For split chassis, order special chassis or order two top fed chassis and mount bottom chassis upside down and fit new label. See accessories for Cat. No.

OFF (line) side of MCB connects to chassis tee-off.

Combinations other than those listed above can be special ordered refer to NHP.

## NC Chassis

### Concept Panelboard busbar chassis assemblies for Din-T MCBs

#### CONCEPT Din-T - 400 A chassis

##### Suits Din-T10H MCBs (27 mm pole pitch)

Pole capacity	Cut-out 'C' length (mm)	Pan height (mm) <sup>2)</sup>	Cat. No. <sup>1)</sup>	400 A Price \$
6	84	107	NCH46/273U	385.00
12	165	188	NCH412/273U	560.00
18	244	267	NCH418/273U	760.00
24	327	350	NCH424/273U	920.00

#### CONCEPT Din-T - 400 A chassis

##### Suits Din-T MCBs and Din-T10H MCBs (27/18 mm pole pitch)

Pole capacity 27 mm	Pole capacity 18 mm	Cut-out 'C' length (mm)	Pan height (mm) <sup>2)</sup>	Cat. No. <sup>1)</sup>	400 A Price \$
6	12	192	215	NCH46/1227/183U	500.00
6	24	300	323	NCH46/2427/183U	560.00
6	36	408	431	NCH46/3627/183U	590.00
6	48	516	539	NCH46/4827/183U	630.00
12	30	435	458	NCH412/3027/183U	660.00
12	42	543	566	NCH412/4227/183U	790.00
12	60	705	728	NCH412/6027/183U	980.00

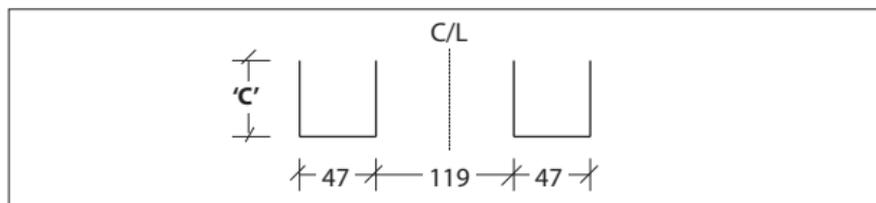
#### CONCEPT Din-T 250 A chassis 1P + N (DC)

##### Suits 2P Din-T DC MCBs (18 mm pitch)

Pole capacity	Cut-out 'C' length (mm)	Pan height (mm)	Cat. No.	Price \$
24	219	242	NC224182U	280.00
36	327	350	NC236182U	350.00
48	435	458	NC248182U	425.00
60	543	566	NC260182U	495.00

Chassis colours - Red and black.

#### Escutcheon critical cut-out dimensions



**Notes:** <sup>1)</sup> For top fed chassis delete "U" and replace with "TF" e.g. NC224184TF.

<sup>2)</sup> Add 55 mm for flared busbar at top and bottom of chassis.

4 pole and other special configurations available to special order refer NHP.

OFF (line) side of MCB connects to chassis tee-off.

Combinations other than those listed above can be special ordered refer to NHP.

## NC Chassis

### Concept Panelboard busbar chassis assemblies for Din-T MCBs

#### Accessories for NC chassis

Description	Cat. No.	250 A Price \$
Tee-off cap (18 mm tee-off)	NC250TOPC	0.80
Tee-off cap (27 mm tee-off)	NC250HTOPC	0.75
Busbar cap (each)	NCBBC	5.70
3P back cover	NCBC	10.80
4P back cover	NCBC4	16.00
Label 24 pole (Red, White, Blue)	NCL243	16.60
Label 24 pole (Custom-field modifiable)	NCL24C	16.60
Label 18 pole (Red, White, Blue) 27 mm pitch	NCH123	15.00
<b>Connection kits</b>		
S160, E/S 250 MCCB direct connect to NC Chassis	NCCK200	135.00
S160, E/S 250 MCCB TAG connect to NC chassis	NCCK250	355.00
E/S 400 MCCB TAG connect to NC chassis	NCCK400	510.00
SLB 400 TAG connect to NC chassis	NCCK4002	720.00
Support bracket to mount S250	NCS250GT	78.00
Support bracket 400 A chassis NCCK400	CPPBNC400GT	41.50

2

## GB Isolation Chassis

### Concept Panelboard busbar chassis assemblies for Din-T MCBs

2

- Standard AS/NZS 3439.1
- Current rating 250 A 3P & 4P
- Tee-Off isolator (AC20)
- Integrated and switchable 4<sup>th</sup> pole
- Padlocking option
- Enclosed busbar
- 1, 2, 3 & 4 pole toggle conversion kit
- Withstand rating 250 A l<sub>cw</sub> 25 kA 0.1S and 10 kA 1.0S
- Withstand rating 250 A l<sub>cc</sub> 63 kA- S250PE
- Busbar direct connect 160 A & 250 A switch
- IP 20 direct connect switch and MCCB connection kits
- Interchangeable with NC or CD chassis

**NEW**  
Isolation  
chassis



The Concept range of busbar chassis assemblies have been specifically designed for incorporation into the Concept family of panelboards, providing a secure mounting platform and connection system for the NHP Din-T range of MCBs. The busbars are fully enclosed therefore not requiring an insulated coating for electrical isolation. The new GB chassis has an isolation switch for each individual TEE-OFF, are type tested and are mounted on a box section steel pan, powdercoated white.

#### CONCEPT Din-T - 250 A chassis

#### Suits Din-T MCBs (18 mm pole pitch)

Connection	Pole capacity	Cut-out length (mm)	Bar Height (mm) <sup>2)</sup>	Cat. No.	Price \$
Top Feed <sup>1)</sup>	12	110	140	GB212183TF	450.00
	24	218	248	GB224183TF	610.00
	36	326	356	GB236183TF	790.00
	48	434	464	GB248183TF	960.00
	60	542	572	GB260183TF	1150.00
	72	650	680	GB272183TF	1350.00
	84	758	788	GB284183TF	1610.00
	96	866	896	GB296183TF	1810.00
Universal Feed	18	110	140	GB212183U	560.00
	24	218	248	GB224183U	720.00
	36	326	356	GB236183U	910.00
	48	434	464	GB248183U	1080.00
	60	542	572	GB260183U	1270.00
	72	650	680	GB272183U	1470.00
	84	758	788	GB284183U	1730.00
	96	866	896	GB296183U	1930.00

**Notes:** <sup>1)</sup> For bottom feed replace TF with BF.  
<sup>2)</sup> Add 41 mm for busbar tags at top or bottom as applicable.  
 Chassis cannot be split, use a top feed and bottom feed in lieu.

## GB Isolation Chassis

### Concept Panelboard busbar chassis assemblies for Din-T MCBs

#### CONCEPT Din-T - 250 A chassis 4 pole Suits Din-T 2P RCBOs (18 mm pole pitch)

Connection	Pole capacity	Cut-out 'C' length (mm)	Pan Height (mm) <sup>2)</sup>	Cat. No. <sup>1)</sup>	Price \$
Top Feed <sup>1)</sup>	24	218	248	GB224184TF	610.00
	48	434	464	GB248184TF	960.00
	72	650	680	GB272184TF	1350.00
	96	866	896	GB296184TF	1810.00
Universal Feed	24	218	248	GB224184U	980.00
	48	434	464	GB248184U	1440.00
	72	650	680	GB272184U	1900.00
	96	866	896	GB296184U	2450.00

Chassis colours - Red, Black, White, Black, Blue, Black

#### CONCEPT Din-T - 250 A chassis 3PN Suits Din-T 4P MCBs (18 mm pole pitch)

Connection	Pole capacity	Cut-out 'C' length (mm)	Pan Height (mm) <sup>2)</sup>	Cat. No. <sup>1)</sup>	Price \$
Top Feed <sup>1)</sup>	24	218	248	GB224183PNTF	790.00
	48	434	464	GB248183PNTF	1220.00
	72	650	680	GB272183PNTF	1700.00
	96	866	896	GB296183PNTF	2250.00
Universal Feed	24	218	248	GB224183PNU	980.00
	48	434	464	GB248183PNU	1440.00
	72	650	680	GB272183PNU	1900.00
	96	866	896	GB296183PNU	2450.00

Chassis colours - Red, White, Blue, Black

#### CONCEPT Din-T - 250 A chassis 1P + N (DC) Suits 2P Din-T DC MCBs (18 mm pole pitch)

Connection	Pole capacity	Cut-out 'C' length (mm)	Pan Height (mm) <sup>2)</sup>	Cat. No.	Price \$
Top Feed <sup>1)</sup>	24	218	248	GB224182TF	610.00
	48	434	464	GB248182TF	960.00
	72	650	680	GB272182TF	1350.00
	96	866	896	GB296182TF	1810.00

Chassis colours - Red and Black

**Notes:** <sup>1)</sup> For bottom feed replace TF with BF.

<sup>2)</sup> Add 41 mm for busbar tags at top or bottom as applicable.

Chassis cannot be split, use a top feed and bottom feed in lieu.

## GB Isolation Chassis

### Concept Panelboard busbar chassis assemblies for Din-T MCBs

#### CONCEPT Din-T - 250 A chassis

#### Suits 1P Din-T MCBs (18 mm pole pitch)

Connection	Pole capacity	Cut-out 'C' length mm	Pan Height (mm) <sup>2)</sup>	Cat. No.	Price \$
	24	218	248	GB224181TF	610.00
Top	48	434	464	GB248181TF	960.00
Feed <sup>1)</sup>	72	650	680	GB272181TF	1350.00
	96	866	896	GB296181TF	1810.00

Chassis colours - Red

#### Accessories for GB chassis

Description	Cat. No.	Price \$
Tee-off cap	GBTOC	1.50
Busbar cap	GBBBC	4.00
Padlock mechanism (factory fit)	GBLM	50.00
Togglebar 1P	GBTB1	2.00
Togglebar 2P	GBTB2	2.00
Togglebar 3P	GBTB3	2.00
Togglebar 4P	GBTB4	2.00
Back cover 3P - Katko switch	GBSPP3P	5.00
Back cover 4P - Katko switch	GBSPP4P	6.00
Interpole barrier	GBIB	5.00
Through terminal 100 A	DINTT100	10.00
Label escutcheon 1-47 LH	GBL148L	10.00
Label escutcheon 2-48 RH	GBL148R	10.00
Label escutcheon 49-95 LH	GBL4996L	10.00
Label escutcheon 50-96 RH	GBL4996R	10.00
Label - R,W,B main bars 3P	GBPL3P	2.00
Label - R, W, B, N main bar 4P	GBPL4P	2.00
Label - blank pole label	GBUSL	2.00

**Notes:** <sup>1)</sup> For bottom feed replace TF with BF.

<sup>2)</sup> Add 41 mm for busbar tags at top or bottom as applicable.

Chassis cannot be split, use a top feed and bottom feed in lieu.

## CD Chassis

### Concept-Plus and Concept-Premier busbar chassis assemblies for Din-T MCBs

- Standard AS/NZS 3439.1
- Current rating 250 A and 355 A
- Withstand rating 250 A / 20 kA for 0.2 sec (9 kA for 1 sec)
- Withstand rating 355 A / 25 kA for 0.3 sec (20 kA for 1 sec)
- Splayed busbar to suit 160 A & 250 A switch
- Top and bottom feed
- Tee-offs stripped and 50 % capped
- Top power feed stripped and capped
- Full 35 mm DIN rail, improved MCB mounting security
- Improved insulation coating



#### Application

The Concept range of busbar chassis assemblies have been specifically designed for incorporation into the Concept-Plus and Concept-Premier range of multipurpose panelboards, providing a secure mounting platform and connection system for the NHP Din-T range of MCBs. The busbars are fully dipped and type tested and are mounted on a box section steel pan, powder coated white.

#### CONCEPT Din-T - 250 A chassis

##### Suits Din-T MCBs (18 mm pole pitch)

Pole capacity	Cut-out 'C' length (mm)	Pan height (mm) <sup>1)</sup>	Cat. No.	250 A Price \$
12	110	152	CD212/183U	200.00
18	164	206	CD218/183U	225.00
24	218	260	CD224/183U	265.00
30	272	314	CD230/183U	310.00
36	326	368	CD236/183U	350.00
42	380	422	CD242/183U	380.00
48	434	476	CD248/183U	425.00
54	488	530	CD254/183U	475.00
60	542	584	CD260/183U	495.00
72	650	692	CD272/183U	660.00
78	704	746	CD278/183U	780.00
84	758	800	CD284/183U	850.00
96	866	908	CD296/183U	990.00

**Notes:** <sup>1)</sup> Add 32.5 mm for flared busbar at top and bottom of chassis.  
 4 pole and other special configurations available to special order refer NHP.  
 'OFF' (line) side of MCB connects to chassis tee-off.  
 Use insulated tool provided to disengage DIN clip when removing MCB from chassis. DIN clip can be removed and discarded when mounting MCB on CD chassis.

## CD Chassis

### Concept-Plus and Concept-Premier busbar chassis assemblies for Din-T MCBs

#### CONCEPT Din-T - 400 A chassis

##### Suits Din-T MCBs (18 mm pole pitch)

Pole capacity	Cut-out 'C' length (mm)	Pan height (mm) <sup>1)</sup>	Cat. No.	355 A Price \$
12	110	152	CD312/183U	340.00
18	164	206	CD318/183U	385.00
24	218	260	CD324/183U	440.00
30	272	314	CD330/183U	495.00
36	326	368	CD336/183U	530.00
42	380	422	CD342/183U	570.00
48	434	476	CD348/183U	650.00
54	488	530	CD354/183U	680.00
60	542	584	CD360/183U	720.00
72	650	692	CD372/183U	850.00
78	704	746	CD378/183U	910.00
84	758	800	CD384/183U	1000.00
96	866	908	CD396/183U	1130.00

#### CONCEPT Din-T 355 A chassis

##### Suits Din-T and Din-T10H MCBs (27/18 mm pole pitch)

Pole cap. 27 mm	Pole cap. 18 mm	Cut-out length 'C' (mm)	Pan Height (mm)	Cat. No. <sup>1)</sup>	Price \$
6	12	191	228	CDH36/1227/183U	490.00
6	24	299	380	CDH36/2427/183U	550.00
6	36	407	488	CDH36/3627/183U	580.00
12	30	434	471	CDH312/3027/183U	640.00
12	42	542	579	CDH312/4227/183U	770.00
12	60	704	741	CDH312/6027/183U	950.00

#### Accessories CD chassis

Description	Cat. No.	Price \$
Split tariff kit 250/355 A (supplied loose)	STKCD	119.00
Split tariff kit (supplied & fitted)	REFER NHP	-
Plastic tee-off cap 250/355 A	CD250TOPC	0.60

**Notes:** <sup>1)</sup> Add 32.5 mm for flared busbar at top and bottom of chassis.  
 4 pole and other special configurations available to special order refer NHP.  
 'OFF' (line) side of MCB connects to chassis tee-off.  
 Use insulated tool provided to disengage DIN clip when removing MCB from chassis. DIN clip can be removed and discarded when mounting MCB on CD chassis.

## CT Chassis

### Concept-Plus and Concept-Premier busbar chassis assemblies for Safe-T MCBs

- Standard AS/NZS 3439.1
- Current rating 250 A and 355 A
- Withstand rating 250 A / 20 kA for 0.2 sec
- Withstand rating 355 A / 20 kA for 1 sec
- Splayed busbar to suit 160 A & 250 A switch
- Top and bottom feed
- Tee-offs stripped and 50 % capped
- Top power feed stripped and capped
- 25 mm pole pitch, Safe-T MCBs
- Improved insulation coating



#### CONCEPT Safe-T - 250 & 355 A chassis

##### Suits Safe-T MCBs

Pole capacity	Cut-out 'C' length (mm)	Pan height (mm) <sup>1)</sup> <sup>2)</sup>	Cat. No.	250 A Price \$
12	147	221	CT 212/253	225.00
18	222	296	CT 218/253	255.00
24	297	371	CT 224/253	280.00
30	372	446	CT 230/253	295.00
36	447	521	CT 236/253	370.00
42	522	596	CT 242/253	395.00
48	597	671	CT 248/253	440.00
60	747	821	CT 260/253	540.00
72	897	971	CT 272/253	740.00
84	1047	1121	CT 284/253	830.00
96	1197	1271	CT 296/253	1020.00

**Notes:** <sup>1)</sup> Add 25 mm for flared busbar at top of chassis.

<sup>2)</sup> Add 22 mm for straight busbar at bottom of chassis.

4 pole and other special configurations available to special order refer NHP.

## CT Chassis

### Concept-Plus and Concept-Premier busbar chassis assemblies for Safe-T MCBs

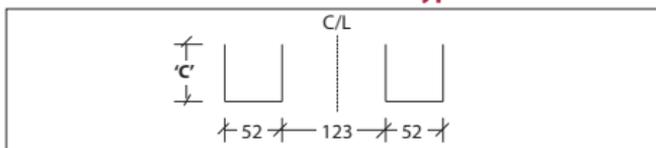
2

Pole capacity	Cut-out 'C' length (mm)	Pan height (mm) <sup>1)</sup> <sup>2)</sup>	Cat. No.	355 A Price \$
12	147	221	CT 312/253	370.00
18	222	296	CT 318/253	425.00
24	297	371	CT 324/253	495.00
30	372	446	CT 330/253	540.00
36	447	521	CT 336/253	590.00
42	522	596	CT 342/253	680.00
48	597	671	CT 348/253	750.00
60	747	821	CT 360/253	860.00
72	897	971	CT 372/253	1030.00
84	1047	1121	CT 384/253	1120.00
96	1197	1271	CT 396/253	1220.00

#### Accessories CT chassis

Description	Cat. No.	Price \$
Split tariff kit 250 A (supplied loose)	STK250ND/TH	119.00
Split tariff kit (supplied and fitted)	REFER NHP	-
Plastic tee-off cap 250/355 A	TH250TOPC	0.60

#### Escutcheon critical cut-out dimensions - CT type



- Notes:** <sup>1)</sup> Add 25 mm for flared busbar at top of chassis.  
<sup>2)</sup> Add 22 mm for straight busbar at bottom of chassis.  
 4 pole and other special configurations available to special order refer NHP.

## Panelboard DIN switch-fuse

### Features

- Compact size suited for panelboard use
- Fuse covers are supplied standard
- Non-captive escutcheon mounting handle supplied standard



2

### Ordering details

Description	Cat. No.	Price \$
160 A fuse switch 3 P	ISO 3160SFH	500.00
200 mm extension shaft <sup>1)</sup>	L2000KT	29.60

### Technical data

Fuse switch ratings	ISO 3160 SFH
Rated insulation voltage, $U_i$ (V)	1000
Rated impulse withstand voltage, $U_{imp}$ (kV)	12
Rated thermal current, $I_{th}$ (A)	160
Rated operational voltage, $U_e$ (V)	690
Rated operational current, $I_e$ (A)	
AC 21/22 415 V	160
AC 23 415 V	125
Rated fused short circuit current	
Back-up fuse (A)	160
RMS value (kA)	50
Peak value (kA)	11
Rated short circuit making capacity (kA)	11
Rated breaking capacity (A)	1000
Mechanical data	
Electrical endurance (no. of ops)	2000
Mechanical endurance (no. of ops)	20000
Terminals/bolt size Cu (mm <sup>2</sup> )	6-70
Maximum terminal torque (Nm)	4.5
Fuse type	DIN size 00
Weight, less fuses (kg)	1.5

**Notes:** <sup>1)</sup> Extension shaft required for CONCEPT•PREMIER panelboards.

## Modular panelboards

2

Concept-Plus and Concept-Premier form a highly featured innovative range of panelboards for commercial and industrial applications. The widely accepted Concept-Plus can be used for a variety of indoor applications, while the Concept-Premier is suited to indoor or outdoor use. Application versatility is also increased because panelboards can be combined with accessory modules or simply bolted together to form custom modular constructions combining power distribution and control equipment.

**PLUS**  
Flexibility  
**PLUS**  
Modularity

**Maximum contactor size in accessory box**  
 CONCEPT-PLUS: CA 6-180 (170 A AC 3)  
 CONCEPT-PREMIER: CA 6-420 (425 A AC 3)

**Unique gutter and seal to obtain IP 42 rating**

**Large range of isolator ratings**

**Emergency lighting kit option**

**Bolt-on accessory boxes-**  
 CONCEPT-PLUS: 400 & 600 mm  
 CONCEPT-PREMIER: 600 mm

**Surge suppressor option**

**Incoming supply terminations**

**Maximum IP Rating**  
 CONCEPT-PLUS: IP 52 (option)  
 CONCEPT-PREMIER: IP 66

**Double screw earth and neutral bars**

**Hinged escutcheon**  
 CONCEPT-PLUS: Option  
 CONCEPT-PREMIER: Standard

**Chassis rated to 250 A, 400 A (355 A option)**

**Stainless Steel Option**  
 CONCEPT-PREMIER

**Chassis can be split in the field**

**Generous space allowance for cable duct.**

**Removable tee-off end caps**

**Dished escutcheon with knock-outs for MCB and accessories**

**Aluminium or brass gland plate option**

**Splayed busbars top & bottom (Din-T) Top (Safe-T)**

**Relay or timer option**

**Choice of door colours. Grey or orange doors standard.**

**Maximum contactor size in panelboard**  
 CONCEPT-PLUS: CA 7-85 (85 A AC 3)  
 CONCEPT-PREMIER: CA 6-180 (170 A AC 3)

**CONCEPT-PLUS: Din-T or Safe-T**  
**CONCEPT-PREMIER: Din-T, Safe-T**  
 125 A or 250 A MCCBs

\*The above modular panelboard represents one possible combination of enclosures and equipment.

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## The TemBreak 1 & 2 product lines

### TemBreak 2

#### Moulded Case Circuit Breakers

Rated current ( $I_n$ ) from 12 A to 1600 A.

Breaking Capacity ( $I_{cu}$ ) from 25 kA to 200 kA at 400/415 V AC.

3



Earth Leakage MCCB



250 A



1600 A

### TemBreak 1

#### Moulded Case Circuit Breakers

Rated current ( $I_n$ ) from 630 A to 3200 A.

Breaking Capacity ( $I_{cu}$ ) from 50 kA to 125 kA at 400/415 V AC.



800 A



3200 A

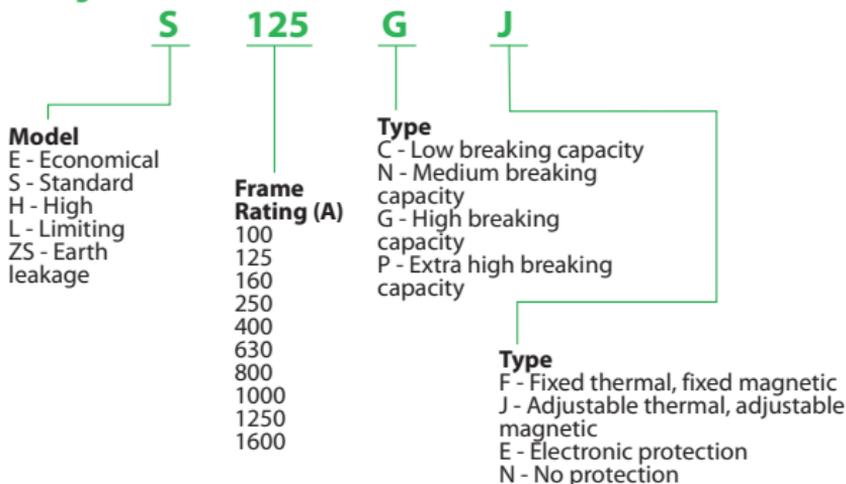
## TemBreak 2

### Easy selection guide – TemBreak 2 MCCBs

The TemBreak 2 range of products includes:

- Moulded Case Circuit Breakers (MCCBs)
- Earth Leakage MCCBs
- Switch-Disconnectors in the same compact moulded case frame sizes as MCCBs
- A comprehensive range of accessories which are common to MCCBs and Switch-Disconnectors. All internal accessories are common to all frame sizes.

### Catalogue Number construction



## About TemBreak 2

### 1. Field installable accessories



- Accessories can be fitted by the switchboard builder or added by the end-user. All internal accessories are common for TemBreak 2 MCCBs.
- Handles and motor operators can be rapidly fitted using the locking pegs. It takes less than 10 seconds to secure a handle or motor to the MCCB.
- All accessories are endurance tested to the same level as the host MCCB.

### 2. Higher kA ratings in Small Frame sizes

125 A Frame models now feature versions to 65 kA, while 250 A Frame models go to 200 kA.



### 3. Modular and Common sizes



- All current ratings up to 1600 A can be supplied in 9 frame sizes.
- 400 A and 630 A MCCB are a common size. (400 AF)
- The compact 125 A size offers the same features and performance but with reduced dimensions.
- 800/ 1000 are a common size
- 1250/ 1600 A common height and width
- 160/ 250 A common size

## About TemBreak 2

### 4. IP 65 or IP 55 variable depth handles

IP 55 or IP 65 on MCCBs  
125 A to 1600 A.



### 5. Increased Thermal-Magnetic flexibility



Overload protection is adjustable between 63 % and 100 % of the rating.

Short-circuit protection is adjustable on all thermal magnetic models.

Short-circuit protection settings are suitable for motor starting on all models, including the compact 125 A and 250 A frames.

### 6. Electronic protection in a 250 A Frame

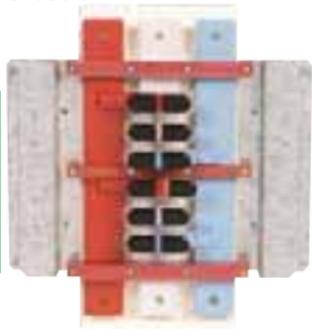


The adjustability of an electronic MCCB in a 250 A Frame MCCB. OCR Ratings range from 16 A to 250 A.

## About TemBreak 2

### 7. 250 A Frame MCCBs:

#### 12 A - 250 A on a common chassis



250 AF MCCBs are available ranging from:

- 12 A – 250 A @ 25, 30 kA (E/S 160-250)
- 32 A – 250 A @ 36, 65 kA (S160-250)
- 16 A – 250 A @ 70 kA (S250PE)

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### 8. Compact Transfer Switches



A mechanical interlock is used with two MCCBs, and is compatible with motor operators and handles. An automatic changeover system can be assembled by a switchboard builder or end-user, from components. Alternatively, pre-assembled transfer switches are available.

Changeover pair with link interlock and motor operators



Viewed from side (250 A frame)

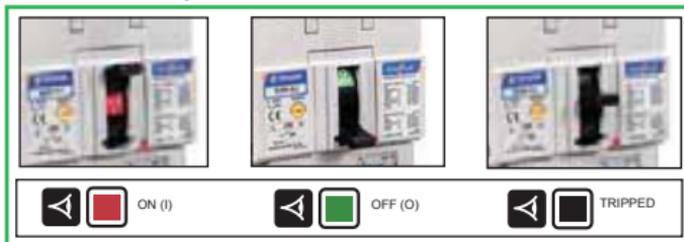
### 9. Transfer Switch Controller options



- Timer / Relay controller TLP2 – offers a simple system of logic control from easy to obtain NHP components
- Temlogic 2 electronic controller for transfer switches. (TL101)
- Suitable for Tembreak 1 and 2 MCCBs.

## About TemBreak 2

### 10. Visual safety



Coloured indicators display the ON or OFF status. The indicators are fully covered if the breaker trips, so that black is the only visible colour.

### 11. Direct opening



Under the heading "Measures to minimise the risk in the event of failure", IEC 60204-1 Safety of Machinery-Electrical Equipment of Machinery includes the following recommendation:

- "-the use of switching devices having positive (or direct) opening operation."
- MCCBs, motors, auxiliaries, alarms (heavy duty) are all direct opening

### 12. ZS Integral Earth Leakage MCCB



The Terasaki earth leakage MCCB is contained within a standard 125/160/250/ 400/ 630/ 800 A frame size.

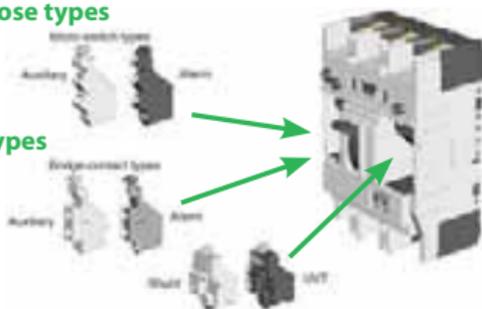
### 13. Metering MCCBs



- TemBreak 2 metering & Modbus comms MCCBs 100 A to 1000 A
- 250 AF (16 A to 250 A) MCCB with Modbus energy metering output
- External meter display option for all metering MCCBs
- Choice of Ammeter only or multifunction energy metering display
- All new TemBreak 2 MCCB range extension to 800 A to 1600 A

## Accessories to suit TemBreak 2, 125 - 1600 AF Accessory fitting combinations

### General purpose types



### Heavy duty types

3

Standard TemBreak 2 MCCBs 125 A - 1600 A  
Permissible combinations and locations

## Accessories to suit TemBreak 2, 125 - 1600 AF

### Accessory fitting combinations

Frame size (A)	125	160 and 250	400 and 630	800 and 1000	1250 and 1600
<b>E</b>	E125	E250	E400 E630		
<b>S</b>	S125 ZS125 <sup>1)</sup>	S160 S250 ZS250 <sup>1)</sup>	S400 S630 ZS630 <sup>1)</sup>	S800 S1000 ZS800 <sup>1)</sup>	S1250 S1600
<b>H</b>		H125 H160 H250	H400	H800	
<b>L</b>		L125 L160 L250	L400	L800	
<b>AUX ALA SHT</b>					
<b>AUX ALA UVT</b>					
<b>AUX ALA SHT</b>					
<b>AUX ALA UVT</b>					

- Auxilliary Switch = ALA
- Alarm Switch = ALA
- Shunt Trip = SHT
- Undervoltage Trip = UVT

**Notes:** <sup>1)</sup> Shunts and UVTs cannot be installed in ZS ELCBs.

General purpose and heavy duty status indication switches cannot be mixed in the same MCCB.

It is not possible to install a shunt trip and an undervoltage trip in an MCCB as they occupy the same location. Undervoltage trips can provide remote tripping if necessary by wiring a normally closed contact or pushbutton in series with the protected supply.

Undervoltage trips with time delays require an external time delay controller which clips to the side of the MCCB.

## Special 'EA' TemBreak 2 MCCBs 125 A - 250 A

### Permissible combinations EA (extra auxiliary) version and locations

- Auxiliary contact blocks: Depending on the auxiliary type and MCCB size, up to 4 auxiliary switches can be fitted in the LEFT and RIGHT pockets.
- Alarm contact blocks: a maximum of 2 can be installed in an MCCB. One LEFT, one RIGHT.
- One Shunt Trip or one Under-Voltage Trip can be installed in the RIGHT side. Both cannot be mounted in an MCCB together as they occupy the same position. When auxiliaries or alarms are fitted in the RIGHT side, shunts and UVT's cannot be fitted.



For more specific information on internal accessory combinations and maximum allowable, refer to the table below.

### Permissible combinations of EA MCCBs <sup>1)</sup>

MCCB type 3 - 4 pole	MCCB left side				MCCB right side					
	General purpose type		or	Heavy duty type		General purpose type		or	Heavy duty type	
	Auxiliary	Alarm		Auxiliary	Alarm	Auxiliary	Alarm		Auxiliary	Alarm
125 A	2	1	1	1	2	1	1	1		
160 / 250 A	2		2		2		2			
125 / 250 A					1 Shunt or 1 Under Voltage Trip					

### ZS Intergral Earth leakage MCCB - internal accessory fitting.

MCCB type 3 - 4 pole	MCCB left side				MCCB right side	
	General purpose type		or	Heavy duty type		Right side pocket area occupied by earth leakage circuitry. Shunts and UVT's cannot be installed.
	Auxiliary	Alarm		Auxiliary	Alarm	
125 A	2	1	1	1		
160 / 250 A	2		2			

**Notes:** <sup>1)</sup> Certain MCCB models will be stocked with the extra auxiliary option. They are S125GJ, S160NJ (20 / 32 A) S160GJ, S250GJ. Other MCCB "EA" types are available on indent.

ZS integral Earth leakage MCCBs only accept auxiliaries and alarms. See table above for auxiliary and alarm options.



## TemBreak 2 MCCB kA ratings 20 A - 630 A

Ampere Range	400/415 V Icu kA rating									
	25	30	36	50	65	70	85	125	200	
12.5 – 125	25									
16 – 125	25									
15 – 100	65				65					
12.5 – 125		36		1)						
12.5 – 125					65					
12.5 – 125								125		
12.5 – 125									200	
12.5 – 160	25									
12.5 – 160		36								
32 – 160					65					
100 – 160								125		
100 – 160									200	
12.5 – 250	25									
160 – 250		36								
160 – 250					65					
16 – 250						70				
160 – 250								125		
16 – 250								125		
160 – 250									200	
252 – 400	25									
160 – 400		36								
160 – 400				50						
100 – 400				50						
160 – 400					70					
100 – 400					70					
100 – 400						85				
100 – 400								125		
252 – 400									200	
252 – 630		36								
252 – 630				50						
252 – 630					70					
<b>Isolator switches</b>	<b>Short time rating for 0.3 seconds Icw (kA)</b>									
125	2									
160	3									
250	3									
400	5									
630	5									

### Colour Key

MCCB labels are similarly colour coded via a coloured rectangle around the catalogue number on the breaker.

- Motor Circuit Range - XM
- Economy Range - E
- Standard range - S
- High kA range - H
- Limitor Range - L
- Isolators/ Non-auto - N

Thermal Magnetic OCR	Electronic OCR	Catalogue Number
Yes	-	E125NJ
Yes	-	S125NF
Yes	-	S100GF
Yes	-	S125NJ
Yes	-	S125GJ/Z5125GJ
Yes	-	H125NJ
Yes	-	L125NJ
Yes	-	S160NF
Yes	-	S160NJ
Yes	-	S160GJ/ZS250GJ
Yes	-	H160NJ
Yes	-	L160NJ
Yes	-	E250NJ
Yes	-	S250NJ
Yes	-	S250GJ/Z5250GJ
-	Yes	S250PE
Yes	-	H250NJ
-	Yes	H250NE
Yes	-	L250NJ
Yes	-	E400NJ
Yes	-	S400CJ
Yes	-	S400NJ
-	Yes	S400NE
Yes	-	S400GJ/ ZS400GF
-	Yes	S400GE
-	Yes	S400PE
-	Yes	H400NE
-	Yes	L400NE
-	Yes	E630NE
-	Yes	S630CE
-	Yes	S630GE
		S125NN
		S160NN
		S250NN
		S400NN
		S630NN

**Notes:** <sup>1)</sup> 20-32 A trip unit versions rated 30 kA.  
 A TemBreak 1 to TemBreak 2 cross reference can be found at the rear of this section.  
 See page 3 - 12 for colour key.

## TemBreak 1 XM Motor Circuit MCCBs to 12 A, & 630 A – 3000 A MCCBs

### TemBreak 2 MCCB 400A to 1600A kA Ratings / XM30PB

Ampere Range	400/415 V I <sub>cu</sub> kA rating								
	25	30	36	50	65	70	85	125	200
0.7 - 12							85		
500 - 630				50					
396 - 800			36						
700 - 800				50					
396 - 800				50					
396 - 800	65					70			
252 - 800						70			
250 - 800								125	
250 - 800									200
400 - 1000						70			
500 - 1250							85		
640 - 1600							85		

Isolator switches	Short time rating for 0.3 seconds I <sub>cw</sub> (kA)
800	10
1000	10
1250	15
1600	20

### TemBreak 1 MCCBs 2000A to 3200A

Ampere Range	400/415 V I <sub>cu</sub> kA rating								
	25	30	36	50	65	70	85	125	200
1000-2000							85		
1250-2500							85		
1600-3200							85		

- Motor Circuit Range - XM
- High kA range - H
- Economy Range - E
- Limitor Range - L
- Standard range - S
- Isolators/ Non-auto - N

Thermal Magnetic	Electronic OCR	Catalogue Number
<b>Hydraulic - mag</b>	-	<b>XM30PB</b>
Yes	-	ZS630NF
Yes	-	S800CJ
Yes	-	ZS800NF
Yes	-	S800NJ
Yes	-	S800RJ
-	Yes	S800RE
-	Yes	H800NE
-	Yes	L800NE
-	Yes	S1000NE
-	Yes	S1250GE
-	Yes	S1600NE

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S800NN
S1000NN
S1250NN
S1600NN

Thermal Magnetic	Electronic OCR	Catalogue Number
-	Yes	XS2000NE
-	Yes	XS2500NE
-	Yes	XS3200NE



630/800 AF MCCB



1250/1600 AF MCCB

## MCCB types and setting ranges

MCCBs with a common colour have the same physical dimensions

Ampere Range	415 V kA		Thermal Magnetic Trip Unit Adjustment	
	$I_{CU}$	$I_{CS}$	Thermal $I_R$	Magnetic $I_M$
12.5 – 125	25	19	0.63 – 100%	6 – 10 or 12M
16 – 125	25	13	Fixed	Fixed
15 – 100	65	33	Fixed	Fixed
12.5 – 125	36	36	0.63 – 100%	6 – 10 or 12M
12.5 – 125	65	36	0.63 – 100%	6 – 10 or 12M
12.5 – 125	125	85	0.63 – 100%	6 – 10 or 12M
12.5 – 125	200	150	0.63 – 100%	6 – 10 or 12M
16 – 160	25	19	Fixed	Fixed
12.5 – 160 <sup>3)</sup>	36	36	0.63 – 100%	6 – 12M
32 – 160	65	36	0.63 – 100%	6 – 12M
100 – 160	125	85	0.63 – 100%	6 – 12M
100 – 160	200	150	0.63 – 100%	6 – 12M
12.5 – 250	25	19	0.63 – 100%	6 – 10 or 12M
160 – 250	36	36	0.63 – 100%	6 – 10M
160 – 250	65	36	0.63 – 100%	6 – 10M
16 – 250	70	70	–	–
160 – 250	125	85	0.63 – 100%	6 – 10M
16 – 250	125	85	–	–
160 – 250	200	150	0.63 – 100%	6 – 10M
252 – 400	25	25	0.63 – 100%	6 – 12M
160 – 400	36	36	0.63 – 100%	6 – 12M
160 – 400	50	50	0.63 – 100%	6 – 12M
100 – 400	50	50	–	6 – 12M
160 – 400	70	50	0.63 – 100%	6 – 12M
100 – 400	70	50	–	–
160 – 400	85	85	–	–
100 – 400	125	85	–	–
100 – 400	200	150	–	–
252 – 630	36	36	–	–
252 – 630	50	50	–	–
252 – 630	70	50	–	–

Isolator switches	Short time rating for 0.3 seconds $I_{cw}$ (kA)	Rated short-circuit making capacity $I_{cm}$ (kA)
125	2	3.6
160	3	6
250	3	6
400	5	9
630	5	9

**Notes:** 1) The STD settings are not adjustable, however by selecting different curve types, the STD setting will vary between  $2.5 - 10 \times I_R$  : for 250/400 A MCCBs and  $2.5 - 8 \times I_R$  : for 630 A MCCBs.

3) 20-32 A trip unit versions rated 30 kA.

Electronic OCR Adjustment Range $I_R$	STD x $I_R$ / INST x IR <sup>1)2)</sup>	Catalogue Number	Dimensions (mm)		
			H	W	D
-	-	E125NJ	155	90	68
-	-	S125NF	155	30	68
-	-	S100GF	155	60	68
-	-	S125NJ	155	90	68
-	-	S125GJ	155	90	68
-	-	H125NJ	165	105	103
-	-	L125NJ	165	105	103
-	-	S160NF	165	35	68
-	-	S160NJ	165	105	68
-	-	S160GJ	165	105	68
-	-	H160NJ	165	105	103
-	-	L160NJ	165	105	103
-	-	E250NJ	165	105	68
-	-	S250NJ	165	105	68
-	-	S250GJ	165	105	68
40 – 100%	2.5, 5, 10 / 13 or 14	S250PE	165	105	103
-	-	H250NJ	165	105	103
40 – 100%	2.5, 5, 10 / 13 or 14	H250NE	165	105	103
-	-	L250NJ	165	105	103
-	-	E400NJ	260	140	103
-	-	S400CJ	260	140	103
-	-	S400NJ	260	140	103
40 – 100%	2.5, 5, 10 / 13 or 14	S400NE	260	140	103
-	-	S400GJ	260	140	103
40 – 100%	2.5, 5, 10 / 13 or 14	S400GE	260	140	103
40 – 100%	2.5, 5, 10 / 13 or 14	S400PE	260	140	103
40 – 100%	2.5, 5, 10 / 13 or 14	H400NE	260	140	140
40 – 100%	2.5, 5, 10 / 13 or 14	L400NE	260	140	140
40 – 100%	2.5, 5, 8 / 10 or 14	E630NE	260	140	103
40 – 100%	2.5, 5, 8 / 10 or 14	S630CE	260	140	103
40 – 100%	2.5, 5, 8 / 10 or 14		260	140	103
		S125NN	155	90	68
		S160NN	165	105	68
		S250NN	165	105	68
		S400NN	260	140	103
		S630NN	260	140	103

**Notes:** <sup>2)</sup> The Instantaneous settings are not adjustable, however by selecting different curve types, the INST instantaneous setting will vary from 13 or 14 x  $I_R$ ; for 400 A MCCBs and 10 or 14 x  $I_R$  for 630 A MCCBs. Refer curve examples & setting data in Section 9.

## ZS ELCB / XM30PB / 800 A to 3200 A MCCB types and setting ranges

MCCBs with a common colour have the same physical dimensions

Ampere Range	415 V kA		Thermal Magnetic Trip Unit Adjustment		Electronic OCR Adjustment
	I <sub>CU</sub>	I <sub>CS</sub>	Thermal I <sub>R</sub>	Magnetic I <sub>M</sub>	Range I <sub>R</sub>
0.7 - 12	85	85	-	-	-
12.5 - 125	65	36	0.63 - 100%	-	-
100 - 250	65	36	0.63 - 100%	-	-
250 - 400	70	-	-	6 - 12M	-
500 - 630	50	-	-	6 - 10M	-
396 - 800	36	36	0.63 - 100%	5 - 10M	-
396 - 800	50	50	0.63 - 100%	5 - 10M	-
700 - 800	50	-	-	6 - 10M	-
396 - 800	70	50	0.63 - 100%	5 - 10M	-
252 - 800	70	50	-	-	40 - 100%
250 - 800	125	94	-	-	40 - 100%
250 - 800	200	150	-	-	40 - 100%
400 - 1000	70	50	-	-	40 - 100%
500 - 1250	85	65	-	-	40 - 100%
640 - 1600	85	65	-	-	40 - 100%
1000-2000	85	64	-	-	50 - 100%
1250-2500	85	64	-	-	50 - 100%
1600-3200	85	64	-	-	50 - 100%

### Isolator switches

	Short time rating for 0.3 seconds ICW (kA)	Rated short-circuit Making capacity ICM (kA)
800	10	17
1000	10	17
1250	15	32
1600	20	45

STD x I <sub>R</sub> / INST x I <sub>R</sub> (1)	Catalogue Number	Dimensions 3P (mm)		
		H	W	D
-	XM30PB	148	78	97
-	ZS125GJ	155	90	68
-	ZS250GJ	165	105	68
-	ZS400GF	260	140	103
-	ZS630NF	273	210	103
-	S800CJ	273	210	103
-	S800NJ	273	210	103
-	ZS800NF	273	210	103
-	S800RJ	273	210	103
2.5, 5, 10 / 12 or 14	S800RE	273	210	103
2.5, 5, 10 / 12 or 14	H800NE	273	210	140
2.5, 5, 10 / 12 or 14	L800NE	273	210	140
2.5, 5, 10 / 10 or 14	S1000NE	273	210	103
2.5, 5, 10 / 12 or 14	S1250GE	370	210	120
2.5, 5, 10 / 12 or 14	S1600NE	370	210	140
LSI Adjustable	XS2000NE	450	320	185
LSI Adjustable	XS2500NE	450	320	185
LSI Adjustable	XS3200NE	450	320	185



	S800NN	273	210	103
	S1000NN	273	210	103
	S1250NN	370	210	120
	S1600NN	370	210	140

## TemBreak T2SW Add-on current and voltage metering blocks

### Block dimensions (mm) excluding MCCB

	125 AF		250 AF		400/ 630 AF	
	3P	4P	3P	4P	3P	4P
Height <sup>2)</sup>	85	85	85	85	86	86
Width	90	120	105	140	140	185
Depth <sup>3)</sup>	66	66	66	66	88	88

3

### Ordering details

Suit MCCB type	Pri- Poles	mary	T2SW block Cat. No.	Price \$	Optional load side terminal cover Cat. No.	Price \$
E125, S125	3	125 A	T2SW3P1251255K	900.00	T2SW3P125TC	55.00
E125, S125	4	125 A	T2SW4P1251255K	1190.00	T2SW4P125TC	66.50
H125, E/S/ H16/25	3	150 A	T2SW3P2501505K	940.00	T2SW3P250TC	110.00
H125, E/S/ H16/25	3	250 A	T2SW3P2502505K	940.00	T2SW3P250TC	110.00
H125, E/S/ H16/25	4	150 A	T2SW4P2501505K	1230.00	T2SW4P250TC	148.00
H125, E/S/ H16/25	4	250 A	T2SW4P2502505K	1230.00	T2SW4P250TC	148.00
E/S/H400, E/S630	3	400 A	T2SW3P6304005K	1230.00	T2SW3P630TC	110.00
E/S/H400, E/S630	3	600 A	T2SW3P6306005K	1230.00	T2SW3P630TC	110.00
E/S/H400, E/S630	4	400 A	T2SW4P6304005K	1630.00	T2SW4P630TC	160.00
E/S/H400, E/S630	4	600 A	T2SW4P6306005K	1630.00	T2SW4P630TC	160.00

Suit MCCB type	Frame size	Voltage Poles	Total Amp & voltage terminals	quantity	T2SW block Cat. No.
E125, S125	125	3	0 <sup>1)</sup>	6	T2SW3P1251255K
E125, S125	125	4	4 (3+N)	10	T2SW4P1251255K
H125, E/S/H/L 16/25	160, 2503	3		9	T2SW3P2501505K
H125, E/S/H/L 16/25	160, 2503	3		9	T2SW3P2502505K
H125, E/S/H/L 16/25	160, 2504	4 (3+N)		10	T2SW4P2501505K
H125, E/S/H/L 16/25	160, 2504	4 (3+N)		10	T2SW4P2502505K
E/S/H400, E/S630	400, 6303	3		9	T2SW3P6304005K
E/S/H400, E/S630	400, 6303	3		9	T2SW3P6306005K
E/S/H400, E/S630	400, 6304	4 (3+N)		10	T2SW4P6304005K
E/S/H400, E/S630	400, 6304	4 (3+N)		10	T2SW4P6306005K

- Notes:** <sup>1)</sup> Voltage lugs supplied for mounting on external bars for 125 A 3 pole block.  
<sup>2)</sup> Height excludes connection bars  
<sup>3)</sup> Refer NHP for additional dimension data

## TemBreak co-ordination motor protection

### Circuit breakers - XM30PB

**85 kA****Current rating:** 0.7 – 12 A**Approvals and tests:** Standards: AS/NZS 3947-2 and IEC 60947-2**Interrupting capacity:** Symmetrical amps (kA RMS)**Trip unit:** Fixed hydraulic-magnetic

3

	Voltage	Icu kA	Ics kA
AC use	400/415	85	85

**Dimensions (mm)**

Poles	3
H	148
W	78
D (less toggle)	97
Weight (kg)	1.3

Amp rating NRC	Cat. No.	Price \$
0.7	<b>XM30PB0.7 3P</b>	<b>500.00</b>
1.4	<b>XM30PB1.4 3P</b>	<b>500.00</b>
2.0	<b>XM30PB2.0 3P</b>	<b>500.00</b>
2.6	<b>XM30PB2.6 3P</b>	<b>500.00</b>
4	<b>XM30PB4 3P</b>	<b>500.00</b>
5	<b>XM30PB5 3P</b>	<b>500.00</b>
8	<b>XM30PB8 3P</b>	<b>500.00</b>
10	<b>XM30PB10 3P</b>	<b>500.00</b>
12	<b>XM30PB12 3P</b>	<b>500.00</b>

**Notes:** NRC: Nominal rated current.
**Price schedule 'T2'**
**Q-Pulse Id**
GST not included
NHP Sales 1300 NHP NHP
[www.nhp.com.au](http://www.nhp.com.au)

## Accessories to suit XM30PB

### Internal accessories - factory fit

		Cat. No.	Price \$
Shunt trip	110 V AC SHT (100 – 115 V)	2H1931BAA	131.00
	240 V AC SHT (200 – 480 V)	2H1931BBA	131.00
	24 V DC SHT	2H1931BCA	131.00
	48 V DC SHT	2H1931BDA	131.00
	110 V DC SHT (100 – 115 V)	2H1931BEA	131.00
	24 V AC SHT	2H1932BAD	131.00
	48 V AC SHT	2H1932BBA	131.00
	12 V DC SHT	2H1932BDA	131.00
	125 V DC SHT	2H1932BGA	131.00
	200 V DC SHT (200 – 230 V)	2H1932BHA	131.00
Auxiliary switches	AUX SW right/left hand 1C	UXXB0001D	86.50
	AUX SW right/left hand 2C	UXXB0003C	127.00
Alarm switches	Alarm SW right/left hand	UXLB0006C	84.00
Alarm & auxiliary switches	Alarm/AUX SW right/left hand 1C	UXLB0008C	120.00

### External accessories - user fit

		Cat. No.	Price \$
Solderless terminals	3 P solderless terminals (6)	TXBD0009A	36.50
	IP55 Grey variable depth handle + 357 mm shaft	T1HS03R5GM	240.00
	T1HS escutcheon plate option: 100 mm <sup>2</sup>	T2HSESC100	18.20
Handle operators	90 mm T pin shaft for T2HS - no flexi coupling	T2HS250SHAFT	47.00
	IP65 Grey variable depth handle + 420 mm shaft	T1HP03R6BNA4	141.00
	Padlock attachment for T2HP/HS mechanism	T1HP30PALK	44.50
	IP55 direct mount fixed depth handle	TFJ21PB	235.00
Trapped Key interlock	Prosafe shot bolt lock HS handles xx code	TKNHPPXX	520.00
	Prosafe standard key xx code for above	TKNNHPKEYXX	130.00
	Cam for T2HS handle shafts Key codes A to Z are available. Specify by changing the key code above.	14997702	235.00
TemPlug	3 P Templug	UPX330PB <sup>1)</sup>	270.00
Terminal Cover	Line side terminal screw cover	XM30TSC	21.80

Notes: <sup>1)</sup> Price schedule 'T3' applies for this item.

## CAPTIVE LOCK ATTACHMENTS

Securely locks off Terasaki Tembreak2 circuit breakers.

POWER PROTECTION



PP-TERASAKI-CAP-LOCK-CPB

- Three types: T2HL12CAP, T2HL25CAP, T2HL40CAP
- Also available for 1 Pole MCCBs
- Consists of a fully moulded front cover with built-in padlockable flap
- Off position padlockable as standard
- Knockout provided for ON position padlocking
- Internal accessory fitting not affected
- Locking not padlock size dependant
- Suits one lock up to 8 mm
- Accepts multiple padlock hasps
- XKA captive locks for MCCBs to 800 A also available
- Can be field fitted
- Suits MCCBs up to 630 A
- Suits ZS earth leakage MCCBs
- Accepts a compression seal



## TemBreak 2 Thermal magnetic type E125NJ

**25 kA**

**Current rating:** 12.5 – 125 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**



3

	Voltage	Icu	Ics
AC use	380/415	25	19
DC use	250	25	19

**Trip unit:** Adjustable thermal (0.63 Ir to 100 % Ir) and adjustable magnetic

**Dimensions (mm)**

Poles	3
H	155
W	90
D (less toggle)	68
Toggle cut-out	104

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
20	12.5 – 20	120 – 240	E125 NJ 3 20	440.00
32	20 – 32	192 – 384	E125 NJ 3 32	440.00
50	32 – 50	300 – 600	E125 NJ 3 50	440.00
63	40 – 63	378 – 756	E125 NJ 3 63	440.00
100	63 – 100	600 – 1200	E125 NJ 3 100	630.00
125	80 – 125	750 – 1250	E125 NJ 3 125	780.00

**Notes:** <sup>1)</sup> Adj. Ir: Adjustable thermal setting  
 Adj. Im: Adjustable magnetic setting  
 NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.  
 For 4 pole MCCBs refer S125GJ type.

## TemBreak 2 Thermal magnetic type S125NF

**25 kA**

**Current rating:** 16 – 125 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	230	25	13



**Trip unit:** Fixed thermal magnetic

**Dimensions (mm)**

Poles	1
H	155
W	30
D (less toggle)	68
Toggle cut-out	104

Ampere Rating	NRC	Ir	Im	Cat. No.	1 pole Price \$
16	16	16	208	S125 NF 1 16	165.00
20	20	20	260	S125 NF 1 20	165.00
25	25	25	325	S125 NF 1 25	165.00
32	32	32	420	S125 NF 1 32	165.00
40	40	40	520	S125 NF 1 40	165.00
50	50	50	650	S125 NF 1 50	165.00
63	63	63	820	S125 NF 1 63	165.00
80	80	80	1040	S125 NF 1 80	235.00
100	100	100	1300	S125 NF 1 100	310.00
125	125	125	1550	S125 NF 1 125	310.00



Optional terminal covers



Optional captive lock attachment

**Notes:** For Interpole Barriers, Terminal Covers and Padlock attachments refer to accessories pages.

Ir: thermal rating

Im: magnetic rating

NRC: Nominal rated current

S125NF will not accept rear connection studs. (S160NF types do)

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## TemBreak 2 Thermal magnetic type S100GF

**65 kA**

**Current rating:** 15 – 100 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	230	85	85
	380/415	65	33
DC use		40	40



Black TemBreak 2 MCCB

**Trip unit:** Fixed thermal magnetic

**Dimensions (mm)**

Poles	2
H	155
W	60
D (less toggle)	68
Toggle cut-out required 52 <sup>1)</sup> or 104	

**Accessories**

Has mounting provision for any 1 (one) of the following: TemBreak 2 accessories UVT or Shunt or a combination of up to 2 Auxiliaries plus 1 Alarm.

Will accept standard TemBreak 2 external accessories such as: interpole barriers, terminal connection options, toggle locks, and 2 pole terminal covers.

Refer accessories pages. Will not accept motors or handles due to the 60 mm width of the MCCB.

Ampere Rating NRC	Ir	Im	Cat. No.	2 pole Price \$
15	15	180	S100 GF 2 15	315.00
20	20	240	S100 GF 2 20	315.00
30	30	360	S100 GF 2 30	315.00
40	40	480	S100 GF 2 40	315.00
50	50	600	S100 GF 2 50	315.00
60	60	720	S100 GF 2 60	315.00
75	75	900	S100 GF 2 75	355.00
100	100	1200	S100 GF 2 100	430.00

**Notes:** <sup>1)</sup> S100GF 2 Pole MCCBs require a 52 mm cut-out as the toggle area is 50 mm high.

Ir: thermal rating

Im: magnetic rating

NRC: Nominal rated current

Magnetic only MCCBs are available on request.

## TemBreak 2 Thermal magnetic type S125NJ

### 36 kA

**Current rating:** 12.5 – 125 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/400	36	36
DC use	250	25	19



3

**Trip unit:** Adjustable thermal (0.63 Ir to 100 % Ir) and adjustable magnetic

**Dimensions (mm)**

Poles	3
H	155
W	90
D (less toggle)	68
Toggle cut-out	104

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
20	12.5 – 20	120 – 240	S125 NJ 3 20	480.00
32	20 – 32	192 – 384	S125 NJ 3 32	480.00
50	32 – 50	300 – 600	S125 NJ 3 50	480.00
63	40 – 63	378 – 756	S125 NJ 3 63	480.00
100	63 – 100	600 – 1200	S125 NJ 3 100	680.00
125	80 – 125	750 – 1250	S125 NJ 3 125	810.00

**Notes:** <sup>1)</sup> Adj. Ir: Adjustable thermal setting  
 Adj. Im: Adjustable magnetic setting  
 NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.  
 For 4 pole MCCBs refer S125GT types.

## TemBreak 2 Thermal magnetic type S125GJ

**65 kA**

**Current rating:** 12.5 – 125 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/400	65	36
DC use	250	40	40



**Trip unit:** Adjustable thermal (0.63 Ir to 100 % Ir) and adjustable magnetic

Poles	3	4
H	155	155
W	90	120
D (less toggle)	68	68
Toggle cut-out	104	104

### 3 Pole

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
20	12.5 – 20	120 – 240	S125 GJ 3 20 <sup>2)</sup>	750.00
32	20 – 32	192 – 384	S125 GJ 3 32 <sup>2)</sup>	750.00
50	32 – 50	300 – 600	S125 GJ 3 50 <sup>2)</sup>	750.00
63	40 – 63	378 – 756	S125 GJ 3 63 <sup>2)</sup>	750.00
100	63 – 100	600 – 1200	S125 GJ 3 100 <sup>2)</sup>	900.00
125	80 – 125	750 – 1250	S125 GJ 3 125 <sup>2)</sup>	1000.00

### 4 Pole

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No.	4 pole Price \$
20	12.5 – 20	120 – 240	S125 GJ 4 20 <sup>2)</sup>	990.00
32	20 – 32	192 – 384	S125 GJ 4 32 <sup>2)</sup>	990.00
50	32 – 50	300 – 600	S125 GJ 4 50 <sup>2)</sup>	990.00
63	40 – 63	378 – 756	S125 GJ 4 63 <sup>2)</sup>	990.00
100	63 – 100	600 – 1200	S125 GJ 4 100 <sup>2)</sup>	1210.00
125	80 – 125	750 – 1250	S125 GJ 4 125 <sup>2)</sup>	1330.00

- Notes:** <sup>1)</sup> Adj. Ir: Adjustable thermal setting  
 Adj. Im: Adjustable magnetic setting  
<sup>2)</sup> To obtain MCCBs that accept additional internal auxiliary circuits add "EA" to the above Cat. No.'s. E.g.: S125GJ3125EA. Otherwise leave blank. Refer NHP for availability. Refer page 3 - 9 for details.  
 NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.

## TemBreak 2 690V AC High Fault Interruption MCCB L125PJ

### 70 kA

**Current rating:** 12.5 – 125 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	690 V	70	33



**Trip unit:** Adjustable thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and adjustable magnetic  
Adjustable magnetic 6 I<sub>m</sub> to 12 I<sub>m</sub>, trip unit: 20 A to 100 A  
6 I<sub>m</sub> to 10 I<sub>m</sub>, trip unit: 125 A

Poles	3
H	165
W	105
D (less toggle)	103
Toggle cut-out	48
	105 on chassis <sup>1)</sup>

Ampere Rating NRC	Adj. I <sub>r</sub> Min. – Max.	Adj. I <sub>m</sub> Min. – Max.	Cat. No.	Price \$
20	12.5 – 20	120 – 240	L125 PJ 3 20	730.00
32	20 – 32	192 – 384	L125 PJ 3 32	730.00
50	32 – 50	300 – 600	L125 PJ 3 50	730.00
63	40 – 63	378 – 756	L125 PJ 3 63	730.00
100	63 – 100	600 – 1200	L125 PJ 3 100	830.00
125	80 – 125	750 – 1250	L125 PJ 3 125	830.00

**Notes:** <sup>1)</sup> Not suitable for reverse connection either individually or on chassis.  
Suitable for general motor starting and power distribution applications.  
Refer to NHP for availability of 4 pole version.  
Adj. I<sub>r</sub>: Adjustable thermal setting  
Adj. I<sub>m</sub>: Adjustable magnetic setting  
NRC: Nominal rated current

## TemBreak 2 Thermal magnetic type H125NJ

### 125 kA

**Current rating:** 12.5 – 125 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	125	85
DC use	250	40	40



**Trip unit:** Adjustable thermal (0.63 Ir to 100 % Ir) and adjustable magnetic

### Dimensions (mm)

Poles	3	4
H	165	155
W	105	140
D (less toggle)	105	103
Toggle cut-out	104	104

\*H125NJ is a 250 AF MCCB

### 3 Pole

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
20	12.5 – 20	120 – 240	H125 NJ 3 20	960.00
32	20 – 32	192 – 384	H125 NJ 3 32	960.00
50	32 – 50	300 – 600	H125 NJ 3 50	960.00
63	40 – 63	378 – 756	H125 NJ 3 63	960.00
100	63 – 100	600 – 1200	H125 NJ 3 100	1110.00
125	80 – 125	750 – 1250	H125 NJ 3 125	1110.00

### 4 Pole

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No.	4 pole Price \$
20	12.5 – 20	120 – 240	H125 NJ 4 20	1290.00
32	20 – 32	192 – 384	H125 NJ 4 32	1290.00
50	32 – 50	300 – 600	H125 NJ 4 50	1290.00
63	40 – 63	378 – 756	H125 NJ 4 63	1290.00
100	63 – 100	600 – 1200	H125 NJ 4 100	1470.00
125	80 – 125	750 – 1250	H125 NJ 4 125	1470.00

**Notes:** <sup>1)</sup> Adj. Ir: Adjustable thermal setting  
 Adj. Im: Adjustable magnetic setting  
 NRC: Nominal rated current

## TemBreak 2 Thermal magnetic type L125NJ

### 200 kA

**Current rating:** 12.5 – 125 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	200	150
DC use	250	40	40



3

**Trip unit:** Adjustable thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and adjustable magnetic

### Dimensions (mm)

Poles	3	4
H	165	165
W	105	140
D (less toggle)	103	103
Toggle cut-out	104	104

\*L125NJ is a 250 AF MCCB

### 3 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
20	12.5 – 20	120 – 240	L125 NJ 3 20	1090.00
32	20 – 32	192 – 384	L125 NJ 3 32	1090.00
50	32 – 50	300 – 600	L125 NJ 3 50	1090.00
63	40 – 63	378 – 756	L125 NJ 3 63	1090.00
100	63 – 100	600 – 1200	L125 NJ 3 100	1170.00
125	80 – 125	750 – 1250	L125 NJ 3 125	1170.00

### 4 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	4 pole Price \$
20	12.5 – 20	120 – 240	L125 NJ 4 20	1440.00
32	20 – 32	192 – 384	L125 NJ 4 32	1440.00
50	32 – 50	300 – 600	L125 NJ 4 50	1440.00
63	40 – 63	378 – 756	L125 NJ 4 63	1440.00
100	63 – 100	600 – 1200	L125 NJ 4 100	1570.00
125	80 – 125	750 – 1250	L125 NJ 4 125	1570.00

**Notes:** <sup>1)</sup> Adj. I<sub>r</sub>: Adjustable thermal setting  
 Adj. I<sub>m</sub>: Adjustable magnetic setting  
 NRC: Nominal rated current

## Accessories to suit 125 A TemBreak 2



	<b>Internal accessories</b>	<b>Cat. No.</b>	<b>Price \$</b>	
<b>SH</b>	Shunt trips	Internal accessories are common for MCCBs 125 A to 630 A. All have screw terminals except those indicated below with wire leads.		
	<b>For 2, 3 and 4 pole MCCBs</b>			
		110 V AC	T2SH00A10TA <sup>1)</sup>	255.00
		230 – 240 V AC	T2SH00A20TA <sup>1)</sup>	255.00
		400 – 415 V AC	T2SH00A40TA <sup>1)</sup>	255.00
		24 V DC (Suits 24 V AC)	T2SH00D02TA <sup>1)</sup>	255.00
		48 V DC	T2SH00D04TA <sup>1)</sup>	255.00
		110 V DC	T2SH00D10TA <sup>1)</sup>	255.00
	230 V DC	T2SH00D20TA <sup>1)</sup>	255.00	
<b>UV</b>	Undervoltage trips	<b>Instantaneous operation</b>		
		110 V AC	T2UV00A10NTA	270.00
		200 – 240 V AC	T2UV00A20NTA	270.00
		380 – 450 V AC	T2UV00A40NTA	270.00
		24 V DC	T2UV00D02NTA	270.00
		110 V DC	T2UV00D10NTA	270.00
		230 V DC	T2UV00D20NTA	270.00
<b>AXAL</b>	Auxiliary & Alarm switches	<b>Time delayed operation (500 ms) – refer NHP</b>		
		<b>General type (2 A @ 240 V Inductive)</b>		
		1 C/O Auxiliary	T2AX00M3STA	134.00
		1 C/O Auxiliary – with 0.7 m wire leads	T2AX00M3SWA	146.00
		1 C/O Alarm	T2AL00M3STA	134.00
		1 C/O Alarm – with 0.7 m wire leads	T2AL00M3SWA	146.00
	<b>Heavy-duty type (4 A @ 240 V Inductive)</b>			
		1 N/O Auxiliary	T2AX00B1STA	146.00
		1 N/C Auxiliary	T2AX00B2STA	146.00
		1 N/O Alarm	T2AL00B1STA	146.00
		1 N/C Alarm	T2AL00B2STA	146.00
	<b>Micro switching type (very low voltages)</b>			
	1 C/O Auxiliary	T2AX00M3RTA	187.00	
	1 C/O Alarm	T2AL00M3RTA	187.00	

**Notes:** <sup>1)</sup> Wire lead types available.

## Accessories to suit 125 A TemBreak 2

External accessories		Cat. No.	Price \$	
Motor operators	<b>Suits MCCB types E125, S125</b>			
	110 V AC	T2MC12A10NB	1200.00	
	230 – 240 V AC	T2MC12A24NB	1200.00	
	24 V DC	T2MC12D02NB	1200.00	
	48 V DC	T2MC12D04NB	1190.00	
	110 V DC	T2MC12D10NB	1200.00	
	MC	<b>H125, L125</b>		
		110 V AC	T2MC25A10NB	1620.00
		230 – 240 V AC	T2MC25A24NB	1630.00
		24 V DC	T2MC25D02NB	1630.00
48 V DC		T2MC25D04NB	1620.00	
110 V DC		T2MC25D10NB	1620.00	
Motor Accessories	<b>Motor connection cable loom for electrical interlocking for transfer switches</b>			
	T2MC12 cable 500 mm 125/250AF	T2MM25L05A	60.50	
	T2MC12 cable 1500 mm 125/250AF	T2MM25L15A	73.00	
	Motor options: Contact NHP for key locking and auto-reset.			
	MCCB identification labels	T12CAPLAB	3.50	



T2 HB Direct mounted handle

Door mounted escutcheon plate



T2 MC Motor operator



Variable depth T2HP handle



T2HS Variable depth handle

## Accessories to suit 125 A TemBreak 2

External accessories		Cat. No.	Price \$	
Operating handles Direct mounting, fixed depth, IP 54	<b>Suits MCCB types</b> <b>E125, S125</b>			
	Grey/black	<b>T2HB12UR5BN</b>	<b>175.00</b>	
	Red/yellow	<b>T2HB12UR5RN</b>	<b>199.00</b>	
	<b>H125, L125</b>			
	Grey/black	<b>T2HB25UR5BN</b>	<b>189.00</b>	
	Red/yellow	<b>T2HB25UR5RN</b>	<b>210.00</b>	
	Optional MCCB identification labels	<b>T12CAPLAB</b>	<b>3.50</b>	
	<b>HB</b>			
	Door interlocking variable depth handle	<b>E125, S125</b>		
		Grey IP 55 handle + 357 mm shaft	<b>T2HS12R5GM</b>	<b>280.00</b>
Red/ yellow IP 55 handle 357 mm shaft		<b>T2HS12R5RM</b>	<b>290.00</b>	
Escutcheon plate option: 100 mm <sup>2</sup>		<b>T2HSESC100</b>	<b>18.20</b>	
90 mm T pin shaft for T2HS - no flexi coupling		<b>T2HS250SHAFT</b>	<b>47.00</b>	
<b>HS</b>				
Grey/ black IP65 handle + 420 mm shaft		<b>T2HP12R6BN</b>	<b>290.00</b>	
Red/ yellow IP65 handle + 420 mm shaft		<b>T2HP12R6RN</b>	<b>300.00</b>	
<b>HP</b>				
Padlock attachment for T2HP/HS mechanism		<b>T2HP25PALK</b>	<b>49.50</b>	
Optional MCCB identification labels	<b>T12CAPLAB</b>	<b>3.50</b>		
<b>H125, L125</b>				
IP 55 handle + 357 mm shaft	<b>T2HS25R5GM</b>	<b>280.00</b>		
Red/ yellow IP 55 handle + 357 mm shaft	<b>T2HS25R5RM</b>	<b>290.00</b>		
Large escutcheon plate option: 100 mm <sup>2</sup>	<b>T2HSESC100</b>	<b>18.20</b>		
90 mm T pin shaft for T2HS - no flexi coupling	<b>T2HS250SHAFT</b>	<b>47.00</b>		
Grey/ black IP 65 handle + 420 mm shaft	<b>T2HP25R6BN</b>	<b>290.00</b>		
Red/ yellow IP 65 handle + 420 mm shaft	<b>T2HP25R6RN</b>	<b>300.00</b>		
Padlock attachment for T2HP/ HS mechanism	<b>T2HP25PALK</b>	<b>49.50</b>		
Optional MCCB identification labels	<b>T12CAPLAB</b>	<b>3.50</b>		



T2HS handle mechanism with T2HP25PALK mechanism lock



T2HS handle with T2HSESC100 escutcheon plate

## Accessories to suit 125 A TemBreak 2

### External accessories

		Cat. No.	Price \$
Mechanical Interlocks	Link Interlock – suitable for manual or motorised operation. Will accept handles. Suitable for front or rear connect type MCCBs.		
Link type	<b>Suits MCCB types E125, S125</b>		
<b>ML</b>	Common 3 or 4 pole right side section	<b>T2ML12RA</b>	<b>113.00</b>
	3 pole left side section	<b>T2ML12L3A</b>	<b>127.00</b>
	4 pole left side section	<b>T2ML12L4A</b>	<b>127.00</b>
	MCCB identification labels	<b>T12CAPLAB</b>	<b>3.50</b>
		<b>H125, L125</b>	
	Common 3 or 4 pole right side section	<b>T2ML25RA</b>	<b>113.00</b>
	3 pole left side section	<b>T2ML25L3A</b>	<b>127.00</b>
	4 pole left side section	<b>T2ML25L4A</b>	<b>127.00</b>
	MCCB identification labels	<b>T12CAPLAB</b>	<b>3.50</b>



Left section 3 or 4 pole (T2ML12L4A shown)



Common right section (T2ML12RA shown)

Link interlock on MCCBs, T2ML



Link interlock on MCCBs with motors and electrical interlocking cable T2MM

**Notes:** Handles supplied with shaft  
Refer to Section 5 if MCCB labels are required or refer to NHP.

## Accessories to suit 125 A TemBreak 2

External accessories	Cat. No.	Price \$	
Slide type interlock	Manual operation, padlockable. Does not allow motors, handles or other front mounted accessories to be fitted.		
<b>MS</b>	<b>Suitable for front or rear connection</b>		
	<b>E125, S125 MCCB types</b>		
	3 pole	<b>T2MS123SFA</b>	<b>120.00</b>
	4 pole	<b>T2MS124SFA</b>	<b>134.00</b>
	<b>H125, L125</b>		
	3 pole	<b>T2MS253LFA</b>	<b>120.00</b>
4 pole	<b>T2MS254LFA</b>	<b>134.00</b>	
Cable interlock	Allows an MCCB to be mounted horizontally, vertically or diagonally. Accepts Motors and handles.		
<b>MW</b>	<b>Suitable for 3 or 4 pole MCCBs</b>		
	<b>E125, S125 MCCB types</b>		
	Interlock kit less wire	<b>T2MW12CA 1)</b>	<b>265.00</b>
	MCCB identification labels	<b>T12CAPLAB</b>	<b>3.50</b>
	<b>H125, L125</b>		
	Interlock kit less wire	<b>T2MW25CA</b>	<b>275.00</b>
	MCCB identification labels	<b>T12CAPLAB</b>	<b>3.50</b>
	Wire for above interlocks	<b>T2MW00SA 2)</b>	<b>63.00</b>
Wire 1.0 M			
Wire 1.5 M	<b>T2MW00LA 2)</b>	<b>73.00</b>	



Slide interlock on MCCBs, T2MS



Cable interlock on MCCBs, T2MW

**Notes:** 1) Order one interlock kit for each MCCB.  
2) One wire length will cover two MCCBs.

## Accessories to suit 125 A TemBreak 2

External accessories		Cat. No.	Price \$
Terminal	Front connected MCCBs		
Covers Flush IP 20	<b>Suits MCCB types E125, S125</b>		
<b>CS</b>	1 pole cover set of 2	<b>T2CS121SG</b>	<b>10.60</b>
	3 pole cover set of 2	<b>T2CS123SG</b>	<b>44.00</b>
	4 pole cover set of 2	<b>T2CS124SG</b>	<b>55.00</b>
	<b>H125, L125</b>		
	3 pole cover set of 2	<b>T2CS253SG</b>	<b>54.00</b>
	4 pole cover set of 2	<b>T2CS254SG</b>	<b>60.50</b>
Short terminal covers	<b>E125, S125</b>		
<b>CF</b>	3 pole cover set of 2, 22 mm long	<b>T2CF123SSNBA</b>	<b>60.50</b>
	4 pole cover set of 2, 22 mm long	<b>T2CF124SSNBA</b>	<b>71.00</b>
Standard terminal covers	<b>E125, S125</b>		
<b>CF</b>	1 pole cover set of 2, 40 mm long	<b>T2CF121SLNG</b>	<b>35.00</b>
	2 pole cover set of 2, 40 mm long	<b>T2CF122SLNG</b>	<b>49.50</b>
	3 pole cover set of 2, 40 mm long	<b>T2CF123SLNG</b>	<b>64.50</b>
	4 pole cover set of 2, 40 mm long	<b>T2CF124SLNG</b>	<b>73.00</b>
	<b>H125, L125</b>		
	3 pole cover set of 2, 40 mm long	<b>T2CF253LLNG</b>	<b>71.00</b>
	4 pole cover set of 2, 40 mm long	<b>T2CF254LLNG</b>	<b>77.50</b>



T2CS Flush IP20 Cover



T2CF Short terminal



Single pole terminal cover



T2CF Standard terminal covers



T2RC Rear connect terminal cover

## Accessories to suit 125 A TemBreak 2

External accessories		Cat. No.	Price \$
Terminal covers rear connect	<b>Suits MCCB types E125, S125</b>		
	3 pole cover set of 2	T2CR123SG	44.00
	4 pole cover set of 2	T2CR124SG	55.00
	<b>H125, L125</b>		
	3 pole cover set of 2	T2CR253SG	54.00
	4 pole cover set of 2	T2CR254SG	60.50
Terminal and cover locking clip	A clip that provides additional terminal cover position locking also allows a sealing device to be fitted.		
	All sizes 125, 250, 400, 630 AF	T2CF00L	9.10
Interpole Barriers <sup>1) 2)</sup>	<b>Suits MCCB types E125, S125</b>		
	Interpole barrier (Qty 2)	T2BA123SHA	17.40
	<b>H125, L125</b>		
	Interpole barrier (Qty 2)	T2BA253LHA	20.00
Toggle locks	Non Captive: Fits up to 3 padlocks or a multiple lock device		
	2, 3 and 4 pole E/S125 lock	T2HL25B	31.50
	1 pole S125NF lock	UXKB0013A	61.00
	Captive: Allows a single padlock or multiple padlock device		
	<b>E125, S125</b>		
HL	For 3/4 pole MCCBs 1 x 8 mm hole	T2HL12CAP	33.50
	For 1 pole MCCBs, 1 x 8 mm hole	T2HLS125NFCAP	92.00
	<b>H125, L125</b>		
	Lock with one 8 mm hole	T2HL25CAP	33.50



T2CF locking clip



Non captive lock attachment



Inter pole barriers



Captive lock attachment

- Notes:** 1) Line side interpole barriers or terminal covers must be installed with MCCBs.  
 2) Interpole Barriers are supplied with MCCBs as standard; 2 barriers with 3 pole MCCBs, and 3 barriers with 4 pole MCCBs.

## Accessories to suit 125 A TemBreak 2

External accessories		Cat. No.	Price \$
ProSafe lock option <sup>1)</sup>	Allen-Bradley ProSafe locks can be used with T2HS variable depth handles. Refer NHP for direct mounting handle options.		
	<b>Suits MCCB types E/S/H/L 125</b>		
<b>TKN</b>	Prosafe shot bolt lock HS handles xx code	<b>TKNHPXX</b>	<b>520.00</b>
	Prosafe standard key xx code for above	<b>TKNNHPKEYXX</b>	<b>130.00</b>
	Cam for T2HS handle shafts Key codes A to Z are available. Specify by changing the key code above.	<b>14997702</b>	<b>235.00</b>
Extention Busbars	<b>E125, S125</b>		
	1 set of 2 of straight bars	<b>T2FB251BA</b>	<b>26.80</b>
	3 pole set of 6 straight bars	<b>T2FB123BA</b>	<b>77.50</b>
	4 pole set of 8 straight bars	<b>T2FB124BA</b>	<b>103.00</b>
	<b>H125, L125</b>		
	1 set of straight terminal bars	<b>T2FB251BA</b>	<b>26.80</b>
	3 pole, set of 6, flanged bars	<b>T2FB253BA</b>	<b>77.50</b>
	4 pole, set of 8, straight bars	<b>T2FB254BA</b>	<b>103.00</b>
	Tunnel clamp terminals	<b>E125, S125</b>	
3 pole set of 6 terminals 50 mm <sup>2</sup>		<b>T2FW12S3A</b>	<b>107.00</b>
4 pole set of 8 terminals 50 mm <sup>2</sup>		<b>T2FW12S4A</b>	<b>141.00</b>
<b>H125, L125</b>			
3 pole set of 6 terminals 35 - 120 mm <sup>2</sup>		<b>T2FW25L3B</b>	<b>173.00</b>
4 pole set of 8 terminals 35 - 120 mm <sup>2</sup>		<b>T2FW25L4B</b>	<b>240.00</b>



T2FW Tunnel clamp terminals and optional T2CS terminal cover



T2FB Attached busbar



ProSafe key Interlock and cam

Notes: <sup>1)</sup> Contact NHP for lock options.

## Accessories to suit 125 A TemBreak 2

External accessories		Cat. No.	Price \$
Rear connect terminal studs	<b>Suits MCCB types E125, S125 <sup>1)</sup></b>		
	3 pole kit, set of 6 studs	<b>T2RP123SA</b>	<b>200.00</b>
	4 pole kit, set of 8 studs	<b>T2RP124SA</b>	<b>270.00</b>
	<b>H125, L125</b>		
<b>RP</b>	3 pole kit, set of 6 studs	<b>T2RP253LA</b>	<b>390.00</b>
	4 pole kit, set of 8 studs	<b>T2RP254LA</b>	<b>540.00</b>
TemPlug	<b>Suits MCCB types TemPlug MCCB line-side plug-in attachment E125, S125</b>		
	3 pole TemPlug	<b>T2UPX3125</b>	<b>305.00</b>
	<b>H125, L125</b>		
	3 pole TemPlug (65 kA limit)	<b>T2UPXE3250</b>	<b>350.00</b>
Templugs suit 6.3 mm busbar as standard, 10 mm types indent			
OCR sealing cover	125/250 A thermal magnetic	<b>T2SF25NTA</b>	<b>26.80</b>
<b>SF</b>			
<b>PM</b>	Plug-in MCCBs (refer rear of section 3)		
<b>DR</b>	Draw-out MCCBs (refer NHP)		



T2RP Rear connect studs



T2UPX Templug



T2SF OCR Seal kit. Suitable for a compression seal device.



T2CR Rear connect term cover

**Notes:** <sup>1)</sup> 125 A rear connect studs will not fit to S125NF single pole MCCBs. S160NF single pole MCCBs will accept rear studs.

## Accessories to suit 125 A TemBreak 2

External accessories		Cat. No.	Price \$
Pole fillers	<b>Suits MCCB types E/S/H/L125</b>		
<b>PF</b>	Pole filler 1 strip for a 46 mm high cut-out <sup>1)</sup>	<b>DTPF</b>	<b>4.30</b>
	Pole filler, 30 mm wide for a 104 mm cut-out	<b>XAB2</b>	<b>3.80</b>
DIN Rail Adaptor	Allows a 125 AF MCCB to be mounted on standard 35 mm DIN rail <b>E125, S125</b>		
<b>DA</b>	Metal DIN rail adaptor	<b>T2DA12A</b>	<b>63.00</b>
Door flange	Provides an attractive panel cut-out surround for MCCBs or motors <b>Suits MCCB types E/S/H/L125</b>		
<b>DF</b>	MCCB IP 30 gland and gasket	<b>T2DF25A</b>	<b>127.00</b>
	MOTOR IP 30 gland and gasket	<b>T2DM25A</b>	<b>215.00</b>
Door mounting flush plate	A kit that allows an MCCB to be mounted directly onto a door		
<b>FP</b>	3 pole kit E125, S125	<b>T2FP12S3B</b>	<b>82.50</b>
	4 pole kit E125, S125	<b>T2FP12S4A</b>	<b>POA</b>
Wire lead terminal block	125/250 AF left side	<b>T2TF25LGA</b>	<b>189.00</b>
<b>TF</b>	125/250 AF right side	<b>T2TF25RGA</b>	<b>189.00</b>

T2PF

Pole fillers



T2DF/DM

Door flange

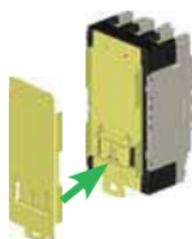


T2TF

Wire lead terminal block



T2DA  
DIN rail  
adaptor



**Notes:** <sup>1)</sup> 1 strip is 8 off, 9 mm segments. Order 2 strips for each 125 A MCCB.

## TemBreak 2 Thermal magnetic type S160NF

**25 kA**

**Current rating:** 16 – 160 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
	230	25	19
AC use	125	15	8
DC use	125	15	–



**Trip unit:** Fixed thermal and magnetic

**Dimensions (mm)**

Poles	1
H	165
W	35
D (less toggle)	68
Toggle cut-out	104

Ampere Rating	NRC	I <sub>r</sub>	I <sub>m</sub>	Cat. No.	1 pole Price \$
16	16	16	160	S160 NF 1 16	165.00
20	20	20	200	S160 NF 1 20	165.00
25	25	25	250	S160 NF 1 25	165.00
32	32	32	320	S160 NF 1 32	165.00
40	40	40	400	S160 NF 1 40	165.00
50	50	50	500	S160 NF 1 50	165.00
63	63	63	630	S160 NF 1 63	165.00
80	80	80	800	S160 NF 1 80	220.00
100	100	100	1000	S160 NF 1 100	310.00
125	125	125	1250	S160 NF 1 125	310.00
160	160	160	1600	S160 NF 1 160	340.00



**Optional terminal covers**



**Optional captive lock attachment**

**Notes:** For Shunt Trips, Interpole Barriers and Terminal Covers refer to accessories pages.

I<sub>r</sub>: thermal rating

I<sub>m</sub>: magnetic rating

NRC: Nominal rated current

S160NF will accept rear terminal studs.

## TemBreak 2 Thermal magnetic type S160NJ

**30 / 36 kA**

**Current rating:** 12.5 – 160 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

**20 – 32 A:**

	Voltage	Icu	Ics
AC use	380/415	30	25
DC use	250	40	40

**50 – 250 A:**

	Voltage	Icu	Ics
AC use	380/415	36	36
DC use	250	40	40



**Trip unit:** Adj thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and adj magnetic

**Dimensions (mm)**

Poles	3	4
H	165	165
W	105	140
D (less toggle)	68	68
Toggle cut-out	104	104

**3 Pole**

Ampere Rating NRC	I <sub>r</sub> <sup>1)</sup> Min. – Max.	I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
20	12.5 – 20	120 – 240	S160 NJ 3 20 <sup>2)</sup>	480.00
32	20 – 32	192 – 384	S160 NJ 3 32 <sup>2)</sup>	480.00
50	32 – 50	300 – 600	S160 NJ 3 50	480.00
63	40 – 63	378 – 756	S160 NJ 3 63	480.00
100	63 – 100	600 – 1200	S160 NJ 3 100	680.00
125	80 – 125	750 – 1500	S160 NJ 3 125	810.00
160	100 – 160	960 – 2080	S160 NJ 3 160	1080.00

**4 Pole**

Ampere Rating NRC	I <sub>r</sub> <sup>1)</sup> Min. – Max.	I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	4 pole Price \$
20	12.5 – 20	120 – 240	S160 NJ 4 20	630.00
32	20 – 32	192 – 384	S160 NJ 4 32	630.00
50	32 – 50	300 – 600	S160 NJ 4 50	630.00
63	40 – 63	378 – 756	S160 NJ 4 63	630.00
100	63 – 100	600 – 1200	S160 NJ 4 100	900.00
125	80 – 125	750 – 1500	S160 NJ 4 125	1090.00
160	100 – 160	960 – 2080	S160 NJ 4 160	1425.00

**Notes:** 1) Adj. I<sub>r</sub>: Adjustable thermal setting - Adj. I<sub>m</sub>: Adjustable magnetic setting  
 2) To obtain MCCBs that accept additional internal auxiliary circuits add "EA" to the above Cat. No.'s. E.g.: S125GJ3125EA.  
 Some types are stocked. Refer to NHP for availability. Refer page 3 - 9 for details.

NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.

## TemBreak 2 Thermal magnetic type S160GJ

### 65 kA

**Current rating:** 32 – 160 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	65	36
DC use	250	40	40



**Trip unit:** Adjustable thermal (0.63 I<sub>n</sub> to 100 % I<sub>n</sub>) and adjustable magnetic

### Dimensions (mm)

Poles	3	4
H	165	165
W	105	140
D (less toggle)	68	68
Toggle cut-out	104	104

### 3 Pole

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No. <sup>2)</sup>	3 pole Price \$
50	32 – 50	300 – 600	S160 GJ 3 50	750.00
63	40 – 63	378 – 756	S160 GJ 3 63	750.00
100	63 – 100	600 – 1200	S160 GJ 3 100	900.00
125	80 – 125	750 – 1500	S160 GJ 3 125	1000.00
160	100 – 160	960 – 2080	S160 GJ 3 160 <sup>2)</sup>	1210.00

### 4 Pole

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No. <sup>2)</sup>	4 pole Price \$
50	32 – 50	300 – 600	S160 GJ 4 50	990.00
63	40 – 63	378 – 756	S160 GJ 4 63	990.00
100	63 – 100	600 – 1200	S160 GJ 4 100	1210.00
125	80 – 125	750 – 1500	S160 GJ 4 125	1330.00
160	100 – 160	960 – 2080	S160 GJ 4 160 <sup>2)</sup>	1620.00

**Notes:** 1) Adj. Ir: Adjustable thermal setting  
 Adj. Im: Adjustable magnetic setting  
 2) To obtain MCCBs that accept additional internal auxiliary circuits add "EA" to the above Cat. No.'s. E.g.: S160GJ3160EA. Otherwise leave blank.  
 NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.

## TemBreak 2 Thermal magnetic type H160NJ

### 125 kA

**Current rating:** 100 – 160 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	125	85
DC use	250	40	40



3

**Trip unit:** Adjustable thermal (0.63 I<sub>n</sub> to 100 % I<sub>n</sub>) and adjustable magnetic (6 I<sub>m</sub> to 13 I<sub>m</sub>)

### Dimensions (mm)

Poles	3	4
H	165	165
W	105	140
D (less toggle)	103	103
Toggle cut-out	104	104

### 3 Pole

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
160	100 – 160	960 – 2080	H160 NJ 3 160	1650.00

### 4 Pole

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No.	4 pole Price \$
160	100 – 160	960 – 2080	H160 NJ 4 160	2210.00

**Notes:** <sup>1)</sup> Adj. Ir: Adjustable thermal setting  
 Adj. Im: Adjustable magnetic setting  
 NRC: Nominal rated current

## TemBreak 2 Thermal magnetic type L160NJ

### 200 kA

**Current rating:** 100 – 160 A

**Approvals and Tests:** Standards AS/NZS 3947-2  
and IEC 60947-2

**Interrupting capacity:**



3

	Voltage	Icu	Ics
AC use	380/415	200	150
DC use	250	40	40

**Trip unit:** Adjustable thermal ( $0.63 I_r$  to  $100\% I_r$ )  
and adjustable magnetic ( $6 I_m$  to  $13 I_m$ )

### Dimensions (mm)

Poles	3	4
H	165	165
W	105	140
D (less toggle)	103	103
Toggle cut-out	104	104

### 3 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> '1) Min. – Max.	Adj. I <sub>m</sub> '1) Min. – Max.	Cat. No.	3 pole Price \$
160	100 – 160	960 – 2080	L160 NJ 3 160	2030.00

### 4 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> '1) Min. – Max.	Adj. I <sub>m</sub> '1) Min. – Max.	Cat. No.	4 pole Price \$
160	100 – 160	960 – 2080	L160 NJ 4 160	2710.00

**Notes:** '1) Adj. I<sub>r</sub>: Adjustable thermal setting  
Adj. I<sub>m</sub>: Adjustable magnetic setting  
NRC: Nominal rated current

## TemBreak 2 Thermal magnetic type E250NJ

### 25 kA

**Current rating:** 12.5 – 250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	230	25	19
DC use	250	25	–



3

**Trip unit:** Adjustable thermal (0.63 I<sub>n</sub> to 100 % I<sub>n</sub>) and adjustable magnetic

### Dimensions (mm)

Poles	3
H	165
W	105
D (less toggle)	68
Toggle cut-out	104

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Adj. Im <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
20	12.5 – 20	120 – 240	E250 NJ 3 20	440.00
32	20 – 32	192 – 384	E250 NJ 3 32	440.00
50	32 – 50	300 – 600	E250 NJ 3 50	440.00
63	40 – 63	378 – 756	E250 NJ 3 63	440.00
100	63 – 100	600 – 1200	E250 NJ 3 100	630.00
125	80 – 125	750 – 1500	E250 NJ 3 125	780.00
160	100 – 160	960 – 2080	E250 NJ 3 160	1030.00
250	160 – 250	1500 – 2500	E250 NJ 3 250	1400.00

**Notes:** <sup>1)</sup> Adj. Ir: Adjustable thermal setting  
 Adj. Im: Adjustable magnetic setting  
 NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.

## TemBreak 2 Thermal magnetic type S250NJ

### 36 kA

**Current rating:** 160 – 250 A

**Approvals and Tests:** Standards AS/NZS 3947-2  
and IEC 60947-2

**Interrupting capacity:**



3

	Voltage	Icu	Ics
AC use	380/415	36	36
DC use	250	40	40

**Trip unit:** Adjustable thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and adjustable magnetic (6 I<sub>m</sub> to 10 I<sub>m</sub>)

### Dimensions (mm)

Poles	3	4
H	165	165
W	105	140
D (less toggle)	68	68
Toggle cut-out	104	104

### 3 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
250	160 – 250	1500 – 2500	S250 NJ 3 250	1480.00

### 4 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	4 pole Price \$
250	160 – 250	1500 – 2500	S250 NJ 4 250	1860.00

**Notes:** <sup>1)</sup> Adj. I<sub>r</sub>: Adjustable thermal setting  
 Adj. I<sub>m</sub>: Adjustable magnetic setting  
 NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.  
 For smaller amp trip units in the same 36 kA frame size, refer S160NJ MCCBs.

## TemBreak 2 Thermal magnetic type S250GJ

**65 kA**

**Current rating:** 160 – 250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	65	36
DC use	250	40	40

**Trip unit:** Adjustable thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and adjustable magnetic (6 I<sub>m</sub> to 10 I<sub>m</sub>)

### Dimensions (mm)

Poles	3	4
H	165	165
W	105	140
D (less toggle)	68	68
Toggle cut-out	104	104

### 3 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No. <sup>2)</sup>	3 pole Price \$
250	160 – 250	1500 – 2500	S250 GJ 3 250	1680.00

### 4 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No. <sup>2)</sup>	4 pole Price \$
250	160 – 250	1500 – 2500	S250 GJ 4 250	2240.00

### Fixed low magnetic and standard magnetic only types

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Fixed magnetic	Cat. No. <sup>2)</sup>	3 pole Price \$
250	160 – 250	750 A	S250 GJ 3 SO23160	1780.00
250	160 - 250	1000 A	S250 GJ 3 250M1000	1870.00
250	Magnetic trip only	2500 A	S250 GJ3 250MAG	1910.00

**Notes:** 1) Adj. I<sub>r</sub>: Adjustable thermal setting  
 Adj. I<sub>m</sub>: Adjustable magnetic setting  
 2) To obtain MCCBs that accept additional internal auxiliary circuits add 'EA' to the above Cat. Nos. E.g.: S250GJ3250EA. Otherwise leave blank.  
 NRC: Nominal rated current  
 For smaller amp trip units in the same 65 kA frame size, refer S160GJ MCCBs.



## MCCBs with Electronic Overcurrent Relays

TemBreak 2 Moulded Case Circuit Breakers to 1600 A are available with electronic overcurrent relays 250 A to 1600 A. Current ratings range from 16 A to 1600 A. The overcurrent relays are easy to adjust – simply select the current rating via a dial adjustment, and depending on the application, a dial selectable pre-set characteristic curve can also be selected.

### STANDARD Overcurrent Relay

#### Features:

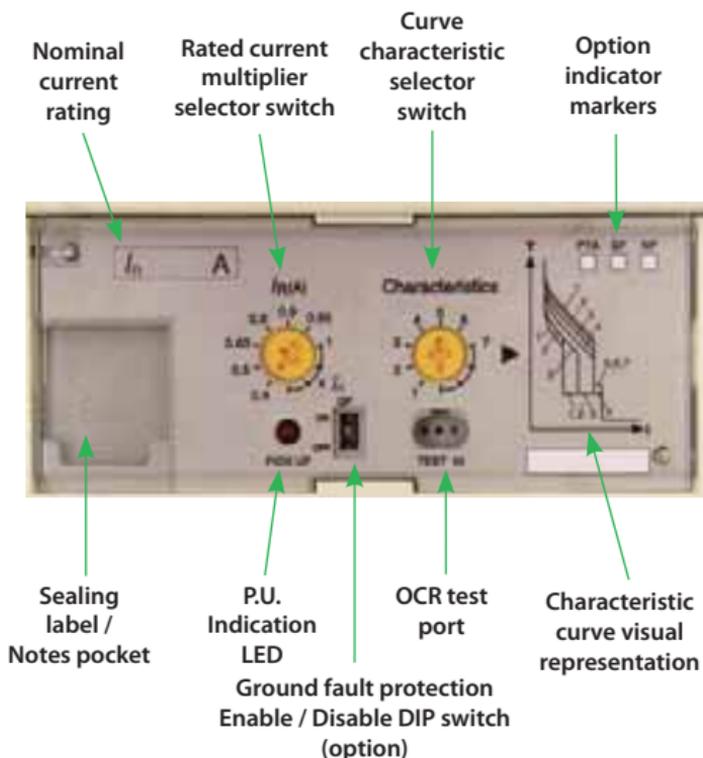
- Electronic overcurrent protection, for general and selectivity applications
- 250 A and 1600 A: 7 characteristic curves, (630 A: 6 characteristic curves)
- Long Time, Short Time & Instantaneous trip times vary depending on the characteristic curve selected
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .  
(dial settings are via incremental steps)

#### OCR Options:

- Ground fault trip on 400-1600 A models
- Neutral pole protection for 4 pole MCCBs
- Pre-trip alarm
- Special curve characteristics are available

#### Right:

Typical OCR adjustment and setting detail shown on electronic MCCBs (400/630 A shown)



**Notes:** Additional ELECTRONIC MCCB setting information can be found in Section 9.

## TemBreak 2 Electronic type S250PE

### 70 kA

**Current rating:** 16 – 250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	<b>Voltage</b>	<b>Icu</b>	<b>Ics</b>
AC use	380/415	70	70

### Overcurrent relay:

- Electronic, for general and selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .

### OCR Options:

- Neutral pole protection for 4 pole MCCBs only
- Pre-trip alarm

### Dimensions (mm)

<b>Poles</b>	<b>3</b>	<b>4</b>
H	165	165
W	105	140
D (less toggle)	103	103
Toggle cut-out	104	104



3

## TemBreak 2 Electronic type S250PE

### 3 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No. <sup>1)</sup>	Price \$
40	16 – 40	S250 PE 3 40	1610.00
125	50 – 125	S250 PE 3 125	1730.00
250	100 – 250	S250 PE 3 250	2100.00

### 4 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No. <sup>1)</sup>	Price \$
40	16 – 40	S250 PE 4 40	1932.00
125	50 – 125	S250 PE 4 125	2430.00
250	100 – 250	S250 PE 4 250	2790.00

### Price Adder – For OCR options.

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Cat. No. <sup>1)</sup>	Price \$
3 P OCR options:	PTA <sup>2)</sup>	S250 PE 3 AP 3	187.00
	PTA <sup>2)</sup>	S250 PE 4 AP 4	187.00
4 P OCR options:	NP <sup>2)</sup>	S250 PE 4 AN 4	187.00
	PTA + NP <sup>2)</sup>	S250 PE 4 APN 4	365.00

**Notes:** <sup>1)</sup> The STD and Instantaneous pickup current (I<sub>sd</sub> & I<sub>i</sub>) settings are not individually adjustable, however by selecting different curve types and different I<sub>r</sub> settings the values will vary. Curve 1 & 2 I<sub>sd</sub> = 2.5 x I<sub>r</sub>, curve 3 I<sub>sd</sub> = 5 x I<sub>r</sub>, curve 4 – 7 I<sub>sd</sub> = 10 x I<sub>r</sub>. I<sub>r</sub> dial setting 0.4 – 0.9 I<sub>i</sub> = 14 x I<sub>r</sub> and I<sub>r</sub> dial setting 0.95 – 1.0 I<sub>i</sub> = 10 x I<sub>r</sub>. Refer curve examples and setting data in Section 9. NRC = Nominal rated current, I<sub>r</sub> = Current adjustment dial setting, STD = Short Time Delay, INST = instantaneous

<sup>2)</sup> To order a MCCB with the above options insert the required option after the pole to make up the Cat. No. E.g.: S250PE 4 APN 250 is a S250PE 4 Pole 250 A MCCB c/w Pre-trip Alarm and Neutral Protection.

## TemBreak 2 Thermal magnetic type H250NJ

### 125 kA

**Current rating:** 100 – 250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	125	85
DC use	250	40	40



**Trip unit:** Adjustable thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and adjustable magnetic (6 I<sub>m</sub> to 10 I<sub>m</sub>)

### Dimensions (mm)

Poles	3	4
H	165	165
W	105	140
D (less toggle)	103	103
Toggle cut-out	104	104

### 3 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> Min. – Max.	Adj. I <sub>m</sub> Min. – Max.	Cat. No.	3 pole Price \$
250	160 – 250	1500 – 2500	H250 NJ 3 250	2020.00

### 4 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> Min. – Max.	Adj. I <sub>m</sub> Min. – Max.	Cat. No.	4 pole Price \$
250	160 – 250	1500 – 2500	H250 NJ 4 250	2700.00

## TemBreak 2 Electronic MCCB with Energy Metering Output S250PE\_AC

**70 kA**

**Current rating:** 16 – 250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	415	70	70

**MCCB Standard features:**

- Electronic, for metering, selectivity, motor starting or general use
- 7 dial selectable characteristic suited to different applications
- Base current I<sub>r</sub> adjustable from 40% - 100% of current I<sub>n</sub>.
- STD setting 2.5 – 10 (x I<sub>R</sub>)<sup>2</sup>
- INST setting 14 (Max 13 x I<sub>n</sub>)<sup>2</sup>
- Energy (multifunction) metering output, A, V, P, kW, kWh, E, Pf, F
- Trip event log, Alarm event log
- Modbus RTU 485 communications output
- External door mounting meter option (T2ED not incl. in below pricing)
- Neutral Pole protection option for 4 pole MCCBs only (AN)
- Pre-Trip Alarm (AP) option

**Dimensions (mm)**

Poles	3
H	165
W	105
D (less toggle)	103
Toggle cut-out	48
	105 on chassis

Ampere Rating NRC	Adj. I <sub>r</sub> Min. – Max.	Cat. No. <sup>1)</sup>	T2ED 3 pole Price \$	4 pole Price \$
40	16 - 40	S250 PE 3 40 AC	3260.00	
		S250 PE 4 40 AC		4100.00
125	50 - 125	S250 PE 3 125 AC	3760.00	
		S250 PE 4 125 AC		4500.00
250	100 - 250	S250 PE 3 250 AC	3970.00	
		S250 PE 4 250 AC		4760.00

**Notes:** <sup>1)</sup> The STD and Instantaneous pickup currents (I<sub>sd</sub> & I<sub>i</sub>) settings are not individually adjustable, however by selecting different curve types and different I<sub>r</sub> settings the values will vary. Curve 1 & 2 I<sub>sd</sub> = 2.5 x I<sub>R</sub>, curve 3 I<sub>sd</sub> = 5 x I<sub>R</sub>, curve 4 - 7 I<sub>sd</sub> = 10 x I<sub>R</sub>. I<sub>r</sub> dial setting 0.4 – 0.9 I<sub>i</sub> = 14 x I<sub>R</sub> and I<sub>r</sub> dial setting 0.95 – 1.0 I<sub>i</sub> = 13 x I<sub>R</sub>. Refer curve examples & setting data in section 9.

<sup>2)</sup> To order a MCCB with the above options add the required amp rating to the end of the catalogue number to complete it. Eg: S250PE 4 AN 250 is a S250PE 4 Pole 250 A MCCB c/w Neutral Protection.

NRC = Nominal rated current, I<sub>R</sub> = Current adjustment dial setting, STD = Short Time Delay, INST = instantaneous

For additional information on installation, options and applications refer Section 9, Part C

## TemBreak 2 Electronic type H250NE

### 125 kA

**Current rating:** 16 – 250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	<b>Voltage</b>	<b>Icu</b>	<b>Ics</b>
AC use	380/415	125	85



3

### Overcurrent relay:

- Electronic, for general and selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .

### OCR Options:

- Neutral pole protection for 4 pole MCCBs only
- Pre-trip alarm

### Dimensions (mm)

<b>Poles</b>	<b>3</b>	<b>4</b>
H	165	165
W	105	140
D (less toggle)	103	103
Toggle cut-out	104	104

## TemBreak 2 Electronic type H250NE

### 3 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No. <sup>1)</sup>	3 pole Price \$
40	16 - 40	H250 NE 3 40	1670.00
125	50 – 125	H250 NE 3 125	2050.00
250	100 – 250	H250 NE 3 250	2560.00

### 4 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No. <sup>1)</sup>	4 pole Price \$
40	16 - 40	H250 NE 4 40	3580.00
125	50 - 125	H250 NE 4 125	3220.00
250	100 – 250	H250 NE 4 250	3410.00

### Price Adder – For OCR options.

Ampere Rating NRC	Adj. Ir <sup>1)</sup> Min. – Max.	Cat. No. <sup>1)</sup>	3 pole Price \$	4 pole Price \$
3 P OCR options:	PTA <sup>2)</sup>	H250 NE 3 AP 3	187.00	
4 P OCR options:	PTA <sup>2)</sup>	H250 NE 4 AP 3		187.00
	NP <sup>2)</sup>	H250 NE 4 AN 3		187.00
	PTA + NP <sup>2)</sup>	H250 NE 4 APN 3		365.00

### Notes: (for pages 3 - 56 and 3 - 57)

- <sup>1)</sup> The STD and Instantaneous pickup currents ( $I_{sd}$  &  $I_i$ ) settings are not individually adjustable, however by selecting different curve types and different IR settings the values will vary. Curve 1 & 2  $I_{sd} = 2.5 \times I_R$ , curve 3  $I_{sd} = 5 \times I_R$ , curve 4 - 7  $I_{sd} = 10 \times I_R$ .  $I_R$  dial setting 0.4 – 0.9  $I_i = 14 \times I_R$  and  $I_R$  dial setting 0.95 – 1.0  $I_i = 13 \times I_R$ . Refer curve examples & setting data in section 9.

- <sup>2)</sup> To order a MCCB with the above options add the required amp rating to the end of the catalogue number to complete it. Eg: H250NE 4 AN 250 is a H250NE 4 Pole 250 A MCCB c/w Neutral Protection.

NRC = Nominal rated current, IR = Current adjustment dial setting,

STD = Short Time Delay, INST = instantaneous

For additional information on installation, options and applications refer Section 9, Part C catalogue or NHP.

## TemBreak 2 Electronic MCCB with Energy Metering Output H250NE\_AC

### 125 kA

**Current rating:** 16 – 250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	415	125	85

### MCCB Standard features:

- Electronic, for metering, selectivity, motor starting or general use
- 7 dial selectable characteristic suited to different applications
- Base current I<sub>r</sub> adjustable from 40% - 100% of current I<sub>n</sub>
- STD setting 2.5 – 10 (x I<sub>R</sub>)<sup>2</sup>
- INST setting 14 (Max 13 x I<sub>n</sub>)<sup>2</sup>
- Energy (multifunction) metering output, A, V, P, kW, kWh, E, Pf, F
- Trip event log, Alarm event log
- Modbus RTU 485 communications output
- External door mounting meter option (T2ED not incl. in below pricing)
- Neutral Pole protection options for 4 pole MCCBs only (AN)
- Pre-Trip Alarm (AP) option



### Dimensions (mm)

Poles	3
H	165
W	105
D (less toggle)	103
Toggle cut-out	48
	105 on chassis



T2ED

Ampere Rating NRC	Adj. I <sub>r</sub> Min. – Max.	Cat. No. 1)	3 pole Price \$	4 pole Price \$
40	16 - 40	H250 NE 3 40 AC	3550.00	
		H250 NE 4 40 AC		4400.00
125	50 - 125	H250 NE 3 125 AC	4150.00	
		H250 NE 4 125 AC		4800.00
250	100 - 250	H250 NE 3 250 AC	4350.00	
		H250 NE 4 250 AC		4990.00

**Notes:** See page 3 - 56 for notes.

## TemBreak 2 Thermal magnetic type L250NJ

### 200 kA

**Current rating:** 100 – 250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	200	150
DC use	250	40	40



**Trip unit:** Adjustable thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and adjustable magnetic (6 I<sub>m</sub> to 10 I<sub>m</sub>)

### Dimensions (mm)

Poles	3	4
H	165	165
W	105	140
D (less toggle)	103	103
Toggle cut-out	104	104

### 3 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
250	160 – 250	1500 – 2500	L250 NJ 3 250	2340.00

### 4 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	4 pole Price \$
250	160 – 250	1500 – 2500	L250 NJ 4 250	3120.00

**Notes:** <sup>1)</sup> Adj. I<sub>r</sub>: Adjustable thermal setting  
 Adj. I<sub>m</sub>: Adjustable magnetic setting  
 NRC: Nominal rated current

## Accessories to suit 160 – 250 AF TemBreak 2

External accessories	Cat. No.	Price \$
Shunt trips	Internal accessories are common for MCCBs 125 A to 630 A. All have screw terminals except those indicated below with wire leads as standard	
	<b>For 2, 3 and 4 pole MCCBs</b>	
SH	110 V AC	T2SH00A10TA <sup>1)</sup> 255.00
	230 – 240 V AC	T2SH00A20TA <sup>1)</sup> 255.00
	400 – 415 V AC	T2SH00A40TA <sup>1)</sup> 255.00
	24 V DC (Suits 24 V AC)	T2SH00D02TA <sup>1)</sup> 255.00
	48 V DC	T2SH00D04TA <sup>1)</sup> 255.00
	110 V DC	T2SH00D10TA <sup>1)</sup> 255.00
	230 V DC	T2SH00D20TA <sup>1)</sup> 255.00
		<b>For 1 pole S160NF MCCBs</b>
	110 V AC	T2SH16A10WA 255.00
	230 – 240 V AC	T2SH16A20WA 255.00
	24 V DC	T2SH16D02WA 255.00
	110 V DC	T2SH16D10WA 250.00
	230 V DC	T2SH16D20WA 250.00
Undervoltage trips	<b>Instantaneous operation</b>	
UV	110 V AC	T2UV00A10NTA 270.00
	200 – 240 V AC	T2UV00A20NTA 270.00
	380 – 450 V AC	T2UV00A40NTA 270.00
	24 V DC	T2UV00D02NTA 270.00
	110 V DC	T2UV00D10NTA 270.00
	230 V DC	T2UV00D20NTA 270.00
	<b>Time delayed operation (500 ms) - refer NHP</b>	
Auxiliary & alarm switches	<b>General type (2 A @ 240 V Inductive)</b>	
AX AL	1 C/O Auxiliary	T2AX00M3STA 134.00
	1 C/O Auxiliary – with 0.7 m wire leads	T2AX00M3SWA 146.00
	1 C/O Alarm	T2AL00M3STA 134.00
	1 C/O Alarm – with 0.7 m wire leads	T2AL00M3SWA 146.00
	<b>Heavy-duty type (4 A @ 240 V Inductive)</b>	
	1 N/O Auxiliary	T2AX00B1STA 146.00
	1 N/C Auxiliary	T2AX00B2STA 146.00
	1 N/O Alarm	T2AL00B1STA 146.00
1 N/C Alarm	T2AL00B2STA 146.00	
	<b>Micro switching type (very low voltages)</b>	
	1 C/O Auxiliary	T2AX00M3RTA 187.00
	1 C/O Alarm	T2AL00M3RTA 187.00

Notes: <sup>1)</sup> Wire lead types available.

## Accessories to suit 160 – 250 AF TemBreak 2

External accessories		Cat. No.	Price \$
Motor operators	<b>Suits MCCB types S/H/L160, E/S/H/L250</b>		
<b>MC</b>	110 V AC	<b>T2MC25A10NB</b>	<b>1620.00</b>
	230 – 240 V AC	<b>T2MC25A24NB</b>	<b>1630.00</b>
	24 V DC	<b>T2MC25D02NB</b>	<b>1630.00</b>
	48 V DC	<b>T2MC25D04NB</b>	<b>1620.00</b>
	110 V DC	<b>T2MC25D10NB</b>	<b>1620.00</b>
<b>Motor Accessories</b>	Motor connection cable loom for electrical interlocking		
	T2MC 25 cable 500 mm, 250AF only	<b>T2MM25L05A</b>	<b>60.50</b>
	T2MC 25 cable 1500 mm, 250AF only	<b>T2MM25L15A</b>	<b>73.00</b>
	Motor options: Contact NHP for key locking and auto-reset.		
	MCCB identification labels	<b>T25CAPLAB</b>	<b>3.50</b>

T2SH  
Shunt trip



T2AX  
T2AL  
Auxiliary &  
Alarm  
switches



T2UV  
Undervoltage  
trip



T2MC  
Motor operators  
250 A motor  
fitted to MCCB

## Accessories to suit 160 – 250 AF TemBreak 2

External accessories		Cat. No.	Price \$
Operating handles Direct mounting, fixed depth, IP 54	<b>Suits MCCB types S/H/L160, E/S/H/L250</b>		
	Grey/black	<b>T2HB25UR5BN</b>	<b>189.00</b>
	Red/yellow	<b>T2HB25UR5RN</b>	<b>210.00</b>
	MCCB identification labels	<b>T25CAPLAB</b>	<b>3.50</b>
<b>HB</b>			
Door interlocking variable depth handle	<b>S/H/L160, E/S/H/L250</b>		
	Grey IP 55 handle + 357 mm shaft	<b>T2HS25R5GM</b>	<b>280.00</b>
	Red/ yellow IP 55 handle + 357 mm shaft	<b>T2HS25R5RM</b>	<b>290.00</b>
	Large escutcheon plate option: 100 mm <sup>2</sup>	<b>T2HSESC100</b>	<b>18.20</b>
	90 mm T pin shaft for T2HS - no flexi coupling	<b>T2HS250SHAFT</b>	<b>47.00</b>
	Grey/ black IP 65 handle + 420 mm shaft	<b>T2HP25R6BN</b>	<b>290.00</b>
	Red/ yellow IP 65 handle + 420 mm shaft	<b>T2HP25R6RN</b>	<b>300.00</b>
	Padlock attachment for T2HP/HS mechanism	<b>T2HP25PALK</b>	<b>49.50</b>
MCCB identification labels	<b>T25CAPLAB</b>	<b>3.50</b>	
<b>HS HP</b>			



T2HS variable depth handle IP 55



T2HP Variable depth handle IP 65



Operating handles Direct mounting, fixed depth, IP 54



Mechanism Padlock attachment

## Accessories to suit 160 – 250 AF TemBreak 2

External accessories	Cat. No.	Price \$
Mechanical Interlocks Link type	Link Interlock – suitable for manual or motorised operation. Will accept handles. Suitable for front or rear connect type MCCBs	
<b>ML</b>	<b>S/H/L160, E/S/H/ L250</b>	
	Common 3 or 4 pole right side section	<b>T2ML25RA</b> 113.00
	3 pole left side section	<b>T2ML25L3A</b> 127.00
	4 pole left side section	<b>T2ML25L4A</b> 127.00
	MCCB identification labels	<b>T25CAPLAB</b> 3.50

3

Left section 3 or 4 pole  
(T2ML25L4A shown)

Common right section  
(T2ML25RA shown)



Link interlocked 250 A MCCBs



T2HS handle with optional T2HSESC100 escutcheon plate

## Accessories to suit 160 – 250 AF TemBreak 2

External accessories		Cat. No.	Price \$
Slide type interlock	Manual operation, padlockable. Does not allow motors, handles or other front mounted accessories to be fitted.		
	<b>Suitable for front or rear connection</b> <b>S160, E250, S250</b>		
<b>MS</b>	3 pole	T2MS253SFA	120.00
	4 pole	T2MS254SFA	134.00
	<b>H160, L160, H250, L250</b>		
	3 pole	T2MS253LFA	120.00
	4 pole	T2MS254LFA	134.00
Cable interlock	Allows an MCCB to be mounted horizontally, vertically or diagonally. Accepts Motors and handles.		
	<b>Suitable for 3 or 4 pole MCCBs</b> <b>S/H/L160, E/S/H/L250</b>		
<b>MW</b>	Interlock kit less wire	T2MW25CA <sup>1)</sup>	275.00
	Wire for above interlocks Wire 1.0 M	T2MW00SA <sup>2)</sup>	63.00
	Wire 1.5 M	T2MW00LA <sup>2)</sup>	73.00
	MCCB identification labels	T25CAPLAB	3.50

T2MW  
Cable interlock



T2MS  
Slide type



**Notes:** <sup>1)</sup> Order one interlock kit for each MCCB.

<sup>2)</sup> Order one wire length for each pair of interlocked MCCBs.

## Accessories to suit 160 – 250 AF TemBreak 2

External accessories		Cat. No.	Price \$
Terminal Covers Flush IP 20 FC  <b>CS</b>	<b>Suits MCCB types S/H/L160, E/S/H/L250</b>		
	1 pole cover set of 2	<b>T2CS251SG</b>	<b>10.00</b>
	3 pole cover set of 2	<b>T2CS253SG</b>	<b>54.00</b>
	4 pole cover set of 2	<b>T2CS254SG</b>	<b>60.50</b>
Short terminal covers FC  <b>CF</b>	<b>S160, E250, S250 – except S250-PE</b>		
	3 pole cover set of 2, 30 mm long	<b>T2CF253SSNBA</b>	<b>67.00</b>
	4 pole cover set of 2, 30 mm long	<b>T2CF254SSNBA</b>	<b>77.50</b>
	Standard terminal covers FC  <b>CF</b>	<b>S160, E250, S250 – except S250-PE</b>	
1 pole cover set of 2, 55 mm long		<b>T2CF161SLNG</b>	<b>40.00</b>
3 pole cover set of 2, 55 mm long		<b>T2CF253SLNG</b>	<b>67.00</b>
4 pole cover set of 2		<b>T2CF254SLNG</b>	<b>77.50</b>
	<b>H/L160, S250-PE, H/L250</b>		
	3 pole cover set of 2, 55 mm long	<b>T2CF253LLNG</b>	<b>71.00</b>
	4 pole cover set of 2, 55 mm long	<b>T2CF254LLNG</b>	<b>77.50</b>



T2CF Standard term covers



Single pole terminal cover



T2CF Short terminal covers



T2CS Flush IP 20 Cover



T2RC Rear connect term cover

## Accessories to suit 160 – 250 AF TemBreak 2

External accessories		Cat. No.	Price \$
Terminal covers <b>CR</b>	<b>Rear Connect MCCBs S/H/L160, E/S/H/L250</b>		
	3 pole cover set of 2	<b>T2CR253SG</b>	<b>54.00</b>
	4 pole cover set of 2	<b>T2CR254SG</b>	<b>60.50</b>
Terminal locking clip	<b>A clip that provides additional terminal cover position locking, and cover also allows a lead seal to be fitted</b>		
	All sizes 125, 250, 400, 630 AF	<b>T2CF00L</b>	<b>9.10</b>
Interpole Barriers <sup>1) 2)</sup> <b>BA</b>	<b>Suits MCCB types S160, E250, S250 – except S250-PE</b>		
	Interpole barrier (Qty 2) <b>H/L160, S250-PE, H/L250</b>	<b>T2BA253SHA</b>	<b>20.00</b>
	Interpole barrier (Qty 2)	<b>T2BA253LHA</b>	<b>20.00</b>
Toggle locks <b>HL</b>	<b>Non Captive: Fits up to 3 padlocks or a multiple lock device All 250 AF MCCBs (1 - 4 pole)</b>		
	Lock with 5 mm x 16.5 mm slot	<b>T2HL25B</b>	<b>31.50</b>
	<b>Captive: Allows a single padlock or multiple padlock device Suits 3/4 pole 250 AF MCCBs</b>		
	Lock with one 8 mm holes	<b>T2HL25CAP</b>	<b>33.50</b>
	For 1 pole MCCBs, 1 x 8 mm hole	<b>T2HLS160NFCAP</b>	<b>92.00</b>



T2CF locking clip



Non captive lock attachment  
T2HL25B



Inter pole barriers  
T2BA



T2HL25CAP Captive lock  
attachment

**Notes:** <sup>1)</sup> Line side interpole barriers or terminal covers must be installed with MCCBs.

<sup>2)</sup> Interpole Barriers are supplied with MCCBs as standard; 2 barriers with 3 pole MCCBs, and 3 barriers with 4 pole MCCBs.

## Accessories to suit 160 – 250 AF TemBreak 2

External accessories		Cat. No.	Price \$
ProSafe handle lock option 1)		Allen-Bradley ProSafe locks can be used with T2HS variable depth handles. Refer NHP for direct mounting handle options.	
<b>Suits MCCB types E/S/H/L 160 - 250</b>			
<b>TKN</b>	Prosafe shot bolt lock HS handles xx code	<b>TKNHP_</b>	<b>520.00</b>
	Prosafe standard key xx code for above	<b>TKNNHPKEY_</b>	<b>130.00</b>
	Cam for T2HS handle shafts Key codes A to Z are available. Specify by changing the key code above.	<b>14997702</b>	<b>235.00</b>
<b>FB</b>	<b>S/H/L160, E/S/H/L250</b>		
	Attached Busbar	2 straight terminal bars	<b>T2FB251BA 26.80</b>
		3 Pole, set of 6, flanged bar set	<b>T2FB253BA 77.50</b>
		3 Pole, set of 6, flanged bar set 2)	<b>TXJD0050B 75.50</b>
		4 Pole, set of 8, straight bar set	<b>T2FB254BA 103.00</b>
<b>FW</b>	<b>S/H/L160, E/S/H/L250</b>		
	Tunnel clamp terminals	3 Pole, set of 6 clamps 35 -120 mm 2)	<b>T2FW25L3B 173.00</b>
		4 Pole, set of 8 clamps 35 -120 mm 2)	<b>T2FW25L4B 240.00</b>

T2FW Tunnel terminals



T2CS Flush cover shown

TXJD Attached busbar (flanged)



ProSafe key Interlock and cam

**Notes:** 1) Contact NHP for lock options.  
2) TemBreak 1 version will fit TemBreak 2.

## Accessories to suit 160 – 250 AF TemBreak 2

External accessories		Cat. No.	Price \$
Rear connect terminal studs	<b>Suits MCCB types S160, E250, S250 <sup>1)</sup> Not S250PE</b>		
	3 pole kit, set of 6 studs	<b>T2RP253SB</b>	<b>375.00</b>
	4 pole kit, set of 8 studs	<b>T2RP254SB</b>	<b>480.00</b>
<b>RP</b>	<b>H160, L160, H250, L250, S250PE</b>		
	3 pole kit, set of 6 studs	<b>T2RP253LA</b>	<b>390.00</b>
	4 pole kit, set of 8 studs	<b>T2RP254LA</b>	<b>540.00</b>
TemPlug	<b>Suits MCCB types TemPlug MCCB line-side plug-in attachment</b>		
	<b>S160, E/S/250</b>		
	3 pole TemPlug	<b>T2UPX3250</b>	<b>330.00</b>
<b>UP</b>	<b>S250PE</b>		
	3 pole TemPlug	<b>T2UPXE3250</b>	<b>350.00</b>
	<b>Templugs suit 6.3 mm busbar (10 mm bar option)</b>		
OCR sealing cover	250 A thermal magnetic	<b>T2SF25NTA</b>	<b>26.80</b>
<b>SF</b>	250 A electronic	<b>T2SF25NEA</b>	<b>26.80</b>
Electronic OCR checker	230 V AC	<b>TNS2</b>	<b>6590.00</b>
<b>PM</b>	Plug-in MCCBs (refer rear of section 3)		
<b>DR</b>	Draw-out MCCBs		

3

Now available - Refer NHP



**T2RP**  
T2RP rear connect studs



**T2UP**  
T2UP Templug



**T2SF**  
OCR sealing kit. Suitable for a compression sealing device.

**Notes:** <sup>1)</sup> S160NF single pole MCCBs will accept T2RP25 rear connect studs.

## Accessories to suit 160 – 250 AF TemBreak 2

External accessories		Cat. No.	Price \$
Pole fillers	<b>Suits MCCB types S/H/L160, E/S/H/L250</b>		
<b>PF</b>	Pole filler 1 strip for a 46 mm high cut-out <sup>1)</sup>	<b>DTPF</b>	<b>4.30</b>
	Pole filler 35 mm wide for a 104 mm cut-out	<b>XAB3</b>	<b>3.80</b>
Door flange	Provides an attractive panel cut-out surround for MCCBs or motors		
<b>DF</b>	<b>Suits MCCB sizes S/H/L160, E/S/H/L250</b>		
	MCCB IP 30 gland and gasket	<b>T2DF25A</b>	<b>127.00</b>
	MOTOR IP 30 gland and gasket	<b>T2DM25A</b>	<b>215.00</b>
Door mounting flush plate	A kit that allows an MCCB to be mounted directly onto a door		
<b>FP</b>	<b>S160, E250, S250 – except for S250PE</b>		
	3 pole kit	<b>T2FP25S3B</b>	<b>82.50</b>
	4 pole kit	<b>T2FP25S4A</b>	<b>POA</b>
Wire lead terminal block	250 AF left side	<b>T2TF25LGA</b>	<b>189.00</b>
<b>TF</b>	250 AF right sideblock	<b>T2TF25RGA</b>	<b>189.00</b>



**T2PF**  
Pole fillers



**T2TF**  
Wire lead terminal block



**T2DF/DM**  
Door flange

**Notes:** <sup>1)</sup> Order 2 strips per MCCB.

## TemBreak 2 Thermal magnetic type E400NJ



### 25 kA

**Current rating:** 252 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	25	25
DC use	250	25	19

**Trip unit:** Adjustable thermal ( $0.63 I_r$  to  $100\% I_r$ ) and adjustable magnetic ( $6 I_m$  to  $13 I_m$ )

### Dimensions (mm)

Poles	3
H	260
W	140
D (less toggle)	103

### 3 Pole

Ampere Rating NRC	Adj. $I_r$ <sup>1)</sup> Min. – Max.	Adj. $I_m$ <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
400	250 – 400	2400 – 4800	E400 NJ 3 400	1930.00

**Notes:** <sup>1)</sup> Adj.  $I_r$ : Adjustable thermal setting  
 Adj.  $I_m$ : Adjustable magnetic setting  
 NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.

## TemBreak 2 Thermal magnetic type S400CJ

### 36 kA

**Current rating:** 160 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

#### Interrupting capacity:

	Voltage	Icu	Ics
AC use	380/415	36	36
DC use	250	40	40



**Trip unit:** Adjustable thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and adjustable magnetic (6 I<sub>m</sub> to 12 I<sub>m</sub>)

#### Dimensions (mm)

Poles	3
H	260
W	140
D (less toggle)	103

#### 3 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
250	160 – 250	1500 – 3000	S400 CJ 3 250	1930.00
400	250 – 400	2400 – 4800	S400 CJ 3 400	1970.00

**Notes:** <sup>1)</sup> Adj. I<sub>r</sub>: Adjustable thermal setting  
 Adj. I<sub>m</sub>: Adjustable magnetic setting  
 NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.

## TemBreak 2 Thermal magnetic type S400NJ

**50 kA**

**Current rating:** 160 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	50	50
DC use	250	40	40



**Trip unit:** Adjustable thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and adjustable magnetic (6 I<sub>m</sub> to 12 I<sub>m</sub>)

**Dimensions (mm)**

Poles	3	4
H	260	260
W	140	185
D (less toggle)	103	103

### 3 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
250	160 – 250	1500 – 3000	S400 NJ 3 250	2020.00
400	250 – 400	2400 – 4800	S400 NJ 3 400	2020.00

### 4 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	4 pole Price \$
250	160 – 250	1500 – 3000	S400 NJ 4 250	2700.00
400	250 – 400	2400 – 4800	S400 NJ 4 400	2700.00

**Notes:** <sup>1)</sup> Adj. I<sub>r</sub>: Adjustable thermal setting  
 Adj. I<sub>m</sub>: Adjustable magnetic setting  
 NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.

## TemBreak 2 Electronic type S400NE

### 50 kA

**Current rating:** 100 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	380/415	50	50



### Overcurrent relay:

- Electronic, for general and selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .
- STD setting 2.5 – 10 ( $\times I_r$ )<sup>1)</sup>
- INST setting 13 – 14 ( $\times I_r$ )<sup>1)</sup>

### OCR Options:

- Refer S400GE

### Dimensions (mm)

Poles	3	4
H	260	260
W	140	185
D (less toggle)	103	103

### 3 Pole

Ampere Rating NRC	Adj. $I_r$ Min. – Max.	Cat. No.	3 pole Price \$
250	100 – 250	S400 NE 3 250	2180.00
400	160 – 400	S400 NE 3 400	2180.00

### 4 Pole

Ampere Rating NRC	Adj. $I_r$ Min. – Max.	Cat. No.	4 pole Price \$
250	100 – 250	S400 NE 4 250	2180.00
400	160 – 400	S400 NE 4 400	2890.00

**Notes:** <sup>1)</sup> For additional information on OCR setting and options refer section 9 or Part C catalogue.

## TemBreak 2 Thermal magnetic type S400GJ

### 70 kA

**Current rating:** 250 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	70	50
DC use	250	TBA	



3

**Trip unit:** Adjustable thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and adjustable magnetic (6 I<sub>m</sub> to 12 I<sub>m</sub>)

### Dimensions (mm)

Poles	3	4
H	260	260
W	140	185
D (less toggle)	103	103

### 3 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	3 pole Price \$
250	160 – 250	1500 – 3000	S400 GJ 3 250	2310.00
400	250 – 400	2400 – 4800	S400 GJ 3 400	2310.00

### 4 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Adj. I <sub>m</sub> <sup>1)</sup> Min. – Max.	Cat. No.	4 pole Price \$
250	160 – 250	1500 – 3000	S400 GJ 4 250	3080.00
400	250 – 400	2400 – 4800	S400 GJ 4 400	3080.00

**Notes:** <sup>1)</sup> Adj. I<sub>r</sub>: Adjustable thermal setting  
 Adj. I<sub>m</sub>: Adjustable magnetic setting  
 NRC: Nominal rated current  
 Magnetic only MCCBs are available on request.

## TemBreak 2 Electronic type S400GE

### 70 kA

**Current rating:** 100 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	380/415	70	50



### Overcurrent relay:

- Electronic, for general and selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .
- STD setting 2.5 – 10 ( $\times I_r$ )<sup>1)</sup>
- INST setting 13 – 14 ( $\times I_r$ )<sup>1)</sup>

### OCR Options:

- Ground fault trip (400 A OCR only)
- Neutral pole protection for 4 pole MCCBs ONLY
- Pre-trip alarm

### Dimensions (mm)

Poles	3	4
H	260	260
W	140	185
D (less toggle)	103	103

**Notes:** <sup>1)</sup> Add overcurrent relay sensor AMP rating where “+” is shown.

## TemBreak 2 Electronic type S400GE

### 3 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No.	3 pole Price \$
250	100 – 250	S400 GE 3 250	2550.00
		S400 GE 3 400	2550.00

### 4 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No.	4 pole Price \$
250	100 – 250	S400 GE 4 250	3380.00
		S400 GE 4 400	3400.00

### S400GE with additional protection options

Description	Cat. No.	Price \$
3 P OCR options:	PTA <sup>1)</sup>	S400 GE 3 AP 400 2750.00
	GF <sup>1)2)</sup>	S400 GE 3 AG 400 2720.00
	PTA + GF <sup>1)2)</sup>	S400 GE 3 APG 400 2925.00
4 P OCR options:	PTA <sup>1)</sup>	S400 GE 4 AP 400 3590.00
	NP <sup>1)</sup>	S400 GE 4 AN 400 3590.00
	PTA + NP <sup>1)</sup>	S400 GE 4 APN 400 3780.00
	GF + NP <sup>1)</sup>	S400 GE 4 AGN 400 3780.00

**Notes:** <sup>1)</sup> For additional information on OCR setting and options refer section 9 or Part C catalogue.

<sup>2)</sup> Where a neutral is present, a 4th Neutral pole CT is required for 3 pole GF MCCBs, and must be ordered separately using Cat. No.: T2GB40N04A. Refer page 3 - 100.

## TemBreak 2 Electronic XOW Metering MCCBs S400GE\_X1L / X1S

**70 kA**

**Current rating:** 100 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	415	70	50



New  
metering  
MCCB

### XOW Over Current Relay:

- Ammeter or Energy Metering types
- Adjustable LSI setting for grading applications
- Base current adjustable from 40% - 100% of I<sub>n</sub>

### MCCB Standard features:

#### S400GE\_X1L

- Ammeter, Adjustable LSI
- Trip event log, Alarm event log, Test function

#### S400GE\_X1S

- Energy (multifunction) meter: A, V, P, kW, kWh, E, Pf, F, H
- Adjustable LSI
- Backlit LCD display
- Ground fault, Pre trip alarm, Phase rotation & Neutral pole protection
- Trip and Alarm event log, Test function, Trip indication contact output
- Modbus RTU 485 communications
- External door mounting meter option (T2ED not incl. in below pricing)

### Dimensions (mm)

Poles	3	4
H (less attached busbar)	260	260
W	140	185
D (less toggle)	103	103



T2ED

	Ampere Rating	Ir Adj. NRC	Ir Adj. Min.	Ir Adj. Max.	Cat. No. ')	3 pole Price \$	4 pole Price \$
MCCB with ammeter	250	100	250		S400 GE 3 250 X1L	4650.00	
	400	160	400		S400 GE 4 250 X1L		5690.00
	250	100	250		S400 GE 3 400 X1L	4900.00	
	400	160	400		S400 GE 4 400 X1L		5880.00
MCCB with energy meter	250	100	250		S400 GE 3 250 X1S	6550.00	
	400	160	400		S400 GE 4 250 X1S		7750.00
	250	100	250		S400 GE 3 400 X1S	6800.00	
	400	160	400		S400 GE 4 400 X1S		8160.00

**Notes:** NRC: Nominal rated current, Ir: Current adjustment dial setting, STD= Short Time Delay, INST = instantaneous  
For additional information on installation, options and applications refer Section 9, Part C catalogue or NHP.

## TemBreak 2 690 V AC High Fault Interruption MCCB L400PE

### 70 kA

**Current rating:** 100 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	690	70	50



### Over Current Relay:

- Electronic, for general & selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_R$  is adjustable from 40% - 100% of the nominal rated current  $I_n$
- STD setting  $2.5 - 10 (x I_R)^1$
- INST setting  $14 (Max 13 x I_n)^1$

### Dimensions (mm)

Poles	3
H (less attached busbar)	260
W	140
D (less toggle)	140

### 3 Pole

Ampere Rating NRC	Adj. $I_R$ Min. – Max.	Cat. No.	3 pole Price \$
250	100 – 250	L400 PE 3 250	3240.00
400	252 – 400	L400 PE 3 400	3240.00

**Notes:** NRC = Nominal rated current,  $I_R$  = Current adjustment dial setting, STD = Short Time Delay, INST = instantaneous

<sup>1)</sup> The STD and Instantaneous pickup currents ( $I_{sd}$  &  $I_i$ ) settings are not individually adjustable, however by selecting different curve types and different  $I_R$  settings the values will vary. Curves 1 & 2  $I_{sd} = 2.5 x I_R$ , curve 3  $I_{sd} = 5 x I_R$ , curves 4 - 7  $I_{sd} = 10 x I_R$ .  
 $I_R$  dial setting 0.4 – 0.9  $I_i = 14 x I_R$  and  $I_R$  dial setting 0.95 – 1.0  $I_i = 13 x I_R$ .  
 Not suitable for reverse connection either individually or on a chassis.  
 Suitable for general motor starting and power distribution applications.  
 Refer NHP for 4 pole version availability.  
 Refer NHP for additional information.

## TemBreak 2 Electronic type S400PE

### 85 kA

**Current rating:** 100 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	85	85



### Overcurrent relay:

- Electronic, for general and selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .
- STD setting 2.5 – 10 (x  $I_r$ )<sup>1)</sup>
- INST setting 13 – 14 (x  $I_r$ )<sup>1)</sup>

### OCR Options:

- Ground fault trip (400 A OCR only)
- Neutral pole protection for 4 pole MCCBs ONLY
- Pre-trip alarm

**Notes:** <sup>1)</sup> Add overcurrent relay sensor AMP rating where “+” is shown.

## TemBreak 2 Electronic type S400PE

### Dimensions (mm)

Poles	3	4
H	260	260
W	140	185
D (less toggle)	103	103

### 3 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No.	3 pole Price \$
250	100 – 250	S400 PE 3 250	2780.00
400	160 – 400	S400 PE 3 400	2780.00

### 4 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No.	4 pole Price \$
250	100 – 250	S400 PE 4 250	3480.00
400	160 – 400	S400 PE 4 400	3480.00

### Price Adder – For OCR options

Description	Cat. No.	Price \$
3 P OCR options:	PTA <sup>1)</sup>	S400 PE 3 AP + 187.00
	GF <sup>1)2)</sup>	S400 PE 3 AG 400 187.00
	PTA + GF <sup>1)2)</sup>	S400 PE 3 APG 400 375.00
4 P OCR options:	PTA <sup>1)</sup>	S400 PE 4 AP + 187.00
	NP <sup>1)</sup>	S400 PE 4 AN + 187.00
	PTA + NP <sup>1)</sup>	S400 PE 4 APN + 375.00
	GF + NP <sup>1)</sup>	S400 PE 4 AGN 400 375.00

**Notes:** <sup>1)</sup> For additional information on OCR setting and options refer section 9 or Part C catalogue.

<sup>2)</sup> Where a neutral is present, a 4th Neutral pole CT is required for 3 pole GF MCCBs, and must be ordered separately using Cat. No.: T2GB40N04A. Refer to page 3 - 100.

## TemBreak 2 Electronic type H400NE

### 125 kA

**Current rating:** 100 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	380/415	125	85



### Overcurrent relay:

- Electronic, for general and selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .
- STD setting 2.5 – 10 ( $\times I_r$ ) <sup>1)</sup>
- INST setting 13 – 14 ( $\times I_r$ ) <sup>1)</sup>

### OCR Options:

- Ground fault trip (400 A OCR only)
- Neutral pole protection for 4 pole MCCBs
- Pre-trip alarm

**Notes:** <sup>1)</sup> Add overcurrent relay sensor AMP rating where "+" is shown.

## TemBreak 2 Electronic type H400NE

### Dimensions (mm)

Poles	3	4
H	260	260
W	140	185
D (less toggle)	140	140

### 3 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No.	3 pole Price \$
250	100 – 250	H400 NE 3 250	3240.00
400	160 – 400	H400 NE 3 400	3240.00

### 4 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No.	4 pole Price \$
250	100 – 250	H400 NE 4 250	4320.00
400	160 – 400	H400 NE 4 400	4320.00

### Price Adder – For OCR options

Description	Cat. No.	Price \$
3 P OCR options:	PTA <sup>1)</sup>	H400 NE 3 AP + 187.00
	GF <sup>1)2)</sup>	H400 NE 3 AG 400 187.00
	PTA + GF <sup>1)2)</sup>	H400 NE 3 APG 400 375.00
4 P OCR options:	PTA <sup>1)</sup>	H400 NE 4 AP + 187.00
	NP <sup>1)</sup>	H400 NE 4 AN + 187.00
	PTA + NP <sup>1)</sup>	H400 NE 4 APN + 375.00
	GF + NP <sup>1)</sup>	H400 NE 4 AGN 400 375.00

**Notes:** <sup>1)</sup> For additional information on OCR setting and options refer section 9 or Part C catalogue.

<sup>2)</sup> Where a neutral is present, a 4th Neutral pole CT is required for 3 pole GF MCCBs, and must be ordered separately using Cat. No.: T2GB40N04A. Refer to page 3 - 100.

## TemBreak 2 Electronic XOW Metering MCCBs H400NE\_X1L / X1S

### 125 kA

**Current rating:** 100 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	415	125	85



3

### XOW Over Current Relay:

- Ammeter or Energy Metering types
- Adjustable LSI setting for grading applications
- Base current adjustable from 40% - 100% of  $I_n$

### MCCB Standard features:

#### H400NE\_X1L

- Ammeter, Adjustable LSI
- Trip event log, Alarm event log, Test function

#### H400NE\_X1S

- Energy (multifunction) meter: A, V, P, kW, kWh, E, Pf, F, H
- Adjustable LSI
- Backlit LCD display
- Ground fault, Pre trip alarm, Phase rotation & Neutral pole protection
- Trip and Alarm event log, Test function, Trip indication contact output
- Modbus RTU 485 communications
- External door mounting meter option (T2ED not incl. in below pricing)



### Dimensions (mm)

Poles	3	4
H (less attached busbar)	260	260
W	140	185
D (less toggle)	103	103



T2ED

	Ampere Rating	Ir Adj. NRC	Min.	Max.	Cat. No.	3 pole Price \$	4 pole Price \$
MCCB with ammeter	250	100	250		H400 NE 3 250 X1L	5350.00	
	400	160	400		H400 NE 4 250 X1L		6540.00
	250	100	250		H400 NE 3 400 X1L	5350.00	
	400	160	400		H400 NE 4 400 X1L		6540.00
MCCB with energy meter	250	100	250		H400 NE 3 250 X1S	7150.00	
	400	160	400		H400 NE 4 250 X1S		8250.00
	250	100	250		H400 NE 3 400 X1S	7150.00	
	400	160	400		H400 NE 4 400 X1S		8250.00

**Notes:** NRC: Nominal rated current, Ir: Current adjustment dial setting, STD= Short Time Delay, INST = instantaneous  
For additional information on installation, options and applications refer Section 9, Part C catalogue or NHP.

## TemBreak 2 Electronic type L400NE

### 200 kA

**Current rating:** 100 – 400 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	<b>Voltage</b>	<b>Icu</b>	<b>Ics</b>
AC use	380/415	200	150



3

### Overcurrent relay:

- Electronic, for general and selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .
- STD setting 2.5 – 10 ( $\times I_r$ )<sup>1)</sup>
- INST setting 13 – 14 ( $\times I_r$ )<sup>1)</sup>

### OCR Options:

- Ground fault trip (400 A OCR only)
- Neutral pole protection for 4 pole MCCBs
- Pre-trip alarm

**Notes:** <sup>1)</sup> Add Over Current Relay sensor AMP rating where "+" is shown.

Price schedule 'T2'

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GST not included

NHP Sales 1300 NHP NHP

www.nhp.com.au

## TemBreak 2 Electronic type L400NE

### Dimensions (mm)

Poles	3	4
H	260	260
W	140	185
D (less toggle)	140	140

### 3 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No. <sup>1)</sup>	3 pole Price \$
250	100 – 250	L400 NE 3 250	3370.00
400	160 – 400	L400 NE 3 400	3370.00

### 4 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No. <sup>1)</sup>	4 pole Price \$
250	100 – 250	L400 NE 4 250	4380.00
400	160 – 400	L400 NE 4 400	4380.00

### Price Adder – For OCR options.

Description	Cat. No.	3 pole Price \$
3 P OCR options:	PTA <sup>2)</sup>	L400 NE 3 AP + 187.00
	GF <sup>2)</sup> <sup>3)</sup>	L400 NE 3 AG 400 187.00
	PTA + GF <sup>2)</sup> <sup>3)</sup>	L400 NE 3 APG 400 375.00
4 P OCR options:	PTA <sup>2)</sup>	L400 NE 4 AP + 187.00
	NP <sup>2)</sup>	L400 NE 4 AN + 187.00
	PTA + NP <sup>2)</sup>	L400 NE 4 APN + 375.00
	GF + NP <sup>2)</sup>	L400 NE 4 AGN 400 375.00

- Notes:**
- 1) Add Over Current Relay sensor AMP rating where "+" is shown.
  - 2) For additional information on OCR setting and options refer section 9 or Part C catalogue.
  - 3) Where a neutral is present, a 4th Neutral pole CT is required for 3 pole GF MCCBs, and must be ordered separately using Cat. No.: T2GB40N04A. Refer to page 3 - 100.



## THINK PRODUCTS AND SOLUTIONS. THINK NHP.

NHP's Products Team is backed by years of experience from dedicated engineers and specialists, focused on providing Australasia's most comprehensive product range and project solutions.

### Products Team

As well as extensive application, technical and product knowledge, our high quality Products Teams are determined to provide customised motor starters and controllers to specification, by listening to you and your needs.

Together with NHP's Service Team, NHP is able to offer assistance with commissioning and site maintenance work.

Think Products and Solutions. Think NHP.

## TemBreak 2 Electronic type E630NE

### 36 kA

**Current rating:** 252 – 630 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	36	36



**Overcurrent relay:**

- Electronic, for general and selectivity applications
- 6 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .
- STD setting 2.5 – 8 ( $\times I_r$ ) <sup>1)</sup>
- INST setting 10 – 14 ( $\times I_r$ ) <sup>1)</sup>

**OCR Options:**

- Ground fault trip

**Dimensions (mm)**

Poles	3
H	260
W	140
D (less toggle)	103

**3 Pole**

Ampere Rating NRC	Adj. $I_r$ Min. – Max.	Cat. No.	3 pole Price \$
630	252 – 630	E630 NE 3 630	2700.00

**Notes:** <sup>1)</sup> The STD and instantaneous pickup current ( $I_{sd}$  &  $I_i$ ) settings are not individually adjustable, however by selecting different curve types and different  $I_r$  settings the values will vary. Curve 1 & 2  $I_{sd} = 2.5 \times I_{Rr}$ , curve 3  $I_{sd} = 5 \times I_{Rr}$ , curve 4 - 6  $I_{sd} = 8 \times I_{Rr}$ .  $I_{Rr}$  dial setting 0.4 – 0.63  $I_i = 14 \times I_{Rr}$  and  $I_{Rr}$  dial setting 0.8 – 1.0  $I_i = 10 \times I_{Rr}$ . Refer curve examples and setting data in Section 9.

NRC = Nominal rated current,  $I_{Rr}$  = Current adjustment dial setting, STD = Short Time Delay, INST = instantaneous

## TemBreak 2 Electronic type S630CE

**50 kA**

**Current rating:** 252 – 630 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	380/415	50	50



**Overcurrent relay:**

- Electronic, for general and selectivity applications
- 6 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .
- STD setting 2.5 – 8 ( $\times I_r$ )<sup>1)</sup>
- INST setting 10 – 14 ( $\times I_r$ )<sup>1)</sup>

**OCR Options:**

- Refer S630GE

**Dimensions (mm)**

Refer page 3 - 86

**3 Pole**

Ampere Rating NRC	Adj. $I_r$ Min. – Max.	Cat. No.	3 pole Price \$
630	252 – 630	S630 CE 3 630	2920.00

**4 Pole**

Ampere Rating NRC	Adj. $I_r$ Min. – Max.	Cat. No.	4 pole Price \$
630	252 – 630	S630 CE 4 630	3880.00

**Notes:** <sup>1)</sup> The STD and instantaneous pickup currents ( $I_{sd}$  &  $I_i$ ) settings are not individually adjustable, however by selecting different curve types and different  $I_r$  settings the values will vary. Curve 1 & 2  $I_{sd} = 2.5 \times I_r$ , curve 3  $I_{sd} = 5 \times I_r$ , curve 4 - 6  $I_{sd} = 8 \times I_r$ .  $I_r$  dial setting 0.4 – 0.63  $I_i = 14 \times I_r$  and  $I_r$  dial setting 0.8 – 1.0  $I_i = 10 \times I_r$ . Refer curve examples and setting data in Section 9.  
 NRC = Nominal rated current,  $I_r$  = Current adjustment dial setting, STD = Short Time Delay, INST = instantaneous

# T1HS / T2HS HANDLES

For Terasaki moulded case circuit breakers up to 1600 A.



POWER PROTECTION



PP-TERASAKI-T1HS HANDLE - CPB

- IP55 rated plastic handle
- Long variable depth shaft supplied standard
- Heavy duty metal locking lever standard
- Internal door interlocking components are all metal
- All handles mount in a 31-37 mm hole
- Short lever handles on MCCBs to 250 A, longer types 400 - 1600 A
- 105 mm<sup>2</sup> or 130 mm<sup>2</sup> escutcheon plates are optional
- Handles are padlockable in the OFF position as standard
- ON padlocking optional via on site handle modification
- Accepts up to three 4 - 8 mm locks or multi lock devices
- Door opens when handle is switched to OFF position
- Door will not open when handle is padlocked OFF
- Door defeat function standard
- Padlock option for handle mechanism mounted on MCCB
- Door defeat non functional when padlocked OFF
- All handle mechanisms allow MCCB dial setting viewing and access
- For IP 65 applications T1HP/T2HP handles are available
- ON indication flag on handle mechanism
- Prosafe trapped key interlock options



## TemBreak 2 Electronic type S630GE

### 70 kA

**Current rating:** 252 – 630 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	<b>Voltage</b>	<b>Icu</b>	<b>Ics</b>
AC use	380/415	70	50



3

### Overcurrent relay:

- Electronic, for general and selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_r$  is adjustable from 40 % – 100 % of the nominal rated current  $I_n$ .
- STD setting  $2.5 - 8 (x I_r)^1$
- INST setting  $10 - 14 (x I_r)^1$

### OCR Options:

- Ground fault trip
- Neutral pole protection for 4 pole MCCBs ONLY
- Pre-trip alarm

**Notes:** <sup>1)</sup> The STD and instantaneous pickup currents ( $I_{sd}$  &  $I_i$ ) settings are not individually adjustable, however by selecting different curve types and different  $I_r$  settings the values will vary. Curve 1 & 2  $I_{sd} = 2.5 \times I_r$ , curve 3  $I_{sd} = 5 \times I_r$ , curve 4 - 6  $I_{sd} = 8 \times I_r$ .  $I_r$  dial setting 0.4 – 0.63  $I_i = 14 \times I_r$  and  $I_r$  dial setting 0.8 – 1.0  $I_i = 10 \times I_r$ . Refer curve examples and setting data in Section 9.  
 NRC = Nominal rated current,  $I_r$  = Current adjustment dial setting, STD = Short Time Delay, INST = instantaneous

## TemBreak 2 Electronic type S630GE

### Dimensions (mm)

Refer page 3 - 86

#### 3 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No.	3 pole Price \$
630	252 – 630	S630 GE 3 630	3130.00

#### 4 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No.	4 pole Price \$
630	252 – 630	S630 GE 4 630	4180.00

### MCCB price with OCR option fitted.

Description	Cat. No.	Price \$
3 P OCR options: PTA <sup>1)</sup>	S630 GE 3 AP 630	3330.00
GF <sup>1)2)</sup>	S630 GE 3 AG 630	3330.00
PTA + GF <sup>1)2)</sup>	S630 GE 3 APG 630	3530.00
4 P OCR options: PTA <sup>1)</sup>	S630 GE 4 AP 630	4370.00
NP <sup>1)</sup>	S630 GE 4 AN 630	4370.00
PTA + NP <sup>1)</sup>	S630 GE 4 APN 630	4570.00
GF + NP <sup>1)</sup>	S630 GE 4 AGN 630	4570.00

- Notes:** <sup>1)</sup> To order a MCCB with the above options insert the required option after the pole to make up the Cat. No. E.g.: S630GE 3 AG 630 is a S630GE 3 Pole 630 A MCCB c/w Ground Fault protection.
- <sup>2)</sup> Where a neutral is present, a 4th Neutral pole CT is required for 3 pole GF MCCBs and must be ordered separately using Cat. No.: T2GB40N06A. Refer to page 3 - 100.

## TemBreak Electronic XOW Metering MCCBs S630GE\_X1L / X1S

**70 kA**

**Current rating:** 252 – 630 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	415	70	50



**XOW Over Current Relay:**

- Ammeter or Energy Metering types
- Adjustable LSI setting for grading applications
- Base current adjustable from 40% - 100% of I<sub>n</sub>

**MCCB Standard features:**

**S630PE\_X1L**

- Ammeter, Adjustable LSI
- Trip event log, Alarm event log, Test function

**S630PE\_X1S**

- Energy (multifunction) meter: A, V, P, kW, kWh, E, Pf, F, H
- Adjustable LSI
- Backlit LCD display
- Ground fault, Pre trip alarm, Phase rotation & Neutral pole protection
- Trip and Alarm event log, Test function, Trip indication, Trip indication contact output
- Modbus RTU 485 communications
- External door mounting meter option (T2ED not incl. in below pricing)



**Dimensions (mm)**

Poles	3	4
H (less attached busbar)	260	260
W	140	185
D (less toggle)	103	103



T2ED

	Ampere Rating	I <sub>r</sub> Adj. NRC	Min. Max.	Cat. No.	3 pole Price \$	4 pole Price \$
MCCB with ammeter	630	252	630	S630 GE 3 630 X1L	5500.00	
				S630 GE 4 630 X1L		6600.00
MCCB with energy meter	630	252	630	S630 GE 3 630 X1S	7340.00	
				S630 GE 4 630 X1S		8800.00

**Notes:** NRC: Nominal rated current, I<sub>r</sub>: Current adjustment dial setting, STD= Short Time Delay, INST = instantaneous  
For additional information on installation, options and applications refer Section 9, Part C catalogue or NHP.

## Accessories to suit 400 / 630 AF TemBreak 2



3

### External accessories

Cat. No.

Price \$

Shunt trips Internal accessories are common for MCCBs 125 A to 630 A. All have screw terminals except those indicated below with wire leads as standard

#### For 3 and 4 pole MCCBs

SH	110 V AC	T2SH00A10TA <sup>1)</sup>	255.00
	230 – 240 V AC	T2SH00A20TA <sup>1)</sup>	255.00
	400 – 415 V AC	T2SH00A40TA <sup>1)</sup>	255.00
	24 V DC (Suits 24 V AC)	T2SH00D02TA <sup>1)</sup>	255.00
	48 V DC	T2SH00D04TA <sup>1)</sup>	255.00
	110 V DC	T2SH00D10TA <sup>1)</sup>	255.00
	230 V DC	T2SH00D20TA <sup>1)</sup>	255.00

Undervoltage trips **Instantaneous operation**

UV	110 V AC	T2UV00A10NTA	270.00
	200 – 240 V AC	T2UV00A20NTA	270.00
	380 – 450 V AC	T2UV00A40NTA	270.00
	24 V DC	T2UV00D02NTA	270.00
	110 V DC	T2UV00D10NTA	270.00
	230 V DC	T2UV00D20NTA	270.00

#### Time delayed operation (500 ms) – refer NHP

Auxiliary & Alarm switches **General type (2 A @ 240 V Inductive)**

AX	1 C/O Auxiliary	T2AX00M3STA	134.00
	1 C/O Auxiliary – with 0.7 m wire leads	T2AX00M3SWA	146.00
	1 C/O Alarm	T2AL00M3STA	134.00
	1 C/O Alarm – with 0.7 m wire leads	T2AL00M3SWA	146.00

#### Heavy-duty type (4 A @ 240 V Inductive)

AL	1 N/O Auxiliary	T2AX00B1STA	146.00
	1 N/C Auxiliary	T2AX00B2STA	146.00
	1 N/O Alarm	T2AL00B1STA	146.00
	1 N/C Alarm	T2AL00B2STA	146.00

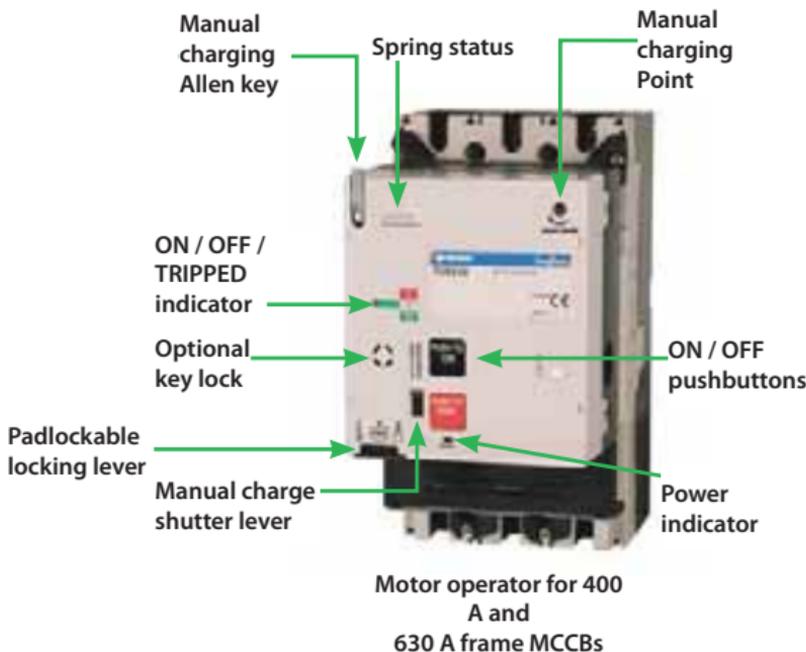
#### Micro switching type (very low voltages)

	1 C/O Auxiliary	T2AX00M3RTA	187.00
	1 C/O Alarm	T2AL00M3RTA	187.00

Notes: <sup>1)</sup> Wire lead types available.

## Accessories to suit 400 / 630 AF TemBreak 2

External accessories	Cat. No.	Price \$
Motor operators	<b>Suits MCCB types E400, S400, H400, L400, E630, S630</b>	
	110 – 240 V AC	<b>T2MC40A10NB 2420.00</b>
	24 – 48 V DC	<b>T2MC40D02NB 2420.00</b>
	110 V DC	<b>T2MC40D10NB 2420.00</b>
<b>MC</b>	<b>Motor connection cable loom for Electrical interlocking</b>	
	T2MC40 cable 600 mm. 400AF only	<b>T2MM40L06A 60.50</b>
	T2MC40 cable 2100 mm. 400AF only	<b>T2MM40L21A 80.00</b>
	Motor options: Contact NHP for key locking and auto-reset.	
MCCB identification labels	<b>T40CAPLAB 3.50</b>	



## Accessories to suit 400 / 630 AF TemBreak 2

External accessories	Cat. No.	Price \$
Operating handles	<b>Suits MCCB types E400, S400, H400, L400, E630, S630</b>	
Direct mounting, fixed depth, IP 54	Grey/black	<b>T2HB40UR5BN 240.00</b>
	Red/yellow	<b>T2HB40UR5RN 265.00</b>
	MCCB identification labels	<b>T40CAPLAB 3.50</b>
<b>HB</b>		
Door interlocking variable depth handles	<b>E400, S400, H400, L400, E630, S630</b>	
	Grey IP55 handle + 320 mm shaft	<b>T2HS40R5GM 370.00</b>
	Red/yellow IP55 handle + 320 mm shaft	<b>T2HS40R5RM 315.00</b>
	Large escutcheon plate option: 100 mm <sup>2</sup>	<b>T2HSESC100 18.20</b>
	390mm T pin shaft for T2HS - no flexi coupling	<b>T2HS400SHAFT 47.00</b>
	Grey/black IP65 handle + 445 mm shaft	<b>T2HP40R6BN 315.00</b>
	Red/yellow IP65 handle + 445 mm shaft	<b>T2HP40R6RN 330.00</b>
	Padlock attachment for T2HP/HS mechanism	<b>T2HP40PALK 49.50</b>
	MCCB identification labels	<b>T40CAPLAB 3.50</b>



T2HP40 Variable depth handle



T2HP40PALK Mechanism padlock attachment



T2HS handle with optional escutcheon plate, type T2HSESC100



T2HB fixed depth "direct mount" handle

**Notes:** Handles supplied with key locks available on request for T2HP handles.

## Accessories to suit 400 / 630 AF TemBreak 2

External accessories	Cat. No.	Price \$
Mechanical Interlocks	Link Interlock – suitable for motorised operation. Suitable for front or rear contact MCCBs	
Link type	<b>E400, S400, H400, L400, E630, S630<sup>1)</sup></b>	
<b>ML</b>	Common 3 or 4 pole right side section	<b>T2ML40RB 350.00</b>
	3 pole left side section	<b>T2ML40L3B 133.00</b>
	4 pole left side section	<b>T2ML40L4B 133.00</b>
	MCCB identification labels	<b>T40CAPLAB 3.50</b>
<b>MH</b>	Link Interlock – suitable for manual handle operation only. Suitable for front or rear contact MCCBs	
	<b>E400, S400, H400, L400, E630, S630</b>	
	Common 3 or 4 pole right side section	<b>T2MLH40RB 350.00</b>
	3 pole left side section	<b>T2MLH40L3B 133.00</b>
	4 pole left side section	<b>T2MLH40L4B 133.00</b>
	MCCB identification	<b>T40CAPLAB 3.50</b>

3

Left section 3 or 4 pole  
(T2ML40L3B shown)

Common right side  
section T2ML40RB



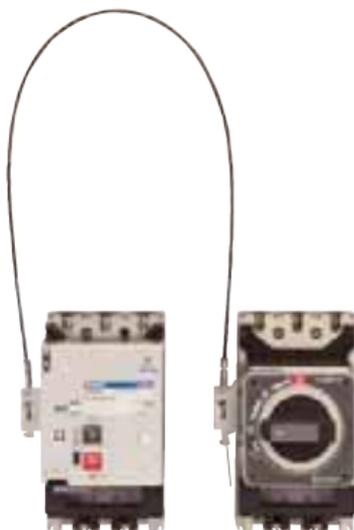
T2ML Interlock for motorised operation

**Notes:** Refer to Section 5 if MCCB labels are required or refer to NHP.  
<sup>1)</sup> A handle or motor must be fitted in addition to the interlock.

## Accessories to suit 400 / 630 AF TemBreak 2

External accessories		Cat. No.	Price \$
Slide type interlock	Manual operation, padlockable. Does not allow motors, handles or other front mounted accessories to be fitted.		
	<b>Suitable for front or rear connection</b> <b>E400, S400, E630, S630</b>		
<b>MS</b>	3 pole	T2MS403SFA	220.00
	4 pole	T2MS404SFA	210.00
Cable interlock	Allows an MCCB to be mounted horizontally, vertically or diagonally.		
	<b>Suitable for 3 or 4 pole MCCBs</b> <b>E400, S400, H400, L400, E630, S630 <sup>1)</sup></b>		
<b>MW</b>	Interlock kit less wire for motorised operation	T2MW40CB	330.00
	Interlock kit less wire for manual handle operation	T2MWH40CB	330.00
	Wire for above interlocks Wire 1.0 M	T2MW00SA <sup>2)</sup>	63.00
	Wire 1.5 M	T2MW00LA <sup>2)</sup>	73.00
	MCCB identification labels	T40CAPLAB	3.50

T2MW50CB  
Interlock  
and motor



T2MWH4CB  
Interlock and  
handle

T2MW40 wire interlocked MCCBs,  
showing either a motor or handle installed

**Notes:** <sup>1)</sup> A handle or motor must be fitted in addition to the interlock.  
<sup>2)</sup> Use one wire length for each MCCB pair.

## Accessories to suit 400 / 630 AF TemBreak 2

External accessories	Cat. No.	Price \$
Standard terminal covers FC	<b>E400, S400, H400, L400, E630, S630 <sup>2)</sup></b>	
	3 pole cover set of 2, 180 mm wide	<b>T2CF403SWNG <sup>1)</sup></b> 190.00
	3 pole cover set of 2, 140 mm wide	<b>T2CF403SLNG <sup>1)</sup></b> 190.00
<b>CF</b>	4 pole cover set of 2, 185 mm wide	<b>T2CF404SLNG</b> 205.00
	4 pole cover set of 2, 238 mm wide	<b>T2CF404SWNG</b> 205.00



T2CF Wide cover shown at top of MCCB



T2CF Narrow cover



T2CF403SWNG Wide cover suitable for flanged bar connection.

**T2CF403SLNG**

Narrow covers include as standard:

- Locking clip for seal device
- IP 20 inserts with knock outs



T2CF403SLNG Narrow cover, which is the same width as the MCCB.

**Notes:** <sup>1)</sup> For 400/630 A MCCBs, 'Flush' and 'rear' covers are the same item.  
<sup>2)</sup> Locking clip T2FOOL tool supplied standard.

## Accessories to suit 400 / 630 AF TemBreak 2

External accessories	Cat. No.	Price \$
Terminal covers <sup>3)</sup>	<b>Rear Connect/ or flush front connect cover. E400, S400, H400, L400, E630, S630</b>	
<b>CS/CR</b>	3 pole cover set of 2	<b>T2CR403SG 93.50</b>
	4 pole cover set of 2	<b>T2CR404SG 111.00</b>
Terminal cover locking clip	A clip that provides additional terminal cover position locking, and also allows a lead seal to be fitted All sizes 125, 250, 400, 630 AF	<b>T2CF00L 9.10</b>
Interpole Barriers <sup>1) 2)</sup>	<b>E400, S400, E630, S630</b>	
	Interpole barrier (Qty 2)	<b>T2BA403SHA 21.60</b>
	<b>H400, L400</b>	
<b>BA</b>	Interpole barrier (Qty 2)	<b>T2BA403LHA POA</b>



T2CR / T2CS

Flush cover with 'knock-outs' for optional rear connect use.



T2CF00L

Locking clip



T2BA

Interpole barriers

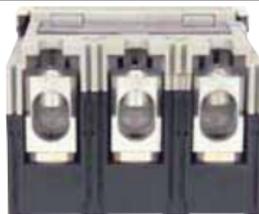
- Notes:**
- 1) Line side interpole barriers or terminal covers must be installed with MCCBs.
  - 2) Interpole Barriers are supplied with MCCBs as standard; 2 barriers with 3 pole MCCBs, and 3 barriers with 4 pole MCCBs.
  - 3) For 400/630 A MCCBs, "flush" and "rear" covers are the same item.

## Accessories to suit 400 / 630 AF TemBreak 2

External accessories	Cat. No.	Price \$
ProSafe lock option	ProSafe locks can be mounted with T2HS variable depth handle operation. Refer NHP for direct mounting handle options.	
<b>TKN</b>	<b>Suits MCCB types E/S/H/L 400 - 630</b>	
	Prosafe shot bolt lock HS handles xx code	<b>TKNHP_ 520.00</b>
	Prosafe standard key xx code for above	<b>TKNNHPKEY_ 130.00</b>
	Cam for T2HS handle shafts Key codes A to Z are available. Specify by changing the key code above.	<b>14997702 235.00</b>
Toggle locks	Non Captive: Fits up to 3 padlocks or a multiple lock device <b>E400, S400, H400, L400, E630, S630</b>	
<b>HL</b>	Lock with three 8 mm holes	<b>T2HL40A 73.00</b>
	Captive: Allows a single padlock or multiple padlock device <b>E400, S400, H400, L400, E630, S630</b>	
	Lock with two 8 mm holes	<b>T2HL40CAP 73.00</b>
Attached Busbar	<b>E400, S400, H400, L400, E630, S630</b>	
<b>FB</b>	3 Pole, set of 6, wide bar, 400 A	<b>2H1384DAA 225.00</b>
	3 Pole, set of 6, wide bar set, 630 A	<b>T2FB463BA 240.00</b>
	4 Pole, set of 8, wide bar set, 630 A	<b>T2FB464BA 305.00</b>
Tunnel clamp terminals	<b>E400, S400, H400, L400, E630, S630</b>	
<b>FW</b>	3 Pole, set of 6 clamps 240 mm <sup>2</sup>	<b>T2FW40L3A 415.00</b>
	4 Pole, set of 8 clamps 240 mm <sup>2</sup>	<b>T2FW40L4A 560.00</b>



T2FB Attached flat bar



T2FW Tunnel clamp terminals



T2HL Toggle lock (captive)



T2HL Toggle lock (non-captive)

## Accessories to suit 400 / 630 AF TemBreak 2

External accessories		Cat. No.	Price \$
3 RP	Rear connect terminal studs	<b>Suits MCCB types E400, S400</b>	
		3 pole kit, set of 6 studs	T2RP403SA 650.00
		4 pole kit, set of 8 studs	T2RP404SA 870.00
		<b>H400, L400</b>	
		3 pole kit, set of 6 studs	T2RP403LA 670.00
		4 pole kit, set of 8 studs	T2RP404LA 940.00
		<b>E630, S630</b>	
		3 pole kit, set of 6 studs	T2RP463SA 740.00
	4 pole kit, set of 8 studs	T2RP464SA 980.00	
UP	TemPlug	<b>Suits MCCB types TemPlug MCCB line-side plug-in attachment</b>	
		<b>E400, S400</b>	
		3 pole TemPlug	T2UPX3400 405.00
		<b>E630, S630</b>	
	3 pole TemPlug	T2UPX3630 770.00	
	Templugs suit 6.3 mm busbar (10 mm optional)		
GB	External neutral CT	400 A CT	T2GB40N04A 290.00
		630 A CT	T2GB40N06A 440.00
PM	Electronic OCR checker	110 V AC	TNS2110V POA
		230 V AC	TNS2240V POA
DR	Plug-in MCCB (refer rear of section 3)		
	Draw-out MCCB		

Now available - Refer NHP



T2RP rear connect studs



T2UPX3400  
400 A Templug



T2UPX3630  
630 A Templug

## Accessories to suit 400 / 630 AF TemBreak 2

External accessories		Cat. No.	Price \$
Door flange	Provides an attractive panel cut-out surround for MCCBs or motors		
	<b>Suits MCCB sizes</b>		
	<b>E400, S400, H400, L400, E630, S630</b>		
<b>DF</b>	MCCB IP 30 gland and gasket	<b>T2DF40A</b>	<b>132.00</b>
	MOTOR IP 30 gland and gasket	<b>T2DM40A</b>	<b>260.00</b>
Door mounting flush plate	A kit that allows an MCCB to be mounted directly onto a door		
	<b>E400, S400, E630, S630</b>		
<b>FP</b>	3 pole kit	<b>T2FP40S3A</b>	<b>280.00</b>
	4 pole kit	<b>T2FP40S4A</b>	<b>POA</b>
Wire lead terminal block	left side	<b>T2TF40LGA</b>	<b>189.00</b>
	right side	<b>T2TF40RGA</b>	<b>189.00</b>
<b>TF</b>			

3

TNS  
Electronic OCR checker



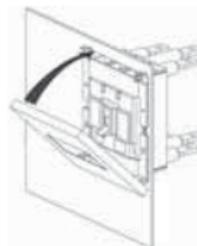
T2DF/DM  
Door flange



T2TF  
Wire lead terminal block



T2FP  
Door mounting flush plate



# MOULDED CASE CIRCUIT BREAKERS

2000 A to 3200 A

POWER PROTECTION



PP-TERASAKI-MCCB 3200A-CPB

- Current limiting
- True RMS monitoring
- I2t switch to assist in obtaining selectivity
- Powerful interrupting capacities
- Icw for 0.5 sec of 38 kA
- Limitation of system damage
- Electronic trip unit with long, short and instantaneous adjustments
- Adjustment range 50 - 100 % of nominal current rating
- Standards AS/NZS 3947-2



## TemBreak 2 Thermal magnetic type S800CJ

### 36 kA

**Current rating:** 630 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	415	36	36
DC use	250	50	50

**Trip unit:**

- Adjustable thermal: 63% I<sub>r</sub> to 100% I<sub>r</sub>
- Adjustable magnetic: 5 to 10 x I<sub>m</sub>

**Dimensions (mm)**

Poles	3
H	273
W	210
D (less toggle)	103



**3 Pole**

Ampere Rating NRC	Adj. Ir Min. – Max.	Adj. Im Min. – Max.	Cat. No.	3 pole Price \$
630	396 - 630	3150 - 6300	S800 CJ 3 630	2500.00
800	504 - 800	4000 - 8000	S800 CJ 3 800	2550.00

**Notes:** Magnetic only available on application.  
For additional information on applications refer section 9 or Part C catalogue.

NRC: Nominal rated current

Adj. Ir: Adjustable thermal setting

Adj. Im: Adjustable magnetic setting

Replaces: XS630CJ and XS800NJ for applications up to 36 kA. Note: check exact ratings or dimensions to suit your application requirement .



## TemBreak 2 Thermal magnetic type S800NJ

### 50 kA

**Current rating:** 630 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	415	50	50
DC use	250	50	50



3

### Trip unit:

- Adjustable thermal: 63%  $I_r$  to 100%  $I_r$
- Adjustable magnetic: 5 to 10 x  $I_m$

### Dimensions (mm)

Poles	3
H	273
W	210
D (less toggle)	103



### 3 Pole

Ampere Rating NRC	Adj. Ir Min. – Max.	Adj. Im Min. – Max.	Cat. No.	3 pole Price \$
630	396 - 630	3150 - 6300	<b>S800 NJ 3 630</b>	<b>2900.00</b>
800	504 - 800	4000 - 8000	<b>S800 NJ 3 800</b>	<b>3150.00</b>

**Notes:** Magnetic only available on application.

For additional information on applications refer section 9 or Part C catalogue.

NRC: Nominal rated current

Adj. Ir: Adjustable thermal setting

Adj. Im: Adjustable magnetic setting

Replaces: XS630NJ and XS800NJ. Note: check exact ratings or dimensions to suit your application requirement .

## TemBreak 2 Thermal magnetic type S800RJ

**70 kA**

**Current rating:** 630 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	415	70	50
DC use	250	50	50



3

**Trip unit:**

- Adjustable thermal: 63% I<sub>r</sub> to 100% I<sub>r</sub>
- Adjustable magnetic: 5 to 10 x I<sub>m</sub>

**Dimensions (mm)**

Poles	3	4
H	273	273
W	210	280
D (less toggle)	103	103

Early  
2013  
Release

Ampere Rating	Adj. Ir Min. – Max.	Adj. Ir Min. – Max.	Cat. No. 1)	3 pole Price \$	4 pole Price \$
630	396 - 630	3150 - 6300	S800 RJ 3 630	3910.00	
			S800 RJ 4 630		4350.00
800	504 - 800	4000 - 8000	S800 RJ 3 800	4500.00	
			S800 RJ 4 800		4950.00

**Notes:** Magnetic only available on application.

For additional information on applications refer section 9 or Part C catalogue.

NRC: Nominal rated current

Adj. Ir: Adjustable thermal setting

Adj. Im: Adjustable magnetic setting

Replaces: XH630SE and XH800SE. Note: check exact ratings or dimensions to suit your application requirement .

## TemBreak 2 Electronic type S800NE

### 50 kA

**Current rating:** 252 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	415	50	50



### Over Current Relay:

- Electronic, for general & selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current I<sub>r</sub> is adjustable from 40% - 100% of the nominal rated current I<sub>n</sub>
- STD setting 2.5 – 10 (x I<sub>R</sub>)<sup>1)</sup>
- INST setting 14 (Max 12 x I<sub>n</sub>)<sup>1)</sup>

### Dimensions (mm)

Poles	3	4
H	273	273
W	210	280
D (less toggle)	103	103



Ampere Rating NRC	Adj. I <sub>r</sub> Min. – Max.	Cat. No.	3 pole Price \$	4 pole Price \$
630	252 - 630	S800 NE 3 630	3250.00	
		S800 NE 4 630		3740.00
800	320 - 800	S800 NE 3 800	3990.00	
		S800 NE 4 800		4560.00

**Notes:** <sup>1)</sup> The STD and Instantaneous pickup currents (I<sub>sd</sub> & I<sub>i</sub>) settings are not individually adjustable, however by selecting different curve types and different I<sub>R</sub> settings the values will vary. Curves 1 & 2 I<sub>sd</sub> = 2.5 x I<sub>R</sub>, curve 3 I<sub>sd</sub> = 5 x I<sub>R</sub>, curves 4 - 7 I<sub>sd</sub> = 10 x I<sub>R</sub>. I<sub>R</sub> dial setting 0.4 – 0.8 I<sub>i</sub> = 14 x I<sub>R</sub> and I<sub>R</sub> dial setting 0.9 – 1.0 I<sub>i</sub> = 12 x I<sub>R</sub>.

NRC: Nominal rated current  
Adj. I<sub>r</sub>: Adjustable thermal setting  
Adj. I<sub>m</sub>: Adjustable magnetic setting

Replaces: XS630SE and XS800SE. Note: check exact ratings or dimensions to suit your application requirement.

## TemBreak 2 Electronic type S800RE

**70 kA**

**Current rating:** 252 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage Icu	Ics
AC use	415	70
		50

**Over Current Relay:**

- Electronic, for general & selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current  $I_R$  is adjustable from 40% - 100% of the nominal rated current  $I_n$
- STD setting  $2.5 - 10 (x I_R)^2$
- INST setting  $14 (Max 12 x I_n)^2$

**OCR options:**

- Ground Fault Trip
- Neutral Pole protection
- Pre-Trip Alarm



**Dimensions (mm)**

Poles	3	4
H	273	273
W	210	280
D (less toggle)	103	103

Ampere Rating NRC	Adj. Ir Min. – Max.	Cat. No. <sup>1)</sup>	3 pole Price \$	4 pole Price \$
630	252 - 630	S800 RE 3 630	3150.00	
		S800 RE 4 630		3810.00
800	320 - 800	S800 RE 3 800	4200.00	
		S800 RE 4 800		4850.00
<b>Price Adder for OCR options.</b> Add to above MCCB price		<b>MCCB Cat. No. with option</b>	<b>3 pole Price \$</b>	<b>4 pole Price \$</b>
3 P OCR options:		PTA <sup>3)</sup>	S800 RE 3 AP #	180.00
		GF <sup>3)</sup>	S800 RE 3 AG #	180.00
		PTA + GF <sup>3)</sup>	S800 RE 3 APG #	360.00
4 P OCR options:		PTA <sup>3)</sup>	S800 RE 4 AP #	180.00
		AP <sup>3)</sup>	S800 RE 4 AN #	180.00
		PTA + NP <sup>3)</sup>	S800 RE 4 APN #	360.00
		GF + NP <sup>3)</sup>	S800 RE 4 AGN #	360.00

**Notes:** <sup>1)</sup> “#” add OCR trip unit rating where shown with OCR options.  
<sup>2)</sup> The STD and Instantaneous pickup currents ( $I_{sd}$  &  $I_i$ ) settings are not individually adjustable, however by selecting different curve types and different  $I_R$  settings the values will vary. Curve 1 & 2  $I_{sd} = 2.5 x I_R$ , curve 3  $I_{sd} = 5 x I_R$ , curve 4 - 7  $I_{sd} = 10 x I_R$ .  
 $I_R$  dial setting 0.4 – 0.8  $I_i = 14 x I_R$  and  $I_R$  dial setting 0.9 – 1.0  $I_i = 12 x I_R$ .  
<sup>3)</sup> To order a MCCB with the above options insert the required amp rating after the option to make up the Cat. No. Eg: S800RE 4 AGN 800 is an S800RE 4 Pole 800 A MCCB c/w Neutral Protection and Ground Fault protection.  
 For additional information on OCR settings, options and applications refer section 9 or part C catalogue.  
 Replaces: XH630SE and XH800SE. Note: check exact ratings or dimensions to suit your application requirement.

## TemBreak 2 Electronic XOW Metering MCCBs S800RE\_X1L/X1S

**70 kA**

**Current rating:** 320 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage Icu		Ics
AC use	415	70	50

**XOW Over Current Relay:**

- Ammeter or Energy Metering types
- Adjustable LSI setting for grading applications
- Base current adjustable from 40% - 100% of I<sub>n</sub>

**MCCB Standard features:**

**S800RE\_X1L**

- Ammeter, Adjustable LSI
- Trip event log, Alarm event log, Test function

**S800RE\_X1S**

- Energy (multifunction) meter: A, V, P, kW, kWh, E, Pf, F, H
- Adjustable LSI
- Backlit LCD display
- Ground fault, Pre trip alarm, Phase rotation & Neutral pole protection
- Trip and Alarm event log, Test function, Trip indication contact output
- Modbus RTU 485 communications
- External door mounting meter option (T2ED not incl. in below pricing)



**Dimensions (mm)**

Poles	3	4
H	273	273
W	210	280
D (less toggle)	103	103



T2ED

	Ampere Rating NRC	Ir Adj. Min.-Max.	Cat. No. 1)	3 pole Price \$	4 pole Price \$
MCCB with ammeter	800	320 - 800	S800 RE 3 800 X1L	6450.00	
			S800 RE 4 800 X1L		7740.00
MCCB with energy meter	800	320 - 800	S800 RE 3 800 X1S	7900.00	
			S800 RE 4 800 X1S		9480.00

**Notes:** NRC: Nominal rated current  
 Adj. Ir: Adjustable thermal setting  
 Adj. Im: Adjustable magnetic setting  
 For additional information on OCR settings, options and applications refer section 9 or part C catalogue.

## TemBreak 2 Electronic type H800NE

**125 kA**

**Current rating:** 252 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	415	125	94

**Over Current Relay:**

- Electronic, for general & selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current I<sub>r</sub> is adjustable from 40% - 100% of the nominal rated current I<sub>n</sub>
- STD setting 2.5 – 10 (x I<sub>R</sub>)<sup>2</sup>)
- INST setting 14 (Max 12 x I<sub>n</sub>)<sup>2</sup>)
- **OCR Options:**
- Ground Fault Trip
- Neutral Pole protection
- Pre-Trip Alarm

**Dimensions (mm)**

Poles	3	4
H	273	273
W	210	280
D (less toggle)	103	103



Early  
2013  
Release

3

Ampere Rating NRC	Adj. I <sub>r</sub> Min. – Max.	Cat. No. <sup>1)</sup>	3 pole Price \$	4 pole Price \$
630	252 - 630	H800 NE 3 630	4230.00	
		H800 NE 4 630		4810.00
800	320 - 800	H800 NE 3 800	4590.00	
		H800 NE 4 800		5220.00
Price Adder for OCR options. Add to above MCCB price		MCCB Cat. No. with option	3 pole Price \$	4 pole Price \$
3 P OCR options:	PTA <sup>3)</sup>	H800 NE 3 AP #	180.00	
	GF <sup>3)</sup>	H800 NE 3 AG #	180.00	
	PTA + GF <sup>3)</sup>	H800 NE 3 APG #	180.00	
4 P OCR options:	PTA <sup>3)</sup>	H800 NE 4 AP #		180.00
	AP <sup>3)</sup>	H800 NE 4 AN #		180.00
	PTA + NP <sup>3)</sup>	H800 NE 4 APN #		360.00
	GF + NP <sup>3)</sup>	H800 NE 4 AGN #		360.00

**Notes:** <sup>1)</sup> “#” add OCR trip unit rating where shown with OCR options.  
<sup>2)</sup> The STD and Instantaneous pickup currents (I<sub>sd</sub> & I<sub>i</sub>) settings are not individually adjustable, however by selecting different curve types and different I<sub>r</sub> settings the values will vary. Curve 1 & 2 I<sub>sd</sub> = 2.5 x I<sub>R</sub>, curve 3 I<sub>sd</sub> = 5 x I<sub>R</sub>, curve 4 - 7 I<sub>sd</sub> = 10 x I<sub>R</sub>.  
 I<sub>R</sub> dial setting 0.4 – 0.8 I<sub>i</sub> = 14 x I<sub>R</sub> and I<sub>R</sub> dial setting 0.9 – 1.0 I<sub>i</sub> = 12 x I<sub>R</sub>.  
<sup>3)</sup> To order a MCCB with the above options insert the required amp rating after the option to make up the Cat. No. Eg: H800NE 4 AGN 800 is an H800NE 4 Pole 800 A MCCB c/w Neutral Protection and Ground Fault protection.  
 For additional information on OCR settings, options and applications refer section 9 or part C catalogue.

Replaces: TL630NE and TL800NE. Note: check exact ratings or dimensions to suit your application requirement.

## TemBreak 2 Electronic XOW Metering MCCBs H800NE\_X1L/X1S

### 125 kA

**Current rating:** 320 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	415	125	94

### XOW Over Current Relay:

- Ammeter or Energy Metering types
- Adjustable LSI setting for grading applications
- Base current adjustable from 40% - 100% of I<sub>n</sub>

### MCCB Standard features:

#### H800NE\_X1L

- Ammeter, Adjustable LSI
- Trip event log, Alarm event log, Test function

#### H800NE\_X1S

- Energy (multifunction) meter: A, V, P, kW, kWh, E, Pf, F, H
- Adjustable LSI
- Backlit LCD display
- Ground fault, Pre trip alarm, Phase rotation & Neutral pole protection
- Trip and Alarm event log, Test function, Trip indication contact output
- Modbus RTU 485 communications
- External door mounting meter option ((T2ED not incl. in below pricing)

### Dimensions (mm)

Poles	3	4
H	273	273
W	210	280
D (less toggle)	140	140



T2ED

	Ampere Rating NRC	Ir Adj. Min.-Max.	Cat. No.	3 pole Price \$	4 pole Price \$
MCCB with ammeter	800	320 - 800	H800 NE 3 800 X1L	7150.00	
			H800 NE 4 800 X1L		8500.00
MCCB with energy meter	800	320 - 800	H800 NE 3 800 X1S	8650.00	
			H800 NE 4 800 X1S		10300.00

**Notes:** NRC: Nominal rated current

Adj. Ir: Adjustable thermal setting

Adj. Im: Adjustable magnetic setting

For additional information on OCR settings, options and applications refer section 9 or part C catalogue.



## TemBreak 2 Electronic type L800NE

### 200 kA

**Current rating:** 252 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	415	200	150

### Over Current Relay:

- Electronic, for general & selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current I<sub>r</sub> is adjustable from 40% - 100% of the nominal rated current I<sub>n</sub>
- STD setting 2.5 – 10 (x I<sub>R</sub>)<sup>2</sup>)
- INST setting 14 (Max 12 x I<sub>n</sub>)<sup>2</sup>)

### OCR options:

- Ground Fault Trip
- Neutral Pole protection
- Pre-Trip Alarm



### Dimensions (mm)

Poles	3	4
H	273	273
W	210	280
D (less toggle)	140	140

Ampere Rating NRC	Adj. I <sub>r</sub> Min. – Max.	Cat. No. <sup>1)</sup>	3 pole Price \$	4 pole Price \$
630	252 - 630	L800 NE 3 630	4520.00	
		L800 NE 4 630		5350.00
800	320 - 800	L800 NE 3 800	4960.00	
		L800 NE 4 800		5960.00
Price Adder for OCR options. Add to above MCCB price		MCCB Cat. No. with option	3 pole Price \$	4 pole Price \$
3 P OCR options:		PTA <sup>3)</sup>	L800 NE 3 AP #	180.00
		GF <sup>3)</sup>	L800 NE 3 AG #	180.00
		PTA + GF <sup>3)</sup>	L800 NE 3 APG #	180.00
4 P OCR options:		PTA <sup>3)</sup>	L800 NE 4 AP #	180.00
		AP <sup>3)</sup>	L800 NE 4 AN #	180.00
		PTA + NP <sup>3)</sup>	L800 NE 4 APN #	360.00
		GF + NP <sup>3)</sup>	L800 NE 4 AGN #	360.00

**Notes:** <sup>1)</sup> “#” add OCR trip unit rating where shown with OCR options.

<sup>2)</sup> The STD and Instantaneous pickup currents (I<sub>sd</sub> & I<sub>i</sub>) settings are not individually adjustable, however by selecting different curve types and different I<sub>r</sub> settings the values will vary. Curve 1 & 2 I<sub>sd</sub> = 2.5 x I<sub>R</sub> curve 3 I<sub>sd</sub> = 5 x I<sub>R</sub> curve 4 - 7 I<sub>sd</sub> = 10 x I<sub>R</sub>. I<sub>r</sub> dial setting 0.4 – 0.8 I<sub>i</sub> = 14 x I<sub>R</sub> and I<sub>r</sub> dial setting 0.9 – 1.0 I<sub>i</sub> = 12 x I<sub>R</sub>.

<sup>3)</sup> To order a MCCB with the above options insert the required amp rating after the option to make up the Cat. No. Eg: L800NE 4 AGN 800 is an L800NE 4 Pole 800 A MCCB c/w Neutral Protection and Ground Fault protection.

For additional information on OCR settings, options and applications refer section 9 or part C catalogue.

## TemBreak 2 690V AC High Fault Interruption MCCB L800PE

### 70 kA

**Current rating:** 252 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	I <sub>cu</sub>	I <sub>cs</sub>
AC use	690	70	50

Early  
2013  
Release



3

### Over Current Relay:

- Electronic, for general & selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current I<sub>R</sub> is adjustable from 40% - 100% of the nominal rated current I<sub>N</sub>
- STD setting 2.5 – 10 (x I<sub>R</sub>)<sup>1)</sup>
- INST setting 14 (Max 12 x I<sub>N</sub>)<sup>1)</sup>

### Dimensions (mm)

Poles	3
H	273
W	210
D (less toggle)	140

### 3 Pole

Ampere Rating NRC	Adj. I <sub>r</sub> Min. – Max.	Cat. No.	3 pole Price \$
630	252 - 630	L800 PE 3 630	5340.00
800	320 - 800	L800 PE 3 800	5460.00

**Notes:** <sup>1)</sup> The STD and Instantaneous pickup currents (I<sub>sd</sub> & I<sub>i</sub>) settings are not individually adjustable, however by selecting different curve types and different I<sub>R</sub> settings the values will vary. Curves 1 & 2 I<sub>sd</sub> = 2.5 x I<sub>R</sub>, curve 3 I<sub>sd</sub> = 5 x I<sub>R</sub>, curves 4 - 7 I<sub>sd</sub> = 10 x I<sub>R</sub>. I<sub>R</sub> dial setting 0.4 - 0.9 I<sub>i</sub> = 14 x I<sub>R</sub> and I<sub>R</sub> dial setting 0.95 - 1.0 I<sub>i</sub> = 13 x I<sub>R</sub>. Not suitable for reverse connection either individually or on a chassis. Suitable for general motor starting and power distribution applications. Refer NHP for 4 pole version availability. Refer NHP for additional information. NRC: Nominal rated current. Adj. I<sub>r</sub>: Adjustable thermal setting. Adj. I<sub>m</sub>: Adjustable magnetic setting.

## TemBreak 2 Electronic type S1000NE

### 70 kA

**Current rating:** 400 – 1000 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage	Icu	Ics
AC use	415	70	50

### Over Current Relay:

- Electronic, for general & selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current I<sub>r</sub> is adjustable from 40% - 100% of the nominal rated current I<sub>n</sub>
- STD setting 2.5 – 10 (x I<sub>R</sub>)<sup>1)</sup>
- INST setting 14 (Max 12 x I<sub>n</sub>)<sup>1)</sup>

### OCR Options:

- Ground Fault Trip
- Neutral Pole protection
- Pre-Trip Alarm

Early  
2013 release  
Reduced  
frame size



### Dimensions (mm)

Poles	3	4
H	273	273
W	210	280
D (less toggle)	103	103

Ampere Rating NRC	Adj. I <sub>r</sub> Min. – Max.	Cat. No.	3 pole Price \$	4 pole Price \$
1000	400 - 1000	S1000 NE 3 1000	3850.00	
		S1000 NE 4 1000		4812.00

Price Adder for OCR options. Add to above MCCB price	MCCB Cat. No. with option	3 pole Price \$	4 pole Price \$	
3 P OCR options:	PTA <sup>2)</sup>	S1000 NE 3 AP #	180.00	
	GF <sup>2)</sup>	S1000 NE 3 AG #	180.00	
	PTA + GF <sup>2)</sup>	S1000 NE 3 APG #	360.00	
4 P OCR options:	PTA <sup>2)</sup>	S1000 NE 4 AP #		180.00
	AP <sup>2)</sup>	S1000 NE 4 AN #		180.00
	PTA + NP <sup>2)</sup>	S1000 NE 4 APN #		360.00
	GF + NP <sup>2)</sup>	S1000 NE 4 AGN #		360.00

**Notes:** <sup>1)</sup> The STD and Instantaneous pickup currents (I<sub>sd</sub> & I<sub>i</sub>) settings are not individually adjustable, however by selecting different curve types and different I<sub>R</sub> settings the values will vary. Curve 1 & 2 I<sub>sd</sub> = 2.5 x I<sub>R</sub>, curve 3 I<sub>sd</sub> = 5 x I<sub>R</sub>, curve 4 - 6 I<sub>sd</sub> = 8 x I<sub>R</sub>. I<sub>R</sub> dial setting 0.4 – 0.63 I<sub>i</sub> = 14 x I<sub>R</sub> and I<sub>R</sub> dial setting 0.8 – 1.0 I<sub>i</sub> = 10 x I<sub>R</sub>.

<sup>2)</sup> To order a MCCB with the above options insert the required amp rating after the option to make up the Cat. No. Eg: S1000NE 4 AGN 800 is an S1000NE 4 Pole 800 A MCCB c/w Neutral Protection and Ground Fault protection.

For additional information on OCR settings, options and applications refer section 9 or part C catalogue.

Replaces: XH800SE and XS1250SE 1000A. Note: check exact ratings or dimensions to suit your application requirement.

## TemBreak 2 Electronic XOW Metering MCCBs S1000NE\_X1L/X1S

### 70 kA

**Current rating:** 400 - 1000 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

### Interrupting capacity:

	Voltage Icu		Ics
AC use	415	70	50

### XOW Over Current Relay:

- Ammeter or Energy Metering types
- Adjustable LSI setting for grading applications
- Base current adjustable from 40% - 100% of  $I_n$

### MCCB Standard features:

#### S1000NE\_X1L

- Ammeter, Adjustable LSI
- Trip event log, Alarm event log, Test function

#### S1000NE\_X1S

- Energy (multifunction) meter: A, V, P, kW, kWh, E, Pf, F, H
- Adjustable LSI
- Backlit LCD display
- Ground fault, Pre trip alarm, Phase rotation & Neutral pole protection
- Trip and Alarm event log, Test function, Trip indication contact output
- Modbus RTU 485 communications
- External door mounting meter option (T2ED not incl. in below pricing)

### Dimensions (mm)

Poles	3	4
H	273	273
W	210	280
D (less toggle)	103	103



T2ED

	Ampere Rating NRC	Ir Adj. Min.-Max.	Cat. No.	3 pole Price \$	4 pole Price \$
MCCB with ammeter	1000	400 - 1000	S1000 NE 3 1000 X1L	7750.00	
			S1000 NE 4 1000 X1L		9300.00
MCCB with energy meter	1000	400 - 1000	S1000 NE 3 1000 X1S	9450.00	
			S1000 NE 4 1000 X1S		11340.00

**Notes:** NRC: Nominal rated current  
 Adj. Ir: Adjustable thermal setting  
 Adj. Im: Adjustable magnetic setting  
 For additional information on OCR settings, options and applications refer section 9 or part C catalogue.

## Accessories for 800 - 1000 A MCCBs



	Internal accessories	Cat. No.	Price \$
	Shunt trips	Internal accessories are common for MCCBs 800 A to 1600 A. All have screw terminals except those indicated below with wire leads as indicated.	
		<b>For 3 and 4 pole MCCBs</b>	
SH	110 V AC	T2SH00A10TA	255.00
	230 – 240 V AC	T2SH00A20TA	255.00
	400 – 415 V AC	T2SH00A40TA	255.00
	12 V DC	T2SH00D01TA	255.00
	24 V DC (suits 24 V AC)	T2SH00D02TA	255.00
	48 V DC	T2SH00D04TA	255.00
	110 V DC	T2SH00D10TA	255.00
	230 V DC	T2SH00D20TA	255.00
	Undervoltage trips	<b>Instantaneous operation</b>	
UV	110 V AC	T2UV80A10NTA	270.00
	200 – 240 V AC	T2UV80A20NTA	270.00
	380 – 450 V AC	T2UV80A40NTA	270.00
	24 V DC	T2UV80D02NTA	270.00
	110 V DC	T2UV80D10NTA	270.00
	230 V DC	T2UV80D20NTA	270.00
		Time delay types are available – refer NHP for details.	
	Auxiliary & Alarm switches	<b>General type (2 A @ 240 V Inductive)</b>	
AX	1 C/O Auxiliary with terminals	T2AX00M3STA	134.00
	1 C/O 1 <sup>st</sup> Auxiliary with 700 mm leads	T2AX00M3SWA	146.00
	1 C/O 2 <sup>nd</sup> Auxiliary with 700 mm leads	T2AX00M4SWA	146.00
	1 C/O 3 <sup>rd</sup> Auxiliary with 700 mm leads	T2AX00M5SWA	146.00
	1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> aux have different numbered wire leads, otherwise identical.		
AL	1 C/O Alarm	T2AL00M4STA	129.00
	1 C/O Alarm with 700 mm wire leads	T2AL00M5SWA	141.00
		<b>Heavy-duty type (4 A @ 240 V Inductive)</b>	
	1 N/O Auxiliary	T2AX00B1STA	146.00
	1 N/C Auxiliary	T2AX00B2STA	146.00
	1 N/O Alarm	T2AL00B1STA	146.00
	1 N/C Alarm	T2AL00B2STA	146.00
		<b>Micro switching type (very low voltages and currents)</b>	
	1 C/O Auxiliary	T2AX00M3RTA	187.00
	1 C/O Alarm	T2AL00M3RTA	187.00

3

## Accessories for 800 - 1000 A MCCBs

External accessories		Cat. No.	Price \$
Operating handles Direct mounting, fixed depth, IP 54	<b>Suits MCCB types 800 - 1000AF</b>		
	Grey/black IP 54	<b>T2HB80UR5BN</b>	<b>495.00</b>
	Red/yellow IP 54	<b>T2HB80UR5RN</b>	<b>495.00</b>
<b>HB</b>			
3 Door interlocking variable depth handles	<b>800 A to 1000 A</b>		
	<b>T2HS compact handle</b>		
	Grey IP55 handle + 320 mm shaft	<b>T2HS80R6GM</b>	<b>470.00</b>
Red/yellow IP55 handle + 320 mm shaft	<b>T2HS80R6RM</b>	<b>470.00</b>	
<b>HS</b>	<b>METAL compact handle</b>		
	Silver IP 65 handle + 320 mm shaft	<b>T2HP80R6ME</b>	<b>470.00</b>
<b>HP</b>	<b>T2HP square handle</b>		
	Grey, IP 55 handle + 320 mm shaft	<b>T2HP80R6BN</b>	<b>690.00</b>
	Red/yellow, IP 55 handle + 320 mm shaft	<b>T2HP80R6RN</b>	<b>470.00</b>
	<b>Handle options</b>		
	Large escutcheon plate option: 100 mm <sup>2</sup>	<b>T2HSESC100</b>	<b>18.20</b>
	390 mm T pin shaft for T2HS - no flexi coupling	<b>T2HS400SHAFT</b>	<b>47.00</b>
	Handle shaft CAM for trapped key interlock	<b>1499 7702</b>	<b>235.00</b>
	MCCB/handle mech padlock attachment	<b>T2HP80PALK</b>	<b>47.50</b>
	MCCB identification labels	<b>T80CAPLAB</b>	<b>3.50</b>
External Neutral CT	<b>S1250, S1600</b>		
<b>GB</b>	Optional neutral CT, Ground Fault MCCBs	<b>T2GBX6N12A</b>	<b>410.00</b>
	Optional neutral CT, Ground Fault MCCBs	<b>T2GBX6N16A</b>	<b>410.00</b>



T2HB fixed depth "direct mount" handle



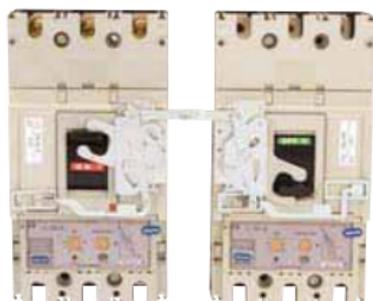
T2HS handle



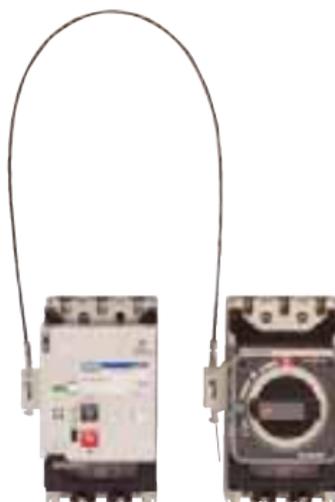
T2HP handle

## Accessories for 800 – 1000 A MCCBs

External accessories	Cat. No.	Price \$
Mechanical Interlock	<p><b>Link Interlock</b> – suitable for manual or motorised operation. Will accept handles. Suitable for front or rear connect type MCCBs.</p> <p><b>Suits MCCB types 800 A to 1000 A</b></p>	
<b>ML</b>	3 or 4 pole right side section	<b>T2ML80RA 365.00</b>
	3 pole left side section	<b>T2ML80L3A 140.00</b>
	4 pole left side section	<b>T2ML80L4A 140.00</b>
	<p><b>Slide type</b> - manual operation, padlockable. Does not allow motors, handles or other front mounted accessories to be fitted. Suitable for front or rear connection.</p> <p><b>S800, S1000</b></p>	
<b>MS</b>	3 pole	<b>T2MS803SFA 240.00</b>
	4 pole	<b>T2MS804SFA 260.00</b>
	<b>H800</b>	
	3 pole	<b>T2MS803LFA 260.00</b>
4 pole	<b>T2MS804LFA 280.00</b>	
	<p><b>Cable interlock</b> – allows an MCCB can be mounted horizontally, vertically or diagonally. Accepts Motors and handles. Suitable for 3 or 4 pole MCCBs</p> <p><b>800 A to 1000 A</b></p>	
<b>ML</b>	Interlock kit less wire	<b>T2MW80CA 335.00</b>
	Wire for above interlocks	
	Wire 1.0 m	<b>T2MW00SA 63.00</b>
	Wire 1.5 m	<b>T2MW00LA 73.00</b>



Link interlock



Cable interlock

## Accessories for 800 - 1000A MCCBs

### External accessories

		Cat. No.	Price \$
Terminal covers - front connected MCCBs Rear connect terminal covers RC <b>CR</b>	<b>Suits MCCB types S800, S1000</b>		
	3 pole cover set of 2	T2CR803SHGA	170.00
	4 pole cover set of 2	T2CR804SHGA	210.00
	<b>H800</b>		
	3 pole cover set of 2	T2CR803LHGA	210.00
	4 pole cover set of 2	T2CR804LHGA	240.00
Terminal covers for plug in base <b>CB</b>	<b>S800, S1000, H800</b>		
	3 pole cover set	T2CB803GHNA	170.00
	4 pole cover set	T2CB804GHNA	210.00
Extended terminal covers FC <b>CF</b>	Terminal covers are the same width as the MCCB		
	<b>S800, S1000, H800</b>		
	3 pole cover set	T2CF803SLHGA	205.00
	4 pole cover set	T2CF804SLHGA	260.00
Terminal cover locking clip	<b>800 A to 1000 A</b> A clip that provides additional terminal cover locking, and also allows a lead seal to be fitted	T2CF00LA	8.80
Interpole Barriers <sup>1) 2)</sup>	<b>S800, S1000</b>		
	Interpole barrier (Qty 2)	T2BA803SHA	10.00
	<b>H800</b>		
	Interpole barrier (Qty 2)	T2BA803LHA	10.00



Terminal covers (T2CR)



T2CR Terminal covers



Extended terminal covers FC



Terminal cover locking clip



Interpole barriers

- Notes:** 1) Line side interpole barriers or terminal covers must be installed with MCCBs.  
2) Interpole Barriers are supplied with MCCBs as standard; 2 barriers with 3 pole MCCBs, and 3 barriers with 4 pole MCCBs.

## Accessories for 800 - 1000 A MCCBs

	External accessories	Cat. No.	Price \$
	Toggle locks	<b>Non Captive:</b> Fits up to 3 padlocks or a multiple lock device	
		<b>Suits MCCB types 800 A, 1000 A</b>	
<b>HL</b>	Lock with 5 mm x 16.5 mm slot	<b>T2HL40A</b>	<b>73.00</b>
		<b>Captive:</b> Allows a single padlock or multiple padlock device	
		<b>800 A, 1000 A</b>	
	Lock with single 8 mm hole	<b>T2HL80CAP</b>	<b>125.00</b>
Motor operators	<b>800 - 1000 A</b>		
	110 - 240 V AC	<b>T2MC80A10NA</b>	<b>2570.00</b>
	24 - 48 V DC	<b>T2MC80D10NA</b>	<b>2570.00</b>
	Electrical interlocking connector between motor operators		
	<b>E400, S400, H400, L400, E630, S630</b>		
<b>MC</b>	0.6 m connector 400 A to 1000 A	<b>T2MM40L06A</b>	<b>60.50</b>
	2.1 m connector 400 A to 1000 A	<b>T2MM40L21A</b>	<b>80.00</b>
	0.6 m connector 125 A to 1000 A	<b>T2MM40S06A</b>	<b>58.50</b>
	2.1 m connector 125 A to 1000 A	<b>T2MM40S21A</b>	<b>70.50</b>
	1. <b>Motor options:</b> Contact NHP for key locking and auto reset.		
Rear connect terminal studs	<b>S800</b> for line and load terminals		
	3 pole kit, set of 6 studs	<b>T2RP803HA</b>	<b>1150.00</b>
	4 pole kit, set of 8 studs	<b>T2RP804HA</b>	<b>1440.00</b>
	<b>H800</b> for line terminals		
	3 pole kit, set of 3 studs	<b>T2RP803MA</b>	<b>780.00</b>
	4 pole kit, set of 4 studs	<b>T2RP804MA</b>	<b>840.00</b>
	<b>H800</b> for load terminals		
<b>RP</b>	3 pole kit, set of 3 studs	<b>T2RP803NA</b>	<b>780.00</b>
	4 pole kit, set of 4 studs	<b>T2RP804NA</b>	<b>840.00</b>
	<b>S1000</b> for line and load terminals		
	3 pole kit, set of 6 studs	<b>T2RPX03HA</b>	<b>1420.00</b>
	4 pole kit, set of 8 studs	<b>T2RPX04HA</b>	<b>1830.00</b>
Door Flange	Provides an attractive panel cut-out surround for MCCBs or MOTORS		
	<b>800 to 1000 A</b>		
<b>FW</b>	MCCB IP 30 gland and gasket	<b>T2FW40L3A</b>	<b>415.00</b>
	MOTOR IP 30 gland and gasket	<b>T2FW40L4A</b>	<b>560.00</b>
Wire Lead Terminal Block	MCCB mounted terminal block connected to internal accessories. This accessory is a <b>FACTORY FIT ITEM</b> .		
<b>TF</b>	Terminal block and wiring loom RIGHT side	<b>T2TF40RGA</b>	<b>189.00</b>
	Terminal block and wiring loom LEFT side	<b>T2TF40LGA</b>	<b>189.00</b>

## Accessories for 800 - 1000 A MCCBs

External accessories <sup>1) 2)</sup>		Cat. No.	Price \$
UP	TemPlug	TemPlug MCCB line-side plug in attachment	
	<b>Suits MCCB types</b>		
	<b>S800</b>		
	3 pole TemPlug	T2UPX3800	690.00
PM	<b>S1000</b>		
	3 pole TemPlug	T2UPX31000	950.00
	Plug in MCCBs	Plug in MCCB base kit. Includes MCCB plugs and other parts for converting an MCCB to a plug in MCCB. Mounting bases are ordered separately. MCCB conversion kits:	
	<b>S800, S1000</b>		
	3 pole kit	2H...TBA	POA
	4 pole kit	2H...TBA	POA
	Plug in bases, IP20, includes rear insulation screen. The base includes terminal studs which are suitable for front or rear connection. Interpole barriers can be used with these bases, but not terminal covers. Plug in mounting bases:		
	<b>S800, S1000</b>		
	3 pole kit	T2PM80A3A	485.00
	4 pole kit	T2PM80A4A	640.00
	Control wiring plugs and sockets for plug in MCCBs		
	3 pin plug for aux/alarms – MCCB side	2H6959CAA1	37.00
	3 pin plug for shunt/UVT – MCCB side	2H6959CBA1	37.00
3 pin socket for panel mount base	T2TP003A	37.00	
Extension bars			
3 pole kit	T2PF803HA	235.00	
4 pole kit	T2PF804HA	290.00	



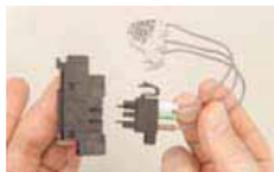
TemPlug



Plug in MCCBs



Plug in MCCBs



Plug in MCCBs

**Notes:** <sup>1)</sup> Up to 4 control wiring plug kits can be used in a base.  
<sup>2)</sup> Internal accessories are used with the above plugs and sockets

## TemBreak 2 Electronic type S1250GE

**85 kA**

**Current rating:** 500 – 1250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	415	85	65
	400	100	76



**Over Current Relay:**

- Electronic, for general & selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current I<sub>R</sub> is adjustable from 40% - 100% of the nominal rated current I<sub>N</sub>
- STD setting 2.5 – 10 (x I<sub>R</sub>)<sup>1)</sup>
- INST setting 14 (Max 12 x I<sub>N</sub>)<sup>1)</sup>

**Dimensions (mm)**

Poles	3	4
H	370	370
W	210	280
D (less toggle)	120	120

**OCR Options:**

- Ground Fault Trip
- Neutral Pole protection
- Pre-Trip Alarm

Ampere Rating NRC	Adj. I <sub>R</sub> Min. – Max.	Cat. No.	3 pole Price \$	4 pole Price \$
1000	400 - 1250	S1250 GE 3 1250	8650.00	
		S1250 GE 4 1250		10250.00

Price Adder for OCR options. Add to above MCCB price	MCCB Cat. No. with option	3 pole Price \$	4 pole Price \$
3 P OCR options:	PTA <sup>2)</sup>	S1250 GE 3 AP #	180.00
	GF <sup>2)</sup>	S1250 GE 3 AG #	180.00
	PTA + GF <sup>2)</sup>	S1250 GE 3 APG #	180.00
4 P OCR options:	PTA <sup>2)</sup>	S1250 GE 4 AP #	180.00
	AP <sup>2)</sup>	S1250 GE 4 AN #	180.00
	PTA + NP <sup>2)</sup>	S1250 GE 4 APN #	360.00
	GF + NP <sup>2)</sup>	S1250 GE 4 AGN #	360.00

**Notes:** 1) The STD and Instantaneous pickup currents (I<sub>sd</sub> & I<sub>i</sub>) settings are not individually adjustable, however by selecting different curve types and different I<sub>R</sub> settings the values will vary. Curve 1 & 2 I<sub>sd</sub> = 2.5 x I<sub>R</sub>, curve 3 I<sub>sd</sub> = 5 x I<sub>R</sub>, curve 4 - 6 I<sub>sd</sub> = 8 x I<sub>R</sub>. I<sub>R</sub> dial setting 0.4 – 0.63 I<sub>i</sub> = 14 x I<sub>R</sub> and I<sub>R</sub> dial setting 0.8 – 1.0 I<sub>i</sub> = 10 x I<sub>R</sub>.

2) To order a MCCB with the above options insert the required amp rating after the option to make up the Cat. No. Eg: S1250GE 4 AGN 800 is an S1250GE 4 Pole 800 A MCCB c/w Neutral Protection and Ground Fault protection.

For additional information on OCR settings, options and applications refer section 9 or part C catalogue.

Replaces: XS1250SE. Note: check exact ratings or dimensions to suit your application requirement.

## TemBreak 2 Electronic type S1600NE

**85 kA**

**Current rating:** 640 – 1600 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:**

	Voltage	Icu	Ics
AC use	415	85	65
	400	100	76

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### Over Current Relay:

- Electronic, for general & selectivity applications
- 7 dial selectable characteristic curves suited for a variety of applications
- Base current I<sub>R</sub> is adjustable from 40% - 100% of the nominal rated current I<sub>n</sub>
- STD setting 2.5 – 10 (x I<sub>R</sub>)<sup>1)</sup>
- INST setting 14 (Max 12 x I<sub>n</sub>)<sup>1)</sup>
- **OCR Options:**
- Ground Fault Trip
- Neutral Pole protection
- Pre-Trip Alarm

### Dimensions (mm)

Poles	3	4
H	370	370
W	210	280
D (less toggle)	140	140

Ampere Rating NRC	Adj. I <sub>R</sub> Min. – Max.	Cat. No.	3 pole Price \$	4 pole Price \$
1000	400 - 1250	S1600 NE 3 1250	9820.00	
		S1600 NE 4 1250		11500.00

### Price Adder for OCR options.

Add to above MCCB price		MCCB Cat. No. with option	3 pole Price \$	4 pole Price \$
3 P OCR options:	PTA <sup>2)</sup>	S1600 NE 3 AP #	180.00	
	GF <sup>2)</sup>	S1600 NE 3 AG #	180.00	
	PTA + GF <sup>2)</sup>	S1600 NE 3 APG #	180.00	
4 P OCR options:	PTA <sup>2)</sup>	S1600 NE 4 AP #		180.00
	AP <sup>2)</sup>	S1600 NE 4 AN #		180.00
	PTA + NP <sup>2)</sup>	S1600 NE 4 APN #		360.00
	GF + NP <sup>2)</sup>	S1600 NE 4 AGN #		360.00

**Notes:** <sup>1)</sup> The STD and Instantaneous pickup currents (I<sub>sd</sub> & I<sub>i</sub>) settings are not individually adjustable, however by selecting different curve types and different I<sub>R</sub> settings the values will vary. Curve 1 & 2 I<sub>sd</sub> = 2.5 x I<sub>R</sub>, curve 3 I<sub>sd</sub> = 5 x I<sub>R</sub>, curve 4 - 6 I<sub>sd</sub> = 8 x I<sub>R</sub>. I<sub>R</sub> dial setting 0.4 – 0.63 I<sub>i</sub> = 14 x I<sub>R</sub> and I<sub>R</sub> dial setting 0.8 – 1.0 I<sub>i</sub> = 10 x I<sub>R</sub>.

<sup>2)</sup> To order a MCCB with the above options insert the required amp rating after the option to make up the Cat. No. Eg: S1600NE 4 AGN 800 is an S1600NE 4 Pole 800 A MCCB c/w Neutral Protection and Ground Fault protection.

For additional information on OCR settings, options and applications refer section 9 or part C catalogue.

Replaces: XS1600SE. Note: check exact ratings or dimensions to suit your application requirement.

## Accessories for 1250 - 1600 A MCCBs



	Internal accessories	Cat. No.	Price \$
	Shunt trips	Internal accessories are common for MCCBs 800 A to 1600 A. All have screw terminals except those indicated below with wire leads as indicated.	
		<b>For 3 and 4 pole MCCBs</b>	
SH	110 V AC	T2SH00A10TA	255.00
	230 – 240 V AC	T2SH00A20TA	255.00
	400 – 415 V AC	T2SH00A40TA	255.00
	12 V DC	T2SH00D01TA	255.00
	24 V DC (suits 24 V AC)	T2SH00D02TA	255.00
	48 V DC	T2SH00D04TA	255.00
	110 V DC	T2SH00D10TA	255.00
	230 V DC	T2SH00D20TA	255.00
	Undervoltage trips	<b>Instantaneous operation</b>	
UV	110 V AC	T2UV80A10NTA	270.00
	200 – 240 V AC	T2UV80A20NTA	270.00
	380 – 450 V AC	T2UV80A40NTA	270.00
	24 V DC	T2UV80D02NTA	270.00
	110 V DC	T2UV80D10NTA	270.00
	230 V DC	T2UV80D20NTA	270.00
		Time delay types are available – refer NHP for details.	
	Auxiliary & Alarm switches	<b>General type (2 A @ 240 V Inductive)</b>	
AX	1 C/O Auxiliary with terminals	T2AX00M3STA	134.00
	1 C/O 1 <sup>st</sup> Auxiliary with 700 mm leads	T2AX00M3SWA	146.00
	1 C/O 2 <sup>nd</sup> Auxiliary with 700 mm leads	T2AX00M4SWA	146.00
	1 C/O 3 <sup>rd</sup> Auxiliary with 700 mm leads	T2AX00M5SWA	146.00
	1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> aux have different numbered wire leads, otherwise identical.		
AL	1 C/O Alarm	T2AL00M4STA	129.00
	1 C/O Alarm with 700 mm wire leads	T2AL00M5SWA	141.00
		<b>Heavy-duty type (4 A @ 240 V Inductive)</b>	
	1 N/O Auxiliary	T2AX00B1STA	146.00
	1 N/C Auxiliary	T2AX00B2STA	146.00
	1 N/O Alarm	T2AL00B1STA	146.00
	1 N/C Alarm	T2AL00B2STA	146.00
		<b>Micro switching type (very low voltages and currents)</b>	
	1 C/O Auxiliary	T2AX00M3RTA	187.00
	1 C/O Alarm	T2AL00M3RTA	187.00

3

## Accessories for 1250 - 1600 A MCCBs

External accessories	Cat. No.	Price \$
Operating handles	<b>Suits MCCB types 1250 - 1600 A</b>	
Direct mounting, fixed depth, IP 54	Grey/black IP 54	<b>T2HBX6UR5BN 560.00</b>
	Red/yellow IP 54	<b>T2HBX6UR5RN 560.00</b>
<b>HB</b>		
Door interlocking variable depth handles	<b>1250 - 1600 A</b>	
	<b>T2HS compact handle</b>	
	Grey IP55 handle + 320 mm shaft	<b>T2HSX6R6GM 550.00</b>
	Red/yellow IP55 handle + 320 mm shaft	<b>T2HSX6R6RM 550.00</b>
	<b>METAL compact handle</b>	
	Silver IP 65 handle + 320 mm shaft	<b>T2HPX6R6ME 830.00</b>
	<b>T2HP square handle</b>	
	Grey, IP 55 handle + 320 mm shaft	<b>T2HPX6R6BN 550.00</b>
	Red/yellow, IP 55 handle + 320 mm shaft	<b>T2HPX6R6RN 550.00</b>
<b>HP</b>		
	<b>Handle options</b>	
	Large escutcheon plate option: 100 mm <sup>2</sup>	<b>T2HSESC100 18.20</b>
	390 mm T pin shaft for T2HS - no flexi coupling	<b>T2HS400SHAFT 47.00</b>
	Handle shaft CAM for trapped key interlock	<b>1499 7702 235.00</b>
	MCCB/handle mech padlock attachment	<b>T2HPX6PALK 85.00</b>
	MCCB identification labels	<b>TX6CAPLAB 3.50</b>



T2HB fixed depth "direct mount" handle



T2HS handle



T2HP handle

## Accessories for 1250 - 1600 A MCCBs

External accessories		Cat. No.	Price \$
Mechanical Interlock	<b>Rear cable interlock</b> – allows an MCCB can be mounted horizontally, vertically or diagonally. Accepts motors and handles. Suitable for 3 or 4 pole MCCBs		
<b>MW</b>	<b>Suits MCCB types 1250 - 1600 A</b>		
	Interlock kit less wire – <b>Factory fit item</b>	<b>T2MWX6CA</b>	<b>445.00</b>
	Wire for above interlocks		
	Wire 1.0 m	<b>T2MW00S</b>	<b>60.50</b>
	Wire 1.5 m	<b>T2MW00L</b>	<b>70.50</b>
<b>MS</b>	<b>Slide type</b> - manual operation, padlockable. Does not allow motors, handles or other front mounted accessories to be fitted. Suitable for front or rear connection.		
	<b>S1250, S1600</b>		
	3 pole	<b>T2MSX63SFA</b>	<b>360.00</b>
4 pole	<b>T2MSX64SFA</b>	<b>450.00</b>	
<b>MB</b>	<b>Rear walking beam interlock</b> – allows 2 MCCBs to be interlocked side by side. Combinations of 3 and 4 pole types are possible.		
	<b>1250 - 1600 A</b>		
	For 3 pole S1250	<b>T2MBX33P</b>	<b>850.00</b>
	For 4 pole S1250 <b>Factory fit only</b>	<b>T2MBX34P</b>	<b>1130.00</b>
	For 3 pole S1600	<b>T2MBX63P</b>	<b>850.00</b>
For 4 pole S1600 <b>Factory fit only</b>	<b>T2MBX64P</b>	<b>1130.00</b>	

3

## Accessories for 1250 - 1600A MCCBs

External accessories		Cat. No.	Price \$
Terminal covers - front connected MCCBs	Terminal covers are the same width as the MCCB		
Extended terminal covers FC	<b>Suits MCCB types S1250</b>		
	3 pole cover	<b>T2CFX33SLHGA</b>	<b>225.00</b>
	4 pole cover	<b>T2CFX34SLHGA</b>	<b>280.00</b>
	Terminal covers are not available for S1600 MCCBs		
<b>CR</b>			
Terminal cover locking clip	<b>800 A to 1600 A</b>		
	A clip that provides additional terminal cover locking, and also allows a lead seal to be fitted	<b>T2CF00LA</b>	<b>8.80</b>
Interpole Barriers <sup>1) 2)</sup>	<b>S1250, S1600</b>		
	Interpole barrier (Qty 2)	<b>T2BAX63LHA</b>	<b>10.00</b>
<b>BA</b>			
External Neutral CT	<b>S1250, S1600</b>		
	Optional neutral CT, Ground Fault MCCBs	<b>T2GBX6N12A</b>	<b>430.00</b>
	Optional neutral CT, Ground Fault MCCBs	<b>T2GBX6N16A</b>	<b>430.00</b>



Extended terminal covers FC



Terminal cover locking clip

- Notes:** 1) Line side interpole barriers or terminal covers must be installed with MCCBs.  
 2) Interpole Barriers are supplied with MCCBs as standard; 2 barriers with 3 pole MCCBs, and 3 barriers with 4 pole MCCBs.

## Accessories for 1250 - 1600A MCCBs

External accessories		Cat. No.	Price \$
Toggle locks	<b>Non Captive:</b> Fits up to 3 padlocks or a multiple lock device		
	<b>Suits MCCB types 1250 A, 1600 A</b>		
<b>HL</b>	Lock with three 8 mm holes	<b>T2HLX6A</b>	<b>77.00</b>
	<b>Captive:</b> Allows a single padlock or multiple padlock device		
	<b>1250 A, 1600 A</b>		
	Lock with two 8 mm holes	<b>T2HLX6CAP</b>	<b>165.00</b>
Motor operators	<b>1250 A, 1600 A</b>		
	110 V AC	<b>T2MCX6A10NA</b>	<b>3150.00</b>
	240 V AC	<b>T2MCX6A24NA</b>	<b>3150.00</b>
	24 V DC	<b>T2MCX6D02NA</b>	<b>3150.00</b>
Rear connect terminal studs	<b>1250 A, 1600 A (factory fit only)</b>		
	3 pole kit, set of 6 studs (1250 A)	<b>T2RPX335B</b>	<b>1350.00</b>
	4 pole kit, set of 8 studs (1250 A)	<b>T2RPX345B</b>	<b>1940.00</b>
	3 pole kit, set of 6 studs (1600 A)	<b>T2RPX635B</b>	<b>1730.00</b>
	4 pole kit, set of 8 studs (1600 A)	<b>T2RPX645B</b>	<b>2250.00</b>



T2RP rear connect studs



T2HLX6A



Rear connect terminal studs fitted



Motor operator fitted to MCCB

## TemBreak 1 series Electronic XS2000NE

### 85 kA

**Current rating:** 1000 – 2000 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)



3

	Voltage	Icu kA	Ics kA
AC use	400/415 <sup>1)</sup>	85	64

#### Trip unit:

Adjustable long, short and instantaneous trip

LTD adjustment: I<sub>1</sub>: 0.8 – 1                      t: 5 – 30 s  
 STD adjustment: I<sub>2</sub>: 2 – 10                     t: 0.1 – 0.3 s  
 Instantaneous Adj: I<sub>3</sub>: 3 – 12                 NRC

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

#### Dimensions (mm)

Poles	3	4
H <sup>2)</sup>	450	450
W	320	429
D (less toggle)	185	185
Weight (kg)	55.0	67

Amp rating NRC	Min.	Max.	Cat. No.	Price \$
<b>3 Pole</b>				
2000	1000	2000	XS2000NE 20003 RC	17400.00
<b>4 Pole</b>				
2000	1000	2000	XS2000NE 20004 RC	23310.00
<b>Ground Fault Trip MCCBs <sup>3)</sup></b>				
<b>3 Pole</b>				
2000	1000	2000	XS2000NE 20003L	18250.00
<b>4 Pole</b>				
2000	1000	2000	XS2000NE 20004L	24160.00

**Notes:** <sup>1)</sup> 415 V Icu rating to IEC 60947-2.

<sup>2)</sup> H excludes attached busbar.

<sup>3)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCB applications. (If a neutral is present) Refer accessories.

NRC: Nominal rated current

## TemBreak 1 series Electronic XS2500NE

### 85 kA

**Current rating:** 1250 – 2500 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)

	Voltage	Icu kA	Ics kA
AC use	400/415 <sup>1)</sup>	85	64



**Trip unit:** Adjustable long, short and instantaneous settings

LTD adjustment: I<sub>1</sub>: 0.8 – 1                      t: 5 – 30 s  
 STD adjustment: I<sub>2</sub>: 2 – 10                     t: 0.1 – 0.3 s  
 Instantaneous Adj: I<sub>3</sub>: 3 – 12                 NRC

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

### Dimensions (mm)

Poles	3	4
H <sup>2)</sup>	450	450
W	320	429
D (less toggle)	185	185
Weight (kg)	66.0	78

Amp rating NRC	Min.	Max.	Cat. No.	Price \$
<b>3 Pole</b>				
2500	1250	2500	XS2500NE 2500 RC3	19410.00
<b>4 Pole</b>				
2500	1250	2500	XS2500NE 2500 RC4	25880.00
<b>Ground Fault Trip MCCBs <sup>2)</sup>3)</b>				
<b>3 Pole</b>				
2500	1250	2500	XS2500SE 25003L	20280.00
<b>4 Pole</b>				
2500	1250	2500	XS2500SE 25004L	26750.00

**Notes:** <sup>1)</sup> 415 V Icu rating to IEC 60947-2.

<sup>2)</sup> H excludes attached busbar.

<sup>3)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCB applications. (If a neutral is present) Refer accessories.

NRC: Nominal rated current.

## TemBreak 1 series Electronic XS3200NE

### 85 kA

**Current rating:** 1600 – 3200 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)



3

	Voltage	Icu kA	Ics kA
AC use	400/415	85	64
$I_{CW}$ for 0.5 sec		38	

**Trip unit:** Adjustable long, short and instantaneous settings

LTD adjustment:  $I_1$ : 0.8 – 1                      t: 5 – 30 s  
 STD adjustment:  $I_2$ : 2 – 10                     t: 0.1 – 0.3 s  
 Instantaneous Adj:  $I_3$ : 3 – 12                 NRC

**OCR options:** Pre-trip alarm, fault indication with relay contact

### Dimensions (mm)

<b>Poles</b>	<b>3</b>
H <sup>1)</sup>	450
W	320
D (less toggle)	185
Weight (kg)	66.0

### 3 Pole

#### Amp rating

NRC	Min.	Max.	Cat. No.	3 pole Price \$
3200	1600	3200	XS3200NE32003 RC	23810.00

**Notes:** <sup>1)</sup> H excludes attached busbar.  
 NRC: Nominal rated current.

## Accessories to suit 2000 – 3200 AF

	Internal accessories - factory fit	Cat. No.	Price \$
Shunt trips	110 V AC/DC (110–115 V)	2H1526BAA	560.00
	240 V AC (200–480 V)	2H1527BAA	560.00
	12 V DC	2H1528BAA	560.00
	24 V DC	2H1529BAA	560.00
	48 V DC	2H1530BAA	560.00
	200 V DC (200–230 V)	2H1531BAA	560.00
	415 V AC	2H1541BAB	560.00
	24 V AC	2H1532BAA	560.00
	48 V AC	2H1533BAA	560.00
Undervoltage trips	AC coil <sup>1)</sup>	2H1509BAA	455.00
	100–230 V DC coil <sup>2)</sup>	2H1510BAA	465.00
	24 V DC coil <sup>2)</sup>	2H1511BAA	465.00
	48 V DC coil <sup>2)</sup>	2H1512BAA	465.00
	60 V DC coil <sup>2)</sup>	2H1513BAA	465.00
	110 V AC instantaneous controller	UXUB0013B	113.00
	240 V AC instantaneous controller	UXUB0014B	113.00
	440 V AC instantaneous controller	UXUB0015B	113.00
	110 V AC time delay controller	UXUB0016B	220.00
240 V AC time delay controller	UXUB0017B	220.00	
440 V AC time delay controller	UXUB0018B	215.00	
200–230 V DC controller	UXUB0038B	113.00	
Auxiliary switches	AUX SW right hand 1C	UXXB0013C	350.00
	AUX SW right hand 2C	UXXB0014C	400.00
	AUX SW right hand 3C	UXXB0015C	465.00
	AUX SW right hand 4C	UXXB0016C	540.00
	AUX SW right hand 5C	UXXB0017C	590.00
	AUX SW right hand 6C	UXXB0018C	640.00
Alarm switch	ALT SW right hand	UXLB0012C	445.00
	ALT/AUX right hand 1C	UXLB0019D	510.00
Alarm & auxiliary switch	ATL/AUX right hand 2C	UXLB0020C	580.00
	ATL/AUX right hand 3C	UXLB0021C	670.00
	ATL/AUX right hand 5C	UXLB0023C	790.00

**Notes:** <sup>1)</sup> An AC UVT controller is required for 100–440 V AC.

<sup>2)</sup> A DC UVT controller is needed for 200–230 V DC operation.  
None required for 24–110 V DC.

## Accessories to suit 2000 – 3200 AF

3

Internal accessories - factory fit		Cat. No.	Price \$
Ground fault trip (GFT)	An option for all 2000-2500 A types <b>Add</b>	LSIG	870.00
Optional ext. 4th CTs	2000 A 4th CT	UXOY0006A	720.00
	2500 A 4th CT	UXOY0007A	880.00
Fault indication with contacts	An option for all 2000–3200 A types <b>Add FI then voltage</b>	FI	730.00
Fault indication	LED's mounted at top of OCR	FILED	2050.00
Pre-trip alarm	An option for all 2000–3200 A types	LSIP	700.00

External accessories - most user fit		Cat. No.	Price \$
Front connect busbar (factory fit)	3 P attached busbars XS2000 (6 in kit) <sup>1)</sup>	TXRD0003A	2030.00
	4 P attached busbars XS2000 (8 in kit) <sup>1)</sup>	TXRD0004A	2810.00
	Mounting bolts <sup>1)</sup>	TXRD0005A	210.00
Motor operators	110 V AC motor	UXMB0006B	3820.00
	240 V AC motor	UXMB0008B	3820.00
	110 V DC motor	UXMB0009B	3820.00
Mechanical interlocks (factory fit)	3 P rear mechanical interlock	UXKC0012A	2090.00
	4 P rear mechanical interlock	UXKC0013A	3120.00
	Interlock wire (cable style interlock)	UXKC0020A	83.00
	Interlock mechanism - cable type <sup>2)</sup>	UXKC0025B	650.00
Handle operator	Direct mount handle mechanism <sup>3)</sup>	XFE10	1690.00
	Handle extension	UXHB0001B	195.00
Toggle locks factory fit	Blocks toggle activation (non captive)	UXKB0001A	79.00
Accessory lead terminal	Accessory lead block (factory fit)	UXYD0001A	26.80
	Terminal bolt (6 in kit)	UXYD0002A	2.20
OCR sealing kit	Tamperproof cover for OCR adjustment dials	XS2000OCRSK	60.50

- Notes:** <sup>1)</sup> When an XS2000NE MCCB is configured for “front connection”, the Front Connect busbar kits TXRD0003A & 4A already include mounting screws for the FC terminals.  
 The TXRD0005A mounting bolts, which also include spacers, are required to mount the MCCB itself. TXRD0005A is always required for FC 2000A MCCBs, but not RC.
- <sup>2)</sup> Order one interlock mechanism per breaker.
- <sup>3)</sup> Extension shaft handle not available.

## Integral Earth Leakage Moulded Case Circuit Breakers

### ZS Earth Leakage Circuit Breakers 125 A and 250 A

The ZS earth leakage MCCB from Terasaki offers machine or personnel protection within a standard 125 A, 160 / 250 A MCCB frame size. The ZS earth leakage MCCB also maintains the full functionality of a standard thermal-magnetic overload / short circuit protection device.

#### Features

- Thermal/ magnetic MCCB
- Standard 125 A or 250 A frame
- Thermal magnetic trip unit ratings:  
12 A - 125 A (125 AF), 100 - 250 A (250 AF)
- Fixed magnetic characteristic
- 65 kA fault interruption rating @ 400 / 415 V as standard



3

#### Earth Leakage features

- Switching utilisation voltage up to 550 V AC (160 V AC minimum)
- Suitable for use at 40 / 50 / 60 Hz (except for the 3 A setting @ 40 Hz)
- 3 or 4 pole types
- Yellow earth leakage TRIP indication flag
- Grey TEST button
- Green 'Power ON' LED
- Adjustable thermal characteristic dial setting from 63 - 100 % of  $I_R$
- Adjustable earth leakage ranges: 30 mA, 100 mA, 300 mA, 500 mA, 1 A, 3 A
- Trip time selection: 0, 60, 200, 400, 700 mS or NT (No Trip)
- 30 mA trip time defaults to a less than 300 mS trip time as per AS/NZS standard requirements
- Built-in dielectric test disconnection test plug
- Remove trip function (standard)
- Harmonics inhibition (standard)
- Pre trip alarm unit (TCU) with cause of trip output

#### Options and accessory fitting

- Accepts auxiliaries and alarm switches
- Will not accept shunts and under voltage trips
- Accepts all external accessories, except mechanical interlocks
- ZS 125/250 A MCCBs can be installed on standard XA, XB, XC chassis
- ZS 250 can be fitted to HC Chassis
- Seal label available for sealing the residual current dial setting area for use at 30 mA (Catalogue number of label sheet T12CAPLAB)
- Captive padlock attachment that includes a dial sealing feature
- ZS ELCBs with unswitched or switched neutral poles are available

**Notes:** Fault interruption and other performance data for ZS125-250GJ ELCBs, is the same as the standard S125-250GJ MCCBs, except:

- Rated to an operational voltage of 550 V AC maximum
- Magnetic characteristic is fixed

## Earth Leakage Circuit Breaker ZS125GJ/ ZS250GJ

### 65 kA

**Current rating:** 20 – 250 A

**Approvals and Tests:** AS/NZS 3947-2, IEC 60947-2,  
Annex B, EN/IEC 60755

**Operating voltage:** 200 - 580 V 50/60 Hz

#### Interrupting capacity:

	Voltage	Icu kA	Ics kA
AC use	380/415	65	36
DC use	250 V	40	40



**Trip unit:** Adjustable thermal (0.63 I<sub>r</sub> to 100 % I<sub>r</sub>) and fixed magnetic

**Earth leakage characteristic:** Type 'A' - suitable for AC and residual pulsating DC currents.

- Earth leakage adjustments:**
- 30 mA, 100 mA, 300 mA, 500 mA, 1 A, 3 A.
  - NT 1), 0, 60, 200, 400, 700 mS
  - 30 mA time setting non adjustable for instant trip

#### Neutral pole option:

ZS ELCBs are available with switched or unswitched (or 'solid neutral') neutral poles. Many general distribution applications can use switched neutral types, whereas for UPS and some other uses, an unswitched neutral pole is preferred.

## Earth Leakage Circuit Breaker ZS125GJ

### Dimensions (mm)

Poles	3	4
H	155	155
W	90	120
D (less toggle)	68	68
Toggle cut-out	104	104

### 3 Pole

Amp rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Fixed I <sub>m</sub> <sup>1)</sup> (Amps)	Cat. No. <sup>2)</sup>	3 pole Price \$
20	12 - 20	240	ZS125 GJ 3 20	2000.00
32	20 - 32	384	ZS125 GJ 3 32	2000.00
50	32 - 50	600	ZS125 GJ 3 50	2000.00
63	40 - 63	756	ZS125 GJ 3 63	2000.00
100	63 - 100	1200	ZS125 GJ 3 100	2230.00
125	80 - 125	1250	ZS125 GJ 3 125	2380.00

### 4 Pole - fixed neutral type

Amp rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Fixed I <sub>m</sub> <sup>1)</sup> (Amps)	Cat. No. <sup>2)</sup>	4 pole Price \$
20	12 - 20	240	ZS125 GJ 4 20 <sup>2)</sup>	2200.00
32	20 - 32	384	ZS125 GJ 4 32 <sup>2)</sup>	2200.00
50	32 - 50	600	ZS125 GJ 4 50 <sup>2)</sup>	2200.00
63	40 - 63	756	ZS125 GJ 4 63 <sup>2)</sup>	2200.00
100	63 - 100	1200	ZS125 GJ 4 100 <sup>2)</sup>	2560.00
125	80 - 125	1250	ZS125 GJ 4 125 <sup>2)</sup>	2750.00

### 4 Pole - solid neutral type

Amp rating NRC	Adj. I <sub>r</sub> <sup>1)</sup> Min. – Max.	Fixed I <sub>m</sub> <sup>1)</sup> (Amps)	Cat. No. <sup>2)</sup>	4 pole Price \$
20	12 - 20	240	ZS125GJ 420 SN	2200.00
32	20 - 32	384	ZS125GJ 432 SN	2200.00
50	32 - 50	600	ZS125GJ 450 SN	2200.00
63	40 - 63	756	ZS125GJ 463 SN	2200.00
100	63 - 100	1200	ZS125GJ 4100 SN	2560.00
125	80 - 125	1250	ZS125GJ 4125 SN	2750.00

**Notes:** 1) NRC: Nominal rated current. Adj. I<sub>r</sub>: Adjustable thermal setting  
Fixed I<sub>m</sub>: Fixed magnetic setting NT: No Trip

2) Use list prices above for unswitched versions.

## Earth Leakage Circuit Breaker ZS250GJ



### Dimensions (mm)

Poles	3	4
H	165	165
W	105	140
D (less toggle)	68	68
Toggle cut-out	104	104

### 3 Pole

Amp rating	Adj. Ir <sup>1)</sup> Min. – Max.	Fixed Im <sup>1)</sup> (Amps)	Cat. No. <sup>2)</sup>	Price \$
160	100-160	1760	ZS250 GJ 3 160	2490.00
250	160-250	2750	ZS250 GJ 3 250	2780.00

### 4 Pole

160	100-160	1760	ZS250 GJ 4 160 <sup>2)</sup>	2890.00
			ZS250 GJ 4 160 SN <sup>2)</sup>	2890.00
250	160-250	2750	ZS250 GJ 4 250 <sup>2)</sup>	3110.00
			ZS250 GJ 4 250 SN <sup>2)</sup>	3110.00

**Notes:** <sup>1)</sup> Unswitched (solid neutral) type.

<sup>2)</sup> Use list prices above for unswitched versions.

## Integral Earth Leakage Circuit Breaker ZS 400 A - 800 A

The ZS 400 – 800A Earth Leakage Circuit Breaker from Terasaki offers machine protection within a standard 400 A, 630 / 800 A MCCB frame size.

The full functionality of a standard thermal-magnetic overload / short circuit protection MCCB is maintained.

### Standard Features

- AS/NZS 60947.6, JIS Standards compliance
- Thermal/magnetic MCCB
- 3 or 4 pole 400 A, 630/800 A 3 pole only
- Switching utilisation up to 110 to 440 V AC
- Suitable for use at 40/50/60 Hz
- Trip unit ratings: 250 A – 400 A (400 AF),  
500 A – 800 A (800AF)
- Fixed thermal setting, adjustable magnetic setting
- 70 kA / 50kA fault interruption rating 400 AF / 800 AF
- Harmonics inhibition
- Megger / Dielectric test voltage: 500 V DC Maximum

### Earth Leakage features

- Yellow ground fault TRIP indication flag
- Grey TEST button
- Green 'Power ON' LED
- Adjustable thermal characteristic dial setting from 63 - 100 % of IR
- Adjustable earth leakage ranges: 100 mA, 200 mA, 500 mA,
- Trip time selection: Fixed
- Type "AC" earth leakage device suitable for AC currents

### Options, Internal and external accessories

- Accessories are a customer fit.
- Auxiliaries & Alarms can be used. The quantities refer to standard MCCB quantity configurations
- Cannot fit Shunt & UVTs
- Standard MCCB external accessories can be installed, except for T2ML link and T2MW wire interlocks. T2MS slide interlocks can be installed
- Will fit to XC and HC chassis



3

Available  
late  
2013

## Integral Earth Leakage Circuit Breaker ZS 400 A - 800 A

### Settings & Features:



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- Earth leakage (RCD) Test button
- Earth leakage tripped indicator flag
- Current sensitivity
- Trip button

### Rated breaking capacities (Ics kA):

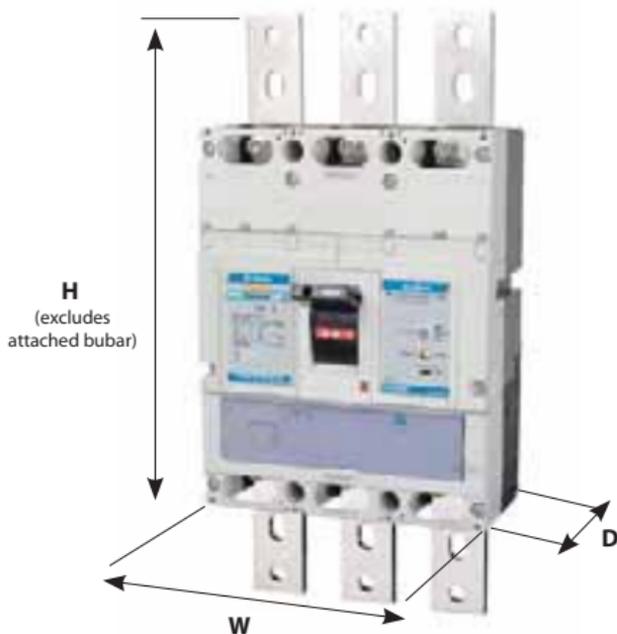
#### ZS ELCB model & kA Rating (Ics)

Voltage range	ZS400GF	ZS630NF	ZS800NF
AC440 V	70	50	50
AC100/240 V	100	85	85

### Overcurrent relay ratings and adjustment:

Trip mechanism type	Thermal magnetic all types		
ZS400NF/GF	trip unit ampere ratings:	250, 300, 350, 400 A	fixed thermal / Adj mag 6 -12 x I <sub>n</sub>
ZS630NF		500 A, 600 A, 630 A, 700, 800 A	fixed thermal / Adj mag 5 -10 x I <sub>n</sub>
ZS800NF			fixed thermal / Adj mag 5 -10 x I <sub>n</sub>

## Integral Earth Leakage Circuit Breaker ZS 400 A - 800 A



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### Dimensions

Outline Dimensions (mm)	ZS400GF	ZS630NF	ZS800NF
H	260	273	273
W	140 3P / 185 4P	210 3P	210 3P
D	103	103	103

## Integral Earth Leakage Circuit Breaker ZS 400GF

**70 kA**

**Current rating:** 250 – 400 A

**Approvals and Tests:** AS/NZS 3947-2, IEC 60947-2,  
AS/NZS 2081: 2011, JIS C 8201

**Operating voltage:** 110 – 440 V 50/60 Hz

**Interrupting capacity:**

3

AC use	Voltage Icu	Icu
	380/415	70

New 400AF  
ZS ELCB



**Trip unit:** Fixed thermal, adjustable magnetic 6 x 12 li

**Earth leakage characteristic:** Type "AC" - suitable for AC currents.

**Earth leakage adjustments:** 100 mA, 200 mA, 500 mA

Fixed operating time: 0.1 second maximum

### Options:

TemBreak 2, 400 A internal and external accessories can be installed, except for shunts, UVTs, Trip Control Units, T2ML / MW Interlocks.

### Neutral Pole

ZS ELCBs are available with switched neutral poles.

### Dimensions

Poles	3	4
H (less attached busbars)	260	260
W	140	185
D (less toggle)	103	103

Available  
late  
2013

Ampere Rating NRC	Fixed Ir <sup>1)</sup> Amps	Adj. li <sup>1)</sup> Amps	Cat. No.	3 Pole Price \$	4 Pole Price \$
250	250	1500 - 3000	ZS400 GF 3 250	3900.00	
			ZS400 GF 4 250		4600.00
300	300	1800 - 3600	ZS400 GF 3 300	3900.00	
			ZS400 GF 4 300		4600.00
350	350	2100 - 4200	ZS400 GF 3 350	4150.00	
			ZS400 GF 4 350		4800.00
400	400	2400 - 4800	ZS400 GF 3 400	4300.00	
			ZS400 GF 4 400		4950.00

**Notes:** <sup>1)</sup> NRC: Nominal rated current, Fixed Ir : Fixed thermal setting, Adj. Fixed li: Adjustable magnetic setting,

## Integral Earth Leakage Circuit Breaker ZS630NF and ZS800NF

### 50 kA

**Current rating:** 500 – 800 A

**Approvals and Tests:** AS/NZS 3947-2, IEC 60947-2,  
AS/NZS 2081: 2011, JIS C8201

**Operating voltage:** 110 – 440 V 50/60 Hz

**Interrupting capacity:**

AC use	Voltage Icu	Icu
	380/415	50



**Trip unit:** Fixed thermal, adjustable magnetic 6 x 10 li

**Earth leakage characteristic:** Type "AC" - suitable for AC currents.

**Earth leakage adjustments:** 100 mA, 200 mA, 500 mA

Fixed operating time: 0.1 second maximum

### Options:

TemBreak 2, 630 - 800 A internal and external accessories can be installed, except for shunts, UVTs, Trip Control Units, T2ML / MW Interlocks

### Neutral Pole

ZS ELCBs are available with switched neutral poles.



### Dimensions

Poles	3	4
H (less attached busbars)	273	273
W	210	280
D (less toggle)	103	103

Ampere Rating NRC	Fixed I <sub>r</sub> <sup>1)</sup> Amps	Adj. I <sub>i</sub> <sup>1)</sup> Amps	Cat. No.	Price \$
500	500	2500 - 5000	ZS630 NF 3 500	4920.00
600	600	3000 - 6000	ZS630 NF 3 600	5200.00
630	630	3150 - 6300	ZS630 NF 3 630	5200.00
700	700	3500 - 7000	ZS800 NF 3 700	5900.00
800	800	4000 - 8000	ZS800 NF 3 800	6200.00

**Notes:** <sup>1)</sup> NRC: Nominal rated current, Fixed I<sub>r</sub>: Fixed thermal setting, Adj. Fixed I<sub>i</sub>: Adjustable magnetic setting,

## TemBreak 2 MCCB Switch Disconnectors (non-auto MCCBs)

**Current rating:** 125 – 2500 A

**Approvals:** Standards AS/NZS 3947-2 and IEC 60947-2

- Accepts MCCB internal and external accessories
- No overcurrent protection (isolator only)
- Suitable for use as a panelboard or switchboard isolator switch
- AC 23 and DC 22 rated to IEC 60947-3
- Rated impulse withstand voltage  $U_{imp} = 8 \text{ kV}$



3

### 3 Pole

Amp rating NRC	Short time rating kA for 0.3 sec (Icw)	Rated short- circuit making capacity (Icm)(kA)	Cat. No.	3 pole Price \$
125	2	3.6	S125NN3	430.00
160	3	6	S160NN3	500.00
250	3	6	S250NN3	500.00
400	5	9	S400NN3	1650.00
630	5	9	S630NN3	2490.00
800	10	15	S800NN3	3150.00
1250	15	32	S1250NN3	7600.00
1600	20	45	S1600NN3	8700.00
2000	35	90	XS2000NN3RC	15610.00
2500 <sup>1)</sup>	35	90	XS2500NN3RC	15990.00

### 4 Pole

Amp rating NRC	Short time rating kA for 0.3 sec (Icw)	Rated short- circuit making capacity (Icm)(kA)	Cat. No.	4 pole Price \$
125	2	3.6	S125NN4	570.00
160	3	6	S160NN4	670.00
250	3	6	S250NN4	670.00
400	5	9	S400NN4	2200.00
630	5	9	S630NN4	3320.00
800	10	15	S800NN4	3990.00
1250	15	32	S1250NN4	8950.00
1600	20	45	S1600NN4	9900.00
2000 <sup>1)</sup>	35	90	XS2000NN4RC	20820.00
2500 <sup>1)</sup>	35	90	XS2500NN4FC	23660.00

**Notes:** <sup>1)</sup> TemBreak 1 MCCBs

Refer Part C catalogue for additional technical details and dimensions.  
 UVTs and shunts are operated by the MCCBs trip lever which remains  
 fitted in MCCB Switch disconnectors (Non Auto MCCBs)

## Moulded Case Circuit Breakers

### TemBreak DC rated MCCBs

- Special "ND" models for 350 V to 600 V DC use <sup>1)</sup>
- Thermal magnetic and Magnetic only types
- 3 and 4 pole types
- 125 A – 2500 A
- Will accept standard accessories on sizes to 630 A
- Will accept standard external accessories for sizes 800 - 2500 A
- Refer NHP for internal accessory fitting for types XS800 - XS2500



3

### DC MCCBs to 800 A

Ampere frame	Trip unit / OCR Sensor ratings (Amps)	Poles <sup>2)</sup>	OCR type	Cat. No.	Price \$
125 AF	20, 32, 50, 63, 100, 125	3	Therm Mag	<b>S125ND3</b>	POA
125 AF	20, 32, 50, 63, 100, 125	4	Therm Mag	<b>S125ND4</b>	POA
250 AF	20, 32, 50, 63, 100, 125, 160	3	Therm Mag	<b>S160ND3</b>	POA
250 AF	20, 32, 50, 63, 100, 125, 160	4	Therm Mag	<b>S160ND4</b>	POA
250 AF	250	3	Therm Mag	<b>S250ND3</b>	POA
250 AF	250	4	Therm Mag	<b>S250ND4</b>	POA
400 AF	400	3	Therm Mag	<b>S400ND3</b>	POA
800 AF	630, 800	3	Therm Mag	<b>S800ND4</b>	POA

New MCCBs  
to 1000 V DC  
available

**Notes:** <sup>1)</sup> All standard thermal magnetic MCCBs are rated to switch DC currents up to 250 V DC.

<sup>2)</sup> Connect poles in series for 350 V DC and above.

The time constant (L/R) of the circuit should be less than 2 ms at or below rated current, less than 7 ms for short circuit equal and below 10 kA, less than 15 ms for short circuits over 10 kA, the connections should be as shown in the diagrams on following page.

## Moulded Case Circuit Breakers

### Ratings

DC Breaking capacity (kA)			Poles 1)	OCR type	Current adjust.	Cat. No.
350 V	500 V	600 V				
10	-	-	3	Therm Mag	63-100 % I <sub>r</sub>	<b>S125ND</b>
10	7.5	5	4	Therm Mag	63-100 % I <sub>r</sub>	<b>S125ND</b>
10	-	-	3	Therm Mag	63-100 % I <sub>r</sub>	<b>S160ND</b>
10	7.5	5	4	Therm Mag	63-100 % I <sub>r</sub>	<b>S160ND</b>
10	-	-	3	Therm Mag	63-100 % I <sub>r</sub>	<b>S250ND</b>
10	7.5	5	4	Therm Mag	63-100 % I <sub>r</sub>	<b>S250ND</b>
20	15	15	3	Therm Mag	63-100 % I <sub>r</sub>	<b>S400ND</b>
30	20	20	3	Therm Mag	50-100 % I <sub>r</sub>	<b>S800ND</b>

Ampere rating	Device type	Part Prefix	DC Utilisation voltage
20 - 2500	MCCB	S125 - 2500 ND	600 V
250 - 800	MCCB	PVS 400 - 800 ND	750 V
250 - 800	MCCB	PVS 400 - 800 NDH	1000 V
160 - 800	Isolator	PVS 160 - 800 NNL	800 V
160 - 800	Isolator	PVS 400 - 800 NNH	1000 V

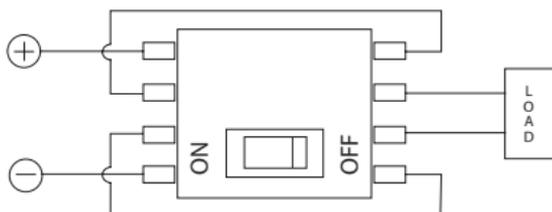
### 3 and 4 pole series connection

The following wiring connection diagrams should be followed to obtain the kA switching rating levels indicated in the table above.

#### 3 pole in series



#### 4 pole in series



**Notes:** 1) Connect poles in series for 350 V DC and above.

The time constant (L/R) of the circuit should be less than 2 ms at or below rated current, less than 7 ms for short circuit equal and below 10 kA, less than 15 ms for short circuits over 10 kA, the connections should be as shown in the diagrams on following page.

## DC magnetic types 630 A – 2500 A

- Ampere range 630 – 2500 A
- 3 pole
- Special shunt and UVT available for sizes 1250 A to 1600 A
- Magnetic adjustment range 4 - 8 x I<sub>m</sub>



### 3 pole

Amp rating NRC	Trip Unit Type	3 Pole Cat. No. <sup>2) 3)</sup>	3 pole Price \$
1000 <sup>4)</sup>	Thermal Magnetic	<b>XS1000ND10003FC</b>	<b>9630.00</b>
1250	Magnetic only	<b>XS1250ND12503FC <sup>2)3)</sup></b>	<b>10160.00</b>
1600	Magnetic only	<b>XS1600ND16003FC <sup>1)3)</sup></b>	<b>16750.00</b>
2000	Magnetic only	<b>XS2000ND20003RC</b>	<b>18460.00</b>
2500	Magnetic only	<b>XS2500ND25003RC</b>	<b>20710.00</b>

**Notes:** <sup>1)</sup> 3 pole sizes stocked.

<sup>2)</sup> Mounting details for DC Applications series are identical to those for the same frame size Standard series (i.e. for XS1000ND refer to XS800NJ, XS1250ND and XS1600ND refer to XS1600NE, XS2000ND and XS2500ND refer to XS2500NE).

<sup>3)</sup> For 1250 A and 1600 A DC MCCBs some internal accessories may differ from standard AC types. Information is as follows. Internal accessories are a FACTORY fit.

a) Auxiliaries and alarms - Same as standard AC MCCB type

b) Shunt trips are type: 2H2438BAA - 110 V DC or 2H2439BDA - 220 V DC

c) Under voltage trips are type: 2H3776CBB - 110 V DC or 2H3776CCB - 220 V DC + barrier 2H3748EBA

<sup>4)</sup> Thermal/magnetic adjustment down to 630 amps.

NRC: Nominal rated current.

All TemBreak thermal magnetic MCCBs can be used for DC applications

## Plug in MCCBs: 125 – 630 AF TemBreak 2

### External accessories

#### Plug-in MCCBs <sup>1)</sup>

A range of MCCBs are stocked with a rear mounted pre-fitted plug-in section that plugs into the panel mounted base section. The panel mounted base section is ordered separately. The TemBreak 2 plug-in bases include a safety interlock system where the MCCB must be switched OFF to allow MCCB removal. The plug-in base allows for the fitting of up to 4 terminal blocks when auxiliaries, alarms, shunts or UVTs are used. Rear connect terminal covers can be used on the front of the MCCB for IP 20 ingress protection. Standard MCCB conversion to plug-in – NHP can convert standard MCCB to plug-in use.

#### MCCBs complete with base plug (3 pole types below are stocked) <sup>1)</sup>

MCCB Ampere Rating	MCCB Ampere NRC	400/415 V <sup>6)</sup> kA rating	3 pole Cat. No.	Price \$
20		30 kA	S125NJ320PM	850.00
32		30 kA	S125NJ332PM	850.00
50		65 kA	S125GJ350PM	850.00
63		65 kA	S125GJ363PM	850.00
100		65 kA	S125GJ3100PM	1050.00
125		65 kA	S125GJ3125PM	1210.00
160		65 kA	S160GJ3160PM	1440.00
250		65 kA	S250GJ3250PM	1780.00
400		70 kA	S400GE3400PM	3010.00
630 (530 A) <sup>2)</sup>		70 kA	S630GE3630PM	3600.00
<b>MCCB panel mounting bases</b>				
3 pole kit for 125 AF <sup>3)</sup>			T2PM12A3A	159.00
4 pole kit for 125 AF <sup>3)</sup>			T2PM12A4A	200.00
3 pole kit for 160/250 AF <sup>3)</sup>			T2PM25A3A	178.00
4 pole kit for 160/250 AF <sup>3)</sup>			T2PM25A4A	235.00
3 pole kit for 400/630 AF <sup>3)</sup>			T2PM40A3A	380.00
4 pole kit for 400/630 AF <sup>3)</sup>			T2PM40A4A	510.00
<b>Control wiring terminals for plug-in MCCBs <sup>3)</sup> <sup>4)</sup> <sup>5)</sup></b>				
3 pin plug for aux/alarm - MCCB side			2H6959CAA1	37.00
3 pin plug for shunt/UVT - MCCB side			2H6959CBA1	37.00
3 pin socket for panel mount section			T2TP003A	37.00

**Notes:** <sup>1)</sup> Other MCCBs not listed can be supplied on request or converted to plug-in, refer next page.

<sup>2)</sup> S630 MCCBs when used with a plug-in base must be derated to 530 A.

<sup>3)</sup> Up to 4 control wiring plug and socket sets can be used in a base.

<sup>4)</sup> Control wiring kits include pin lugs for internal accessories.

<sup>5)</sup> Internal accessories must be ordered separately.

<sup>6)</sup> TemBreak 2 MCCBs types E/S/H/L can be converted for plug-in use.

## Accessories to suit 125 – 630 AF TemBreak 2

### FC connection bars — 'L' shaped terminal bar set

	Cat. No.	Price \$
<b>S125</b>		
3 pole kit of 3 bars	T2PF123BA	34.00
4 pole kit of 4 bars	T2PF124BA	46.00
<b>S160, S250</b>		
3 pole kit of 3 bars	T2PF253BA	71.00
4 pole kit of 4 bars	T2PF254BA	94.00
<b>S400, S630</b>		
3 pole kit of 3 bars	T2PF403BA	215.00
4 pole kit of 4 bars	T2PF404BA	280.00

### Plug in MCCB kits Suits MCCB types

	Cat. No.	Price \$	
 <p>"S.....PM" MCCB with plugs fitted</p> <p>MCCB</p>	<b>E125, S125</b>		
	3 pole kit (base not included)	2H6843CAB	105.00
	4 pole kit (base not included)	2H6844CAB	127.00
	<b>S160, E/S 250</b>		
	3 pole kit (base not included)	2H6845CAA	132.00
	4 pole kit (base not included)	2H6846CAA	167.00
	<b>H/L 125-160-250 (not S250PE/H250NE)</b>		
	3 pole kit (base not included)	2H6940CAB	220.00
	4 pole kit (base not included)	2H6941CAB	275.00
	<b>S250PE, H250NE</b>		
	3 pole kit (base not included)	2H6940CBA	250.00
	4 pole kit (base not included)	2H6941CBA	305.00
	<b>E400, S400 (not for H/L400)</b>		
	3 pole kit (base not included)	2H6847CAAK	305.00
4 pole kit (base not included)	2H6848CAAK	395.00	
<b>S630</b>			
3 pole kit (base not included)	2H7234CAAK	500.00	
4 pole kit (base not included)	2H7235CAAK	640.00	



T2PM base



Plug in MCCBs

## TemBreak 2 & TemBreak 1 MCCB cross reference

### TemBreak 2 MCCB



3

Ampere Range	TemBreak 2 415 V kA		Thermal-Mag. Adjustable	Electronic Adjustment	TemBreak 2 Catalogue Number
	Icu	Ics			
12.5 – 125	25	19	Yes	–	E125NJ
16 – 125	25	13	No	–	S125NF
15 – 100	65	33	No	–	S100GF
12.5 – 125	36	36	Yes	–	S125NJ
12.5 – 125	65	36	Yes	–	S125GJ
12.5 – 125	125	85	Yes	–	H125NJ
12.5 – 125	200	150	Yes	–	L125NJ
16 – 160	25	19	No	–	S160NF
12.5 – 160	36	36	Yes	–	S160NJ
32 – 160	65	36	Yes	–	S160GJ
100 – 160	125	85	Yes	–	H160NJ
100 – 160	200	150	Yes	–	L160NJ
12.5 – 250	25	19	Yes	–	E250NJ
160 – 250	36	36	Yes	–	S250NJ
160 – 250	65	36	Yes	–	S250GJ
16 – 250	70	70	–	Yes	S250PE
160 – 250	125	85	Yes	–	H250NJ
16 – 250	125	85	–	Yes	H250NE
160 – 250	200	150	Yes	–	L250NJ
100 – 400	25	25	Yes	–	E400NJ
160 – 400	36	36	Yes	–	S400CJ
160 – 400	50	50	Yes	–	S400NJ
100 – 400	50	50	–	Yes	S400NE
160 – 400	70	50	Yes	–	S400GJ
100 – 400	70	50	–	Yes	S400GE
100 – 400	85	85	–	Yes	S400PE
100 – 400	125	85	–	Yes	H400NE
100 – 400	200	150	–	Yes	L400NE
252 – 630	36	36	–	Yes	E630NE
252 – 630	50	50	–	Yes	S630CE
252 – 630	70	50	–	Yes	S630GE

**Notes:** The above equivalents are approximate only. Physical sizes may vary slightly as well as kA ratings.

## TemBreak 2 & TemBreak 1 MCCB cross reference

### TemBreak 1 MCCB



To obtain stocked TemBreak 1 MCCBs  
125 - 400 A Refer Section 6 or refer NHP

### TemBreak 1 – approximate equivalent Primary equivalent 1, secondary 2, third 3, / & 415 V kA rating

1		2		3	
XS125CJ	18 kA	XS125NJ	25 kA	XE225NC	18 kA
XS125CS	14 kA	XS125NS	25 kA	-	
XH125NJ	50 kA	-	-	-	
XS125NJ	25 kA	XS125CJ	18 kA	XE225NC	18 kA
XH125NJ	50 kA	TL100NJ	85 kA	XH125PJ	50 kA
TL30F	120 kA	TL100F	120 kA	TL100NJ	85 kA
TL225B	180 kA	-	-	-	
-		-		-	
XS250NJ	25 kA	XH160PJ	50 kA	XE225NC	18 kA
XH250NJ	50 kA	XH250PJ	85 kA	XH160PJ	50 kA
TL250NJ	85 kA	TL225F	120 kA	TL100F	120 kA
TL225B	180 kA	TL100C	180 kA	-	
XS250NJ	25 kA	XE225NC	18 kA	-	
XS250NJ	25 kA	-	-	-	
XH250NJ	50 kA	TL250NJ	85 kA	-	
XH400SE	65 kA	XS400SE	50 kA	-	
TL250NJ	85 kA	XH250PJ	65 kA	-	
TL400NE	85 kA	TL225F	120 kA	-	
TL225B	180 kA	-	-	-	
XS400CJ	35 kA	-	-	-	
XS400CJ	35 kA	-	-	-	
XS400NJ	50 kA	-	-	-	
XS400SE	50 kA	XH400SE	65 kA	XH400PE	65 kA
XH400PJ	65 kA	-	-	-	
XH400SE	65 kA	XH400PE	65 kA	TL400NE	85 kA
TL400NE	85 kA	-	-	-	
TL400NE	85 kA	TL630NE	125 kA	-	
-		-		-	
XS630CJ	42 kA	XS630NJ	50 kA	-	
XS630SE	50 kA	XS630NJ	50 kA	-	
XH630SE	65 kA	XH630PE	65 kA	XS630PJ	85 kA

**Notes:** MCCBs with the same colours have the same outline dimensions, though in the case of 400 AF & 630 AF, main terminal heights vary.

## TemBreak 2 & TemBreak 1 MCCB cross reference

### TemBreak 2 MCCB



#### Isolators - Short time rating for 0.3 seconds I<sub>cw</sub> (kA)

3

Ampere Range	TemBreak 2 415 V kA I <sub>cu</sub>	TemBreak 2 415 V kA I <sub>cs</sub>	Thermal-Mag Adjust-able	Electronic Adjustment	TemBreak 2 Catalogue Number
125	2	-	-	-	S125NN
160	3	-	-	-	S160NN
250	3	-	-	-	S250NN
400	5	-	-	-	S400NN
630	5	-	-	-	S630NN

### TemBreak 1 MCCB



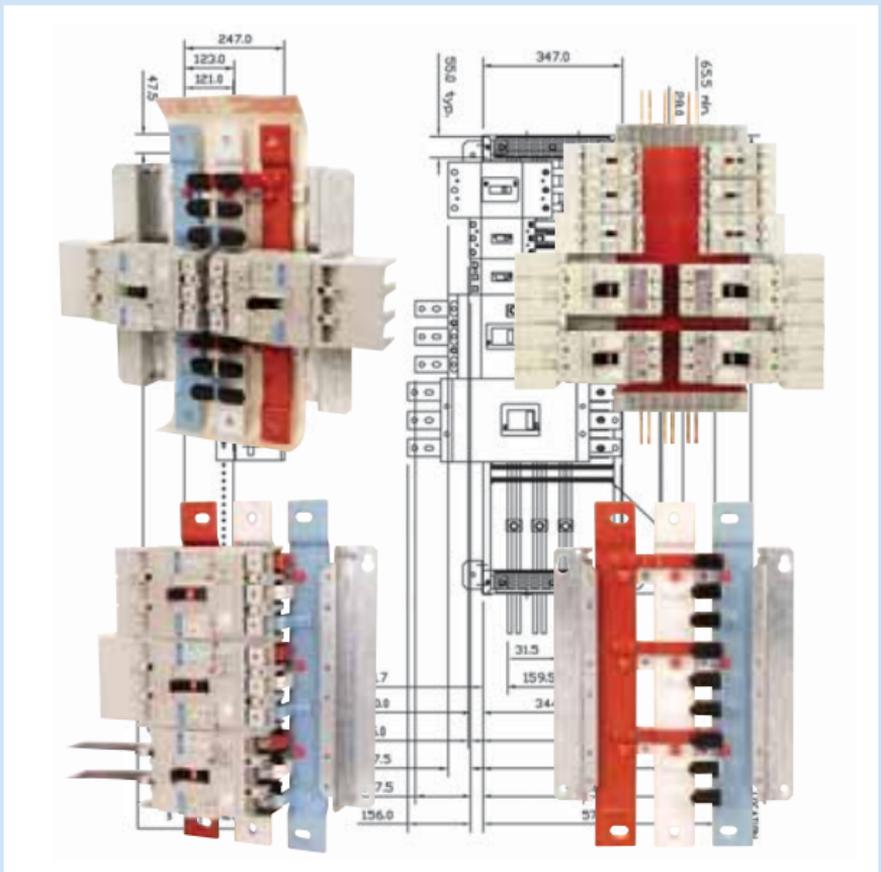
#### TemBreak 1 – approximate equivalent Primary equivalent 1, secondary 2, third 3, / & 415 V kA rating

	1	2	3
XS125NN	1.8 kA	-	-
XS250NN	4 kA	XE250NNC	3 kA
XS250NN	4 kA	-	-
XS400NN	5 kA	-	-
XS630NN	10 kA	XS800NN	10 kA

**Notes:** The above equivalents are approximate only. Physical sizes may vary slightly as well as kA ratings.

## Chassis assemblies for the TemBreak range

	Page
Chassis assemblies overview	4 – 2
XA / XB, PXB series	4 – 3
XB SS series	4 – 7
XC series	4 – 9
Chassis to suit 125 - 250 AF MCCBs	4 – 11
Terminal covers	4 – 12
HC High-current chassis	
- to suit TemBreak 2 125 – 630 AF MCCBs	4 – 15
- to suit TemBreak 1 630 – 1250 AF MCCBs	



## Moulded Case Circuit Breaker Chassis Systems

### General features of TemWay XA, XB, PXB, XC chassis

- 36 and 40 kA ratings on standard TemWay XA, XB, PXB chassis
- 50 and 65 kA ratings on TemWay XC chassis
- XC 1000 A chassis are now stocked with 400 A and 250 A tee off combinations
- A range of TemWay 4 pole XA and XB chassis, suitable for earth leakage MCCBs
- A simplified range of single sided chassis for 250 AF MCCBs, 20 – 250 A
- Suitable for 690 V AC applications



### General features of heavy current "HC" chassis

- For MCCBs, 20 - 1250 A
- Compact single sided version
- Common configurations of HC chassis now stocked - fully assembled for quick delivery
- 11 box sizes – more economical sizing to suit applications and save cost
- Suitable for 690 V AC applications

4

### Testing

Both TemWay and HC Chassis have been unconditionally type tested (no MCCBs fitted) in Australia, at the short time withstand ratings shown in the table below.

### Chassis ratings

Chassis Type	Description	Main bar rating (A)	Fault current level l <sub>cw</sub> rating	MCCB frame size	MCCB type
XA	Double sided	630, 800 A <sup>1)</sup>	36 kA 1 sec. / 40 kA 0.5 sec.	125 AF	E/S/ZS125 12A-125A
XB	Double sided	800 A <sup>1)</sup>	36 kA 1 sec. / 40 kA 0.5 sec.	250 AF	E/S/ZS250 NJ/GJ 12 A-250 A
XBSS	Single sided Left or right sided	800 A <sup>1)</sup>	36 kA 1 sec. / 40 kA 0.5 sec.	250 AF	E/S/ZS250 NJ/GJ 12 A-250 A
PXB	Double sided	800 A	36 kA 1 sec. / 40 kA 0.5 sec.	250 AF	S250PE, or a mix of 250 AF sizes
XC	Double sided	1000 A <sup>1)</sup>	50 kA 1 sec. / 65 kA 0.5 sec.	250 AF, 400 AF	E/S/ZS160-250 up to E/S400
HC	Double sided or single sided left or right	1250 A, 1600 A, 2200 A	65 kA 1 Sec.	250 AF to 1250 AF	E/S160 up to XS1250SE

**Notes:** <sup>1)</sup> XB and PXB Chassis main bars are rated at 800 A. Optional for XA chassis. To comply to the new Australian New Zealand AS/NSZ 3000 - 2007 standard regarding separation, XA, XB, PXB and XC chassis should be only used in switchboards having operational currents less than 800 A. For chassis that include integral separation and for currents equal to, and exceeding 800 A, a HC high current chassis must be used.

## XA / XB Chassis for 125 - 250 AF MCCBs

### 3 pole, double sided

#### Features

- Complies with AS/NZS 3439, AS/NZS 3000 - 2007
- Suits TemBreak MCCBs 125-250 A
- Top and bottom fed
- Busbars fully insulated
- Side mounting rail now standard for quicker mounting on all chassis
- XA and XB chassis now rated up to : 36 kA for 1 second  
40 kA for 0.5 seconds

#### XA 630 and XA 800

##### Suits E125, S125, ZS125 MCCBs

No. Poles	Cutout <sup>1)</sup> Height (mm)	Pan Height (mm)	Cat. No.	630 A Price \$	Cat. No.	800 A Price \$ <sup>2)</sup>
6	92	90	<b>XA6306U</b>	<b>275.00</b>	<b>XA8006U</b>	<b>285.00</b>
12	182	180	<b>XA63012U</b>	<b>390.00</b>	<b>XA80012U</b>	<b>400.00</b>
18	272	270	<b>XA63018U</b>	<b>500.00</b>	<b>XA80018U</b>	<b>540.00</b>
24	362	360	<b>XA63024U</b>	<b>670.00</b>	<b>XA80024U</b>	<b>670.00</b>
30	452	450	<b>XA63030U</b>	<b>750.00</b>	<b>XA80030U</b>	<b>800.00</b>
36	542	540	<b>XA63036U</b>	<b>900.00</b>	<b>XA80036U</b>	<b>960.00</b>
42	632	630	<b>XA63042U</b>	<b>1020.00</b>	<b>XA80042U</b>	<b>1090.00</b>
48	722	720	<b>XA63048U</b>	<b>1130.00</b>	<b>XA80048U</b>	<b>1180.00</b>
60	902	900	<b>XA63060U</b>	<b>1380.00</b>	<b>XA80060U</b>	<b>1450.00</b>
72	1082	1080	<b>XA63072U</b>	<b>1650.00</b>	<b>XA80072U</b>	<b>1730.00</b>

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#### XB 800

##### Suits S160, S250NJ, S250GJ, ZS250 MCCBs (not S250PE)

No. Poles	Cutout <sup>1)</sup> Height (mm)	Pan Height (mm)	Cat. No.	800 A Price \$ <sup>2)</sup>
6	107	105	<b>XB8006U</b>	<b>455.00</b>
12	212	210	<b>XB80012U</b>	<b>400.00</b>
18	317	315	<b>XB80018U</b>	<b>740.00</b>
24	422	420	<b>XB80024U</b>	<b>670.00</b>
30	527	525	<b>XB80030U</b>	<b>1120.00</b>
36	632	630	<b>XB80036U</b>	<b>1330.00</b>
42	737	735	<b>XB80042U</b>	<b>1540.00</b>
48	842	840	<b>XB80048U</b>	<b>1760.00</b>
60	1052	1050	<b>XB80060U</b>	<b>2130.00</b>
72	1262	1260	<b>XB80072U</b>	<b>2710.00</b>

- Notes:**
- <sup>1)</sup> The length of the escutcheon cut-out
  - <sup>2)</sup> XB Chassis main bars are rated at 800 A, while for XA chassis it is an option. To comply to the new Australian New Zealand AS/NSZ 3000 - 2007 standard regarding separation, XA, XB chassis should be used in switchboards having operational currents less than 800 A. For chassis that include integral separation and for currents equal to, and exceeding 800 A, a HC high current chassis must be used. For XB chassis with Form 3bih separation, refer NHP.

## PXB Chassis for 250AF electronic / thermal magnetic MCCBs

### 3 pole, double sided

#### Features

- Complies with AS/NZS 3439, AS/NZS 3000 - 2007
- Suitable for MCCBs 12 A - 250 A
- Suits either all electronic or a mix of electronic and thermal magnetic MCCBs
- Top and bottom fed
- Busbars fully insulated
- PXB chassis rated: 36 kA for 1 second  
40 kA for 0.5 seconds



PXB80018U  
chassis shown

#### PXB 800

**Suits S250PE electronic, S160, E250, S250, ZS250 thermal mag. MCCBs**

4

No. of Poles	Cutout Height <sup>1)</sup> (mm)	Pan Height <sup>2)</sup> (mm)	800 A Cat. No.	Price \$
6	107	105	PXB8006U	510.00
12	212	210	PXB80012U	590.00
18	317	315	PXB80018U	810.00
24	422	420	PXB80024U	1040.00
30	527	525	PXB80030U	1230.00
36	632	630	PXB80036U	1600.00
42	737	735	PXB80042U	1850.00
48	842	840	PXB80048U	2120.00
60	1052	1050	PXB80060U	2540.00
72	1262	1260	PXB80072U	3250.00

PXB Chassis showing add-on brackets for mounting thermal magnetic MCCBs



#### PXB chassis details

##### Fitting S250PE Electronic MCCBs

The PXB chassis has extra long tee offs to accommodate 103 mm deep S250PE electronic MCCBs. An S250PE MCCB will not mount onto a standard XB chassis.

##### Fitting S250PE electronic, S160, E250 and S250 thermal magnetic MCCBs

The PXB chassis caters for a mix of 103 mm deep S250PE and 68mm deep thermal magnetic S160, E250, S250 MCCBs. The chassis comes as standard with add-on metal brackets & screws, to allow shallower 68 mm deep MCCBs to be installed in any position on the chassis. The total quantity of 3 pole brackets supplied equals the number of 3 pole tee off sets.

- Notes:**
- <sup>1)</sup> The length of the escutcheon cut-out.
  - <sup>2)</sup> Busbars extend 50 mm beyond the pan length at the top and bottom on XA, XB, XC chassis.

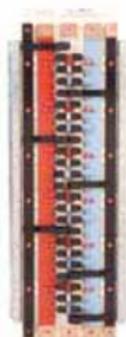
PXB Chassis main bars are rated at 800 A. In order for adhere to the new Australian New Zealand AS/NZS 3000 - 2007 standard regarding separation, XB chassis should be used in switchboards having operational currents less than 800 A. For chassis that includes integral separation and for utilisation currents equal to, and exceeding 800 A, a HC high current chassis must be used.

## XA / XB Chassis for 125 - 250AF MCCBs

### 4 pole, double sided

#### Features

- Complies with AS/NZS 3439, AS/NZS 3000 - 2007
- Suits TemBreak MCCBs 125-250 A
- Top and bottom fed
- Busbars fully insulated
- Side mounting rail now standard for quicker mounting on all chassis
- XA and XB chassis now rated up to : 36 kA for 1 second  
40 kA for 0.5 seconds



800A chassis shown <sup>3)</sup>

#### XA 630 and XA 800

#### Suits E125, S125, ZS125 MCCBs

No. Poles	Cutout <sup>1)</sup> Height (mm)	Pan Height (mm)	Cat. No.	630 A Price \$
8	122	150	XA6308U4POLE	760.00
16	242	270	XA63016U4POLE	910.00
24	362	390	XA63024U4POLE	1320.00
32	482	510	XA63032U4POLE	1680.00
40	602	630	XA63040U4POLE	2010.00
48	722	750	XA63048U4POLE	2360.00
56	842	850	XA63056U4POLE	2920.00
64	962	990	XA63064U4POLE	3110.00

No. Poles	Cutout <sup>1)</sup> Height (mm)	Pan Height (mm)	Cat. No. <sup>2)</sup>	800 A Price \$
8	122	150	XA8008U4POLE	840.00
16	242	270	XA80016U4POLE	940.00
24	362	390	XA80024U4POLE	1380.00
32	482	510	XA80032U4POLE	1780.00
40	602	630	XA80040U4POLE	2170.00
48	722	750	XA80048U4POLE	2600.00
56	842	850	XA80056U4POLE	3020.00
64	962	990	XA80064U4POLE	3370.00

**Notes:** <sup>1)</sup> The length of the escutcheon cut-out.

<sup>2)</sup> XB Chassis main bars are rated at 800 A, while for XA chassis it is an option.

To comply to the new Australian New Zealand AS/NSZ 3000 - 2007 standard regarding separation, XA, XB chassis should be only used in switchboards having operational currents less than 800 A. For chassis that include integral separation and for currents equal to, and exceeding 800 A, a HC high current chassis must be used.

<sup>3)</sup> XA and XB 4 pole chassis have a common pan width. 630A chassis use 4 main bars while 800 A have 5 main bars (2 neutral bars).

## XA / XB Chassis for 125 - 250AF MCCBs

### 4 pole, double sided

#### **XB 800**

**Suits S160, S250NJ, S250GJ, ZS250 MCCBs (not S250PE)**

No. Poles	Cutout <sup>1)</sup> Height (mm)	Pan Height (mm)	Cat. No. <sup>2)</sup>	800 A Price \$
8	142	175	<b>XB8008U4POLE</b>	<b>930.00</b>
16	282	315	<b>XB80016U4POLE</b>	<b>1170.00</b>
24	422	455	<b>XB80024U4POLE</b>	<b>1630.00</b>
32	562	595	<b>XB80032U4POLE</b>	<b>2100.00</b>
40	702	735	<b>XB80040U4POLE</b>	<b>2540.00</b>
48	842	875	<b>XB80048U4POLE</b>	<b>3060.00</b>

4

**Notes:** <sup>1)</sup> The length of the escutcheon cut-out.

<sup>2)</sup> XB Chassis main bars are rated at 800 A, while for XA chassis it is an option.

To comply to the new Australian New Zealand AS/NSZ 3000 - 2007 standard regarding separation, XA, XB chassis should be only used in switchboards having operational currents less than 800 A. For chassis that include integral separation and for currents equal to, and exceeding 800 A, a HC high current chassis must be used.

## XB SS Chassis for 125 - 250 AF MCCBs

### 3 pole, single sided

#### Features

- Single sided MCCB mounting
- Different chassis for left or right side MCCB mounting
- Complies with AS/NZS 3439, AS/NZS 3000 - 2007
- Suits TemBreak, 160 / 250 A Frame MCCBs
- Current ratings of MCCBs range 12 A to 250 A
- Top and bottom fed
- Busbars fully insulated
- Side mounting rail now standard for quicker mounting on all chassis
- XA and XB chassis now rated up to : 36 kA for 1 second  
40 kA for 0.5 seconds



#### Single Sided Chassis

**Suits S160NJ, E250NJ, S250NJ, S160GJ, S250GJ, ZS250 MCCBs (not S250PE)**

#### XB SSL 800

**LEFT hand single sided 3 pole** (MCCB loadside connections at LEFT)

No. Poles	Cutout <sup>1)</sup> Height (mm)	Pan Height (mm)	Cat. No. <sup>2)</sup>	800 A Price \$
3	107	105	<b>XBSSL 800 3U</b>	<b>370.00</b>
6	212	210	<b>XBSSL 800 6U</b>	<b>440.00</b>
9	317	315	<b>XBSSL 800 9U</b>	<b>590.00</b>
12	422	420	<b>XBSSL 800 12U</b>	<b>750.00</b>
15	527	525	<b>XBSSL 800 15U</b>	<b>890.00</b>
18	632	630	<b>XBSSL 800 18U</b>	<b>1080.00</b>
21	737	735	<b>XBSSL 800 21U</b>	<b>1220.00</b>
24	842	840	<b>XBSSL 800 24U</b>	<b>1760.00</b>
30	1052	1050	<b>XBSSL 800 30U</b>	<b>2130.00</b>
36	1262	1260	<b>XBSSL 800 36U</b>	<b>2710.00</b>

#### Notes:

- <sup>1)</sup> The length of the escutcheon cut-out.
- <sup>2)</sup> Busbars extend 50 mm beyond the pan length at the top and bottom on XA, XB, XC chassis.

PXB Chassis main bars are rated at 800 A. In order for adhere to the new Australian New Zealand AS/NZS 3000 - 2007 standard regarding separation, XB chassis should be used in switchboards having operational currents less than 800 A. For chassis that includes integral separation and for utilisation currents equal to, and exceeding 800 A, a HC high current chassis must be used.

## XB SS Chassis for 125 - 250 AF MCCBs

### 3 pole, single sided

#### XB SSR 800

**RIGHT hand single sided 3 pole** (MCCB loadside connections at RIGHT)

No. Poles	Cutout <sup>1)</sup> Height (mm)	Pan Height (mm)	Cat. No. <sup>2)</sup>	800 A Price \$
3	107	105	<b>XBSSR 800 3U</b>	<b>370.00</b>
6	212	210	<b>XBSSR 800 6U</b>	<b>440.00</b>
9	317	315	<b>XBSSR 800 9U</b>	<b>590.00</b>
12	422	420	<b>XBSSR 800 12U</b>	<b>750.00</b>
15	527	525	<b>XBSSR 800 15U</b>	<b>890.00</b>
18	632	630	<b>XBSSR 800 18U</b>	<b>1080.00</b>
21	737	735	<b>XBSSR 800 21U</b>	<b>1220.00</b>
24	842	840	<b>XBSSR 800 24U</b>	<b>1760.00</b>
30	1052	1050	<b>XBSSR 800 30U</b>	<b>2130.00</b>
36	1262	1260	<b>XBSSR 800 36U</b>	<b>2710.00</b>

4

- Notes:**
- <sup>1)</sup> The length of the escutcheon cut-out.
  - <sup>2)</sup> Busbars extend 50 mm beyond the pan length at the top and bottom on XA, XB, XC chassis.

PXB Chassis main bars are rated at 800 A. In order for adhere to the new Australian New Zealand AS/NZS 3000 - 2007 standard regarding separation, XB chassis should be used in switchboards having operational currents less than 800 A. For chassis that includes integral separation and for utilisation currents equal to, and exceeding 800 A, a HC high current chassis must be used.



## XC Chassis for 160 / 250 A - 400 A MCCBs

### 3 pole, double sided

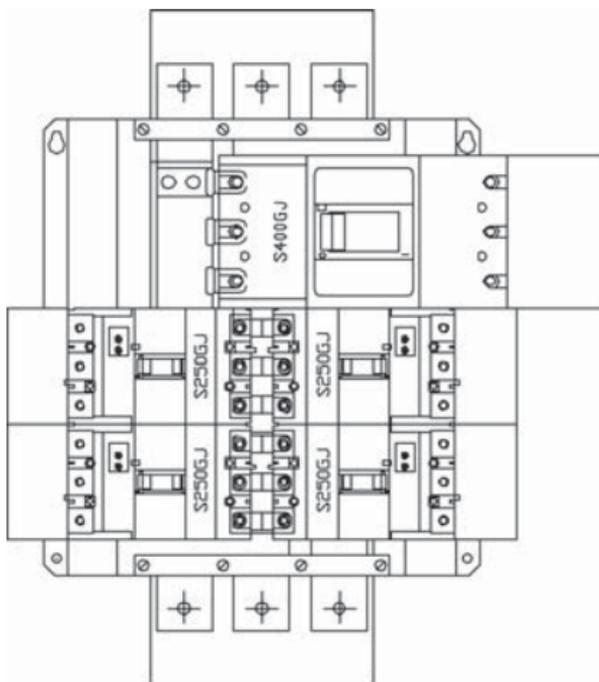
#### XC 1000 Chassis

#### Suits 250 A and 400 A MCCBs <sup>2)</sup> (not S250PE)

As an alternative to a larger high current chassis, where only up to 2 x 400 A and up to 12 x 68 mm deep 250 A MCCBs need to be installed, the configurations of stocked XC chassis below can be used.

Pan Height (mm)	Chassis configured for MCCBs below <sup>2)</sup> <sup>3)</sup>	Cat. No. <sup>1)</sup>	1000 A Price \$
415	1 x 400 A and 4 x 250 A	<b>XC10001X4R12U</b>	<b>1490.00</b>
625	1 x 400 A and 8 x 250 A	<b>XC10001X4R24U</b>	<b>2100.00</b>
835	1 x 400 A and 12 x 250 A	<b>XC10001X4R36U</b>	<b>2800.00</b>
555	2 x 400 A and 4 x 250 A	<b>XC10002X4R12U</b>	<b>2320.00</b>
765	2 x 400 A and 8 x 250 A	<b>XC10002X4R24U</b>	<b>2930.00</b>
975	2 x 400 A and 12 x 250 A	<b>XC10002X4R36U</b>	<b>3630.00</b>

4



- Notes:**
- <sup>1)</sup> XC Chassis main bars are rated at 1000 A. To comply to the new Australian New Zealand AS/NSZ 3000 - 2007 standard regarding separation, XC chassis should be only used in switchboards having operational currents less than 800 A. For chassis that include integral separation and for currents equal to, and exceeding 800 A, a HC high current chassis must be used.
  - <sup>2)</sup> XC chassis can be custom built for alternate combinations of 250 A MCCBs, and up to 2 x 400 AF MCCBs, and ZS125 (125 AF) ELCBs. **630 A MCCB mounting is not possible.**
  - <sup>3)</sup> 400 A MCCB right side mounted as standard. LH mounting optional to special order.

## Chassis to suit 125 – 250 AF MCCBs

### TemWay chassis ratings and cut-out detail

Chassis Type	Amps	(Icw) kA short time with-stand	Standard Chassis suits MCCBs <sup>1)</sup>
XA	630	36 kA for 1 sec	E125, S125NJ, S125GJ, ZS125
	630	40 kA for 0.5 sec	
	800	36 kA for 1 sec	
	800	40 kA for 0.5 sec	
XB / XBSS	800	36 kA for 1 sec	S160NJ, E250NJ, S250NJ, ZS250 S160GJ, S250GJ
	800	40 kA for 0.5 sec	
PXB	800	36 kA for 1 sec	S250PE or a mix of 250 AF sizes.
	800	40 kA for 0.5 sec	
XC	800	50 kA for 1 sec	S160NJ/GJ, E250NJ (400 A MCCBs <sup>2)</sup> ) S250NJ/GJ, ZS250
	800	65 kA for 0.5 sec	

### Testing

TemWay chassis have been unconditionally type tested (without MCCBs fitted) at the above short time kA ratings (Icw).

#### MCCB dimensions (mm)

	H	W	D
<b>E125, S125NJ/GJ, ZS125</b>			
1 pole	155	30	68
3 pole	155	90	68
<b>S160, S250NJ/GJ, ZS250</b>			
1 pole	165	40	68
3 pole	165	105	68

#### MCCB dimensions (mm)

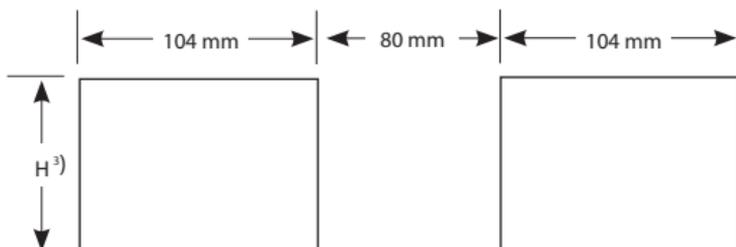
	H	W	D
<b>E400, S400</b>			
1 pole	-	-	-
3 pole	260	140	103

### Escutcheon cut-out dimensions (mm)

Applicable to:

TemBreak 2 MCCBs: E/S 125/160/250 AF/400 AF

TemBreak 1 MCCBs: XS/XH 125/250 AF



- Notes:**
- <sup>1)</sup> TemBreak 1, XS/XH MCCBs can be fitted to the above chassis.
  - <sup>2)</sup> Refer XC chassis ordering page in this section for special XC chassis that accept 400 A MCCBs.
  - <sup>3)</sup> For height dimensions for MCCB cut-out refer to "H" in the charts above.

## Terminal cover options for TemWay XA, XB, XBSS and XC Chassis

### Installation considerations

- MCCBs on the chassis are to be reverse connected, that is, connect the 'bottom' of breaker to the chassis tee offs
- Terminal or interpole barriers or "other adequate insulation material" must be fitted at MCCB load side, (top of MCCB) which is the gas venting end of the MCCB

### Load Side

**Terminal or interpole barriers below:**

### Line Side

**Optional covers below:**

4

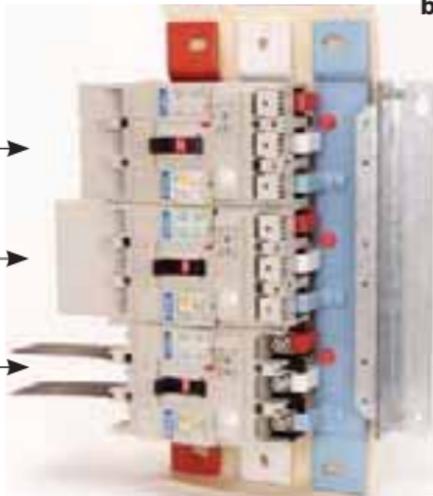
T2CF Short terminal cover

T2CF Standard terminal cover

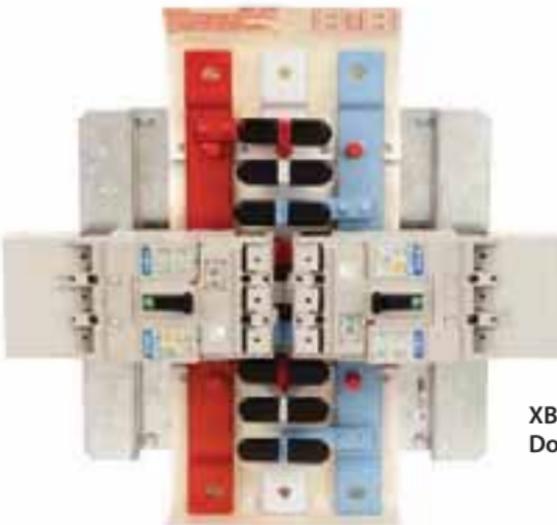
T2BA Interpole barriers

T2CS flush terminal cover (optional)

No cover (optional)



**XBSSL8009U  
Single Sided Chassis**



**XB80018U  
Double Sided Chassis**

## Terminal cover selection

### 20 A - 1250 A MCCBs

	Suit MCCB types	Cover length	Cat. No.	Price \$
<b>Flush IP 20 covers (FC)</b>	<b>E125, S125</b>			
	1 pole cover - set of 2	-	T2CS1215G	10.60
	2 pole cover - set of 2	-	T2CS1225G	12.00
	3 pole cover - set of 2	-	T2CS1235G	44.00
	4 pole cover - set of 2	-	T2CS1245G	55.00
	<b>H125, S160, H160, E250, S250, H250</b>			
	1 pole cover - set of 2	-	T2CS2515G	10.00
	3 pole cover - set of 2	-	T2CS2535G	54.00
	4 pole cover - set of 2	-	T2CS2545G	60.50
	<b>E400, S400, H400, E630, S630</b>			
	3 pole cover set - RC cov c/w cut-outs		T2CR4035G	93.50
	4 pole cover set - RC cov c/w cut-outs		T2CR4045G	111.00
<b>Start terminal covers (FC)</b>	<b>E125, S125</b>			
	3 pole cover set of 2	22 mm	T2CF1235SNA	60.50
	4 pole cover set of 2	22 mm	T2CF1245SNA	71.00
	<b>S160, E250, S250 - except S250PE</b>			
	3 pole cover set of 2	30 mm	T2CF2535SNA	67.00
	4 pole cover set of 2	30 mm	T2CF2545SNA	77.50
<b>Extended terminal covers (FC)</b>	<b>E125, S125</b>			
	1 pole cover - set of 2	40 mm	T2CF1215SLNG	35.00
	3 pole cover - set of 2	40 mm	T2CF1235SLNG	64.50
	4 pole cover - set of 2	40 mm	T2CF1245SLNG	73.00
	<b>S160, E250NJ, S250NJ, S250GJ (not S250PE)</b>			
	1 pole cover - set of 2	55 mm	T2CF1615SLNG	40.00
	3 pole cover - set of 2	55 mm	T2CF2535SLNG	67.00
	4 pole cover - set of 2	55 mm	T2CF2545SLNG	77.50
	<b>H125, H160, S250PE, H250</b>			
	3 pole cover - set of 2	55 mm	T2CF2535LLNG	71.00
4 pole cover - set of 2	55 mm	T2CF2545LLNG	77.50	
	<b>E400, S400, H400, E630, S630</b>			
	3 pole cover - narrow - set of 2	80 mm	T2CF4035SLNG	190.00
	3 pole cover - wide - set of 2	110 mm	T2CF4035WNG	190.00
	<b>XS630, XH630, XS800, XH800</b>			
	3 pole cover - set of 2	130 mm	2H1417DAB	215.00
<b>400/630 A narrow and wide terminal cover options shown</b>	IP20 pole insert - order 1 per terminal		2A1787DBA	6.20
	<b>XS1250</b>			
	3 pole cover - set of 2	130 mm	2H1419DAB	235.00
	IP20 pole insert - order 1 per terminal		2A1787DBA	6.20

4

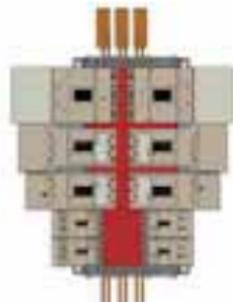
## Terminal cover selection

	Suit MCCB types	Cat. No.	Price \$
<b>Rear Connect terminal covers (RC)</b> 	<b>E125, S125</b>		
	3 pole cover – set of 2	T2CR123SG	44.00
	4 pole cover – set of 2	T2CR124SG	55.00
	<b>H125, S160, H160, E250, S250, H250</b>		
	3 pole cover – set of 2	T2CR253SG	54.00
	4 pole cover – set of 2	T2CR254SG	60.50
	<b>E400, S400, H400, E630, S630</b>		
	3 pole cover – set of 2	T2CR403SG	93.50
	<b>XS630, XH630, XS800, XH800</b>		
	3 pole cover – set of 2	UXPD0013C	220.00
<b>XS630, XH630, XS800, XH800</b>			
<b>4 Terminal cover locking clip</b> 	A clip that provides terminal cover locking, and allows a seal device to be fitted.	T2CF00L	9.10
<b>Interpole Barriers</b> 	<b>E125, S125</b>		
	Interpole barrier – set of 2	T2BA123SHA	17.40
	<b>S160, E250NJ, S250NJ, S250GJ (not S250PE)</b>		
	Interpole barrier – set of 2	T2BA253SHA	20.00
	<b>H125, H160, S250PE, H250</b>		
	Interpole barrier – set of 2	T2BA253LHA	20.00
	<b>E400, S400, E630, S630</b>		
	Interpole barrier – set of 2	T2BA403SHA	21.60
	<b>XS630, XH630, XS800, XH800, XS1250</b>		
	Interpole barrier – 1 only	UXQH0004B	10.40

## HC High Current chassis for 250 AF to 1250 AF MCCBs

### Features

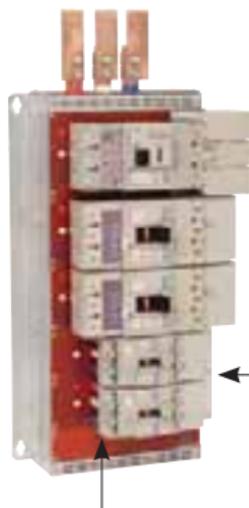
- Double sided 3 pole MCCB chassis
- Compact single sided chassis 3 or 4 pole
- 1250 A, 1600 A or 2200 A rated main bars
- 11 enclosure sizes for economical chassis sizing
- Front connect tags supplied as standard
- Complies with AS/NZS 3439, AS/NZS 3000 - 2007
- Form of separation 4bih. AS/NZS 3439.1 : 2000 (Annex ZF)
- Circuit breakers are reverse fed as standard
- 4th pole neutral bars 100 % rated
- Accepts MCCBs rated 12 A to 1250 A
- Ordering: choose from pre-assembled types, or custom assembly



### Stocked assembled chassis selection - Suit MCCB amp frames shown below:

Main bar rating (A)	Chassis Size	800 A 6 units	630 A 5 units	400 A 4 units	250 A 3 units	Cat. No.	Price \$
1600 A DS	-		2 x 630	2 x 400	4 x 250	HCSTD1DS16153	3990.00
1600 A DS	-		4 x 630	-	8 x 250	HCSTD2DS16243	5680.00
1600 A SS left	-		1 x 630	1 x 400	2 x 250	HCSTD3SSL16153	3990.00
1600 A SS right	-		1 x 630	1 x 400	2 x 250	HCSTD4SSR16153	3990.00
1600 A SS left	-		1 x 630	1 x 400	4 x 250	HCSTD5SSL16213	5460.00
1600 A SS right	-		1 x 630	1 x 400	4 x 250	HCSTD6SSR16213	5460.00
2200 A SS left	1 x 800	1 x 630	1 x 630	1 x 400	3 x 250	HCSTD7SSL22243	7000.00
2200 A SS right	1 x 800	1 x 630	1 x 630	1 x 400	3 x 250	HCSTD8SSR22243	7000.00

4



Example of a single side HC chassis with MCCBs and terminal covers fitted

Standard T2CF front connect terminal covers

T2CR rear connect terminal covers

## HC High Current chassis for 250 AF to 1250 AF MCCBs

### Chassis box selection – for custom assembly

Chassis Size	Main bar rating (A)	Icw kA rating (1 sec)	MCCB unitspace	Overall height (mm) <sup>1)</sup>	Cat. No.	Price \$
1	1250 A (2 x 10 x 20 mm bars)	65	15 U	610	HC12153	1140.00
2			18 U	718	HC12183	1510.00
3			21 U	826	HC12213	1840.00
4			24 U	934	HC12243	1930.00
5			27 U	1042	HC12273	2090.00
6			30 U	1150	HC12303	2300.00
7			33 U	1258	HC12333	2430.00
8			36 U	1366	HC12363	2620.00
9			39 U	1474	HC12393	2710.00
10			42 U	1582	HC12423	3000.00
11			45 U	1690	HC12453	3240.00
1	1600 A (2 x 10 x 30 mm bars)	65	15 U	610	HC16153	1710.00
2			18 U	718	HC16183	2050.00
3			21 U	826	HC16213	2360.00
4			24 U	934	HC16243	2570.00
5			27 U	1042	HC16273	2850.00
6			30 U	1150	HC16303	3240.00
7			33 U	1258	HC16333	3360.00
8			36 U	1366	HC16363	3620.00
9			39 U	1474	HC16393	3800.00
10			42 U	1582	HC16423	3930.00
11			45 U	1690	HC16453	4200.00
1	2200 A (2 x 10 x 50 mm bars)	65	15 U	610	HC22153	2640.00
2			18 U	718	HC22183	2840.00
3			21 U	826	HC22213	3140.00
4			24 U	934	HC22243	3430.00
5			27 U	1042	HC22273	3710.00
6			30 U	1150	HC22303	3980.00
7			33 U	1258	HC22333	4210.00
8			36 U	1366	HC22363	4350.00
9			39 U	1474	HC22393	4490.00
10			42 U	1582	HC22423	4680.00
11			45 U	1690	HC22453	4910.00

- Notes:** <sup>1)</sup> Height excludes extended and attached busbar
- Overall chassis depth when MCCBs are fitted is 269 mm
  - Refer next page for chassis Tee Off details
  - For detailed dimensions, refer to the chassis technical catalogue
  - For an ordering form, refer to the chassis technical catalogue
  - HC chassis' are not compatible with TemBreak 1, 125 A - 400 A MCCBs

## HC High current MCCB chassis MCCB

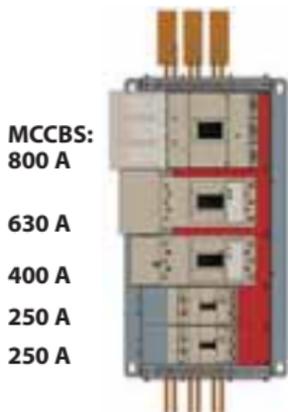
### HC Chassis TEE OFFs <sup>1)</sup>

Frame	MCCB Amp Frame (A)	MCCB width	Single sided Cat. No. Right load	Single sided Cat. No. Left load	Double sided Cat. No.	Price \$
S160 / 250	250	3 U	HCR250	HCL250	HCD250	355.00
H125 / S250PE	250	3 U	HCR250P	HCL250P	HCD250P	355.00
E/S400-630 Narrow	400-630	4 U	HCRN630	HCLN630	HCDN630	510.00
E/S400-630 Wide	400-630	5 U	HCRW630	HCLW630	HCDW630	510.00
XS/XH630-800	630-800	6 U	HCR800	HCL800	HCD800	740.00
XS1250 Right hand load	1250	6 U	HCR1250	-	HCR1250	770.00
XS1250 Left hand load	1250	6 U	-	HCL1250	HCL1250	770.00

4

### Ordering notes

- 1) Add tee offs as required to the chassis enclosure to complete the chassis components list.
- 2) Note: If MCCB below 32 A and a kA rating above 30 kA are required, use H125NJ320 and H125NJ332 with 250 A Tee Off Catalogue Number above.
- 3) 400 A MCCBs fitted with a same width narrow cover are 4 units in width.
- 4) 630 A MCCBs fitted with a 'wide' width cover are 5 units in width.
- 5) For ordering, use order from chassis catalogue or contact NHP.
- 6) All MCCBs to be reverse fitted on chassis.



MCCBs:  
800 A  
630 A  
400 A  
250 A  
250 A

Example: Single sided chassis	Chassis components	Quantity
Chassis box 1600 A, less tee offs	HC16183	1
800 A left load tee off set	HCL800	1
630 A left load tee off set	HCLW630	1
400 A left load tee off set	HCLN630	1
250 A left load tee off set	HCL250	1
250 A left load tee off set	HCL250	1

### Testing

The HC chassis has been unconditionally type tested (no MCCBs fitted) in Australia, at a short time rating of 65 kA for 1 second.

**Notes:** <sup>1)</sup> Refer to NHP for HC chassis with new TemBreak 2 800 A - 1250 A MCCBs. Bottom or top extended main bar are optional. For MCCB terminal cover selection use refer pages 4 - 13 and 4 - 14

## Chassis to suit:

**TemBreak 2 125 A - 630 AF, TemBreak 1 630 A - 1250 A**

### 400 / 630 A terminal covers

Terminal covers for 400 A and 630 AF MCCBs can be supplied as wide or narrow types, depending on the size of conductors to be connected to the MCCB. Generally for 400 A rated MCCBs, a narrow cover can be used for its smaller conductors, while a wide cover is used for the 630 A size.

4

A 630 A MCCB using a T2CF403SWNG wide cover is 5 units of width (Narrow cover optional)



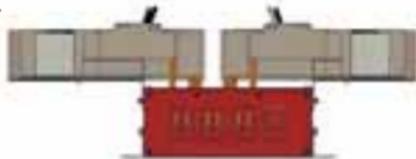
5 Units wide: MCCB + wide cover

A 400 A MCCB using a T2CF403SLNG narrow (same width as MCCB) cover is 4 units wide (Wide cover optional)

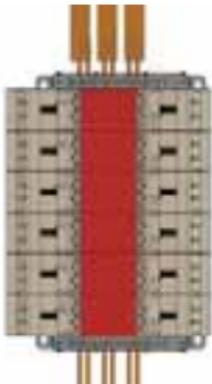
4 Units wide: MCCB + narrow cover

### HC Chassis MCCB mounting brackets

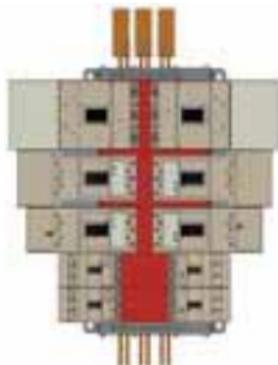
Metal extension brackets are attached to the side of HC chassis to cover rear of fitted MCCBs and terminal covers



### HC Chassis configuration types – 2 examples



HC Chassis with 250 A Frame MCCBs Double sided, 3 pole, 1250 A main bars



HC Chassis with 250 A – 800 A MCCBs Double sided, 3 pole, 2200 A main bars

## MCCB transfer switches and controllers

	Page
<b>Terasaki</b>	
Transfer switch types	5 - 2
Transfer switch selection	5 - 7
Transfer switch component ordering	5 - 12
Logic panel selection	5 - 28
Transfer switch options	5 - 34
Accessories to suit 125 - 630 AF MCCB	5 - 36



## *TemBreak* Transfer Switches

TemBreak 2 transfer switches are available from 20 A to 630 A, and consist of mechanically interlocked circuit breakers, with or without a motor fitted. The transfer switches can be either 'link' interlocked, or cable interlocked. Link types are pictured below.

Transfer switches can be ordered as pre-assembled and wired units, or in broken down component form, for user assembly. A common loadside busbar kit is an option.

### Basic types

## MTS



5

## BTS



## TemBreak

The standard arrangement of MCCBs

### ATS



### Changeover logic panel / Controller

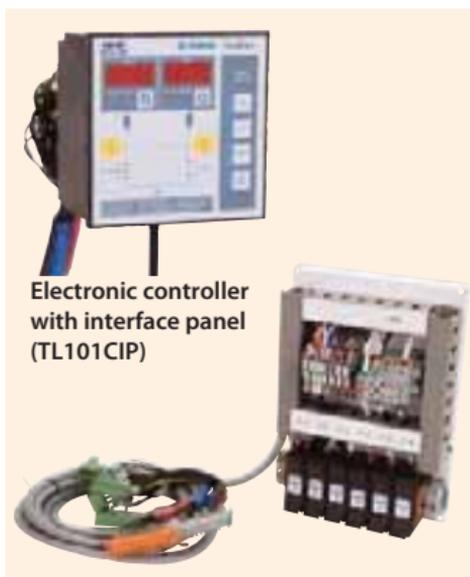
+

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Relay/Timer Controller (TLP2)

OR



Electronic controller with interface panel (TL101CIP)

- MTS** = Manual transfer switch: no motors and no logic panel
- BTS** = Basic transfer switch: MCCBs have motors, but no logic panel
- ATS** = BTS and logic panel

## TemBreak

### TemBreak 1 transfer switches

TemBreak 1 transfer switches are factory assembled, and range from 400 A to 2500 A. The switches are interlocked via rear mounted walking beam interlock, or are available with a rod or cable interlock in sizes 400 A to 2500 A. Common loadside busbars (CLSBB) are an option.

A basic transfer switch fitted with motors, can be coupled with a TemLogic control panel TL101 electronic controller or TLP1 relay controller that will automatically changeover to a standby power supply in the event of power failure. The transfer switches are fitted with a mechanical interlock so as to prevent both breakers from being switched to the ON position at the same time.

#### Basic types

### MTS



### BTS



**TemBreak**

The standard arrangement of MCCBs:

**ATS**



**Logic panel**

+



Electronic controller plus interface panel (TL101CIP)

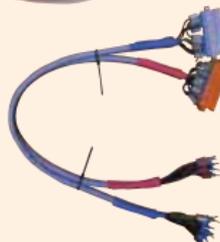


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**OR**



Relay/timer logic panel type controller Cat. No. TLP1



An Interconnection wire loom is also required to connect between the TL101 interface panel and terminals on the transfer switch. Cat. No. TLP2L1CABLE

**MTS** = Manual transfer switch: no motors and no logic panel

**BTS** = Basic transfer switch: MCCBs have motors mounted on them, no logic panel

**ATS** = BTS and logic panel

## TemBreak 1 and 2 transfer switch ordering

### Type definition

**MTS** = Manual Transfer Switch

**BTS** = Basic Transfer Switch

**ATS** = Automatic Transfer Switch (consists of a BTS and controller)



TemBreak 2, MCCB transfer switches can be ordered in a number of ways:

### 1. Pre-Assembled

Pre-assembled BTS transfer switches using a link interlock, up to 630 A.

### 2. Components

Components for complete user assembly. This is applicable to TemBreak 2 transfer switches to 630 A, using either link or cable interlocks, in manual or basic transfer switch configuration.

### 3. Manual Transfer Switches to 630 A

TemBreak 2, manual transfer switches to 630 A are not assembled by NHP. The user orders the components.

### 4. 630 A – 2500 A Transfer Switches

Larger TemBreak 1, 630 A – 2500 A transfer switches, both automatic and manual types are pre-assembled to customer order by NHP.

### 5. Change-Over Controllers

Transfer switch change-over controllers, either electronic or relay logic, are ordered separately by the user for all above types, except where a completely enclosed transfer switch is being assembled by NHP.

### Standards conformity

#### Product: TemBreak MCCB based automatic Transfer Switches

Terasaki confirm that the TemBreak MCCB based automatic Transfer Switches have been designed and comply with the international standard IEC 60947.6.1, and the Australian New Zealand standards AS/NZS 3947.6.1 and AS/NZS 3000 - 2007, for a utilisation class of AC31B for the following MCCB types:

E125, S125, H125, L125, S160, H160, L160, E250, S250, H250, L250, E400, S400, H400, L400, E630, S630, XS630, XH630, XS800, XH800, XS1250, XS1600, XS2000, XS2500

Class CB means: ATSE (Automatic Transfer Switching Equipment) provided with over-current releases and the main contacts of which are capable of making and are intended for breaking short-circuit currents.

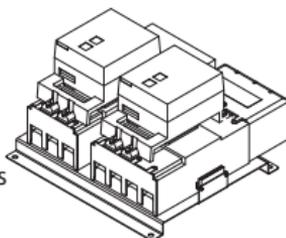
## TemBreak

### Basic Transfer Switches (BTS)

#### 3 or 4 pole

#### Features / options:

- Motor driven MCCBs
- 3 or 4 pole types
- Front mounting link interlock used
- Pre-assembled and wired on a mounting plate
- Automatic changeover controller option
- A choice of Relay-Logic, or electronic controllers
- Common load side busbar option
- Conforms to AS/NZS 60947.6.1



#### BTS selection chart and catalogue numbers

MCCBs used	Amp range	400 V kA Icu	3 or 4 Pole outline dimensions (mm)			3 pole BTS Cat. No.	4 pole BTS Cat. No.
			H	W	D		
S125NJ	40-63	36 <sup>1)</sup>	260	305	180	BTSS1NJ6333	BTSS1GJ6344
S125NJ	63-100	36 <sup>1)</sup>				BTSS1NJ10033	BTSS1GJ10044
S125NJ	80-125	36 <sup>1)</sup>				BTSS1NJ12533	BTSS1GJ12544
S125GJ	40-63	65				BTSS1GJ6333	BTSS1GJ6344
S125GJ	63-100	65				BTSS1GJ10033	BTSS1GJ10044
S125GJ	80-125	65				BTSS1GJ12533	BTSS1GJ12544
S160NJ	40-63	36 <sup>1)</sup>	279	340	180	BTSS16NJ6333	BTSS16GJ6344
S160NJ	63-100	36 <sup>1)</sup>				BTSS16NJ10033	BTSS16GJ10044
S160NJ	100-160	36 <sup>1)</sup>				BTSS16NJ16033	BTSS16GJ16044
S250NJ	160-250	36 <sup>1)</sup>				BTSS2NJ25033	BTSS2GJ25044
S160GJ	100-160	65				BTSS16GJ16033	BTSS16GJ16044
S250GJ	160-250	65				BTSS2GJ25033	BTSS2GJ25044
S250PE	50-125	70	279	340	215	BTSS2PE12533	BTSS2PE12544
S250PE	100-250	70				BTSS2PE25033	BTSS2PE25044
S400NJ	160-250	50	360	415	244	BTSS4NJ25033	BTSS4NJ25044
S400NJ	250-400	50				BTSS4NJ40033	BTSS4NJ40044
S400GJ	160-250	70				BTSS4GJ25033	BTSS4GJ25044
S400GJ	250-400	70				BTSS4GJ40033	BTSS4GJ40044
S400NE	100-250	50				BTSS4NE25033	BTSS4NE25044
S400NE	160-400	50				BTSS4NE40033	BTSS4NE40044
S400GE	100-250	70	360	415	244	BTSS4GE25033	BTSS4GE25044
S400GE	160-400	70				BTSS4GE40033	BTSS4GE40044
S630CE	315-630	50	360	415	244	BTSS6CE63033	BTSS6CE63044
S630GE	315-630	70				BTSS6GE63033	BTSS6GE63044

**Notes:** Transfer switches are stocked off the shelf in sizes 125 A to 630 A in some sizes, while others are made to order. Contact NHP for availability.

Refer following pages for information on TLP2 logic and TL101 electronic changeover controllers.

Wire interlocks must be used for transfer switches combining MCCBs of different frame size (different heights).

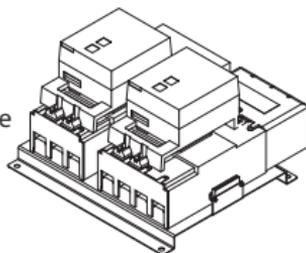
<sup>1)</sup> 4 Pole types are 65 kA rated.

## TemBreak

### Basic Transfer Switches (BTS) 3 or 4 pole combination types

#### Features / options:

- Motor driven MCCBs
- 3 or 4 pole MCCB combinations
- Front mounting link interlock used
- Pre-assembled and wired on a mounting plate
- Automatic changeover controller option
- A choice of Relay-Logic, or electronic controllers
- Common load side busbar option
- Conforms to AS/NZS 60947.6.1



#### BTS selection chart and catalogue numbers

MCCBs used	Amp range	400 V kA Icu	3 or 4 Pole outline dimensions (mm)			3 : 4 pole BTS Cat. No.	4 : 3 pole BTS Cat. No.
			H	W	D		
S125GJ 40-63	65		260	305	180	BTSS1GJ6334	BTSS1GJ6343
S125GJ 63-100	65	BTSS1GJ10034				BTSS1GJ10043	
S125GJ 80-125	65	BTSS1GJ12534				BTSS1GJ12543	
S160GJ 40-63	65		279	340	180	BTSS16GJ6334	BTSS16GJ6343
S160GJ 63-100	65	BTSS16GJ10034				BTSS16GJ10043	
S160GJ 100-160	65	BTSS16GJ16034				BTSS16GJ16043	
S250GJ 160-250	65		279	340	215	BTSS2GJ25034	BTSS2GJ25043
S250PE 50-125	70	BTSS2PE12534				BTSS2PE12543	
S250PE 100-250	70	BTSS2PE25034				BTSS2PE25043	
S400NJ 160-250	50		360	415	244	BTSS4NJ25034	BTSS4NJ25043
S400NJ 250-400	50	BTSS4NJ40034				BTSS4NJ40043	
S400GJ 160-250	70	BTSS4GJ25034				BTSS4GJ25043	
S400GJ 250-400	70		360	415	244	BTSS4GJ40034	BTSS4GJ40043
S400NE 100-250	50	BTSS4NE25034				BTSS4NE25043	
S400NE 160-400	50	BTSS4NE40034				BTSS4NE40043	
S400GE 100-250	70		360	415	244	BTSS4GE25034	BTSS4GE25043
S400GE 160-400	70	BTSS4GE40034				BTSS4GE40043	
S630CE 315-630	50	BTSS6CE63034				BTSS6CE63043	
S630GE 315-630	70		BTSS6GE63034	BTSS6GE63043			

**Notes:** Transfer switches are stocked off the shelf in sizes 125 A to 630 A in some sizes, while others are made to order. Contact NHP for availability. Refer following pages for information on TLP2 logic and TL101 electronic changeover controllers. Transfer switch 'kits' are also available for quick on-site assembly of the above transfer switches. Refer following pages. Wire interlocks must be used for transfer switches combining MCCBs of different frame size (different heights).

## TemBreak

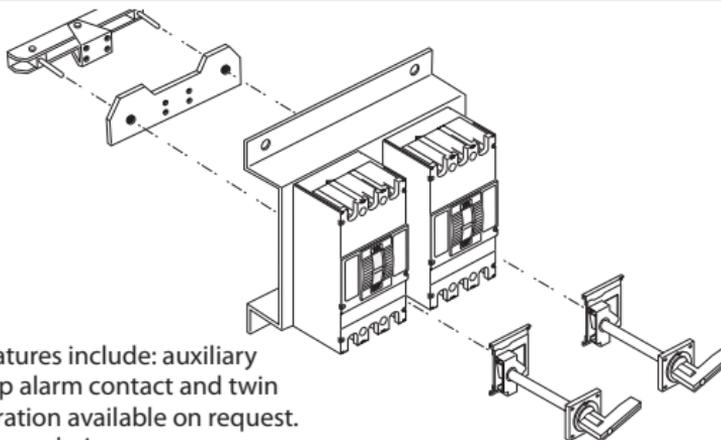
### Manual transfer switches 3 and 4 pole

#### Features / options:

- 3 or 4 pole types
- Rear walking beam interlock used
- Pre-assembled and wired on a mounting plate
- Will accept handles
- Common load side busbar option
- Conforms to AS/NZS 60947.6.1

#### MTS selection chart and catalogue numbers

MCCBs used	Ampere range	Inter-rupting capacity (400 V)		Overall dimensions (mm)			3 pole MTS Cat. No. <sup>3)</sup>	4 pole MTS Cat. No. <sup>3)</sup>
		Icu	Ics	W	H <sup>1)</sup>	D		
XS630NJ	250-400	50	25	550	433	182	<b>MS6N433</b>	<b>MS6N444</b>
XS630NJ	400-630	50	25	550	433	182	<b>MS6N633</b>	<b>MS6N644</b>
XS630SE	315-630	50	25	550	433	182	<b>MS6S633</b>	<b>MS6S644</b>
XH630SE	315-630	65	33	550	433	182	<b>MH6S633</b>	<b>MH6S644</b>
XS800NJ	500-800	50	25	550	433	182	<b>MS8N833</b>	<b>MS8N844</b>
XS800SE	400-800	50	25	550	433	182	<b>MS8S833</b>	<b>MS8S844</b>
XH800PE	400-800	65	50	550	433	182	<b>MH8P833</b>	<b>MH8P844</b>
XS1250SE	500-1000	85	65	553	570	198	<b>MS12S1033</b>	<b>MS12S1044</b>
XS1250SE	625-1250	85	65	553	550	198	<b>MS12S1233</b>	<b>MS12S1244</b>
XS1600SE	800-1600	100	75	553	570	198	<b>MS16S1633</b>	<b>MS16S1644</b>
XS2000SE	1000-2000	85	64	774	450	361	<b>MS20E2033</b>	<b>MS20E2044</b>
XS2500SE	1250-2500	85	64	774	450	361	<b>MS25E2533</b>	<b>MS25E2544</b>



Optional features include: auxiliary contacts, trip alarm contact and twin handle operation available on request. Specify when ordering.

- Notes:** <sup>1)</sup> Height includes attached busbar on MCCBs 630 A and above.  
<sup>2)</sup> Detailed dimensions including 4 pole types refer catalogue Part C.  
<sup>3)</sup> Ordering sheet refer catalogue Part C.  
 All units are POA.

Transfer switches using 125 - 400 A MCCB are TemBreak 2 types, and are sold in component form. Refer component selection pages in this section.

# TemBreak

## Basic transfer switches (BTS) with motor 3 and 4 pole

### Features / options:

- Motor driven MCCBs
- 3 or 4 pole types
- Rear walking beam interlock used
- Pre-assembled and wired on a mounting plate
- Automatic changeover controller option
- A choice of Relay-Logic, or electronic controllers
- Common load side busbar option
- Conforms to AS/NZS 60947.6.1



### Application notes:

- When a TL101CIP electronic controller plus interface panel is used with a TemBreak 1 transfer switch, an interconnection wire loom consisting of 2 cables is also required. This wire loom connects between the interface panel and the standard terminals on the transfer switch. The Cat. No. of the interconnection cable is "TLP2L1CABLE". The cables are 0.5 m long. Longer cable lengths are an option up to 2 metres. Refer page 5 - 32.
- When TLP1 relay controllers are used, an interconnection cable is not required.
- TLP2 relay controllers for TemBreak 2 transfer switches cannot be used with Tembreak 1 transfer switches.

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### BTS selection chart and catalogue numbers

MCCBs used	Ampere range	Inter-rupting capacity (400 V)		Overall (3 pole) <sup>3)</sup> dimensions (mm)			3 pole BTS Cat. No. <sup>4)</sup>	4 pole BTS Cat. No. <sup>4)</sup>
		Icu	Ics	W	H <sup>1)</sup>	D		
XS630NJ	250-400	50	25	550	433	341	<b>BS6N433</b>	<b>BS6N444</b>
XS630NJ	400-630	50	25	550	433	341	<b>BS6N633</b>	<b>BS6N644</b>
XS630SE	315-630	50	25	550	433	341	<b>BS6S633</b>	<b>BS6S644</b>
XH630SE	315-630	65	33	550	433	341	<b>BH6S633</b>	<b>BH6S644</b>
XS800NJ	500-800	50	25	550	433	341	<b>BS8N833</b>	<b>BS8N844</b>
XH800SE	400-800	65	33	550	433	341	<b>BH8S833</b>	<b>BH8S844</b>
XS800SE	400-800	50	25	550	433	341	<b>BS8S833</b>	<b>BS8S844</b>
XS1250SE	500-1000	85	65	553	530	300	<b>BS12S1033</b>	<b>BS12S1044</b>
XS1250SE	625-1250	85	65	553	530	300	<b>BS12S1233</b>	<b>BS12S1244</b>
XS1600SE	800-1600	100	75	553	570	320	<b>BS16S1633</b>	<b>BS16S1644</b>
XS2000SE	1000-2000	85	64	774	490	361 <sup>2)</sup>	<b>BS20E2033</b>	<b>BS20E2044</b>
XS2500SE	1250-2500	85	64	774	490	361 <sup>2)</sup>	<b>BS25E2533</b>	<b>BS25E2544</b>

- Notes:** 1) Height includes attached busbar on sizes 630 A and above.  
 2) Depth does not include rear connect busbars.  
 3) Detailed dimensions 3/4 pole refer catalogue Part C.  
 4) Ordering sheet refer catalogue Part C.  
 All units are POA.

# TL101 AUTOMATIC TRANSFER SWITCH SYSTEM

**NHP**

High level functionality and ease of use.

## POWER PROTECTION



PP-TERASAKI-ATS-CPB

## COMPLETE AUTOMATIC TRANSFER SWITCH SOLUTIONS



AUTOMATIC TRANSFER SWITCH CONTROLLER



INTERFACE PANEL



TRANSFER SWITCH

## 'PLUG 'N PLAY' STYLE INSTALLATION

### Terasaki TemLogic 2 TL101 automatic transfer switch controller

- Genuine 144 x 144 mm controller solution
- User friendly display and menu selection
- Large selection of functions and options as standard

### Terasaki TemLogic 2 to TemBreak interface panel

- The optional TemBreak interface panel provides a safe link between the Terasaki TemLogic 2 TL101 controller and a temBreak 1 or 2 MCCB transfer switch.
- The TemBreak interface panel comes complete with 'plug 'n' play style connectors, eliminating the need for separate control and power wiring.

### Terasaki TemBreak 1 or 2 transfer switch

- Large range of amp-frame sizes available
- Enclosed types and options
- Selection of mechanical interlocks
- Suitable for TemBreak 1 or 2 125-2500 A

**TERASAKI**  
Innovators in Protection Technology

## TemBreak

### Basic transfer switches – Component ordering

#### 125 A (E125, S125) MCCBs fitted with a LINK interlock <sup>1)</sup> <sup>2)</sup> <sup>3)</sup>

Item	Description	Comment
1	Left and right side MCCBs	MCCB depth 68 mm <sup>1)</sup>
2	Link mechanical Interlock	For 3 or 4 pole MCCB right side For 3 pole MCCB left side For 4 pole MCCB left side
3	Left & right side 1 C/O alarm switches	Wire type alarm
4	Left & right side 2 C/O auxiliary switches	Wire type auxiliary
5	240 V AC Motor operator	Other voltages available
6	Interlock connection wire	For motor electrical interlocking <sup>4)</sup>
7	WAGO male connector Left	For TLP2 / TL101 controllers only
8	WAGO male connector Right	For TLP2 / TL101 controllers only
9	Optional 3P:3P mounting plate	With pre threaded mounting holes
10	Optional 4P:4P / 4P:3P mounting plate	With pre threaded mounting holes

#### 125 A (H125, L125) MCCBs fitted with a LINK interlock <sup>1)</sup> <sup>2)</sup> <sup>3)</sup>

1	Left and right side MCCBs	MCCB depth 103 mm <sup>1)</sup>
2	Link mechanical interlock	For 3 or 4 pole MCCB right side For 3 pole MCCB left side For 4 pole MCCB left side
3	Left & right side 1 C/O alarm switches	Wire type alarm
4	Left & right side 2 C/O auxiliary switches	Wire type auxiliary
5	240 V AC Motor operator	Other voltages available
6	Interlock connection wire	For motor electrical interlocking <sup>4)</sup>
7	WAGO male connector - Left	For TLP2 / TL101 controllers only
8	WAGO male connector - Right	For TLP2 / TL101 controllers only
9	Optional 3 & 4P mounting plate	With pre threaded mounting holes

- Notes:**
- 1) The left and right side MCCBs have to be the same depth for correct interlocking function.
  - 2) Where E / S and H / L MCCBs of a different height need to be interlocked, a Cable Interlock must be used. Refer following pages.
  - 3) MCCB marker and capacity size labels can be ordered for mounting on motors etc. Use ratings label sheet Cat. No. T25CAPLAB.
  - 4) One electrical interlock wiring loom is required between motors on motorised transfer switches.

## TemBreak

### Manual and basic transfer switches – Component ordering

Component quantity	Cat. No.
<b>BTS</b>	
2	E125, S125NJ/GJ
1	T2ML12RA
1	T2ML12L3A
1	T2ML12L4A
2	T2AL00M3SWA
4	T2AX00M3SWA
2	T2MC12A24NB
1	T2MM25L05A
1	231-612-019-000
1	231-642-019-000
1	T2SB123334
1	T2SB124344
2	H125NJ, L125NJ
1	T2ML125RA
1	T2ML125L3A
1	T2ML125L4A
2	T2AL00M3SWA
4	T2AX00M3SWA
2	T2MC25A24NB
1	T2MM25L05A
1	231-612-019-000
1	231-642-019-000
1	T2SB2533344344

5



Electrical interlocking lead T2MM

## TemBreak

### Basic transfer switches – Component ordering

#### 160 A and 250 A MCCBs fitted with a LINK interlock <sup>1)</sup> <sup>2)</sup> <sup>3)</sup>

Item	Description	Comment <sup>2)</sup> <sup>3)</sup>
1	Left or right side MCCBs	MCCB depth 68 mm <sup>1)</sup>
		MCCB depth 103 mm <sup>1)</sup>
2	Link mechanical interlock	For 3 or 4 pole MCCB right side For 3 pole MCCB left side For 4 pole MCCB left side
3	Left & right side 1 C/O alarm switches	Wire type alarm
4	Left & right side 2 C/O auxiliary switches	Wire type auxiliary
5	240 V AC Motor operator	Other voltages available
6	Interlock connection wire	For motor electrical interlocking <sup>4)</sup>
7	WAGO male connector - Left	For TLP2 / TL101 controllers only
8	WAGO male connector - Right	For TLP2 / TL101 controllers only
9	Optional 3 & 4P mounting plate	With pre threaded mounting holes

5

- Notes:**
- <sup>1)</sup> The left and right side MCCBs have to be the same depth for correct interlocking function.
  - <sup>2)</sup> Where E / S and H / L MCCBs of a different height need to be interlocked, a Cable Interlock must be used. Refer following pages.
  - <sup>3)</sup> MCCB marker and capacity size labels can be ordered for mounting on motors etc. Use ratings label sheet Cat. No. T25CAPLAB.
  - <sup>4)</sup> One electrical interlock wiring loom is required between motors on motorised transfer switches.

## TemBreak

### Manual and basic transfer switches – Component ordering

Component quantity	Cat. No.
<b>BTS</b> 2	S160NJ / GJ ES250NJ / GJ
2	H160,S250PE H250NJ / NE
1 1 1	T2ML25RA T2ML25L3A T2ML25L4A
2	T2AL00M3SWA
4	T2AX00M3SWA
2	T2MC25A24NB
1	T2MM25L05A
1	231-612-019-000
1	231-642-019-000
1	T2SB253334344

5



Electrical interlocking lead T2MM

## TemBreak

### Basic transfer switches – Component ordering

#### 400 A MCCBs fitted with a LINK interlock

Item	Description	Comment <sup>1) 2)</sup>
1	Left and right side MCCBs	MCCB depth 103 mm <sup>1)</sup>
		MCCB depth 140 mm <sup>1)</sup>
2	Link mechanical interlock (For motorised MCCBs)	For 3 or 4 pole MCCB right side For 3 pole MCCB left side For 4 pole MCCB left side
3	Link mechanical interlock (for MCCBs with handles)	For 3 or 4 pole MCCB right side For 3 pole MCCB left side For 4 pole MCCB right side
4	Left & right side 1 C/O alarm switches	Wire type alarm
5	Left & right side 2 C/O auxiliary switches	Wire type auxiliary
6	240 V AC Motor operator	Other voltages available
7	Interlock connection wire	For motor electrical interlocking
8	WAGO male connector - Left	For TLP2 / TL101 controllers only
9	WAGO male connector - Right	For TLP2 / TL101 controllers only
10	Optional 3P: 3P mounting plate	With pre threaded mounting holes
11	Optional 4P: 4P / 4P: 3P mounting plate	With pre threaded mounting holes



- Notes:**
- 1) Where E / S and H / L MCCBs of a different height need to be interlocked, a Cable Interlock must be used. Refer following pages.
  - 2) MCCB marker and capacity size labels can be ordered for mounting on motors etc. Refer to page 5 - 36.

## TemBreak

### Manual and basic transfer switches – Component ordering

Component quantity BTS	Cat. No.
2	E400NJ S400CJ S400NJ S400NE S400GJ S400GE
2	H400NE L400NE
1	T2ML40RB
1	T2ML40L3B
1	T2ML40L4B
–	T2MLH40RB
–	T2MLH40L3B
–	T2MLH40L4B
2	T2AL00M3SWA
4	T2AX00M3SWA
2	T2MC40A10NB
1	T2MM40L06A
1	231-612-019-000
1	231-642-019-000
1	T2TSB403334MP
1	T2TSB404344MP

5

## TemBreak

### Basic transfer switches – Component ordering

#### 630 A MCCBs fitted with a LINK interlock <sup>2)</sup> <sup>3)</sup>

Item	Description	Comment
1	Left and right side MCCBs	MCCB depth 103 mm <sup>1)</sup>
2	Link mechanical interlock <sup>5)</sup> <sup>6)</sup> (For motorised MCCBs)	For 3 or 4 pole MCCB right side For 3 pole MCCB left side For 4 pole MCCB left side
3	Link mechanical interlock (For MCCBs with handles)	For 3 or 4 pole MCCB right side For 3 pole MCCB left side For 4 pole MCCB right side
3	Left & right side 1 C/O auxiliary switches	Wire type alarm
4	Left & right side 2 C/O auxiliary switches	Wire type auxiliary
5	240 V AC Motor operator	Other voltages available
6	Interlock connection wire	For motor electrical interlocking <sup>4)</sup>
7	WAGO male connector - Left	For TLP2 / TL101 controllers only
8	WAGO male connector - Right	For TLP2 / TL101 controllers only
9	Optional 3P: 3P mounting plate	With pre threaded mounting holes
10	Optional 4P: 4P / 4P: 3P mounting plate	With pre threaded mounting holes

- Notes:**
- <sup>1)</sup> The Left and Right side MCCBs have to be the same depth for correct interlocking function.
  - <sup>2)</sup> Where E / S and H / L MCCBs of a different height need to be interlocked, a Cable Interlock must be used. Refer following pages.
  - <sup>3)</sup> MCCB marker and capacity size labels can be ordered for mounting on motors etc. Use ratings label sheet Cat. No. T40CAPLAB.
  - <sup>4)</sup> One electrical interlock wiring loom is required between motors on motorised transfer switches.
  - <sup>5)</sup> 400 A / 630 A link interlocks must use handles for manual transfer switches.
  - <sup>6)</sup> An alternative interlock type is the manual 'slide interlock', which does not require a handle to be fitted. Refer S630 Accessories in Section 3.

## *TemBreak*

### Manual and basic transfer switches – Component ordering

Component quantity	Cat. No.
<b>BTS</b>	
2	<b>E630NE</b>
	<b>S630CE / GE</b>
1	<b>T2ML40RB</b>
1	<b>T2ML40L3B</b>
1	<b>T2ML40L4B</b>
	<b>T2MLH40RB</b>
–	<b>T2MLH40L3B</b>
–	<b>T2MLH40L4B</b>
2	<b>T2AL00M3SWA</b>
	<b>T2AX00M3SWA</b>
4	<b>T2AX00M3SWA</b>
2	<b>T2MC40A10NB</b>
1	<b>T2MM40L06A</b>
1	<b>231-612-019-000</b>
1	<b>231-642-019-000</b>
1	<b>T2TSB403334MP</b>
1	<b>T2TSB404344MP</b>

5





## Manual and basic transfer switches – Component ordering

### 125 A (E125, S125) MCCBs fitted with a CABLE interlock <sup>2)3)</sup>

Item	Description	Comment
1	Left and right side MCCBs	MCCB depth 68 mm <sup>1)</sup>
2	Cable mechanical interlock	For 3 or 4 pole MCCBs 1.0 m length of cable - option 1 1.5 m length of cable - option 2
3	Left & right side 1 C/O alarm switch	Wire type alarm
4	Left & right side 2 C/O auxiliary switches	Wire type auxiliary
5	240 V AC Motor operator	Other voltages available
6	Interlock connection wire	For motor electrical interlocking <sup>4)</sup>
7	WAGO male connector - Left	For TLP2 / TL101 controllers only
8	WAGO male connector - Right	For TLP2 / TL101 controllers only
9	Optional 3P:3P mounting plate	With pre threaded mounting holes
10	Optional 4P:4P / 4P:3P mounting plate	With pre threaded mounting holes

### 125 A (E125, S125) MCCBs fitted with a CABLE interlock <sup>2)3)</sup>

Item	Description	Comment
1	Left and right side MCCBs	MCCB depth 103 mm <sup>1)</sup>
2	Cable mechanical interlock	For 3 or 4 pole MCCBs 1.0 m length of cable - option 1 1.5 m length of cable - option 2
3	Left & right side 1 C/O alarm switches	Wire type alarm
4	Left & right side 2 C/O auxiliary switches	Wire type auxiliary
5	240 V AC Motor operator	Other voltages available
6	Interlock connection wire	For motor electrical interlocking <sup>4)</sup>
7	WAGO male connector - Left	For TLP2 / TL101 controllers only
8	WAGO male connector - Right	For TLP2 / TL101 controllers only
9	Optional 3P:3P mounting plate	With pre threaded mounting holes
10	Optional 4P:4P / 4P:3P mounting plate	With pre threaded mounting holes

- Notes:**
- <sup>1)</sup> Where E / S and H / L MCCBs of a different height need to be interlocked, a Cable Interlock must be used.
  - <sup>2)</sup> MCCB marker and capacity size labels can be ordered for mounting on motors etc. Use ratings label sheet Cat. No. T25CAPLAB.
  - <sup>3)</sup> Using TemBreak 2 MCCBs and by using a cable interlock, any combination of frame size or poles can be interlocked.
  - <sup>4)</sup> One electrical interlocking connection wire is required between motors on motorised transfer switches. Cat. No. T2MM.  
Refer alternate lengths, 160/250 A motor accessories in Section 3.

**TemBreak**  
**Manual and basic transfer switches –**  
**Component ordering**

Component quantity		Cat. No.
MTS	BTS	
2	2	E125NJ, S125NJ / GJ
1	1	T2MW12CA
1	1	T2MW00SA
1	1	T2MW00LA
-	2	T2AL00M3SWA
-	4	T2AX00M3SWA
-	2	T2MC12A24NB
-	1	T2MM25L15A
-	1	231-612-019-000
-	1	231-642-019-000
1	1	T2SB123334
1	1	T2SB124344

Component quantity		Cat. No.
MTS	BTS	
2	2	H125NJ, L125NJ
1	1	T2MW25CA
1	1	T2MW00SA
1	1	T2MW00LA
-	2	T2AL00M3SWA
-	4	T2AX00M3SWA
-	2	T2MC25A24NB
-	1	T2MM25L15A
-	1	231-612-019-000
-	1	231-642-019-000
1	1	T2SB253334
1	1	T2SB254344

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## TemBreak

### Manual and basic transfer switches – Component ordering

#### 160 A and 250 A MCCBs fitted with a CABLE interlock 2)3)

Item	Description	Comment
1	Left or right side MCCBs	MCCB depth 68 mm 1)  MCCB depth 103 mm 1)
2	Cable mechanical interlock	For 3 or 4 pole MCCBs 1.0 m length of cable - option 1 1.5 m length of cable - option 2
3	Left & right side 1 C/O alarm switch	Wire type alarm
4	Left & right side 2 C/O auxiliary switches	Wire type auxiliary
5	240 V AC Motor operator	Other voltages available
6	Interlock connection wire	For motor electrical interlocking 4)
7	WAGO male connector - Left	For TLP2 / TL101 controllers only
8	WAGO male connector - Right	For TLP2 / TL101 controllers only
9	Optional 3P:3P mounting plate	With pre threaded mounting holes
10	Optional 4P:4P / 4P:3P mounting plate	With pre threaded mounting holes

5



- Notes:**
- 1) Where E / S and H / L MCCBs of a different height need to be interlocked, a Cable Interlock must be used.
  - 2) MCCB marker and capacity size labels can be ordered for mounting on motors etc. Use ratings label sheet Cat. No. T25CAPLAB.
  - 3) Using TemBreak 2 MCCBs and by using a cable interlock, any combination of frame size or poles can be interlocked.
  - 4) One electrical interlocking connection wire is required between motors on motorised transfer switches. Cat. No. T2MM.

## TemBreak

### Manual and basic transfer switches – Component ordering

Component quantity		Cat. No.
MTS	BTS	
2	2	S160NJ / GJ ES250NJ / GJ
2	2	H160, S250PE H250NJ / NE
1 1 1	1 1 1	T2MW25CA T2MW00SA T2MW00LA
-	2	T2AL00M3SWA
-	4	T2AX00M3SWA
-	2	T2MC25A24NB
-	1	T2MM25L15A
-	1	231-612-019-000
-	1	231-642-019-000
1	1	T2SB253334
1	1	T2SB254344

5

## TemBreak

### Manual and basic transfer switches – Component ordering

#### 400 A MCCBs fitted with a CABLE interlock <sup>2)3)</sup>

Item	Description	Comment
1	Left and right side MCCBs	MCCB depth 103 mm <sup>1)</sup>
	* 400/ 630 A interlocks must use a motor or handle operator	
		MCCB depth 140 mm <sup>1)</sup>
2	Cable mechanical interlock <sup>5) 6)</sup>	For 3 or 4 pole MCCBs with motors For 3 or 4 pole MCCBs with handles 1.0 m length of cable - option 1 1.5 m length of cable - option 2
3	Left & right side 1 C/O alarm switch	Wire type alarm
4	Left & right side 2 C/O auxiliary switches	Wire type auxiliary
5	240 V AC Motor operator	Other voltages available
6	Interlock connection wire	For motor electrical interlocking <sup>4)</sup>
7	WAGO male connector - Left	For TLP2 / TL101 controllers only
8	WAGO male connector - Right	For TLP2 / TL101 controllers only
9	Optional 3P:3P mounting plate	With pre threaded mounting holes
10	Optional 4P:4P / 4P:3P mounting plate	With pre threaded mounting holes

- Notes:**
- 1) Where E / S and H / L MCCBs of a different height need to be interlocked, a Cable Interlock must be used. .
  - 2) MCCB marker and capacity size labels can be ordered for mounting on motors etc. Use ratings label sheet Cat. No. T40CAPLAB..
  - 3) Using TemBreak 2 MCCBs and by using a cable interlock, any combination of frame size or poles can be interlocked.
  - 4) One electrical interlocking connection wire is required between motors on motorised transfer switches. Cat. No. T2MM. Refer alternate lengths for 400/630 A motor accessories in Section 3.
  - 5) 400 A and 630 A interlocks must use handles for manual transfer switches.
  - 6) An alternative interlock type is a manual “slide interlock”, which does not require a handle to be fitted. Slide interlocks will not allow handles or motors to be fitted. Refer 400/630 A accessories in Section 3 for further information.

**TemBreak**  
**Manual and basic transfer switches –**  
**Component ordering**

MTS	Component quantity	BTS	Cat. No.
2		2	E400NJ S400CJ S400NJ S400NE S400GJ S400GE
2		2	H400NJ / NE L400NJ / NE
-		1	T2MW40CB
-		1	T2MWH40CB
1		1	T2MW00SA
1		1	T2MW00LA
-		2	T2AL00M3SWA
-		4	T2AX00M3SWA
-		2	T2MC40A10NB
-		1	T2MM40L21A
-		1	231-612-019-000
-		1	231-642-019-000
1		1	T2TSB403334MP
1		1	T2TSB404344MP

5



## TemBreak

### Manual and basic transfer switches – Component ordering

#### 630 A MCCBs fitted with a CABLE interlock <sup>2)3)</sup>

Item	Description	Comment
1	Left and right side MCCBs	MCCB depth 103 mm <sup>1)</sup>
2	Cable mechanical interlock <sup>5) 6)</sup>	For 3 or 4 pole MCCBs with motors For 3 or 4 pole MCCBs with handles 1.0 m length of cable - option 1 1.5 m length of cable - option 2
3	Left & right side 1 C/O alarm switches	Wire type alarm
4	Left & right side 2 C/O auxiliary switches	Wire type auxiliary
5	240 V AC Motor operator	Other voltages available
6	Interlock connection wire	For motor electrical interlocking <sup>4)</sup>
7	WAGO male connector - Left	For TLP2 / TL101 controllers only
8	WAGO male connector - Right	For TLP2 / TL101 controllers only
9	Optional 3P:3P mounting plate	With pre threaded mounting holes
10	Optional 4P:4P / 4P:3P mounting plate	With pre threaded mounting holes

5

- Notes:**
- 1) Where E / S and H / L MCCBs of a different height need to be interlocked, a Cable Interlock must be used. .
  - 2) MCCB marker and capacity size labels can be ordered for mounting on motors etc. Use ratings label sheet Cat. No. T40CAPLAB..
  - 3) Using TemBreak 2 MCCBs and by using a cable interlock, any combination of frame size or poles can be interlocked.
  - 4) One electrical interlocking connection wire is required between motors on motorised transfer switches. Cat. No. T2MM.  
Refer alternate lengths for 400/630 A motor accessories in Section 3.
  - 5) 400 A and 630 A interlocks must use handles for manual transfer switches.
  - 6) An alternative interlock type is a manual “slide interlock”, which does not require a handle to be fitted. Slide interlocks will not allow handles or motors to be fitted. Refer 400/630 A accessories in Section 3 for further information.

## TemBreak

### Manual and basic transfer switches – Component ordering

MTS	Component quantity	BTS	Cat. No.
2		2	E630NE S630CE / GE
1		1	T2MW00CB T2MWH40CB T2MW00SA T2MW00LA
-		2	T2AL00M3SWA
-		4	T2AX00M3SWA
-		2	T2MC40A10NB
-		1	T2MM40L21A
-		1	231-612-019-000
-		1	231-642-019-000
1		1	T2TSB403334MP
1		1	T2TSB404344MP

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## TemBreak Automatic transfer switches (ATS) Logic controller for Tembreak 2

### Timer / Relay logic controller

NHP offers a choice of electromagnetic (relay) logic panels with various options, or a PLC controller type. The basic timer/relay logic controller includes the following standard features:

- Voltage and phase sequence sensing relay
- Time delay normal to emergency and back
- Common power supply relays
- Normal supply phase sequence relay
- Control wiring terminals
- A 4 position mode selector switch is provided loose (Manual / Automatic / Test / Off) - SSW5
- Optional PLC logic panel (TLPC2)



TLP2  
Relay/timer  
Controller panel

### TLP logic controller and options

Description	Cat. No. <sup>1)</sup>	Price \$
Logic Panel for Tembreak 2 ATS	TLP2	2250.00

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Option <sup>1)2)</sup>	Description	Cat. No. <sup>1)</sup>	Price \$
2	Emergency supply phase sequence and voltage sensing relays	EPSR / EVSR	310.00
3	Emergency supply frequency relay	EFR	560.00
4	Engine run-on time delay	ERTD	335.00
5	Engine start time delay	ESTD	305.00
6	Inhibit return control (Prevents auto-return to normal from emergency)	IRC	119.00
7	Cranking limiter time delay	CLTD	310.00
8	Additional mode selection 'Normal supply'	SSW2	390.00
9	Additional contacts for remote indication of mode switch position (includes option 8)	SSW3	405.00
10	Alarm lock-out relay. (Prevents breaker closure after overload or short circuit trip)	ALR	465.00
13	Mains stability timer	MST	210.00
14	Surge protection – single phase	SPD1	210.00
15	Surge protection – 3 phase	SPD3	280.00

**Notes:** <sup>1)</sup> NHP has limited the number of gear tray plates to three (3) standard sizes, which cover all optional features.  
<sup>2)</sup> NHP stock basic TLP2 logic panels. All others are built to order.  
 Standard and custom logic panel ordering sheet, refer Catalogue Part C.  
 Due to component and wiring differences, TemBreak 1 logic panels are not configured to work with TemBreak 2 Transfer Switches and vice versa.  
**Do not use TLP1 with TemBreak 2 Motor operators otherwise motor burnout will occur. Use TLP2 for TemBreak 2.**

## TemBreak Automatic transfer switches (ATS) Logic controller for Tembreak 1

### Timer / Relay logic controller

NHP offers a choice of electromagnetic (relay) logic panels with various options, or a PLC controller type. The basic timer/ relay logic controller includes the following standard features:

- Voltage and phase sequence sensing relay
- Time delay normal to emergency and back
- Common power supply relays
- Normal supply phase sequence relay
- Control wiring terminals
- A 4 position mode selector switch is provided loose (Manual / Automatic / Test / Off) - SSW1
- Optional PLC logic panel (TLPC1)



### TLP logic controller and options

Description	Cat. No. <sup>1)</sup>	Price \$
Logic Panel for Tembreak 1 ATS	TLP1	2250.00

Option <sup>1)2)</sup>	Description	Cat. No. <sup>1)</sup>	Price \$
2	Emergency supply phase sequence and voltage sensing relays	EPSR / EVSR	310.00
3	Emergency supply frequency relay	EFR	560.00
4	Engine run-on time delay	ERTD	335.00
5	Engine start time delay	ESTD	305.00
6	Inhibit return control (Prevents auto-return to normal from emergency)	IRC	119.00
7	Cranking limiter time delay	CLTD	310.00
8	Additional mode 'Normal supply'	SSW2	390.00
9	Additional contacts for remote indication of mode switch position (includes option 8)	SSW3	405.00
10	Alarm lock-out relay (Prevents breaker closure after MCCB trip.)	ALR	465.00
11	Changeover time delay (required for ACB C/O switch)	COTD	365.00
13	Mains stability timer	MST	210.00
14	Surge protection – single phase	SPD1	210.00
15	Surge protection – 3 phase	SPD3	280.00



**Notes:** <sup>1)</sup> NHP has limited the number of gear tray plates to three (3) standard sizes, which cover all optional features.  
<sup>2)</sup> NHP stock basic TLP1 logic panels. All others are built to order.  
 Standard and custom logic panel ordering sheet, refer catalogue Part C.  
**Do not use TLP1 with TemBreak 2 Motor operators otherwise motor burnout will occur. Use TLP2 for TemBreak 2.**

## TemLogic TL101 Transfer switch controller

The Temlogic2 TL101 automatic transfer switch controller will control and supervise the primary and secondary power of an installation and initiate transferring of the mains to a back-up source in the event of main source interruption. The changeover from one power source to the other can be fully automatic or manually operated. The logic controller includes all necessary features to monitor energy distribution systems or generating sets, and transfer equipment, such as motorised circuit breakers.



The TL101 is simply programmed from the front panel with visual LED indication or can be pre-programmed by NHP. The circuit breakers can be manually controlled using the function keys on the front face of the controller.

### TL101 Provides:

Control of minimum voltage, maximum voltage, phase loss, asymmetry, minimum frequency, maximum frequency, with independent enable and delay.

### Front panel operation and display

Refer Part C Section 8 or TL101 manual.

### Technical features

- Flush mount 144 mm<sup>2</sup> housing
- Plug-in removable connections
- Phase to phase voltage measure inputs: 80-800 V AC
- Voltage transformer programming
- True RMS voltage measure
- Frequency measurement 45-65 Hz
- Control functions: phase sequence, phase loss, maximum/minimum voltage, asymmetry, maximum/minimum frequency
- Two displays for voltage/frequency viewing
- 8 digital programming inputs/ 7 relay programmable outputs
- RS 232 interface (refer NHP for RS 485)
- Modbus communication <sup>1)</sup>

FOR  
TEMBREAK 1  
& TEMBREAK 2  
TRANSFER  
SWITCHES

**Notes:** <sup>1)</sup> Modbus communications: A 24 V DC power supply is needed.

## TemLogic TL101 Transfer switch controller

### Interface panel

The interface panel provides short circuit protection via fuses between the transfer switch and TL101 controller. The interface panel comes complete with pre-terminated cable looms, enabling fast 'plug 'n' play' electrical connection between system components.

### Ordering details - controller and interface panel

Heading	Cat. No.	Price \$
TemLogic2 TL101 controller only	<b>TL101240V</b>	<b>1900.00</b>
TemLogic2 TL101 controller plus interface panel <sup>2)</sup>	<b>TL101CIP</b>	<b>2990.00</b>
TemBreak 1 Transfer switch inter-connection cable (0.5 m standard length or refer next page)	<b>TLP2L1LCABLE <sup>1)</sup></b>	<b>114.00</b>

**Notes:** <sup>1)</sup> This cable is used to connect between a TL101 electronic controller interface panel (LTLP2 or LTLP2S) and a standard TemBreak 1 transfer switch. Refer page 5 - 33 for a features comparison table between TLP1, TLP2 & TL101.

<sup>2)</sup> Modbus communications: A 24 V DC power supply is needed.

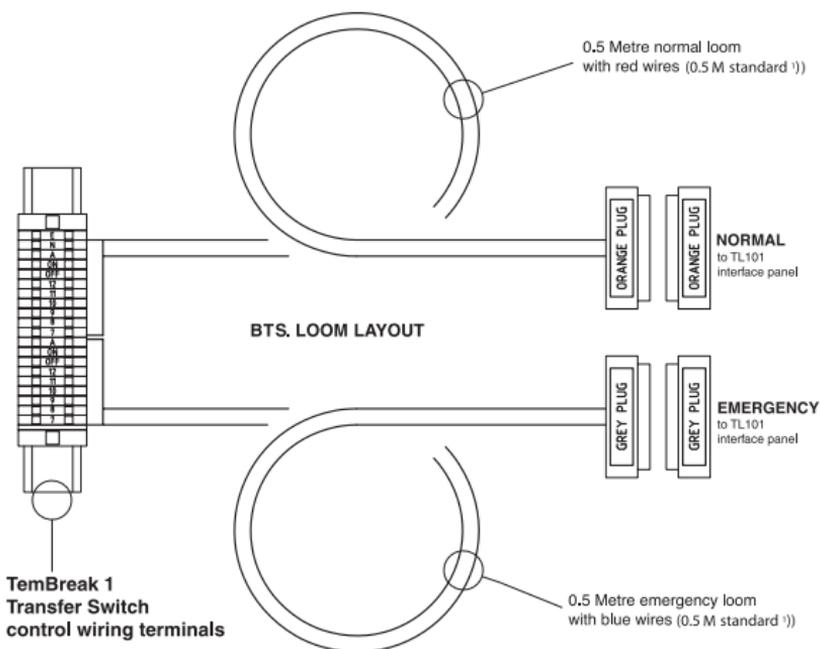
## TemBreak Basic Transfer Switch (BTS)

### Inter-connection cable for Tembreak 1 transfer switches using TLP1 controllers

#### TLP2L1CABLE

For use with a TL101 CIP (electronic controller and interface panel) when used with a TemBreak 1 transfer switch.

The connector cable connects to the standard BTS control wiring terminals.



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Red and blue cable lengths	Cat. No.	Price \$
0.5 m (standard)	<b>TLP2L1CABLE</b>	<b>114.00</b>
1.0 m	<b>TLP2L1CABLE10</b>	<b>125.00</b>
1.5 m	<b>TLP2L1CABLE15</b>	<b>140.00</b>
2.0 m	<b>TLP2L1CABLE20</b>	<b>156.00</b>
2.5 m	<b>TLP2L1CABLE25</b>	<b>176.00</b>
3.0 m	<b>TLP2L1CABLE30</b>	<b>197.00</b>

**Notes:** 1) Alternate interconnecting cable lengths are available on application. Refer NHP catalogue numbers for the alternate lengths indicated above.

## TemLogic

### Temlogic controller types

#### For Tembreak 1 and 2 transfer switches

This page is a cross reference of features and options. For more specific information on each controller type, refer to the previous pages.

#### CONTROLLER TYPES

Features and options cross reference <sup>1)</sup>

Standard and optional features	Cat. No.	Relay/Timer controller to suit TemBreak 1 MCCBs	Relay/Timer controller to suit TemBreak 2 MCCBs	Electronic controller unit to suit TemBreak 1 or 2 MCCBs
		TLP1	TLP2	TL101
Normal voltage sensing phase failure relay	(NCSR)	✓	✓	✓
Time delay emergency to normal	(TDEN)	✓	✓	✓
Time delay normal to emergency	(TDNE)	✓	✓	✓
Common power supply relay	(CPSR)	✓	✓	✓
2 Emergency supply phase sequence relay	(EPSR)	0	0	✓
Emergency supply voltage sensing relay	(ECSR)	0	0	✓
3 Emergency supply frequency relay	(EFR)	0	0	✓
4 Engine run-on time delay	(ERTD)	0	0	✓
5 Engine start time delay	(ESTD)	0	0	✓
6 Inhibit return control	(IRC)	0	0	✓
7 Cranking limiter time delay	(CLTD)	0	0	-
8 Additional mode selection 'Normal supply'	(SSW2)	0	0	✓
9 Additional contacts for remote indication of mode switch position	(SSW3)	0	0	✓
10 Alarm lock-out relay	(ALR)	0	0	✓
11 Changeover time delay	(COTD)	0	0	✓
13 Mains stability timer	(MST)	0	0	✓
Interface with building management system		- <sup>1)</sup>	- <sup>1)</sup>	✓
Load shedding control		-	-	✓
14 Surge protection single phase (SPD1)		0	0	0
15 Surge protection 3 phase (SPD3)		0	0	0
16 Modbus communications		-	-	TL102 required (RS485)

✓ = Standard,

0 = Optional

- = Not available

**Notes:** <sup>1)</sup> PLC logic panels: TLPC2 and TLPC1 are available as options. Refer NHP. NHP PLC logic panels are ideally suited to BMS applications due to the multiple I/O of the PLC providing status to the BMS.

## TemLogic

### Basic Transfer Switches (BTS) and Manual Transfer Switches (MTS)

#### Options and accessories

Common loadside busbars – for connection to **BOTTOM** of MCCBs <sup>2)</sup>

**Tembreak 2: 250 – 630 A, Tembreak 1: 630 – 1250 A**

#### 3 pole CLSBB

Busbar Amp Rating	Dimensions (mm)			3 pole set Cat. No.
	H	W	D	
250 A <sup>1)</sup>	349	340	176	T2CLSBB25033
400 A <sup>1)</sup>	505	415	244	T2CLSBB40033
630 A <sup>1)</sup>	505	415	244	T2CLSBB63033
630/800 A	633	550	341	CLSBB63033
1000/1250	950	553	301	CLSBB125033

#### 4 pole CLSBB

Busbar Amp Rating	Dimensions (mm)			4 pole set Cat. No.
	H	W	D	
250 A <sup>1)</sup>	349	340	176	T2CLSBB25044
400 A <sup>1)</sup>	505	415	244	T2CLSBB40044
630 A <sup>1)</sup>	505	415	244	T2CLSBB63044
630/800 A	633	690	341	CLSBB63044
1000/1250	950	693	301	CLSBB125044

#### 3 & 4 pole combination CLSBB

Busbar Amp Rating	Dimensions (mm)			4 P and 3 P set Cat. No.
	H	W	D	
250 A <sup>1)</sup>	349	340	176	T2CLSBB25043
400 A <sup>1)</sup>	505	415	244	T2CLSBB40043
630 A <sup>1)</sup>	505	415	244	T2CLSBB63043
630/800 A	633	550/690	341	-
1000/1250	950	553/693	301	-



250 A Transfer switch  
Common loadside bars  
(for MCCB loadside only)



400 – 630 A Transfer switch  
Common loadside bars  
(for MCCB loadside only)

**Notes:** <sup>1)</sup> Do not fit TemBreak 1 transfer switches.

<sup>2)</sup> Bars not designed for MCCB top mounting. Refer NHP for options.

## Automatic transfer switches Interlocked and enclosed types

### Cable mechanical interlocked MCCBs

#### TemBreak 1 types

The cable wire is supplied. Please specify length.

#### TemBreak 2 types

Any combination of 125 – 630 A can be interlocked by a cable interlock.

Cable interlocking for vertical / horizontal / diagonal mounting



125 A and 250 A MCCBs shown.  
 (S125NJ / H250NJ)



Interlocked 3 pole types  
 MCCB to MCCB: 2000 A and 400 A

### Enclosed automatic transfer switches, free-standing or wall mounted

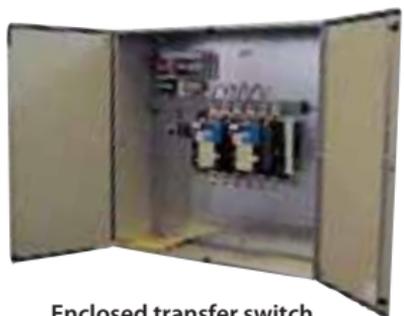
Enclosed automatic transfer switches are assembled to order from stock components on a fast-track delivery system. The basic transfer switch section and associated logic panel are housed inside a pre-specified enclosure. A mode selector is supplied as standard and optional indicator lights may be mounted externally on the cabinet door.

#### Standard features include:

- IP 65 rated enclosure
- Common loadside busbars
- Standard 240 V control (other voltage on application)
- Neutral and earth bars

#### Optional features:

- Busbar flags for large cable termination
- Pushbuttons or other front controls



Enclosed transfer switch

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## TemBreak Accessories

### to suit 125 - 630 AF MCCBs External accessories

#### MCCB rating labels

Can be used to identify the MCCBs ratings and type when a motor or interlock is fitted to an MCCB.



#### Accessory label sheets - stocked

A4 sheets with multiple small catalogue number and rating labels for TemBreak2 MCCBs

125 AF	<b>T12CAPLAB</b>	<b>3.50</b>
160/250 AF	<b>T25CAPLAB</b>	<b>3.50</b>
400/630 AF	<b>T40CAPLAB</b>	<b>3.50</b>

MCCB types	Left side Marker label Cat. No.	Rights side Marker label Cat. No.	Per label Price \$
E125NJ	2H4322SAB	2H4324SAA	7.20
S125NJ	2H4223SAB	2H4218SAA	7.20
S125GJ	2H4223SAB	2H4219SAA	7.20
H125NJ	2H4299SAA	2H4307SAA	7.20
L125NJ	2H4300SAA	2H4308SAA	7.20
S160NJ	2H4227SAB	2H4221SAB	7.20
S160GJ	2H4227SAB	2H4222SAB	7.20
H160NJ	2H4299SAA	2H4307SAA	7.20
L160NJ	2H4300SAA	2H4308SAA	7.20
E250NJ	2H4224SAB	2H4220SAA	7.20
S250NJ	2H4227SAB	2H4221SAB	7.20
S250GJ	2H4227SAB	2H4222SAB	7.20
S250PE	2H4277SAB	2H6972SAA	7.20
H250NJ	2H4299SAA	2H4307SAA	7.20
H250NE	2H4299SAA	2H6973SAA	7.20
L250NJ	2H4300SAA	2H4308SAA	7.20
E400NJ	2H5161SAB	2H5162SAA	7.20
E400CJ	2H5153SAB	2H5331SAA	7.20
S400NJ	2H5153SAB	2H5154SAA	7.20
S400GJ	2H5153SAB	2H5155SAA	7.20
S400GE	2H5153SAB	2H6198SAA	7.20
E630NE	2H5161SAB	2H6871SAA	7.20
S630CE	2H5153SAB	2H6872SAA	7.20
S630GE	2H5153SAB	2H6873SAA	7.20

#### Isolator switches

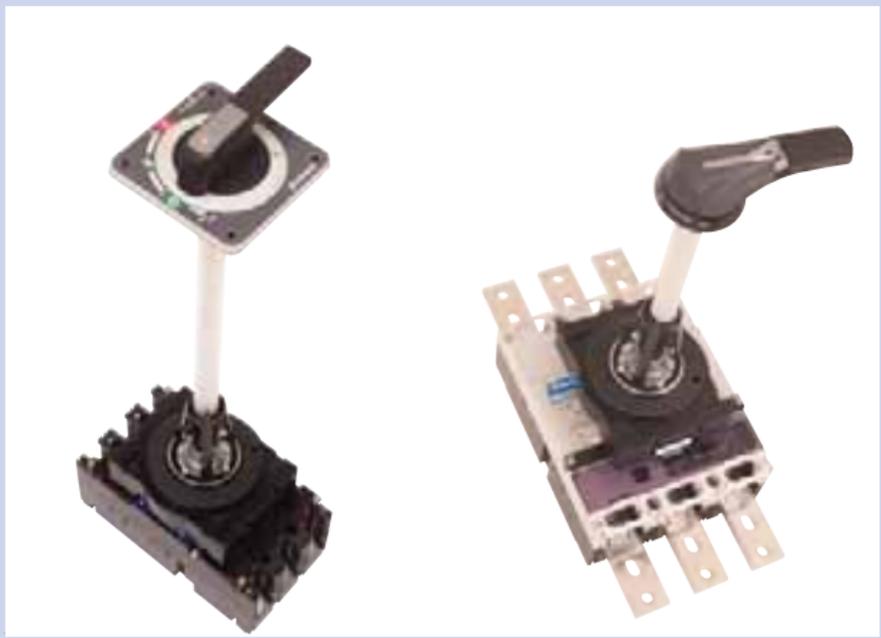
S125NN	2H4645SAB	2H4648SAB	7.20
S160NN	2H4650SAC	2H4653SAB	7.20
S250NN	2H4650SAC	2H4653SAB	7.20
S400NN	2H5364SAC	2H5365SAB	7.20
S630NN	2H5364SAC	2H5365SAB	7.20

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## TemBreak 1, 630 A - 1600 A and 1000 V mining MCCBs

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TL630NE	6 - 32
TL800NE	6 - 33
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## TemBreak 1 – selection and location guide

Amps	kA	OCR Type	Base current adj.	TemBreak Cat. No.	CPB Sect.
0.7-12	85	Hydraulic/magnetic	Fixed	XM30PB	3
16-125	14	Thermal magnetic	Fixed	XS125CS	-
16-125	25	Thermal magnetic	Fixed	XS125NS	-
12.5-125	18	Thermal magnetic	63-100 %	XS125CJ	-
12.5-125	25	Thermal magnetic	63-100 %	XS125NJ	-
12.5-125	50	Thermal magnetic	63-100 %	XH125NJ	-
12.5-125	50	Thermal magnetic	63-100 %	XH125PJ	-
100-250	25	Thermal magnetic	63-100 %	XS250NJ	-
100-250	50	Thermal magnetic	63-100 %	XH250NJ	-
160-250	65	Thermal magnetic	63-100 %	XH250PJ	-
160-400	35	Thermal magnetic	63-100 %	XS400CJ	-
160-400	50	Thermal magnetic	63-100 %	XS400NJ	-
250-400	65	Thermal magnetic	63-100 %	XH400PJ	-
80-400	50	Electronic	50-100 %	XS400SE	-
80-400	65	Electronic	50-100 %	XH400SE	-
125-400	65	Electronic	50-100 %	XH400PE	-
250-630	42	Thermal magnetic	63-100 %	XS630CJ	-
250-630	50	Thermal magnetic	63-100 %	XS630NJ	6
250-630	85	Thermal magnetic	63-100 %	XH630PJ	6
315-630	50	Electronic	50-100 %	XS630SE	6
315-630	65	Electronic	50-100 %	XH630SE	6
315-630	65	Electronic	50-100 %	XH630PE	6
500-800	50	Thermal magnetic	63-100 %	XS800NJ	6
500-800	85	Thermal magnetic	63-100 %	XH800PJ	6
400-800	50	Electronic	50-100 %	XS800SE	6
400-800	65	Electronic	50-100 %	XH800SE	6
400-800	65	Electronic	50-100 %	XH800PE	6
500-1250	85	Electronic	50-100 %	XS1250SE	6
800-1600	100	Electronic	50-100 %	XS1600SE	6
1000-2000	85	Electronic	50-100 %	XS2000NE	3
1250-2500	85	Electronic	50-100 %	XS2500NE	3
12.5-100	85	Thermal magnetic	63-100 %	TL100NJ	-
100-250	85	Thermal magnetic	63-100 %	TL250NJ	-
200-400	85	Electronic	50-100 %	TL400NE	-
315-630	125	Electronic	50-100 %	TL630NE	6
400-800	125	Electronic	50-100 %	TL800NE	6
500-1250	125	Electronic	50-100 %	TL1250NE	6
630-2500	20-40	Magnetic	63-100 %	XS-ND	3
15-100	10	Thermal magnetic	Fixed	TL100EM	6
80-400	12.5	Electronic	50-100 %	XV400NE	6
200-630	18	Electronic	50-100 %	XV630PE	6
400-800	18	Electronic	50-100 %	XV800PE	6
200-1250	20	Electronic	50-100 %	XV1250NE	6

**Notes:** TemBreak 1 and 2 cross reference chart, refer section 3.

## 2013 stocking guide: 125 A - 400 A TemBreak 1 MCCBs

This table can be used as a guide for situations where an older TemBreak 1 MCCB must be used. TemBreak 1 consists of the 'TemBreak' and 'TemBreak PLUS' series of MCCBs.

The breakers marked 'stocked' can be used to replace those others which are not stocked. The stocked types will typically have a higher kA rating.<sup>2)</sup>

### MCCBs contained in CPB section 6: Standard MCCBs

Amps	kA rating	OCR type	Base current adjustment	TB1 type stocked in 2012	MCCB type Cat. No.
12.5	85	Therm Mag	Fixed	stocked	<b>XM30PB</b>
16-125	14	Therm Mag	Fixed	use XS125NS	<b>XS125CS</b>
16-125	25	Therm Mag	Fixed	stocked	<b>XS125NS</b>
12.5-125	18	Therm Mag	63-100 %	use XH125NJ	<b>XS125CJ</b>
12.5-125	25	Therm Mag	63-100 %	use XH125NJ	<b>XS125NJ</b>
12.5-125	50	Therm Mag	63-100 %	stocked	<b>XH125NJ</b>
12.5-125	50	Therm Mag	63-100 %	use XH125NJ <sup>2)</sup>	<b>XH125PJ</b>
125-225	18	Therm Mag	Fixed	use E250NJ <sup>2)</sup>	<b>XE225NC</b>
100-160	50	Therm Mag	63-100 %	use XH250NJ/160 <sup>2)</sup>	<b>XH160PJ</b>
100-250	25	Therm Mag	63-100 %	stocked	<b>XS250NJ</b>
100-250	50	Therm Mag	63-100 %	stocked	<b>XH250NJ</b>
100-250	65	Therm Mag	63-100 %	use S400GJ/250 <sup>1)</sup>	<b>XH250PJ</b>
160-400	35	Therm Mag	63-100 %	use XS400NJ	<b>XS400CJ</b>
160-400	50	Therm Mag	63-100 %	stocked	<b>XS400NJ</b>
160-400	65	Therm Mag	63-100 %	use XH400SE <sup>2)</sup>	<b>XH400PJ</b>
125-400	50	Electronic	50-100 %	use XH400SE	<b>XS400SE</b>
125-400	65	Electronic	50-100 %	stocked	<b>XH400SE</b>
125-400	65	Electronic	50-100 %	use XH400SE <sup>2)</sup>	<b>XH400PE</b>
250-630	42	Therm Mag	63-100 %	use XS630NJ	<b>XS630CJ</b>
250-630	50	Therm Mag	63-100 %	stocked	<b>XS630NJ</b>
250-630	85	Therm Mag	63-100 %	stocked	<b>XH630PJ</b>
315-630	50	Electronic	50-100 %	stocked	<b>XS630SE</b>
315-630	65	Electronic	50-100 %	stocked	<b>XH630SE</b>
315-630	65	Electronic	50-100 %	stocked	<b>XH630PE</b>
12.5-100	85	Therm Mag	50-100 %	use H125NJ	<b>TL100NJ</b>
160-250	85	Therm Mag	50-100 %	use H250NJ <sup>1)</sup>	<b>TL250NJ</b>
200-400	85	Electronic	50-100 %	use S400PE	<b>TL400NE</b>

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**Notes:** <sup>1)</sup> TemBreak 2 MCCB. This is an electrical equivalent, though check the application as the physical size of the TemBreak 2 equivalent will be different.

<sup>2)</sup> Ics ratings are lower on SE / NJ types compared to PE / PJ types. TemBreak 1 and 2 cross reference chart refer section 3.

## 2012 stocking guide: 125 A - 400 A TemBreak 1 MCCBs

### Mining MCCBs

Amps	kA rating	OCR type	Base current adjustment	TB1 type stocked in 2012	MCCB type Cat. No.
15-100	10	Therm Mag	Fixed	stocked	TL100EM
80-400	12.5	Therm Mag	Fixed	stocked	XV400NE
200-630	18	Electronic	50-100 %	stocked	XV630PE
400-800	18	Electronic	50-100 %	stocked	XV800PE
200-1250	20	Electronic	50-100 %	stocked	XV1250NE

### Non auto / switch disconnectors

Amps	kA rating	OCR type	Base current adjustment	TB1 type stocked in 2012	MCCB type Cat. No.
125	-	Non Auto	Fixed	use S125NN <sup>1)</sup>	XS125NN
250	-	Non Auto	Fixed	stocked	XS250NN
400	-	Non Auto	Fixed	use S400NN <sup>1)</sup>	XS400NN
630	-	Non Auto	Fixed	use S630NN <sup>1)</sup>	XS630NN

**Notes:** <sup>1)</sup> TemBreak 2 MCCB. This is an electrical equivalent, though check the application as the physical size of the TemBreak 2 equivalent will be different.

## 1000V AC Mining MCCBs VS125NJ

**6 kA**

**Current rating: 12.5-125 A**

**Approvals and tests:** Standards AS/NZS 3947-2, and IEC60947-2

**Interrupting capacity:**

	Voltage	Icu kA	Ics kA	Types
AC	1100	4	4	20 A, 32 A
use	1100	6	4	50 A, 63 A, 100 A, 125 A



**Trip unit:**

**Adjustable thermal:** 63 % I<sub>r</sub> to 100% I<sub>r</sub>

**Adjustable magnetic:** 6 x I<sub>m</sub> to 12 x I<sub>m</sub> for 20 – 100 A trip unit types  
6 x I<sub>m</sub> to 10 x I<sub>m</sub> for 125 A trip unit types

**Dimensions (mm)**

Poles	3
H	155
W	90
D (less toggle)	68



Amp rating	Adj. I <sub>r</sub>		Adj. I <sub>m</sub>		Cat. No.	Price \$
NRC	Min.	Max.	Min.	Max.		
20	12.5	20	120	240	VS125NJ320	1250.00
32	20	32	192	384	VS125NJ332	1250.00
50	32	50	300	600	VS125NJ350	1250.00
63	40	63	378	756	VS125NJ363	1250.00
100	63	100	600	1200	VS125NJ3100	1250.00
125	80	125	750	1250	VS125NJ3125	1450.00

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**Notes:** The rear insulation barrier, terminal covers, and terminal screw caps supplied with the MCCB, must be used for MCCB installation.  
For internal and external accessory selection refer TemBreak 2 standard 125/250 AF accessories, section 3.  
NRC: Nominal rated current  
Adj. I<sub>r</sub>: Adjustable thermal setting  
Adj. I<sub>m</sub>: Adjustable magnetic setting  
**Replaces: TL100EM. Check exact ratings and dimensions to suit your application requirement.**

## 1000V AC Mining MCCBs VS250NJ

**6 kA**

**Current rating:** 100 – 250A

**Approvals and tests:** Standards AS/NZS 3947-2, and IEC60947-2

**Interrupting capacity:**

	Voltage	Icu kA	Ics kA
AC use	1100	6	4



**Trip unit:**

**Adjustable thermal:** 63% I<sub>r</sub> to 100% I<sub>r</sub>

**Adjustable magnetic:** 6 x I<sub>m</sub> to 13 x I<sub>m</sub> for 160 A trip unit types  
6 x I<sub>m</sub> to 10 x I<sub>m</sub> for 250 A trip unit types



**Dimensions (mm)**

Poles	3
H	165
W	105
D (less toggle)	68

Amp rating NRC	Adj. I <sub>r</sub>		Adj. I <sub>m</sub>		Cat. No.	Price \$
	Min.	Max.	Min.	Max.		
160	100	160	960	2080	VS250NJ3160	1750.00
250	160	250	1500	2500	VS250NJ3250	1850.00

**Notes:** The rear insulation barrier, terminal covers, and terminal screw caps supplied with the MCCB, must be used for MCCB installation.  
For internal and external accessory selection refer TemBreak 2 standard 125/250 AF Accessories, section 3.  
NRC: Nominal rated current  
Adj. I<sub>r</sub>: Adjustable thermal setting  
Adj. I<sub>m</sub>: Adjustable magnetic setting

## TemBreak 1000 V mining circuit breakers TL100EM

**50 kA**

**Current rating:** 15-100 A

**Approvals and tests:** Complies with AS 2184 /  
AS/NZS 3947-2  
Complies with IEC 60947-2

**Interrupting capacity:** 10 kA at 900 V AC (sym)  
6.5 kA at 1100 V AC (sym) <sup>1)</sup>

**Trip unit:** Fixed

**Thermal setting:** Fixed 40 °C industrial  
45 °C and 50 °C marine

**Magnetic setting:** Fixed

**Dimensions (mm)**

Poles	3
H	165
W	105
D (less toggle)	125
Weight (kg)	3.2



Ampere rating	Cat. No.	Price \$
15	TL100EM 15 3K	2330.00
20	TL100EM 20 3K	2330.00
30	TL100EM 30 3K	2330.00
40	TL100EM 40 3K	2330.00
50	TL100EM 50 3K	2330.00
60	TL100EM 60 3K	2330.00
75	TL100EM 75 3K	2330.00
100	TL100EM 100 3K	2330.00

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Refer previous pages for new VS125/250 1000 V MCCBs

**Notes:** <sup>1)</sup> Ratings based upon IEC 60947-2.  
TL100EM must use line-side terminal cover supplied with MCCB.

## Accessories to suit TL100EM / F

### Internal accessories

Description		Cat. No.	Price \$
Shunt trips	110 V AC sht (100-115 V)	<b>7VF 2M1</b>	<b>280.00</b>
	240 V AC sht (200-480 V)	<b>7VF 2M2-B</b>	<b>280.00</b>
	48 V DC sht	<b>7VF 2M6</b>	<b>280.00</b>
	24 V DC sht	<b>7VF 2M7</b>	<b>280.00</b>
Undervoltage trips	440 V AC	<b>7UF 2D5B</b>	<b>360.00</b>
	110 V AC	<b>7UF 2D6B</b>	<b>360.00</b>
	240 V AC	<b>7UF 2D7B</b>	<b>360.00</b>
	110 V DC	<b>7UF 2FD1</b>	<b>360.00</b>
	24 V DC	<b>7UF 2FD2</b>	<b>360.00</b>
Auxiliary switches	AUX SW right hand 1C	<b>7XA 2D31B</b>	<b>245.00</b>
	AUX SW left hand 1C	<b>7XA 2D41B</b>	<b>245.00</b>
Alarm switches	ALT SW right hand	<b>7AB 2D11B</b>	<b>245.00</b>

### External accessories

Description		Cat. No.	Price \$
Screw tunnel lugs	3 P solderless term. (6)	<b>7T 2M1</b>	<b>110.00</b>
Rear connect studs	3 P RC studs (6)	<b>7RC 2LE</b>	<b>210.00</b>
Motor operators	110 V AC motor	<b>7MB 3BA1</b>	<b>1910.00</b>
Handle operators	Door interlocking handle kit	<b>TFH 22D</b>	<b>335.00</b>
	IP 55 handle kit (plastic)	<b>TL100EMR5GM</b>	<b>390.00</b>
	IP 65 handle kit (plastic)	<b>TL100EMR6BN <sup>1)</sup></b>	<b>280.00</b>
	IP 65 handle kit (metal)	<b>YASD22D</b>	<b>445.00</b>
Toggle locks	IP 55 direct mounting handle kit	<b>TFJ 22LU</b>	<b>355.00</b>
	Toggle lock	<b>7KB 3BA</b>	<b>60.00</b>
Accessory lead terminal	Lock plate	<b>UXKE0030A</b>	<b>2.20</b>
	Accessory lead terminal, black	<b>7YD3</b>	<b>55.00</b>

**Notes:** <sup>1)</sup> 'HS' handle option Cat. No. TL100EMR5GM (IP 55).

## TemBreak 1000 V mining circuit breakers Electronic XV400NE

**12.5 kA**

**Current rating: 80-400 A**

**Approvals and tests:** Standards AS/NZS 3947-2  
Complies with IEC 60947-2

**Interrupting capacity:** 12.5 kA at 1000/1100 V AC,  
(IEC 60947-2)

**Trip unit:**

Trip unit:	Fixed	
LTD adjustment:	I <sub>t</sub> : 0.8-1	t: 5-30 s
STD adjustment:	I <sub>t</sub> : 2-10	t: 0.1-0.3 s
INST adjustment:	I <sub>t</sub> : 3-12	
Instantaneous Adj:	I <sub>p</sub> : 0.7-1	t: fixed at 40 s (sep control power req.)

**Dimensions (mm)**

<b>Poles</b>	<b>3</b>
H	260
W	140
D (Less toggle)	103
Weight (kg)	5.0



**Amp rating**

NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
160	80	160	XV400NE 160 3K <sup>2)</sup>	3860.00
250	125	250	XV400NE 250 3K <sup>2)</sup>	3860.00
400	200	400	XV400NE 400 3K <sup>2)</sup>	4080.00

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**XV400 MINING BREAKERS MUST USE LINE-SIDE TERMINAL COVERS, TERMINAL BOLT COVERS and REAR INSULATION PLATES.**  
All items supplied with breaker<sup>1) 3)</sup>

- Notes:** 1) Applicable for front connect MCCBs. Contact NHP for rear connect details.  
 2) For FAULT INDICATION option add 'FI' and nominate control voltage.  
 3) Installation and incoming connection information is supplied with each MCCB or can be requested from NHP.  
 NRC: Nominal rated current  
 ASR: Adjustable setting range  
 Overcurrent trip combinations: (specify combinations req.)  
 LSI - standard,  
 LS - optional,  
 LSIP - optional (pre-trip alarm).  
 Special current ratings available on indent, refer NHP.

## Accessories to suit 400 AF

### Internal accessories

Description	Cat. No.	Price \$	
Shunt trips	110 V AC/DC (100 - 115 V)	<b>2H1305BAA</b>	<b>405.00</b>
	240 V AC (200 - 480 V)	<b>2H1306BAA</b>	<b>405.00</b>
	12 V DC	<b>2H1307BAA</b>	<b>405.00</b>
	24 V DC	<b>2H1308BAA</b>	<b>405.00</b>
	48 V DC	<b>2H1309BAA</b>	<b>405.00</b>
	24 V AC	<b>2H1311BAA</b>	<b>405.00</b>
	Undervoltage trips	AC coil <sup>1)</sup>	<b>2H1492BAA</b>
100-230 V DC coil <sup>2)</sup>		<b>2H1493BAA</b>	<b>315.00</b>
24 V DC coil <sup>2)</sup>		<b>2H1494BAA</b>	<b>315.00</b>
48 V DC coil <sup>2)</sup>		<b>2H1495BAA</b>	<b>315.00</b>
60 V DC coil <sup>2)</sup>		<b>2H1496BAA</b>	<b>315.00</b>
110 V AC instantaneous controller		<b>UXUB0013B</b>	<b>113.00</b>
240 V AC instantaneous controller		<b>UXUB0014B</b>	<b>113.00</b>
440 V AC instantaneous controller		<b>UXUB0015B</b>	<b>113.00</b>
110 V AC time delay controller		<b>UXUB0016B</b>	<b>220.00</b>
240 V AC time delay controller		<b>UXUB0017B</b>	<b>220.00</b>
440 V AC time delay controller	<b>UXUB0018B</b>	<b>215.00</b>	
200-230 V DC controller	<b>UXUB0038B</b>	<b>113.00</b>	
Auxiliary switches	AUX SW right hand 1C	<b>UXXB0004D</b>	<b>169.00</b>
	AUX SW right hand 2C	<b>UXXB0005D</b>	<b>220.00</b>
	AUX SW right hand 3C	<b>UXXB0006D</b>	<b>255.00</b>
Alarm switch	ALT SW right hand	<b>UXLB0009D</b>	<b>178.00</b>
	ALT/AUX SW right hand 1C	<b>UXLB0013D</b>	<b>189.00</b>
Alarm & auxiliary switch	ALT/AUX SW right hand 2C <small>Add then voltage</small>	<b>UXLB0014D</b>	<b>220.00</b>
Pre-trip alarm	For electronic OCR MCCBs only	<b>Pre-trip alarm</b>	<b>770.00</b>
Fault indication & contacts	Side of breaker mounted module. Electronic MCCBs only	<b>FI</b>	<b>900.00</b>
Fault indication	LEDs mounted at top of OCR (electronic breakers only)	<b>FILED</b>	<b>2050.00</b>

**Notes:** Footnotes, refer to page 6 - 12.

## Accessories to suit 400 AF

### External accessories

Description	Cat. No.	Price \$
Attached busbars	3 P attached busbars (6 in kit)	2H1384DAA 225.00
	4 P attached busbars (8 in kit)	2H1385DAA 305.00
Screw tunnel terminals	3 P solderless terminals (6 in kit)	2H2012DAB 430.00
	4 P solderless terminals (8 in kit)	2H2012DBB 540.00
Rear connect studs	3 P RC studs (6 in kit)	UXRC0006C 810.00
	4 P RC studs (8 in kit)	UXRC0007C 1090.00
Motor operators (XMC4)	110 V AC motor <sup>11)</sup>	UXMC0001B 2780.00
	110 V DC motor <sup>11)</sup>	UXMC0003B 2780.00
	24 V DC motor <sup>11)</sup>	UXMC0004B 2780.00
	240 V AC motor <sup>11)</sup>	UXMC0005B 2780.00
	Motor base support <sup>11)</sup>	UXMD0001B 47.00
Mechanical interlocks	3 P mechanical interlock <sup>3)</sup>	UXKC0001B 560.00
	3/4 P mechanical interlock <sup>4)</sup>	UXKC0002B 560.00
	4 P mechanical interlock <sup>5)</sup>	UXKC0003B 840.00
Cable mechanical interlocks	Interlock cable (wire)	UXKC0020A 83.00
	Cable interlock mechanism <sup>6)</sup>	UXKC0021B 220.00
Handle operators	IP 55 grey vari-depth handle + 320 mm shaft	T1HS40R5GM 415.00
	T1HS escutcheon plate option: 100 mm <sup>2</sup>	T2HSESC100 18.20
	390 mm T pin shaft for T1HS - no flexi coupling	T2HS400SHAFT 47.00
	IP 65 grey vari-depth handle + shaft	T1HP40R6BNA4 355.00
	IP 65 vari-depth metal handle + shaft	YASD34 700.00
	Padlock attachment for T2HP/HS mechanism	T1HP40PALK 44.50
	IP 55 direct mount fixed depth handle <sup>7)</sup>	TFJ34XU 415.00
Toggle locks	T1HS handle shaft cam for Prosafe and Fortress locks	1499 7702 235.00
	Toggle lock – non captive (Padlockable)	2H1956BAA 47.00
	Toggle -lock – captive (Padlockable)	XKA4 47.00
	Resin for XKA4	LOCTITE 480 83.00



**Notes:** Footnotes, refer to page 6 - 12.

## Accessories to suit 400 AF

### External accessories

Description	Cat. No.	Price \$
Terminal covers	3 P front connecting terminal cover - busbar connect type	<b>2H1413DAB</b> <b>190.00</b>
	4 P front connecting terminal cover - busbar connect type	<b>2H1414DAB</b> <b>245.00</b>
	3 P front connecting terminal cover - cable connect type	<b>2H1415DAB</b> <b>190.00</b>
	4 P front connecting terminal cover - cable connect type	<b>2H1416DAB</b> <b>245.00</b>
	IP 20 protective cover - busbar connect type <sup>8)</sup>	<b>2A1787DBA</b> <b>6.20</b>
	IP 20 protective cover - cable connect type <sup>8)</sup>	<b>2A1788DAA</b> <b>6.20</b>
	3 P rear connecting terminal cover	<b>UXPD0011B</b> <b>190.00</b>
	4 P rear connecting terminal cover	<b>UXPD0012A</b> <b>245.00</b>
Accessory lead terminal	Accessory lead terminal	<b>UXYD0001A</b> <b>26.80</b>
	Terminal and bolt <sup>9)</sup>	<b>UXYD0002A</b> <b>2.20</b>
TemPlugs <sup>13)</sup>	3 P TemPlug 400 A <sup>12)</sup>	<b>UPX3440</b> <b>355.00</b>
Interpole barrier	Interpole barrier <sup>10)</sup>	<b>UXQH0004B</b> <b>10.40</b>
OCR sealing kit	Tamperproof cover for OCR adjustment dials	<b>XS400OCRSK</b> <b>54.00</b>

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- Notes:**
- 1) An AC UVT controller is required for 100-440 V AC.
  - 2) A DC UVT controller is needed for 200-230 V DC operation. None required for 24-110 V DC.
  - 3) For 3 P circuit breakers without motors.
  - 4) For 4 P circuit breakers without motors or 3 P circuit breakers with motors.
  - 5) For 4 P circuit breakers with motors.
  - 6) Order one interlock mechanism for each circuit breaker.
  - 7) Flush plate included.
  - 8) 6 pieces required for 3 P / 8 pieces required for 4 P.
  - 9) Specify quantity required (up to 6 pieces).
  - 10) Order individually.
  - 11) Order a motor base support for each motor : UXMD0001B.
  - 12) **Price Schedule T3** applies to TemPlug.
  - 13) Not to be used with 1000V mining MCCB type XV400.

## MCCB isolating switch

### Non-auto MCCB, XS800NN

- Accepts MCCB accessories
- Standards AS/NZS 3947-2 and IEC 60947-2
- Motor or motorised circuit isolation - no overcurrent protection
- Will accept auxiliaries, UVTs & shunt trips<sup>2)</sup>

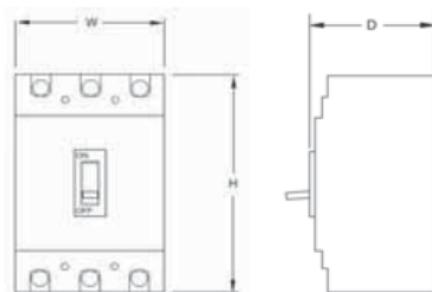


#### Ordering details

Ampere rating	Short time rating (kA)	3 pole Cat. No. <sup>1)</sup>	Price \$
630/800	10 kA for 0.3 sec	<b>XS800NN3</b>	<b>3450.00</b>

#### Dimensions (mm)

Ampere rating	Height <sup>3)</sup>	Width		Depth	Weight (kg)	
		3 P	4 P		3 P	4 P
630/800	273	210	280	103	9.00	12.2



6

- Notes:**
- <sup>1)</sup> Additional technical details, refer to Part C.
  - <sup>2)</sup> UVTs & shunts are operated by the MCCBs trip lever which is fitted in non-auto MCCBs.
  - <sup>3)</sup> Height excludes attached busbar.

## TemBreak 1 series

### Current limiting thermal magnetic type

### XS630NJ

## 50 kA

**Current rating:** 250 – 630 A

**Approvals and Tests:** Standards: AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)

	Voltage	Icu kA	Ics kA
AC use	400/415	50	25
DC use	250	40	–



**Trip unit:** Adjustable thermal adjustable magnetic

**OCR options:** Special calibrated or disabled thermal trip

### Dimensions (mm)

<b>Poles</b>	<b>3</b>
H <sup>1)</sup>	273
W	210
D (less toggle)	103
Weight (kg)	9.6
4 pole	

### 3 Pole

#### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
400	250	400	XS630NJ 400 3	2990.00
630	400	630	XS630NJ 630 3	2990.00

**Notes:** <sup>1)</sup> H excludes attached busbar.  
Magnetic only available on application.  
NRC: Nominal rated current.  
ASR: Adjustable setting range.  
Specify for DC rating.

## TemBreak PLUS PowerBreaker Ics = 50 kA

### Thermal magnetic type XH630PJ

### 85 kA

**Current rating:** 250 – 630 A

**Approvals and Tests:** Standards: AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)

	Voltage	Icu kA	Ics kA
AC use	400	100	50
	415	85	50
DC use	250	40	–



**Trip unit:** Adjustable thermal adjustable magnetic

**OCR options:** Special calibrated or disabled thermal trip

#### Dimensions (mm)

<b>Poles</b>	<b>3</b>
H <sup>1)</sup>	273
W	210
D (less toggle)	103
Weight (kg)	9.6
4 pole on indent	

#### 3 Pole

#### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
400	250	400	XH630PJ 400 3	4350.00
630	400	630	XH630PJ 630 3	4810.00

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**Notes:** <sup>1)</sup> H excludes attached busbar  
Magnetic only available on application.  
NRC: Nominal rated current.  
ASR: Adjustable setting range.

## TemBreak PLUS selectivity series

### Electronic type XS630SE

## 50 kA

**Current rating:** 315 – 630 A

**Approvals and Tests:** Standards: AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)

	Voltage	Icu kA	Ics kA
AC use	400/415	50	25



### Trip unit:

Electronic trip unit: Adjustable long, short and instantaneous trip.

Trip unit:	Fixed.		
LTD adjustment:	I <sub>1</sub> : 0.8 – 1	t:	5 – 30 s
STD adjustment:	I <sub>2</sub> : 2 – 10	t:	0.1 – 0.3 s
Instantaneous Adj:	I <sub>3</sub> : 3 – 12	NRC	

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

### Dimensions (mm)

Poles	3	4
H <sup>1)</sup>	273	273
W	210	280
D (less toggle)	103	103
Weight (kg)	9.6	12.2

### 3 Pole

Amp rating	NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
630	315	630	XS630SE 630 3	3100.00	

### 4 Pole

Amp rating	NRC	ASR Min.	ASR Max.	Cat. No.	4 pole Price \$
630	315	630	XS630SE 630 4	4130.00	

### Ground Fault Trip MCCB<sup>2)</sup>

### 3 Pole

Amp rating	NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
630	315	630	XS630SE 6303LSIG	3960.00	

### 4 Pole

Amp rating	NRC	ASR Min.	ASR Max.	Cat. No.	4 pole Price \$
630	315	630	XS630SE 6304LSIG	6280.00	

**Notes:** <sup>1)</sup> H excludes attached busbar.

<sup>2)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCB applications. (If a neutral is present) Refer accessories.

NRC: Nominal rated current. ASR: Adjustable setting range.

## TemBreak PLUS selectivity series

### Electronic type XH630SE

## 65 kA

**Current rating:** 315 – 630 A

**Approvals and Tests:** Standards: AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)



	Voltage	Icu kA	Ics kA
AC use	400/415	65	33

### Trip unit:

Electronic trip unit: Adjustable long, short and instantaneous trip.

Trip unit:	Fixed.		
LTD adjustment:	I <sub>1</sub> : 0.8 – 1	t:	5 – 30 s
STD adjustment:	I <sub>2</sub> : 2 – 10	t:	0.1 – 0.3 s
Instantaneous Adj:	I <sub>3</sub> : 3 – 12	NRC	

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

### Dimensions (mm)

Poles	3	4
H <sup>1)</sup>	273	273
W	210	280
D (less toggle)	103	103
Weight (kg)	9.6	12.2

### 3 Pole

Amp rating				3 pole
NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
630	315	630	XH630SE 630 3	3260.00

### 4 Pole

Amp rating				4 pole
NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
630	315	630	XH630SE 630 4	4350.00

### Ground Fault Trip MCCB<sup>2)</sup>

### 3 Pole

Amp rating				3 pole
NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
630	315	630	XH630SE6303LSIG	4110.00

### 4 Pole

Amp rating				4 pole
NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
630	315	630	XH630SE6304LSIG	6420.00

**Notes:** <sup>1)</sup> H excludes attached busbar.

<sup>2)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCB applications. (If a neutral is present) Refer accessories.

NRC: Nominal rated current. ASR: Adjustable setting range.

## THERMAL/MAGNETIC CIRCUIT BREAKERS

NHP

Terasaki thermal/magnetic circuit breakers offer superior protection when harmonics exist in a network.

POWER PROTECTION

# DO NOT UNDER RATE



PP-TERASAKI-MCCB-CPB

### Terasaki thermal/magnetic circuit breakers:

- Respond directly to the heat produced by the true RMS value of the load current
- Ensure protection irrespective of the harmonic distortion any future loads may cause
- Protect up to the infinite harmonic
- Are suitable for DC applications



## TemBreak 1 series Current limiting thermal magnetic type XS800NJ

### 50 kA

**Current rating:** 500 – 800 A

**Approvals and Tests:** Standards: AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)



	Voltage	Icu kA	Ics kA
AC use	400/415 <sup>1)</sup>	50	25
DC use	250	40	

**Trip unit:** Adjustable thermal adjustable magnetic

**OCR options:** Special calibrated or disabled thermal trip

### Dimensions (mm)

Poles	3	4
H <sup>1)</sup>	273	273
W	210	280
D (less toggle)	103	103
Weight (kg)	9.7	12.2

### 3 Pole

**Amp rating**

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
800	500	800	XS800NJ 800 3	3850.00

### 4 Pole

**Amp rating**

NRC	ASR Min.	ASR Max.	Cat. No.	4 pole Price \$
800	500	800	XS800NJ 800 4	5130.00

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**Notes:** <sup>1)</sup> H excludes attached busbar.  
 NRC: Nominal rated current.  
 ASR: Adjustable setting range.  
 Magnetic only available on application.  
 Specify for DC rating.

## TemBreak PLUS PowerBreaker Ics = 50 kA

### Thermal magnetic type XH800PJ

### 85 kA

**Current rating:** 500 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)



	Voltage	Icu kA	Ics kA
AC use	400	100	50
	415	85	50
DC use	250	40	–

**Trip unit:** Adjustable thermal adjustable magnetic

**OCR options:** Special calibrated or disabled thermal trip

#### Dimensions (mm)

Poles	3	4
H <sup>1)</sup>	273	273
W	210	280
D (less toggle)	103	103
Weight (kg)	9.7	12.2

#### 3 Pole

**Amp rating**

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
800	500	800	XH800PJ 800 3P	4810.00

#### 4 Pole

**Amp rating**

NRC	ASR Min.	ASR Max.	Cat. No.	4 pole Price \$
800	500	800	XH800PJ 800 4P	6750.00

**Notes:** <sup>1)</sup> H excludes attached busbar.  
Magnetic only available on application.  
NRC: Nominal rated current.  
ASR: Adjustable setting range.

## TemBreak PLUS selectivity series

### Electronic type XS800SE

**50 kA**

**Current rating:** 400 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)



	Voltage	Icu kA	Ics kA
AC use	400/415	50	25

**Trip unit:**

Electronic trip unit: Adjustable long, short and instantaneous trip.

Trip unit:	Fixed.	
LTD adjustment:	I <sub>1</sub> : 0.8 – 1	t: 5 – 30 s
STD adjustment:	I <sub>2</sub> : 2 – 10	t: 0.1 – 0.3 s
Instantaneous Adj:	I <sub>3</sub> : 3 – 12	NRC

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

**Dimensions (mm)**

Poles	3	4
H <sup>1)</sup>	273	273
W	210	280
D (less toggle)	103	103
Weight (kg)	9.7	12.2

**3 Pole**

**Amp rating**

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
800	400	800	XS800SE 800 3	4140.00

**4 Pole**

**Amp rating**

NRC	ASR Min.	ASR Max.	Cat. No.	4 pole Price \$
800	400	800	XS800SE 800 4	5520.00

**Ground Fault Trip MCCB<sup>2)</sup>**

**3 Pole**

**Amp rating**

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
800	400	800	XS800SE8003LSIG	4990.00

**4 Pole**

**Amp rating**

NRC	ASR Min.	ASR Max.	Cat. No.	4 pole Price \$
800	400	800	XS800SE8004LSIG	6370.00

**Notes:** <sup>1)</sup> H excludes attached busbar.

<sup>2)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCBs. (If a neutral is present) Refer accessories.

NRC: Nominal rated current.

ASR: Adjustable setting range.

## TemBreak PLUS selectivity series

### Electronic type XH800SE

## 65 kA

**Current rating:** 400 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)



	Voltage	Icu kA	Ics kA
AC use	400/415	65	33

### Trip unit:

Electronic trip unit: Adjustable long, short and instantaneous trip.

Trip unit:	Fixed.		
LTD adjustment:	I <sub>1</sub> : 0.8 – 1	t: 5 – 30 s	
STD adjustment:	I <sub>2</sub> : 2 – 10	t: 0.1 – 0.3 s	
Instantaneous Adj:	I <sub>3</sub> : 3 – 12	NRC	

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

### Dimensions (mm)

Poles	3	4
H <sup>1)</sup>	273	273
W	210	280
D (less toggle)	103	103
Weight (kg)	9.7	12.2

### 3 Pole

Amp rating				3 pole
NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
800	400	800	XH800SE 800 3	4360.00

### 4 Pole

Amp rating				4 pole
NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
800	400	800	XH800SE 800 4	6750.00

### Ground Fault Trip MCCB<sup>2)</sup>

#### 3 Pole

Amp rating				3 pole
NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
800	400	800	XH800SE8003LSIG	5080.00

#### 4 Pole

Amp rating				4 pole
NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
800	400	800	XH800SE8004LSIG	7480.00

**Notes:** <sup>1)</sup> H excludes attached busbar.

<sup>2)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCB applications. (If a neutral is present) Refer accessories.

NRC: Nominal rated current.

ASR: Adjustable setting range.

## TemBreak PLUS PowerBreaker Ics = 50 kA

### Electronic type XH800PE

### 65 kA

**Current rating:** 400 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)



	Voltage	Icu kA	Ics kA
AC use	400/415	65	50
DC use	250 V	40	-

#### Trip unit:

Electronic trip unit: Adjustable long, short and instantaneous trip.

Trip unit:	Fixed.	
LTD adjustment:	I <sub>1</sub> : 0.8 – 1	t: 5 – 30 s
STD adjustment:	I <sub>2</sub> : 2 – 10	t: 0.1 – 0.3 s
Instantaneous Adj:	I <sub>3</sub> : 3 – 12	NRC

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

#### Dimensions (mm)

Poles	3	4
H <sup>1)</sup>	273	273
W	210	280
D (less toggle)	103	103
kg	9.7	12.2

#### 3 Pole

##### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
800	400	800	XH800PE 800 3	4700.00

#### 4 Pole

##### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
800	400	800	XH800PE 800 4	8500.00

**Notes:** <sup>1)</sup> H excludes attached busbar.

NRC: Nominal rated current.

ASR: Adjustable setting range.

## TemBreak 1000 V mining circuit breakers Electronic XV630PE, XV800PE

### 18 kA

**Current rating:** 200-800 A

**Approvals and tests:** Standards AS 2184, AS/NZS 3947-2  
Complies with IEC 60947-2

**Interrupting capacity:** 18 kA at 1000 V AC <sup>1)</sup> (IEC 60947-2)  
12.5 kA at 1100 V AC <sup>2)</sup>

### Trip unit:

Trip unit:	Fixed		
LTD adjustment:	I <sub>t</sub> : 0.8-1	t:	5-30 s
STD adjustment:	I <sub>t</sub> : 2-10	t:	0.1-0.3
INST adjustment:	I <sub>t</sub> : 3-12		
PTA adjustment:	I <sub>t</sub> : 0.7-1	t:	fixed at 40 s (sep. control power req.)
or GFT adjustment:	I <sub>t</sub> : 0.1-0.4	t:	0.1, 0.2, 0.3, 0.4 or 0.8 s



### Dimensions (mm)

<b>Poles</b>	<b>3</b>
H <sup>3)</sup>	273
W	210
D (Less toggle)	103
Weight (kg)	11.00

### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
400	200	400	XV630PE 400 3K <sup>4)</sup>	4270.00
630	315	630	XV630PE 630 3K <sup>4)</sup>	5440.00
800	400	800	XV800PE 800 3K <sup>4)</sup>	8240.00

**XV630/800 MINING BREAKERS MUST USE  
either line-side terminal covers  
OR  
interpole barriers, and a rear  
insulation plate  
(All supplied with breaker) <sup>5)</sup>**

- Notes:** <sup>1)</sup> Actual test voltage 1105 V.  
<sup>2)</sup> Actual test voltage 1165 V.  
<sup>3)</sup> H excludes attached busbar.  
<sup>4)</sup> For FAULT INDICATION option add 'FI' and nominate control voltage.  
<sup>5)</sup> Installation and incoming connection information can be found with each new MCCB, or by contacting NHP.

NRC: Nominal rated current.

ASR: Adjustable setting range.

Overcurrent trip combinations: (specify combinations req.)

LSI - standard,

LS - optional,

LSIP - optional (pre-trip alarm).

## Accessories to suit 630-800 AF

### Internal accessories

Description		Cat. No.	Price \$
Shunt trips	110 V AC/DC	2H1515BAA	430.00
	240 V AC	2H1516BAA	430.00
	12 V DC	2H1517BAA	430.00
	24 V DC	2H1518BAA	430.00
	48 V DC	2H1519BAA	430.00
	200 V DC	2H1520BAA	430.00
	24 V AC	2H1521BAA	430.00
	48 V AC	2H1522BAA	430.00
	Undervoltage trips	AC coil <sup>1)</sup>	2H1503BAA
100-230 V DC coil <sup>2)</sup>		2H1504BAA	395.00
24 V DC coil <sup>2)</sup>		2H1505BAA	395.00
48 V DC coil <sup>2)</sup>		2H1506BAA	395.00
60 V DC coil <sup>2)</sup>		2H1507BAA	395.00
110 V AC instantaneous controller		UXUB0013B	113.00
240 V AC instantaneous controller		UXUB0014B	113.00
440 V AC instantaneous controller		UXUB0015B	113.00
110 V AC time delay controller		UXUB0016B	220.00
240 V AC time delay controller		UXUB0017B	220.00
Undervoltage trips	440 V AC time delay controller	UXUB0018B	215.00
	200-230 V DC controller	UXUB0038B	113.00
	AUX SW right hand 1C	UXXB0007D	169.00
	AUX SW right hand 2C	UXXB0008D	200.00
Alarm switch	AUX SW right hand 3C	UXXB0009D	240.00
	ALT SW right hand	UXLB0010D	181.00
Alarm & auxiliary switches	ALT/AUX SW right hand 1C	UXLB0015D	195.00
	ALT/AUX SW right hand 2C	UXLB0016D	225.00
Pre-trip alarm	For electronic OCR MCCBs only	Add LSIP	700.00
Fault indication & contacts	Side of breaker mounted module.	Add - then voltage FI	900.00
	Electronic MCCBs only		
Earth fault, with optional 4th external CTs	Earth fault, electronic breakers only (4th CTs optional, add price below)	Add LSIG	730.00
	630 A 4th CT	UXOY0001A	425.00
	800 A 4th CT	UXOY0002A	425.00

**Notes:** Footnotes, refer to page 6 - 26.

## Accessories to suit 630 – 800 AF

External accessories - user fit		Cat. No.	Price \$
Screw tunnel terminals	3 P solderless terminals for 630 AF (6 in kit)	<b>TXLD0005A</b>	<b>385.00</b>
	4 P solderless terminals for 630 AF (8 in kit)	<b>TXLD0006A</b>	<b>495.00</b>
Rear connect studs	3 P rear connect studs, 630/800 AF (6 in kit)	<b>UXRC0008B</b>	<b>1460.00</b>
	4 P rear connect studs, 630/800 AF (8 in kit)	<b>UXRC0009B</b>	<b>2040.00</b>
Motor operators (XMD6) <sup>2)</sup>	110 V AC motor	<b>2H1299CAC</b>	<b>2750.00</b>
	110 V DC motor	<b>2H1301CAC</b>	<b>2750.00</b>
	24 V DC motor	<b>2H1302CAC</b>	<b>2750.00</b>
	240 V AC motor	<b>2H1303CAC</b>	<b>2750.00</b>
Motor operators (XMC6) <sup>2)</sup>	110 V AC motor	<b>UXMC0006B</b>	<b>3550.00</b>
	110 V DC motor	<b>UXMC0008B</b>	<b>3550.00</b>
	24 V DC motor	<b>UXMC0009B</b>	<b>3550.00</b>
	240 V AC motor	<b>UXMC0010B</b>	<b>3550.00</b>
	Motor base support	<b>UXMD0002B</b>	<b>47.00</b>
Mechanical interlocks (Factory fit)	3 P mechanical interlock rear mounting	<b>UXKC0004A</b>	<b>360.00</b>
	4 P mechanical interlock rear mounting	<b>UXKC0005A</b>	<b>520.00</b>
	Interlock cable (wire)	<b>UXKC0020A</b>	<b>83.00</b>
	Cable interlock mechanism <sup>1)</sup>	<b>UXKC0022B</b>	<b>310.00</b>
Handle operators	IP 55 Grey variable depth handle + 357mm shaft	<b>T1HS80R5GM</b>	<b>490.00</b>
	T1HS escutcheon plate option: 100 mm <sup>2</sup>	<b>T2HSESC100</b>	<b>18.20</b>
	390 mm T pin shaft for T2HS - no flexi coupling	<b>T2HS400SHAFT</b>	<b>47.00</b>
	IP 65 Grey variable depth handle + 420 mm shaft	<b>T1HP80R6BNA4</b>	<b>480.00</b>
	Padlock attachment for T1HP/HS mechanism	<b>T1HP80PALK</b>	<b>49.50</b>
	IP 55 direct mount fixed depth handle	<b>TFJ36XU</b>	<b>510.00</b>
Handle extension	Extends length of toggle	<b>UXKB0002A</b>	<b>60.50</b>
Toggle & handle locks	Toggle lock – non captive (Padlockable)	<b>UXKB0002A</b>	<b>60.50</b>
	Toggle lock – captive (Padlockable)	<b>XKA6</b>	<b>60.50</b>
	Resin for XKA6	<b>LOCTITE 480</b>	<b>83.00</b>

**Notes:** 1) Order one interlock mechanism for each circuit breaker.

2) XMC6 motors are used on all transfer switches as standard, and require a motor base support along with the motor when ordered. XMD6 motors offer superior ON/OFF/TRIPPED status indication and can be fitted to transfer switches on request. XMD6 motors do not require a motor base support.

Yellow and red handles available.

## Accessories to suit 630 – 800 AF

External accessories - user fit		Cat. No.	Price \$
Terminal covers	3 P front connecting terminal cover	2H1417DAB	215.00
	4 P front connecting terminal cover	2H1418DAB	270.00
	IP 20 protective cover <sup>1)</sup>	2A1787DBA	6.20
	3 P rear connecting terminal cover	UXPD0013C	220.00
	4 P rear connecting terminal cover	UXPD0014B	270.00
Accessory lead terminal	Accessory terminal block	UXYD0001A	26.80
	Terminal and bolt	UXYD0002A	2.20
Plug-in breaker parts 3 pole	Aux. connection block (MCCB) side	UXYC0005A	54.00
	Aux. connection block (panel) side	UXYB0004A	54.00
	Mounting bolts	TXLD0016A	26.80
	Tulip block (6) 630 <sup>2)</sup>	TXLD0012A	340.00
	Tulip block (6) 800 <sup>2)</sup>	2A3308DAA	360.00
	Mounting base	XDM6-3	880.00
Plug-in breaker parts 4 pole	Aux. connection block (MCCB) side	UXYC0005A	54.00
	Aux. connection block (panel) side	UXYB0004A	54.00
	Mounting bolts	TXLD0016A	26.80
	Tulip block (8) 630 <sup>2)</sup>	TXLD0013A	425.00
	Tulip block (8) 800 <sup>2)</sup>	2A3308DBA	445.00
	Mounting bolts	XDM6-4	980.00
TemPlug	TemPlug 800 A rated <sup>3)</sup>	UPX3800	660.00
Interpole barrier	Interpole barrier	UXQH0004B	10.40
OCR sealing kit	Tamperproof cover for OCR adjustment dials	XS6300CRSK	54.00
ProSafe shot bolt interlock	Prosafe shot bolt lock HS handles xx code	TKNHPPXX	520.00
	Prosafe standard key xx code for above	TKNNHPKEYX_	130.00
	Cam for T2HS handle shafts Key codes A to Z are available. Specify by changing the key code above.	14997702	235.00

**Notes:** <sup>1)</sup> 6 pieces required for 3 P / 8 pieces required for 4 P.

<sup>2)</sup> Specify quantity required (up to 6 pieces).

<sup>3)</sup> Price Schedule T3 applies to TemPlug.

## TemBreak PLUS selectivity series

### Electronic type XS1250SE

## 85 kA

**Current rating:** 500 – 1250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)

	<b>Voltage</b>	<b>Icu kA</b>	<b>Ics kA</b>
AC use	400 V	85	65
	415 V	65	49



### Trip unit:

Electronic trip unit: Adjustable long, short and instantaneous trip.

Trip unit: Fixed.

LTD adjustment:  $I_1$ : 0.8 – 1      t: 5 – 30 s

STD adjustment:  $I_2$ : 2 – 10      t: 0.1 – 0.3 s

Instantaneous Adj:  $I_3$ : 3 – 12      NRC

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

### Dimensions (mm)

<b>Poles</b>	<b>3</b>	<b>4</b>
H <sup>1)</sup>	370	370
W	210	280
D (less toggle)	120	120
Weight (kg)	22	28

6

**Notes:** <sup>1)</sup> H excludes attached busbar.

### 3 Pole

#### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
1000	500	1000	XS1250SE 1000 FC3	7010.00
1250	625	1250	XS1250SE 1250 FC3	8770.00

### 4 Pole

#### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	4 pole Price \$
1000	500	1000	XS1250SE 1000 FC4	9220.00
1250	625	1250	XS1250SE 1250 FC4	11680.00

### Ground Fault Trip MCCBs <sup>1)</sup>

### 3 Pole

#### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
1000	500	1000	XS1250SE 10003LG	7870.00
1250	625	1250	XS1250SE 12503LG	9490.00

### 4 Pole

#### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	4 pole Price \$
1000	500	1000	XS1250SE 10004LG	8940.00
1250	625	1250	XS1250SE 12504LG	12230.00

**Notes:** <sup>1)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCB applications. (If a neutral is present) Refer accessories.

NRC: Nominal rated current.

ASR: Adjustable setting range.

## TemBreak 1000 V mining circuit breakers

### Electronic XV1250NE

**20 kA**

**Current rating:** 200-1250 A

**Approvals and tests:** Standards AS/NZS 3947-2, IEC 60947-2

**Interrupting capacity:** 20 kA at 1000/1100 V AC (IEC 60947-2)

**Trip unit:**

Trip unit:	Fixed		
LTD adjustment:	I <sub>t</sub> : 0.8-1	t:	5-30 s
STD adjustment:	I <sub>t</sub> : 2-10	t:	0.1-0.3 s
INST adjustment:	I <sub>t</sub> : 3-12		
PTA adjustment:	I <sub>t</sub> : 0.7-1	t:	fixed at 40 s (sep control power req.)
or GFT adjustment:	I <sub>t</sub> : 0.1-0.4	t:	0.1, 0.2, 0.3, 0.4 or 0.8 s



**Dimensions (mm)**

Poles	3
H <sup>1)</sup>	370
W	210
D (Less toggle)	120
Weight (kg)	22.0
4 pole	POA

6

Amp rating NRC	ASR Min.	ASR Max.	Cat. No.	Price \$
400	200	400	XV1250NE 400 3 K <sup>2)</sup>	10030.00
800	400	800	XV1250NE 800 3 K <sup>2)</sup>	10030.00
1000	500	1000	XV1250NE1000 3 K <sup>2)</sup>	10620.00
1250	630	1250	XV1250NE1250 3 K <sup>2)</sup>	13630.00

**XV1250 MINING BREAKERS MUST USE either line-side terminal covers OR interpole barriers, and a rear insulation plate (All supplied with breaker)<sup>3)</sup>**

- Notes:**
- <sup>1)</sup> H excludes attached busbar.
  - <sup>2)</sup> For FAULT INDICATION option add "FI" and nominate control voltage.
  - <sup>3)</sup> Installation information is supplied with MCCBs or refer NHP prior to purchase.
- NRC: Nominal rated current.  
 ASR: Adjustable setting range.  
 Overcurrent trip combinations: (specify combinations req.)  
 LSI - standard,  
 LS - optional,  
 LSIP - pre-trip alarm,  
 LSIG - trip indicators - optional.

## TemBreak **PLUS** selectivity series

### Electronic type **XS1600SE**

### 100 kA

**Current rating:** 800 – 1600 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)

	Voltage	Icu kA	Ics kA
AC use	400 V	100	75
	415 V	85	64



#### Trip unit:

Electronic trip unit: Adjustable long, short and instantaneous trip

Trip unit:	Fixed.	
LTD adjustment:	I <sub>t</sub> : 0.8 – 1	t: 5 – 30 s
STD adjustment:	I <sub>s</sub> : 2 – 10	t: 0.1 – 0.3 s
Instantaneous Adj:	I <sub>r</sub> : 3 – 12	NRC

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

#### Dimensions (mm)

Poles	3	4
H <sup>1)</sup>	370	370
W	210	280
D (less toggle)	140	140
Weight (kg)	27	35

#### 3 Pole

##### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
1600	800	1600	XS1600SE 1600 FC3	10050.00

#### 4 Pole

##### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	4 pole Price \$
1600	800	1600	XS1600SE 1600 FC4	13390.00

#### Ground Fault Trip MCCBs <sup>2)</sup>

#### 3 Pole

##### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
1600	800	1600	XS1600SE 16003LG	10780.00

#### 4 Pole

##### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	4 pole Price \$
1600	800	1600	XS1600SE 16004LG	14120.00

**Notes:** <sup>1)</sup> H excludes attached busbar.

<sup>2)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCB applications. (If a neutral is present) Refer accessories.

NRC: Nominal rated current.

ASR: Adjustable setting range.

## TemBreak PLUS LimitorBreaker Ics = 70 kA

### Electronic type TL630NE

### 125 kA

**Current rating:** 315 – 630 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)



	Voltage	Icu kA	Ics kA
AC use	400 V	125	70

#### Trip unit:

Electronic trip unit: Adjustable long, short and instantaneous trip

Trip unit:	Fixed.	
LTD adjustment:	I <sub>1</sub> : 0.8 – 1	t: 5 – 30 s
STD adjustment:	I <sub>2</sub> : 2 – 10	t: 0.1 – 0.3 s
Instantaneous Adj:	I <sub>3</sub> : 3 – 12	NRC

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

#### Dimensions (mm)

<b>Poles</b>	<b>3</b>
H <sup>1)</sup>	370
W	210
D (less toggle)	140
Weight (kg)	25.8
4 pole	

6

#### 3 Pole

#### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
630	315	630	<b>TL630NE 630 3</b>	<b>4280.00</b>

#### Ground Fault Trip MCCBs<sup>2)</sup>

#### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
630	315	630	<b>TL630NE3LSIG</b>	<b>5010.00</b>

**Notes:** <sup>1)</sup> H excludes attached busbar.

<sup>2)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCB applications. (If a neutral is present) Refer accessories.

NRC: Nominal rated current.

ASR: Adjustable setting range.

Accessories, refer to page 6 - 35.

## TemBreak PLUS LimitorBreaker Ics = 70 kA

### Electronic type TL800NE



### 125 kA

**Current rating:** 400 – 800 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)

	Voltage	Icu kA	Ics kA
AC use	400/415	125	70

#### Trip unit:

Electronic trip unit: Adjustable long, short and instantaneous trip

Trip unit:	Fixed.		
LTD adjustment:	I <sub>1</sub> : 0.8 – 1	t:	5 – 30 s
STD adjustment:	I <sub>2</sub> : 2 – 10	t:	0.1 – 0.3 s
Instantaneous Adj:	I <sub>3</sub> : 3 – 12		NRC

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

#### Dimensions (mm)

<b>Poles</b>	<b>3</b>
H <sup>1)</sup>	370
W	210
D (less toggle)	140
Weight (kg)	25.8
4 pole	

#### 3 Pole

##### Amp rating

NRC	ASR Min.	ASR Max. <sup>2)</sup>	Cat. No.	3 pole Price \$
800	400	800	TL800NE 800 3	8850.00

#### Ground Fault Trip MCCBs <sup>2)</sup>

#### 3 Pole

##### Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
800	400	800	TL800NE3LSIG	9580.00

**Notes:** <sup>1)</sup> H excludes attached busbar.

<sup>2)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCB applications. (If a neutral is present) Refer accessories.

NRC: Nominal rated current.

ASR: Adjustable setting range.

Accessories, refer to page 6 - 35.

## TemBreak PLUS LimitorBreaker Ics = 65 kA

Electronic type  
TL1250NE

### 125 kA

**Current rating:** 500 – 1250 A

**Approvals and Tests:** Standards AS/NZS 3947-2 and IEC 60947-2

**Interrupting capacity:** Symmetrical amps (kA RMS)



	Voltage	Icu kA	Ics kA
AC use	400/415	125	65

#### Trip unit:

Electronic trip unit: Adjustable long, short and instantaneous trip

Trip unit: Fixed.

LTD adjustment: I<sub>1</sub>: 0.8 – 1 t: 5 – 30 s

STD adjustment: I<sub>2</sub>: 2 – 10 t: 0.1 – 0.3 s

Instantaneous Adj: I<sub>3</sub>: 3 – 12 NRC

**OCR options:** Pre-trip alarm, fault indication and contacts, ground fault trip

#### Dimensions (mm)

Poles	3
H <sup>1)</sup>	370
W	210
D (less toggle)	140
Weight (kg)	26
4 pole	

6

#### 3 Pole

Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
1000	500	1000	TL1250NE 1000 3 FC	11690.00
1250	625	1250	TL1250NE 1250 3 FC	13080.00

#### Ground Fault Trip MCCBs<sup>2)</sup>

#### 3 Pole

Amp rating

NRC	ASR Min.	ASR Max.	Cat. No.	3 pole Price \$
1000	500	1000	TL1250NE 1000 3 LG	12420.00
1250	625	1250	TL1250NE 1250 3 LG	13810.00

**Notes:** <sup>1)</sup> H excludes attached busbar.

<sup>2)</sup> GF MCCBs require a 4th Neutral CT to be ordered for 3 and 4 pole MCCB applications. (If a neutral is present) Refer accessories.

NRC: Nominal rated current.

ASR: Adjustable setting range.

Accessories, refer to page 6 - 35.



## Accessories to suit 1250 – 1600 AF

<b>Internal accessories - factory fit</b>		<b>Cat. No.</b>	<b>Price \$</b>
Fault indication & contacts	An option for all 1250-1600 A types <b>Add then voltage</b>	<b>FI</b>	<b>900.00</b>
Fault indication	LED's mounted at top of OCR	<b>FILED</b>	<b>2050.00</b>
Pre-Trip alarm	An option for all 1250-1600 A types <b>Add</b>	<b>LSIP</b>	<b>700.00</b>
Ground fault trip (GFT)	An option for all 1250-1600 A types <b>Add</b>	<b>LSIG</b>	<b>730.00</b>
Optional ext. 4th CT's	1000 A 4th CT	<b>UXOY0003A</b>	<b>445.00</b>
	1250 A 4th CT	<b>UXOY0004A</b>	<b>445.00</b>
	1600 A 4th CT	<b>UXOY0005A</b>	<b>445.00</b>

<b>External accessories - factory fit</b>		<b>Cat. No.</b>	<b>Price \$</b>
Rear connect tags	3 P rear connect studs (6 in kit) 1250 A	<b>2H1959DAB</b>	<b>1750.00</b>
	4 P rear connect studs (8 in kit) 1250 A	<b>2H1959DBB</b>	<b>2330.00</b>
	3 P rear connect studs (6 in kit) 1600 A	<b>2H1960DAA</b>	<b>2310.00</b>
	4 P rear connect studs (8 in kit) 1600 A	<b>2H1960DBA</b>	<b>3080.00</b>
Motor operators (XMD9)	110 V AC motor - user fit	<b>2H1191CAB</b>	<b>3670.00</b>
	110 V DC motor - user fit	<b>2H1193CAB</b>	<b>3670.00</b>
	24 V DC motor - user fit	<b>2H1194CAB</b>	<b>3670.00</b>
	240 V AC motor - user fit	<b>2H1195CAB</b>	<b>3670.00</b>
Mechanical interlocks	3 P mech l/lock / 1250 A rear connect	<b>UXKC0006D</b>	<b>880.00</b>
	4 P mech l/lock / 1250 A rear connect	<b>UXKC0007D</b>	<b>1170.00</b>
	3 P mech l/lock / 1600 A rear connect	<b>UXKC0026C</b>	<b>880.00</b>
	4 P mech l/lock / 1600 A rear connect	<b>UXKC0027C</b>	<b>1170.00</b>
	Interlock cable (wire)	<b>UXKC0020A</b>	<b>83.00</b>
	Interlock mechanism 1250 A Cable type <sup>1)</sup>	<b>UXKC0023B</b>	<b>460.00</b>
	Interlock mechanism 1600 A Cable type <sup>1)</sup>	<b>UXKC0024B</b>	<b>460.00</b>

**Notes:** <sup>1)</sup> Order one interlock mechanism for each breaker.

## Accessories to suit 1250 – 1600 AF

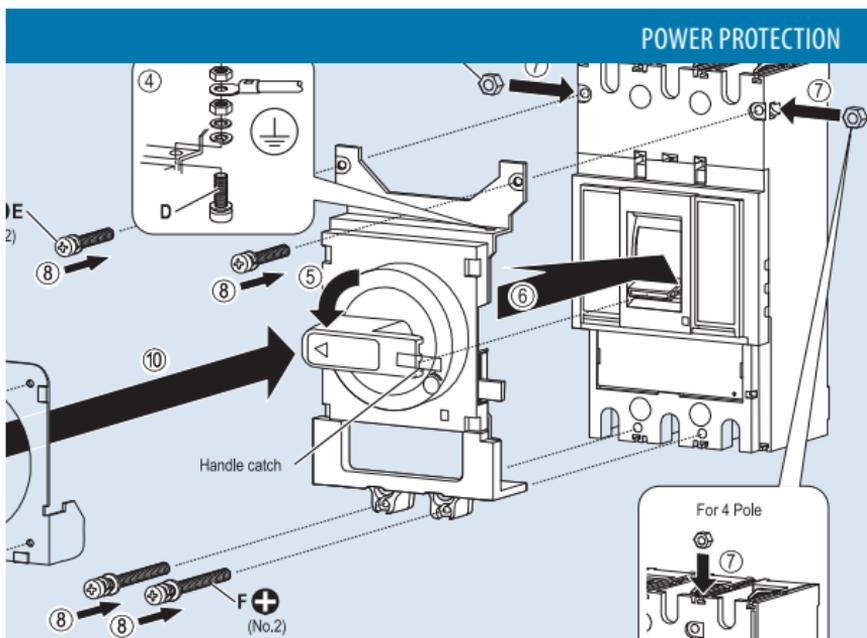
External accessories - user fit		Cat. No.	Price \$
Handle operators	IP 55 Grey ext. handle + 320 mm shaft <sup>1)</sup>	<b>T1HSX6R5GM</b>	<b>570.00</b>
	T1HS escutcheon plate option: 100 mm <sup>2</sup>	<b>T2HSESC100</b>	<b>18.20</b>
	390 mm T pin shaft for T2HS - no flexi coupling	<b>T2HS400SHAFT</b>	<b>47.00</b>
	IP 65 Grey variable depth handle + shaft	<b>T1HPX6R6BNA4</b>	<b>570.00</b>
	Padlock attachment for T1HP/HS mechanism	<b>T1HPX6PALK</b>	<b>49.50</b>
	IP 55 direct mount fixed depth handle	<b>TFJ38XU</b>	<b>610.00</b>
	Prosafe shot bolt lock HS handles xx code	<b>TKNHP_</b>	<b>520.00</b>
	Prosafe standard key xx code for above	<b>TKNHPKEY_</b>	<b>130.00</b>
	Cam for T2HS handle shafts Key codes A to Z are available. Specify by changing the key code above.	<b>14997702</b>	<b>235.00</b>
Handle extension	Handle extension	<b>2A2272BAB</b>	<b>123.00</b>
Toggle & handle locks	Toggle lock – non captive (Padlockable)	<b>UXKB0003A</b>	<b>80.00</b>
	3 P FC terminal cover / 1250 <sup>5)</sup>	<b>2H1419DAB</b>	<b>235.00</b>
Terminal covers	4 P FC terminal cover / 1250 <sup>5)</sup>	<b>2H1420DAB</b>	<b>290.00</b>
	IP 20 protective cover <sup>2)</sup>	<b>2A1787DBA</b>	<b>6.20</b>
Accessory lead terminal	Accessory terminal block	<b>UXYD0001A</b>	<b>26.80</b>
	Terminal and bolt <sup>3)</sup>	<b>UXYD0002A</b>	<b>2.20</b>
Interpole barrier	Interpole barrier <sup>4)</sup>	<b>UXQH0004B</b>	<b>10.40</b>
OCR sealing kit	Tamperproof cover for OCR adjustment dials	<b>XS1250OCRSK</b>	<b>40.00</b>

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- Notes:** <sup>1)</sup> Yellow and red handles available.  
<sup>2)</sup> 6 pieces required for 3 P / 8 pieces required for 4 P.  
<sup>3)</sup> Specify quantity required (up to 6 pieces).  
<sup>4)</sup> Individual barrier (not a set).  
<sup>5)</sup> Use interpole barriers for 1600 A MCCBs.

# APPLICATION, INSTALLATION AND INSTRUCTION GUIDES

**NHP**



## For Terasaki TemBreak 2 MCCBs and accessories

### Installation sheets

Accessories listed below can be found in NHP Price List Catalogue Part C.

### Internal accessories

- Auxiliary switches
- Alarm switches
- Shunt trips
- Undervoltage trips

### External accessories

- Operating handles
- Motor operators
- Mechanical interlocks
- Interpole barriers
- Terminal covers
- Flush plates
- TemPlug
- Plug-in MCCB bases
- Toggle locks and locking devices
- Rear connection terminal studs
- Tunnel clamp terminals
- Attached flat bar



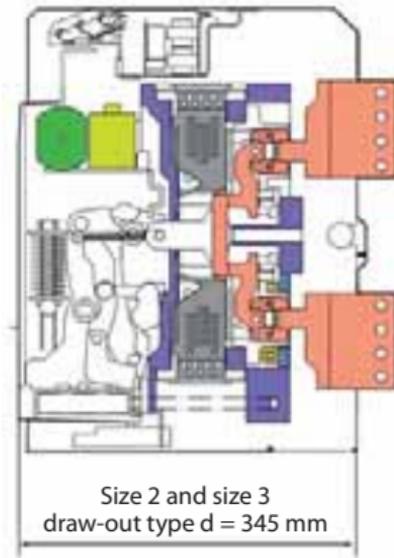
## TemPower 2 Air Circuit Breakers and Arc Detection Relays

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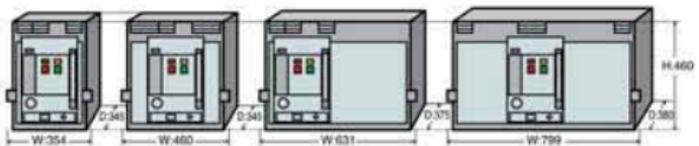
## TemPower Introduction

Meeting the requirements of contemporary switchboard manufacturers, consultants and end users, the TemPower 2 ACB boasts an attractive range of features including fast fault clearing times, advanced digital Overcurrent Relay (OCR) options and a small, compact design that maintains high Ampere Interrupting Capacities (AIC).



### Maximum power from minimum volume

3 Pole model



<b>Standard series</b>	800 - 2000 A	2500 - 3200 A	4000 A	5000 - 6300 A
<b>High fault series</b>	1600 - 2000 A	1600 - 3200 A		
	Size AR2	Size AR3	Size AR4	Size AR6

**Notes:** Measurements on 3 pole model show in mm.

## *TemPower* Standards and certifications

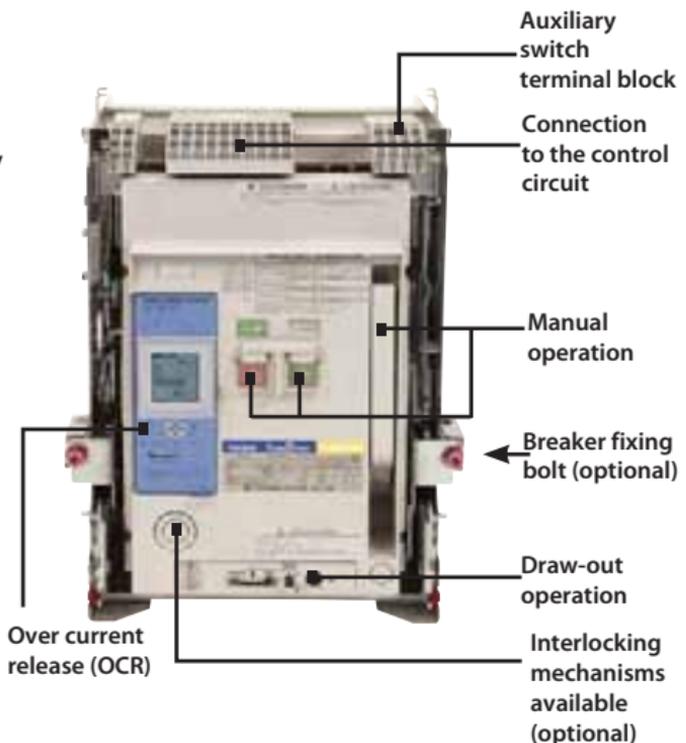
### Based Standards

<b>AS 3947-2</b>	Australian Standard
<b>IEC 60947-2</b>	International Electrotechnical Commission
<b>EN60947-2</b>	European Standard
<b>JIS C8372</b>	Japanese Industrial Standard
<b>NEMA PUB NO.SG3</b>	National Electrical Manufacturers Association
<b>ANSI C37.13</b>	American National Standard Institute

### Certification and Authorisation

<b>ASTA, UK</b>	ASTA Certification Services
<b>NK, Japan</b>	Nippon Kaiji Kyokai
<b>LR, UK</b>	Lloyd's Register of Shipping
<b>ABS, USA</b>	American Bureau of Shipping
<b>GL, Germany</b>	Germanischer Lloyd
<b>BV, France</b>	Bureau Veritas

For easy wiring access, control voltage, auxiliary and position switch terminals are all mounted at the front on the ACB body. Due to a general increase in the level of harmonics in modern power distribution systems, the neutral phase is fully rated as standard on 4P models.



## TemPower Stocked ACBs

Stocked ACBs are kept on the shelf in a standard pre-built configuration providing fast customer delivery. ACB bodies (withdrawable part) and carriages (fixed part) are ordered separately according to the required carriage terminal configuration.

### Stocked ACB specification

- Approvals and test: IEC 60947, A.S.T.A. certified
- AR-S type ACB body, 3 pole
- TemPro PLUS overcurrent release (type AGR21BL-PG) (240 V AC control voltage)
- Adjustable 'LSI'+GF protection standard (GF comes set enabled as default <sup>2)</sup>)
- Single trip indicator contact for 'LSI+GF' standard
- MODBUS communications facility (data monitoring as standard)
- Ground fault ready (external 4th CT required, see below <sup>1)</sup>)
- 240 V AC continuous rated shunt trip
- 7 C/O auxiliary switch
- IP 41 door flange
- ON/OFF push button covers are padlockable as standard
- Position padlock facility (locks ACB inside carriage in 'connected' or 'test' position)

Description	Current rating (A)	400/415 V interrupting capacity (kA)	ACB body Cat. No.	Price \$
AR-S ACB body	1250	65	ARB2123STD	11180.00
	1600	65	ARB2163STD	11290.00
	2000	65	ARB2203STD	13380.00
	2500	85	ARB3253STD	14090.00
	3200	85	ARB3323STD	15920.00
	4000	100	ARB4403STD	22650.00



**Notes:** The above specification is fixed. If different accessories are required (e.g. UVT, OCR, different shunt voltage) please contact NHP sales to place a fully manufactured order.

'LSI+GF': long time delayed trip, short time delayed trip, instantaneous trip, ground fault trip

- <sup>1)</sup> This function provides ground fault protection to TN-C or TN-S power distribution systems on the load side.
- <sup>2)</sup> The ground fault protection setting is set to enabled as default. If GF is not required GF must be set to OFF by the user before ACB energisation.

## TemPower Stocked ACBs

### Stocked ACB carriage specification <sup>1)</sup>

- 3 pole carriage to suit standard ACB body

Description	Suits ACB Body Cat. No.	Terminal arrangement		ACB carriage Cat. No.	Price \$
		Top	Bottom		
AR-S ACB Carriage		Horizontal	Horizontal	ARC2123HHSTD	4480.00
		Vertical	Vertical	ARC2123VVSTD	4480.00
ARB2123STD		Horizontal	Vertical	ARC2123HVSTD	4480.00
		Vertical	Horizontal	ARC2123VHSTD	4480.00
ARB2163STD		Horizontal	Horizontal	ARC2203HHSTD	4950.00
		Vertical	Vertical	ARC2203VVSTD	4950.00
ARB2203STD		Horizontal	Vertical	ARC2203HVSTD	4950.00
		Vertical	Horizontal	ARC2203VHSTD	4950.00
ARB3253STD		Horizontal	Horizontal	ARC3323HHSTD	7470.00
		Vertical	Vertical	ARC3323VVSTD	7470.00
ARB3323STD		Horizontal	Vertical	ARC3323HVSTD	7470.00
		Vertical	Horizontal	ARC3323VHSTD	7470.00
ARB4403STD		Vertical	Vertical	ARC4403VVSTD	11120.00



**Notes:** <sup>1)</sup> The stock carriages are suitable for use with the NHP 'stock body' shown on the previous page. If you require a different ACB specification to that listed on the previous page please contact NHP sales to place a fully manufactured order.

## TemPower Standard accessories

### Ground fault 4th CT

The external ground fault 4th CT is required to be fitted to the switchboard neutral bar when the ground fault protection function used.



Description	Rated Pri. current	Suits ACB type	4th CT Cat. No.	Price \$
Ground fault 4th CT	1250 A	ARB2123STD	XCW0840LS13	330.00
	1600 A	ARB2163STD	XCW0840LS16	330.00
	2000 A	ARB2203STD	XEC1640LS20	330.00
	2500 A	ARB3253STD	XEC1640LS25	650.00
	3200 A	ARB3323STD	XEC1640LS32	650.00
	4000 A	ARB4403STD	XEC1640LS40	1240.00

### Stocked ACB instruction manual

- Customer to specify required quantity at time of order (not supplied as standard)

Description	Cat. No.	Price \$
TemPro Plus (AGR21B) Installation manual	ARAGR21BMANUAL	10.40
TemPro Premier (AGR31B) Installation manual	ARAGR31BMANUAL	10.40

## TemPower Standard accessories

These items are factory fit / NHP service:

Item	Description	Price \$
Motor operator	A motor is used to remotely charge / close the ACB (specify voltage)	POA
Shunt trip (continuously rated)	Allows remote opening of the ACB (specify voltage)	POA
Under voltage trip (UVT)	Trips the ACB during an undervoltage (specify voltage) (single phase)	POA
Trapped key I/lock	Rockwell or Fortress type Prosafe	POA
Mech. Interlock – 2 way	Cable interlock. /per ACB	POA
Mech. Interlock – 3 way	Cable interlock. /per ACB	POA
Door interlock	Prevents enclosure door being opened unless ACB is isolated	POA
Fixing bolts for ACB	Holds the breaker firmly inside the carriage.	POA
Off position padlock facility	Allows the ACB to be padlocked in the OFF position	POA
Cycle counter	A 5 digit counter of the ACBs ON-OFF cycles	POA
Auxiliary contacts	10C changeover contacts.	POA
Position switch	A contact set that switches to indicate the ACB status in a carriage	POA
Storage draw-out handle	Draw-out handle that is stored inside the ACB body	POA

**Notes:** TEMPro PREMIER pricing is POA. Please contact NHP estimating with required specification.

## TemPower Standard accessories

These items can be fitted by the customer:

Item	Description	Cat. No.	Price \$
Interpole barrier	Suits 3P 800 A - 2000 A AR ACB	1H1894BAA	250.00
Interpole barrier	Suits 3P 2500 A, 3200 A AR ACB	1H1895BAA	250.00
Interpole barrier	Suits 3P 4000 A AR ACB	1H1896BAA	250.00
Standard door flange	IP41 front surround for ACB	1H2243BAA	156.00
IP 55 door cover	A clear plastic hinged door cover	1H2300CAB	1220.00
Padlock main safety shutters	Suits 3/4P 800 A-3200 A AR ACB	1H1627CAA	340.00
Padlock main safety shutters	Suits 3/4P 4000 A AR ACB	1H2022CAA	114.00
Lifting lugs	Attachable lifting brackets for ACB bodies only	1A3430BAB	41.50
Lifting truck	Available for lifting an ACB	ARACBTRUCK	17610.00
OCR checker	Hand held secondary injection test unit	ANU1AC200	5510.00
Test jumper	5 m lead for maintenance purpose	1H1615BAA	990.00



OCR checker



IP 41 door flange



IP 55 door cover



Lifting lugs



Interpole barriers



Test jumper

**Notes:** TEMPPro PREMIER pricing is POA. Please contact NHP estimating with required specification.

## **TemPower** **ACB ordering information**

**ACBs can be manufactured to suit specific customer requirements.**

**About TEMPOWER 2 AR ACB Ordering:** TemPower 2 AR ACBs are locally assembled by NHP along with many variations and options available to suit specific end user applications. The listing below represents typical specifications to be considered at the time of ordering:

- 1. ACB type and current rating** (AR, 1250 A)
- 2. Number of poles** (3 P or 4 P)
- 3. Main circuit and control circuit voltage and frequency** (415 or 690 V AC)
- 4. Operating temperatures** (40 degree C ambient)
- 5. Type of mounting.** (Draw out type ACB is available, fixed type is not available)
- 6. Terminal arrangements.** For example rear connect vertical or horizontal main terminals. Front connect terminals are also an option.
- 7. Type of charging.** Manual lever (standard) or motor operated. If a motor is chosen then the operating voltage has to be specified.
- 8. The OCR** (overcurrent relay or 'release').  
The OCR type needs to be chosen depending on the requirements of the installation. NHP / Terasaki have as standard "LSI" OCRs fitted with LCDs, MODBUS communications facilities in all ACBs. The control voltage must be specified at the time of order.
- 9. Electrical tripping devices:** Other options such as Shunt trips, Under voltage releases, or capacitor trips need to be considered.
- 10. Other accessories, some of which are:**
  - ON-OFF cycle counter
  - Auxiliary switch type (7 C is standard)
  - Key lock devices – standard or Trap key interlock etc.
  - Mechanical interlocks
  - IP 55 Cover
  - OFF padlock
  - Door flange
- 11. Contact your NHP sales office for any other special requirements such as service or repair, retrofitting, spare parts, test reports etc.**
- 12. Prices:** Contact your NHP sales office for a pricing of non standard equipment.



An AR ordering sheet is available covering the above ordering process.  
Refer NHP.

## TemPower Specifications

Rated from 200 A to 6300 A NHP can provide a withdrawable Terasaki Air Circuit Breaker (ACB) designed to meet the stringent demands of the industrial and marine market.

The **AR** series is available in four frame sizes:

- frame size 1 which ranges from 200 to 2000 A (AR2)
- frame size 2 which ranges from 2500 to 3200 A (AR3)
- frame size 3 which is rated at 4000 A (AR4)
- frame size 4 which is rated at 5000 to 6300 A (AR6)





## Main power circuit terminals specifications

Main circuit configuration is available in either horizontal or vertical form, a combination of both, or front connected. Refer to the table below, which indicates which terminal types are available for different ACB types. Specification of the desired terminal configuration should be made at the time of ordering the ACB or carriage. A cross 'x' below, indicates a configuration that is unavailable.

### AR-S standard series

Ampere rating (A)	ACB type	ACB mounting method	Horizontal terminals	Vertical terminals	Front connect terminals
800 A	AR208S	Draw-out	✓	✓	✓
1250 A	AR212S	Draw-out	✓	✓	✓
1600 A	AR216S	Draw-out	✓	✓	✓
2000 A	AR220S	Draw-out	✓	✓	✓
2500 A	AR325S	Draw-out	✓	✓	✓
3200 A	AR332S	Draw-out	✓	✓	✓
4000 A	AR440S	Draw-out	X	✓	X

### AR-H high kA series

Ampere rating (A)	ACB type	ACB mounting method	Horizontal terminals	Vertical terminals	Front connect terminals
1600 A	AR216H	Draw-out	✓	✓	X
2000 A	AR220H	Draw-out	✓	✓	X
1600 A	AR316H	Draw-out	✓	✓	X
2000 A	AR320H	Draw-out	✓	✓	X
2500 A	AR325H	Draw-out	✓	✓	X
3200 A	AR332H	Draw-out	✓	✓	X

### AR650 / AR663

Ampere rating (A)	ACB type	ACB mounting method	Horizontal terminals	Vertical terminals	Front connect terminals
5000 A	AR650	Draw-out	X	✓	X
6300 A	AR663	Draw-out	X	✓	X

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## Performance specification of the AR ACB

AR-S TemPower 2 -STANDARD		AR208S	AR212S	AR216S
Rated current (In) <sup>1) 2)</sup>	(A)	800	1250	1600
Number of poles <sup>3) 4)</sup>		3 & 4	3 & 4	3 & 4
Current transformer ratings (Ict)	(A)	200	200	200
		400	400	400
		800	800	800
			1250	1250
	1600			
Insulation voltage (Ui) (V 50/60 Hz)	(V AC)	1000	1000	1000
Operational voltage (Ue) (V 50/60 Hz)	(V AC)	690	690	690
Impulse voltage (Uimp)	(kV)	12	12	12
Breaking capacity kA IEC, AS <sup>5) 7)</sup> (Ics = Icu) [kA sym rms]	690 V	50	50	50
	440 V	65 <sup>6)</sup>	65 <sup>6)</sup>	65 <sup>6)</sup>
Making capacity (kA peak) IEC, AS	690 V	105	105	105
	440 V	143	143	143
Rated short time withstand (Icw)	1 Sec	65	65	65
	3 Sec	50	50	50
Total breaking time	Sec	0.03	0.03	0.03
Motor charging time (max)	Sec	10	10	10
Closing time (max)	Sec	0.08	0.08	0.08
Latching current	(kA)	65	65	65

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- Notes:**
- 1) Values in open air at 40° C (45° C for marine applications).
  - 2) Values of AR208S, AR212S, AR216S for draw-out type with horizontal terminals, values of the other ACBs for draw-out type with vertical terminals.
  - 3) For 2 pole ACBs use outside poles of 3 pole ACB.
  - 4) 4 Pole ACBs without Neutral phases protection can not apply IT earthing system.
  - 5) Contact NHP for the details.
  - 6) For 500 V AC.
  - 7) Please contact NHP for DC applications.
- When the INST trip function is set to NON, the MCR function should be enabled, otherwise, the rated breaking capacity is reduced to the rated latching current.



AR220S	AR325S	AR332S	AR440S	AR650S	AR663S
2000	2500	3200	4000	5000	6300
3 & 4	3 & 4	3 & 4	3 & 4	3 & 4	3 & 4
200	200	200	4000	5000	6300
400	400	400			
800	800	800			
1250	1250	1250			
1600	1600	1600			
2000	2000	2000			
	2500	3200			
1000	1000	1000	1000	1000	1000
690	690	690	690	690	690
12	12	12	12	12	12
50	65	65	75	85	85
65 <sup>6)</sup>	85 <sup>6)</sup>	85 <sup>6)</sup>	100	120	120
105	143	143	165	187	187
143	187	187	220	264	264
65	85	85	100	120	120
50	65	65	85	85	85
0.03	0.03	0.03	0.03	0.05	0.05
10	10	10	10	10	10
0.08	0.08	0.08	0.08	0.08	0.08
65	85	85	100	120	120





## Performance specification of the AR-H ACB

A 'High Fault' series of AR ACB is available (the AR-H) on INDENT. For applications that require a larger breaking capacity than the standard series.

<b>AR-H TemPower 2-HIGH FAULT</b>		<b>AR216H</b>	<b>AR220H</b>
Rated current (In)	(A)	1600	2000
Number of poles		3 & 4	3 & 4
Current transformer ratings (Ict)	(A)	200	200
		400	400
		800	800
		1250	1250
		1600	1600
2000			
AC Insulation voltage (Ui)	(V AC)	1000	1000
Operational voltage	(V AC)	690	690
Impulse voltage (Uimp)	(kV)	12	12
Breaking capacity <sup>1) 2)</sup> kA IEC, AS (Ics = Icu) [kA sym rms]	690 V	55	55
	440 V	80	80
Making capacity (kA peak) IEC, AS	690 V	121	121
	440 V	176	176
Rated short time withstand (Icw)	1 Sec	80	80
	3 Sec	55	55
Total breaking time	Sec	0.03	0.03
Motor charging time	Sec	10	10
Closing time (max)	Sec	0.08	0.08
Latching current	(kA)	65	65

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**Notes:** <sup>1)</sup> Contact NHP for the details.  
<sup>2)</sup> Please contact NHP for DC applications.



AR316H	AR320H	AR325H	AR332H
1600	2000	2500	3200
3 & 4	3 & 4	3 & 4	3 & 4
200	200	200	200
400	400	400	400
800	800	800	800
1250	1250	1250	1250
1600	1600	1600	1600
	2000	2000	2000
		2500	2500
			3200
1000	1000	1000	1000
690	690	690	690
12	12	12	12
85	85	85	85
100	100	100	100
187	187	187	187
220	220	220	220
100	100	100	100
75	75	75	75
0.03	0.03	0.03	0.03
10	10	10	10
0.08	0.08	0.08	0.08
85	85	85	85



## *TemPower* Overcurrent Release (OCR) specification

Boasting an impressive range of standard features and specialised options, the Terasaki overcurrent release range is suitable for commercial, industrial and marine applications. The Terasaki OCR is divided into two performance ranges; the **TEMPro PLUS** and **TEMPro PREMIER**.

### TEMPro PLUS (Type AGR-21B)

Featuring a backlit liquid crystal display (LCD) for easy visual identification and a soft rubber key activated scrolling menu system the **TEMPro PLUS** can display <sup>1)</sup>:

- Phase currents  $I_1, I_2, I_3$  (accuracy + 2.5 %)
- Fault current value
- Tripping delay time
- The maximum phase current
- Cause of fault (LTD, STD, INST, GF <sup>2)</sup>)

Providing adjustable LSI and GF <sup>3)</sup> protection featuring **MODBUS communications** plus a built-in current meter as standard, the **TEMPro PLUS** is perfect for basic and mid range applications.



- Notes:**
- <sup>1)</sup> Trip variables can be viewed after an event via the LCD providing control power is constantly available.
  - <sup>2)</sup> LTD-Long time delay trip, STD-Short time delay trip, INST-Instantaneous trip, GF-Unrestricted ground fault (not available for 'S' curve model OCR).
  - <sup>3)</sup> This function provides ground fault protection to TN-C or TN-S power distribution systems on the load side.



## Overcurrent Release (OCR) specification

### TEMPro PREMIER (Type AGR-31B)

The **TEMPro PREMIER** is an advanced OCR that offers the same LCD appearance and protective functions as the **TEMPro PLUS**. In addition to the current meter measurements listed above the **TEMPro PREMIER** has an inbuilt energy analyser which indicates:

- Phase currents  $I_1, I_2, I_3$  (accuracy + 1.5 %)
- Line voltages (V)  $V_{12}, V_{23}, V_{31}$ <sup>1)</sup>
- Phase voltage (V)  $V_{1N}, V_{2N}, V_{3N}$  (accuracy + 1.0 %)
- Active power (kW) (accuracy + 2.5 %)
- Demanded active power (kW)
- Electric energy (kWh) (accuracy + 3.0 %)
- Power factor ( $\cos \phi$ ) (accuracy + 2.5 %)
- Frequency (Hz) (accuracy + 0.5 Hz)
- Fault current value
- Tripping delay time
- The maximum phase current
- Cause of fault (LTD, STD, INST, GF<sup>2)</sup>)

Furthermore the **TEMPro PREMIER** is available with a range of optional features that make it ideal for use in specialised applications.

### Field test facility

Type AGR-21B/31B OCRs are equipped with a field test function to verify the long time delay, short time delay, instantaneous and ground fault trip features without the need for tripping of the ACB.



- Notes:** <sup>1)</sup> Line voltage and phase voltage cannot be displayed at the same time.  
<sup>2)</sup> LTD-Long time delay trip, STD-Short time delay trip, INST-Instantaneous trip, GF-Unrestricted ground fault (not available for 'S' curve model OCR).



## TEMPro PLUS and PREMIER appearance

OCR control voltage: Confirm the terminal connections to match the indicated control voltage. Refer to page 9 - 51 for terminal designations.

OCR protection curve: Can be 'L'-general feeder protection, 'R'-IEC 60255 conforming or 'S' - generator protection types. Curve type must be specified at the time of order.

OCR type: TemPro PLUS (AGR21B) or TemPro Premier (AGR31B)

Unrestricted Ground fault: If coloured in black it means this function is available. It does not indicate if the function is on or off, confirm this by checking the OCR GF setting (SET 2).

Special functions:  
Must be requested at time of order.  
REF: Restricted earth fault  
NP: Neutral phase protection  
OH: Contact temperature alarm  
Zone: Zone interlocking  
RP: Reverse power

Inbuilt current meter for TEMPro PLUS or inbuilt energy analyser for TEMPro PREMIER

Setting adjustment confirmation button



Alarm contact indication: Standard trip contact indicator is LSI+GF. This is a single contact indicator. Other contact indicators such as individual GF, pre-trip alarm, system alarm and motor spring charge is available on special request.

Modbus & signaling options:  
Data Monitor:  
Interrogate variables  
Remote open: The ACB can trip / open via a Modbus command.

Backlit LCD for easy viewing. The LCD flashes on and off when alarm / trip event occurs

Soft rubber keys for menu navigation

Easy identification of the CT rated current and the set rated current

Test port for secondary injection test. Requires ANU-1 OCR checker

**Notes:** Indicative picture only

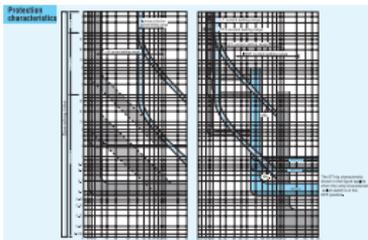


## TEMPro application protection curves

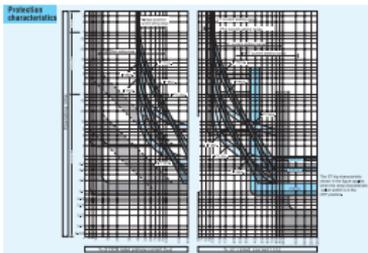
The TEMPro PLUS and TEMPro PREMIER OCR range is available in three model variations:

- **Standard protection curve, or 'L' type** – designed for general feeder applications and will achieve most selectivity and protection requirements.
- **High selectivity curve or 'R' type** - offers 3 curve characteristics to IEC60255 and is used when selectivity can not be achieved with other system protective devices (i.e. fuses or other relays).
- **Generator protection curve or 'S' type** – Specifically designed for generator and marine applications.

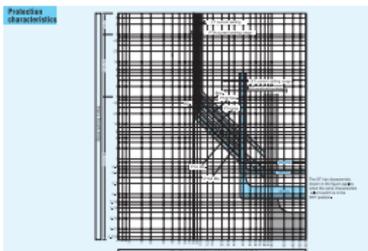
It is recommended that all general feeder circuits be protected by the 'L' type unless the results of a selectivity study indicate that an 'R' type is required to discriminate with another system protective device. **The application curve type must be specified at the time of order.**



L type is designed for General Feeder installations.



R type is used for high selectivity applications and offers 3 curve characteristics to IEC 60255.



S type is best utilised for generator and marine power protection.

## TemPower

### TEMPro PLUS and TEMPro PREMIER

#### Standard protection features

TEMPro PLUS and TEMPro PREMIER have adjustable LSI - long time delay, short time delay, INSTANTANEOUS and GF as standard. This provides an adjustable time delay on overload and also the I<sup>2</sup>t ramp characteristic which is essential to provide selectivity when grading with other protective devices such as downstream fuses and upstream relays. The standard 'LSI' curve provides more than **five million combinations** of unique time current characteristics.

Standard feature	Description	Application curve		
		L	R	S
LTD trip	Adjustable overload protection area trip	✓	✓	✓
STD trip	Adjustable short circuit protection area trip (with intentional delay)	✓	✓	✓
INST trip	Adjustable short circuit protection area trip (with NO intentional delay)	✓	✓	✓
GF trip <sup>1)</sup>	Adjustable unrestricted earth fault protection (GF) (requires external 4th CT for 3 pole model)	✓	✓	X
Single Alarm contact indicator	As standard the single contact alarm indicator is available that indicates when the LTD trip, STD trip, INST/MCR trip or the GF trip function is activated.	✓	✓	✓
MODBUS I/F	MODBUS communication interface allows monitoring of available data variables. ACB control is non standard, refer to communications page.	✓	✓	✓
Backlit LCD with current meter TEMPro PLUS	Displays phase currents I <sub>1</sub> , I <sub>2</sub> , I <sub>3</sub> and I <sub>GF</sub> , fault current values, tripping time delay, the maximum phase current and the cause of fault (LTD, STD, INST, GF) TEMPro PLUS ONLY	✓	✓	✓
Backlit LCD with energy analyser TEMPro	Displays phase currents I <sub>1</sub> , I <sub>2</sub> , I <sub>3</sub> and I <sub>GF</sub> , Line voltages (V) V <sub>12</sub> , V <sub>23</sub> , V <sub>31</sub> , Phase voltage (V) V <sub>1N</sub> , V <sub>2N</sub> , V <sub>3N</sub> , Active power (kW), Demanded active power (kW), Electric energy (kWh), Power factor (cos Ø), Frequency (Hz) TEMPro PREMIER ONLY	✓	✓	✓

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**Notes:** <sup>1)</sup> This function provides ground fault protection to TN-C or TN-S power distribution systems on the load side.

✓ = standard X = not available

## TemPower

### TEMPro PLUS and TEMPro PREMIER

#### Specialised optional features

TEMPro OCRs can be 'optioned up' with specialised application functions to suit customer requirements.

Please indicate what special application functions are required at the time of order as all are factory installed.

Standard feature	Description	Application curve		
		L	R	S
System Alarm	Activates if an internal fault exists within the OCR. System alarm can be monitored remotely via the MODBUS communications interface.	✓	✓	✓
Pre trip alarm	Activates if the monitored load current reaches the user set indication threshold. Useful for load shedding applications. This alarm is available via the MODBUS interface only.	✓	✓	✓
N-Phase protection 4 pole ACB ONLY	In 3-phase, 4-wire systems that contain harmonic distortion, the 3rd harmonic may cause large currents to flow through the neutral conductor. The N-phase protection function (NP) is available on 4 pole ACBs and prevents the neutral conductor from sustaining damage or burnout due to these large currents. The NP trip pickup current can be set between 40% and 100% of the OCR rated primary current for L and R-characteristics. This protection function is not available for special 'generator protection' 'S' type OCRs, and is available on an INDENT basis.	✓	✓	✓
Zone interlocking (TemPro Premier ONLY)	The zone-selective interlock (ZSI) capability permits tripping of the ACB upstream of and nearest to a fault point in the shortest operating time, irrespective of the short time delay trip time setting, and minimizes thermal and mechanical damage to the power distribution line. ZSI cannot be fitted with a UVT.	✓	✓	✓
Phase rotation protection	This function detects the negative-phase current occurring due to reverse phase or phase loss and prevents burnout of a motor or damage to equipment.	✓	✓	✓
Contact over heat protection (TemPro Premier only)	This function monitors the temperature of the ACBs main contacts. An alarm indicates when the temperature exceeds 155 °C. Continuous monitoring of the contact temperature provides valuable input for preventative and predictive maintenance programs.	✓	✓	✓



**Notes:** All special application functions are available on an indent basis. For further information on special application functions please contact NHP. ✓ = standard X = not available

**TemPower**  
**TEMPro PLUS and TEMPro PREMIER**  
 Specialised optional features

Standard feature	Description	Application curve		
		L	R	S
Undervoltage alarm function (TemPro Premier only)	<p>This function monitors the main circuit voltage, and gives an alarm on the LCD and an output signal via an alarm contact when the voltage drops below the setting voltage. The alarm is activated when the main circuit voltage drops below the setting voltage (selectable from 40 %, 60 % or 80 % of the rated main circuit voltage [Vn]), and is deactivated when the main circuit voltage rises to the recovery setting voltage (selectable from 80 %, 85 %, 90 % or 95 % of the rated main circuit voltage [Vn]).</p> <p>Note 1: The undervoltage alarm function is disabled unless the main circuit voltage has once risen to the recovery setting voltage or higher.</p> <p>Note 2: If the undervoltage alarm function is used in conjunction with the undervoltage trip device, an alarm may occur after the ACB trips open depending on the alarm setting voltage.</p>	✓	✓	✓
Reverse power trip function RPT	<p>(TemPro Premier AGR-31BS only.)</p> <p>The RPT function protects 3-phase generators running in parallel against reverse power. The RPT pickup current can be set in seven levels: 4 % thru 10 % of the generator rated power.</p>	✓	✓	✓



**Notes:** All special application functions are available on an indent basis. For further information on special application functions please contact NHP.  
 ✓ = standard X = not available



CORP-PROJECTS-ADS-CPB

## THINK MAJOR PROJECTS. THINK NHP.

When it comes to Major Projects, our staff involvement is always driven by long term results, actively seeking to support you with the right product and technical solutions before, during and after project completion.

### Major Projects Team

No matter what the project, from the initial stages of concept design, through to post-commissioning and future upgrades, NHP's Major Projects Team is there to see the project through together with you - our customer.

Our quality people have a diverse reach across Australia and New Zealand and their vast industry experience is sure to be there for you when you need it.

Think Major Projects. Think NHP.



## TEMPro PLUS and TEMPro PREMIER Specifications

### Standard features

OCR type	Cat. No.	Application protection curve <sup>1)</sup>	LCD monitoring	Basic protection <sup>2)</sup>		
				LTD	STD	INST
TEMPro PLUS	AGR-21B-L-PG	'L'	Current meter (A)	✓		✓
	AGR-21B-R-PG	'R'	Current meter (A)	✓		✓
	AGR-21B-S-PS	'S'	Current meter (A)	✓		X
TEMPro PREMIER	AGR-31B-L-PG	'L'	Energy analyser	✓		✓
	AGR-31B-R-PG	'R'	Energy analyser	✓		✓
	AGR-31B-S-PS	'S'	Energy analyser	✓		X

### OCR control power

If the control power is not supplied or is lost, each function operates as follows:

#### Function when no power

LT, ST, INST, RPT

GF

MCR

PTA

1-channel PTA

Alarm contact output from OCR

LCD/ COMMUNICATIONS

Field test facility & MODBUS

7

- Notes:**
- <sup>1)</sup> L/R/S refers to the application protection curve, please specify at time of ordering.
  - <sup>2)</sup> LTD-Long time delay trip, STD-Short time delay trip, INST-Instantaneous trip, GF-Unrestricted ground fault, (load side GF).
  - <sup>3)</sup> Trip variables can be viewed after an event via the LCD providing control power is constantly available.  
The OCR does not require control power to operate as a protective device, however it is recommended.  
Refer to the table above to see how absence or loss of control power affects the operation of the OCR.
  - <sup>4)</sup> RPT- Reverse power trip. AGR-31BS-PS becomes AGR-31BS-PR with RPT.
  - <sup>5)</sup> This function provides ground fault protection to TN-C or TN-S power distribution systems on the load side.
- ✓ = Standard, X = Not available, OPT = Optional



Single contact indicator (LTD) STD/INST, GF	Modbus Facility (data monitoring only)	RPT <sup>4)</sup>	Control power <sup>3)</sup>
✓	✓	X	Required
✓	✓	X	Required
✓	✓	X	Required
✓	✓	X	Required
✓	✓	X	Required
✓	✓	X	Required

**Operation**

Operates normally.

Operates normally.

When the CT rated primary current (ICT) is less than 800 A and the GF pick-up current is set to 10 %, the GF becomes inoperative.

Operates as INST.

Is inoperative. (Has a 40 ms operation)

Is inoperative.

No display when no other power source is available. Communications is disabled.

Is inoperative.



## TemPower Tripping options - Shunt trip coil

The TEMPOWER 2 AR ACB has two methods of remote tripping of the main contacts:

- Shunt trip coil
- Undervoltage Trip (UVT) Device

### Shunt trip coil

The shunt trip coil is available in three varieties;

- single shunt - short time rated (STR) and should be wired in series with a N/C auxiliary contact.
- single shunt - which is continuously rated (CR)
- double shunt - which is short time rated and should be wired in series with a N/C auxiliary contact.



Shunt coils are available in different voltages and are factory fit accessories / NHP service site visit. Below is a basic list of shunt coils, for voltages not shown on this list please contact your NHP representative.

Rated Voltage	Single shunt coil (CR)	Double shunt coil	Single shunt (STR)
AC 110 V	✓	X	i
AC 220 V	i	X	i
AC 240 V	✓	i	i
DC 24 V	✓	i	i
DC 48 V	✓	X	i
DC 100 V	✓	X	i
DC 110 V	i	X	i

**Continuously rated shunt trip and undervoltage trip can not be fitted to the same ACB. However, the STR shunt trip can be used together with an undervoltage trip.**

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**Notes:** Double shunts require a special wiring loom to be fitted during manufacture. UVT cannot be fitted with a double shunt.

✓ - Stocked X - Not available

i Available on indent only.

## TemPower Tripping options

### Continuously-rated shunt trip device (CR)

Type	Rated voltage (V)	Operational voltage (V)	Max. excitation current (A)	Opening time (max.) (ms)
AVR-1C	AC 100	AC 70 - 110	0.48	40
	AC 110	AC 77 - 121	0.39	
	AC 120	AC 84 - 132	0.37	
	AC 200	AC 140 - 220	0.24	
	AC 220	AC 154 - 242	0.19	
	AC 240	AC 168 - 264	0.18	
	DC 24	DC 16.8 - 26.4	1.65	
	DC 30	DC 21 - 33	1.33	
	DC 48	DC 33.6 - 52.8	0.86	
	DC 100	DC 70 - 110	0.39	
	DC 110	DC 77 - 121	0.37	
	DC 125	DC 87.5 - 137.5	0.31	
	DC 200	DC 140 - 220	0.19	
	DC 220	DC 154 - 242	0.18	

## Tripping options - Undervoltage Trip (UVT) Device

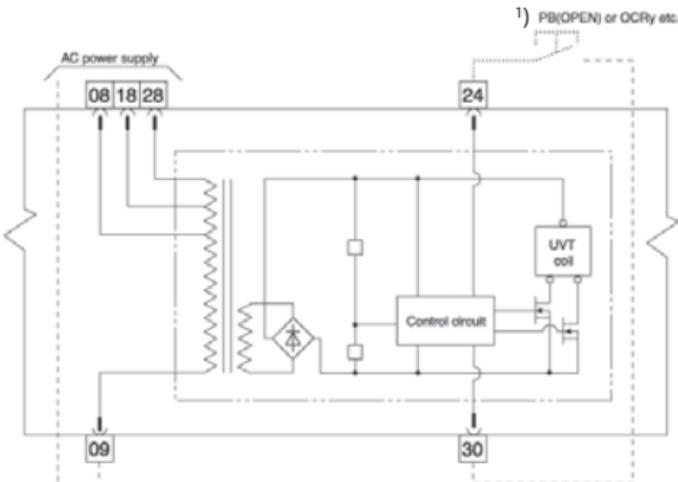
### Can be used to shunt trip the ACB

The Undervoltage Trip Device (UVT) monitors a single phase and trips the ACB when the control voltage drops below the opening voltage. When the control voltage is restored to the pick-up voltage, the ACB can be closed. The pick-up voltage is fixed to 85 % of the rated voltage. The UVT device is available in an instantaneous or a 500 ms time delay version. Please refer to NHP for available monitoring voltages.

When a shunt facility is required to remotely open the ACB, a N/O push button or relay contact can be wired between control terminals 24 and 30 to remotely open the ACB main contacts. This is the recommended method of remotely opening the ACB because it uses the UVTs fail safe coil to 'trip' the main contacts. Alternatively a single shunt (STR) can be fitted together with the UVT coil. The UVT is a separate controller and coil that is not the same as the UV alarm.

### Single Phase Monitoring

Undervoltage trip control circuit (for AC)



7

### Notes: --- Customer wiring

- 1) 1 PB and wiring to be supplied by user. Tripping signal PB contact must be rated for 48 V DC/5 mA. Apply tripping signal for at least 80 ms.
- If a separate shunt trip facility is required (i.e. not using UVT trip terminals 24 and 30 as described above), a short time rated (STR) device can be provided.

## TemPower Tripping options

Type of UVT Control Device	Rated voltage 50/60Hz (V)	Operational voltage (V)	Pick-up Voltage (V)	Coil Excitation Current (A)	Power Consumption (VA)	
					Normal	Reset
AUR-1CS	AC 100	35 – 70	85			
AUR-1CD	AC 110	38.5 – 77	93.5			
	AC 120	42 – 84	102			
	AC 200	70 – 140	170			
	AC 220	77 – 154	187			
	AC 240	84 – 168	204			
	AC 380	133 – 266	323	0.1	8	10
	AC 415	133 – 266	352			
	AC 440	154 – 308	374			
	DC 24 <sup>1)</sup>	8.4 – 16.8	20.4			
	DC 48 <sup>1)</sup>	16.8 – 33.6	40.8			
	DC 100 <sup>1)</sup>	35 – 70	85			



**Notes:** <sup>1)</sup> Special specification.  
 If a separate shunt trip facility is required (i.e. not using UVT trip terminals 24 and 30 as described above), a short time rated (STR) device can be provided.

## TemPower Communications facility

As standard the TEMPro PLUS and TEMPro PREMIER are equipped with a MODBUS communications facility conforming to the following network interface I/O specifications:

	<b>TEMPro OCR</b>
<b>Protocol</b>	MODBUS
<b>Transmission standard</b>	RS-485
<b>Transmission method</b>	Two wire (half duplex)
<b>Topology</b>	Multi drop bus
<b>Transmission rate</b>	19.2 kbps maximum
<b>Transmission distance</b>	1.2 km max. (at 19.2 kbps)
<b>Data format</b>	Modbus-RTU
<b>Maximum number of data nodes</b>	32

The standard MODBUS communications facility enables variable monitoring only. ACB control (OPEN / CLOSE) over the MODBUS link requires an additional communications interface.

### Communications options

NHP offers additional external communications interfaces for other protocols such as Profibus®, DeviceNet™ and Ethernet. Furthermore ACBs fitted with the TEMPro range of OCRs can be remotely monitored and controlled via the TemVision Pro touch screen <sup>1)</sup>.

Description (required per ACB) <sup>1)</sup>	Cat. No.	Price \$
Profibus® monitor & control Interface	ARCOMMSMODPRO	4210.00
DeviceNet™ monitor & control Interface	ARCOMMSMODDEV	4210.00
Ethernet monitor & control Interface	ARCOMMSMOD2ETH	4210.00



**Notes:** <sup>1)</sup> ACBs must be fitted with a remote tripping device and charging motor. For TemVision Pro information, refer to NHP.

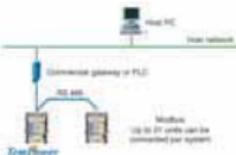


## Monitored and communicated variables

Data variable	Description	TEMPro PLUS	TEMPro PREMIER
max./min. reset	Recorded max./min. variable	✓	✓
open/close status	Indicates the state of the main contacts	✓	✓
diagnosis - system alarm status	Is the system alarm active?	✓	✓
OL pickup status	Is the overload status true?	✓	✓
STD pickup status	Is the short time delay status true?	✓	✓
INST pickup status	Is the Instant status true?	✓	✓
GFT pickup status	Is the UREF status true?	✓	✓
Line side earth fault status <sup>1)</sup>	Is the status true?	X	✓
current - Ia	Phase current A (A)	✓	✓
current - Ib	Phase current B (A)	✓	✓
current - Ic	Phase current C (A)	✓	✓
current - IN	(A) (4P ACB as a special spec.)	✓	✓
current - Ig	Phase current GF (A)	✓	✓
line voltage - Vab	-	X	✓
line voltage - Vbc	-	X	✓
line voltage - Vca	-	X	✓
power factor - Pf	-	X	✓
frequency - F	Supply frequency	X	✓
fault trip time	Speed of trip	✓	✓
diagnosis - MHT disconnect status	Is tripping coil connected?	✓	✓
active power - P	(kW)	X	✓
total real energy - EP (High-High)	(kWh)	X	✓
maximum current - I	Maximum phase current recorded	✓	✓
maximum current - Iinst	Maximum inst. current recorded	✓	✓
maximum active power - Pmax	(kW)	X	✓
fault current value	(A)	✓	✓
maximum voltage	Maximum voltage recorded	X	✓

All communications cabling should conform to the MODBUS standard. At a minimum the cabling should be shielded, of twisted pair construction and be AWG 24.

### Typical MODBUS communication network



**Notes:** <sup>1)</sup> Restricted earth fault model only, not standard.



## TemRelay external alarm module

The TemRelay external alarm module provides individual trip/alarm indication from the OCR as well as monitoring basic variables. The TemRelay connects to ACBs via the RS485 interface.



## TemVision remote monitoring and control

The TemVision Pro series of touch screens is for remote monitoring and control of Terasaki ACBs on a 2-wire half-duplex RS485 network via the MODBUS protocol.

### Features

- Monitoring of variables from the OCR such as:
  - On/off and trip status
  - Phase currents
  - Line voltages <sup>1)</sup>
  - Active power (kW) <sup>1)</sup>
  - Reactive power (kVar) <sup>1)</sup>
  - Power factor <sup>1)</sup>
  - Power consumption (kWh) <sup>1)</sup>
- On/off control of ACBs
- Trip indication and history of trip events
- Maintenance mode
- View and change protection settings
- Password protection



TemVision Pro 6" screen  
Maximum 6 ACBs



TemVision Max 10" screen  
Maximum 15 ACBs

Description	Cat. No.	Price \$
TemRelay	TEMRELAY	POA
TemVision Pro	TEMVISIONPRO	POA
TemVision Max	TEMVISIONMAX	POA

Notes: <sup>1)</sup> TEMPro Premier only.



## TemPower Rack remote racking device for AR ACBs

NHP have developed a remote racking device for Terasaki AR ACBs to help improve operator safety in switchrooms.

### Features

- Racks ACBs between connected, test and isolated positions
- Remote operation of ACB on/off controls
- Controlled by a pendant attached to a 10 metre lead
- Integrated lifting trolley for ACB bodies
- Rechargeable battery power supply
- Requires no modification to ACBs - can be used on existing installations



Description	Cat. No.	Price \$
TemPower Rack unit	ARTEPOWERACK	POA



## TemPower 2 AR ACB service life and maintenance

		AR212S	AR216S	AR220S	AR325S	AR332S	AR440S
Endurance in number of ON/OFF cycles <sup>1)</sup>	Mechanical	30000	30000	25000	20000	20000	15000
	Electrical Without maintenance	15000	15000	12000	10000	10000	8000
With maintenance 30000	AC 460 V	12000	12000	10000	7000	7000	3000
	AC 690 V	10000	10000	7000	5000	5000	2500

### NHP ACB servicing

NHP offers a wide range of ACB preventative maintenance and servicing programs to keep your ACB fully operational. Offered services include:

- Trip unit calibration and secondary injection testing.
- ACB scheduled maintenance and servicing including contact restoration / replacement, parts lubrication, arc chute restoration, mechanical and electrical functional testing.
- On site commissioning and application support (field service).
- Full service reports are provided.

For further information on the available services and pricing please contact the NHP service department.



**Notes:** <sup>1)</sup> Expected service life based on endurance test. The service life of ACB depends on the working and environmental conditions. Refer to NHP for the AR ACB "Maintenance, Inspection and Parts Replacement" guide for further information.



## Retrofitting kits and installation kits

When replacing an obsolete air circuit breaker it is almost always necessary to modify the existing busbar alignment, mounting position and door cut-out. Retrofit kits and installation kits provide a cost effective third party solution that allows you to install a completely new Terasaki AR Air Circuit Breaker into many of the popular older brands cubicle with minor re-work and down time.

Retrofit kit: this is the remaking of connections etc. within the existing carriage to suit the new ACB. Typically the existing carriage remains in an altered form.

Installation kit: duplicates the connection and fixing points of the original ACB. The existing carriage is fully removed. Switchboard isolation is required.

Retrofit and installation kits can be purchased from NHP subject to our limitations of liability statement. For further details please contact NHP.

The table below shows the existing / obsolete ACB details (column 1), the Terasaki AR ACB body and carriage replacement (column 2), and either retrofit or installation kit type (column 3). Before selecting a retrofit or installation kit it is important to fully understand the specification of the existing/obsolete ACB .

Existing / Obsolete air circuit breaker	Terasaki AR ACB equivalent frame size <sup>1)</sup>	Kit type	Cat. No.	Price \$
Terasaki AT12, 3P, V/V	AR212S, 3P	Installation	CONTACT NHP	POA
Terasaki AT12, 3P, H/H	AR212S, 3P (HH T&B)	Installation	CONTACT NHP	POA
Terasaki AT16, 3P, V/V	AR216S, 3P (VV T&B)	Installation	CONTACT NHP	POA
Terasaki AT16, 3P, H/H	AR216S, 3P (HH T&B)	Installation	CONTACT NHP	POA
Terasaki AT20, 3P, V/V	AR220S, 3P (VV T&B)	Installation	CONTACT NHP	POA
Terasaki AT25, 3P, V/V	AR325S, 3P (VV T&B)	Installation	CONTACT NHP	POA
Terasaki AT32, 3P, V/V	AR332S, 3P (VV T&B)	Installation	CONTACT NHP	POA
Nilsen NAB1 D8 3P	AR208S, 3P (HV T&B)	Retrofit	CONTACT NHP	POA
Nilsen NAB1 D12 3P	AR212S, 3P (HH T&B)	Retrofit	CONTACT NHP	POA
Nilsen NAB1 D16 3P	AR216S, 3P (HH T&B)	Retrofit	CONTACT NHP	POA
Nilsen NAB1 D20 3P	AR220S, 3P (HH T&B)	Retrofit	CONTACT NHP	POA

**Notes:** <sup>1)</sup> VV = vertical; HH = horizontal, T&B = top terminal and bottom terminal.

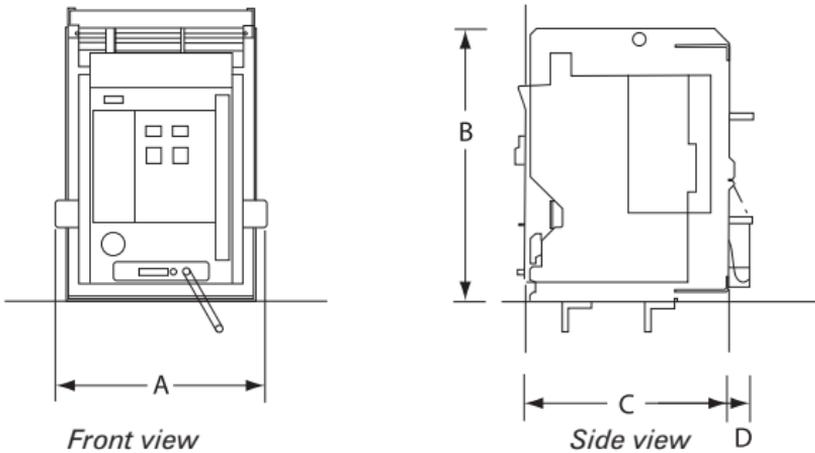


## Retrofitting kits and installation kits

Existing / Obsolete Air circuit breaker	Terasaki AR ACB equivalent frame size <sup>1)</sup>	Kit type	Cat. No.	Price \$
Nilsen NAB1 D25 3P	AR325S, 3P (HH T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Nilsen NAB1 D31 3P	AR332S, 3P (HH T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Nilsen NAB1 D40 3P	AR440S, 3P (HH T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Nilsen NAB2 CBM 3P	AR212S, 3P (VV T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
NAB2 3P Jig Set	Required for use for Nilsen NAB2 Kit	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Nilsen AB5/AB7 3P	AR208S, 3P (HH T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Nilsen AB5/AB7 3P	AR216S, 3P (HH T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Nilsen AB5/AB7 3P	AR332S, 3P (HH T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Unelec C9/8W 3P	AR208S, 3P (VV T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Unelec C9/12W 3P	AR212S, 3P (VV T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Unelec C9/16W 3P	AR216S, 3P (VV T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Unelec C9/20W 3P	AR220S, 3P (VV T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Unelec C9/31W 3P	AR332S, 3P (HH T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
AEG 1600A 3P	AR216S, 3P (HH T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Hundtwebr LH16 3P	AR216S, 3P (VV T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Hundtwebr LH20 3P	AR220S, 3P (VV T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Hawker CNP/16W 3P	AR216S, 3P (HH T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>
Hawker CNP/20W 3P	AR220S, 3P (HH T&B)	Retrofit	<b>CONTACT NHP</b>	<b>POA</b>

**Notes:** <sup>1)</sup> VV = vertical; HH = horizontal, T&B = top terminal and bottom terminal. As highlighted in the table above not all kit types are available ex-stock. All INDENT kits have a 4-6 week lead time from the receipt of a customer purchase order.

## TemPower Outline dimensions



### TemPower 2 draw-out type – 3 and 4 pole outline dimensions (mm)

Cat. No.	AR220S/				AR332S/ AR320H/				AR663									
	AR212S		AR216S		AR220H/		AR325S		AR316H		AR440S		AR650		AR663			
No. of Poles	3 P	4 P	3 P	4 P	3 P	4 P	3 P	4 P	3 P	4 P	3 P	4 P	3 P	4 P	3 P	4 P		
<b>Draw-out type</b>	A		354 439		354 439		354 439		460 580		460 580		631 801		799 1035		799 1034	
	B		460		460		460		460		460		460 460		460 460		460 460	
	C		345		345		345		345		345		375		380 380		380 380	
	D		40		40		40		40		40		53		60 60		60 60	
<b>Approx. Weights (kg)</b>	Body & carriage		73 86		76 90		79 94		105 125		105 125		139 176		200 260		220 285	
<b>Front &amp; rear connect with-drawable<sup>1)</sup></b>	Body only		45 51		46 52		46 52		56 68		56 68		71 92		125 160		140 180	
	Carriage only		28 35		30 38		33 42		49 57		49 57		68 84		75 100		80 105	

**Notes:** <sup>1)</sup> Weights are based on normal specifications with the OCR and standard accessories.



## TemPower

### Our customers' needs

#### Providing solutions



#### Switchboard builder

- Compact size for high packing density
- Zero arc space required for clearance
- Low temperature dissipation
- Built in trip supervision circuit
- Fully rated neutral as standard
- Vertical, horizontal and front terminal connections are available
- Uniform panel cut out size
- Easy access to control, auxiliary and position switch terminals
- Detailed product training available by NHP application engineers
- Manufactured in Australia, allowing for fast delivery and local technical support



#### Consultant

- Approvals and test: IEC 60947, AS3947-2 and A.S.T.A. certified
- Time Current Characteristics to IEC 60255-3 (SI, VI, EI curves)
- Restricted and Unrestricted ground fault protection in one relay
- LSI characteristic curves as standard
- True r.m.s. protection up to 19th harmonic
- Sophisticated undervoltage/phase failure protection
- Integral reverse power protection and load shedding relay
- Only Terasaki can offer  $I_{cw} = 100 \text{ kA/ 1 second}$  in a small 3200 A frame size
- TemPower 2 ACB suffers no loss in performance when tripped through an external protection relay
- Super fast clearance times under fault

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#### End user

- System alarms that indicate tripping coil health
- Built in relay tester - can check on line without tripping ACB
- Contact temperature monitoring options
- Fault diagnosis - type of fault, magnitude, tripping time & trip history
- High making capacity for operator safety
- Communication to B.M.S. or S.C.A.D.A. system
- Main contacts can be changed within 15 minutes per pole
- Full technical support and ACB commissioning available via NHP
- Product servicing available from Australia's only Terasaki trained and certified ACB technicians

## Arc D-Tect

### D1000 Arc Fault Protection system



#### Efficient protection of high, medium and low voltage switchgear

A continuous supply of power is important in modern energy infrastructure and most production facilities. Wherever electrical energy is generated and distributed, arc flash faults and accidents are likely to occur. An arc protection system is an efficient way to maximise the safety and minimise the damages.



SELCO's D1000 arc protection system is designed to dramatically reduce the effects of arc flash faults in high, medium and low voltage switchgear.

#### Fast protection is essential

An arc-fault in a switchboard or control gear develops within milliseconds and leads to the discharge of enormous amounts of energy. An arc fault is the result of a rapid release of energy due to an arcing fault between phase bus bars. If the arc flash is allowed to develop the result is that the massive energy discharge burns the bus bars, vaporising the copper and thus causing an explosion. Finally this may cause extensive material damage and jeopardise the safety of operational personnel.



An arc protection system operates much faster than conventional protection relays and thus damages caused by an arc flash fault can be kept at a minimum level. As a general guideline, an arc will not cause any damage if it is eliminated within 35ms. If the arc is allowed to continue and last 100ms some damage will occur. An arc fault lasting 500ms may cause severe damage to the installation and will require extensive repair.

A short arc time is critical in order to avoid damage to personnel and material. It is therefore of vital importance that the source leading to the arc flash time is minimised and the power is disconnected as fast as possible – SELCO's D1000 arc protection system is the solution to this problem.

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## Arc D-Test

### Arc detecting relay system

#### D1000 Functionality

The D1000 arc protection system is an advanced and fast arc protection system, offering the following features and functionality:

- Compact unit - arc fault and overcurrent protection
- High speed arc fault detection less than 1ms
- Over-current protection with detection within 1ms
- Combines optical fibre and point sensors
- Real-time event logging
- Self-supervision of sensors and protection unit
- Easy installation and configuration via USB



#### D1000 Arc flash protection unit

The D1000 is a stand-alone and high speed arc protection unit for electrical power distribution systems. D1000 supports both point and fibre sensor technologies for arc flash detection and supports up to six sensors. The sensors can be combined in any combination, depending on the application and requirements.

#### Easy configuration

The D1000 is easy to install and set-up and in case any changes are needed this is easily done via the USB interface accessible from the front. The built-in user-friendly menu system is embedded in the D1000 unit and activates automatically when the unit is connected to a PC.

The built-in light sensor on the front makes it easy to adjust and verify that all sensors are correctly installed and equally sensitive. With the TRIP LEVEL adjustment on the front plate the sensitivity to light can be adjusted. The light range is 10-25,000 lux enabling use of sensors under different light conditions, indoor light, sunlight etc.



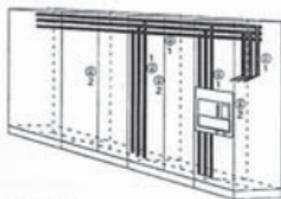
In small installations, the calibration TEST sensor can be used as a single arc detecting sensor, providing additional protection without added cost. Setup of the overcurrent detection, is easily done through the USB interface.

## Arc D-Test

### Arc detecting relay system

#### Easy installation

The D1000 system is easy to install and made to implement in new switchgear installations as well as retrofit projects. Both the D1000 unit and sensors are quick and easy to install. A general guideline is to mount 1-2 sensors per cubicle or chamber. It is important to cover all horizontal/vertical busbars (1) as well as breaker compartments (2) and drawers. Example is shown below: D1000 relays can be linked (up to 4 relays) to provide expanded installation and sensing requirements.



#### Flexible and efficient sensors

##### A1000 point sensor

The point sensor is a light-sensitive element based on phototransistor technology. It detects visible light radiation which is captured at the cylindrical top. The A1000 point sensor has a detection area of up to 2 m with a characteristic of  $180^\circ \times 360^\circ$ . The A1000 supports self supervision, and a clear blinking built-in LED indicates that the sensor is active. If the sensor reaches the trigger level the LED will light up constantly. The A1000 sensor is supplied with a 10 m shielded cable. 6 sensors maximum.



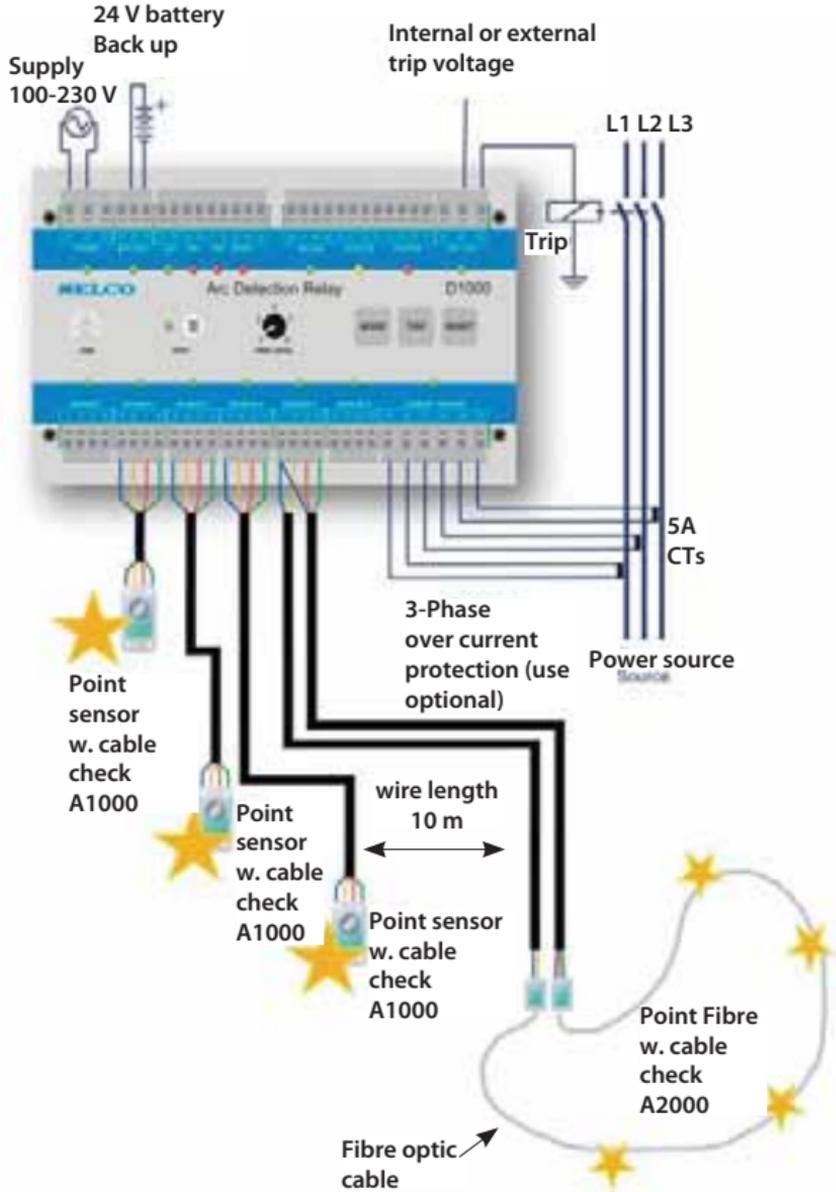
##### A2000 fibre sensor

The A2000 fibre sensor is a light sensitive element based on optical fibre technology. The A2000 fibre sensor is a fully flexible fibre with a detection angle of  $360^\circ$  throughout the length of the fibre. The detection radius is up to 2 meters. The fibre sensor is ideal to install in electrical cabinets with drawer sections. Allows the same coverage as approximately 6 x A1000 point sensors. The fibre optic cable is available in 5 m or 8 m lengths. There is also another 10 m of wire cable attached to each end. The wire cable can be extended up to 50 m at each end.



# Arc D-Test Arc detecting relay system

## D1000 - wiring and installation



7

## Arc D-Test

### Arc detecting relay system

<b>D1000 Arc Protection Unit</b>	<b>D1000.0010</b>
Voltage Supply	85 -240 V AC 100 -250 V DC 24 V Battery – Lead acid gel cell
Trip coil output	IGBT switch, 200µs on-time, 2s pulsed (configurable)
Trip coil voltage range	24-600 V DC 24-440 V DC
Signal contacts	Online, Service, Tripped
Sensitivity	10 – 25000 lux, Trip level adj. 1-9
Current inputs	3-phase 5 A (75 A/1 sec)
Burden	<0.25 VA/inputs at 5 A
Current range	1.5-3.0 x I <sub>n</sub> (7.5-15 A)
Response time	Less than 1ms (arc fault) Less than 1ms (overcurrent)
Number of detectors	Up to 6
System expansion	Up to 4 x D1000 units via Link connection
Interface	USB
Power consumption	<3W
Ambient temperature	-25 to + 70 °C
Dimensions (WxHxD)	200x130x52 mm
Mounting	35 mm DIN Rail or screw-in
<b>A1000 Sensor</b>	<b>A1000.0010</b>
Type	Point sensor
Detection area	180° x 360° - 2 m
Length	10 m shielded cable
Circuit check	Built-in – LED for visual feedback
Dimensions (WxHxD)	32x52x21 mm
<b>A2000 Sensor</b>	<b>A2000.0020</b>
Type	Fibre optical sensor
Detection area	360°
Length	5 m flexible fibre optic cable (plus 10 m of wiring cable)
Circuit check	Built-in – LED for visual feedback
Dimensions (WxHxD)	32x52x21 mm
<b>A2000 Sensor</b>	<b>A2000.0010</b>
Type	Fibre optical sensor
Detection area	360°
Length	8 m flexible fibre optic cable (plus 10 m of wiring cable)
Circuit check	Built-in – LED for visual feedback
Dimensions (WxHxD)	32x52x21 mm
<b>Approvals/standards</b>	
EMC standards	EN60255-26
Enclosure	IP 20

## Arc D-Test D1000 Arc-fault protection system

New  
Product

### Catalogue Numbers and ordering

	Cat. No.	Price \$
D1000 Arc protection unit	<b>D1000 0010</b>	<b>5610.00</b>
A1000 Arc point sensor 10 m	<b>A1000 0010</b>	<b>550.00</b>
A2000 Arc fibre cable sensor 5 m	<b>A2000 0020</b>	<b>2000.00</b>
A2000 Arc fibre cable sensor 8 m	<b>A2000 0010</b>	<b>3030.00</b>
D1000 DIN rail mounting clips	<b>D1000DINCLIPS</b>	<b>11.40</b>



**Built-in overcurrent protection**



**Extended coverage with links input**



**Efficient self-supervision**

**Notes:** Old sensor types ADR/ A0200/ A0300 can be used with the new D1000 relay. Refer NHP for connection details.

## Earth Leakage Relays

	Page
<b>Earth leakage relays</b>	
Surface mounting type TZS series	8 - 2
DIN Rail mounting type RD3A series	8 - 4
DIN Rail mounting type RD1B series	8 - 5
Panel mounting type RD1DF series	8 - 6
Panel mounting type RD1EP series	8 - 7
Panel mounting type RD3E2 series	8 - 8
Panel mounting type RD1G2 series	8 - 10
<b>Mining earth leakage relay</b>	
Panel mount mining relays, DSRM72 and DSR48T Series	8 - 12
Remote current transformer (toroid) TD and DSR Series	8 - 14
Accessories	8 - 15



## TZS series

### Features

- Adjustable time range 0.3 - 2 s
- Sensitivity (adj.) 30 mA - 1 amp.
- Immune to false tripping via harmonics
- High vibration withstand
- Output C/O contact
- Indication - LED
- Reset function - electrical



### TZS relay

Mounting	Voltage	Adj. sensitivity	Adj. time range	Cat. No.	Price \$
Surface	120/240 V AC	30 mA-1 amp	0.3-2 s	<b>TZS AD120240V</b>	<b>680.00</b>
Surface	400/440 V AC	30 mA-1 amp	0.3-2 s	<b>TZS AD415440V</b>	<b>680.00</b>
Surface	24 V AC	30 mA-1 amp	0.3-2 s	<b>TZS AD24VAC</b>	<b>680.00</b>
Flush (collar only)	-	-	-	<b>TPD OSZ</b>	<b>102.00</b>

### Tripping times

Rated operating time (sec)	Operating time range (sec)	Non-operating time range (sec)
0.3	0.2 - 0.36	0.15
0.5	0.4 - 0.6	0.38
1	0.8 - 1.2	0.7 - 1.25
2	1.3 - 2.0	0.7 - 1.25

### Standard features

Earth leakage detection	current operated type
Internally mounted contact	1 C/O
Earth leakage indication	LED
Reset function (electrical)	Yes
Test button	Yes
Remote reset (power source)	1 VA
Dimensions (mm) W/H/D	60/104/78
Weight (kg) (relay only)	0.22

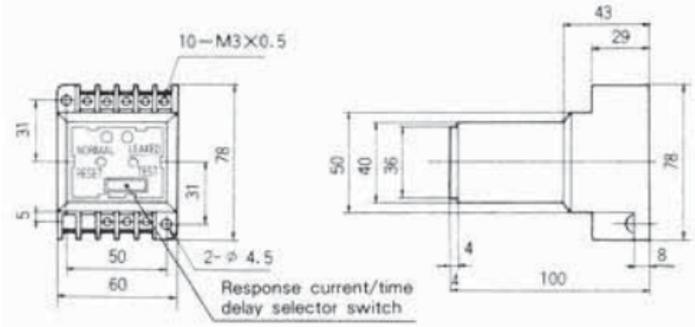
### 8 Toroidal CT - ZCT only (remote, add to relay)

Max. cable 2 wire	Max. cable 4 wire	Internal diameter	Cat. No.	Price \$
8 mm <sup>2</sup>	5.5 mm <sup>2</sup>	15 mm	<b>TZS-15</b>	<b>113.00</b>
30 mm <sup>2</sup>	22 mm <sup>2</sup>	24 mm	<b>TZS-24</b>	<b>340.00</b>
100 mm <sup>2</sup>	80 mm <sup>2</sup>	40 mm	<b>TZS-40</b>	<b>630.00</b>
325 mm <sup>2</sup>	250 mm <sup>2</sup>	68 mm	<b>TZS-68</b>	<b>1050.00</b>
850 mm <sup>2</sup>	600 mm <sup>2</sup>	100 mm	<b>TZS-100</b>	<b>1610.00</b>

**Notes:** Refer page 9 - 68 for AS/NZS requirements when using earth leakage relays.

## TZS series

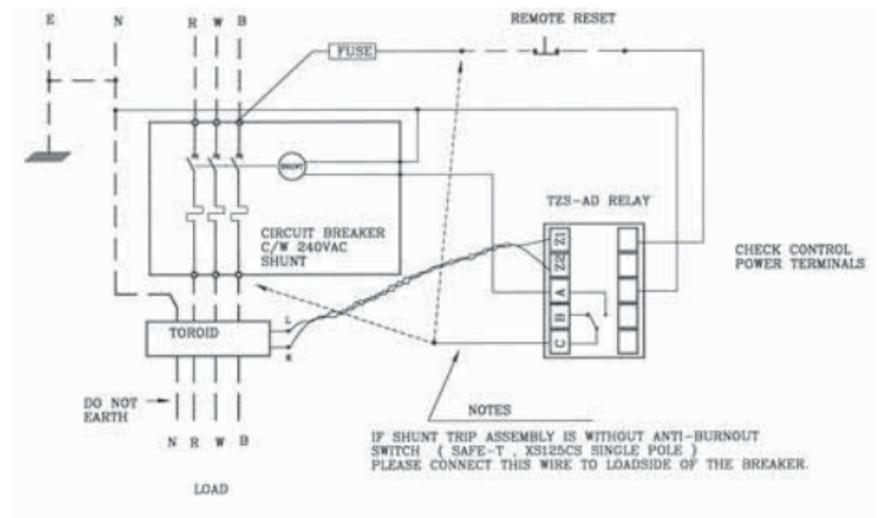
### Outline dimensions (mm)



### Rating of output contact

	Resistance load cos $\phi = 1$	Inductive load cos $\phi = 0.4$ (L/R=7 ms)	Min. load
120/230 V AC	6 A	3.5 A	10 mA at 5 V DC
30 V DC	6 A	3 A	10 mA at 5 V DC

### Connection diagram - Residual current relay



**Notes:** For 415 V AC or 440 V AC contact NHP for availability.  
The output contacts remain until the RESET button is operated.  
Should the control power supply fail the contacts automatically reset.

## DIN rail mount RD series RD3A

- Standard AS 60947-2 (Annex M)
- Core balance earth leakage relay
- Adjustable I $\Delta$ n up to 30 amps
- Adjustable trip time up to 5 s
- Harmonic filter
- 2 wire toroid connection
- Field selectable negative/positive security
- Instantaneous display as percentage I $\Delta$ n
- DIN rail mounting (2 module)



RD3A

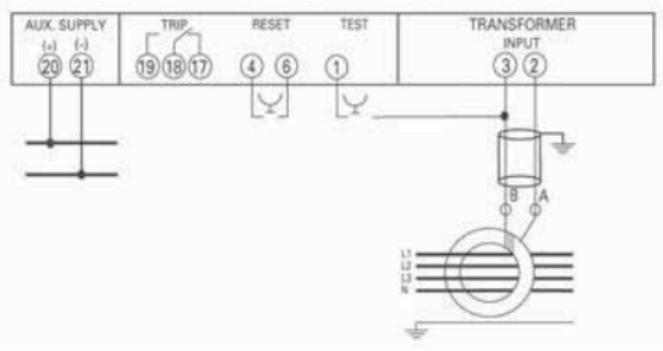
RD relays in conjunction with a ring current transformer (toroid) provide earth leakage protection of electrical distribution systems and electrical equipment.

### Features

- Adjustable: 0, 0.15, 0.25, 0.5, 1, 2.5, 5 sec
- Adjustable trip current: .03, .05, .075, 0.1, 0.15, 0.2, 0.3 A in 3 ranges x 1, x 10, x 100
- Automatic reset option
- Trip: one changeover contact (5 A - 250 V AC cos 1.0, 5 A - 30 V DC)
- Local reset/test and remote reset/test <sup>1)</sup>
- LED indication: green (healthy), red (tripped), yellow (%I $\Delta$ n 20 %, 40 %, 60 %)
- IP 50 Front cover, IP 20 terminals
- Test buttons checks relay function and toroid connections

Auxiliary Voltage	Cat. No.	Price \$
24 V AC	<b>RD3AF1N (24 V AC)</b>	<b>910.00</b>
110 V AC	<b>RD3AF12 (110 V AC)</b>	<b>910.00</b>
240 V AC	<b>RD3AF14 (240 V AC)</b>	<b>910.00</b>
415 V AC	<b>RD3AF15 (415 V AC)</b>	<b>910.00</b>
24 - 150 V DC	<b>RD3AF1H (24-150 V DC)</b>	<b>910.00</b>

### Wiring diagram - RD3A



**Notes:** <sup>1)</sup> Remote test on AC versions only.  
Refer page 9 - 68 for AS/NZS requirements when using earth leakage relays.

8

## DIN rail mount RD series RD1B

- Standard AS 60947-2 (Annex M)
- Core balance earth leakage relay
- Adjustable IΔn up to 30 amps
- Adjustable trip time up to 5 s
- Harmonic filter
- 2 wire toroid connection
- Field selectable negative/positive security
- Instantaneous display as percentage IΔn
- DIN rail mounting (4 module)



RD1B

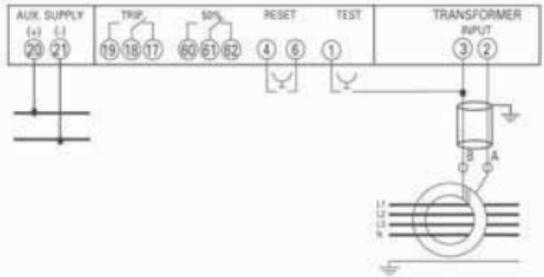
RD relays in conjunction with a ring current transformer (toroid) provide earth leakage protection of electrical distribution systems and electrical equipment.

### Features

- Adjustable: 0, 0.15, 0.25, 0.5, 1, 2.5, 5 sec
- Adjustable trip current: .03, .05, .075, 0.1, 0.15, 0.2, 0.3 A in 3 ranges x 1, x 10, x 100
- Automatic reset option
- Trip: one changeover contact (5 A - 250 V AC cos 1.0, 5 A - 30 V DC)
- Local reset/test and remote reset/test <sup>1)</sup>
- Changeover contact - selectable between alarm preset 50 % IΔn and second trip contact
- Field selectable - high or low harmonic filter circuit
- LED indication: green (healthy), red (tripped), yellow (%IΔn 20 %, 30%, 40 %, 50 %)
- IP 40 Front cover, IP 20 terminals
- Test buttons checks relay function and toroid connections

Auxiliary Voltage	Cat. No.	Price \$
110 V AC	RD1B212	1080.00
240 V AC	RD1B214	1080.00
415 V AC	RD1B215	1080.00
24 - 150 V DC	RD1B21H	1080.00

### Wiring diagram - RD1B



**Notes:** <sup>1)</sup> Remote test on AC versions only.  
Refer page 9 - 68 for AS/NZS requirements when using earth leakage relays.



## Panel mount RD series RD1DF

- Standard AS 60947-2 (Annex M)
- Core balance earth leakage relay
- Adjustable I $\Delta$ n up to 30 amps
- Adjustable trip time up to 5 sec
- Harmonic filter
- 2 wire toroid connection
- Field selectable negative/positive security



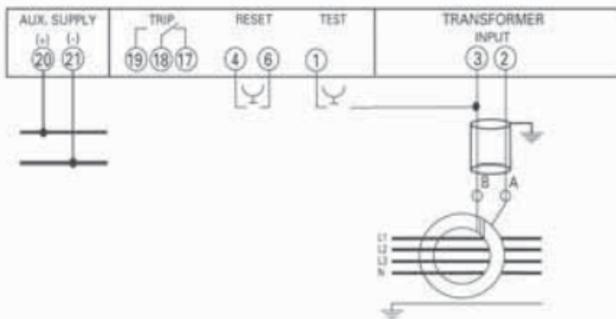
**RD1D**

### Features

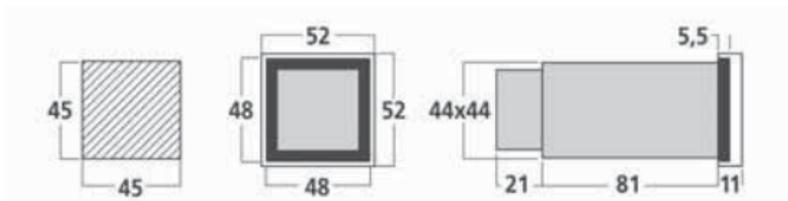
- Panel mounting 48 mm
- Adjustable: 0, 0.15, 0.25, 0.5, 1.0, 2.5, 5 sec
- Adjustable trip current: .03, .05, .075, 0.1, 0.15, 0.2, 0.3 A, in 3 ranges x 1, x 10, x 100
- Automatic reset option
- Trip - one changeover contact (5 A - 250 V AC cos 1.0, 5 A - 30 V DC)
- Local and remote reset/test
- LED indication: green (healthy), red (tripped)
- IP 40 Front cover, IP 20 terminals
- Test buttons checks relay function and toroid connections

Auxiliary Voltage	Cat. No.	Price \$
110 V AC	<b>RD1DF12</b>	<b>520.00</b>
240 V AC	<b>RD1DF14</b>	<b>520.00</b>
415 V AC	<b>RD1DF15</b>	<b>520.00</b>

### Wiring diagram



### Dimensions (mm)



8

## Panel mount RD series RD1EP

- Standard AS 60947-2 (Annex M)
- Core balance earth leakage relay
- Adjustable I $\Delta$ n up to 30 amps
- Adjustable trip time up to 5 sec
- Harmonic filter
- 2 wire toroid connection
- Field selectable negative/positive security



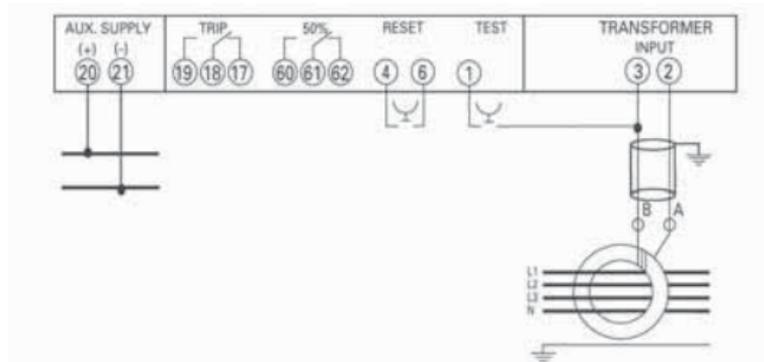
RD1E

### Features

- Panel mounting 72 mm
- Adjustable: 0, 0.15, 0.25, 0.5, 1.0, 2.5, 5 sec
- Adjustable trip current: .03, .05, .075, 0.1, 0.15, 0.2, 0.3 A in 3 ranges x 1, x 10, x 100
- Changeover contact-selectable between alarm pre-set 50 % I $\Delta$ n and extra trip contact (5 A - 250 V AC cos 1.0, 5A - 30 V DC)
- Trip - one changeover contact (5 A - 250 V AC, cos 1.0, 5 A - 30 V DC)
- Local and remote reset/test <sup>1)</sup>
- LED indication: green (healthy), red (tripped), yellow (%I $\Delta$ n 20%, 30%, 40%, 50%)
- IP 40 Front cover, IP 20 terminals
- Test buttons checks relay function and toroid connections

Auxiliary Voltage	Cat. No.	Price \$
110 V AC	RD1EP212	910.00
240 V AC	RD1EP214	910.00
415 V AC	RD1EP215	910.00
24 - 150 V DC	RD1EP21H	910.00

### Wiring diagram



**Notes:** <sup>1)</sup> Remote test on AC versions only.  
Refer page 9 - 68 for AS/NZS requirements when using earth leakage relays.



## Panel mount RD series RD3E2

- Standard AS 60947-2 (Annex M)
- Core balance earth leakage relay
- Adjustable  $I_{\Delta n}$  up to 30 amps
- Adjustable trip time up to 5 sec
- Field selectable negative/positive security
- Instantaneous digital display
- 2 wire toroid connection
- Monitor function <sup>1)</sup>



**RD3E2**

### Technical data

Aux. voltage	110, 240 & 415 V AC	50/60 HZ or 24 - 150 V DC
Contact rating	5 A - 250 V AC cos 1.0; 3 A - 250 V AC cos 0.4; 5 A - 30 V DC	
Pre trip alarm	50 % $I_{\Delta n}$	
Indication	Digital display - 3 digits	
Test	Tests relay function and toroid connections	
IP rating	IP 40 front frame; IP 20 terminals	
Operating temperature	-25 °C to +55 °C	

### Features

- Panel mounting 72 mm
- Adjustable time: 0, 0.15, 0.25, 0.5, 1.0, 2.5, 5, sec
- Adjustable trip current-.03, .05, .075, 0.1, 0.15, 0.2, 0.3 A, in 3 ranges x 1, x 10 x 100
- Digital indication of residual current - 3 digits
- N/O contact-selectable between alarm pre-set 50 %  $I_{\Delta n}$  and extra trip contact
- Trip - one changeover contact
- Local and remote reset/test <sup>2)</sup>

Auxiliary Voltage	Cat. No.	Price \$
110 V	<b>RD3E212B</b>	<b>1510.00</b>
240 V	<b>RD3E217B</b>	<b>1510.00</b>
415 V	<b>RD3E218B</b>	<b>1510.00</b>
24 - 150 V DC	<b>RD3E21HB</b>	<b>1510.00</b>

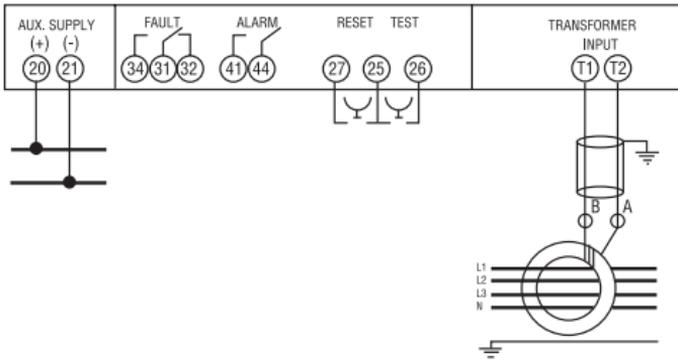
8

**Notes:** <sup>1)</sup> Relay can operate as an earth leakage relay or as a digital meter with trip contacts and current setting disabled. This monitor function is ideal when first selecting the current settings and monitoring the installation.  
<sup>2)</sup> Remote test on AC version only.  
 Refer page 9 - 68 for AS/NZS requirements when using earth leakage relays.

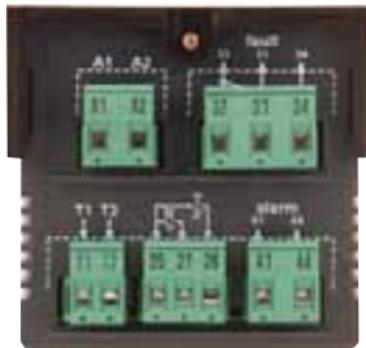
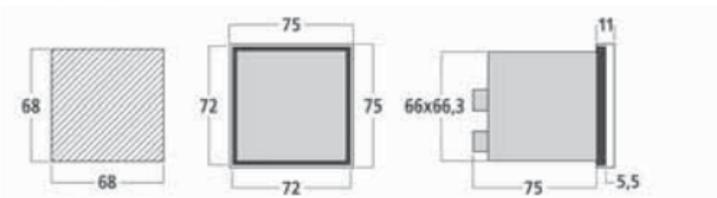
## Panel mount RD series RD3E2

### Wiring diagram – RD3E2

S 291/107



### Dimensions (mm)



Rear view RD3E21

## Panel mount RD series RD1G2

- Standard AS 60947-2 (Annex M)
- Core balance earth leakage relay
- Adjustable sensitivity 30 mA to 30 A
- Adjustable trip time up to 5 sec
- Field selectable negative/positive security
- Reduced depth housing
- 2 wire toroid connection
- Continuous permanent test toroid connections
- Harmonic filter
- Pre trip alarm



### Technical data

Aux. voltage	110 V AC, 240 V AC or 415 V AC 50/60 Hz
Contact rating	5 A-250 V AC cos 1.0; 3 A-250 V AC cos 0.4; 5 A-30 V DC
Indication	Supply healthy – green LED
	Relay tripped – red LED
	% IΔn – LEDS 20, 30, 40 and 50 %
Test	Test button: Tests integrity of relay internal trip circuit
	Permanent test: Continuously monitors toroid connections and trip circuit
IP rating	IP 40 front frame; IP 20 terminals
Operating temperature	-5 °C to +55 °C

### Features

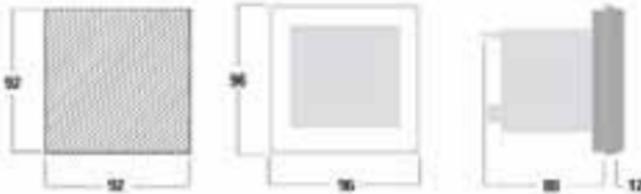
- Panel mounting 96 mm
- Adjustable time delay - 0, 0.15, 0.25, 0.5, 1.0, 2.5, 5 sec
- Adjustable trip current - 0.03, 0.05, 0.75, 0.1, 0.15, 0.2, 0.3 A in range x 1, x 10, x 100
- Field selectable negative/positive security
- Trip – 1 changeover contact
- Local and remote reset/test
- Changeover contact selectable between alarm preset 50 % IΔn and extra trip contact

Auxiliary Voltage	Cat. No.	Price \$
110 V AC	<b>RD1G212</b>	<b>1000.00</b>
240 V AC	<b>RD1G214</b>	<b>1000.00</b>
415 V AC	<b>RD1G215</b>	<b>1000.00</b>

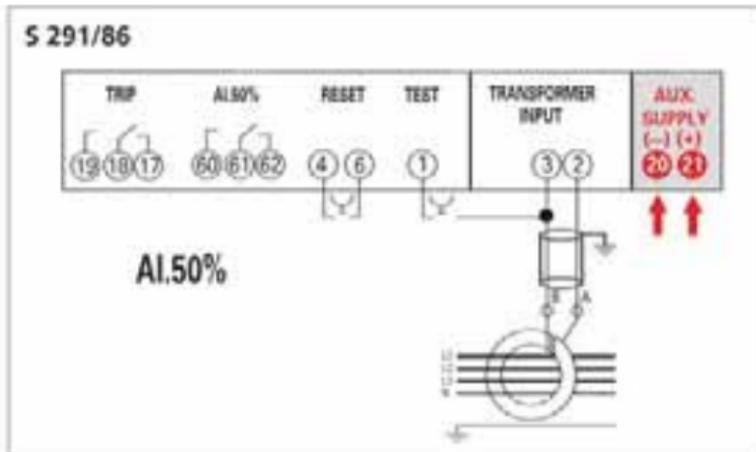
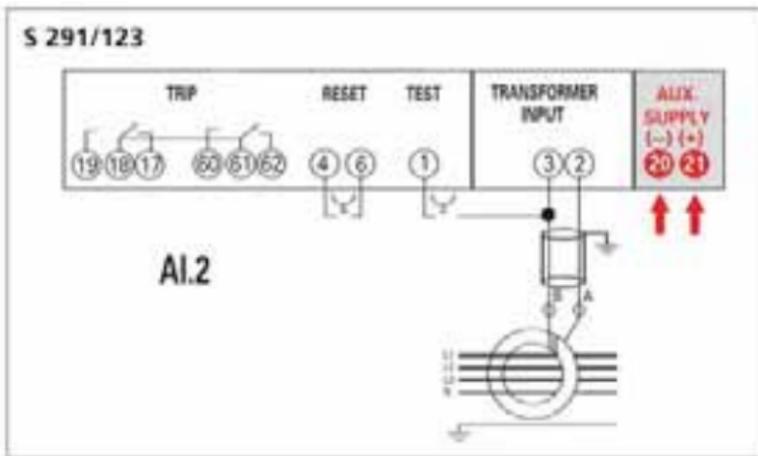
**Notes:** Refer page 9 - 68 for AS/NZS requirements when using earth leakage relays.

## Panel mount RD series RD1G2

### Dimensions (mm) RD1G2



### Wiring diagram - RD1G2



## Panel mount mining relay series DSRM72 and DSR48T

- Standard AS/NZS 2081:2011
- Core balance earth leakage relay
- Adjustable sensitivity 0.03 A – 0.5 A
- Adjustable trip time 0.05 sec – 0.5 sec
- Separate test unit for circuit integrity testing
- Four wire toroid connection
- Field selectable negative/positive security
- Field selectable function of outputs
- Harmonic filter



### Technical data (DSRM72)

Aux. voltage	240 V or 110 V AC 50/60 Hz, 24 V DC
Contact rating	5 A-250 V AC cos 1; 3 A 250 V AC cos 0.4; 5 A 30 V DC
Indication	Supply healthy – green LED
	Power fail - Changeover contact
	Relay tripped – red LED
	Toroid fault – flashing red LED
Test	% IΔn – LEDs 20, 30, 40 and 50 %
	Internal relay test button on unit.
IP rating	Circuit integrity test using external DSR48T.
IP rating	IP 40 front frame; IP 20 terminals
Operating temperature	-10 °C to +60 °C

### Features

- Units supplied complete with separate test device DSR48T
- Panel mounting 72 mm
- Adjustable trip current -7 steps: 0.03, 0.06, 0.1, 0.2, 0.3, 0.4 & 0.5
- Adjustable trip time -7 steps: 0.05, 0.1, 0.15, 0.2, 0.3, 0.4 & 0.5
- Choice of output contacts 2 x AL or 1 x AL + 1 x Power Fail
- Negative/Positive security
- Complies with standard AS/NZS 2081:2011
- Latching contact

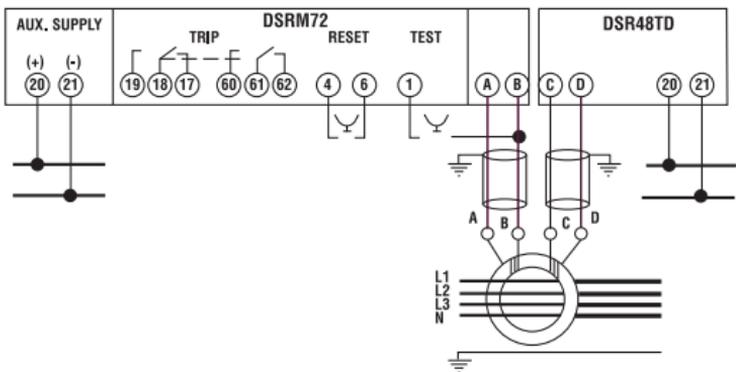
Auxiliary Voltage		Cat. No.	Price \$
110 V AC	Kit <sup>1)</sup>	<b>DSRM110V <sup>1)</sup></b>	<b>1200.00</b>
240 V AC	Kit <sup>1)</sup>	<b>DSRM240V <sup>1)</sup></b>	<b>1200.00</b>
24 V DC	Relay only	<b>DSRM7224 <sup>2)</sup></b>	<b>980.00</b>
110 V AC	Relay only	<b>DSRM72110</b>	<b>980.00</b>
240 V AC	Relay only	<b>DSRM72240</b>	<b>980.00</b>
110 V AC	Test unit	<b>DSR48TD110</b>	<b>390.00</b>
240 V AC	Test unit	<b>DSR48TD240</b>	<b>390.00</b>

**Notes:** <sup>1)</sup> Part number is made up of 1 x relay & 1 x test unit.  
<sup>2)</sup> Can be used with AC test unit.

## Panel mount mining relay series DSRM72 and DSR48T

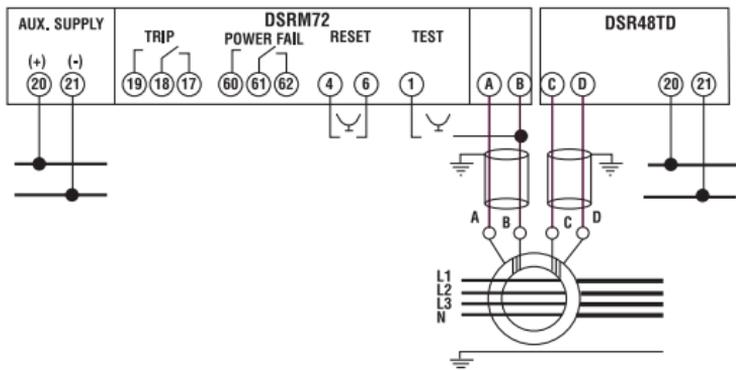
### A1.2

A1.2



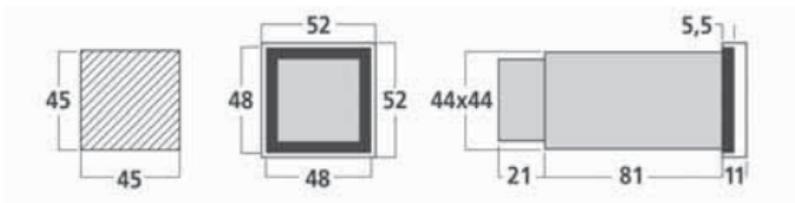
### A1.aux

A1.aux

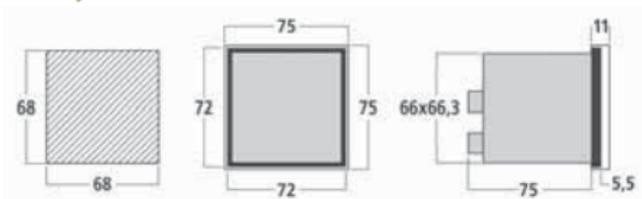


For correct working according to AS/NZS 2081:2011 the device shall be set as positive security Ne.

#### DSR48TD - Test device



#### DSRM72 - Relay



## Remote toroids Type TD Series

### TD series

Only TD type toroids are to be used in conjunction with the NHP range of RD residual current relays. Care should be taken to select a toroid size closest to the diameter of the cables being protected. Also ensure the minimum possible distance between the toroid and relay to ensure maximum accuracy.

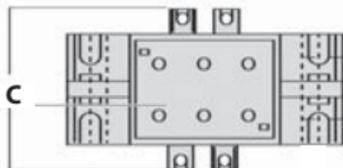
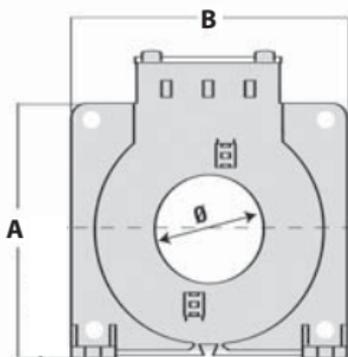


### Closed core toroids (2 wire)

Min. IΔn (A) <sup>1)</sup>	Nom. In (A)	Max. In (A) <sup>2)</sup>	Internal diameter (mm)	Overall dimensions (mm)			Cat. No.	Price \$
				A	B	C		
0.03	65	390	28	59	59	47	<b>TDGA2</b>	<b>225.00</b>
0.03	70	420	35	113	92	56	<b>TDGB2</b>	<b>300.00</b>
0.03	90	540	60	112	105	56	<b>TDGH2</b>	<b>325.00</b>
0.03	170	1020	80	160	125	56	<b>TDGC2</b>	<b>375.00</b>
0.1	250	1500	110	198	165	56	<b>TDGD2</b>	<b>570.00</b>
0.3	250	1500	140	234	200	56	<b>TDGE2</b>	<b>790.00</b>
0.3	400	2400	210	323	290	64	<b>TDGF2</b>	<b>950.00</b>

### Open (split) core toroids (2 wire)

Min. IΔn (A) <sup>1)</sup>	Nom. In (A)	Max. In (A) <sup>2)</sup>	Internal diameter (mm)	Overall dimensions (mm)			Cat. No.	Price \$
				H	W	D		
0.5	250	1500	110	214	235	79	<b>TDAA2</b>	<b>1000.00</b>
0.5	250	1500	150	259	275	79	<b>TDAB2</b>	<b>1310.00</b>
1.0	630	3780	310	386	400	30	<b>TDAC2</b>	<b>2130.00</b>



- Notes:**
- 1) Lowest value of IΔn to be set on relay with this toroid connected.
  - 2) Values shown are valid only for conductors passing exactly in the middle of the toroid.



# TL101 TRANSFER SWITCH CONTROLLER

NHP

The soft touch TL101 controller automatically or manually switches a load from a main line to an emergency supply in the event of a power failure.

POWER PROTECTION

PP-TERASAKI-EARTH LEAKAGE LOCK-CPB



- Genuine 144 x 144 mm controller solution
- User friendly display and menu selection
- Large selection of functions and options as standard

TemLogic

TERASAKI  
Innovators in Protection Technology

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## Din-T MCB

### Features

Description	Din-T 6 2 to 63 A			Din-T 10 0.5 to 63 A				Din-T 15 6 to 63 A				Din-T 10H 80 to 125 A			
	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
No. of poles	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
Protected poles	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
Width (mm)	18	36	54	18	36	54	72	18	36	54	72	27	54	81	108
Depth (mm) <sup>4)</sup>	68			68				68				70			
Rated voltage	240/415 V AC			240/415 V AC				240/415 V AC				240/415 V AC			
Max. current In	63 A			63 A				63 A				125 A			
Calibration temp. °C	30			30				40				40			
No. of operations															
220 V In COS=0.9	10000			10000				4000				4000			
415 V In COS=0.9	10000			10000				4000				4000			
Insulation resistance	>10 Mohm			>10 Mohm				>10 Mohm				>10 Mohm			
Dielectric rigidity	>2.5 kV			>2.5 kV				>2.5 kV				>2.5 kV			
Terminal capacity															
line mm <sup>2</sup>	35			35				35				70			
load mm <sup>2</sup>	35			35				35				70			

### DC application <sup>3)</sup>

Description	Din-T 6 2 to 63 A			Din-T 10 0.5 to 63 A				Din-T 15 6 to 63 A				Din-T 10H 80 to 125 A				
	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4	
Max. voltage	48 110 <sup>1)</sup> --			48 110 <sup>1)</sup> --				48 110 <sup>1)</sup> --				125 <sup>1)</sup> 250 <sup>2)</sup> --				
No. operations at T <sub>≤</sub> 15 ms	10000			10000				10000				40000				
Short circuit kA at T <sub>≤</sub> 15 ms	20	25	- -	25	30	- -	25	30	- -	25	30	- -	10	-	10	-

**Notes:** DC magnetic trip current is approximately 40 % higher than 50/60 Hz.

- 1) Series connection 2 pole MCB.
- 2) Series connection 4 pole MCB.
- 3) For DC switching at 250 V and 500 V DC refer latest edition of Part C catalogue for ratings information.
- 4) Depth measurement, excluding toggle.

## Effects of frequency on the tripping characteristic Din-T 6, 10, 10H, 15

All the MCBs are designed to work at frequencies of 50 - 60 Hz, therefore to work at different values, consideration must be given to the variation of tripping characteristics. The thermal tripping does not change with variation of the frequency but the magnetic tripping values can be up to 50 % higher than the ones at 50-60 Hz.

### Tripping characteristics according to IEC 60898

60 Hz	100 Hz	200 Hz	300 Hz	400 Hz
1	1.1	1.2	1.4	1.5

### Power losses Din-T 6, 10, 10H, 15

The power losses are calculated by measuring the voltage drop between the incoming and the outgoing terminals of the device at rated current.

### Power loss per pole

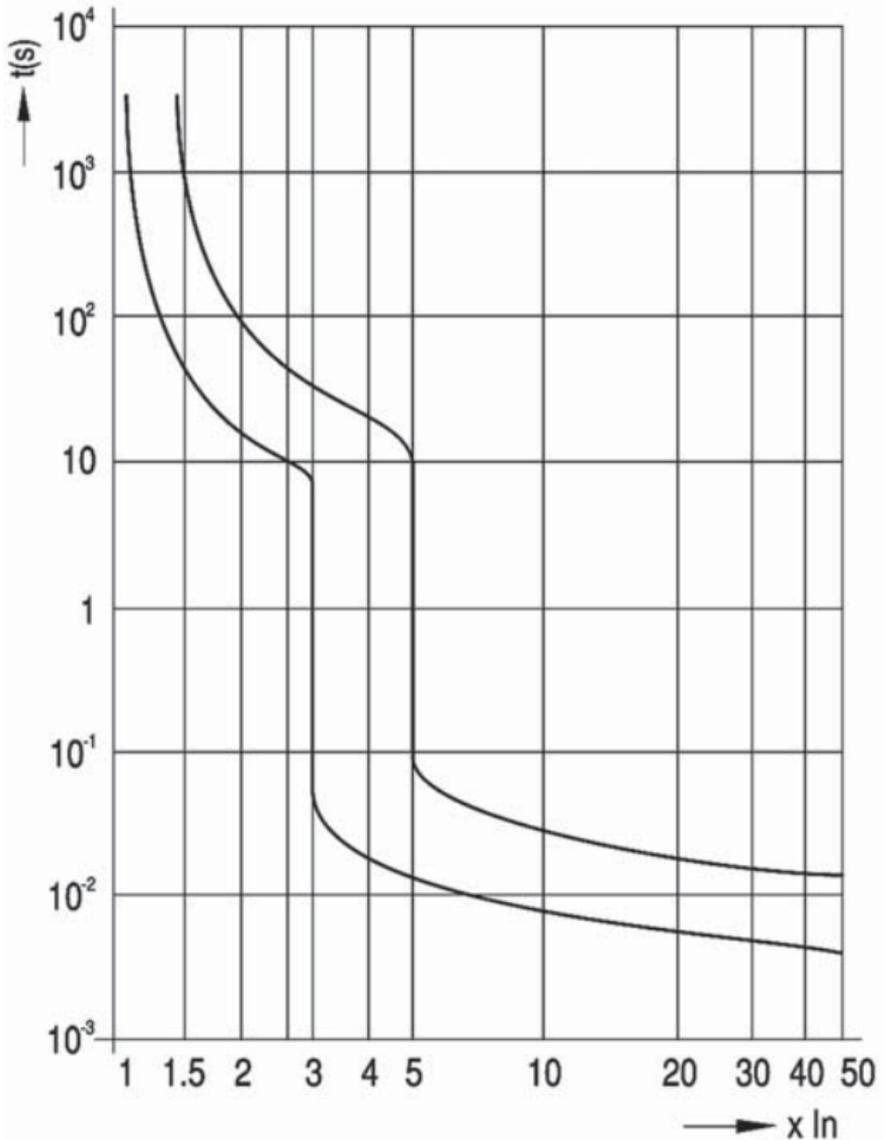
In (A)	Voltage drop (V)	Energy Loss (W)	Resistance (Mohm)
0.5	2.230	1.115	4458.00
1	1.270	1.272	1272.00
2	0.620	1.240	310.00
3	0.520	1.557	173.00
4	0.370	1.488	93.00
6	0.260	1.570	43.60
8	0.160	1.242	19.40
10	0.160	1.560	15.60
13	0.155	2.011	11.90
16	0.162	2.586	10.10
20	0.138	2.760	6.90
25	0.128	3.188	5.10
32	0.096	3.072	3.00
40	0.100	4.000	2.50
50	0.090	4.500	1.80
63	0.082	5.160	1.30
80	0.075	6.000	0.90
100	0.075	7.500	0.75
125	0.076	9.500	0.60

## Din-T time current curves Din-T 6 and 10

Tripping characteristics according to IEC 60898

Din-T 10 B Curve devices

Curve B (3 – 5 x I<sub>n</sub>)

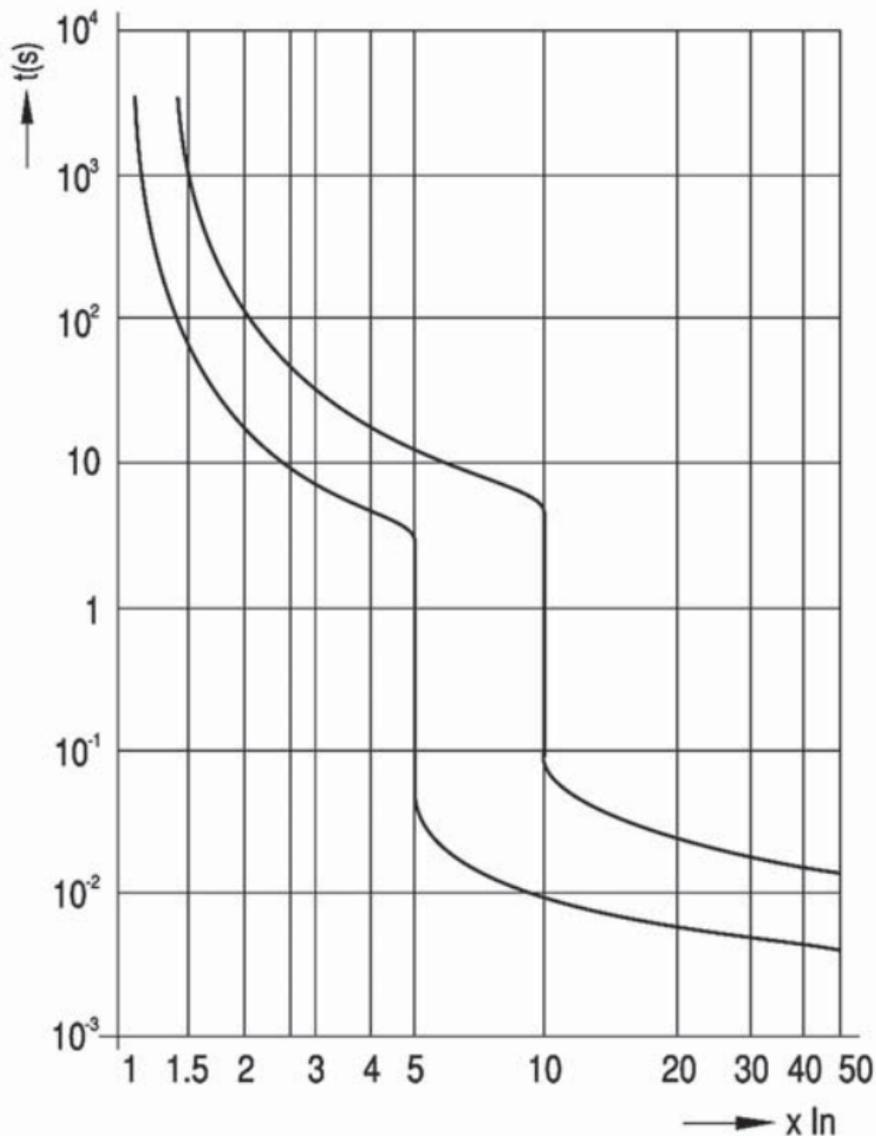


## Din-T time current curves Din-T 6 and 10

Tripping characteristics according to IEC 60898

Din-T 6, 10, 10H, 15, DC

Curve C (5 - 10 x In)

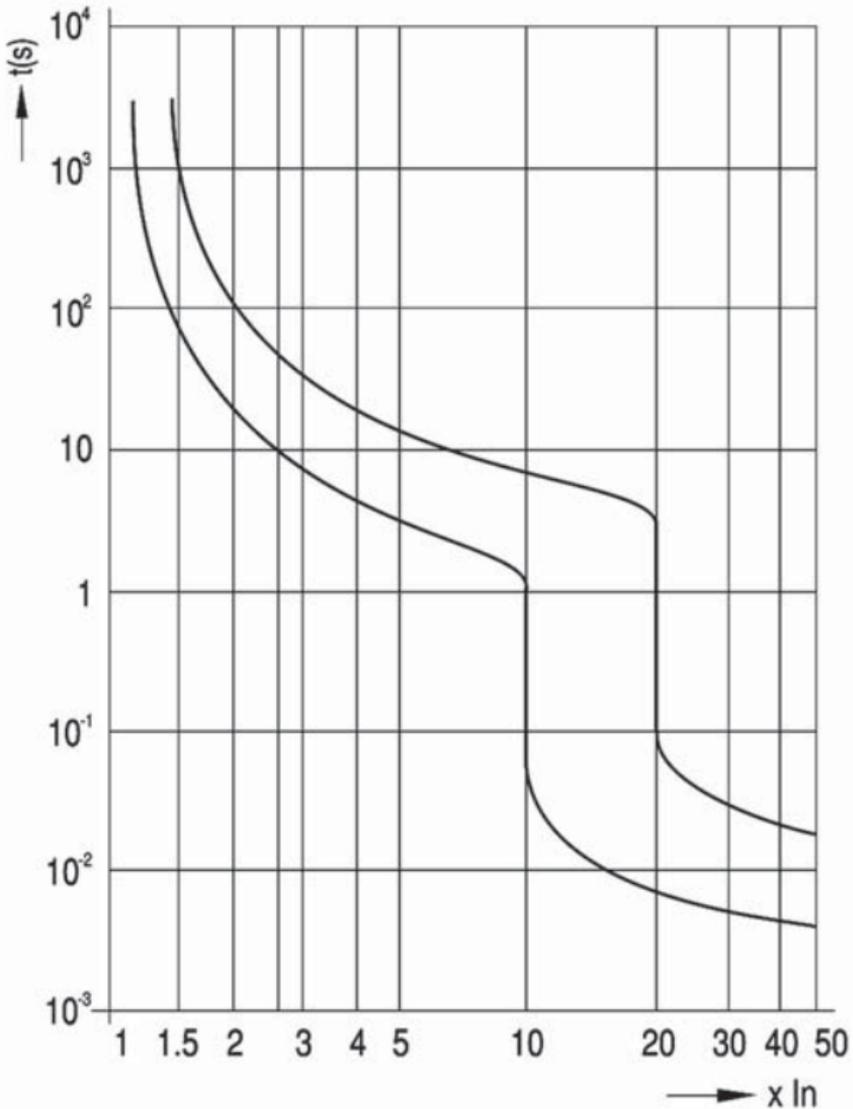


## Din-T time current curves Din-T 6 and 10

Tripping characteristics according to IEC 60898

Din-T 6, 10, 10H, 15

Curve D (10 – 20 x I<sub>n</sub>)



## Characteristics according to EN 60898

Miniature circuit breakers are intended for the protection of wiring installations against both overloads and short-circuits in **domestic** or **commercial** wiring installations, where operation is possible by **uninstructed** people.

### Magnetic release

An electromagnet with plunger ensures instantaneous tripping in the event of short-circuit. The NHP Din-T range has 3 different types, following the current for instantaneous release: types B, C and D curve.

Icn (A)	Test current	Tripping time	Applications
B	3 x In 5 x In	0.1 < t < 45 s (In ≤ 32 A) 0.1 < t < 90 s (In > 32 A) t < 0.1 s	Only for resistive loads such as: - electrical heating - water heater - stoves
C	5 x In 10 x In	0.1 < t < 15 s (In ≤ 32 A) 0.1 < t < 30 s (In > 32 A) t < 0.1 s	Usual loads such as: - lighting - socket outlets - small motors
D	10 x In 20 x In	0.1 < t < 4 s (In ≤ 32 A) 0.1 < t < 8 s (In > 32 A) t < 0.1 s	Control and protection of circuits having important transient inrush currents (large motors)

### Thermal release

The release is initiated by a bimetal strip in the event of overload. The standard defines the range of releases for specific overload values. Reference ambient temperature is 30 °C.

Test current	Tripping time
1.13 x In	t ≥ 1 h (In ≤ 63 A) t ≥ 2 h (In > 63 A)
1.45 x In	t < 1 h (In ≤ 63 A) t < 2 h (In > 63 A)
2.55 x In	1 s < t < 60 s (In ≤ 32 A) 1 s < t < 120 s (In > 32 A)

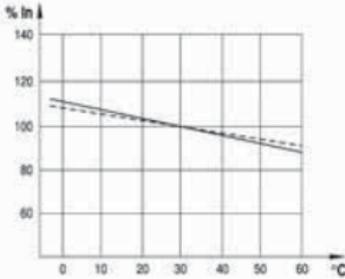
## Temperature compensation curves

### Din-T 6, 10, 10H and 15

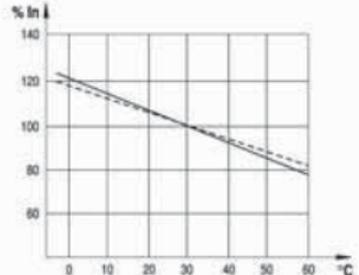
#### Influence of ambient temperature

The thermal calibration of the MCBs was carried out at an ambient temperature of 30 °C . Ambient temperatures different from the calibrated temperature influence the bimetal and this results in earlier or later thermal tripping (see curves).

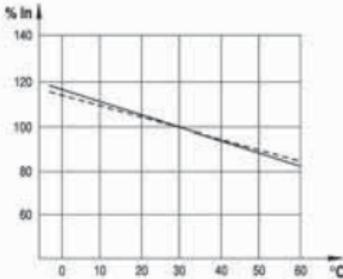
**0.5 - 6 A**



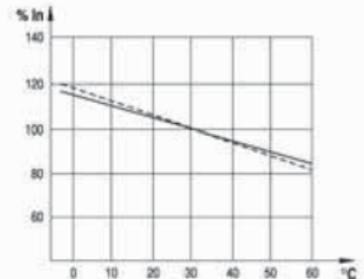
**10 A**



**16 - 40 A**



**50 - 63 A**



**Notes:** — 1 P (single pole)  
 - - - m P (multipole)

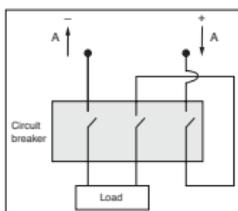
## DC current circuit breaker selection table

Circuit Breaker Type	Rated Current (A)	48 V 1 pole Icu (kA)	110 V 2 poles in series Icu (kA)	250 V 1 pole Icu (kA)	500 V 2 poles in series Icu (kA)
Din-T 6	0.5.....63 A	20	25	-	-
Din-T 10	0.5.....63 A	25	30	-	-
Din-T DC	0.5.....63 A	-	-	6	6
Din-T 15	6 .....25 A	25	30	-	-
Din-T 10H	80.... 125 A	10	10	-	-
Safe-T	6 ..... 100 A	-	5	-	-

MCCB type <sup>2)3)</sup>	24/48/ 60 V	125 V	250 V	kA Rating below		
				350 V	500 V	600 V
S160NF 1 pole	15	15	-			
ES125/NJ	25	25	25			
SHL125NJ/GJ	50	40	40			
E250NJ	25	25	25			
SHL160/250 <sup>2)</sup>	50	40	40			
E400NJ	25	25	25			
SHL400NJ/GJ <sup>3)</sup>	50	40	40			
XS630NJ	50	40	40	30	20	20
S/XS800NJ/RJ	50	40	40	30	20	20
XS1000ND <sup>1)</sup>	-	40	40	30	20	20
XS1250ND	-	40	40	30	20	20
XS1600ND	-	40	40	30	20	20
XS2000ND <sup>1)</sup>	-	40	40	30	20	20
XS2500ND <sup>1)</sup>	-	40	40	30	20	20

Refer to section 3 for 'ND' DC MCCB's rated to 600 V DC at 20 A - 800 A

THE FOLLOWING CONNECTION DIAGRAM SHOULD BE APPLIED.



### Notes for MCCB only:

For voltage levels up to and including 250 V DC standard MCCBs may be used, with two poles connected in series. For voltage levels greater than 250 V DC, three poles are to be connected in series as shown.

The time constant (L/R) of the circuit should be:

- less than 2 ms at rated current
- less than 2.5 ms for overload (2.5 x I<sub>n</sub>)
- less than 7 ms for short circuit ≤ 10 kA
- less than 15 ms for short circuit > 10 kA

**Notes:** <sup>1)</sup> Magnetic trip only, without overload protection. Available on indent only.

<sup>2)</sup> Thermal Magnetic types only can be used on DC.

<sup>3)</sup> MCCBs not suitable for 12 V DC.

## Miniature circuit breakers and fuse-fault current limiters co-ordination chart

Circuit breaker Type	kA	Rating amps	Minimum fuse amps <sup>1)</sup>	Maximum fuse – Amps			
				50 kA		63 kA	
				BS 88	DIN	BS 88	DIN
Safe-T	6	6-10	50	160 <sup>2)</sup>	160	125 <sup>2)</sup>	125
	6	16-25	63	200 <sup>2)</sup>	200	160 <sup>2)</sup>	160
	6	32	80	200 <sup>2)</sup>	200	160 <sup>2)</sup>	160
	6	40-50	100	200 <sup>2)</sup>	200	160 <sup>2)</sup>	160
	6	63-100	160	200 <sup>2)</sup>	200	160 <sup>2)</sup>	160
SRCB	6	10	50	160	160	125	125
	6	16-20	63	200	200	160	160
Din-T	6	2-25	20-63	200	200	160	160
DTCB6	6	32-63	100	200	200	160	160
DTCB10 & DTCB15 <sup>3)</sup>	10, 15	0.5-6	20	250	250	200	200
	10, 25	10	25	250	250	200	200
	10, 25	16	35	250	250	200	200
	10, 20-25	20-32	63	250	250	200	200
	10, 20-15	40-63	100	250	250	200	200
DSRCB & DSRCBH (RCBO)	10	10	25	250	250	200	200
	10	16	35	250	250	200	200
	10	20-32	63	250	250	200	200
Din-T10H	10	80	160	200	200	160	160
	10	100	200	200	200	160	160
	10	125	250	250	250	–	–
E125, S125	18/30	16-125	250	400	400	355	355

- Notes:** <sup>1)</sup> Minimum fuse size is based on grading under overload of one MCB with onset of fuses. Where a single set of fuses protects more than one MCB, the minimum fuse size shall be increased to allow for load biasing effects.
- <sup>2)</sup> Maximum fuse size based on testing to AS 3439.1 clause 8.2.3.
- <sup>3)</sup> For specific kA ratings applicable to MCBs, refer page 1-23 ratings chart. Tables based on the following maximum pre-arcing I2t for both BS 88 and DIN fuses:  
 125 A - 0.4 x 105, 160 A - 0.62 x 105, 200 A - 1.2 x 105, 250 A - 2.1 x 105.  
 Suitable fuses include NHP, GEC, Siemens and Bovara-Crady.  
 Fuses with higher current ratings may be used provided I2t values are equal to, or less than the levels above. Semi-conductor fuses have very low I2t values and may suit some applications.  
 Attention is also drawn to AS 3000 clause 7.10.4.4 regarding the use of fault current limiters in installations containing fire and smoke control equipment, evacuation equipment and lifts.

## Selectivity (discrimination) and cascade

### Selectivity

The principle of Selectivity (Discrimination) is based upon an analysis of several circuit breaker characteristics. These include time-current (tripping) curves, peak-let-through current ( $I_{peak}$ ) and energy let-through ( $I^2t$ ).

The figures stated give the maximum selectivity level with the two nominated breakers in series under short-circuit conditions. For an indication on selectivity under overloads refer to the circuit breaker tripping/characteristic curves, or use the NHP TemCurve selectivity analysis software package.

Selectivity can be enhanced beyond the breaking capacity of the downstream breaker provided it is backed up by an appropriately selected upstream breaker, which should not trip (unlatch) under the stated short circuit current.

### Cascade

Cascading is achieved by using an upstream device to assist (back-up) a downstream device in clearing a fault current. This principal is necessary should the downstream device be required to clear a prospective short circuit current greater than the devices' breaking capacity.

In most cascading applications it is generally necessary for the upstream breaker to trip (unlatch), as well as the downstream breaker to give adequate back-up protection. As such, cascade is commonly used in feeding and protecting non-essential loads, such as basic lighting.

For more information on selectivity and cascading please refer to the latest NHP Part C catalogue.

### Cascade / back-up applications

**Upstream: MCB**

**Downstream: MCB**

#### Voltage 400/415 V, Icc max. in kA

Downstream: MCBs		Upstream: MCBs		
Series	In (A)	Din-T 10 0.5 ... 63 A	Din-T 15 < 40 A	Din-T 15 50 ... 63 A
Din-T 6	0.5 ... 63	10	20	15
Din-T 10	0.5 ... 63	-	20	15

#### Voltage 220/440 V, Icc max. in kA

Downstream: MCBs		Upstream: MCBs		
Series	In (A)	Din-T 10 0.5 ... 63 A	Din-T 15 0.5 ... 63 A	Din-T 15 80 ... 125 A
Din-T 6	0.5 ... 63	30	30	-
Din-T 10	0.5 ... 63	-	30	-
Din-T 10	0.5 ... 63	-	35	-

## Selectivity MCB to MCB: Thermal Magnetic

MCBs	MCBs	Upstream C curve		Din-T 6, 10, 15						Din-T 10H		
		10 A	16 A	20 A	25 A	32 A	40 A	50 A	63 A	80 A	100 A	125 A
Down-stream B curve Din-T 10	In (A)	(kA below)								C Curve		
	6	0.07	0.10	0.15	0.18	0.23	0.27	0.35	0.45	1.5	1.6	1.7
	10	-	-	0.15	0.18	0.23	0.27	0.35	0.45	1	1.1	1.2
	16	-	-	-	-	0.23	0.27	0.35	0.45	1	1.1	1.2
	20	-	-	-	-	0.23	0.27	0.35	0.45	1	1.1	1.2
	25	-	-	-	-	-	0.27	0.35	0.45	0.9	1.1	1.1
	32	-	-	-	-	-	0.27	0.35	0.45	0.9	1	1
	40	-	-	-	-	-	-	-	-	-	0.9	0.9
	50	-	-	-	-	-	-	-	-	-	-	-
63	-	-	-	-	-	-	-	-	-	-	-	

MCBs	MCBs	Upstream C curve		Din-T 6, 10, 15						Din-T 10H		
		10 A	16 A	20 A	25 A	32 A	40 A	50 A	63 A	80 A	100 A	125 A
Down-stream C curve Din-T 6 Din-T 10 Din-T 15	In (A)	(kA below)								C Curve		
	6	0.07	0.10	0.15	0.18	0.23	0.27	0.35	0.45	1	1.1	1.2
	10	-	-	0.15	0.18	0.23	0.27	0.35	0.45	1	1.1	1.2
	16	-	-	-	-	-	0.27	0.35	0.45	1	1.1	1.2
	20	-	-	-	-	-	0.27	0.35	0.45	1	1.1	1.1
	25	-	-	-	-	-	0.27	0.35	0.45	0.9	1	1.1
	32	-	-	-	-	-	-	0.35	0.45	0.9	0.9	1
	40	-	-	-	-	-	-	-	0.45	-	-	0.9
	50	-	-	-	-	-	-	-	-	-	-	-
63	-	-	-	-	-	-	-	-	-	-	-	

## Cascade / back-up applications - Upstream: MCB Downstream: MCB

### Voltage 400/415 V, Icc max. in kA

Downstream: MCBs		Upstream: MCBs		
Series	In (A)	Din-T 10 0.5 ... 63 A	Din-T 15 < 40 A	Din-T 15 50 ... 63 A
Din-T 6	0.5...63	10	20	15
Din-T 10	0.5...63	-	20	15

### Voltage 400/415 V, Icc max. in kA

Downstream: MCBs		Upstream: MCBs		
Series	In (A)	Din-T 10 0.5 ... 63 A	Din-T 15 0.5 ... 63 A	Din-T 15 80 ... 125 A
Din-T 6	0.5...63	20	22	16
Din-T 10	≤ 32	-	50	-
Din-T 15	≥ 40	-	35	-

### Back-up protection with MCBs (DSRCD)

		Din-T 6	Din-T 10	Din-T 15	Din-T 10H
	(A)	(kA)	(kA)	(kA)	(kA)
<b>RCCB 2 Poles 240 V (DSRCD)</b>	16	20	20	20	10
	25	20	20	20	10
	40	20	20	20	10
	63	20	20	20	10
	80	-	-	-	10
	100	-	-	-	10
<b>RCCB 4 Poles 415 V (DSRCD)</b>	25	10	10	10	10
	40	10	10	10	10
	63	10	10	10	10
	80	-	-	-	10
	100	-	-	-	10

### Back-up protection with fuses gG (DSRCD)

		16 A	25 A	32 A	40 A	50 A	63 A	80 A	100 A
	(A)	(kA)							
<b>RCCB 2 Poles 240 V (DSRCD)</b>	16	100	100	80	50	40	25	16	10
	25	100	100	80	50	40	25	16	10
	40	100	100	80	50	40	25	16	10
	63	100	100	80	50	40	25	16	10
	80	100	100	80	50	40	25	16	10
	100	100	100	80	50	40	25	16	10
<b>RCCB 4 Poles 415 V (DSRCD)</b>	25	100	100	80	50	40	25	16	10
	40	100	100	80	50	40	25	16	10
	63	100	100	80	50	40	25	16	10
	80	100	100	80	50	40	25	16	10
	100	100	100	80	50	40	25	16	10

## Selectivity and Cascade tables @ 400/415 V - MCCBs and MCBs

Downstream MCB			Upstream MCCBs								
			25 kA E125NJ				36 kA S125NJ				65 kA S125GJ- ZS125GJ
			63	80	100	125	63	80	100	125	63
DTCB6	≤20	6	25 /25	25 /25	25 /25	25 /25	25 /25	25 /25	25 /25	25 /25	35 /35
	25 & 32		20 /25	20 /25	20 /25	20 /25	20 /25	20 /25	20 /25	20 /25	20 /25
	40		- /25	20 /25	20 /25	20 /25	- /25	20 /25	20 /25	20 /25	- /25
	50 & 63		- /25	- /25	20 /25	20 /25	- /25	- /25	20 /25	20 /25	- /25
DINT10, DSRCBH & DSRCB	≤32	10	25 /25	25 /25	25 /25	25 /25	30 /36	30 /36	30 /36	30 /36	30 /50
	40		2 /25	20 /25	20 /25	20 /25	- /25	20 /25	20 /25	20 /25	- /25
	50 & 63		2 /25	- /25	20 /25	20 /25	- /25	- /25	20 /25	20 /25	- /25
DIN-T10H	80	10			4 /25	4 /25			4 /25	4 /25	
	100					4 /25				4 /25	
	125										
DIN-T15	≤32	15	25 /25	25 /25	25 /25	25 /25	30 /36	30 /36	30 /36	30 /36	30 /50
	40		- /25	20 /25	20 /25	20 /25	- /25	20 /25	20 /25	20 /25	- /25
	50 & 63		- /25	- /25	20 /25	20 /25	- /25	- /25	20 /25	20 /25	- /25
SAFE-T & SRCB	≤63	6	- /10	3 /10	3 /10	3 /10	- /10	3 /10	3 /10	3 /10	- /10

Downstream MCB			Upstream MCCBs												
			25 kA E250NJ					36 kA S250NJ			65 kA S250GJ - ZS250GJ			63	
			63	80	100	160	200	250	160	200	250	160	200	250	63
DTCB6	≤20	6	25 /25	25 /25	25 /25	25 /25	25 /25	25 /25	36 /36	36 /36	36 /36	36 /36	36 /36	36 /36	36 /36
	25 & 32		25 /25	25 /25	25 /25	25 /25	25 /25	25 /25	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	- /30
	40		- /25	20 /25	25 /25	25 /25	25 /25	25 /25	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30
	50 & 63		- /25	- /25	25 /25	25 /25	25 /25	25 /25	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	- /30
DINT10H, DSRCBH & DSRCB	≤32	10	25 /25	25 /25	25 /25	25 /25	25 /25	25 /25	36 /36	36 /36	36 /36	40 /65	40 /65	40 /65	40 /65
	40		- /25	20 /25	25 /25	25 /25	25 /25	25 /25	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	- /30
	50 & 63		- /25	- /25	25 /25	25 /25	20 /25	25 /25	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	- /30
DIN-T10H	80	10			15 /25	15 /25	15 /25	15 /25	15 /25	15 /25	15 /25	15 /25	15 /25	15 /25	
	100					15 /25	15 /25	15 /25	15 /25	15 /25	15 /25	15 /25	15 /25	15 /25	
	125					- /25	15 /25	15 /25	- /25	15 /25	15 /25	- /25	15 /25	15 /25	
DIN-T15	≤32	15	25 /25	25 /25	25 /25	25 /25	25 /25	25 /25	36 /36	36 /36	36 /36	40 /65	40 /65	40 /65	40 /65
	40		- /25	25 /25	25 /25	25 /25	25 /25	25 /25	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	- /30
	50 & 63		- /25	- /25	25 /25	25 /25	25 /25	25 /25	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	- /30

**Notes:** XX Selectivity YY Cascade

& 125 kA H125NJ			36 kA S160NJ					65 kA S160GJ			& 125 kA H160NJ			
80	100	125	63	80	100	125	160	63	80	100	125	160		
35 /35	35 /35	35 /35	36 /36	36 /36	36 /36	36 /36	36 /36	36 /36	36 /36	36 /36	36 /36	36 /36	36 /36	
20 /25	20 /25	20 /25	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	30 /30	
20 /25	20 /25	20 /25	- /30	30 /30	30 /30	30 /30	30 /30	- /30	30 /30	30 /30	30 /30	30 /30	30 /30	
- /25	20 /25	20 /25	- /30	- /30	30 /30	30 /30	30 /30	- /30	- /30	30 /30	30 /30	30 /30	30 /30	
30 /50	30 /50	30 /50	36 /36	36 /36	36 /36	36 /36	36 /36	40 /65	40 /65	40 /65	40 /65	40 /65	40 /65	
25 /25	25 /25	25 /25	- /30	30 /30	30 /30	30 /30	30 /30	- /30	30 /30	30 /30	30 /30	30 /30	30 /30	
- /25	25 /25	25 /25	- /30	- /30	30 /30	30 /30	30 /30	- /30	- /30	30 /30	30 /30	30 /30	30 /30	
	4 /25	4 /25			15 /15	15 /15	15 /15			15 /15	15 /15	15 /15	15 /15	
		4 /25				15 /15	15 /15				15 /15	15 /15	15 /15	
							15 /15						15 /15	
30 /50	30 /50	30 /50	36 /36	30 /36	30 /36	30 /36	30 /36	40 /65	40 /65	40 /65	40 /65	40 /65	40 /65	
20 /25	25 /25	25 /25	- /30	30 /30	30 /30	30 /30	30 /30	- /30	30 /30	30 /30	30 /30	30 /30	30 /30	
- /25	25 /25	25 /25	- /30	- /30	30 /30	30 /30	30 /30	- /30	- /30	30 /30	30 /30	30 /30	30 /30	
3 /10	3 /10	3 /10												

70 kA S250PE & 125 kA H250NJ-H250NE			36 kA S400CJ				50 kA S400NJ - S400NE				70 kA S400GE						
80	100	125	160	200	250	100	200	250	400	100	200	250	400	100	200	250	400
36/36	36/36	36/36	36/36	36/36	36/36												
30/30	30/30	30/30	30/30	30/30	30/30												
30/30	30/30	30/30	30/30	30/30	30/30												
- /30	30/30	30/30	30/30	30/30	30/30												
40/65	40/65	40/65	40/65	40/65	40/65	36/36	36/36	36/36	36/36	40/50	40/50	40/50	40/50	40/65	40/65	40/65	40/65
30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30
- /30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30
	15/15	15/15	15/15	15/15	15/15	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
		15/15	15/15	15/15	15/15	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
						- /10	10/10	10/10	10/10	- /10	10/10	10/10	10/10	- /10	10/10	10/10	10/10
40/65	40/65	40/65	40/65	40/65	40/65	36/36	36/36	36/36	36/36	40/50	40/50	40/50	40/50	40/65	40/65	40/65	40/65
- /30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30
- /30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30

## Selectivity & Cascade Tables

@ 400 / 415 V

Upstream MCCBs 1)

Down-stream MCCB	kA (RMS)	Upstream MCCBs 1)								
		S250PE 70	H250NE 125	S400NE 50	S400GE 70	S400PE 85	H400NE 125	L400NE 200	E630NE 36	S630CE 50
E125NJ	25	25 / 50	25 / 65	25 / 36	25 / 50	25 / 50	25 / 65	25 / 85	25 / 36	25 / 36
S125NJ	36	36 / 65	36 / 85	36 / 50	36 / 65	36 / 65	36 / 85	36 / 125	36 / 36	36 / 50
S125GJ	65	65 / 70	65 / 125	50 / 50	65 / 70	65 / 85	65 / 125	65 / 150	36 / 36	50 / 50
ZS125GJ										
H125NJ	125	70 / 70	125 / 125	50 / 50	70 / 70	85 / 85	125 / 125	125 / 200	36 / 36	50 / 50
S160NJ	36	- / 65	- / 85	36 / 50	36 / 65	36 / 65	36 / 85	36 / 125	36 / 36	36 / 50
S160GJ	65	- / 70	- / 125	50 / 50	65 / 70	65 / 85	65 / 125	65 / 150	36 / 36	50 / 50
H160NJ	125	- / 70	- / 125	- / 50	- / 70	- / 85	125 / 125	125 / 200	36 / 36	50 / 50
E250NJ	25	- / 50	- / 85	25 / 36	25 / 50	25 / 50	25 / 65	25 / 85	25 / 36	25 / 36
S250NJ	36	- / 65	- / 85	36 / 50	36 / 65	36 / 65	36 / 85	36 / 125	36 / 36	36 / 50
S250GJ	65	- / 70	- / 125	50 / 50	65 / 70	65 / 85	65 / 125	65 / 150	36 / 36	50 / 50
ZS250GJ										
S250PE	70		- / 125	- / 50	- / 70	- / 85	70 / 125	70 / 150	36 / 36	50 / 50
H250NJ	125			- / 50	- / 70	- / 85	125 / 125	125 / 200	36 / 36	50 / 50
H250NE	125			- / 50	- / 70	- / 85	125 / 125	125 / 200	36 / 36	50 / 50
E400NJ	25			- / 36	- / 50	- / 50	- / 65	- / 85	10 / 36	10 / 36
S400CJ	36			- / 50	- / 65	- / 65	- / 70	- / 100	10 / 36	10 / 50
S400NE	50				- / 50	- / 70	- / 50	- / 50	10 / 36	10 / 50
S400NJ	50				- / 70	- / 70	- / 85	- / 125	10 / 36	10 / 50
S400GJ/GE	70					- / 85	- / 125	- / 150	10 / 36	10 / 50
S400PE	85					- / 85	- / 125	- / 150	10 / 36	10 / 50
H400NE	125					- / 85			10 / 36	10 / 50
E630NE	36									
E630CE	50									
S630GE	70									
XS630CJ	42									
XS630NJ	65									
XS630PJ	85									
XS630SE	50									
XH630SE	65									
XH630PE	65									
XS800NJ	65									
XS800SE	50									
XJ800PJ	85									
XH800SE	65									
XH800PE	65									
XS1250SE	65									
XS1600SE	85									

Notes: XX Selectivity YY Cascade

## Selectivity & Cascade Tables @ 400 / 415 V

XS630SE	XH630SE	S630GE	TL630NE	XS800SE	XH800SE	TL800NE	XS1250SE	TL1250NE	XS1600SE	XS2000NE	XS2500NE	XS3200NE
50	65	70	125	50	65	125	85	125	100	85		
25 / 36	25 / 50	25 / 50	25 / 25	25 / 36	25 / 36	25 / 36	25 / 25	25 / 25	25 / 25	25 / 25		
36 / 50	36 / 65	36 / 65	36 / 36	36 / 50	36 / 36	36 / 36	36 / 36	36 / 36	36 / 36	36 / 36		
50 / 50	65 / 65	65 / 70	65 / 65	50 / 50	65 / 65	65 / 65	65 / 65	65 / 65	65 / 65	65 / 65		
50 / 50	50 / 65	70 / 70	70 / 125	50 / 50	65 / 65	65 / 125	85 / 85	85 / 125	100 / 100	85 / 85		85 / 85
36 / 50	36 / 50	36 / 50	36 / 36	36 / 50	36 / 65	36 / 36	36 / 36	36 / 36	36 / 36	36 / 36		36 / 36
50 / 50	50 / 65	65 / 70	65 / 65	50 / 50	50 / 65	50 / 65	65 / 65	65 / 65	65 / 65	65 / 65		65 / 65
50 / 50	50 / 65	70 / 70	70 / 125	50 / 50	50 / 65	50 / 125	85 / 85	85 / 125	100 / 100	85 / 85		85 / 85
25 / 36	25 / 50	25 / 50	25 / 25	25 / 36	25 / 50	25 / 50	25 / 25	25 / 25	25 / 25	25 / 25		25 / 25
36 / 50	36 / 65	36 / 65	36 / 36	36 / 50	36 / 65	36 / 65	36 / 36	36 / 36	36 / 36	36 / 36		36 / 36
50 / 50	50 / 65	65 / 70	65 / 65	50 / 50	50 / 65	50 / 65	65 / 65	65 / 65	65 / 65	65 / 65		65 / 65
50 / 50	50 / 65	70 / 70	70 / 70	50 / 50	65 / 65	50 / 70	70 / 70	70 / 70	70 / 70	70 / 70		70 / 70
50 / 50	50 / 65	70 / 70	70 / 125	50 / 50	50 / 65	50 / 125	85 / 85	85 / 125	100 / 100	85 / 85		85 / 85
50 / 50	50 / 65	70 / 70	70 / 125	50 / 50	65 / 65	50 / 125	85 / 85	85 / 125	100 / 100	85 / 85		85 / 85
10 / 36	10 / 50	10 / 50	10 / 36	25 / 36	25 / 50	25 / 36	25 / 36	25 / 36	25 / 36	25 / 36		25 / 25
10 / 50	10 / 65	10 / 65	10 / 50	25 / 50	25 / 65	25 / 50	36 / 50	36 / 50	36 / 50	36 / 50		36 / 36
10 / 50	10 / 50	10 / 50	10 / 50	25 / 50	25 / 50	25 / 50	50 / 50	50 / 50	50 / 50	50 / 50		50 / 50
10 / 50	10 / 65	10 / 70	10 / 65	25 / 50	25 / 65	25 / 65	50 / 65	50 / 65	50 / 65	50 / 65		50 / 50
10 / 50	10 / 65	10 / 70	10 / 70	25 / 50	25 / 65	25 / 70	70 / 70	70 / 70	70 / 85	70 / 70		70 / 70
10 / 50	10 / 65	10 / 70	10 / 85	25 / 50	25 / 65	25 / 85	70 / 85	85 / 85	85 / 85	85 / 85		85 / 85
10 / 50	10 / 65	10 / 70	10 / 125	25 / 50	25 / 65	25 / 125	85 / 85	85 / 125	85 / 100	85 / 85		85 / 85
				25 / 36	25 / 36	25 / 36	36 / 36	36 / 36	36 / 36	36 / 36		36 / 36
				25 / 50	25 / 50	25 / 50	50 / 50	50 / 50	50 / 50	50 / 50		50 / 50
							70 / 70	70 / 70	70 / 70	70 / 70		70 / 70
							30 / 42	30 / 42	30 / 42	35 / 42		35 / 42
							30 / 65	30 / 65	30 / 65	35 / 65		35 / 65
							30 / 85	30 / 85	30 / 85	35 / 85		35 / 85
							30 / 65	30 / 65	30 / 85	30 / 85		30 / 85
							30 / 65	30 / 65	30 / 85	30 / 85		30 / 85
							30 / 65	30 / 65	30 / 85	30 / 85		30 / 85
							15 / 65	15 / 65	20 / 65	35 / 65		35 / 65
							15 / 50	15 / 50	20 / 50	35 / 50		35 / 50
							15 / 85	15 / 85	20 / 85	35 / 85		35 / 85
							15 / 65	15 / 65	20 / 65	35 / 65		35 / 65
							15 / 65	15 / 65	20 / 65	35 / 65		35 / 65
									20 / 65	35 / 65		35 / 65
										35 / 85		35 / 85

**Notes:** 1) Refer NHP for TemBreak 2 MCCB combinations not included above.

## Cascade table

### Upstream-Downstream MCCBs (Thermal magnetic upstream)

#### Cascade @ 380 - 415 V AC <sup>1)</sup>

Upstream MCCBs		E125NJ	S125NJ	S125GJ ZS- 125GJ	H125NJ	L125NJ	S160NJ	S160GJ	H160NJ	L160NJ	
<b>DownstreamkA</b>											
<b>MCCBs (RMS)</b>	<b>25</b>	<b>25</b>	<b>36</b>	<b>65</b>	<b>125</b>	<b>200</b>	<b>36</b>	<b>65</b>	<b>125</b>	<b>200</b>	
<b>E125NJ</b>	<b>25</b>	25	36	50	65	85	36	50	65	85	
<b>S125NJ</b>	<b>36</b>	-	36	65	85	125	36	65	85	125	
<b>S125GJ</b>	<b>65</b>	-	-	65	125	150	36	65	125	150	
<b>H125NJ</b>	<b>125</b>	-	-	65	125	200	36	65	125	200	
<b>S160NJ</b>	<b>36</b>	-	-	65	36	36	36	65	85	125	
<b>S160GJ</b>	<b>65</b>	-	-	-	-	-	-	65	125	150	
<b>H160NJ</b>	<b>125</b>	-	-	-	-	-	-	65	125	200	
<b>E250NJ</b>	<b>25</b>	-	-	-	-	-	-	25	25	25	
<b>S250NJ</b>	<b>36</b>	-	-	-	-	-	-	65	36	36	
<b>S250GJ</b>	<b>65</b>	-	-	-	-	-	-	-	-	-	
<b>S250PE</b>	<b>70</b>	-	-	-	-	-	-	-	-	-	
<b>H250NJ</b>	<b>125</b>	-	-	-	-	-	-	-	-	-	
<b>E400NJ</b>	<b>25</b>	-	-	-	-	-	-	-	-	-	
<b>S400CJ</b>	<b>36</b>	-	-	-	-	-	-	-	-	-	
<b>S400NJ</b>	<b>50</b>	-	-	-	-	-	-	-	-	-	
<b>S400GJ</b>	<b>70</b>	-	-	-	-	-	-	-	-	-	
<b>H400NJ</b>	<b>125</b>	-	-	-	-	-	-	-	-	-	

**Notes:** <sup>1)</sup> Ratings have not been verified where a dash "-" is shown. All pick-up and time delay settings are to be set at a maximum for upstream MCCBs.

E250NJ	S250NJ	S250GJ ZS- 250GJ	H250NJ	L250NJ	S400CJ	S400NJ	S400GJ	H400NJ	L400NJ	XS- 800NJ
<b>25</b>	<b>36</b>	<b>65</b>	<b>125</b>	<b>200</b>	<b>36</b>	<b>50</b>	<b>70</b>	<b>125</b>	<b>200</b>	<b>65</b>
25	36	50	65	85	36	36	50	65	85	36
25	36	65	85	125	36	50	65	85	125	50
25	36	65	125	150	36	50	70	125	150	65
25	36	65	125	200	36	50	70	125	200	65
25	36	65	85	125	36	50	65	85	125	65
25	36	65	125	150	36	50	70	125	150	65
25	36	65	125	200	36	50	70	125	200	65
25	25	50	65	85	36	36	50	65	85	36
25	36	65	85	125	36	50	65	85	125	65
-	-	65	125	150	36	50	70	125	150	65
-	-	65	125	150	36	50	70	125	150	65
-	-	65	125	200	36	50	70	125	200	65
-	-	25	65	25	36	36	50	65	85	50
-	-	36	70	36	36	50	65	70	100	65
-	-	50	85	50	36	50	70	85	125	50
-	-	50	125	70	36	50	70	125	150	65
-	-	-	-	-	-	-	-	-	200	65

## Application data Load-break / MCCB

### Socomec load-break switch and TemBreak MCCB co-ordination chart

#### TemBreak MCCB

Socomec Load-break switch	(kA) rms		(kA) rms		(kA) rms		(kA) rms	
	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
SLB63	E125NJ	6.5	S125NJ	6.5	S125GJ <sup>1)</sup>	6.5	H125NJ	7.5
	E125NJ	22	S125NJ	22	S125GJ <sup>1)</sup>	22	H125NJ	30
SLB125	-	-	S160NJ	15	S160GJ	15	H160NJ	27
	E250NJ	15	S250NJ	15	S250GJ <sup>1)</sup>	15	H250NJ	26
SLB200	E125NJ	25	S125NJ	36	S125GJ <sup>1)</sup>	65	H125NJ	80
	-	-	S160NJ	30	S160GJ	30	H160NJ	80
	E250NJ	25	S250NJ	30	S250GJ <sup>1)</sup>	30	H250NJ	80
SLB250	E250NJ	25	S250NJ	30	S250GJ <sup>1)</sup>	30	H250NJ	50
	E400NJ	25	S400NJ	25	S400GJ	25	H400NJ	35
SLB315	E250NJ	25	S250NJ	36	S250GJ <sup>1)</sup>	65	H250NJ	100
	E400NJ	25	S400NJ	50	S400GJ	65	H400NJ	100
SLB400	E400NJ	25	S400NJ	50	S400GJ	65	H400NJ	100

#### TemBreak MCCB

Socomec Load-break switch	(kA) rms		(kA) rms		(kA) rms	
	MCCB	MCCB	MCCB	MCCB	MCCB	MCCB
SLB630	E630NE	35	S630CE	35	TL630NE	24
SLB800	XS800NJ	40	XH800PJ	40	TL800NE	28
SLB1000	XS1250SE	45	XS1600SE	45	TL1250NE	45
SLB1250	XS1250SE	65	XS1600SE	75	TL1250NE	70
SLB1600	XS1600SE	75	XS2000NE	60	-	-
SLB2000	XS2000NE	60	XS2500NE	60	-	-
SLB2500	XS2500NE	60	-	-	-	-

**Notes:** <sup>1)</sup> Ratings also apply for ZS125GJ and ZS250GJ.  
 Figures based on / valid for – 400/415 V AC  
 Application example:  
 All Socomec load-break switches can be used in higher prospective fault current level applications, due to the upstream Terasaki TemBreak MCCB reducing the peak let-through current.  
 Example: SLB250 can be used in a 30 kA application if there is an upstream S250NJ MCCB.  
 For other combinations please refer to NHP.

## Watts loss for Terasaki MCCBs <sup>1)</sup>

C/B rating MCCBs	Amps	AC Watts	DC Watts
<b>TemBreak 2 MCCBs</b>			
E/S125 NJ - GJ, VS125NJ	125	38	34
S160 NJ - GJ, VS250NJ (160 A)	160	40	36
E/S250 NJ - GJ, VS250NJ	250	55	49
S250PE	250	82	73
E/S400 CJ - NJ - GJ	400	75	67
E/S400 NE - GE	400	70	62
E/S630 NE - CE - GE-PE	630	133	119
<b>TemBreak 1 MCCBs</b>			
XS/XH400SE, XV400NE	400	69	62
XS/XH630SE, XV630PE	630	109	97
XS800NJ	800	150	134
XS/XH800SE, XV800PE	800	151	134
XS1250SE, XV1250NE	1250	194	173
XS1600SE	1600	189	169
XS2000NE	2000	228	204
XS2500NE	2500	357	319
XS3200NE	3200	585	522

**Notes:** <sup>1)</sup> Values are valid for the maximum ampere trip units per breaker type. (E.g. S125GJ : 125 A) The above watts losses are for 3 poles combined.

## Downstream short-circuit current calculator

Calculation of a downstream short-circuit current is a function of the upstream short-circuit current ( $I_{sc0}$ ), cross-section and length of the conductor. The following table provides information to calculate approximately the short-circuit current at a relevant point of the installation.

### Line protection - copper conductor

mm <sup>2</sup>	Length of the line in metres											
1.5												
2.5												
4												0.8
6												1.2
10									0.8	1.1	2.1	
16							0.8	1.0	1.3	1.7	3.3	
25						1.1	1.3	1.6	2.1	2.6	5.1	
35						1.5	1.8	2.2	3.0	3.7	7.2	
50					1.0	2.2	2.6	3.1	4.2	5.3	10	
70					1.4	3.0	3.6	4.4	5.9	7.4	14	
95		0.8	0.9	1.0	2.0	4.1	4.9	6.0	8.0	10	20	
120		0.9	1.0	1.2	1.3	2.5	5.2	6.2	7.5	10	13	25
150	0.8	1.0	1.1	1.3	1.4	2.7	5.6	6.8	8.2	11	14	27
185	1.0	1.2	1.3	1.5	1.7	3.2	6.7	8.0	9.7	13	16	32
240	1.2	1.5	1.7	1.9	2.1	3.9	8.3	10	12	16	20	39
300	1.4	1.7	2.0	2.2	2.5	4.7	10	12	14	19	24	47
400	1.6	1.9	2.2	2.4	2.7	5.1	11	13	16	21	26	51
500	1.7	2.1	2.4	2.7	3.0	5.7	12	14	17	23	29	57
625	1.8	2.1	2.5	2.8	3.1	5.8	12	15	18	24	30	58
2x95	1.2	1.4	1.6	1.8	2.1	3.9	8.2	9.9	12	16	20	39
2x120	1.5	1.8	2.1	2.3	2.6	4.9	10	12	15	20	25	49
2x150	1.6	2.0	2.3	2.5	2.8	5.4	11	14	16	22	28	54
2x185	1.9	2.3	2.7	3.0	3.3	6.3	13	16	19	26	33	63
2x240	2.4	2.9	3.3	3.7	4.2	7.9	17	20	24	32	41	79
3x95	1.8	2.2	2.5	2.8	3.1	5.9	12	15	18	24	30	59
3x120	2.3	2.7	3.1	3.5	3.9	7.4	16	19	23	30	38	74
3x150	2.5	3.0	3.4	3.8	4.2	8.0	17	20	25	33	41	80
3x185	2.9	3.5	4.0	4.5	5.0	9.5	20	24	29	39	49	95
3x240	3.6	4.4	5.0	5.6	6.2	12	25	30	36	49	61	118

Isc at the origin of the cable	Isc <sub>0</sub> kA	Short-circuit current at the end of the cable											
	100	94	93	92	91	90	83	70	66	62	55	49	33
90	85	84	84	83	82	76	65	62	58	52	47	32	
80	76	76	75	74	74	69	60	57	54	48	44	31	
70	67	67	66	66	65	61	54	52	49	44	41	29	
60	58	57	57	57	56	54	48	46	44	40	37	27	
50	49	48	48	48	47	45	41	40	38	35	33	25	
40	39	39	39	39	38	37	34	33	32	30	28	22	
35	34	34	34	34	34	33	30	30	29	27	26	21	
30	29	29	29	29	29	28	27	26	25	24	23	19	
25	25	25	24	24	24	24	23	22	22	21	20	17	
20	20	20	20	20	20	19	18	18	18	17	17	14	
15	15	15	15	15	15	15	14	14	14	13	13	12	
10	9.9	9.9	9.9	9.9	9.9	9.8	9.6	9.5	9.4	9.2	9.1	8.3	
7	7.0	7.0	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.6	6.5	6.1	
5	5.0	5.0	5.0	5.0	5.0	5.0	4.9	4.9	4.9	4.8	4.8	4.5	
4	4.0	4.0	4.0	4.0	4.0	4.0	3.9	3.9	3.9	3.9	3.8	3.7	
3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.9	2.8	
2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	
1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	

## 9 Example

Cable with cross-section 95 mm<sup>2</sup> Cu, 45 m length, and short-circuit current at the transformer terminals of 30 kA. Estimated short-circuit current of **12 kA** at the end of the cable.

		0.9	1.3	1.6	3.1	6.2	7.8	9.4	13	16	31
1.0	1.3	1.6	2.1	2.6	5.1	10	13	16	21	26	51
1.6	2.1	2.5	3.4	4.2	8.2	16	21	25	34	42	82
2.5	3.1	3.8	5.1	6.4	12	25	31	38	51	64	123
4.1	5.2	6.3	8.4	11	21	41	52	63	84	106	205
6.6	8.3	10	13	17	33	66	83	100	135	170	329
10	13	16	21	26	51	103	130	157	211	265	514
14	18	22	30	37	72	144	182	219	295	371	719
21	26	31	42	53	103	205	259	314	422	530	
29	36	44	59	74	144	288	363	439	590	742	
39	49	60	80	101	195	390	493	596	801		
49	62	75	101	127	246	493	623	752			
54	68	82	110	138	268	536	677	818			
63	80	97	130	163	317	633	800	967			
79	100	120	162	203	394	789	996				
95	120	145	195	244	474	948					
103	130	157	211	265	514						
114	144	174	234	294	571						
117	147	178	240	301	584						
78	99	119	160	201	390	781	986				
99	125	150	202	254	493	986					
107	135	164	220	276	536						
127	160	193	260	327	633						
158	199	241	324	407	789						
117	148	179	240	302	585						
148	187	226	304	381	739						
161	203	245	330	415	804						
190	240	290	390	490	950						
237	299	361	486	610							

20	16	14	11	8.8	4.7	2.4	1.9	1.6	1.2	1.0	0.5
19	16	14	11	8.7	4.7	2.4	1.9	1.6	1.2	1.0	0.5
19	16	14	11	8.6	4.7	2.4	1.9	1.6	1.2	1.0	0.5
18	15	13	10	8.5	4.6	2.4	1.9	1.6	1.2	1.0	0.5
18	15	13	10	8.3	4.6	2.4	1.9	1.6	1.2	0.9	0.5
17	14	12	9.8	8.1	4.5	2.4	1.9	1.6	1.2	0.9	0.5
15	13	12	9.3	7.8	4.4	2.3	1.9	1.6	1.2	0.9	0.5
15	13	11	9.0	7.6	4.4	2.3	1.9	1.6	1.2	0.9	0.5
14	12	11	8.6	7.3	4.3	2.3	1.8	1.5	1.2	0.9	0.5
12	11	9.9	8.2	7.0	4.2	2.3	1.8	1.5	1.2	0.9	0.5
11	10	9.0	7.5	6.5	4.0	2.2	1.8	1.5	1.1	0.9	0.5
9.4	9.0	7.8	6.7	5.9	3.7	2.1	1.7	1.5	1.1	0.9	0.5
7.1	7.0	6.2	5.5	4.9	3.3	2.0	1.6	1.4	1.1	0.9	0.5
5.5	5.0	4.9	4.4	4.1	2.9	1.8	1.5	1.3	1.0	0.8	0.5
4.2	4.0	3.8	3.5	3.3	2.5	1.7	1.4	1.2	1.0	0.8	0.5
3.4	3.0	3.2	3.0	2.8	2.2	1.5	1.3	1.2	0.9	0.8	0.4
2.7	3.0	2.5	2.4	2.3	1.9	1.4	1.2	1.1	0.9	0.7	0.4
1.9	2.0	1.8	1.7	1.7	1.4	1.1	1.0	0.9	0.8	0.7	0.4
1.0	1.0	0.9	0.9	0.9	0.8	0.7	0.7	0.6	0.5	0.5	0.3

**Correction coefficient**

<b>Voltage</b>	<b>K</b>
230 V	0.58
660 V	1.65

- Values shorter than 0.8 m or longer than 1 km are not considered.
- All values are for voltage 400 V.

## Short circuit co-ordination

### What is co-ordination?

The motor starter consists of a combination of contactor, overload relay and short circuit protective device (SCPD) being either fuses or circuit breakers.

During motor starting and at normal loading, the overload relay protects both the motor and cables by tripping the contactor in a time inversely proportional to the current. However, under short circuit conditions, the response time would be too long and the fuses or circuit breaker must take over to interrupt the fault current therefore limiting energy passed through the starter components. When this is successfully achieved, the combination is said to be co-ordinated.

The primary function of co-ordination is to ensure that the selected components result in safe interruption of fault currents while minimising damage to the starter components themselves.

### Why is co-ordination important?

Contactors are designed to switch loads frequently. They can carry the high starting currents of motors, but at short circuit levels, the extremely high current can force the contacts open due to electro- dynamic effects (it is this effect that is needed at normal operating currents to extinguish the arc quickly). Large short circuit currents can therefore lift the contacts possibly resulting in contact welding or further damage to the starter components.

The importance of selecting the correct SCPD is to minimise the effects of short circuits, provide safe interruption and a level of performance to meet the criteria for Type '2' co-ordination.

### Precise contactor control

While the correct selection of SCPD is of prime importance to ensure reliable operation under short circuit conditions, there are other malfunctions which can occur in a control circuit that can create contact welding due to uncontrolled and repetitive switching of the coil circuit (this is referred to as 'contact chatter'). This is particularly important with high current contactors where the switching currents of the respective motors are particularly high.

The electronically controlled mechanism 'ECM' of the CA 6 contactors prevent uncontrolled switching under all voltage conditions by providing precise control over the magnet system, thus preventing contact chatter and minimising contact bounce. Contactors of the CA 5 series are provided with a delayed release mechanism to prevent contact chatter under low voltage conditions.

### High performance contactors

Under normal operating conditions all Sprecher + Schuh contactors offer high mechanical life (up to 10 million operations) with a contact life (electrical) up to 1.3 million under AC 3 conditions. Optimal performance is assured even under adverse conditions due to the design and selection of contactor components. This performance is evident in the design of the CA 6 contactor range which has enabled them to reach their full kilowatt potential under Type '2' conditions with both fuses and circuit breakers (refer co-ordination charts).



Terasaki 'TemBreak' tested with Sprecher + Schuh contactors to IEC 60947



The KTA 7 with CA 7 contactors.



CA-6-110

CA-6-95

Excellent design enables the CA 6 series contactors to reach their full potential under Type '2' conditions with both fuses and circuit breakers.

# TEMBREAK 2 -

## 2013 ADDITIONS



- 250A – 1600A MCCBs
- New 1000 A MCCB in a smaller 800 A Frame
- Ground Fault, Neutral pole, Phase Rotation, Pre Trip Alarm Protection
- Premium OCR - L S I Adjustable
  - Back-lit LCD display
  - Metering: I, U, P, W, Cos  $\phi$ , F
  - Modbus communications
  - Intelligent fault analysis
- Basic 2 dial OCR types
- Thermal magnetic to 800 A
- Common internal accessories for 125 A to 1600 A MCCBs
- Metering block for 125 A - 630 A MCCBs



Availability  
early 2013

**TemBreak**

**TERASAKI**  
Innovators in Protection Technology



## Type 2 Short Circuit Coordination

### Terasaki/Sprecher + Schuh

For DOL motor starting, 50/60 kA @ 400/415 V to AS/NZS 60947.4.1

TemBreak MCCB circuit breakers

Sprecher + Schuh Electronic overload relays.

**TYPE 2**  
**50/65 KA**  
**415 V**

### Component Selection Table C64.2

Motor		Circuit Breaker	Contactors	Overload Relay	
Motor Kw	Motor Amp Ratings @ 400/415 V	Moulded Case Circuit Breaker	Contactors Type	Overload Relay (Electronic)	Ampere Setting Range
0.18	0.6	XM30PB / 0.7A	CA7-9	CEP 7 EEBB	0.2 – 1.0
0.25	0.8	XM30PB / 1.4A	CA7-9	CEP 7 EEBB	0.2 – 1.0
0.37	1.1	XM30PB / 1.4A	CA7-9	CEP 7 EECB	1.0 – 5.0
0.55	1.5	XM30PB / 2.0 A	CA7-9	CEP 7 EECB	1.0 – 5.0
0.75	1.8	XM30PB / 2.6A	CA7-9	CEP 7 EECB	1.0 – 5.0
1.1	2.6	XM30PB / 4A	CA7-16	CEP 7 EECB	1.0 – 5.0
1.5	3.4	XM30PB / 5A	CA7-16	CEP 7 EECB	1.0 – 5.0
2.2	4.8	XM30PB / 8A	CA7-16	CEP 7 EEEB	5.4 – 27
3	6.5	XM30PB / 10A	CA7-23	CEP 7 EEEB	5.4 – 27
4	8.2	XM30PB / 12A	CA7-23	CEP 7 EEEB	5.4 – 27
5.5	11	S125GJ / 20A	CA7-30	CEP 7 EEED	5.4 – 27
7.5	14	S125GJ / 20A	CA7-30	CEP 7 EEED	5.4 – 27
10	17	S125GJ / 20A	CA7-30	CEP 7 EEED	5.4 – 27
11	21	S125GJ / 32A	CA7-30	CEP 7 EEED	5.4 – 27
15	28	S125GJ / 50A	CA7-30	CEP 7 EEFD	9.0 – 45
18.5	34	S125GJ / 50A	CA7-37	CEP 7 EEFD	9.0 – 45
22	40	S125GJ / 63A	CA7-43	CEP 7 EEFD	9.0 – 45
30	55	S125GJ / 100A	CA7-72	CEP 7 EEGE	18 – 90
37	66	S125GJ / 100A	CA7-72	CEP 7 EEGE	18 – 90
45	80	S125GJ / 125A	CA7-85	CEP 7 EEGE	18 – 90
55	100	S125GJ / 125A	CA6-115	CEP 7 EEHF	30 – 150
75	130	S160GJ / 160A	CA6-140-EI	CEP 7 EEHF	30 – 150
90	155	S250GJ / 250A	CA6-140-EI	CEP 7 EEJF	40 – 200
110	200	S250GJ / 250A	CA6-180-EI	CEP 7 EEKG	60 – 300
132	225	S400GJ / 400A	CA6-420-EI	CEP 7 EEKG	60 – 300
150	250	S400GJ / 400A	CA6-420-EI	CEP 7 EEKG	60 – 300
160	270	S400GJ / 400A	CA6-420-EI	CEP 7 EEKG	60 – 300
185	325	S400GJ / 400A	CA6-420-EI	CEP 7 EELG	100 – 500
200	361	S400GJ / 400A	CA6-420-EI	CEP 7 EELG	100 – 500
220	383	S400GJ / 400A	CA6-630-EI	CEP 7 EEMH	120 – 600
250	425	S630GE / 630A	CA6-860-EI	CEP 7 EEMH	120 – 600
320	538	S630GE / 630A	CA6-860-EI	CEP 7 EEMH	120 – 600
400	700	XH800SE / 800A	CA6-860-EI	CEP 7 EENH	160 – 800

- Notes:**
- Thermal or electronic overload relays may be used.
  - XM30PB can be replaced with S125GJ/20 and CA7-23/ CA7-30
  - Combinations based on the overload tripping before the circuit breaker at overload currents up to the motor locked rotor current.
  - Electronic MCCBs may be changed to thermal magnetic types if required.
  - Same 'look' handles can be used on XM30PB and S125-630 A MCCBs.
  - S125GJ and S250GJ MCCBs can be changed to ZS125GJ and ZS250GJ earth leakage relay MCCBs if required.
  - Refer to NHP for other device combinations.
  - The above combinations are designed for motors with an inrush of 7 x FLC for 5 seconds. The instant trip point of MCCBs must be considered when used with high inrush, high efficiency motors.

## Type 2 Short Circuit Coordination

### Terasaki/Sprecher + Schuh

For DOL motor starting, 50/60 kA @ 400/415 V to AS/NZS 60947.4.1

TemBreak MCCB circuit breakers

Sprecher + Schuh Electronic overload relays with communications and earth leakage.

**TYPE 2**  
**50/65 kA**  
**415 V**

### Component Selection Table C64.11

Motor		Circuit Breaker	Contactors	Overload Relay	
Motor Kw	Motor Amp Ratings @ 400/415 V	Moulded Case Circuit Breaker	Contactors Type	Overload Relay (Electronic)	Ampere Setting Range
0.18	0.6	S125GJ / 20A	CA7-23	CEP7 C3-23-2	0.4 – 2.0
0.25	0.8	S125GJ / 20A	CA7-23	CEP7 C3-23-2	0.4 – 2.0
0.37	1.1	S125GJ / 20A	CA7-23	CEP7 C3-23-2	0.4 – 2.0
0.55	1.5	S125GJ / 20A	CA7-23	CEP7 C3-23-5	1.0 – 5.0
0.75	1.8	S125GJ / 20A	CA7-23	CEP7 C3-23-5	1.0 – 5.0
1.1	2.6	S125GJ / 20A	CA7-23	CEP7 C3-23-5	1.0 – 5.0
1.5	3.4	S125GJ / 20A	CA7-23	CEP7 C3-23-5	1.0 – 5.0
2.2	4.8	S125GJ / 20A	CA7-23	CEP7 C3-23-5	1.0 – 5.0
3	6.5	S125GJ / 20A	CA7-23	CEP7 C3 23-25	5.0 – 25
4	8.2	S125GJ / 20A	CA7-23	CEP7 C3 23-25	5.0 – 25
5.5	11	S125GJ / 20A	CA7-30	CEP7 C3 43-25	5.0 – 25
7.5	14	S125GJ / 20A	CA7-30	CEP7 C3 43-25	5.0 – 25
10	17	S125GJ / 20A	CA7-30	CEP7 C3 43-25	5.0 – 25
11	21	S125GJ / 32A	CA7-30	CEP7 C3 43-25	5.0 – 25
15	28	S125GJ / 50A	CA7-30	CEP7 C3 43-45	9.0 – 45
18.5	34	S125GJ / 50A	CA7-37	CEP7 C3 43-45	9.0 – 45
22	40	S125GJ / 63A	CA7-43	CEP7 C3 43-45	9.0 – 45
30	55	S125GJ / 100A	CA7-72	CEP7 C3 85-90	18 – 90
37	66	S125GJ / 100A	CA7-72	CEP7 C3 85-90	18 – 90
45	80	S125GJ / 125A	CA7-85	CEP7 C3 85-90	18 – 90
55	100	S125GJ / 125A	CA6-115	CEP7 C3 180 140	28 – 140
75	130	S160GJ / 160A	CA6-140-EI	CEP7 C3 180 140	28 – 140
90	155	S250GJ / 250A	CA6-140-EI	CEP7 C3 180 210	42 – 210
110	200	S250GJ / 250A	CA6-180-EI	CEP7 C3 420 302	60 – 302
132	225	S400GJ / 400A	CA6-420-EI	CEP7 C3 420 302	60 – 302
150	250	S400GJ / 400A	CA6-420-EI	CEP7 C3 420 302	60 – 302
160	270	S400GJ / 400A	CA6-420-EI	CEP7 C3 420 302	60 – 302
185	325	S400GJ / 400A	CA6-420-EI	CEP7 C3 420 420	84 – 420
200	361	S400GJ / 400A	CA6-420-EI	CEP7 C3 420 420	84 – 420
220	383	S400GJ / 400A	CA6-630-EI	CEP7 C3 860 630	125 – 630
250	425	S630GE / 630A	CA6-860-EI	CEP7 C3 860 630	125 – 630
320	538	S630GE / 630A	CA6-860-EI	CEP7 C3 860 630	125 – 630
400	700	XH800SE / 800A	CA6-860-EI	CEP7 C3 860 860	172 – 860

- Notes:**
- Thermal or electronic overload relays may be used.
  - S125GJ combinations can be replaced with XM30PB and smaller contactors if required.
  - Combinations based on the thermal overload relay tripping before the circuit breaker at overload currents up the motor locked rotor current.
  - Thermal magnetic MCCBs may be changed to electronic types if required.
  - Same look handles can be used on XM30PB and S125 - 630 A MCCBs.
  - Refer to NHP for other device combinations.
  - The above combinations are designed for motors with an inrush of 7 x FLC for 5 seconds.
- The instant trip point of MCCBs must be considered when used with high inrush, high efficiency motors.

## Type 2 Short Circuit Coordination

### Terasaki/Sprecher + Schuh

For DOL motor starting, 50/60 kA @ 400/415 V to AS/NZS 60947.4.1  
 TemBreak MCCB circuit breakers  
 Sprecher + Schuh Thermal magnetic and electronic overload relays.

**TYPE 2**  
**85 KA**  
**415 V**

### Component Selection Table C84.0

Motor		Circuit Breaker	Contactors	Overload Relay	
Motor Kw	Motor Amp Ratings @ 400/415 V	Moulded Case Circuit Breaker	Contactors Type	Overload Relay	Ampere Setting Range
0.18	0.6	XM30PB / 0.7A	CA7-9	CT7N 23 A80	0.55 – 0.8
0.25	0.8	XM30PB / 1.4A	CA7-9	CT7N 23 B10	0.75 – 1.0
0.37	1.1	XM30PB / 1.4A	CA7-9	CT7N 23 B13	0.9 – 1.3
0.55	1.5	XM30PB / 2.0 A	CA7-9	CT7N 23 B20	1.4 – 2.0
0.75	1.8	XM30PB / 2.6A	CA7-9	CT7N 23 B25	1.8 – 2.5
1.1	2.6	XM30PB / 4A	CA7-16	CT7N 23 B32	2.3 – 3.2
1.5	3.4	XM30PB / 5A	CA7-16	CT7N 23 B40	2.9 – 4.0
2.2	4.8	XM30PB / 8A	CA7-16	CT7N 23 B63	4.5 – 6.3
3	6.5	XM30PB / 10A	CA7-23	CT7N 23 B75	5.5 – 7.5
4	8.2	XM30PB / 12A	CA7-23	CT7N 23 C10	7.2 – 10
5.5	11	H125NJ / 20A	CA7-30	CEP7 EEED	5.4 – 27
7.5	14	H125NJ / 20A	CA7-30	CT7N 37 C20	15 – 20
10	17	H125NJ / 20A	CA7-30	CT7N 37 C20	15 – 20
11	21	H125NJ / 32A	CA7-30	CT7N 37 C25	21 – 25
15	28	H125NJ / 50A	CA7-30	CT7N 37 C30	24.5 – 30
18.5	34	H125NJ / 50A	CA7-37	CT7N 37 C38	33 – 38
22	40	H125NJ / 63A	CA7-43	CT7N 43 C47	35 – 47
30	55	H125NJ / 100A	CA7-72	CT7N 85 C60	45 – 60
37	66	H125NJ / 100A	CA7-72	CT7N 85 C75	58 – 75
45	80	H125NJ / 125A	CA7-85	CT7N 85 C90	72 – 90
55	100	H125NJ / 125A	CA6-115	CEP 7 EEHF	30 – 150
75	130	H160NJ / 160A	CA6-140-EI	CEP 7 EEHF	30 – 150
90	155	H250NJ / 250A	CA6-140-EI	CEP 7 EEJF	40 – 200
110	200	H250NJ / 250A	CA6-180-EI	CEP 7 EEKG	60 – 300
132	225	H400NE / 400A	CA6-420-EI	CEP 7 EEKG	60 – 300
150	250	H400NE / 400A	CA6-420-EI	CEP 7 EEKG	60 – 300
160	270	H400NE / 400A	CA6-420-EI	CEP 7 EEKG	60 – 300
185	325	H400NE / 400A	CA6-420-EI	CEP 7 EELG	100 – 500
200	361	H400NE / 400A	CA6-420-EI	CEP 7 EELG	100 – 500
220	383	H400NE / 400A	CA6-630-EI	CEP 7 EEMH	120 – 600
250	425	XH630PJ / 630A	CA6-860-EI	CEP 7 EEMH	120 – 600
320	538	XH630PJ / 630A	CA6-860-EI	CEP 7 EEMH	120 – 600
400	700	XH800PJ / 800A	CA6-860-EI	CEP 7 EENH	160 – 800

- Notes:**
- Thermal or electronic overload relays may be used.
  - XM30PB can be replaced with H125GJ and CA7-30 if required.
  - Combinations based on the thermal overloads relay tripping before the circuit breaker at overload currents up to the motor locked rotor current.
  - Thermal magnetic MCCBs may be changed to electronic types if required.
  - Same look handles can be used on XM30PB and S125 - 630 A MCCBs
  - Refer to NHP for other device combinations.
  - The above combinations are designed for motors with an inrush of 7 x FLC for 5 seconds. The instant trip point of MCCBs must be considered when used with high inrush, high efficiency motors.



## Type 2 Short Circuit Coordination

### Terasaki ZS ELCB/Sprecher + Schuh

For DOL motor starting, 50/60 kA @ 400/415 V to AS/NZS 60947.4.1  
 TemBreak MCCB circuit breakers  
 Sprecher + Schuh Electronic overload relays.

**TYPE 2**  
50/65 KA  
415 V

### Component Selection Table EC64.3

Motor		Circuit Breaker	Contactor		Overload Relay	
Motor Amp Ratings @ 400/415 V	Motor Kw	Moulded Case Circuit Breaker	Earth Fault Sensing Range	Type	Overload Relay	Ampere Setting Range
0.18	0.6	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP 7 EEBB	0.2 – 1.0
0.25	0.8	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP 7 EEBB	0.2 – 1.0
0.37	1.1	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP 7 EECB	1.0 – 5.0
0.55	1.5	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP 7 EECB	1.0 – 5.0
0.75	1.8	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP 7 EECB	1.0 – 5.0
1.1	2.6	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP 7 EECB	1.0 – 5.0
1.5	3.4	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP 7 EECB	1.0 – 5.0
2.2	4.8	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP 7 EEDB	3.4 – 16
3	6.5	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP 7 EEDB	3.4 – 16
4	8.2	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP 7 EEDB	3.4 – 16
5.5	11	ZS125GJ / 20A	30mA – 3A	CA7-30	CEP 7 EEED	5.4 – 27
7.5	14	ZS125GJ / 20A	30mA – 3A	CA7-30	CEP 7 EEED	5.4 – 27
10	17	ZS125GJ / 20A	30mA – 3A	CA7-30	CEP 7 EEED	5.4 – 27
11	21	ZS125GJ / 32A	30mA – 3A	CA7-30	CEP 7 EEED	5.4 – 27
15	28	ZS125GJ / 50A	30mA – 3A	CA7-30	CEP 7 EEFD	9.0 – 45
18.5	34	ZS125GJ / 50A	30mA – 3A	CA7-37	CEP 7 EEFD	9.0 – 45
22	40	ZS125GJ / 63A	30mA – 3A	CA7-43	CEP 7 EEFD	9.0 – 45
30	55	ZS125GJ / 100A	30mA – 3A	CA7-72	CEP 7 EEGE	18 – 90
37	66	ZS125GJ / 100A	30mA – 3A	CA7-72	CEP 7 EEGE	18 – 90
45	80	ZS125GJ / 125A	30mA – 3A	CA7-85	CEP 7 EEGE	18 – 90
55	100	ZS125GJ / 125A	30mA – 3A	CA6-115	CEP 7 EEHF	30 – 150
75	130	ZS250GJ / 160A	30mA – 3A	CA6-140-EI	CEP 7 EEHF	30 – 150
90	155	ZS250GJ / 250A	30mA – 3A	CA6-140-EI	CEP 7 EEJF	40 – 200
110	200	ZS250GJ / 250A	30mA – 3A	CA6-180-EI	CEP 7 EEKG	60 – 300
132	225	S400GE_AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-420-EI	CEP 7 EEKG	60 – 300
150	250	S400GE_AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-420-EI	CEP 7 EEKG	60 – 300
160	270	S400GE_AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-420-EI	CEP 7 EEKG	60 – 300
185	325	S400GE_AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-420-EI	CEP 7 EELG	100 – 500
200	361	S400GE_AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-420-EI	CEP 7 EELG	100 – 500
220	383	S400GE_AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-630-EI	CEP 7 EEMH	120 – 600
250	425	S630GE_AG / 630A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-860	CEP 7 EEMH	120 – 600
320	538	S630GE_AG / 630A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-860	CEP 7 EEMH	120 – 600
400	700	XH800SE 800_LSIG	$I_g = 0.2 \times I_n \text{ min.}$	CA6-860	CEP 7 EENH	160 – 800

- Notes:**
- Thermal or electronic overload relays may be used.
  - Combinations based on the thermal overloads relay tripping before the circuit breaker at overload currents up to the motor locked rotor current.
  - MCCBs 400 - 800 A have a Ground Fault option fitted. This will not sense small earth leakage (residual currents)
  - Refer to NHP for other device combinations.
  - The above combinations are designed for motors with an inrush of 7 x FLC for 5 seconds. The instant trip point of MCCBs must be considered when used with high inrush, high efficiency motors.

## Type 2 Short Circuit Coordination

### Terasaki ZS ELCB/Sprecher + Schuh

For DOL motor starting, 50/60 kA @ 400/415 V to AS/NZS 60947.4.1

TemBreak MCCB circuit breakers

Sprecher + Schuh Electronic overload relays with communications and earth leakage.

**TYPE 2**  
50/65 KA  
415 V

### Component Selection Table EC64.11

Motor		Circuit Breaker	Earth Fault Sensing Range	Contactor Type	Overload Relay	Overload Relay
Motor Amp Ratings @ 400/415 V Kw	Motor Amp Ratings @ 400/415 V	Moulded Case Circuit Breaker	Earth Fault Sensing Range	Type	Overload Relay	Ampere Setting Range
0.18	0.6	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP7 C3-23-2	0.4 – 2.0
0.25	0.8	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP7 C3-23-2	0.4 – 2.0
0.37	1.1	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP7 C3-23-2	0.4 – 2.0
0.55	1.5	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP7 C3-23-5	1.0 – 5.0
0.75	1.8	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP7 C3-23-5	1.0 – 5.0
1.1	2.6	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP7 C3-23-5	1.0 – 5.0
1.5	3.4	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP7 C3-23-5	1.0 – 5.0
2.2	4.8	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP7 C3-23-5	1.0 – 5.0
3	6.5	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP7 C3 23-25	5.0 – 25
4	8.2	ZS125GJ / 20A	30mA – 3A	CA7-23	CEP7 C3 23-25	5.0 – 25
5.5	11	ZS125GJ / 20A	30mA – 3A	CA7-30	CEP7 C3 43-25	5.0 – 25
7.5	14	ZS125GJ / 20A	30mA – 3A	CA7-30	CEP7 C3 43-25	5.0 – 25
10	17	ZS125GJ / 20A	30mA – 3A	CA7-30	CEP7 C3 43-25	5.0 – 25
11	21	ZS125GJ / 32A	30mA – 3A	CA7-30	CEP7 C3 43-25	5.0 – 25
15	28	ZS125GJ / 50A	30mA – 3A	CA7-30	CEP7 C3 43-45	9.0 – 45
18.5	34	ZS125GJ / 50A	30mA – 3A	CA7-37	CEP7 C3 43-45	9.0 – 45
22	40	ZS125GJ / 63A	30mA – 3A	CA7-43	CEP7 C3 43-45	9.0 – 45
30	55	ZS125GJ / 100A	30mA – 3A	CA7-72	CEP7 C3 85-90	18 – 90
37	66	ZS125GJ / 100A	30mA – 3A	CA7-72	CEP7 C3 85-90	18 – 90
45	80	ZS125GJ / 125A	30mA – 3A	CA7-85	CEP7 C3 85-90	18 – 90
55	100	ZS125GJ / 125A	30mA – 3A	CA6-115	CEP7 C3 180 140 28 – 140	
75	130	ZS250GJ / 160A	30mA – 3A	CA6-140-EI	CEP7 C3 180 140 42 – 140	
90	155*	ZS250GJ / 250A	30mA – 3A	CA6-140-EI	CEP7 C3 180 210 42 – 210	
110	200	ZS250GJ / 250A	30mA – 3A	CA6-180-EI	CEP7 C3 420 302 60 – 302	
132	225	S400GE AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-420-EI	CEP7 C3 420 302 60 – 302	
150	250	S400GE AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-420-EI	CEP7 C3 420 302 60 – 302	
160	270	S400GE AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-420-EI	CEP7 C3 420 302 60 – 302	
185	325	S400GE AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-420-EI	CEP7 C3 420 420 84 – 420	
200	361	S400GE AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-420-EI	CEP7 C3 420 420 84 – 420	
220	383	S400GE AG / 400A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-630-EI	CEP7 C3 860 630 125 – 630	
250	425	S630GE AG / 630A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-860-EI	CEP7 C3 860 630 125 – 630	
320	538	S630GE AG / 630A	$I_g = 0.2 \times I_n \text{ min.}$	CA6-860-EI	CEP7 C3 860 630 125 – 630	
400	700	XH800SE 800	$I_g = 0.2 \times I_n \text{ min.}$	CA6-860-EI	CEP7 C3 860 860 172 – 860	

- Notes:**
- CEP7 C3 overloads include DeviceNet comms, earth fault relay, and thermistor relay.
  - The CEP7 C3 inbuilt earth fault relay senses currents from 20 mA to 5 A. An external CT is required.
  - MCCBs 400 - 800 A have a Ground Fault option fitted. This will not sense small earth leakage (residual currents)
  - Combinations based on the thermal overloads relay tripping before the circuit breaker at overload currents up to the motor locked rotor current.
  - The above combinations are designed for motors with an inrush of 7 x FLC for 5 seconds. The instant trip point of MCCBs must be considered when used with high inrush, high efficiency motors.

## Type 2 Short Circuit Coordination

**TYPE 2**  
50 KA  
690 V

### Sprecher + Schuh

For DOL motor starting, 50/60 kA @ 690 V to AS/NZS 60947.4.1

Sprecher + Schuh KTA7 motor circuit breakers/ CEP 7 electronic overload relays

### Component Selection Table C56.0

Motor Kw	Motor Amp Ratings @ 690 V AC	Circuit Breaker MPCB/ MCCB	Contactors Type	Overload Relay	Ampere Setting Range
0.37	0.63	KTA 7-25S-1A	CA7-9	KT7 overload or separate Relay	0.63 – 1.0
0.55	0.86	KTA 7-25S-1A	CA7-9	KT7 has adjustable O/L	0.63 – 1.0
0.75	1.1	KTA 7-25S-1.6A	CA7-9	KT7 has adjustable O/L	1.0 – 1.6
1.1	1.5	KTA 7-25S-1.6A	CA7-9	KT7 has adjustable O/L	1.0 – 1.6
1.5	2.1	KTA 7-25H-2.5A	CA7-9	KT7 has adjustable O/L	1.6 – 2.5
2.2	2.9	KTA 7-25H-4A	CA7-9	KT7 has adjustable O/L	2.5 – 4
3	3.8	KTA 7-25H-4A	CA7-12	KT7 has adjustable O/L	2.5 – 4
4	4.9	KTA 7-25H-6.3A	CA7-12	KT7 has adjustable O/L	4.0 – 6.3
5.5	6.6	KTA 7-25H-10A	CA7-16	KT7 has adjustable O/L	6.3 – 10
7.5	8.9	KTA 7-25H-10A	CA7-23	KT7 has adjustable O/L	6.3 – 10
10	12	KTA 7-25H-16A	CA7-23	KT7 has adjustable O/L	10 – 16
11	13	KTA 7-25H-16A	CA7-30	KT7 has adjustable O/L	10 – 16
15	17	KTA 7-45H-20A	CA7-30	KT7 has adjustable O/L	14.5 – 20
18.5	21	KTA 7-45H-25A	CA7-43	KT7 has adjustable O/L	18 – 25
22	24	KTA 7-45H-32A	CA7-60	KT7 has adjustable O/L	23 – 32

**Notes:** • The above combinations are designed for motors with an inrush of 7 x FLC for 5 seconds.

## Type 2 Short Circuit Coordination

**TYPE 2**  
**50/65 KA**  
**690 V**

### Socomec switch fuses/Sprecher + Schuh

For DOL motor starting, 50/60 kA @ 690 V to AS/NZS 60947.4.1

DIN Fuse links, SOCOMEC Switch Fuses

Sprecher + Schuh KTA7 Electronic overload relays

### Component Selection Table F66D.1

Motor		Circuit Breaker		Contactor	Overload Relay	
Motor Kw	Motor Amp Ratings @ 690 V AC	DIN gG Fuse Amps/Size	Switch-Fuse	Type	Overload Relay (Electronic)	Ampere Setting Range
0.18	0.35	2 / 00C	SSFDN 63	CA7-9	CEP 7 EEBB	0.2 – 1.0
0.25	0.46	2 / 00C	SSFDN 63	CA7-9	CEP 7 EEBB	0.2 – 1.0
0.37	0.63	4 / 00C	SSFDN 63	CA7-9	CEP 7 EEBB	0.2 – 1.0
0.55	0.86	4 / 00C	SSFDN 63	CA7-9	CEP 7 EEBB	0.2 – 1.0
0.75	1.1	4 / 00C	SSFDN 63	CA7-9	CEP 7 EECB	1.0 – 5.0
1.1	1.5	6 / 00C	SSFDN 63	CA7-9	CEP 7 EECB	1.0 – 5.0
1.5	2.1	6 / 00C	SSFDN 63	CA7-9	CEP 7 EECB	1.0 – 5.0
2.2	2.9	10 / 00C	SSFDN 63	CA7-9	CEP 7 EECB	1.0 – 5.0
3	3.8	10 / 00C	SSFDN 63	CA7-9	CEP 7 EECB	1.0 – 5.0
4	4.9	16 / 00C	SSFDN 63	CA7-9	CEP 7 EECB	1.0 – 5.0
5.5	6.6	20 / 00C	SSFDN 63	CA7-12	CEP 7 EEEB	5.4 – 27
7.5	8.9	25 / 00C	SSFDN 63	CA7-16	CEP 7 EEEB	5.4 – 27
10	12	32 / 00C	SSFDN 63	CA7-23	CEP 7 EEEB	5.4 – 27
11	13	35 / 00C	SSFDN 63	CA7-30	CEP 7 EEED	5.4 – 27
15	17	50 / 00C	SSFDN 63	CA7-30	CEP 7 EEED	5.4 – 27
18.5	21	50 / 00C	SSFDN 63	CA7-37	CEP 7 EEED	5.4 – 27
22	24	63 / 00C	SSFDN 63	CA7-43	CEP 7 EEED	5.4 – 27
30	32	80 / 00	SSFDN 125	CA7-60	CEP 7 EEGE	18 – 90
37	39	100 / 00	SSFDN 125	CA7-72	CEP 7 EEGE	18 – 90
45	47	125 / 00	SSFDN 125	CA7-85	CEP 7 EEGE	18 – 90
55	57	125 / 00	SSFDN 125	CA6-95	CEP 7 EEHF	30 – 150
75	78	160 / 00	SSFDN 160	CA6-115	CEP 7 EEHF	30 – 150
90	94	200 / 1	SSFDN 250	CA6-110-EI	CEP 7 EEHF	30 – 150
110	114	224 / 1	SSFDN 250	CA6-140-EI	CEP 7 EEHF	30 – 150
132	135	250 / 1	SSFDN 250	CA6-140-EI	CEP 7 EEHF	30 – 150
160	163	300 / 2	SSFDN 400	CA6-180-EI	CEP 7 EEJF	40 – 200
200	203	400 / 2	SSFDN 400	CA6-210-EI	CEP 7 EEKG	60 – 300
220	220	400 / 2	SSFDN 400	CA6-300-EI	CEP 7 EEKG	60 – 300
250	252	425 / 3	SSFDN 630	CA6-300-EI	CEP 7 EEKG	60 – 300
315	312	500 / 3	SSFDN 630	CA6-420-EI	CEP 7 EELG	100 – 500
355	354	630 / 3	SSFDN 630	CA6-420-EI	CEP 7 EELG	100 – 500
400	397	630 / 3	SSFDN 630	CA6-420-EI	CEP 7 EELG	100 – 500

- Notes:**
- Thermal or electronic overload relays may be used.
  - Refer to NHP for other device combinations.
  - The above combinations are designed for motors with an inrush of 7 x FLC for 5 seconds.
  - The fuse maximum inrush current must be considered when used with high inrush, high efficiency motors.

## Type 2 Short Circuit Coordination

**TYPE 2**  
6.5-20 kA  
1000 V

### Terasaki/Sprecher + Schuh

For DOL motor starting, 6.5-20 kA @ 1000 V to AS/NZS 60947.4.1

TemBreak 1 Moulded Case Circuit Breakers

Sprecher + Schuh Electronic overload relays

### Component Selection Table C21.0

Motor Kw	Motor Amp Ratings @ 690 V AC	Circuit Breaker MPCB/ MCCB Circuit Breaker	Contact Type	Overload Relay	Ampere Setting Range
25	20	TL100EM403K	CA6 115 EI	CEF1-11	20 - 180
30	25	TL100EM503K	CA6 115 EI	CEF1-11	20 - 180
45	33	TL100EM603K	CA6 115 EI	CEP7 EE HF	30 - 150
55	40	TL100EM753K	CA6 105 EI	CEP7 EE HF	30 - 150
75	55	TL100EM1003K	CA6 140 EI	CEP7 EE HF	30 - 150
90	65	TL100EM1003K	CA6 170 EI	CEP7 EE HF	30 - 150
111	80	XV400NE2503K	CA6 210 EI	CEP7 EE HF	30 - 150
133	95	XV400NE2503K	CA6 250 EI	CEP7 EE HF	30 - 150
163	115	XV400NE2503K	CA6 300 EI	CEP7 EE HF	30 - 150
206	145	XV400NE2503K	CA6 420 EI	CEP7 EE JF	40 - 200
280	200	XV400NE4003K	CA5 450	CEP7 EE KG	60 - 300
355	250	XV400NE4003K	CA5 550	CEP7 EE KG	60 - 300
500	340	XV400NE4003K	CA5 700	CEP7 EE LG	100 - 500
550	380	XV630PE6303K	CA5 860	CEP7 EE LG	100 - 500

- Notes:**
- CEP7 overload add-on modules are available for Profibus, DeviceNet, Ethernet, Ground Fault, remote reset, jam protection, and a thermister protection relay. A CEP7 overload will accept one only add-on module.
  - CEF 1 CT overloads can replace CEP7 overloads if required.
  - For CEP7 C3 overload use, 1000 V rated CTs must be used.
  - Combinations based on the overload relay tripping before the circuit breaker at overload currents up to the motor locked rotor current.
  - Same 'look' handles can be used on MCCBs. Refer NHP for other device combinations.
  - The above combinations are designed for motors with an inrush of 7 x FLC for 5 seconds.  
The instant trip point of MCCBs must be considered when used with high inrush, high efficiency motors.

# TEMCURVE 6 - CIRCUIT BREAKER SELECTIVITY APPLICATION SOFTWARE

The latest version of TemCurve 6 includes advanced new features making it a versatile application tool for use with Terasaki MCBs, MCCBs, ACBs, NHP fuses as well as generic IEC protection relay curves.



PP-TERASAKI/MCCB 3.200A-CPB

## TemCurve 6 includes:

- Circuit line-diagrams
- Cable fault calculations
- TemCurve file sharing
- Distribution schematic
- Supply fault calculations
- Supply voltage options
- Catalogue data prints
- Time current curves
- Device photos
- User defined curves
- Motor start applications
- Internet update capability
- Energy let through curves
- Supply device type options
- Exports to AutoCad
- Circuit breaker setting detail
- Calculator



## Motor circuit application table for DOL starting Breaker type and current rating (A)

Motor Rating (kW)	Approx. FLC (Amps)	Din-T C & D curve	Safe-T	ZS125 E125 S125 H125 L125
0.37	1.1	4	6	
0.55	1.5	4	6	20
0.75	1.8	6	6	20
1.1	2.6	10	6	20
1.5	3.4	10	10	20
2.2	4.8	16	16	20
3.0	6.5	20	16	20
4	8.2	25	20	20
4.5	9	32	25	20
5.5	11	32	32	32
7.5	14	40	40	32
10	19	50	50	50
11	21	50	50	50
15	28	63	63	63
18.5	34	100 <sup>1)</sup>	80	100
22	40	125 <sup>1)</sup>	100	100
25	46	125 <sup>1)</sup>	100	100
30	55			125
37	66			125
45	80			125
55	100			
75	135			
90	160			
110	200			
132	230			
160	270			
185	320			
200	361			
220	380			
250	430			
280	480			
300	510			
375	650			
450	750			



**Notes:** <sup>1)</sup> 80, 100 and 125 amp refers to Din-T10H type.  
<sup>2)</sup> Electronic TemBreak MCCB only.

## Motor circuit application table for DOL starting Breaker type and current rating (A)

ZS250			ZS800	
S160			S800CJ	
H160			S800NJ	
L160			S800RJ	
S250	ZS400	S800 (630 A)	S800NE	
E250	E400	ZS630	S800RE	
H250	S400	E630	H800NE	S1000NE
L250	H400	S630	XS800NJ	S1250NE/1250
	L400	XH630	XH800SE	XS1250SE/1000
		XS630	XS800SE	

160				
160				
160				
160	250			
250	250			
250	250			
	400	400		
	400	400		
	400	400		
	400 <sup>2)</sup>	630		
	400 <sup>2)</sup>	630		
		630	800 <sup>2)</sup>	
		630	800	
		630 <sup>2)</sup>	800	
		630 <sup>2)</sup>	800	
			800 <sup>2)</sup>	
				1000

- Notes:**
- The DOL table is based on holding 125 % FLC continuously and 600 % FLC for 10 seconds. For non-standard drives consult NHP.
  - Lower circuit breaker ratings are possible in most applications. Refer to Type '2' co-ordination tables for specific circuit breaker/overload combinations.
  - Adjustable magnetic trips set to high. Thermal magnetic TemBreak adjustable 63 % – 100 % of NRC (nominal rated current).
  - Din-T MCBs are calibrated to IEC 60898 Curve 'C' & 'D'. Selected sizes of 'D' Curve are available from stock, refer NHP.



## General motor circuit application table for reduced voltage starting

**Breaker type and current rating, star-delta, auto-transformer resistor or reactance starting**

Motor rating (kW)	Approx. FLC (Amps)	Din-T C & D curve	Safe-T	ZS125 E125 S125 H125 L125
0.37	1.1	4	6	
0.55	1.5	4	6	20
0.75	1.8	4	6	20
1.1	2.6	6	6	20
1.5	3.4	10	6	20
2.2	4.8	10	10	20
3.0	6.5	16	16	20
4	8.2	20	16	20
4.5	9	20	16	20
5.5	11	25	20	20
7.5	14	32	25	20
10	19	40	40	32
11	21	50	40	32
15	28	50	50	50
18.5	34	63	63	50
22	40	80 <sup>1)</sup>	63	63
25	46	100 <sup>1)</sup>	80	100
30	55	125 <sup>1)</sup>	100	100
37	66	125 <sup>1)</sup>		100
45	80			125
55	100			
75	135			
90	160			
110	200			
132	230			
160	270			
185	320			
200	361			
220	380			
250	430			
280	480			
300	510			
375	650			
450	750			

**Notes:** <sup>1)</sup> 80, 100 and 125 amp refers to Din-T10H type.  
<sup>2)</sup> Electronic TemBreak MCCB only.  
 If co-ordination to IEC 60947-4-1 is required refer to co-ordination tables.  
 Reduced voltage table is based on holding 120 % FLC continuously and 350 % FLC for 20 seconds.  
 Din-T MCBs are calibrated to IEC 898 Curve 'C' & 'D'. Selected sizes of 'D' Curve are available from stock refer NHP.



## General motor circuit application table for reduced voltage starting

ZS250			ZS800	
S160			S800CJ	
H160			S800NJ	
L160			S800RJ	
S250	ZS400	S800 (630 A)	S800NE	
E250	E400	ZS630	S800RE	
H250	S400	E630	H800NE	
L250	H400	S630	XS800NJ	S1000NE
	L400	XH630	XH800SE	S1250NE/1250
		XS630	XS800SE	XS1250SE/1000

160				
160				
160	250			
160	250			
250	250			
250	250			
250	250	400		
	400	400		
	400	400		
	400	400	800 <sup>2)</sup>	
	400 <sup>2)</sup>	630	800 <sup>2)</sup>	
		630	800	
		630	800	
		630	800	
		630	800	
			800 <sup>2)</sup>	
				1000

## Motor circuit application table for DOL fire pump starting duty

### Breaker type and current rating (A)

Motor rating (kW)	Approx. FLC (Amps)	Din-T C & D curve	Safe-T	XM30PB	ZS125 E125 S125 H125 L125
0.37	1.1	4	6	3.6	
0.55	1.5	6	6	3.6	
0.75	1.8	6	6	5	20
1.1	2.6	10	6	7.4	20
1.5	3.4	16	10	10	20
2.2	4.8	20	16	12	20
3	6.5	25	20		20
4	8.2	32	25		32
4.5	9	32	32		32
5.5	11	40	40		32
7.5	14	50	50		50
10	19	63	50		50
11	21	63	63		63
15	28	100 <sup>1)</sup>	80		100
18.5	34	125 <sup>1)</sup>	100		100
22	40				125
25	46				125
30	55				
37	66				
45	80				
55	100				
75	130				
90	155				
110	200				
132	225				
160	270				
185	320				
200	361				
220	380				
250	430				
280	480				
300	510				
375	650				
450	750				

**Notes:** <sup>1)</sup> 80, 100 and 125 amp refers to Din-T10H type.  
<sup>2)</sup> Electronic TemBreak MCCB only.  
 DOL table is based on holding 125 % FLC continuously and 600 % FLC for at least 20 seconds.  
 Din-T MCBs are calibrated to IEC 60898 Curve 'C' & 'D'. Selected sizes of 'D' Curve are available from stock refer NHP.



## Motor circuit application table for DOL fire pump starting duty

ZS250			S800CJ	
S160			S800NJ	
H160			S800RJ	
L160	ZS400	ZS630	S800NE	
S250	E400	E630	S800RE	
E250	S400	S630	H800NE	S1000NE
H250	H400	XH630	ZS800	S1250NE/1250
L250	L400	XS630	XS800NJ	XS1250SE
			XH800SE	X51250SE
			XS800SE	/1000

160				
160				
250	250			
250	250			
	400			
	400			
	400	630		
	400	630		
	400	630		
	400 <sup>2)</sup>	630		
		630	800	
		630	800	
		630	800	
			800	
			800	
			800 <sup>2)</sup>	1000
				1000

## Motor starting table for DOL starting at 1000 V AC 50 Hz

Motor Size (kW)	Full Load Current Amperes (A)	MCCB	Voltage (V)
0.37-10	0.4-7.5	VS125NJ 20	1000
11.0	9.0	VS125NJ 20	1000
15-18.5	12-14.5	VS125NJ 32	1000
22-33	17-23	VS125NJ 50	1000
37-50	28-38	VS125NJ 50	1000
55-80	40-57	VS125NJ 63	1000
90-110	65-78	VS125NJ 100	1000
150	102	VS125NJ 160	1000
185-220	138-160	VS125NJ 250	1000
220-500	160-350	XV400NE/400K	1000



**Sprecher + Schuh**  
1000 V CA 6 Contactor  
(Refer Part A for more information)

**Notes:** This table should be used as a selection guide for standard applications only. 1000 V Type 2 co-ordination chart available. Refer NHP.

## Rated outputs and standard values for rated operational currents of standard squirrel-cage motors

### 3 phase 4 pole 50/60 Hz motors <sup>1) 2)</sup>

kW <sup>1)</sup>	hp	230 V	400 -415 V	690 V	1000 V	1100 V
		A	A	A	A	A
0.18	0.3	1.2	0.6	0.4	0.3	0.24
0.37	0.5	1.95	1.1	0.6	0.4	0.4
0.55	0.75	2.7	1.5	0.9	0.6	0.56
0.75	1	3.2	1.8	1.2	1.0	0.7
1.1	1.5	4.6	2.6	1.6	1.1	0.92
1.5	2	6.3	3.4	2.1	1.5	1.3
2.2	3	9	4.8	2.9	2	1.85
3	4	12	6.5	4	2.7	2.5
4	5.5	15.5	8.2	5	3.4	3.2
4.5	6	17	9	5.7	4.4	3.5
5.5	7.5	20	11	6.6	6	4.3
7.5	10	27	14	9	7	5.6
10	13.5	36	19	12	7.6	7.5
11	15	39	21	13	9	8
15	20	52	28	17	12.1	10.5
18.5	25	63	34	22	15	13
22	30	75	40	25	18	15.5
25	35	83	46	28	22	18
30	40	100	55	35	23	21
37	50	122	65	40	27	25
45	60	147	80	49	34	30
55	75	180	100	59	42	37
75	100	240	130	79	54	50
90	125	290	155	95	66	60
110	150	350	200	114	80	73
132	180	410	225	135	90	85
160	220	500	270	160	117	105
185	250	570	325	185	135	120
200	270	625	361	200	150	130
220	300	675	380	220	160	142
250	340	775	430	250	200	160
280	380	830	480	280	225	180
300	410	920	505	300	235	195
315	430	980	535	315	240	200
375	500	1150	650	375	270	240
400	545	1225	665	400	290	255
475	645	1450	780	465	335	300
500	680	–	820	495	360	320
560	750	–	920	570	390	350
600	800	–	1000	610	420	390
670	900	–	1100	680	470	430
750	1000	–	1250	770	530	490
900	1200	–	1470	930	650	600

**Notes:** Refer to 9 - 46 for footnotes



## Rated outputs and standard values for rated operational currents of standard squirrel-cage motors

### Single phase motors

kW <sup>1)</sup>	hp	230 V
		A
0.37	0.5	4
0.55	0.75	5
0.75	1	6.3
1.1	1.5	9
1.5	2	12
1.8	2.5	15
2.2	3	18
3	4	23
4	5	28
5.5	7.5	41
6	8	42
7.5	10	52

- Notes:** <sup>1)</sup> Standard values for standard squirrel-cage motors: Rated operational currents for motors with n = 1500 RPM (4 pole), possible deviation +\_ 10 % depending on type and manufacturer, +\_ 50 % for small motors. Deviation of rated operational currents for motors with other speeds (greater deviations for smaller motors):  
 With n = 3000 rpm (2 pole): -2 %...-10 %  
 With n = 1000 rpm (6 pole): +2 %...+10 %  
 With n = 750 rpm (8 pole): +5 %...+20 %
- <sup>2)</sup> The power factor is usually around 0.8, but this varies with the size and speed of the motor. Efficiency ranges from 85 % in small motors to 90 % and over for large motors.

## TemBreak MCCB clearance requirements at 380/415 V

Clearance requirements for MCCBs (phase to phase and earth).

When MCCBs are called upon to interrupt large short-circuits, ionised gas and arcing material is expelled from the vents, usually at the top of the MCCB.

This ionised gas is highly conductive and is also at an elevated temperature when it exits the MCCB via the arc vents. Care must be taken to avoid an arcing fault occurring due to the presence of the ionised gas.

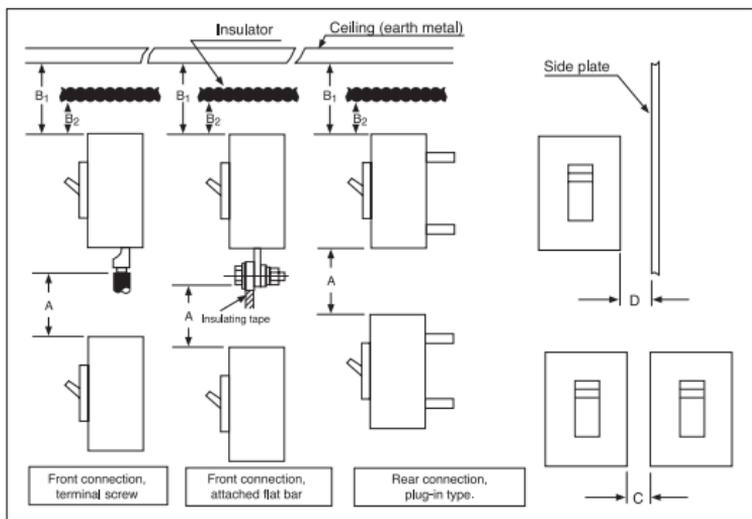
Therefore, incoming conductors must be insulated right up to the terminal opening of the MCCB. This also applies to the attached busbars supplied as a proprietary part with the MCCB.

Proprietary type interpole barriers may be used to achieve creepage and clearance requirements.

Conductors must not impede the flow of ionised gas.

### Insulating distance from Line-End for 380/415 V

When earth metal is installed within proximity of the breakers the correct insulating distance must be maintained. This distance is necessary to allow the exhausted arc gases to disperse.



### WARNING:

**EXPOSED CONDUCTORS INCLUDING TERMINALS AT ATTACHED BUSBARS MUST BE INSULATED TO AVOID POSSIBLE SHORT-CIRCUITING OR EARTHING DUE TO FOREIGN MATTER COMING INTO CONTACT WITH THE CONDUCTORS.**

**Notes:** When using the terminal bar (optional), the specified insulating distance must be maintained.

All dimensions in mm.

When earthed metal is installed within proximity of the breakers the correct insulating distance must be maintained (refer to Table 1 over the page).

This distance is necessary to allow the exhausted arc gases to disperse.

## TemBreak MCCB clearance requirements at 380/415 V

### Insulation distance in mm (at 440 V AC Maximum) <sup>1)</sup>

#### TemBreak 2 MCCBs

Table 1 below illustrates the minimum clearance that must be maintained

- A Distance from lower breaker to open charging part of terminal on upper breaker (front connection) or the distance from lower breaker to upper breaker end (rear connection and plug-in type)
- B1 Distance from breaker end to ceiling (earthed metal)
- B2 Distance from breaker end to insulator
- C Clearance between breakers
- D Distance from breaker side to side plate (earthed metal)

Cat. No.	Type	A	B1	B2	C	D
E125	NJ	50	10	10	0	25
S125	NF	50	10	10	0	25
S125	NJ	50	10	10	0	25
S125	GJ	75	45	25	0	25
ZS125	GJ	75	45	25	0	25
H125	NJ	100	80	60	0	50
L125	NJ	100	80	60	0	50
S160	NF	50	40	30	0	25
S160	NJ	50	40	30	0	25
S160	GJ	100	80	60	0	25
H160	NJ	100	80	60	0	50
L160	NJ	100	80	60	0	50
E250	NJ	50	40	30	0	25
S250	NJ	50	40	30	0	25
S250	GJ	100	80	30	0	25
ZS250	GJ	100	80	30	0	25
S250	PE	100	80	60	0	50
H250	NJ	100	80	60	0	50
H250	NE	100	80	60	0	50
L250	NJ	100	80	60	0	50
E400	NJ	100	80	40	0	30
S400	CJ	100	80	40	0	30
S400	NJ	100	80	40	0	30
S400	GJ	100	80	40	0	30
S400	GE/ PE	100	80	40	0	30
H400	NJ	120	120	80	0	80
H400	NE	120	120	80	0	80
L400	NJ	120	120	80	0	80
L400	NE	120	120	80	0	80
E630	NE	120	100	80	0	80
S630	CE	120	100	80	0	80
S630	GE	120	100	80	0	80

**Notes:** <sup>1)</sup> Insulate the exposed conductor until it overlaps the moulded case at the terminal, or the terminal cover. All dimensions in mm.

## TemBreak MCCB clearance requirements at 380/415 V

### Insulation distance in mm (at 440 V AC Maximum)<sup>1)</sup>

#### This table is valid for 380/415 V – TemBreak 1 MCCBs

Table below illustrates the minimum clearance that must be maintained

- A Distance from lower breaker to open charging part of terminal on upper breaker (front connection) or the distance from lower breaker to upper breaker end (rear connection and plug-in type)
- B1 Distance from breaker end to ceiling (earthed metal)
- B2 Distance from breaker end to insulator
- C Clearance between breakers
- D Distance from breaker side to side plate (earthed metal)

MCCB type	A	B1	B2	C	D
<b>XM30PB</b>	30	10	10	0	25
<b>XH125NJ</b>	75	45	25	0	25
<b>XS250NJ</b>	80	60	30	0	25
<b>XH250NJ</b>	100	60	30	0	25
<b>XS400NJ</b> <b>XH400SE</b>	100	70	40	0	30
<b>XS630NJ</b> <b>XS630SE</b> <b>XS800NJ</b> <b>XS800SE</b>	120	70	40	0	30
<b>XH630SE</b> <b>XH800SE</b> <b>XH800PE</b>	150	80	50	0	40
<b>XS1250SE</b>	150	70	40	0	30
<b>XH630PJ</b> <b>XH800PJ</b> <b>XS1600SE</b> <b>XS2000NE</b> <b>XS2500NE</b>	150	150	100	0	100

**Notes:** <sup>1)</sup> Insulate the exposed conductor until it overlaps the moulded case at the terminal, or the terminal cover. All dimensions in mm.

## Electrical formulae

– For obtaining kW, kVA, HP, and Amperes

Wanted	Alternating Current			Direct current
	Single-phase	Two-phase Four-wire	Three-phase	
Kilowatts	$\frac{I \times E \times PF}{1000}$	$\frac{I \times E \times 2 \times PF}{1000}$	$\frac{I \times E \times 1.73 \times PF}{1000}$	$\frac{I \times E}{1000}$
kVA	$\frac{I \times E}{1000}$	$\frac{I \times E \times 2}{1000}$	$\frac{I \times E \times 1.73}{1000}$	$\frac{I \times E}{1000}$
Horse-power	$\frac{I \times E \times \% \text{ Eff.} \times PF}{746}$	$\frac{I \times E \times 2 \times \% \text{ Eff.} \times PF}{746}$	$\frac{I \times E \times 1.73 \times \% \text{ Eff.} \times PF}{746}$	$\frac{I \times E \times \% \text{ Eff.}}{746}$
Amperes from kVA	$\frac{kVA \times 1000}{E}$	$\frac{kVA \times 1000}{2 \times E}$	$\frac{kVA \times 1000}{1.73 \times E}$	$\frac{kVA \times 1000}{E}$

## **TemBreak** **Electronic OCR adjustment setting**

### **Configuring the STANDARD Over current relay**

The standard TemBreak 2 OCR can be configured allowing the user to adjust the rated current ( $I_{Rated}$ ) of the MCCB and select a predetermined tripping curve. This allows the user to tailor the MCCBs tripping characteristics to suit the requirements of the electrical load.

### **Setting the rated current**

The TemBreak 2 MCCB OCR rated current is adjustable from 40 % - 100 % of the nominal rated current ( $I_n$ ). The dial is adjustable in increments. It is not infinitely adjustable between setting indicators. This is a desirable feature where the demand of the protected electrical load increases over time. As the load demand increases, the rating of the breaker can be adjusted accordingly to meet the system requirements. For example, an S250PE TemBreak 2 MCCB can be configured to operate with an expected load of 125 A. The OCR can be set by rotating the rated current  $I_R$  (A) selector switch to '0.5'. This has the effect of setting the rated current of the S250PE to  $I_{Rated} = I_n (250 \text{ A}) \times I_R (0.5) = 125 \text{ A}$ .



**Notes:** Additional setting and options information can be found in the 2010 - 2011 Part C catalogue.

# TemBreak

## Electronic OCR adjustment setting

### Curve selection

The predetermined curve characteristic dial on TemBreak 2 MCCBs simplifies the OCR tripping settings by reducing the number of often misunderstood variables that need to be specified. This enables users of various technical abilities to set the OCR to match the required electrical load and service application. For example if an electrical contractor was required to configure a S400 A TemBreak 2 MCCB for use in a three phase Squirrel-cage motor application, curve 5 would be the correct setting as for most applications it provides class 10 general purpose motor protection.

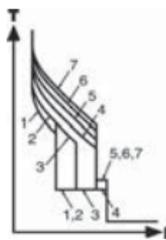
### Curve types provided as standard on TemBreak 2 electronic MCCBs:

- 250 A and 400 A MCCBs: 7 selectable curves 16 A – 400 A
- 630 A: 6 selectable curves 252 A – 630 A (Curve type 7 not available)
- 800 - 1600 A 7 selectable curves 630 A - 1600 A.

Although each of the curves can be said to be targeted towards particular applications, the use of the curves can be extended to any other use where that curve suits. For example, curve 1 is ideal for many generator applications, though curve 1 can also be used for any other application that suits the curve.

### General applications by curve type:

	Primary Application	Short circuit (SC)/ motor start type	Application 2	Application 3
Curve 1	Generator protection	Low level SC	Heating, resistive loads	Long cable runs
Curve 2	Generator protection	Low level SC	General, heating, resistive	Long cable runs
Curve 3	General distribution	Med. level SC	Long cable runs	Lighting
Curve 4	General distribution	Std. level SC	Various motor starting	Lighting
Curve 5	Motor start - standard run up time	Class 10	Transformers	Lighting
Curve 6	Motor start - longer run up time	Class 20	Capacitor switching	Lighting
Curve 7	Motor start - extra run up time	Class 30	Capacitor switching	-



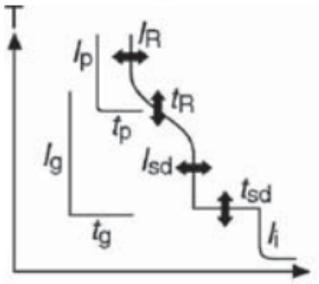
**Notes:** Curve 4 is the MCCB factory default setting for new MCCBs out of the box.

# TemBreak

## Electronic OCR adjustment setting

### Curve comparison

The predetermined curve characteristic dial on TemBreak 2 MCCBs enables easy OCR configuration to match the electrical characteristics of the load.



### Tabular representation

#### Curve selection dial ONLY

Characteristic curve selection dial position	LTD (sec)		STD Characteristics		
	200 % overload	600 % overload	In < 630 A	In ≥ 630 A	Delay (sec)
1	11	–	2.5 x I <sub>R</sub>	2.5 x I <sub>R</sub>	0.1
2	21	–	2.5 x I <sub>R</sub>	2.5 x I <sub>R</sub>	0.1
3	21	–	5 x I <sub>R</sub>	5 x I <sub>R</sub>	0.1
4	53	5	10 x I <sub>R</sub>	8 x I <sub>R</sub>	0.1
5	108	10	10 x I <sub>R</sub>	8 x I <sub>R</sub>	0.2
6	200	19	10 x I <sub>R</sub>	8 x I <sub>R</sub>	0.2
7	308	29 (Not applicable for 630 A)	10 x I <sub>R</sub>	8 x I <sub>R</sub>	0.2

I <sub>R</sub> Selection dial position	I <sub>R</sub> Selection dial ONLY INST (A)		Optional features		
	In < 630 A	In > 630 A			
0.40	14 x I <sub>R</sub>	14 x I <sub>R</sub>	PTA Pre Trip Alarm	I <sub>D</sub> x I <sub>R</sub>	0.8
0.50	14 x I <sub>R</sub>	14 x I <sub>R</sub>		t <sub>p</sub> (sec)	40
0.63	14 x I <sub>R</sub>	14 x I <sub>R</sub>	GFT Ground Fault Trip	I <sub>g</sub> x I <sub>n</sub>	0.2
0.80	14 x I <sub>R</sub>	10 x I <sub>R</sub>		t <sub>g</sub> (sec)	0.2
0.85	14 x I <sub>R</sub>	10 x I <sub>R</sub>	NP Neutral protection	I <sub>N</sub> x I <sub>n</sub>	1
0.90	14 x I <sub>R</sub>	10 x I <sub>R</sub>		t <sub>N</sub> (sec)	t <sub>N</sub> = t <sub>R</sub> 1) 2)
0.95	13 x I <sub>R</sub>	10 x I <sub>R</sub>			
1.00	13 x I <sub>R</sub>	10 x I <sub>R</sub>			

- Notes:**
- 1) The standard setting of I<sub>n</sub> is 100 % of I<sub>n</sub>. For any other setting, specify when ordering.
  - 2) When neutral pole protection is installed the breaker must be set at 100 % of its I<sub>n</sub> rating for the neutral protection to function. For other settings contact NHP.

## TemBreak Optional Functions

Curve	Application	Description	LTD	STD
1	Generator / heating / resistive loads (LOW short cct level) 	The characteristic curve features faster tripping times during overload situations & low level short circuit faults.	Fastest tripping time during an overload	Fastest tripping time during a low level short circuit
2	General distribution (LOW short cct level) 	Sharing the same short circuit tripping time characteristics as curve 1, curve 2 has greater tolerance to allow for overloads caused by small inrush currents.	Intermediate tripping time during an overload	Fastest tripping time during a low level short circuit
3	General distribution (MEDIUM short cct level) 	Featuring a shallower overload time trip curve and higher short circuit current protection characteristics than curve 2, curve 3 allows greater tolerance during overload and short circuit conditions.	Intermediate tripping time during an overload	Intermediate tripping time during a low level short circuit
4	General distribution (HIGH short cct level) 	Featuring a shallower overload time trip curve and a higher short circuit current protection characteristic than curve 3.	Slow tripping time during an overload	Slow tripping time (high tolerance) during a low level short circuit
5	Motor Protection Class 10 	Class 10 protection requires the overload detection element to trip the breaker in 10 seconds or less when a current of 600 % of its rated current is experienced. Use - general purpose motor applications, hermetic motors and submersible pumps.	Slow tripping time during an overload	Slow tripping time (high tolerance) during a low level short circuit
6	Motor Protection Class 20 	Class 20 protection requires the overload detection element to trip the breaker in 20 seconds or less when a current of 600 % of its rated current is experienced. Use - motors with difficult starting conditions.	Slow tripping time during an overload	Slow tripping time (high tolerance) during a low level short circuit
7	Motor Protection Class 30 	Class 30 protection requires the overload detection element to trip the breaker in 30 seconds or less when a current of 600 % of its rated current is experienced. Use - motors with difficult starting conditions that are driving high inertia loads.	Slowest tripping time during an overload	Slowest tripping time (high tolerance) during a low level short circuit

## TemBreak

### Optional functions

#### Pre-Trip Alarm (PTA)

An LED and volt-free output contact are activated after a time delay,  $t_p$ , if the load current exceeds the preset threshold,  $I_p$ . The default time delay,  $t_p$  is set to 40 seconds and the load current threshold,  $I_p$  is 80% of the rated current.

For example a S250PE TemBreak 2 MCCB with a  $I_{Rated}$  setting of 125 A would have a pre-trip alarm threshold of  $I_p (0.8) \times I_{Rated} (125) = 100$  A.

#### Ground Fault Trip (GF)

This function trips the MCCB after a time delay,  $t_g$ , if the ground fault current exceeds the preset threshold,  $I_g$ . Ground fault protection can be enabled and disabled by operating a DIP switch on the OCR. The default time delay,  $t_g$  is set to 0.2 seconds and the load current threshold,  $I_g$  is 20 % of the nominal current.

For example, an S400GE TemBreak 2 MCCB with a nominal current ( $I_n$ ) 400 A would have a ground fault trip threshold of  $I_g (0.2) \times I_n (400 \text{ A}) = 80$  A.

When 3 pole GF MCCBs are used, a 4th neutral pole CT will be required. Refer MCCB accessories. 4 pole GF MCCBs do not require a 4th CT as the neutral pole protection CT is used. As a general note, 4 wire systems are used in Australia and New Zealand, and this is why a 4th CT is required for 3 and 4 pole applications.

The MCCB OCR facia showing GFT option below. A DIP switch allows the GFT to be switched OFF or ON, while a 'pick up' LED indicates that the 20 % of rated current activation point for GFT has been reached.



#### Neutral Protection (NP)

Neutral protection trips the MCCB after a time delay,  $t_N$ , if the current in the neutral conductor exceeds the nominal current rating,  $I_N$ , of the MCCB. The time delay characteristic is identical to that of the overload time delay characteristic, therefore  $t_N = t_R$ . The load current threshold,  $I_N$ , is 100 % of the nominal current.

For example a S250PE A TemBreak 2 MCCB with a nominal current,  $I_N$ , of 250 A would have neutral protection threshold of  $I_N (1.0) \times I_n (250) = 250$  A.

## TemBreak Optional functions

### Option ordering

Optional functions must be specified at the time of order. Options can be selected by identifying the appropriate 'code' from the table below and appending this code after the MCCB type designation. For example, to select a 4 pole, 400 AF MCCB, front connect, with a nominal current (In) of 250 A, featuring a Pre-Trip Alarm (P) option the correct description would be: Cat. No. example: **S400GE3 AP 400 3 Pole**: with the pre-trip alarm option

### Optional Functions

$I_n$	Poles	Code	Ground Fault (GF)	Neutral Protection (NP)	Pre-Trip Alarm (PTA)
250 A	3	AP	-	-	Yes
	4	AP	-	-	Yes
	4	AN	-	Yes	-
	4	APN	-	Yes	Yes
400 A	3	AP	-	-	Yes
	3	AG	Yes	-	-
	3	APG	Yes	-	Yes
	4	AP	-	-	Yes
	4	AN	-	Yes	-
	4	APN	-	Yes	Yes
	4	AGN	Yes	Yes	-
630 - 1600 A	3	AP	-	-	Yes
	3	AG	Yes	-	-
	3	APG	Yes	-	Yes
	4	AP	-	-	Yes
	4	AN	-	Yes	-
	4	APN	-	Yes	Yes
	4	AGN	Yes	Yes	-

# TemBreak

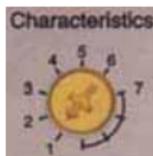
## Example 1: Generator Protection, Curve 1

Compared to a transformer, a generator has a limited short circuit capacity (say 4 times the full load rating). Therefore to avoid possible damage to the generator it is desirable to select a tripping characteristic curve that accommodates a generator's limitations.

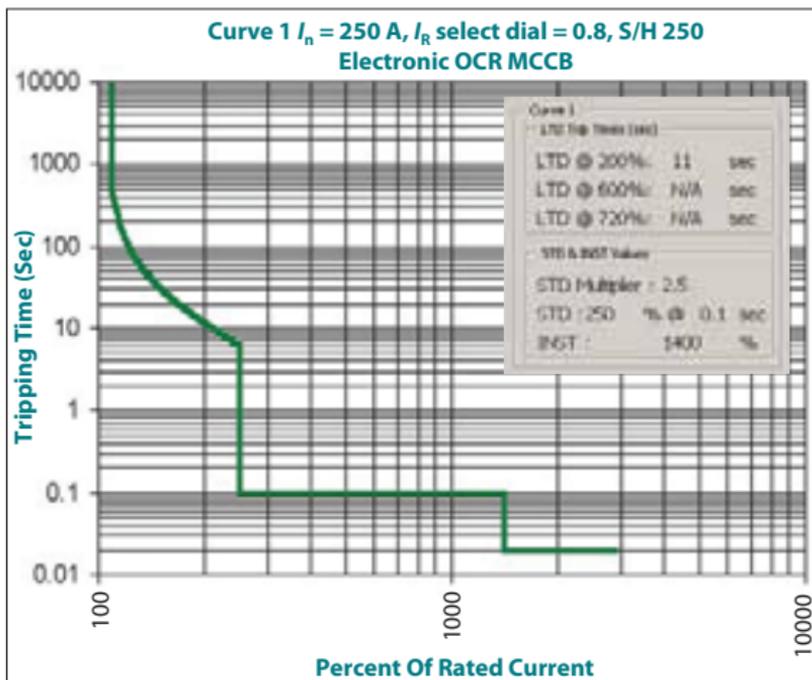
When configured for use in a generator application the characteristic curve features faster tripping times during overload situations and low level short circuit faults.

From the curve below, an S250 TemBreak 2 MCCB with a rated current of  $I_n$  (250 A)  $\times I_R$  (0.8) = 200 A features:

- Approximate trip time of 11 seconds during a 200 % of rated current (400 A) overload
- Approximate trip time of 0.1 seconds during a 250 % of rated current (500 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400 % of rated current (2800 A).



Generator Protection



**Notes:** The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.



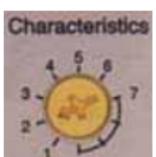
# TemBreak

## Example 2: General Feeder LOW SCP, Curve 2

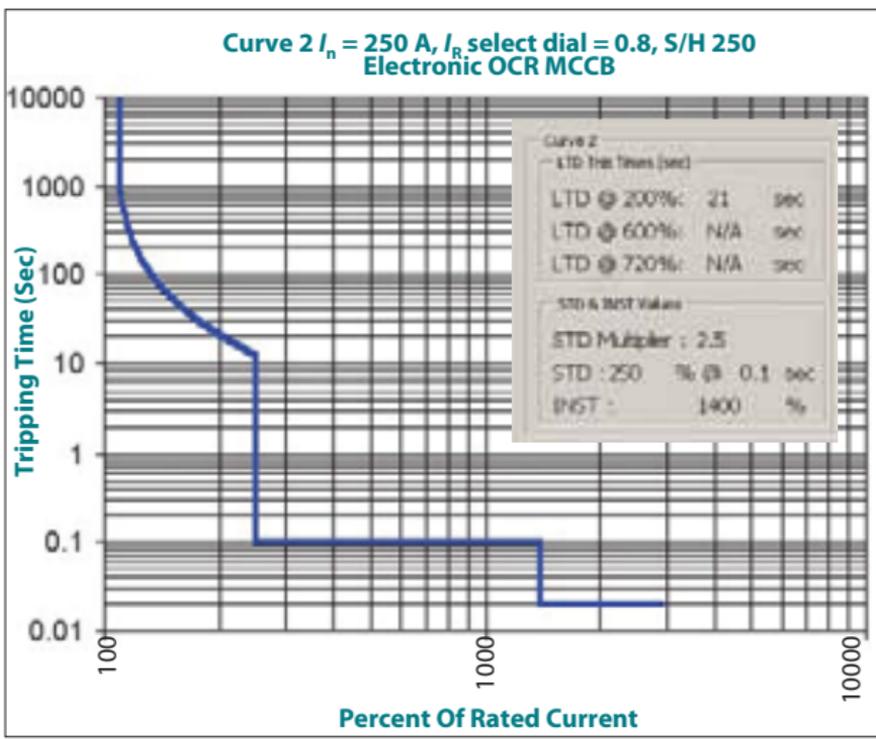
Sharing the same short circuit tripping time characteristics as the generator protection curve, the General Feeder LOW SCP curve 2 has greater tolerance to allow for overloads caused by small inrush currents.

From the curve below, an S250 TemBreak 2 MCCB with a rated current of  $I_N$  (250 A) x  $I_R$  (0.8) = 200 A features:

- Approximate trip time of 21 seconds during a 200 % of rated current (400 A) overload
- Approximate trip time of 0.1 seconds during a 250 % of rated current (500 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400 % of rated current (2800 A).



General Feeder LOW SCP (SCP = Short circuit protection)



9

**Notes:** The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

# TemBreak

## Example 3: General Feeder MEDIUM SCP, Curve 3

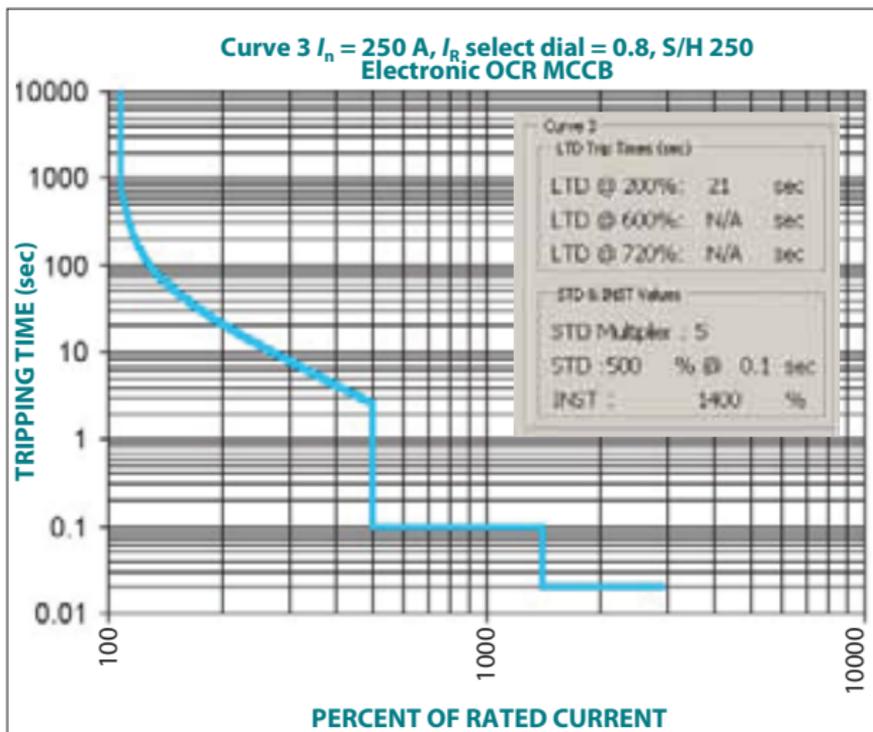
Featuring a shallower overload time trip curve and higher short circuit current protection characteristics than curve 2, curve 3 allows greater tolerance during overload and short circuit conditions.

From the curve below, an S250 TemBreak 2 MCCB with a rated current of  $I_n$  (250 A)  $\times I_R$  (0.8) = 200 A features:

- Approximate trip time of 21 seconds during a 200 % of rated current (400 A) overload
- Approximate trip time of 0.1 seconds during a 500 % of rated current (1000 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400 % of rated current (2800 A).



General Feeder MEDIUM SCP



**Notes:** The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

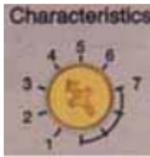
# TemBreak

## Example 4: General Feeder HIGH SCP, Curve 4

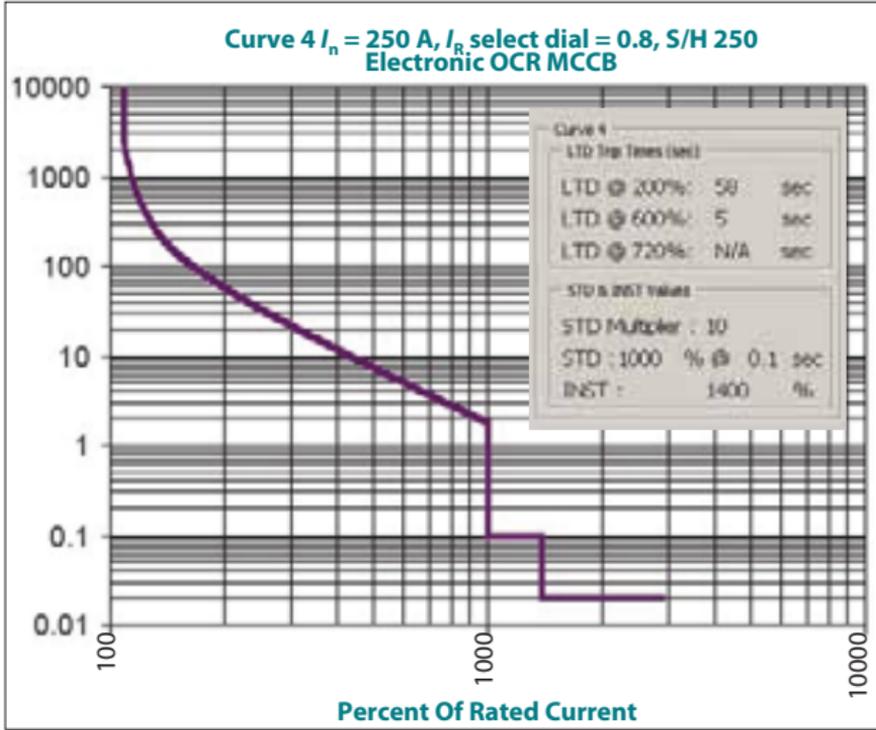
This curve contains a shallower overload time trip curve and a higher short circuit current protection characteristic compared to the previous curve 3.

From the curve below an S250 TemBreak 2 MCCB with a rated current of  $I_n$  (250 A)  $\times I_R$  (0.8) = 200 A features:

- Approximate trip time of 58 seconds during a 200 % of rated current (400 A) overload
- Approximate trip time of 5 seconds during a 600 % of rated current (1200 A) overload
- Approximate trip time of 0.1 seconds during a 1000 % of rated current (2000 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400 % of rated current (2800 A).



General Feeder HIGH SCP



9

**Notes:** The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

# TemBreak

## Example 5: Motor Protection Class 10, Curve 5

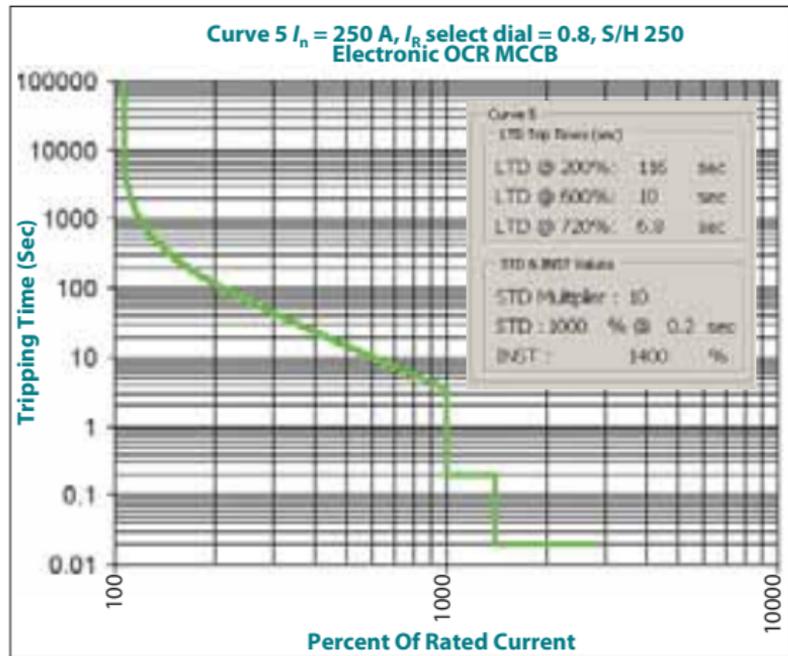
Class 10 protection requires the overload detection element to trip the breaker in 10 seconds or less when a current of 600 % of its rated current is experienced. Class 10 protection is commonly used for general purpose motor applications, hermetic motors and submersible pumps.

From the curve below an S250 TemBreak 2 MCCB with a rated current of  $I_n$  (250 A) x  $I_R$  (0.8) = 200 A features:

- Approximate trip time of 116 seconds during a 200 % of rated current (400 A) overload
- Approximate trip time of 10 seconds during a 600 % of rated current (1200 A) overload
- Approximate trip time of 6.8 seconds during a 720 % of rated current (1440 A) overload
- Approximate trip time of 0.2 seconds during a 1000 % of rated current (2000 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400 % of rated current (2800 A).



Motor Protection Class 10



**Notes:** The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.



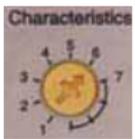
# TemBreak

## Example 6: Motor Protection Class 20, Curve 6

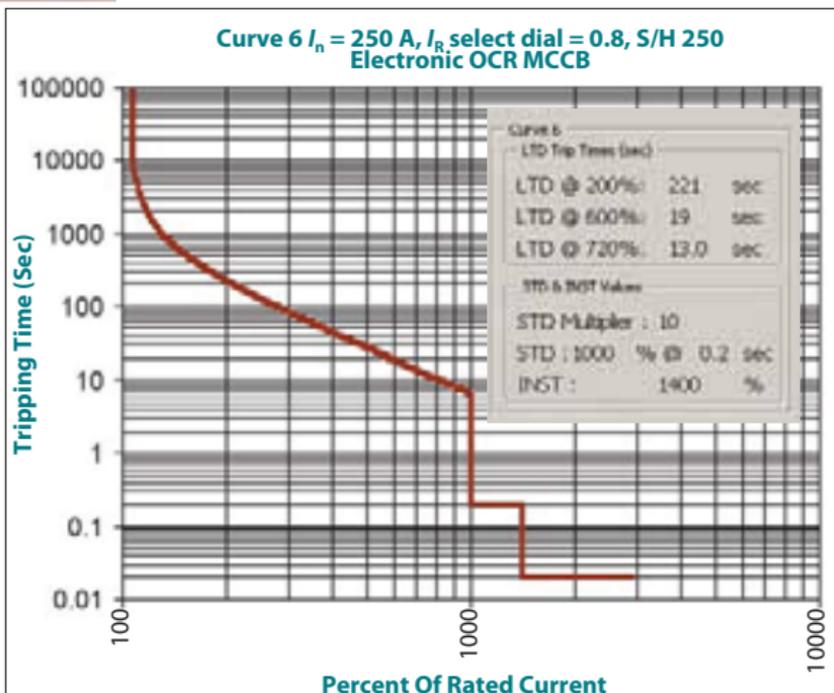
Class 20 protection requires the overload detection element to trip the breaker in 20 seconds or less when a current of 600 % of its rated current is experienced. Class 20 protection is typically reserved for motors with difficult starting conditions.

From the curve below an S250 TemBreak 2 MCCB with a rated current of  $I_n$  (250 A) x  $I_R$  (0.8) = 200 A features:

- Approximate trip time of 221 seconds during a 200 % of rated current (400 A) overload
- Approximate trip time of 19 seconds during a 600 % of rated current (1200 A) overload
- Approximate trip time of 13 seconds during a 720 % of rated current (1440 A) overload
- Approximate trip time of 0.2 seconds during a 1000 % of rated current (2000 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400 % of rated current (2800 A).



Motor Protection Class 20



**Notes:** The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

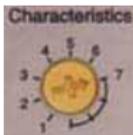
# TemBreak

## Example 7: Motor Protection Class 30, Curve 7

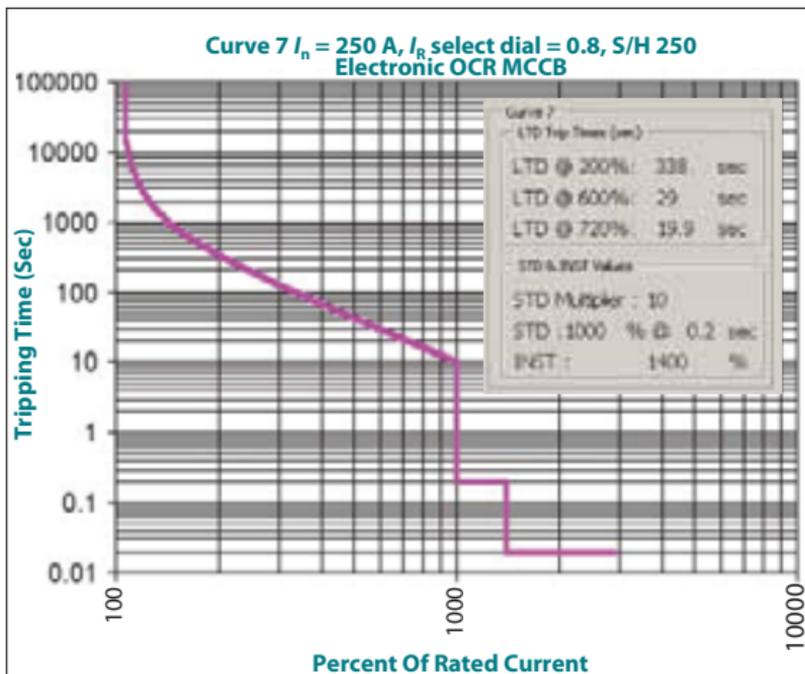
Class 30 protection requires the overload detection element to trip the breaker in 30 seconds or less when a current of 600 % of its rated current is experienced. Class 30 protection is typically reserved for motors with difficult starting conditions that are driving high inertia loads.

From the curve below an S250 TemBreak 2 MCCB with a rated current of  $I_n$  (250 A)  $\times I_R$  (0.8) = 200 A features:

- Approximate trip time of 338 seconds during a 200 % of rated current (400 A) overload
- Approximate trip time of 29 seconds during a 600 % of rated current (1200 A) overload
- Approximate trip time of 19.9 seconds during a 720 % of rated current (1440 A) overload
- Approximate trip time of 0.2 seconds during a 1000 % of rated current (2000 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400 % of rated current (2800 A).



Motor Protection Class 30

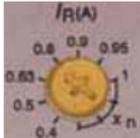


**Notes:** The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

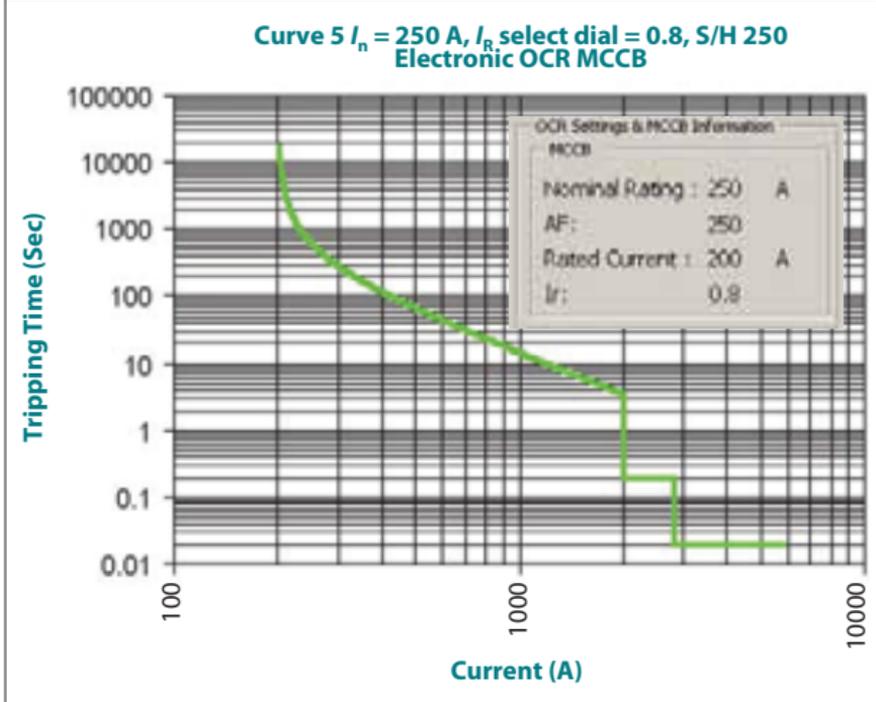
# TemBreak

## Example 8: Setting the Rated Current IR (A) Adjustment

The rated current value of the breaker can be adjusted from 40 % to 100 % of its nominal value. In this example an S250 TemBreak 2 MCCB OCR is initially set with a rated current of  $I_n (250 \text{ A}) \times I_R (0.8) = 200 \text{ A}$ .



**Rated Current**



# 9

**Notes:** See also example next page.  
 The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

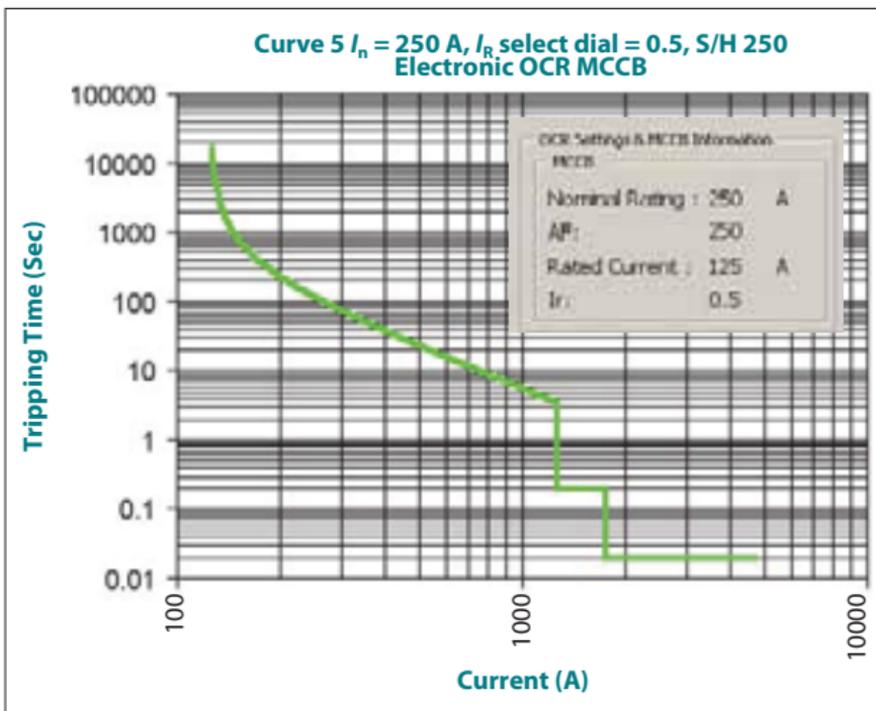
# TemBreak

## Example 9: Setting the Rated Current $I_R$ (A) Adjustment

The next example shows the OCR being set at 0.5' of  $I_R$  (A). This has the effect of changing the rated current of the breaker to  $I_n$  (250 A) x  $I_R$  (0.5) = 125 A. This change can be clearly seen in the curve movement.



Rated Current



**Notes:** The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

# INTEGRAL EARTH LEAKAGE MCCBs

The innovative ZS earth leakage MCCB from Terasaki offers machine or personnel protection within a standard 125 A or 250 A MCCB frame size.

## POWER PROTECTION



PP-TERASAKI-EARTH-LEAKAGE-CPB

### The ZS earth leakage MCCB offers the following features and options:

- Thermal magnetic MCCB
- 125 A or 250 A frame
- 65 kA as standard
- 3 or 4 pole types
- Adjustable thermal-curve dial
- Trip unit ratings: 12 A – 250 A
- 30, 100, 300, 500 mA, 1 A, 3 A settings
- 30 mA setting is non-adjustable, for near instant trip
- 0 sec to 700 ms selectable (100 mA – 3 A)
- Will fit existing XA, XB, XC Chassis
- Complies with AS2081:20
- Yellow TEST button
- Green 'Power ON' LED
- 'No Trip' dial setting
- Remote trip function standard
- Harmonic inhibition standard



REFER TO NHP FOR NEW  
400 A - 800 A ZS SIZES

## Terasaki MCCB Old Vs New cross reference

Amps	kA	TO/TG/TT MCCB	OCR type	Base current adj.	TemBreak Cat.No.	TemBreak Plus Cat.No.	2009/10 Tem-Break 2 & Tem-Break 1 combined range	400 V AC ratings kA
12.5-125	18	<b>TO100BA</b>	Adj. therm. fixed mag.	63-100 %	<b>XS125CJ</b>	-	<b>E125NJ</b>	25
12.5-125	30	<b>TO100BH</b>	Adj. therm. fixed mag.	63-100 %	<b>XS125NJ</b>	-	<b>S125NJ</b>	36
12.5-125	50	<b>TG100B</b>	Adj. therm. fixed mag.	63-100 %	<b>XH125NJ<sup>1)</sup></b>	-	<b>S125GJ</b>	65
125-225	18	<b>TO225CB</b>	Fixed therm. fixed mag.	Fixed	<b>XE225NS</b>	-	<b>E250NJ</b>	25
100-160 160-250	35	<b>TO225BA</b>	Adj. therm. fixed mag.	63-100 %	<b>XS250NJ<sup>1)</sup></b>	-	<b>S160NJ S250NJ</b>	36
100-160 160-250	50	<b>TG225B</b>	Adj. therm. fixed mag.	63-100 %	<b>XH250NJ<sup>1)</sup></b>	-	<b>S160GJ S250GJ</b>	65
160-250 250-400	35	<b>TO400BA</b>	Adj. therm. fixed mag.	63-100 %	<b>XS400CJ</b>	-	<b>S400CJ</b>	36
160-250 250-400	50	<b>TG400B</b>	Adj. therm. adj. mag.	63-100 %	<b>XS400NJ<sup>1)</sup></b>	-	<b>S400NJ</b>	50
125-250 200-400	50	<b>TTE400</b>	Electronic LSI	50-100 %	<b>XS400NE</b>	<b>XS400SE</b>	<b>S400SE</b>	50
125-250 200-400	65	<b>TTE400</b>	Electronic LSI	50-100 %	<b>XH400NE</b>	<b>XH400SE<sup>1)</sup></b>	<b>S400GE</b>	70
250-400 400-630	45	<b>TO600BA</b>	Adj. therm. adj. mag.	63-100 %	<b>XS630CJ</b>	-	<b>XS630NJ</b>	50
250-400 400-630	65	<b>TG600B</b>	Adj. therm. adj. mag.	63-100 %	<b>XS630NJ<sup>1)</sup></b>	-	<b>XS630NJ</b>	50
315-630	50	<b>TTE630</b>	Electronic	50-100 %	<b>XS630NE</b>	<b>XS630SE<sup>1)</sup></b>	<b>S630CE</b>	50
315-630	65	<b>TTE630</b>	Electronic	50-100 %	<b>XH630NE</b>	<b>XH630SE<sup>1)</sup></b>	<b>S630GE</b>	70
500-800	65	<b>TO800BA</b>	Adj. therm. adj. mag.	63-100 %	<b>XS800NJ<sup>1)</sup></b>	-	<b>XS800NJ</b>	50
500-800	85	<b>TG800B</b>	Adj. therm. adj. mag.	63-100 %	<b>XS1250NE</b>	<b>XS1250SE<sup>1)</sup></b>	<b>XS1250SE</b>	85
400-800	50	<b>TTE800</b>	Electronic	50-100 %	<b>XS800NE</b>	<b>XS800SE<sup>1)</sup></b>	<b>XS800SE</b>	50
400-800	65	<b>TTE800</b>	Electronic	50-100 %	<b>XH800NE</b>	<b>XH800SE<sup>1)</sup></b>	<b>XH800SE</b>	65
630-1250	85	<b>TO1000B TO1200B</b>	Electronic	50-100 %	<b>XS1250NE</b>	<b>XS1250SE<sup>1)</sup></b>	<b>XS1250SE</b>	85
800-1600	100	<b>TO1600B</b>	Electronic	50-100 %	<b>XS1600NE</b>	<b>XS1600SE<sup>1)</sup></b>	<b>XS1600SE</b>	100
1000-2000	100	<b>TTE2000 TO2000</b>	Electronic	50-100 %	<b>XS2000NE</b>	- <sup>1)</sup>	<b>XS2000NE</b>	85
1250-2500	100	<b>TO2500</b>	Electronic	50-100 %	<b>XS2500NE</b>	- <sup>1)</sup>	<b>XS2500NE</b>	85
1600-3200	100	<b>TO3200</b>	Electronic	50-100 %	-	<b>2009</b>	<b>XS3200NE</b>	85
Introduction date:		<b>1982</b>	-	-	<b>1990</b>	<b>2000</b>	<b>2006/07</b>	

Notes: <sup>1)</sup> Stocked

## Earth Leakage Relay and Circuit Breaker based RCD device applications

Amongst the users of various earth leakage devices, there is sometimes confusion between the correct application of the more sophisticated adjustable earth leakage relays and circuit breaker RCCB or RCBO devices. It is necessary therefore to define the correct use of earth leakage devices covering the areas of general industrial equipment protection, personnel protection and their use in applications, such as in mining.

### Din-Safe Relays, TZS Relays, and the new RD Series Relay



RD3A relay



TZS relay

#### 1. Equipment Protection

Terasaki Earth Leakage relays are suitable for earth fault protection of equipment and limitation of touch voltages where automatic disconnection of supply is required.

Typically this is achieved by shunt tripping another protective device such as an upstream circuit breaker.

Earth leakage relays are used in particular where ground (earth) fault detection is required

or the Fault Loop Impedance is of such a level that the over-current device (circuit breaker) does not achieve automatic disconnection within the times prescribed in the Wiring Rules.

#### 2. Personnel Protection

Earth leakage relays are NOT suitable for personnel protection against direct contact as specified in the Wiring Rules, e.g. for socket outlets and lighting circuits. For these applications an RCD (10 mA or 30 mA) must comply with the relevant standards (AS 3190, AS/NZS 61008 or AS/NZS 61009) and be approved by the relevant authorities. Terasaki earth leakage relays are not designed to meet the requirements of this approval.

For personnel protection Safe-T and Din-T devices such as the ELR relay, SRCB, SAFETRCB6, DSRCB, DSRCM & DSRCBH are all suitable. These are approved devices and meet the relevant standards.

Circuit breaker based RCD devices



## Earth Leakage Relay and Circuit Breaker based RCD device applications

### 3. Mining Protection

Terasaki Earth Leakage Relays are suitable for mining applications, with the exception of coal and shale mine applications as governed by AS 2081:2011 - Electrical Equipment for coal and shale mines: "Earth Leakage protection for use on earth-fault current limited systems (IT systems)".

This is because Terasaki Earth Leakage Relays are not designed to comply with certain technical requirements of the above mining standard.

Terasaki Earth Leakage Relays that DO comply with AS 2081.3 and the DSRM72 relay.

Circuit breaker based 10 mA and 30 mA RCD devices do not need to comply with AS 2081.3, as this standard accepts devices that meet the personnel protection standards: AS 3190, AS/NZS 61008 or AS/NZS 61009. As such the following Safe-T and Din-T devices are suitable: ELR relay, SRCB, SAFETRCB6, DSRCD, DSRCB, DSRCM & DSRCBH.

ZS earth leakage MCCBs also comply with the standard AS 2081:2011.

## Protection grades against contact and foreign bodies - Ingress Protection (IP)

### First Number Protection against solid objects

#### IP Tests

**0**  No protection.

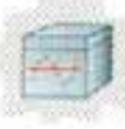
**1**  Protected against solid objects up to 50 mm. (e.g. accidental touch by hands).

**2**  Protected against solid objects up to 12 mm (e.g. fingers).

**3**  Protected against solid objects over 2.5 mm (tools + small wires).

**4**  Protected against solid objects over 1 mm (tools + small wires).

**5**  Protected against dust - limited ingress permitted (no harmful deposit).

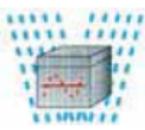
**6**  Totally protected against dust.

### First Number Protection against solid objects

#### IP Tests

**0**  No protection.

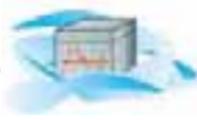
**1**  Protected against vertical falling drops of water.

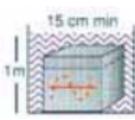
**2**  Protected against direct sprays of water up to 15° from the vertical.

**3**  Protected against spray of water up to 60° from the vertical.

**4**  Protected against water sprayed from all directions - limited ingress permissible.

**5**  Protected against low pressure jets of water from all directions - limited ingress permissible.

**6**  Protected against strong jets of water e.g. for use on shipdecks - limited ingress permissible.

**7**  Protected against the effects of immersion between 15 cm and 1 m.

**8**  Protected against long periods of immersion under pressure.

A quarterly NHP publication, the NHP technical news features a wide range of application and design criteria for the motor control, power distribution and numerous other product fields. Copies can be issued on request. NHP Technical news ranges from 4 to 8 pages.



**Issue Technical subject**

1. Contactor control circuits, latches etc.
2. Contactors: Parallel/series connection, non standard frequencies
3. Contactors: Failure to open or close, flashover, coil burnout
4. Soft starters: Motor starting, loads, electronic soft starters
5. MCCB overcurrent relay types and applications
6. Contactors: AC and DC control
7. Fault Levels: At the point of supply and reducing factors – bars, cables etc.
8. IP ratings: Definition and applications
9. AC-1 to AC-23 (AC types only)
10. VSDs: Loads, Dynamic resistor and DC injection braking
11. Thermal and electronic overloads
12. Contactors: Operating curves and contact inspection
13. Slip ring motors, liquid resistance types and applications
14. DC contactor arc design, arcing and connection options
15. Selecting the right kind of motor starter for an application
16. AC, DC lamps, types and applications
17. Surge causes and diverters
18. PLCs: Control, mathematics, inputs and outputs
19. Conventional types and contactors with electronic coils
20. Enclosures and temperature rise
21. Electro-magnetic interference (EMI)
22. The need for safety, sensors, E stops and other devices
23. Torque and motor starters
24. Power Factor: Electricity supply degradation and solutions
25. Safety, RCD operating speed, and applications
26. Terminations: Control circuit Temp. rise, vibration, corrosion, developments
27. Switchboards: Design, venting, earthing, fault containment, control equipment
28. Electrical Equip: Ambient temp, current, voltage, impulse, ins ratings
29. Electro-magnetic compatibility, cabling and EMC sources
30. Current limiting circuit breakers: Electric arcs, applications and device types
31. MCBs, characteristic curves, fault calculation, RCD's
32. Cable ratings, overloads, faults, circuit breakers, AS standards
33. RCDs, how they work, wiring, nuisance tripping, testing.



**Issue Technical subject**

- 34. Derating: TemPerformance CD, enclosures, heat loss, enclosure design
- 35. Star-delta starters and wiring, different versions, SC protection
- 36. CT selection, types and applications
- 37. Flexible copper busbar - application
- 38. New standard Australian voltages: 230/400 V
- 39. Motor protection and the wiring rules
- 40. Confused about which RCD you should be choosing?
- 41. Circuit breaker - selectivity & cascade applications
- 42. Keeping in contact.
- 43(b). Is your switchboard in good form?
- 44. Automation in a technological world.
- 45. Thermal simulation of switchgear
- 46. Cable considerations.
- 47. Output chokes for use with Variable Speed Drives.
- 48. VSD installation techniques
- 49. The modern SCADA system
- 50. NHP still delivering its promise
- 51. Electrical design considerations for commercial buildings
- 52. Terminal temperatures - how hot are they?
- 53. Taking care of business - prevention is better than cure
- 54. Control voltages for contactors
- 55. Electrical switchgear - Will it turn you off?
- 56. Electrical Arcs, Beauty and the Beast
- 57. The Power of Copper.
- 58. Industrial networking with Ethernet/IP.
- 59. Drives: benefits, operation, pitfalls and harmonic solutions.
- 60. Exposing the confusion of key surge parameters.
- 61. Ensuring low voltage air circuit breakers are fit for service.
- 62. Renewable Energy: Part 1 What does it all mean?
- 63. Renewable Energy: Part 2 Solar, Wind and the Future for Renewable
- 64. Harmonics: Part 1 Where they come from, the problems they cause and how to reduce their effects.



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	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>1</b>				
	1499 7702	3 - 22	NB20071	235.00
	1499 7702	3 - 39	NB20071	235.00
	1499 7702	3 - 66	NB20071	235.00
	1499 7702	3 - 99	NB20071	235.00
	1499 7702	3 - 116	NB20071	235.00
	1499 7702	3 - 124	NB20071	235.00
	1499 7702	6 - 11	NB20071	235.00
	1499 7702	6 - 27	NB20071	235.00
	1499 7702	6 - 37	NB20071	235.00
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	1H1895BAA	7 - 8	NZ00150	250.00
	1H1896BAA	7 - 8	NZ00150	250.00
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	1H2022CAA	7 - 8	NZ00150	114.00
	1H2243BAA	7 - 8	NZ00150	156.00
	1H2300CAB	7 - 8	NZ00150	1220.00
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	1LS2VS	2 - 51	NB20064	12.00
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<b>I</b>	2A1787DBA	6 - 12	NT20138	6.20
<b>I</b>	2A1787DBA	6 - 27	NT20138	6.20
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<b>I</b>	2A3308DBA	6 - 27	NT20138	445.00
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	2H...TBA	3 - 120	NT20138	POA
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<b>I</b>	2H1193CAB	6 - 36	NT20138	3670.00
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	2H1195CAB	6 - 36	NT30141	3670.00
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	2H1198BAA	6 - 35	NT30141	520.00
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<b>I</b>	2H1201BAA	6 - 35	NT30141	520.00
<b>I</b>	2H1202BAA	6 - 35	NT30141	520.00
<b>I</b>	2H1203BAB	6 - 35	NT30141	520.00
<b>I</b>	2H1204BAA	6 - 35	NT30141	520.00
	2H1208BAA	6 - 35	NT30141	425.00
	2H1209BAA	6 - 35	NT30141	425.00
	2H1210BAA	6 - 35	NT30141	425.00
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	2H1302CAC	6 - 26	NT20138	2750.00
	2H1303CAC	6 - 26	NT20138	2750.00
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	2H1526BAA	3 - 131	NT20138	560.00
	2H1527BAA	3 - 131	NT20138	560.00

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	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I</b>	2H1528BAA	3 - 131	NT20138	560.00
	2H1529BAA	3 - 131	NT20138	560.00
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<b>I</b>	2H1532BAA	3 - 131	NT20138	560.00
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I 2H6941CBA	3 - 147	NT20138	305.00
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2H6959CAA1	3 - 146	NT20138	37.00
2H6959CBA1	3 - 120	NT20138	37.00
2H6959CBA1	3 - 146	NT20138	37.00
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2H6973SAA	5 - 36	NT20138	7.20
I 2H7234CAAK	3 - 147	NT20138	500.00
I 2H7235CAAK	3 - 147	NT20138	640.00

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<b>3</b>				
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	392.00002	2 - 57	NT40143	46.50
	392.35554	2 - 57	NT40143	46.50
	392.35555	2 - 57	NT40143	46.50
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<b>I</b>	7KB 3BA	6 - 8	NT20138	60.00
<b>I</b>	7MB 3BA1	6 - 8	NT20138	1910.00
	7RC 2LE	6 - 8	NT20138	210.00
	7T1ST	1 - 9	NT10136	13.00
<b>I</b>	7T 2M1	6 - 8	NT20138	110.00
	7T2ST	1 - 9	NT10136	15.60
<b>I</b>	7UF 2D5B	6 - 8	NT20138	360.00
	7UF 2D6B	6 - 8	NT20138	360.00
<b>I</b>	7UF 2D7B	6 - 8	NT20138	360.00
<b>I</b>	7UF 2FD1	6 - 8	NT20138	360.00
<b>I</b>	7UF 2FD2	6 - 8	NT20138	360.00
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	7VF 2M2-B	6 - 8	NT20138	280.00
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<b>I</b>	7VF 2M7	6 - 8	NT20138	280.00
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	A2000 0010	7 - 44	NB20067	3030.00
<b>I</b>	A2000 0020	7 - 44	NB20067	2000.00
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	ALR	5 - 29	NT30141	465.00
	ANU1AC200	7 - 8	NZ00150	5510.00
	ARACBTRUCK	7 - 8	NZ00150	17610.00
	ARAGR21BMANUAL	7 - 6	NZ00150	10.40
	ARAGR31BMANUAL	7 - 6	NZ00150	10.40
<b>A</b>	ARB2123STD	7 - 4	NT40143	11180.00
<b>A</b>	ARB2163STD	7 - 4	NT40143	11290.00
<b>A</b>	ARB2203STD	7 - 4	NT40143	13380.00
<b>A</b>	ARB3253STD	7 - 4	NT40143	14090.00
<b>A</b>	ARB3323STD	7 - 4	NT40143	15920.00
<b>A</b>	ARB4403STD	7 - 4	NT40143	22650.00
<b>A</b>	ARC2123HHSTD	7 - 5	NT40143	4480.00
<b>A</b>	ARC2123HVSTD	7 - 5	NT40143	4480.00
<b>A</b>	ARC2123VHSTD	7 - 5	NT40143	4480.00
<b>A</b>	ARC2123VVSTD	7 - 5	NT40143	4480.00
<b>A</b>	ARC2203HHSTD	7 - 5	NT40143	4950.00
<b>A</b>	ARC2203HVSTD	7 - 5	NT40143	4950.00
<b>A</b>	ARC2203VHSTD	7 - 5	NT40143	4950.00

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	A ARC3323HVSTD	7 - 5	NT40143	7470.00
	A ARC3323VHSTD	7 - 5	NT40143	7470.00
	A ARC3323VVSTD	7 - 5	NT40143	7470.00
	A ARC4403VVSTD	7 - 5	NT40143	11120.00
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I	A ARCOMMSMODDEV	7 - 30	NZ00150	4210.00
I	A ARCOMMSMODPRO	7 - 30	NZ00150	4210.00
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I	A BTSS16NJ6333	5 - 7	NT20138	3910.00
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I	A BTSS1GJ10044	5 - 7	NT20138	6810.00
I	A BTSS1GJ10044	5 - 7	NT20138	6810.00
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I	A BTSS1GJ12544	5 - 7	NT20138	7140.00
I	A BTSS1GJ12544	5 - 7	NT20138	7140.00

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	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I A</b>	BTSS1GJ6333	5 - 7	NT20138	4210.00
<b>I A</b>	BTSS1GJ6344	5 - 7	NZ00150	5620.00
<b>I A</b>	BTSS1GJ6344	5 - 7	NZ00150	5620.00
<b>I A</b>	BTSS1NJ10033	5 - 7	NT20138	4620.00
<b>A</b>	BTSS1NJ12533	5 - 7	NT20138	4700.00
<b>I A</b>	BTSS1NJ6333	5 - 7	NT20138	3230.00
<b>A</b>	BTSS2GJ25033	5 - 7	NT20138	6190.00
<b>I A</b>	BTSS2GJ25034	5 - 8	NT20138	7350.00
<b>I A</b>	BTSS2GJ25043	5 - 8	NT20138	7350.00
<b>I A</b>	BTSS2GJ25044	5 - 7	NT20138	8250.00
<b>I A</b>	BTSS2GJ25044	5 - 7	NT20138	8250.00
<b>A</b>	BTSS2NJ25033	5 - 7	NT20138	5450.00
<b>I A</b>	BTSS2PE12533	5 - 7	NT20138	6330.00
<b>A</b>	BTSS2PE25033	5 - 7	NT20138	6740.00
<b>I A</b>	BTSS2PE25044	5 - 7	NT20138	8980.00
<b>I A</b>	BTSS4GE25033	5 - 7	NT20138	11080.00
<b>I A</b>	BTSS4GE40033	5 - 7	NT20138	12400.00
<b>I A</b>	BTSS4GE40044	5 - 7	NT20138	14840.00
<b>I A</b>	BTSS4GJ25033	5 - 7	NT20138	7840.00
<b>I A</b>	BTSS4GJ25044	5 - 7	NT20138	10450.00
<b>A</b>	BTSS4GJ40033	5 - 7	NT20138	8180.00
<b>I A</b>	BTSS4GJ40034	5 - 8	NT20138	9640.00
<b>I A</b>	BTSS4GJ40043	5 - 8	NT20138	9640.00
<b>I A</b>	BTSS4GJ40044	5 - 7	NT20138	10880.00
<b>I A</b>	BTSS4NE25033	5 - 7	NT20138	8750.00
<b>A</b>	BTSS4NE25044	5 - 7	NT20138	POA
<b>I A</b>	BTSS4NE40033	5 - 7	NT20138	9680.00
<b>I A</b>	BTSS4NE40044	5 - 7	NT20138	12900.00
<b>I A</b>	BTSS4NJ25033	5 - 7	NT20138	7080.00
<b>I A</b>	BTSS4NJ25044	5 - 7	NT20138	9420.00
<b>A</b>	BTSS4NJ40033	5 - 7	NT20138	7550.00
<b>I A</b>	BTSS4NJ40034	5 - 8	NT20138	8970.00
<b>I A</b>	BTSS4NJ40044	5 - 7	NT20138	10070.00
<b>A</b>	BTSS6CE63033	5 - 7	NT20138	9980.00
<b>I A</b>	BTSS6CE63034	5 - 8	NT20138	11750.00
<b>I A</b>	BTSS6CE63044	5 - 7	NT20138	13320.00
<b>A</b>	BTSS6GE63033	5 - 7	NT20138	12470.00
<b>I A</b>	BTSS6GE63044	5 - 7	NT20138	16630.00
<b>C</b>				
	CA81210110VAC	1 - 56	NA10007	137.00
	CA81210240VAC	1 - 56	NA10007	137.00
	CA8121024VAC	1 - 56	NA10007	137.00
	CA81210415VAC	1 - 56	NA10007	137.00
	CA8510110VAC	1 - 56	NA10007	99.50
	CA8510240VAC	1 - 56	NA10007	99.50
	CA851024VAC	1 - 56	NA10007	99.50
	CA8510415VAC	1 - 56	NA10007	99.50
	CA8910110VAC	1 - 56	NA10007	113.00
	CA8910240VAC	1 - 56	NA10007	113.00

CAT. NO.	PAGE	P.S.	PRICE \$
CA891024VAC	1 - 56	NA10007	113.00
CA8910415VAC	1 - 56	NA10007	113.00
CA891048VAC	1 - 56	NA10007	113.00
CD212/183U	2 - 65	NT40143	200.00
CD218/183U	2 - 65	NT40143	225.00
CD224/183U	2 - 65	NT40143	265.00
CD230/183U	2 - 65	NT40143	310.00
CD236/183U	2 - 65	NT40143	350.00
CD242/183U	2 - 65	NT40143	380.00
CD248/183U	2 - 65	NT40143	425.00
<b>A</b> CD250CKT2	2 - 31	NT40143	280.00
<b>A</b> CD250CKT2	2 - 51	NT40143	280.00
CD250TOPC	2 - 51	NT40143	0.60
CD250TOPC	2 - 66	NT40143	0.60
CD254/183U	2 - 65	NT40143	475.00
CD260/183U	2 - 65	NT40143	495.00
CD272/183U	2 - 65	NT40143	660.00
CD278/183U	2 - 65	NT40143	780.00
CD284/183U	2 - 65	NT40143	850.00
CD296/183U	2 - 65	NT40143	990.00
<b>I</b> CD312/183U	2 - 66	NT40143	340.00
CD318/183U	2 - 66	NT40143	385.00
CD324/183U	2 - 66	NT40143	440.00
<b>I</b> CD330/183U	2 - 66	NT40143	495.00
CD336/183U	2 - 66	NT40143	530.00
CD342/183U	2 - 66	NT40143	570.00
CD348/183U	2 - 66	NT40143	650.00
<b>I</b> CD354/183U	2 - 66	NT40143	680.00
CD360/183U	2 - 66	NT40143	720.00
CD372/183U	2 - 66	NT40143	850.00
<b>I</b> CD378/183U	2 - 66	NT40143	910.00
CD384/183U	2 - 66	NT40143	1000.00
CD396/183U	2 - 66	NT40143	1130.00
<b>I A</b> CDG 24G2	2 - 24	NT40143	1550.00
<b>I A</b> CDG 24M160G2	2 - 24	NT40143	1750.00
<b>I A</b> CDG 24M160O2	2 - 25	NT40143	1750.00
CDG 24M250G2	2 - 24	NT40143	1910.00
CDG 24M250O2	2 - 25	NT40143	1910.00
<b>I A</b> CDG 24O2	2 - 25	NT40143	1550.00
<b>I A</b> CDG 36G2	2 - 24	NT40143	1750.00
<b>I A</b> CDG 36M160G2	2 - 24	NT40143	1950.00
<b>I A</b> CDG 36M160O2	2 - 25	NT40143	1950.00
<b>I A</b> CDG 36M250G2	2 - 24	NT40143	2110.00
<b>I A</b> CDG 36M250O2	2 - 25	NT40143	2110.00
<b>I A</b> CDG 36O2	2 - 25	NT40143	1750.00
<b>I A</b> CDG 48G2	2 - 24	NT40143	2010.00
<b>I A</b> CDG 48M160G2	2 - 24	NT40143	2150.00
<b>I A</b> CDG 48M160O2	2 - 25	NT40143	2150.00
<b>I A</b> CDG 48M250G2	2 - 24	NT40143	2370.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I A</b>	CDG 48M250O2	2 - 25	NT40143	2370.00
<b>I A</b>	CDG 48O2	2 - 25	NT40143	2010.00
<b>I A</b>	CDG 60G2	2 - 24	NT40143	2320.00
<b>I A</b>	CDG 60M160G2	2 - 24	NT40143	2480.00
	CDG 60M160O2	2 - 25	NT40143	2480.00
<b>I A</b>	CDG 60M250G2	2 - 24	NT40143	2680.00
<b>I A</b>	CDG 60M250O2	2 - 25	NT40143	2680.00
<b>I A</b>	CDG 60O2	2 - 25	NT40143	2320.00
<b>I A</b>	CDG 72G2	2 - 24	NT40143	2550.00
<b>I A</b>	CDG 72M250G2	2 - 24	NT40143	2850.00
<b>I A</b>	CDG 72M250O2	2 - 25	NT40143	2850.00
<b>I A</b>	CDG 72O2	2 - 25	NT40143	2550.00
<b>I A</b>	CDG 84G2	2 - 24	NT40143	2990.00
<b>I A</b>	CDG 84M250G2	2 - 24	NT40143	3350.00
<b>I A</b>	CDG 84M250O2	2 - 25	NT40143	3350.00
<b>I A</b>	CDG 84O2	2 - 25	NT40143	2990.00
<b>I A</b>	CDG 96G2	2 - 24	NT40143	3400.00
<b>I A</b>	CDG 96M250G2	2 - 24	NT40143	3750.00
	CDG 96M250O2	2 - 25	NT40143	3750.00
<b>I A</b>	CDG 96O2	2 - 25	NT40143	3400.00
	CDH312/3027/183U	2 - 66	NT40143	640.00
	CDH312/4227/183U	2 - 66	NT40143	770.00
	CDH312/6027/183U	2 - 66	NT40143	950.00
	CDH36/1227/183U	2 - 66	NT40143	490.00
	CDH36/2427/183U	2 - 66	NT40143	550.00
	CDH36/3627/183U	2 - 66	NT40143	580.00
<b>I A</b>	CDM36M160G	2 - 26	NT40143	3370.00
<b>I A</b>	CDM48M160G	2 - 26	NT40143	3530.00
<b>I A</b>	CDM60M160G	2 - 26	NT40143	3790.00
<b>I A</b>	CDM60M250G	2 - 26	NT40143	3890.00
<b>I A</b>	CDM72M250G	2 - 26	NT40143	4100.00
<b>I A</b>	CDM84M250G	2 - 26	NT40143	4410.00
<b>I A</b>	CDM96M250G	2 - 26	NT40143	4510.00
<b>I A</b>	CDMRFDM250AG6	2 - 26	NT40143	2750.00
<b>I A</b>	CDMRFG	2 - 26	NT40143	1610.00
<b>I A</b>	CDMRFSM250AG6	2 - 26	NT40143	2020.00
<b>A</b>	CDT160MS	2 - 51	NT40143	305.00
	CDT 18G2	2 - 18	NT40143	1090.00
	CDT 18M160G2	2 - 18	NT40143	1340.00
<b>A</b>	CDT 18M160O2	2 - 19	NT40143	1340.00
	CDT 18M250G2	2 - 18	NT40143	1460.00
	CDT 18M250O2	2 - 19	NT40143	1460.00
<b>A</b>	CDT 18O2	2 - 19	NT40143	1090.00
	CDT 24G2	2 - 18	NT40143	1190.00
	CDT 24M160G2	2 - 18	NT40143	1440.00
<b>A</b>	CDT 24M160O2	2 - 19	NT40143	1440.00
	CDT 24M250G2	2 - 18	NT40143	1570.00
	CDT 24M250O2	2 - 19	NT40143	1570.00
<b>A</b>	CDT 24MCCB160G2	2 - 22	NT40143	1800.00

CAT. NO.	PAGE	P.S.	PRICE \$
A CDT 24MCCB200G2	2 - 22	NT40143	1950.00
A CDT 24O2	2 - 19	NT40143	1190.00
A CDT250MS	2 - 51	NT40143	435.00
CDT 36G2	2 - 18	NT40143	1300.00
CDT 36M160G2	2 - 18	NT40143	1550.00
A CDT 36M160O2	2 - 19	NT40143	1550.00
A CDT 36M250G2	2 - 18	NT40143	1670.00
A CDT 36M250O2	2 - 19	NT40143	1670.00
A CDT 36O2	2 - 19	NT40143	1300.00
A CDT 42MCCB160G2	2 - 22	NT40143	1990.00
A CDT 42MCCB200G2	2 - 22	NT40143	2150.00
CDT 48G2	2 - 18	NT40143	1460.00
CDT 48M160G2	2 - 18	NT40143	1710.00
A CDT 48M160O2	2 - 19	NT40143	1710.00
A CDT 48M250G2	2 - 18	NT40143	1840.00
A CDT 48M250O2	2 - 19	NT40143	1840.00
A CDT 48O2	2 - 19	NT40143	1460.00
A CDT 60G2	2 - 18	NT40143	1630.00
A CDT 60M160G2	2 - 18	NT40143	1880.00
CDT 60M160O2	2 - 19	NT40143	1880.00
A CDT 60M250G2	2 - 18	NT40143	2000.00
A CDT 60M250O2	2 - 19	NT40143	2000.00
A CDT 60MCCB160G2	2 - 22	NT40143	2200.00
A CDT 60MCCB200G2	2 - 22	NT40143	2350.00
A CDT 60O2	2 - 19	NT40143	1630.00
A CDT 72G2	2 - 18	NT40143	1780.00
A CDT 72M250G2	2 - 18	NT40143	2160.00
A CDT 72M250O2	2 - 19	NT40143	2160.00
A CDT 72O2	2 - 19	NT40143	1780.00
A CDT78MCCB160G2	2 - 22	NT40143	2600.00
A CDT78MCCB200G2	2 - 22	NT40143	2750.00
A CDT 84G2	2 - 18	NT40143	2060.00
A CDT 84M250G2	2 - 18	NT40143	2440.00
A CDT 84M250O2	2 - 19	NT40143	2440.00
A CDT 84O2	2 - 19	NT40143	2060.00
A CDT 96G2	2 - 18	NT40143	2390.00
A CDT 96M250G2	2 - 18	NT40143	2760.00
CDT 96M250O2	2 - 19	NT40143	2760.00
A CDT 96MCCB160G2	2 - 22	NT40143	2990.00
A CDT 96MCCB200G2	2 - 22	NT40143	3150.00
A CDT 96O2	2 - 19	NT40143	2390.00
A CDTE18G2	2 - 20	NT40143	1190.00
A CDTE18M160G2	2 - 20	NT40143	1440.00
A CDTE18M160O2	2 - 21	NT40143	1440.00
A CDTE18M250G2	2 - 20	NT40143	1560.00
A CDTE18M250O2	2 - 21	NT40143	1560.00
A CDTE18O2	2 - 21	NT40143	1190.00
A CDTE36G2	2 - 20	NT40143	1400.00
A CDTE36M160G2	2 - 20	NT40143	1650.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>A</b>	CDTE36M160O2	2 - 21	NT40143	1650.00
<b>A</b>	CDTE36M250G2	2 - 20	NT40143	1770.00
<b>A</b>	CDTE36M250O2	2 - 21	NT40143	1770.00
<b>A</b>	CDTE36O2	2 - 21	NT40143	1400.00
<b>A</b>	CDTE48G2	2 - 20	NT40143	1660.00
<b>A</b>	CDTE48M160G2	2 - 20	NT40143	1910.00
<b>A</b>	CDTE48M160O2	2 - 21	NT40143	1910.00
<b>A</b>	CDTE48M250G2	2 - 20	NT40143	2040.00
<b>A</b>	CDTE48M250O2	2 - 21	NT40143	2040.00
<b>A</b>	CDTE48O2	2 - 21	NT40143	1660.00
<b>A</b>	CDTE72G2	2 - 20	NT40143	1890.00
<b>A</b>	CDTE72M160G2	2 - 20	NT40143	2140.00
<b>A</b>	CDTE72M160O2	2 - 21	NT40143	2140.00
<b>A</b>	CDTE72M250G2	2 - 20	NT40143	2260.00
<b>A</b>	CDTE72M250O2	2 - 21	NT40143	2260.00
<b>A</b>	CDTE72O2	2 - 21	NT40143	1890.00
<b>A</b>	CDTE96G2	2 - 20	NT40143	2490.00
<b>A</b>	CDTE96M160G2	2 - 20	NT40143	2740.00
<b>A</b>	CDTE96M160O2	2 - 21	NT40143	2740.00
<b>A</b>	CDTE96M250G2	2 - 20	NT40143	2860.00
<b>A</b>	CDTE96M250O2	2 - 21	NT40143	2860.00
<b>A</b>	CDTE96O2	2 - 21	NT40143	2490.00
	CE4DT 14A2	1 - 42	NY80146	560.00
	CE4DT 14A6	1 - 42	NY80146	640.00
	CEN24	2 - 29	NT40143	88.00
	CEN24	2 - 48	NT40143	88.00
	CEN36	2 - 29	NT40143	95.00
	CEN36	2 - 48	NT40143	95.00
	CEN48	2 - 29	NT40143	118.00
	CEN48	2 - 48	NT40143	118.00
	CEN60	2 - 29	NT40143	144.00
	CEN60	2 - 48	NT40143	144.00
	CEN72	2 - 29	NT40143	158.00
	CEN72	2 - 48	NT40143	158.00
	CEN84	2 - 29	NT40143	193.00
	CEN84	2 - 48	NT40143	193.00
	CEN96	2 - 29	NT40143	215.00
	CEN96	2 - 48	NT40143	215.00
	CLSBB125033	5 - 34	NT30141	1840.00
<b>I</b>	CLSBB125044	5 - 34	NT30141	3150.00
	CLSBB63033	5 - 34	NT30141	1200.00
	CLSBB63044	5 - 34	NT30141	1690.00
	CLTD	5 - 28	NT30141	310.00
	CLTD	5 - 29	NT30141	310.00
<b>A</b>	CON 24 M160 G	2 - 15	NT40143	1190.00
<b>A</b>	CON 24 M160 O	2 - 15	NT40143	1190.00
<b>A</b>	CON 24 M250 G	2 - 15	NT40143	1400.00
<b>I A</b>	CON 24 M250 O	2 - 15	NT40143	1400.00
<b>A</b>	CON 36 M160 G	2 - 15	NT40143	1300.00

	CAT. NO.	PAGE	P.S.	PRICE \$
	A CON 36 M160 O	2 - 15	NT40143	1300.00
	A CON 36 M250 G	2 - 15	NT40143	1500.00
I	A CON 36 M250 O	2 - 15	NT40143	1500.00
	A CON 48 M160 G	2 - 15	NT40143	1400.00
	A CON 48 M160 O	2 - 15	NT40143	1400.00
	A CON 48 M250 G	2 - 15	NT40143	1620.00
I	A CON 48 M250 O	2 - 15	NT40143	1620.00
	A CON 60 M160 G	2 - 15	NT40143	1540.00
	A CON 60 M160 O	2 - 15	NT40143	1540.00
	A CON 60 M250 G	2 - 15	NT40143	1740.00
I	A CON 60 M250 O	2 - 15	NT40143	1740.00
	CONFK1	2 - 16	NT40143	285.00
	CONFK2	2 - 16	NT40143	285.00
I	CONFK3	2 - 16	NT40143	285.00
I	CONFK4	2 - 16	NT40143	285.00
	COTD	5 - 29	NT30141	365.00
A	CPACC24G2	2 - 29	NT40143	790.00
	CPACC48G2	2 - 29	NT40143	810.00
	CPACC72G2	2 - 29	NT40143	880.00
A	CPACCS1GE2	2 - 29	NT40143	900.00
A	CPACCS2GE2	2 - 29	NT40143	1020.00
A	CPACCS3GE2	2 - 29	NT40143	1130.00
A	CPACCS4GE2	2 - 29	NT40143	1320.00
A	CPACCS5GE2	2 - 29	NT40143	1430.00
A	CPACCS6GE2	2 - 29	NT40143	1610.00
A	CPACCSHG2	2 - 29	NT40143	870.00
	CPACCSHGE2	2 - 29	NT40143	870.00
	CPACCSOG2	2 - 29	NT40143	740.00
	CPACCSOGE2	2 - 29	NT40143	740.00
	CPBFK1	2 - 30	NT40143	300.00
	CPBFK2	2 - 30	NT40143	300.00
	CPBFK3	2 - 30	NT40143	300.00
	CPBFK4	2 - 30	NT40143	300.00
	CPBFK5	2 - 30	NT40143	300.00
I	CPBFK6	2 - 30	NT40143	300.00
	CPBGTS1	2 - 29	NT40143	46.50
	CPBGTS1	2 - 48	NT40143	46.50
	CPBGTS2	2 - 29	NT40143	67.50
	CPBGTS2	2 - 48	NT40143	67.50
	CPBGTS3	2 - 29	NT40143	88.00
	CPBGTS3	2 - 48	NT40143	88.00
	CPBGTS4	2 - 29	NT40143	145.00
	CPBGTS4	2 - 48	NT40143	145.00
	CPBGTS6	2 - 29	NT40143	230.00
	CPBGTS6	2 - 48	NT40143	230.00
	CPBGTSH	2 - 29	NT40143	114.00
	CPBGTSH	2 - 48	NT40143	114.00
	CPBMN	2 - 57	NT40143	4.20
	CPBS250	2 - 31	NT40143	83.00

I Available on indent only.

A Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>A</b>	CPD 18G	2 - 34	NT40143	1870.00
	CPD 18G2	2 - 40	NT40143	1870.00
	CPD 18M160G	2 - 34	NT40143	2120.00
	CPD 18M160G2	2 - 40	NT40143	2120.00
	CPD 18M160O	2 - 35	NT40143	2120.00
	CPD 18M160O2	2 - 41	NT40143	2120.00
	CPD 18M160SS	2 - 36	NT40143	7160.00
	CPD 18M160SS2	2 - 42	NT40143	7160.00
	CPD 18M250G	2 - 34	NT40143	2240.00
	CPD 18M250G2	2 - 40	NT40143	2240.00
	CPD 18M250O	2 - 35	NT40143	2240.00
	CPD 18M250O2	2 - 41	NT40143	2240.00
	CPD 18M250SS	2 - 36	NT40143	7310.00
	CPD 18M250SS2	2 - 42	NT40143	7310.00
<b>A</b>	CPD 18O	2 - 35	NT40143	1870.00
	CPD 18O2	2 - 41	NT40143	1870.00
<b>A</b>	CPD 18SS	2 - 36	NT40143	6850.00
	CPD 18SS2	2 - 42	NT40143	6850.00
<b>A</b>	CPD 24G	2 - 34	NT40143	1970.00
	CPD 24G2	2 - 40	NT40143	1970.00
<b>A</b>	CPD 24M160G	2 - 34	NT40143	2220.00
	CPD 24M160G2	2 - 40	NT40143	2220.00
	CPD 24M160O	2 - 35	NT40143	2220.00
	CPD 24M160O2	2 - 41	NT40143	2220.00
	CPD 24M160SS	2 - 36	NT40143	7240.00
	CPD 24M160SS2	2 - 42	NT40143	7240.00
	CPD 24M250G	2 - 34	NT40143	2340.00
	CPD 24M250G2	2 - 40	NT40143	2340.00
	CPD 24M250O	2 - 35	NT40143	2340.00
	CPD 24M250O2	2 - 41	NT40143	2340.00
	CPD 24M250SS	2 - 36	NT40143	7420.00
	CPD 24M250SS2	2 - 42	NT40143	7420.00
<b>A</b>	CPD 24O	2 - 35	NT40143	1970.00
	CPD 24O2	2 - 41	NT40143	1970.00
<b>A</b>	CPD 24SS	2 - 36	NT40143	6950.00
	CPD 24SS2	2 - 42	NT40143	6950.00
<b>A</b>	CPD 36G	2 - 34	NT40143	2180.00
	CPD 36G2	2 - 40	NT40143	2180.00
	CPD 36M160G	2 - 34	NT40143	2430.00
	CPD 36M160G2	2 - 40	NT40143	2430.00
	CPD 36M160O	2 - 35	NT40143	2430.00
	CPD 36M160O2	2 - 41	NT40143	2430.00
	CPD 36M160SS	2 - 36	NT40143	8140.00
	CPD 36M160SS2	2 - 42	NT40143	8140.00
	CPD 36M250G	2 - 34	NT40143	2550.00
	CPD 36M250G2	2 - 40	NT40143	2550.00
	CPD 36M250O	2 - 35	NT40143	2550.00
	CPD 36M250O2	2 - 41	NT40143	2550.00
	CPD 36M250SS	2 - 36	NT40143	8290.00

	CAT. NO.	PAGE	P.S.	PRICE \$
	CPD 36M250SS2	2 - 42	NT40143	8290.00
<b>A</b>	CPD 36O	2 - 35	NT40143	2180.00
	CPD 36O2	2 - 41	NT40143	2180.00
<b>A</b>	CPD 36SS	2 - 36	NT40143	7890.00
	CPD 36SS2	2 - 42	NT40143	7890.00
<b>A</b>	CPD 48G	2 - 34	NT40143	2310.00
	CPD 48G2	2 - 40	NT40143	2310.00
	CPD 48M160G	2 - 34	NT40143	2560.00
	CPD 48M160G2	2 - 40	NT40143	2560.00
	CPD 48M160O	2 - 35	NT40143	2560.00
	CPD 48M160O2	2 - 41	NT40143	2560.00
	CPD 48M160SS	2 - 36	NT40143	8290.00
	CPD 48M160SS2	2 - 42	NT40143	8290.00
<b>A</b>	CPD 48M250G	2 - 34	NT40143	2690.00
	CPD 48M250G2	2 - 40	NT40143	2690.00
	CPD 48M250O	2 - 35	NT40143	2690.00
	CPD 48M250O2	2 - 41	NT40143	2690.00
	CPD 48M250SS	2 - 36	NT40143	8460.00
	CPD 48M250SS2	2 - 42	NT40143	8460.00
<b>A</b>	CPD 48M300G	2 - 39	NT40143	3300.00
<b>A</b>	CPD 48M400G	2 - 39	NT40143	3300.00
<b>A</b>	CPD 48MCCB300G	2 - 39	NT40143	3800.00
<b>A</b>	CPD 48O	2 - 35	NT40143	2310.00
	CPD 48O2	2 - 41	NT40143	2310.00
<b>A</b>	CPD 48SS	2 - 36	NT40143	7980.00
	CPD 48SS2	2 - 42	NT40143	7980.00
<b>A</b>	CPD 60G	2 - 34	NT40143	2540.00
	CPD 60G2	2 - 40	NT40143	2540.00
	CPD 60M160G	2 - 34	NT40143	2790.00
	CPD 60M160G2	2 - 40	NT40143	2790.00
	CPD 60M160O	2 - 35	NT40143	2790.00
	CPD 60M160O2	2 - 41	NT40143	2790.00
<b>I A</b>	CPD 60M160SS	2 - 36	NT40143	9330.00
	CPD 60M160SS2	2 - 42	NT40143	9330.00
	CPD 60M250G	2 - 34	NT40143	2920.00
	CPD 60M250G2	2 - 40	NT40143	2920.00
	CPD 60M250O	2 - 35	NT40143	2920.00
	CPD 60M250O2	2 - 41	NT40143	2920.00
<b>I A</b>	CPD 60M250SS	2 - 36	NT40143	9490.00
	CPD 60M250SS2	2 - 42	NT40143	9490.00
<b>A</b>	CPD 60M300G	2 - 39	NT40143	3600.00
<b>A</b>	CPD 60M400G	2 - 39	NT40143	3600.00
<b>A</b>	CPD 60MCCB300G	2 - 39	NT40143	4100.00
<b>A</b>	CPD 60O	2 - 35	NT40143	2540.00
	CPD 60O2	2 - 41	NT40143	2540.00
<b>I A</b>	CPD 60SS	2 - 36	NT40143	9050.00
	CPD 60SS2	2 - 42	NT40143	9050.00
<b>A</b>	CPD 72G	2 - 34	NT40143	3100.00
	CPD 72G2	2 - 40	NT40143	3100.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	CPD 72M250G	2 - 34	NT40143	3480.00
	CPD 72M250G2	2 - 40	NT40143	3480.00
	CPD 72M250O	2 - 35	NT40143	3480.00
	CPD 72M250O2	2 - 41	NT40143	3480.00
<b>I A</b>	CPD 72M250SS	2 - 36	NT40143	10480.00
	CPD 72M250SS2	2 - 42	NT40143	10480.00
<b>A</b>	CPD 72M300G	2 - 39	NT40143	4200.00
<b>A</b>	CPD 72M400G	2 - 39	NT40143	4200.00
<b>A</b>	CPD 72MCCB300G	2 - 39	NT40143	4700.00
<b>A</b>	CPD 72O	2 - 35	NT40143	3100.00
	CPD 72O2	2 - 41	NT40143	3100.00
<b>I A</b>	CPD 72SS	2 - 36	NT40143	10150.00
	CPD 72SS2	2 - 42	NT40143	10150.00
<b>A</b>	CPD 84G	2 - 34	NT40143	3620.00
	CPD 84G2	2 - 40	NT40143	3620.00
	CPD 84M250G	2 - 34	NT40143	3990.00
	CPD 84M250G2	2 - 40	NT40143	3990.00
	CPD 84M250O	2 - 35	NT40143	3990.00
	CPD 84M250O2	2 - 41	NT40143	3990.00
<b>I A</b>	CPD 84M250SS	2 - 36	NT40143	10690.00
	CPD 84M250SS2	2 - 42	NT40143	10690.00
<b>A</b>	CPD 84M300G	2 - 39	NT40143	4700.00
<b>A</b>	CPD 84M400G	2 - 39	NT40143	4700.00
<b>A</b>	CPD 84MCCB300G	2 - 39	NT40143	5200.00
<b>A</b>	CPD 84O	2 - 35	NT40143	3620.00
	CPD 84O2	2 - 41	NT40143	3620.00
<b>I A</b>	CPD 84SS	2 - 36	NT40143	10320.00
	CPD 84SS2	2 - 42	NT40143	10320.00
<b>A</b>	CPD 96G	2 - 34	NT40143	4250.00
	CPD 96G2	2 - 40	NT40143	4250.00
	CPD 96M250G	2 - 34	NT40143	4630.00
	CPD 96M250G2	2 - 40	NT40143	4630.00
	CPD 96M250O	2 - 35	NT40143	4630.00
	CPD 96M250O2	2 - 41	NT40143	4630.00
<b>I A</b>	CPD 96M250SS	2 - 36	NT40143	11400.00
	CPD 96M250SS2	2 - 42	NT40143	11400.00
<b>A</b>	CPD 96M300G	2 - 39	NT40143	5300.00
<b>A</b>	CPD 96M400G	2 - 39	NT40143	5300.00
<b>A</b>	CPD 96MCCB300G	2 - 39	NT40143	5800.00
<b>A</b>	CPD 96O	2 - 35	NT40143	4250.00
	CPD 96O2	2 - 41	NT40143	4250.00
<b>I A</b>	CPD 96SS	2 - 36	NT40143	11100.00
	CPD 96SS2	2 - 42	NT40143	11100.00
	CPDHANDLE92268	2 - 16	NT40143	36.50
	CPDHANDLE92268	2 - 30	NT40143	36.50
	CPDHANDLECL001	2 - 16	NT40143	36.50
	CPDHANDLECL001	2 - 30	NT40143	36.50
	CPDHANDLEELOCK	2 - 16	NT40143	290.00
	CPDHANDLEELOCK	2 - 30	NT40143	290.00

	CAT. NO.	PAGE	P.S.	PRICE \$
I	CPDHANDLENOLOCK	2 - 16	NT40143	36.50
I	CPDHANDLENOLOCK	2 - 30	NT40143	36.50
I	CPDHANDLEPADLCK	2 - 16	NT40143	78.00
I	CPDHANDLEPADLCK	2 - 30	NT40143	78.00
	CPDRUBBER	2 - 30	NT40143	197.00
	CPECS	2 - 30	NT40143	104.00
A	CPELK1	2 - 16	NT40143	430.00
A	CPELK1	2 - 30	NT40143	430.00
A	CPELK1	2 - 50	NT40143	430.00
A	CPELK1W	2 - 16	NT40143	445.00
A	CPELK1W	2 - 30	NT40143	445.00
A	CPELK1W	2 - 50	NT40143	445.00
A	CPELK2	2 - 16	NT40143	495.00
A	CPELK2	2 - 30	NT40143	495.00
A	CPELK2	2 - 50	NT40143	495.00
	CPEN18	2 - 56	NT40143	88.00
	CPEN18EVE	2 - 57	NT40143	98.50
	CPEN18ODD	2 - 57	NT40143	98.50
	CPEN24	2 - 56	NT40143	101.00
	CPEN24EVE	2 - 57	NT40143	111.00
	CPEN24ODD	2 - 57	NT40143	111.00
	CPEN30EVE	2 - 57	NT40143	130.00
	CPEN30ODD	2 - 57	NT40143	130.00
	CPEN36	2 - 56	NT40143	130.00
	CPEN36EVE	2 - 57	NT40143	140.00
	CPEN36ODD	2 - 57	NT40143	140.00
	CPEN48	2 - 56	NT40143	140.00
	CPEN48EVE	2 - 57	NT40143	150.00
	CPEN48ODD	2 - 57	NT40143	150.00
	CPEN60	2 - 56	NT40143	171.00
	CPEN72	2 - 56	NT40143	192.00
	CPEN84	2 - 56	NT40143	225.00
	CPEN96	2 - 56	NT40143	265.00
	CPEN9EVE	2 - 57	NT40143	78.00
	CPEN9ODD	2 - 57	NT40143	78.00
A	CPESC	2 - 30	NT40143	50.00
	CPEXTLK1	2 - 31	NT40143	395.00
	CPEXTLK2	2 - 31	NT40143	710.00
	CPEXTLKC	2 - 31	NT40143	300.00
I A	CPG 24G	2 - 37	NT40143	2300.00
A	CPG 24G2	2 - 43	NT40143	2300.00
I A	CPG 24M160G	2 - 37	NT40143	2550.00
A	CPG 24M160G2	2 - 43	NT40143	2550.00
	CPG 24M160O	2 - 38	NT40143	2550.00
A	CPG 24M160O2	2 - 44	NT40143	2550.00
	CPG 24M250G	2 - 37	NT40143	2650.00
A	CPG 24M250G2	2 - 43	NT40143	2650.00
	CPG 24M250O	2 - 38	NT40143	2650.00
A	CPG 24M250O2	2 - 44	NT40143	2650.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I</b>	<b>A</b> CPG 24O	2 - 38	NT40143	2300.00
	<b>A</b> CPG 24O2	2 - 44	NT40143	2300.00
<b>I</b>	<b>A</b> CPG 36G	2 - 37	NT40143	2600.00
	<b>A</b> CPG 36G2	2 - 43	NT40143	2600.00
	CPG 36M160G	2 - 37	NT40143	2850.00
	<b>A</b> CPG 36M160G2	2 - 43	NT40143	2850.00
	CPG 36M160O	2 - 38	NT40143	2850.00
	<b>A</b> CPG 36M160O2	2 - 44	NT40143	2850.00
	CPG 36M250G	2 - 37	NT40143	2950.00
	<b>A</b> CPG 36M250G2	2 - 43	NT40143	2950.00
	CPG 36M250O	2 - 38	NT40143	2950.00
	<b>A</b> CPG 36M250O2	2 - 44	NT40143	2950.00
<b>I</b>	<b>A</b> CPG 36O	2 - 38	NT40143	2600.00
	<b>A</b> CPG 36O2	2 - 44	NT40143	2600.00
<b>I</b>	<b>A</b> CPG 48G	2 - 37	NT40143	2850.00
	<b>A</b> CPG 48G2	2 - 43	NT40143	2850.00
	CPG 48M160G	2 - 37	NT40143	3050.00
	<b>A</b> CPG 48M160G2	2 - 43	NT40143	3050.00
	CPG 48M160O	2 - 38	NT40143	3050.00
	<b>A</b> CPG 48M160O2	2 - 44	NT40143	3050.00
<b>I</b>	<b>A</b> CPG 48M250G	2 - 37	NT40143	3200.00
	<b>A</b> CPG 48M250G2	2 - 43	NT40143	3200.00
	CPG 48M250O	2 - 38	NT40143	3200.00
	<b>A</b> CPG 48M250O2	2 - 44	NT40143	3200.00
<b>I</b>	<b>A</b> CPG 48O	2 - 38	NT40143	2850.00
	<b>A</b> CPG 48O2	2 - 44	NT40143	2850.00
<b>I</b>	<b>A</b> CPG 60G	2 - 37	NT40143	3200.00
	<b>A</b> CPG 60G2	2 - 43	NT40143	3200.00
	CPG 60M160G	2 - 37	NT40143	3450.00
	<b>A</b> CPG 60M160G2	2 - 43	NT40143	3450.00
	CPG 60M160O	2 - 38	NT40143	3450.00
	<b>A</b> CPG 60M160O2	2 - 44	NT40143	3450.00
	CPG 60M250G	2 - 37	NT40143	3550.00
	<b>A</b> CPG 60M250G2	2 - 43	NT40143	3550.00
	CPG 60M250O	2 - 38	NT40143	3550.00
	<b>A</b> CPG 60M250O2	2 - 44	NT40143	3550.00
<b>I</b>	<b>A</b> CPG 60O	2 - 38	NT40143	3200.00
	<b>A</b> CPG 60O2	2 - 44	NT40143	3200.00
<b>I</b>	<b>A</b> CPG 72G	2 - 37	NT40143	3850.00
	<b>A</b> CPG 72G2	2 - 43	NT40143	3850.00
	CPG 72M250G	2 - 37	NT40143	4200.00
	<b>A</b> CPG 72M250G2	2 - 43	NT40143	4200.00
	CPG 72M250O	2 - 38	NT40143	4200.00
	<b>A</b> CPG 72M250O2	2 - 44	NT40143	4200.00
<b>I</b>	<b>A</b> CPG 72O	2 - 38	NT40143	3850.00
	<b>A</b> CPG 72O2	2 - 44	NT40143	3850.00
<b>I</b>	<b>A</b> CPG 84G	2 - 37	NT40143	4550.00
	<b>A</b> CPG 84G2	2 - 43	NT40143	4550.00
	CPG 84M250G	2 - 37	NT40143	4900.00

	CAT. NO.	PAGE	P.S.	PRICE \$
	A CPG 84M250G2	2 - 43	NT40143	4900.00
	CPG 84M250O	2 - 38	NT40143	4900.00
	A CPG 84M250O2	2 - 44	NT40143	4900.00
I	A CPG 84O	2 - 38	NT40143	4550.00
	A CPG 84O2	2 - 44	NT40143	4550.00
I	A CPG 96G	2 - 37	NT40143	5250.00
	A CPG 96G2	2 - 43	NT40143	5250.00
	CPG 96M250G	2 - 37	NT40143	5600.00
	A CPG 96M250G2	2 - 43	NT40143	5600.00
	CPG 96M250O	2 - 38	NT40143	5600.00
	A CPG 96M250O2	2 - 44	NT40143	5600.00
I	A CPG 96O	2 - 38	NT40143	5250.00
	A CPG 96O2	2 - 44	NT40143	5250.00
	CPGPA	2 - 30	NT40143	67.50
	CPGPB	2 - 30	NT40143	220.00
	CPGPS	2 - 30	NT40143	54.00
	CPIP52G	2 - 30	NT40143	210.00
	A CPPACC24G	2 - 48	NT40143	1030.00
	CPPACC24G2	2 - 49	NT40143	1030.00
	CPPACC48G	2 - 48	NT40143	1060.00
	CPPACC48G2	2 - 49	NT40143	1060.00
	A CPPACCG	2 - 48	NT40143	950.00
	CPPACCG2	2 - 49	NT40143	1020.00
	CPPACCGE	2 - 48	NT40143	1020.00
	CPPACCGE2	2 - 49	NT40143	1020.00
	A CPPACCS1GE	2 - 48	NT40143	1250.00
	CPPACCS1GE2	2 - 49	NT40143	1250.00
	A CPPACCS2GE	2 - 48	NT40143	1450.00
	CPPACCS2GE2	2 - 49	NT40143	1450.00
	A CPPACCS3GE	2 - 48	NT40143	1660.00
	CPPACCS3GE2	2 - 49	NT40143	1660.00
	A CPPACCS4GE	2 - 48	NT40143	1970.00
	CPPACCS4GE2	2 - 49	NT40143	1970.00
	A CPPACCS5GE	2 - 48	NT40143	2280.00
	CPPACCS5GE2	2 - 49	NT40143	2280.00
	A CPPACCS6GE	2 - 48	NT40143	2590.00
	CPPACCS6GE2	2 - 49	NT40143	2590.00
	A CPPACCS7GE	2 - 48	NT40143	2910.00
	CPPACCS7GE2	2 - 49	NT40143	2910.00
	CPPBNC400GT	2 - 61	NT40143	41.50
	CPPBS250	2 - 51	NT40143	83.00
	CPPD92268	2 - 51	NT40143	78.00
	CPPDCL001	2 - 51	NT40143	67.50
	CPPE5100DTL	1 - 47	NT40143	210.00
	CPPE5200DTL	1 - 47	NT40143	250.00
	CPPE5300DTL	1 - 47	NT40143	290.00
	CPPE5400DTL	1 - 47	NT40143	330.00
	CPPE5500DTL	1 - 47	NT40143	375.00
I	CPPFK1	2 - 50	NT40143	300.00

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**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	CPPFK2	2 - 50	NT40143	300.00
	CPPFK3	2 - 50	NT40143	300.00
	CPPFK4	2 - 50	NT40143	300.00
<b>I</b>	CPPFK5	2 - 50	NT40143	300.00
	CPPFK6	2 - 50	NT40143	300.00
	CPPFK7	2 - 50	NT40143	300.00
<b>I</b>	CPPFKH	2 - 50	NT40143	300.00
	CPPGPA	2 - 50	NT40143	67.50
	CPPGPA6	2 - 50	NT40143	72.50
	CPPGPB	2 - 50	NT40143	200.00
	CPPGPB5	2 - 50	NT40143	375.00
	CPPPLINTH	2 - 30	NT40143	365.00
	CPPPLINTHD	2 - 50	NT40143	930.00
<b>I</b>	CPPPLINTHDSS	2 - 50	NT40143	2650.00
	CPPPLINTHS	2 - 50	NT40143	360.00
	CPPPLINTHSSS	2 - 50	NT40143	1220.00
	CPPPWDNSW	2 - 51	NT40143	295.00
	CPPWB	2 - 50	NT40143	325.00
	CPPWBMS	2 - 50	NT40143	290.00
	CPPWC	2 - 50	NT40143	255.00
	CPPWCD	2 - 50	NT40143	415.00
<b>I</b>	CPPWCDSS	2 - 50	NT40143	2390.00
	CPPWCSS	2 - 50	NT40143	650.00
	CPPWIL1	2 - 50	NT40143	150.00
	CPPWIL2	2 - 50	NT40143	150.00
	CPPWIL3	2 - 50	NT40143	150.00
	CPPWIL4	2 - 50	NT40143	150.00
	CPPWIL5	2 - 50	NT40143	150.00
	CPPWIL6	2 - 50	NT40143	150.00
	CPPWIL7	2 - 50	NT40143	150.00
	CPPWILH	2 - 50	NT40143	150.00
<b>A</b>	CPS 24G	2 - 45	NT40143	2060.00
	CPS 24M160G	2 - 45	NT40143	2310.00
	CPS 24M160O	2 - 46	NT40143	2310.00
	CPS 24M250G	2 - 45	NT40143	2440.00
	CPS 24M250O	2 - 46	NT40143	2440.00
<b>A</b>	CPS 24O	2 - 46	NT40143	2060.00
<b>A</b>	CPS 36G	2 - 45	NT40143	2260.00
	CPS 36M160G	2 - 45	NT40143	2510.00
	CPS 36M160O	2 - 46	NT40143	2510.00
	CPS 36M250G	2 - 45	NT40143	2640.00
	CPS 36M250O	2 - 46	NT40143	2640.00
<b>A</b>	CPS 36O	2 - 46	NT40143	2260.00
<b>A</b>	CPS 48G	2 - 45	NT40143	2410.00
	CPS 48M160G	2 - 45	NT40143	2660.00
	CPS 48M160O	2 - 46	NT40143	2660.00
	CPS 48M250G	2 - 45	NT40143	2780.00
	CPS 48M250O	2 - 46	NT40143	2780.00
<b>A</b>	CPS 48O	2 - 46	NT40143	2410.00

CAT. NO.	PAGE	P.S.	PRICE \$
<b>A</b> CPS 60G	2 - 45	NT40143	2580.00
CPS 60M160G	2 - 45	NT40143	2830.00
CPS 60M160O	2 - 46	NT40143	2830.00
CPS 60M250G	2 - 45	NT40143	2960.00
CPS 60M250O	2 - 46	NT40143	2960.00
<b>A</b> CPS 60O	2 - 46	NT40143	2580.00
<b>A</b> CPS 72G	2 - 45	NT40143	3220.00
CPS 72M250G	2 - 45	NT40143	3590.00
CPS 72M250O	2 - 46	NT40143	3590.00
<b>A</b> CPS 72O	2 - 46	NT40143	3220.00
<b>A</b> CPS 84G	2 - 45	NT40143	3720.00
CPS 84M250G	2 - 45	NT40143	4100.00
<b>A</b> CPS 96G	2 - 45	NT40143	4360.00
CPS 96M250G	2 - 45	NT40143	4730.00
CPS 96M250O	2 - 46	NT40143	4730.00
<b>A</b> CPS 96O	2 - 46	NT40143	4360.00
CPSCHEDULECARD	2 - 57	NT40143	3.00
CPSCHEDULEHOLD	2 - 57	NT40143	13.00
CPTPSC1-100N	1 - 57	NE90129	530.00
CPTPSC1-12/230IR	1 - 57	NE90129	265.00
CPTPSC1-12-230MOD	1 - 57	NE90129	280.00
CPTPSC1-25/230IR	1 - 57	NE90129	425.00
CPTPSC1-25N	1 - 57	NE90129	265.00
CPTPSC1-50N	1 - 57	NE90129	425.00
CPTPSC2-12/230IR	1 - 57	NE90129	540.00
CPTPSC2-25/230IR	1 - 57	NE90129	990.00
CPTPSC2-25-230MOD	1 - 57	NE90129	475.00
CPTPSC4-12/400IR	1 - 57	NE90129	1060.00
CPTPSC4-25/400IR	1 - 57	NE90129	2150.00
CPTPSM1- 20/230 IR	1 - 59	NE90129	109.00
CPTPSM1- 20N	1 - 59	NE90129	109.00
CPTPSM1- 40/230 IR	1 - 59	NE90129	156.00
CPTPSM1- 40N	1 - 59	NE90129	156.00
CPTPSM20-230MOD	1 - 59	NE90129	62.00
CPTPSM2- 20/230 IR	1 - 59	NE90129	270.00
CPTPSM2- 40/230 IR	1 - 59	NE90129	320.00
CPTPSM40-230MOD	1 - 59	NE90129	72.50
CPTPSM4- 20/400 IR	1 - 59	NE90129	510.00
CPTPSM4- 40/400 IR	1 - 59	NE90129	670.00
CPWIL0	2 - 30	NT40143	83.00
CPWIL02	2 - 30	NT40143	83.00
CPWIL1	2 - 30	NT40143	83.00
CPWIL12	2 - 30	NT40143	83.00
CPWIL2	2 - 30	NT40143	83.00
CPWIL22	2 - 30	NT40143	83.00
CPWIL3	2 - 30	NT40143	125.00
CPWIL32	2 - 30	NT40143	125.00
CPWIL4	2 - 30	NT40143	135.00
CPWIL42	2 - 30	NT40143	135.00

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**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	CPWIL5	2 - 30	NT40143	145.00
	CPWIL52	2 - 30	NT40143	145.00
	CPWIL6	2 - 30	NT40143	156.00
	CPWIL62	2 - 30	NT40143	156.00
	CPWILH	2 - 30	NT40143	83.00
	CPWILH2	2 - 30	NT40143	83.00
<b>A</b>	CPX18G	2 - 47	NT40143	3680.00
<b>I A</b>	CPX18O	2 - 47	NT40143	3680.00
<b>I A</b>	CPX18SS	2 - 47	NT40143	8560.00
<b>A</b>	CPX24G	2 - 47	NT40143	4100.00
<b>I A</b>	CPX24O	2 - 47	NT40143	4100.00
<b>I A</b>	CPX24SS	2 - 47	NT40143	8770.00
<b>A</b>	CPX36G	2 - 47	NT40143	4460.00
<b>I A</b>	CPX36O	2 - 47	NT40143	4460.00
<b>I A</b>	CPX36SS	2 - 47	NT40143	10220.00
<b>A</b>	CPX42G	2 - 47	NT40143	4880.00
<b>I A</b>	CPX42O	2 - 47	NT40143	4880.00
<b>I A</b>	CPX42SS	2 - 47	NT40143	11460.00
<b>I A</b>	CPX48G	2 - 47	NT40143	4930.00
<b>I A</b>	CPX48O	2 - 47	NT40143	4930.00
<b>I A</b>	CPX48SS	2 - 47	NT40143	11670.00
<b>I A</b>	CPX60G	2 - 47	NT40143	5290.00
<b>I A</b>	CPX60O	2 - 47	NT40143	5290.00
<b>I A</b>	CPX60SS	2 - 47	NT40143	13120.00
<b>I A</b>	CPX72G	2 - 47	NT40143	5710.00
<b>I A</b>	CPX72O	2 - 47	NT40143	5710.00
<b>I A</b>	CPX72SS	2 - 47	NT40143	14270.00
	CPXEN12	2 - 57	NT40143	140.00
	CPXEN18	2 - 57	NT40143	250.00
	CPXEN36	2 - 57	NT40143	320.00
	CPXEN8	2 - 57	NT40143	109.00
<b>I</b>	CSB08ST	2 - 4	NT30141	67.50
<b>I</b>	CSB08SW	2 - 4	NT30141	67.50
	CSB12FMPL	2 - 5	NT10135	37.00
	CSB12FT	2 - 5	NT10135	78.00
	CSB12FW	2 - 5	NT10135	78.00
	CSB12ST	2 - 4	NT10135	78.00
	CSB12SW	2 - 4	NT10135	78.00
	CSB18FMPL	2 - 5	NT10135	37.00
	CSB18FT	2 - 5	NT10135	119.00
	CSB18FW	2 - 5	NT10135	119.00
	CSB18ST	2 - 4	NT10135	119.00
	CSB18SW	2 - 4	NT10135	119.00
	CSB24FMPL	2 - 5	NT10135	42.00
	CSB24FT	2 - 5	NT10135	156.00
	CSB24FW	2 - 5	NT10135	156.00
	CSB24ST	2 - 4	NT10135	156.00
	CSB24SW	2 - 4	NT10135	156.00
	CSB36FMPL	2 - 5	NT10135	42.00

CAT. NO.	PAGE	P.S.	PRICE \$
CSB36FT	2 - 5	NT10135	197.00
CSB36FW	2 - 5	NT10135	197.00
CSB36ST	2 - 4	NT10135	197.00
CSB36SW	2 - 4	NT10135	197.00
CSPC1	2 - 2	NT30141	7.30
<b>A</b> CST160MS	2 - 30	NT40143	305.00
<b>A</b> CST 24G	2 - 27	NT40143	1300.00
<b>A</b> CST 24M160G	2 - 27	NT40143	1550.00
CST 24M160O	2 - 28	NT40143	1550.00
CST 24M250G	2 - 27	NT40143	1670.00
CST 24M250O	2 - 28	NT40143	1670.00
<b>A</b> CST 24O	2 - 28	NT40143	1300.00
<b>A</b> CST250MS	2 - 30	NT40143	435.00
<b>A</b> CST 36G	2 - 27	NT40143	1410.00
<b>A</b> CST 36M160G	2 - 27	NT40143	1660.00
<b>A</b> CST 36M160O	2 - 28	NT40143	1660.00
CST 36M250G	2 - 27	NT40143	1780.00
CST 36M250O	2 - 28	NT40143	1780.00
<b>A</b> CST 36O	2 - 28	NT40143	1410.00
<b>A</b> CST 48G	2 - 27	NT40143	1550.00
<b>A</b> CST 48M160G	2 - 27	NT40143	1790.00
CST 48M250G	2 - 27	NT40143	1920.00
<b>A</b> CST 60G	2 - 27	NT40143	1710.00
<b>A</b> CST 60M160G	2 - 27	NT40143	1960.00
CST 60M160O	2 - 28	NT40143	1960.00
CST 60M250G	2 - 27	NT40143	2090.00
<b>A</b> CST 60M250O	2 - 28	NT40143	2090.00
<b>A</b> CST 60O	2 - 28	NT40143	1710.00
<b>A</b> CST 72G	2 - 27	NT40143	1860.00
CST 72M250G	2 - 27	NT40143	2230.00
CST 72M250O	2 - 28	NT40143	2230.00
<b>A</b> CST 72O	2 - 28	NT40143	1860.00
<b>I A</b> CST 96G	2 - 27	NT40143	2490.00
CST 96M250G	2 - 27	NT40143	2860.00
CST 96M250O	2 - 28	NT40143	2860.00
<b>I A</b> CST 96O	2 - 28	NT40143	2490.00
CT 212/253	2 - 67	NT40143	225.00
CT 218/253	2 - 67	NT40143	255.00
CT 224/253	2 - 67	NT40143	280.00
CT 230/253	2 - 67	NT40143	295.00
CT 236/253	2 - 67	NT40143	370.00
CT 242/253	2 - 67	NT40143	395.00
CT 248/253	2 - 67	NT40143	440.00
CT 260/253	2 - 67	NT40143	540.00
CT 272/253	2 - 67	NT40143	740.00
CT 284/253	2 - 67	NT40143	830.00
CT 296/253	2 - 67	NT40143	1020.00
<b>I</b> CT 312/253	2 - 68	NT40143	370.00
<b>I</b> CT 318/253	2 - 68	NT40143	425.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	CT 324/253	2 - 68	NT40143	495.00
<b>I</b>	CT 330/253	2 - 68	NT40143	540.00
	CT 336/253	2 - 68	NT40143	590.00
<b>I</b>	CT 342/253	2 - 68	NT40143	680.00
	CT 348/253	2 - 68	NT40143	750.00
	CT 360/253	2 - 68	NT40143	860.00
	CT 372/253	2 - 68	NT40143	1030.00
	CT 384/253	2 - 68	NT40143	1120.00
	CT 396/253	2 - 68	NT40143	1220.00
<b>I A</b>	CTACC24HO	2 - 54	NT40143	4250.00
<b>I A</b>	CTACC24O	2 - 54	NT40143	4250.00
<b>I A</b>	CTACCO	2 - 54	NT40143	3990.00
<b>I A</b>	CTD18O	2 - 54	NT40143	5910.00
<b>I A</b>	CTD18SSO	2 - 54	NT40143	20020.00
<b>I A</b>	CTD24O	2 - 54	NT40143	6230.00
<b>I A</b>	CTD24SSO	2 - 54	NT40143	20230.00
<b>I A</b>	CTD36O	2 - 54	NT40143	6540.00
<b>I A</b>	CTD36SSO	2 - 54	NT40143	20270.00
<b>I A</b>	CTD48O	2 - 54	NT40143	6740.00
<b>I A</b>	CTD48SSO	2 - 54	NT40143	20580.00
<b>I A</b>	CTD60O	2 - 54	NT40143	8090.00
<b>I A</b>	CTD60SSO	2 - 54	NT40143	24010.00
<b>I A</b>	CTD72O	2 - 54	NT40143	8510.00
<b>I A</b>	CTD72SSO	2 - 54	NT40143	24320.00
<b>I A</b>	CTD84O	2 - 54	NT40143	8920.00
<b>I A</b>	CTD84SSO	2 - 54	NT40143	24530.00
<b>I A</b>	CTD96O	2 - 54	NT40143	9230.00
<b>I A</b>	CTD96SSO	2 - 54	NT40143	24730.00
	CTES248RDCOLD	1 - 47	NT40143	570.00
	CTES396RDCOLD	1 - 47	NT40143	670.00
<b>A</b>	CTX18M400O	2 - 55	NT40143	POA
<b>I A</b>	CTX18O	2 - 55	NT40143	7420.00
<b>I A</b>	CTX18SSO	2 - 55	NT40143	23290.00
<b>A</b>	CTX24M400O	2 - 55	NT40143	POA
<b>I A</b>	CTX24O	2 - 55	NT40143	7680.00
<b>I A</b>	CTX24SSO	2 - 55	NT40143	23600.00
<b>A</b>	CTX36M400O	2 - 55	NT40143	POA
<b>I A</b>	CTX36O	2 - 55	NT40143	8140.00
<b>I A</b>	CTX36SSO	2 - 55	NT40143	24120.00
<b>A</b>	CTX48M400O	2 - 55	NT40143	POA
<b>I A</b>	CTX48O	2 - 55	NT40143	8660.00
<b>I A</b>	CTX48SSO	2 - 55	NT40143	24590.00
<b>A</b>	CTX60M400O	2 - 55	NT40143	POA
<b>I A</b>	CTX60O	2 - 55	NT40143	11050.00
<b>I A</b>	CTX60SSO	2 - 55	NT40143	29620.00
<b>A</b>	CTX72M400O	2 - 55	NT40143	POA
<b>I A</b>	CTX72O	2 - 55	NT40143	11620.00
<b>I A</b>	CTX72SSO	2 - 55	NT40143	30190.00

	CAT. NO.	PAGE	P.S.	PRICE \$
<b>D</b>	D1000 0010	7 - 44	NB20067	5610.00
	D1000DINCLIPS	7 - 44	NB20067	11.40
	DCLD6	1 - 50	NT30141	57.00
	DINT10H1100C	1 - 22	NT10136	151.00
<b>I</b>	DINT10H1100D	1 - 22	NT10136	182.00
	DINT10H1125C	1 - 22	NT10136	189.00
	DINT10H1125D	1 - 22	NT10136	210.00
	DINT10H180C	1 - 22	NT10136	128.00
	DINT10H180D	1 - 22	NT10136	182.00
	DINT10H2100C	1 - 22	NT10136	350.00
<b>I</b>	DINT10H2100D	1 - 22	NT10136	400.00
	DINT10H2125C	1 - 22	NT10136	470.00
<b>I</b>	DINT10H2125D	1 - 22	NT10136	530.00
	DINT10H280C	1 - 22	NT10136	330.00
	DINT10H280D	1 - 22	NT10136	355.00
	DINT10H3100C	1 - 22	NT10136	400.00
	DINT10H3100D	1 - 22	NT10136	455.00
	DINT10H3125C	1 - 22	NT10136	590.00
	DINT10H3125C	2 - 31	NT10136	590.00
	DINT10H3125D	1 - 22	NT10136	650.00
	DINT10H380C	1 - 22	NT10136	400.00
	DINT10H380D	1 - 22	NT10136	455.00
	DINT10H4100C	1 - 22	NT10136	700.00
<b>I</b>	DINT10H4100D	1 - 22	NT10136	780.00
<b>I</b>	DINT10H4125C	1 - 22	NT10136	1040.00
<b>I</b>	DINT10H4125D	1 - 22	NT10136	1140.00
<b>I</b>	DINT10H480C	1 - 22	NT10136	700.00
<b>I</b>	DINT10H480D	1 - 22	NT10136	780.00
	DINT10H HS	1 - 40	NT10136	114.00
	DINT10HTC	1 - 50	NT30141	5.40
	DINTMS1001	1 - 38	NT10136	48.00
	DINTMS1002	1 - 38	NT10136	75.00
	DINTMS1003	1 - 38	NT10136	115.00
	DINTMS1003	2 - 30	NT10136	115.00
	DINTMS631	1 - 38	NT10136	42.00
	DINTMS632	1 - 38	NT10136	56.00
	DINTMS633	1 - 38	NT10136	86.50
	DINTMS801	1 - 38	NT10136	45.00
	DINTMS802	1 - 38	NT10136	67.00
	DINTMS803	1 - 38	NT10136	102.00
	DINTMS803	2 - 30	NT10136	102.00
	DINTSHT110415U	1 - 39	NT30141	164.00
	DINTSHT2460U	1 - 39	NT30141	164.00
<b>I</b>	DINTT100	2 - 64	NT40143	10.00
	DINTT100	2 - 64	NT40143	10.00
<b>A</b>	DM15036	2 - 6	NT40143	305.00
<b>A</b>	DM15054	2 - 6	NT40143	440.00
<b>A</b>	DM15072	2 - 6	NT40143	580.00

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**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I</b>	DM150JK	2 - 6	NT40143	23.40
<b>I</b>	DM150LD	2 - 6	NT40143	46.00
<b>A</b>	DM150NAA	2 - 6	NT40143	39.50
<b>I A</b>	DM150NAB	2 - 6	NT40143	72.50
<b>A</b>	DM150NAC	2 - 6	NT40143	72.50
<b>A</b>	DMWP12	2 - 8	NT40143	220.00
<b>A</b>	DMWP24	2 - 8	NT40143	280.00
<b>A</b>	DMWP36	2 - 8	NT40143	370.00
	DMWPCS	2 - 8	NT40143	13.00
	DMWPLD	2 - 8	NT40143	28.00
<b>A</b>	DSLK	2 - 9	NT40143	30.50
<b>A</b>	DSLK	2 - 10	NT40143	30.50
	DSR110DEL	8 - 15	NT30141	580.00
	DSR140DEL	8 - 15	NT30141	800.00
	DSR210DEL	8 - 15	NT30141	960.00
	DSR35DEL	8 - 15	NT30141	305.00
	DSR48TD110	8 - 12	NT30141	390.00
	DSR48TD240	8 - 12	NT30141	390.00
	DSR80DEL	8 - 15	NT30141	375.00
	DSRCB0610A	1 - 30	NT30141	285.00
	DSRCB0630	1 - 30	NT30141	275.00
	DSRCB0630P	1 - 31	NT30141	280.00
	DSRCB10100A	1 - 30	NT30141	305.00
	DSRCB1010A	1 - 30	NT30141	285.00
	DSRCB1030	1 - 30	NT30141	275.00
	DSRCB1030A	1 - 30	NT30141	285.00
	DSRCB1030P	1 - 31	NT30141	280.00
<b>I</b>	DSRCB16100A	1 - 30	NT30141	305.00
	DSRCB1610A	1 - 30	NT30141	285.00
	DSRCB1630	1 - 30	NT30141	275.00
	DSRCB1630A	1 - 30	NT30141	285.00
	DSRCB1630P	1 - 31	NT30141	280.00
<b>I</b>	DSRCB20100A	1 - 30	NT30141	305.00
	DSRCB2010A	1 - 30	NT30141	285.00
	DSRCB2030	1 - 30	NT30141	275.00
	DSRCB2030A	1 - 30	NT30141	285.00
	DSRCB2030P	1 - 31	NT30141	280.00
	DSRCB2530	1 - 30	NT30141	275.00
	DSRCB2530A	1 - 30	NT30141	285.00
	DSRCB2530P	1 - 31	NT30141	280.00
	DSRCB3230	1 - 30	NT30141	275.00
	DSRCB3230A	1 - 30	NT30141	285.00
	DSRCB3230P	1 - 31	NT30141	280.00
	DSRCB4030	1 - 30	NT30141	275.00
	DSRCB4030A	1 - 30	NT30141	285.00
	DSRCB4030P	1 - 31	NT30141	280.00
<b>I</b>	DSRCBH0610A	1 - 29	NT30141	400.00
	DSRCBH0630A	1 - 29	NT30141	310.00
	DSRCBH1010A	1 - 29	NT30141	400.00

CAT. NO.	PAGE	P.S.	PRICE \$
DSRCBH1030A	1 - 29	NT30141	310.00
DSRCBH1610A	1 - 29	NT30141	400.00
DSRCBH1630A	1 - 29	NT30141	310.00
DSRCBH2010A	1 - 29	NT30141	400.00
DSRCBH2030A	1 - 29	NT30141	310.00
I DSRCBH2510A	1 - 29	NT30141	400.00
DSRCBH2530A	1 - 29	NT30141	310.00
I DSRCBH3210A	1 - 29	NT30141	400.00
DSRCBH3230A	1 - 29	NT30141	310.00
I DSRCBH4010A	1 - 29	NT30141	400.00
DSRCBH4030A	1 - 29	NT30141	310.00
DSRCBHTC	1 - 50	NT30141	7.50
I DSRCBS0630B	1 - 28	NT30141	320.00
DSRCBS0630C	1 - 28	NT30141	320.00
I DSRCBS1030B	1 - 28	NT30141	320.00
DSRCBS1030C	1 - 28	NT30141	320.00
I DSRCBS1630B	1 - 28	NT30141	320.00
DSRCBS1630C	1 - 28	NT30141	320.00
I DSRCBS2030B	1 - 28	NT30141	320.00
DSRCBS2030C	1 - 28	NT30141	320.00
I DSRCBS2530B	1 - 28	NT30141	320.00
DSRCBS2530C	1 - 28	NT30141	320.00
I DSRCBS3230B	1 - 28	NT30141	320.00
DSRCBS3230C	1 - 28	NT30141	320.00
DSRCBSAX	1 - 40	NT10136	102.00
DSRCBSAXAL	1 - 40	NT10136	114.00
I DSRCBSAXALG	1 - 40	NT10136	125.00
DSRC240100	1 - 25	NT30141	290.00
I DSRC240100A	1 - 26	NT30141	365.00
DSRC24030	1 - 25	NT30141	240.00
DSRC240300	1 - 25	NT30141	330.00
DSRC24030A	1 - 26	NT30141	265.00
DSRC24030AI	1 - 25	NT30141	290.00
DSRC263100S	1 - 25	NT30141	365.00
DSRC26330	1 - 25	NT30141	265.00
DSRC263300S	1 - 25	NT30141	400.00
I DSRC26330A	1 - 26	NT30141	340.00
DSRC26330AI	1 - 25	NT30141	335.00
DSRC280100	1 - 25	NT30141	355.00
I DSRC280100A	1 - 26	NT30141	365.00
DSRC28030	1 - 25	NT30141	295.00
I DSRC280300	1 - 25	NT30141	370.00
I DSRC28030A	1 - 26	NT30141	400.00
DSRC4100100	1 - 25	NT30141	560.00
DSRC4100100S	1 - 25	NT30141	610.00
DSRC410030	1 - 25	NT30141	560.00
DSRC4100300	1 - 25	NT30141	560.00
DSRC4100300S	1 - 25	NT30141	620.00
I DSRC410030A	1 - 26	NT30141	630.00

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**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I</b>	DSRCD4100500	1 - 25	NT30141	570.00
<b>I</b>	DSRCD4125500B	1 - 26	NT30141	2780.00
	DSRCD440100	1 - 25	NT30141	340.00
	DSRCD44030	1 - 25	NT30141	315.00
	DSRCD440300	1 - 25	NT30141	370.00
	DSRCD44030A	1 - 26	NT30141	375.00
	DSRCD44030AI	1 - 25	NT30141	350.00
	DSRCD463100	1 - 25	NT30141	425.00
<b>I</b>	DSRCD463100A	1 - 26	NT30141	445.00
<b>I</b>	DSRCD463100B	1 - 26	NT40143	2780.00
	DSRCD463100S	1 - 25	NT30141	445.00
	DSRCD46330	1 - 25	NT30141	335.00
<b>I</b>	DSRCD463300BS	1 - 26	NT40143	2780.00
	DSRCD463300S	1 - 25	NT30141	510.00
	DSRCD46330A	1 - 26	NT30141	395.00
	DSRCD46330AI	1 - 25	NT30141	435.00
<b>I</b>	DSRCD46330B	1 - 26	NT40143	2780.00
	DSRCD480100	1 - 25	NT30141	475.00
<b>I</b>	DSRCD480100A	1 - 26	NT30141	560.00
<b>I</b>	DSRCD48030	1 - 25	NT30141	375.00
	DSRCDE24030	1 - 24	NT10136	250.00
<b>I</b>	DSRCDE26330	1 - 24	NT10136	285.00
<b>I</b>	DSRCDE44030	1 - 24	NT10136	335.00
<b>I</b>	DSRCDE46330	1 - 24	NT10136	360.00
	DSRCM321001PN	1 - 32	NT30141	455.00
	DSRCM321003PN	1 - 32	NT30141	580.00
	DSRCM323001PN	1 - 32	NT30141	510.00
	DSRCM323003PN	1 - 32	NT30141	580.00
	DSRCM32301PN	1 - 32	NT30141	435.00
	DSRCM32303PN	1 - 32	NT30141	495.00
	DSRCM631001PN	1 - 32	NT30141	570.00
	DSRCM631003P	1 - 32	NT30141	640.00
	DSRCM631003PN	1 - 32	NT30141	640.00
	DSRCM633001PN	1 - 32	NT30141	620.00
	DSRCM633003PN	1 - 32	NT30141	640.00
	DSRCM63301PN	1 - 32	NT30141	550.00
	DSRCM63303P	1 - 32	NT30141	590.00
	DSRCM63303PN	1 - 32	NT30141	580.00
	DSRM110V	8 - 12	NT30141	1200.00
	DSRM240V	8 - 12	NT30141	1200.00
	DSRM72110	8 - 12	NT30141	980.00
	DSRM7224	8 - 12	NT30141	980.00
	DSRM72240	8 - 12	NT30141	980.00
	DTAUXAL	1 - 40	NT10136	102.00
	DTAUXALG	1 - 40	NT10136	123.00
	DTC2002240	1 - 52	NT30141	151.00
	DTC2011240	1 - 52	NT30141	151.00
	DTC202024	1 - 52	NT30141	151.00
	DTC2020240	1 - 52	NT30141	151.00

CAT. NO.	PAGE	P.S.	PRICE \$
DTC2020240L	1 - 54	NT30141	78.00
DTC202024L	1 - 54	NT30141	78.00
DTC2404240	1 - 52	NT30141	175.00
DTC244012	1 - 52	NT30141	175.00
DTC244024	1 - 52	NT30141	175.00
DTC2440240	1 - 52	NT30141	175.00
DTC2504240L	1 - 54	NT30141	98.50
DTC254012L	1 - 54	NT30141	98.50
DTC2540240L	1 - 54	NT30141	98.50
I DTC404024	1 - 52	NT30141	310.00
DTC4040240	1 - 52	NT30141	310.00
DTC4040240L	1 - 54	NT30141	235.00
I DTC634024	1 - 52	NT30141	430.00
DTC6340240	1 - 52	NT30141	430.00
DTC6340240L	1 - 54	NT30141	260.00
DTCB10 1 01C	1 - 20	NT10136	58.50
I DTCB10 1 01D	1 - 21	NT10136	66.50
DTCB10 1 02C	1 - 20	NT10136	58.50
DTCB10 1 02D	1 - 21	NT10136	66.50
DTCB10 1 04C	1 - 20	NT10136	58.50
DTCB10 1 04D	1 - 21	NT10136	66.50
DTCB10 1 05C	1 - 20	NT10136	58.50
I DTCB10 1 05D	1 - 21	NT10136	66.50
DTCB10 1 06B	1 - 19	NT10136	66.50
DTCB10 1 06C	1 - 20	NT10136	58.50
DTCB10 1 06D	1 - 21	NT10136	66.50
DTCB10 1 10B	1 - 19	NT10136	66.50
DTCB10 1 10C	1 - 20	NT10136	58.50
DTCB10 1 10D	1 - 21	NT10136	66.50
I DTCB10 1 13C	1 - 20	NT10136	58.50
I DTCB10 1 13D	1 - 21	NT10136	66.50
DTCB10 1 16B	1 - 19	NT10136	66.50
DTCB10 1 16C	1 - 20	NT10136	58.50
DTCB10 1 16D	1 - 21	NT10136	66.50
DTCB10 1 20B	1 - 19	NT10136	66.50
DTCB10 1 20C	1 - 20	NT10136	58.50
DTCB10 1 20D	1 - 21	NT10136	66.50
DTCB10 1 25B	1 - 19	NT10136	66.50
DTCB10 1 25C	1 - 20	NT10136	58.50
DTCB10 1 25D	1 - 21	NT10136	66.50
DTCB10 1 32B	1 - 19	NT10136	66.50
DTCB10 1 32C	1 - 20	NT10136	58.50
DTCB10 1 32D	1 - 21	NT10136	66.50
DTCB10 1 40B	1 - 19	NT10136	78.50
DTCB10 1 40C	1 - 20	NT10136	58.50
DTCB10 1 40D	1 - 21	NT10136	84.50
I DTCB10 1 50B	1 - 19	NT10136	91.00
DTCB10 1 50C	1 - 20	NT10136	58.50
DTCB10 1 50D	1 - 21	NT10136	109.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I</b>	DTCB10 1 63B	1 - 19	NT10136	109.00
	DTCB10 1 63C	1 - 20	NT10136	58.50
	DTCB10 1 63D	1 - 21	NT10136	133.00
	DTCB10 2 01C	1 - 20	NT10136	179.00
	DTCB10 2 01D	1 - 21	NT10136	188.00
	DTCB10 2 02C	1 - 20	NT10136	179.00
	DTCB10 2 02D	1 - 21	NT10136	188.00
	DTCB10 2 04C	1 - 20	NT10136	179.00
	DTCB10 2 04D	1 - 21	NT10136	188.00
	DTCB10 2 05C	1 - 20	NT10136	179.00
<b>I</b>	DTCB10 2 05D	1 - 21	NT10136	188.00
	DTCB10 2 06B	1 - 19	NT10136	188.00
	DTCB10 2 06C	1 - 20	NT10136	179.00
	DTCB10 2 06D	1 - 21	NT10136	188.00
	DTCB10 2 10B	1 - 19	NT10136	188.00
	DTCB10 2 10C	1 - 20	NT10136	179.00
	DTCB10 2 10D	1 - 21	NT10136	188.00
<b>I</b>	DTCB10 2 13C	1 - 20	NT10136	179.00
<b>I</b>	DTCB10 2 13D	1 - 21	NT10136	188.00
<b>I</b>	DTCB10 2 16B	1 - 19	NT10136	188.00
	DTCB10 2 16C	1 - 20	NT10136	179.00
	DTCB10 2 16D	1 - 21	NT10136	188.00
<b>I</b>	DTCB10 2 20B	1 - 19	NT10136	188.00
	DTCB10 2 20C	1 - 20	NT10136	179.00
	DTCB10 2 20D	1 - 21	NT10136	188.00
<b>I</b>	DTCB10 2 25B	1 - 19	NT10136	188.00
	DTCB10 2 25C	1 - 20	NT10136	179.00
	DTCB10 2 25D	1 - 21	NT10136	188.00
<b>I</b>	DTCB10 2 32B	1 - 19	NT10136	188.00
	DTCB10 2 32C	1 - 20	NT10136	179.00
	DTCB10 2 32D	1 - 21	NT10136	188.00
<b>I</b>	DTCB10 2 40B	1 - 19	NT10136	194.00
	DTCB10 2 40C	1 - 20	NT10136	179.00
	DTCB10 2 40D	1 - 21	NT10136	205.00
<b>I</b>	DTCB10 2 50B	1 - 19	NT10136	220.00
	DTCB10 2 50C	1 - 20	NT10136	179.00
	DTCB10 2 50D	1 - 21	NT10136	230.00
<b>I</b>	DTCB10 2 63B	1 - 19	NT10136	230.00
	DTCB10 2 63C	1 - 20	NT10136	179.00
	DTCB10 2 63D	1 - 21	NT10136	255.00
	DTCB10 3 01C	1 - 20	NT10136	215.00
<b>I</b>	DTCB10 3 01D	1 - 21	NT10136	220.00
	DTCB10 3 02C	1 - 20	NT10136	215.00
<b>I</b>	DTCB10 3 02D	1 - 21	NT10136	220.00
	DTCB10 3 04C	1 - 20	NT10136	215.00
	DTCB10 3 04D	1 - 21	NT10136	220.00
	DTCB10 3 05C	1 - 20	NT10136	215.00
<b>I</b>	DTCB10 3 05D	1 - 21	NT10136	220.00
<b>I</b>	DTCB10 3 06B	1 - 19	NT10136	220.00

CAT. NO.	PAGE	P.S.	PRICE \$
DTCB10 3 06C	1 - 20	NT10136	215.00
DTCB10 3 06D	1 - 21	NT10136	220.00
DTCB10 3 10B	1 - 19	NT10136	220.00
DTCB10 3 10C	1 - 20	NT10136	215.00
DTCB10 3 10D	1 - 21	NT10136	220.00
I DTCB10 3 13C	1 - 20	NT10136	215.00
I DTCB10 3 13D	1 - 21	NT10136	220.00
DTCB10 3 16B	1 - 19	NT10136	220.00
DTCB10 3 16C	1 - 20	NT10136	215.00
DTCB10 3 16D	1 - 21	NT10136	220.00
DTCB10 3 20B	1 - 19	NT10136	220.00
DTCB10 3 20C	1 - 20	NT10136	215.00
DTCB10 3 20D	1 - 21	NT10136	220.00
DTCB10 3 25B	1 - 19	NT10136	220.00
DTCB10 3 25C	1 - 20	NT10136	215.00
DTCB10 3 25D	1 - 21	NT10136	220.00
DTCB10 3 32B	1 - 19	NT10136	220.00
DTCB10 3 32C	1 - 20	NT10136	215.00
DTCB10 3 32D	1 - 21	NT10136	220.00
DTCB10 3 40B	1 - 19	NT10136	230.00
DTCB10 3 40C	1 - 20	NT10136	215.00
DTCB10 3 40D	1 - 21	NT10136	230.00
I DTCB10 3 50B	1 - 19	NT10136	305.00
DTCB10 3 50C	1 - 20	NT10136	215.00
DTCB10 3 50D	1 - 21	NT10136	305.00
DTCB10 3 63B	1 - 19	NT10136	365.00
DTCB10 3 63C	1 - 20	NT10136	215.00
DTCB10 3 63D	1 - 21	NT10136	365.00
I DTCB10 4 01C	1 - 20	NT10136	255.00
DTCB10 4 02C	1 - 20	NT10136	255.00
I DTCB10 4 04C	1 - 20	NT10136	255.00
I DTCB10 4 04D	1 - 21	NT10136	265.00
DTCB10 4 06C	1 - 20	NT10136	255.00
I DTCB10 4 06D	1 - 21	NT10136	265.00
DTCB10 4 10C	1 - 20	NT10136	255.00
I DTCB10 4 10D	1 - 21	NT10136	265.00
I DTCB10 4 13C	1 - 20	NT10136	255.00
I DTCB10 4 13D	1 - 21	NT10136	265.00
DTCB10 4 16C	1 - 20	NT10136	255.00
I DTCB10 4 16D	1 - 21	NT10136	265.00
DTCB10 4 20C	1 - 20	NT10136	255.00
I DTCB10 4 20D	1 - 21	NT10136	265.00
DTCB10 4 25C	1 - 20	NT10136	255.00
DTCB10 4 25D	1 - 21	NT10136	265.00
DTCB10 4 32C	1 - 20	NT10136	255.00
DTCB10 4 32D	1 - 21	NT10136	265.00
DTCB10 4 40C	1 - 20	NT10136	265.00
I DTCB10 4 40D	1 - 21	NT10136	280.00
DTCB10 4 50C	1 - 20	NT10136	280.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I</b>	DTCB10 4 50D	1 - 21	NT10136	365.00
	DTCB10 4 63C	1 - 20	NT10136	290.00
	DTCB10 4 63D	1 - 21	NT10136	550.00
	DTCB15 1 06C	1 - 23	NT10136	150.00
	DTCB15 1 10C	1 - 23	NT10136	150.00
<b>I</b>	DTCB15 1 13C	1 - 23	NT10136	150.00
	DTCB15 1 16C	1 - 23	NT10136	150.00
	DTCB15 1 20C	1 - 23	NT10136	150.00
	DTCB15 1 25C	1 - 23	NT10136	150.00
	DTCB15 1 32C	1 - 23	NT10136	150.00
	DTCB15 1 40C	1 - 23	NT10136	150.00
	DTCB15 1 50C	1 - 23	NT10136	150.00
	DTCB15 1 63C	1 - 23	NT10136	150.00
<b>I</b>	DTCB15 2 06C	1 - 23	NT10136	270.00
	DTCB15 2 10C	1 - 23	NT10136	270.00
<b>I</b>	DTCB15 2 13C	1 - 23	NT10136	270.00
	DTCB15 2 16C	1 - 23	NT10136	270.00
<b>I</b>	DTCB15 2 20C	1 - 23	NT10136	270.00
<b>I</b>	DTCB15 2 25C	1 - 23	NT10136	270.00
<b>I</b>	DTCB15 2 32C	1 - 23	NT10136	270.00
<b>I</b>	DTCB15 2 40C	1 - 23	NT10136	270.00
	DTCB15 2 50C	1 - 23	NT10136	270.00
<b>I</b>	DTCB15 2 63C	1 - 23	NT10136	270.00
	DTCB15 3 06C	1 - 23	NT10136	420.00
	DTCB15 3 10C	1 - 23	NT10136	420.00
<b>I</b>	DTCB15 3 13C	1 - 23	NT10136	420.00
	DTCB15 3 16C	1 - 23	NT10136	420.00
	DTCB15 3 20C	1 - 23	NT10136	420.00
	DTCB15 3 25C	1 - 23	NT10136	420.00
	DTCB15 3 32C	1 - 23	NT10136	420.00
	DTCB15 3 40C	1 - 23	NT10136	420.00
	DTCB15 3 50C	1 - 23	NT10136	420.00
	DTCB15 3 63C	1 - 23	NT10136	420.00
<b>I</b>	DTCB15 4 06C	1 - 23	NT10136	490.00
<b>I</b>	DTCB15 4 10C	1 - 23	NT10136	490.00
<b>I</b>	DTCB15 4 13C	1 - 23	NT10136	490.00
<b>I</b>	DTCB15 4 16C	1 - 23	NT10136	490.00
<b>I</b>	DTCB15 4 20C	1 - 23	NT10136	490.00
<b>I</b>	DTCB15 4 25C	1 - 23	NT10136	490.00
<b>I</b>	DTCB15 4 32C	1 - 23	NT10136	490.00
<b>I</b>	DTCB15 4 40C	1 - 23	NT10136	490.00
<b>I</b>	DTCB15 4 50C	1 - 23	NT10136	490.00
<b>I</b>	DTCB15 4 63C	1 - 23	NT10136	490.00
	DTCB6102C	1 - 14	NT10136	37.00
	DTCB6102D	1 - 15	NT10136	51.00
	DTCB6104C	1 - 14	NT10136	37.00
	DTCB6104D	1 - 15	NT10136	51.00
	DTCB6106C	1 - 14	NT10136	37.00
	DTCB6106D	1 - 15	NT10136	51.00

CAT. NO.	PAGE	P.S.	PRICE \$
DTCB6110C	1 - 14	NT10136	37.00
DTCB6110D	1 - 15	NT10136	51.00
DTCB6113C	1 - 14	NT10136	37.00
DTCB6113D	1 - 15	NT10136	51.00
DTCB6116C	1 - 14	NT10136	37.00
DTCB6116D	1 - 15	NT10136	51.00
DTCB6120C	1 - 14	NT10136	37.00
DTCB6120D	1 - 15	NT10136	51.00
DTCB6125C	1 - 14	NT10136	37.00
DTCB6125D	1 - 15	NT10136	51.00
DTCB6132C	1 - 14	NT10136	37.00
DTCB6132D	1 - 15	NT10136	51.00
DTCB6140C	1 - 14	NT10136	37.00
DTCB6140D	1 - 15	NT10136	54.50
DTCB6150C	1 - 14	NT10136	37.00
DTCB6150D	1 - 15	NT10136	54.50
DTCB6163C	1 - 14	NT10136	37.00
DTCB6163D	1 - 15	NT10136	54.50
DTCB6202C	1 - 14	NT10136	131.00
DTCB6202D	1 - 15	NT10136	153.00
DTCB6204C	1 - 14	NT10136	131.00
DTCB6204D	1 - 15	NT10136	153.00
DTCB6206C	1 - 14	NT10136	131.00
DTCB6206D	1 - 15	NT10136	153.00
DTCB6210C	1 - 14	NT10136	131.00
DTCB6210D	1 - 15	NT10136	153.00
I DTCB6213C	1 - 14	NT10136	131.00
I DTCB6213D	1 - 15	NT10136	153.00
DTCB6216C	1 - 14	NT10136	131.00
DTCB6216D	1 - 15	NT10136	153.00
DTCB6220C	1 - 14	NT10136	131.00
DTCB6220D	1 - 15	NT10136	153.00
DTCB6225C	1 - 14	NT10136	131.00
DTCB6225D	1 - 15	NT10136	153.00
DTCB6232C	1 - 14	NT10136	131.00
DTCB6232D	1 - 15	NT10136	153.00
DTCB6240C	1 - 14	NT10136	131.00
DTCB6240D	1 - 15	NT10136	164.00
DTCB6250C	1 - 14	NT10136	131.00
DTCB6250D	1 - 15	NT10136	164.00
DTCB6263C	1 - 14	NT10136	131.00
DTCB6263D	1 - 15	NT10136	164.00
DTCB6302C	1 - 14	NT10136	166.00
DTCB6302D	1 - 15	NT10136	215.00
DTCB6304C	1 - 14	NT10136	166.00
DTCB6304D	1 - 15	NT10136	215.00
DTCB6306C	1 - 14	NT10136	166.00
DTCB6306D	1 - 15	NT10136	215.00
DTCB6310C	1 - 14	NT10136	166.00

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**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	DTCB6310D	1 - 15	NT10136	215.00
<b>I</b>	DTCB6313C	1 - 14	NT10136	166.00
<b>I</b>	DTCB6313D	1 - 15	NT10136	215.00
	DTCB6316C	1 - 14	NT10136	166.00
	DTCB6316D	1 - 15	NT10136	215.00
	DTCB6320C	1 - 14	NT10136	166.00
	DTCB6320D	1 - 15	NT10136	215.00
	DTCB6325C	1 - 14	NT10136	166.00
	DTCB6325D	1 - 15	NT10136	215.00
	DTCB6332C	1 - 14	NT10136	166.00
	DTCB6332D	1 - 15	NT10136	215.00
	DTCB6340C	1 - 14	NT10136	166.00
	DTCB6340D	1 - 15	NT10136	225.00
	DTCB6350C	1 - 14	NT10136	166.00
	DTCB6350D	1 - 15	NT10136	225.00
	DTCB6363C	1 - 14	NT10136	166.00
	DTCB6363D	1 - 15	NT10136	225.00
<b>I</b>	DTCBD61102C	1 - 16	NT10136	182.00
<b>I</b>	DTCBD61104C	1 - 16	NT10136	182.00
	DTCBD61106C	1 - 16	NT10136	182.00
	DTCBD61110C	1 - 16	NT10136	182.00
	DTCBD61116C	1 - 16	NT10136	182.00
	DTCBD61120C	1 - 16	NT10136	182.00
	DTCBD6202C	1 - 16	NT10136	171.00
<b>I</b>	DTCBD6204C	1 - 16	NT10136	171.00
	DTCBD6206C	1 - 16	NT10136	171.00
	DTCBD6210C	1 - 16	NT10136	171.00
	DTCBD6216C	1 - 16	NT10136	171.00
	DTCBD6220C	1 - 16	NT10136	171.00
<b>I</b>	DTCBD6225C	1 - 16	NT10136	171.00
<b>I</b>	DTCBD6232C	1 - 16	NT10136	171.00
<b>I</b>	DTCBD6240C	1 - 16	NT10136	171.00
<b>I</b>	DTCBD6302C	1 - 16	NT10136	275.00
<b>I</b>	DTCBD6304C	1 - 16	NT10136	275.00
	DTCBD6306C	1 - 16	NT10136	275.00
	DTCBD6310C	1 - 16	NT10136	275.00
	DTCBD6316C	1 - 16	NT10136	275.00
	DTCBD6320C	1 - 16	NT10136	275.00
<b>I</b>	DTCBD6325C	1 - 16	NT10136	275.00
<b>I</b>	DTCBD6332C	1 - 16	NT10136	275.00
<b>I</b>	DTCBD6340C	1 - 16	NT10136	275.00
<b>I</b>	DTCBD6402C	1 - 16	NT10136	390.00
<b>I</b>	DTCBD6404C	1 - 16	NT10136	390.00
	DTCBD6406C	1 - 16	NT10136	390.00
	DTCBD6410C	1 - 16	NT10136	390.00
	DTCBD6416C	1 - 16	NT10136	390.00
	DTCBD6420C	1 - 16	NT10136	390.00
<b>I</b>	DTCBD6425C	1 - 16	NT10136	390.00
<b>I</b>	DTCBD6432C	1 - 16	NT10136	390.00

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I</b>	DTCBD6440C	1 - 16	NT10136	390.00
	DTCBDC101C	1 - 17	NT10136	126.00
	DTCBDC102C	1 - 17	NT10136	126.00
	DTCBDC104C	1 - 17	NT10136	126.00
<b>I</b>	DTCBDC105C	1 - 17	NT10136	126.00
	DTCBDC106C	1 - 17	NT10136	126.00
	DTCBDC110C	1 - 17	NT10136	126.00
	DTCBDC116C	1 - 17	NT10136	126.00
	DTCBDC120C	1 - 17	NT10136	126.00
	DTCBDC125C	1 - 17	NT10136	126.00
	DTCBDC132C	1 - 17	NT10136	126.00
	DTCBDC140C	1 - 17	NT10136	126.00
	DTCBDC150C	1 - 17	NT10136	126.00
	DTCBDC163C	1 - 17	NT10136	126.00
	DTCBDC201C	1 - 17	NT10136	265.00
	DTCBDC202C	1 - 17	NT10136	265.00
	DTCBDC204C	1 - 17	NT10136	265.00
	DTCBDC206C	1 - 17	NT10136	265.00
	DTCBDC210C	1 - 17	NT10136	265.00
	DTCBDC216C	1 - 17	NT10136	265.00
	DTCBDC220C	1 - 17	NT10136	265.00
	DTCBDC225C	1 - 17	NT10136	265.00
	DTCBDC232C	1 - 17	NT10136	265.00
	DTCBDC240C	1 - 17	NT10136	265.00
	DTCBDC250C	1 - 17	NT10136	265.00
	DTCBDC263C	1 - 17	NT10136	265.00
	DTCBDC410B	1 - 18	NT10136	580.00
	DTCBDC416B	1 - 18	NT10136	580.00
<b>I</b>	DTCBDC420B	1 - 18	NT10136	580.00
<b>I</b>	DTCBE6106C	1 - 24	NT10136	40.50
	DTCBE6110C	1 - 24	NT10136	40.50
	DTCBE6116C	1 - 24	NT10136	40.50
	DTCBE6120C	1 - 24	NT10136	40.50
	DTCBE6125C	1 - 24	NT10136	40.50
	DTCBE6132C	1 - 24	NT10136	40.50
<b>I</b>	DTCBE6140C	1 - 24	NT10136	40.50
<b>I</b>	DTCBE6150C	1 - 24	NT10136	40.50
	DTCBE6163C	1 - 24	NT10136	40.50
<b>I</b>	DTCBE6306C	1 - 24	NT10136	166.00
<b>I</b>	DTCBE6310C	1 - 24	NT10136	166.00
<b>I</b>	DTCBE6316C	1 - 24	NT10136	166.00
<b>I</b>	DTCBE6320C	1 - 24	NT10136	166.00
<b>I</b>	DTCBE6325C	1 - 24	NT10136	166.00
<b>I</b>	DTCBE6332C	1 - 24	NT10136	166.00
<b>I</b>	DTCBE6340C	1 - 24	NT10136	166.00
<b>I</b>	DTCBE6350C	1 - 24	NT10136	166.00
<b>I</b>	DTCBE6363C	1 - 24	NT10136	166.00
	DTCF35	1 - 50	NT30141	17.60
	DTCS3212	1 - 44	NT30141	47.50

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	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	DTCS3213	1 - 44	NT30141	59.00
	DTCS3222	1 - 44	NT30141	71.50
	DTCS3223	1 - 44	NT30141	83.00
	DTHR	1 - 52	NT30141	131.00
<b>I</b>	DTIS1012VAC	1 - 55	NT30141	66.00
<b>I</b>	DTIS1012VDC	1 - 55	NT30141	66.00
<b>I</b>	DTIS10240VAC	1 - 55	NT30141	66.00
<b>I</b>	DTIS1024VAC	1 - 55	NT30141	66.00
<b>I</b>	DTIS1024VDC	1 - 55	NT30141	66.00
<b>I</b>	DTIS1048VAC	1 - 55	NT30141	66.00
<b>I</b>	DTIS1112VAC	1 - 55	NT30141	96.00
<b>I</b>	DTIS1112VDC	1 - 55	NT30141	96.00
	DTIS11240VAC	1 - 55	NT30141	96.00
<b>I</b>	DTIS1124VAC	1 - 55	NT30141	96.00
<b>I</b>	DTIS1124VDC	1 - 55	NT30141	96.00
<b>I</b>	DTIS113212VDC	1 - 55	NT30141	187.00
<b>I</b>	DTIS1148VAC	1 - 55	NT30141	96.00
<b>I</b>	DTIS123212VDC	1 - 55	NT30141	187.00
	DTIS132PWR	1 - 55	NT30141	187.00
<b>I</b>	DTIS2012VAC	1 - 55	NT30141	96.00
	DTIS2012VDC	1 - 55	NT30141	96.00
	DTIS20240VAC	1 - 55	NT30141	96.00
<b>I</b>	DTIS2024VAC	1 - 55	NT30141	96.00
<b>I</b>	DTIS2024VDC	1 - 55	NT30141	96.00
<b>I</b>	DTIS2048VAC	1 - 55	NT30141	96.00
	DTIS2CO	1 - 55	NT30141	83.00
	DTIS2NO	1 - 55	NT30141	83.00
	DTLCM	1 - 47	NT30141	4.70
	DTLD	1 - 50	NT30141	23.00
	DTLDH	1 - 50	NT40143	30.50
	DTLDM	1 - 47	NT30141	12.00
	DTLLA	1 - 47	NT30141	51.00
	DTLLA10H	1 - 47	NT20138	61.00
	DTLLAB	1 - 47	NT30141	51.00
	DTLLABRH	1 - 47	NT30141	51.00
	DTLLABULK	1 - 47	NT30141	570.00
	DTLLARH	1 - 47	NT30141	51.00
	DTLLARHBULK	1 - 47	NT30141	570.00
	DTLLB	1 - 47	NT30141	12.00
	DTLPF	1 - 47	NT30141	12.00
	DTMD240VAC	1 - 41	NT40143	660.00
	DTPB10L	1 - 44	NT30141	54.00
	DTPB11	1 - 44	NT30141	35.50
	DTPBS	1 - 42	NT30141	59.00
	DTPC2	2 - 2	NT30141	13.00
<b>A</b>	DTPC2LD	1 - 49	NT40143	19.20
<b>A</b>	DTPC2LD	2 - 2	NT40143	19.20
<b>A</b>	DTPC2LDCB	1 - 48	NT30141	109.00
	DTPC2LDCBV	1 - 48	NT30141	109.00

CAT. NO.	PAGE	P.S.	PRICE \$
<b>A</b> DTPC2LDR CBO	1 - 49	NT40143	19.80
DTPC4	2 - 2	NT30141	16.80
<b>A</b> DTPC4LD	1 - 49	NT40143	23.40
<b>A</b> DTPC4LD	2 - 2	NT40143	23.40
<b>A</b> DTPC4LDCB	1 - 48	NT30141	250.00
DTPC4LDCBV	1 - 48	NT30141	540.00
DTPC6	2 - 2	NT30141	31.50
DTPC8	2 - 2	NT30141	41.00
DTPF	1 - 50	NT30141	4.30
DTPF	2 - 16	NT30141	4.30
DTPF	2 - 31	NT30141	4.30
DTPF	2 - 51	NT30141	4.30
DTPF	3 - 41	NT30141	4.30
DTPF	3 - 68	NT30141	4.30
DTPLB	1 - 44	NT30141	25.40
DTPLL24	1 - 44	NT30141	3.60
DTPLL240	1 - 44	NT30141	3.60
<b>I</b> DTPLLCL	1 - 44	NT30141	3.30
DTPLLGR	1 - 44	NT30141	3.30
DTPLLOR	1 - 44	NT30141	3.30
DTPLLRD	1 - 44	NT30141	3.30
DTSHT110415V	1 - 39	NT30141	158.00
DTSHT2460V	1 - 39	NT30141	158.00
DTSP	1 - 50	NT30141	4.40
DTTAX16PN3	1 - 50	NT30141	19.40
DTTAX25PN	1 - 50	NT30141	10.80
DTTAX25SP	1 - 50	NT30141	10.80
DTTAX50PN	1 - 50	NT30141	18.20
DTTC35	1 - 50	NT30141	16.60
DTTC5	1 - 50	NT30141	4.70
DTTTLT35LPN	1 - 50	NT30141	10.80
DTTTLT35PN	1 - 50	NT30141	10.80
DTTTLT35SP	1 - 50	NT30141	10.80
<b>I</b> DTUVT12VDC	1 - 39	NT30141	171.00
DTUVT240VAC	1 - 39	NT30141	171.00
DTUVT24VDC	1 - 39	NT30141	171.00
<b>E</b>			
E125 NJ 3 100	3 - 24	NT20138	630.00
E125 NJ 3 125	3 - 24	NT20138	780.00
E125 NJ 3 20	3 - 24	NT20138	440.00
E125 NJ 3 32	3 - 24	NT20138	440.00
E125 NJ 3 50	3 - 24	NT20138	440.00
E125 NJ 3 63	3 - 24	NT20138	440.00
E250 NJ 3 100	3 - 47	NT20138	630.00
E250 NJ 3 125	3 - 47	NT20138	780.00
E250 NJ 3 160	3 - 47	NT20138	1030.00
E250 NJ 3 20	3 - 47	NT20138	440.00
E250 NJ 3 250	3 - 47	NT20138	1400.00
E250 NJ 3 32	3 - 47	NT20138	440.00

**I** Available on indent only.**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	E250 NJ 3 50	3 - 47	NT20138	440.00
	E250 NJ 3 63	3 - 47	NT20138	440.00
	E400 NJ 3 400	3 - 69	NT20138	1930.00
	E630 NE 3 630	3 - 86	NT20138	2700.00
	EFR	5 - 28	NT30141	560.00
	EFR	5 - 29	NT30141	560.00
	ELR24010	1 - 11	NT10136	590.00
	ELR240100	1 - 11	NT10136	590.00
	ELR24030	1 - 11	NT10136	590.00
	ELR240300	1 - 11	NT10136	590.00
	ELR44030	1 - 11	NT10136	590.00
<b>A</b>	ELTK	1 - 56	NA40037	250.00
<b>A</b>	ELTS	1 - 56	NA40037	235.00
	EPSR / EVSR	5 - 28	NT30141	310.00
	EPSR / EVSR	5 - 29	NT30141	310.00
	ERTD	5 - 28	NT30141	335.00
	ERTD	5 - 29	NT30141	335.00
	ESTD	5 - 28	NT30141	305.00
	ESTD	5 - 29	NT30141	305.00
	EVA3160H	2 - 30	NT40143	305.00
	EVA3160H	2 - 51	NT40143	305.00
	EVA3250H	2 - 30	NT40143	435.00
	EVA3250H	2 - 51	NT40143	435.00
<b>F</b>				
	FI	3 - 132	NT30141	900.00
	FI	6 - 10	NT20138	900.00
	FI	6 - 25	NT20138	900.00
	FI	6 - 36	NT30141	900.00
	FILED	3 - 132	NT30141	2050.00
	FILED	6 - 10	NT20138	2050.00
	FILED	6 - 36	NT30141	2050.00
<b>G</b>				
	GB224184U	2 - 63	NT40143	980.00
<b>I</b>	GB212183TF	2 - 62	NT40143	450.00
	GB212183U	2 - 62	NT40143	560.00
<b>I</b>	GB224181TF	2 - 64	NT40143	610.00
<b>I</b>	GB224182TF	2 - 63	NT40143	610.00
	GB224182TF	2 - 63	NT40143	610.00
<b>I</b>	GB224183PNTF	2 - 63	NT40143	790.00
	GB224183PNU	2 - 63	NT40143	980.00
<b>I</b>	GB224183TF	2 - 62	NT40143	610.00
	GB224183U	2 - 62	NT40143	720.00
<b>I</b>	GB236183TF	2 - 62	NT40143	790.00
	GB236183U	2 - 62	NT40143	910.00
<b>I</b>	GB248181TF	2 - 64	NT40143	960.00
<b>I</b>	GB248182TF	2 - 63	NT40143	960.00
	GB248182TF	2 - 63	NT40143	960.00
<b>I</b>	GB248183PNTF	2 - 63	NT40143	1220.00
	GB248183PNU	2 - 63	NT40143	1440.00

	CAT. NO.	PAGE	P.S.	PRICE \$
I	GB248183TF	2 - 62	NT40143	960.00
	GB248183U	2 - 62	NT40143	1080.00
	GB248184U	2 - 63	NT40143	1440.00
I	GB260183TF	2 - 62	NT40143	1150.00
	GB260183U	2 - 62	NT40143	1270.00
I	GB272181TF	2 - 64	NT40143	1350.00
I	GB272182TF	2 - 63	NT40143	1350.00
	GB272182TF	2 - 63	NT40143	1350.00
I	GB272183PNTF	2 - 63	NT40143	1700.00
	GB272183PNU	2 - 63	NT40143	1900.00
I	GB272183TF	2 - 62	NT40143	1350.00
	GB272183U	2 - 62	NT40143	1470.00
	GB272184U	2 - 63	NT40143	1900.00
I	GB284183TF	2 - 62	NT40143	1610.00
	GB284183U	2 - 62	NT40143	1730.00
I	GB296181TF	2 - 64	NT40143	1810.00
I	GB296182TF	2 - 63	NT40143	1810.00
	GB296182TF	2 - 63	NT40143	1810.00
I	GB296183PNTF	2 - 63	NT40143	2250.00
	GB296183PNU	2 - 63	NT40143	2450.00
I	GB296183TF	2 - 62	NT40143	1810.00
	GB296183U	2 - 62	NT40143	1930.00
	GB296184U	2 - 63	NT40143	2450.00
	GBBBC	2 - 64	NT40143	4.00
	GBIC	2 - 64	NT40143	5.00
	GBIB	2 - 64	NT40143	5.00
	GBL148L	2 - 64	NT40143	10.00
	GBL148R	2 - 64	NT40143	10.00
	GBL4996L	2 - 64	NT40143	10.00
	GBL4996R	2 - 64	NT40143	10.00
	GBLM	2 - 64	NT40143	50.00
	GBPL3P	2 - 64	NT40143	2.00
	GBPL4P	2 - 64	NT40143	2.00
	GBSPP3P	2 - 64	NT40143	5.00
	GBSPP4P	2 - 64	NT40143	6.00
	GBTOC	2 - 51	NT40143	1.50
	GBTB1	2 - 64	NT40143	2.00
	GBTB2	2 - 64	NT40143	2.00
	GBTB3	2 - 64	NT40143	2.00
	GBTB4	2 - 64	NT40143	2.00
	GBTOC	2 - 64	NT40143	1.50
	GBUSL	2 - 64	NT40143	2.00
<b>H</b>				
	H125 NJ 3 100	3 - 30	NT20138	1110.00
	H125 NJ 3 125	3 - 30	NT20138	1110.00
	H125 NJ 3 20	3 - 30	NT20138	960.00
	H125 NJ 3 32	3 - 30	NT20138	960.00
	H125 NJ 3 50	3 - 30	NT20138	960.00
	H125 NJ 3 63	3 - 30	NT20138	960.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I</b>	H125 NJ 4 100	3 - 30	NT20138	1470.00
<b>I</b>	H125 NJ 4 125	3 - 30	NT20138	1470.00
<b>I</b>	H125 NJ 4 20	3 - 30	NT20138	1290.00
<b>I</b>	H125 NJ 4 32	3 - 30	NT20138	1290.00
<b>I</b>	H125 NJ 4 50	3 - 30	NT20138	1290.00
<b>I</b>	H125 NJ 4 63	3 - 30	NT20138	1290.00
	H160 NJ 3 160	3 - 45	NT20138	1650.00
<b>I</b>	H160 NJ 4 160	3 - 45	NT20138	2210.00
	H250 NE 3 125	3 - 56	NT20138	2050.00
	H250 NE 3 125 AC	3 - 57	NT20138	4150.00
	H250 NE 3 250	3 - 56	NT20138	2560.00
	H250 NE 3 250 AC	3 - 57	NT20138	4350.00
	H250 NE 3 40	3 - 56	NT20138	1670.00
	H250 NE 3 40 AC	3 - 57	NT20138	3550.00
<b>I</b>	H250 NE 3 AP 3	3 - 56	NT20138	187.00
<b>I</b>	H250 NE 4 125	3 - 56	NT20138	3220.00
	H250 NE 4 125 AC	3 - 57	NT20138	4800.00
<b>I</b>	H250 NE 4 250	3 - 56	NT20138	3410.00
	H250 NE 4 250 AC	3 - 57	NT20138	4990.00
<b>I</b>	H250 NE 4 40	3 - 56	NT20138	3580.00
	H250 NE 4 40 AC	3 - 57	NT20138	4400.00
<b>I</b>	H250 NE 4 AN 3	3 - 56	NT20138	187.00
<b>I</b>	H250 NE 4 AP 3	3 - 56	NT20138	187.00
<b>I</b>	H250 NE 4 APN 3	3 - 56	NT20138	365.00
	H250 NJ 3 250	3 - 53	NT20138	2020.00
<b>I</b>	H250 NJ 4 250	3 - 53	NT20138	2700.00
	H400 NE 3 250	3 - 81	NT20138	3240.00
<b>I</b>	H400 NE 3 250 X1L	3 - 82	NT20138	5350.00
<b>I</b>	H400 NE 3 250 X1S	3 - 82	NT20138	7150.00
	H400 NE 3 400	3 - 81	NT20138	3240.00
<b>I</b>	H400 NE 3 400 X1L	3 - 82	NT20138	5350.00
<b>I</b>	H400 NE 3 400 X1S	3 - 82	NT20138	7150.00
<b>I</b>	H400 NE 3 AG 400	3 - 81	NT20138	187.00
<b>I</b>	H400 NE 3 AP +	3 - 81	NT20138	187.00
<b>I</b>	H400 NE 3 APG 400	3 - 81	NT20138	375.00
<b>I</b>	H400 NE 4 250	3 - 81	NT20138	4320.00
<b>I</b>	H400 NE 4 250 X1L	3 - 82	NT20138	6540.00
<b>I</b>	H400 NE 4 250 X1S	3 - 82	NT20138	8250.00
<b>I</b>	H400 NE 4 400	3 - 81	NT20138	4320.00
<b>I</b>	H400 NE 4 400 X1L	3 - 82	NT20138	6540.00
<b>I</b>	H400 NE 4 400 X1S	3 - 82	NT20138	8250.00
<b>I</b>	H400 NE 4 AGN 400	3 - 81	NT20138	375.00
<b>I</b>	H400 NE 4 AN +	3 - 81	NT20138	187.00
<b>I</b>	H400 NE 4 AP +	3 - 81	NT20138	187.00
<b>I</b>	H400 NE 4 APN +	3 - 81	NT20138	375.00
	H800 NE 3 630	3 - 109	NT20138	4230.00
	H800 NE 3 800	3 - 109	NT20138	4590.00
	H800 NE 3 800 X1L	3 - 110	NT20138	7150.00
	H800 NE 3 800 X1S	3 - 110	NT20138	8650.00

CAT. NO.	PAGE	P.S.	PRICE \$
I H800 NE 3 AG #	3 - 109	NT20138	180.00
I H800 NE 3 AP #	3 - 109	NT20138	180.00
I H800 NE 3 APG #	3 - 109	NT20138	180.00
H800 NE 4 630	3 - 109	NT20138	4810.00
H800 NE 4 800	3 - 109	NT20138	5220.00
H800 NE 4 800 X1L	3 - 110	NT20138	8500.00
H800 NE 4 800 X1S	3 - 110	NT20138	10300.00
I H800 NE 4 AGN #	3 - 109	NT20138	360.00
I H800 NE 4 AN #	3 - 109	NT20138	180.00
I H800 NE 4 AP #	3 - 109	NT20138	180.00
I H800 NE 4 APN #	3 - 109	NT20138	360.00
HC12153	4 - 16	NT40143	1140.00
HC12183	4 - 16	NT40143	1510.00
HC12213	4 - 16	NT40143	1840.00
HC12243	4 - 16	NT40143	1930.00
HC12273	4 - 16	NT40143	2090.00
HC12303	4 - 16	NT40143	2300.00
HC12333	4 - 16	NT40143	2430.00
HC12363	4 - 16	NT40143	2620.00
HC12393	4 - 16	NT40143	2710.00
HC12423	4 - 16	NT40143	3000.00
HC12453	4 - 16	NT40143	3240.00
HC16153	4 - 16	NT40143	1710.00
HC16183	4 - 16	NT40143	2050.00
HC16213	4 - 16	NT40143	2360.00
HC16243	4 - 16	NT40143	2570.00
HC16273	4 - 16	NT40143	2850.00
HC16303	4 - 16	NT40143	3240.00
HC16333	4 - 16	NT40143	3360.00
HC16363	4 - 16	NT40143	3620.00
HC16393	4 - 16	NT40143	3800.00
HC16423	4 - 16	NT40143	3930.00
HC16453	4 - 16	NT40143	4200.00
HC22153	4 - 16	NT40143	2640.00
HC22183	4 - 16	NT40143	2840.00
HC22213	4 - 16	NT40143	3140.00
HC22243	4 - 16	NT40143	3430.00
HC22273	4 - 16	NT40143	3710.00
HC22303	4 - 16	NT40143	3980.00
HC22333	4 - 16	NT40143	4210.00
HC22363	4 - 16	NT40143	4350.00
HC22393	4 - 16	NT40143	4490.00
HC22423	4 - 16	NT40143	4680.00
HC22453	4 - 16	NT40143	4910.00
HCD250	4 - 17	NT40143	355.00
HCD250P	4 - 17	NT40143	355.00
HCD800	4 - 17	NT40143	740.00
HCDN630	4 - 17	NT40143	510.00
HCDW630	4 - 17	NT40143	510.00

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**I** Available on indent only.

**A** Assembled to order.

CAT. NO.	PAGE	P.S.	PRICE \$
HCL1250	4 - 17	NT40143	770.00
HCL1250	4 - 17	NT40143	770.00
HCL250	4 - 17	NT40143	355.00
HCL250P	4 - 17	NT40143	355.00
HCL800	4 - 17	NT40143	740.00
HCLN630	4 - 17	NT40143	510.00
HCLW630	4 - 17	NT40143	510.00
HCR1250	4 - 17	NT40143	770.00
HCR1250	4 - 17	NT40143	770.00
HCR250	4 - 17	NT40143	355.00
HCR250P	4 - 17	NT40143	355.00
HCR800	4 - 17	NT40143	740.00
HCRN630	4 - 17	NT40143	510.00
HCRW630	4 - 17	NT40143	510.00
<b>A</b> HCSTD1DS16153	4 - 15	NT40143	3990.00
<b>A</b> HCSTD2DS16243	4 - 15	NT40143	5680.00
<b>A</b> HCSTD3SSL16153	4 - 15	NT40143	3990.00
<b>A</b> HCSTD4SSR16153	4 - 15	NT40143	3990.00
<b>A</b> HCSTD5SSL16213	4 - 15	NT40143	5460.00
<b>A</b> HCSTD6SSR16213	4 - 15	NT40143	5460.00
<b>A</b> HCSTD7SSL22243	4 - 15	NT40143	7000.00
<b>A</b> HCSTD8SSR22243	4 - 15	NT40143	7000.00
<b>I</b>			
IBC108P	1 - 43	NT40143	10.60
IBC112P	1 - 43	NT40143	17.80
IBC115P	1 - 43	NT40143	21.20
IBC118P	1 - 43	NT40143	29.60
IBC121P	1 - 43	NT40143	36.00
IBC155P	1 - 43	NT40143	77.50
IBCEC1	1 - 43	NT40143	2.00
ICL102	1 - 43	NT40143	26.00
ICL123	1 - 43	NT40143	49.00
ICL153	1 - 43	NT40143	61.00
ICL183	1 - 43	NT40143	72.50
ICL213	1 - 43	NT40143	94.50
ICL561F	1 - 43	NT40143	78.00
ICL562	1 - 43	NT40143	128.00
ICL563A	1 - 43	NT40143	200.00
ICL564	1 - 43	NT40143	255.00
ICL573	1 - 43	NT40143	225.00
ICL573F	1 - 43	NT40143	230.00
ICL62	1 - 43	NT40143	18.20
ICLEC23	1 - 43	NT40143	4.00
ICLEC4	1 - 43	NT40143	4.00
ICLTOC	1 - 50	NT40143	4.60
ILC 4EN	2 - 3	NT40143	27.00
ILC 4S	2 - 3	NT40143	65.50
<b>A</b> ILC4SLD	1 - 49	NT40143	71.50
<b>A</b> ILC4SLD	2 - 3	NT40143	71.50

CAT. NO.	PAGE	P.S.	PRICE \$
<b>A</b> ILC4SLD10H	1 - 49	NT40143	77.00
<b>A</b> ILC4SLD10H	2 - 3	NT40143	77.00
ILC4SLDCB1001P	1 - 48	NT40143	365.00
ILC4SLDCB1001PD	1 - 48	NT40143	440.00
ILC4SLDCB1003P	1 - 48	NT40143	950.00
ILC4SLDCB1003PD	1 - 48	NT40143	1020.00
ILC4SLDCB1251P	1 - 48	NT40143	365.00
ILC4SLDCB1251PD	1 - 48	NT40143	440.00
ILC4SLDCB1253P	1 - 48	NT40143	950.00
ILC4SLDCB1253PD	1 - 48	NT40143	1020.00
ILC4SLDCB1P	1 - 48	NT40143	156.00
ILC4SLDCB1PD	1 - 48	NT40143	161.00
ILC4SLDCB801P	1 - 48	NT40143	365.00
ILC4SLDCB801PD	1 - 48	NT40143	440.00
ILC4SLDCB803P	1 - 48	NT40143	950.00
ILC4SLDCB803PD	1 - 48	NT40143	1020.00
ILC 8EN	2 - 3	NT40143	31.00
ILC 8S	2 - 3	NT40143	79.00
ILCSB	2 - 3	NT40143	3.60
IRC	5 - 28	NT30141	119.00
IRC	5 - 29	NT30141	119.00
ISO 3160SFH	2 - 31	NB20064	500.00
ISO 3160SFH	2 - 69	NB20064	500.00

**K**

KEY92268	2 - 16	NT40143	7.80
KEY92268	2 - 30	NT40143	7.80
KEY92268	2 - 51	NT40143	7.80
KEYCL001	2 - 16	NT40143	7.80
KEYCL001	2 - 30	NT40143	7.80
KEYCL001	2 - 51	NT40143	7.80

**L**

<b>I</b> L125 NJ 3 100	3 - 31	NT20138	1170.00
<b>I</b> L125 NJ 3 125	3 - 31	NT20138	1170.00
<b>I</b> L125 NJ 3 20	3 - 31	NT20138	1090.00
<b>I</b> L125 NJ 3 32	3 - 31	NT20138	1090.00
<b>I</b> L125 NJ 3 50	3 - 31	NT20138	1090.00
<b>I</b> L125 NJ 3 63	3 - 31	NT20138	1090.00
<b>I</b> L125 NJ 4 100	3 - 31	NT20138	1570.00
<b>I</b> L125 NJ 4 125	3 - 31	NT20138	1570.00
<b>I</b> L125 NJ 4 20	3 - 31	NT20138	1440.00
<b>I</b> L125 NJ 4 32	3 - 31	NT20138	1440.00
<b>I</b> L125 NJ 4 50	3 - 31	NT20138	1440.00
<b>I</b> L125 NJ 4 63	3 - 31	NT20138	1440.00
L125 PJ 3 100	3 - 29	NT20138	830.00
L125 PJ 3 125	3 - 29	NT20138	830.00
L125 PJ 3 20	3 - 29	NT20138	730.00
L125 PJ 3 32	3 - 29	NT20138	730.00
L125 PJ 3 50	3 - 29	NT20138	730.00
L125 PJ 3 63	3 - 29	NT20138	730.00

# 044 Lytton Road East Brisbane SPS - Electrical Installation OM Mar

**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	L160 NJ 3 160	3 - 46	NT20138	2030.00
<b>I</b>	L160 NJ 4 160	3 - 46	NT20138	2710.00
<b>I</b>	L2000KT	2 - 69	NB20064	29.60
<b>I</b>	L250 NJ 3 250	3 - 58	NT20138	2340.00
<b>I</b>	L250 NJ 4 250	3 - 58	NT20138	3120.00
<b>I</b>	L400 NE 3 250	3 - 84	NT20138	3370.00
<b>I</b>	L400 NE 3 400	3 - 84	NT20138	3370.00
<b>I</b>	L400 NE 3 AG 400	3 - 84	NT20138	187.00
<b>I</b>	L400 NE 3 AP +	3 - 84	NT20138	187.00
<b>I</b>	L400 NE 3 APG 400	3 - 84	NT20138	375.00
<b>I</b>	L400 NE 4 250	3 - 84	NT20138	4380.00
<b>I</b>	L400 NE 4 400	3 - 84	NT20138	4380.00
<b>I</b>	L400 NE 4 AGN 400	3 - 84	NT20138	375.00
<b>I</b>	L400 NE 4 AN +	3 - 84	NT20138	187.00
<b>I</b>	L400 NE 4 AP +	3 - 84	NT20138	187.00
<b>I</b>	L400 NE 4 APN +	3 - 84	NT20138	375.00
	L400 PE 3 250	3 - 77	NT20138	3240.00
	L400 PE 3 400	3 - 77	NT20138	3240.00
	L800 NE 3 630	3 - 111	NT20138	4520.00
	L800 NE 3 800	3 - 111	NT20138	4960.00
<b>I</b>	L800 NE 3 AG #	3 - 111	NT20138	180.00
<b>I</b>	L800 NE 3 AP #	3 - 111	NT20138	180.00
<b>I</b>	L800 NE 3 APG #	3 - 111	NT20138	180.00
	L800 NE 4 630	3 - 111	NT20138	5350.00
	L800 NE 4 800	3 - 111	NT20138	5960.00
<b>I</b>	L800 NE 4 AGN #	3 - 111	NT20138	360.00
<b>I</b>	L800 NE 4 AN #	3 - 111	NT20138	180.00
<b>I</b>	L800 NE 4 AP #	3 - 111	NT20138	180.00
<b>I</b>	L800 NE 4 APN #	3 - 111	NT20138	360.00
	L800 PE 3 630	3 - 112	NT20138	5340.00
	L800 PE 3 800	3 - 112	NT20138	5460.00
	LABLE148DT	1 - 47	NT40143	22.80
	LABLE4996DT	1 - 47	NT40143	22.80
	LB18	1 - 9	NT10136	27.00
	LB3PH12	1 - 9	NZ00150	153.00
	LB3PH18	1 - 9	NZ00150	215.00
	LD12/15	2 - 9	NT40143	78.00
	LD12/15	2 - 10	NT40143	78.00
	LD15/18	2 - 9	NT40143	78.00
	LD18/21	2 - 9	NT40143	83.00
	LD18/21	2 - 10	NT40143	83.00
	LD24	2 - 9	NT40143	109.00
	LD6/8	2 - 9	NT40143	67.50
	LD6/8	2 - 10	NT40143	67.50
	LD9/12	2 - 9	NT40143	67.50
	LE 73151753	2 - 31	NA30018	1090.00
	LOCTITE 480	6 - 11	NT10136	83.00
	LOCTITE 480	6 - 26	NT10136	83.00
	LSIG	3 - 132	NT30141	870.00

CAT. NO.	PAGE	P.S.	PRICE \$
LSIG	6 - 25	NT20138	870.00
LSIG	6 - 36	NT30141	870.00
LSIP	3 - 132	NT30141	700.00
LSIP	6 - 25	NT20138	700.00
LSIP	6 - 36	NT30141	700.00
<b>M</b>			
<b>A</b> M22IVS	1 - 42	NT40143	23.40
MCEPCN5MFM	2 - 7	NB20054	88.00
MCEPCN9MFM	2 - 7	NB20054	140.00
<b>I A</b> MH6S633	5 - 9	NZ00150	8460.00
<b>I A</b> MH6S644	5 - 9	NZ00150	10920.00
<b>I A</b> MS12S1033	5 - 9	NZ00150	15880.00
<b>I A</b> MS12S1044	5 - 9	NZ00150	20740.00
<b>I A</b> MS12S1233	5 - 9	NZ00150	18140.00
<b>I A</b> MS12S1244	5 - 9	NZ00150	23730.00
<b>I A</b> MS16S1633	5 - 9	NZ00150	29040.00
<b>I A</b> MS16S1644	5 - 9	NZ00150	38180.00
<b>I A</b> MS20E2033	5 - 9	NZ00150	32570.00
<b>I A</b> MS20E2044	5 - 9	NZ00150	42640.00
<b>I A</b> MS25E2533	5 - 9	NZ00150	34950.00
<b>I A</b> MS25E2544	5 - 9	NZ00150	45820.00
<b>I A</b> MS6N433	5 - 9	NZ00150	7300.00
<b>I A</b> MS6N444	5 - 9	NZ00150	7730.00
<b>I A</b> MS6N633	5 - 9	NZ00150	7300.00
<b>I A</b> MS6N644	5 - 9	NZ00150	8860.00
<b>I A</b> MS6S633	5 - 9	NZ00150	7850.00
<b>I A</b> MS6S644	5 - 9	NZ00150	10140.00
<b>I A</b> MS8N833	5 - 9	NZ00150	8900.00
<b>I A</b> MS8N844	5 - 9	NZ00150	11520.00
<b>I A</b> MS8S833	5 - 9	NZ00150	9670.00
<b>I A</b> MS8S844	5 - 9	NZ00150	12510.00
MST	5 - 28	NT30141	210.00
MST	5 - 29	NT30141	210.00
<b>N</b>			
NC212/183U	2 - 58	NT40143	200.00
NC218/183U	2 - 58	NT40143	225.00
NC224/182U	2 - 60	NT40143	280.00
NC224/183PNU	2 - 59	NT40143	430.00
NC224/183U	2 - 58	NT40143	280.00
NC224/184U	2 - 59	NT40143	430.00
NC230/183U	2 - 58	NT40143	310.00
NC236/182U	2 - 60	NT40143	350.00
NC236/183U	2 - 58	NT40143	350.00
NC236/184U	2 - 59	NT40143	520.00
NC242/183U	2 - 58	NT40143	380.00
NC248/182U	2 - 60	NT40143	425.00
NC248/183PNU	2 - 59	NT40143	630.00
NC248/183U	2 - 58	NT40143	425.00
NC248/184U	2 - 59	NT40143	630.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	NC250HTOPC	2 - 61	NT40143	0.75
	NC250TOPC	2 - 51	NT40143	0.80
	NC250TOPC	2 - 61	NT40143	0.80
	NC254/183U	2 - 58	NT40143	475.00
	NC260182U	2 - 60	NT40143	495.00
	NC260/183U	2 - 58	NT40143	495.00
	NC260/184U	2 - 59	NT40143	750.00
<b>I</b>	NC272183PNU	2 - 59	NT40143	980.00
	NC272/183U	2 - 58	NT40143	660.00
	NC272/184U	2 - 59	NT40143	980.00
	NC278/183U	2 - 58	NT40143	780.00
	NC284/183U	2 - 58	NT40143	850.00
<b>I</b>	NC296183PNU	2 - 59	NT40143	1330.00
	NC296/183U	2 - 58	NT40143	990.00
	NC4108/183TF	2 - 59	NT40143	1380.00
	NC412/183U	2 - 59	NT40143	375.00
	NC418/183U	2 - 59	NT40143	425.00
	NC424/183U	2 - 59	NT40143	480.00
	NC430/183U	2 - 59	NT40143	540.00
	NC436/183U	2 - 59	NT40143	580.00
	NC442/183U	2 - 59	NT40143	620.00
	NC448/183U	2 - 59	NT40143	710.00
	NC454/183U	2 - 59	NT40143	750.00
	NC460/183U	2 - 59	NT40143	790.00
	NC472/183U	2 - 59	NT40143	930.00
	NC478/183U	2 - 59	NT40143	1000.00
	NC484/183U	2 - 59	NT40143	1090.00
	NC496/183U	2 - 59	NT40143	1250.00
	NCBBC	2 - 61	NT40143	5.70
	NCBC	2 - 61	NT40143	10.80
	NCBC4	2 - 61	NT40143	16.00
<b>A</b>	NCCK200	2 - 61	NT40143	135.00
	NCCK200CP	2 - 31	NT40143	182.00
	NCCK200CPP	2 - 51	NT40143	187.00
<b>A</b>	NCCK250	2 - 61	NT40143	355.00
	NCCK250CP	2 - 31	NT40143	490.00
	NCCK250CPP	2 - 51	NT40143	500.00
<b>A</b>	NCCK400	2 - 61	NT40143	510.00
<b>A</b>	NCCK4002	2 - 61	NT40143	720.00
	NCCK4002CPP	2 - 51	NT40143	820.00
	NCCK400CPP	2 - 51	NT40143	590.00
	NCH123	2 - 61	NT40143	15.00
	NCH412/273U	2 - 60	NT40143	560.00
	NCH412/3027/183U	2 - 60	NT40143	660.00
	NCH412/4227/183U	2 - 60	NT40143	790.00
	NCH412/6027/183U	2 - 60	NT40143	980.00
	NCH418/273U	2 - 60	NT40143	760.00
	NCH424/273U	2 - 60	NT40143	920.00
	NCH46/1227/183U	2 - 60	NT40143	500.00

CAT. NO.	PAGE	P.S.	PRICE \$
NCH46/2427/183U	2 - 60	NT40143	560.00
NCH46/273U	2 - 60	NT40143	385.00
NCH46/3627/183U	2 - 60	NT40143	590.00
NCH46/4827/183U	2 - 60	NT40143	630.00
NCL243	2 - 61	NT40143	16.60
NCL24C	2 - 61	NT40143	16.60
NCS250GT	2 - 61	NT40143	78.00
NEB185	1 - 50	NT40143	88.00
NEB185	2 - 57	NT40143	88.00
NEB33S	2 - 57	NT40143	88.00
NLC12FE	2 - 9	NT40143	35.50
NLC12S	2 - 9	NT40143	164.00
NLC15FE	2 - 9	NT40143	35.50
NLC15S	2 - 9	NT40143	187.00
NLC18FE	2 - 9	NT40143	41.50
NLC18S	2 - 9	NT40143	205.00
NLC21FE	2 - 9	NT40143	45.50
NLC21S	2 - 9	NT40143	215.00
NLC24S	2 - 9	NT40143	275.00
NLC8FE	2 - 9	NT40143	27.40
NLC8S	2 - 9	NT40143	141.00
<b>P</b>			
PRE-TRIP ALARM	6 - 10	NT20138	770.00
I PXB80012U	4 - 4	NT40143	590.00
I PXB80018U	4 - 4	NT40143	810.00
I PXB80024U	4 - 4	NT40143	1040.00
I PXB80030U	4 - 4	NT40143	1230.00
I PXB80036U	4 - 4	NT40143	1600.00
I PXB80042U	4 - 4	NT40143	1850.00
I PXB80048U	4 - 4	NT40143	2120.00
I PXB80060U	4 - 4	NT40143	2540.00
I PXB8006U	4 - 4	NT40143	510.00
I PXB80072U	4 - 4	NT40143	3250.00
<b>R</b>			
RD1B212	8 - 5	NT30141	1080.00
RD1B214	8 - 5	NT30141	1080.00
RD1B215	8 - 5	NT30141	1080.00
I RD1B21H	8 - 5	NT30141	1080.00
I RD1DF12	8 - 6	NT30141	520.00
RD1DF14	8 - 6	NT30141	520.00
I RD1DF15	8 - 6	NT30141	520.00
RD1EP212	8 - 7	NT30141	910.00
RD1EP214	8 - 7	NT30141	910.00
RD1EP215	8 - 7	NT30141	910.00
RD1EP21H	8 - 7	NT30141	910.00
RD1G212	8 - 10	NT30141	1000.00
I RD1G214	8 - 10	NT30141	1000.00
I RD1G215	8 - 10	NT30141	1000.00
RD3AF12 (110 V AC)	8 - 4	NT30141	910.00

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**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	RD3AF14 (240 V AC)	8 - 4	NT30141	910.00
	RD3AF15 (415 V AC)	8 - 4	NT30141	910.00
	RD3AF1H (24-150 V DC)	8 - 4	NT30141	910.00
	RD3AF1N (24 V AC)	8 - 4	NT30141	910.00
	RD3E212B	8 - 8	NT30141	1510.00
	RD3E217B	8 - 8	NT30141	1510.00
	RD3E218B	8 - 8	NT30141	1510.00
	RD3E21HB	8 - 8	NT30141	1510.00
<b>I</b>	RD4848C	8 - 15	NT30141	200.00
<b>I</b>	RD7272C	8 - 15	NT30141	200.00
	RD7296A	8 - 15	NT30141	88.00
<b>I</b>	RD9696C	8 - 15	NT30141	255.00
<b>S</b>				
	S1000 NE 3 1000	3 - 113	NT20138	6850.00
	S1000 NE 3 1000 X1L	3 - 114	NT20138	7750.00
	S1000 NE 3 1000 X1S	3 - 114	NT20138	9450.00
<b>I</b>	S1000 NE 3 AG #	3 - 113	NT20138	180.00
<b>I</b>	S1000 NE 3 AP #	3 - 113	NT20138	180.00
<b>I</b>	S1000 NE 3 APG #	3 - 113	NT20138	360.00
	S1000 NE 4 1000	3 - 113	NT20138	4812.00
	S1000 NE 4 1000 X1L	3 - 114	NT20138	9300.00
	S1000 NE 4 1000 X1S	3 - 114	NT20138	11340.00
<b>I</b>	S1000 NE 4 AGN #	3 - 113	NT20138	360.00
<b>I</b>	S1000 NE 4 AN #	3 - 113	NT20138	180.00
<b>I</b>	S1000 NE 4 AP #	3 - 113	NT20138	180.00
<b>I</b>	S1000 NE 4 APN #	3 - 113	NT20138	360.00
<b>I</b>	S100 GF 2 100	3 - 26	NT20138	430.00
<b>I</b>	S100 GF 2 15	3 - 26	NT20138	315.00
	S100 GF 2 20	3 - 26	NT20138	315.00
	S100 GF 2 30	3 - 26	NT20138	315.00
	S100 GF 2 40	3 - 26	NT20138	315.00
	S100 GF 2 50	3 - 26	NT20138	315.00
	S100 GF 2 60	3 - 26	NT20138	315.00
	S100 GF 2 75	3 - 26	NT20138	355.00
	S1250 GE 3 1250	3 - 121	NT20138	8650.00
<b>I</b>	S1250 GE 3 AG #	3 - 121	NT20138	180.00
<b>I</b>	S1250 GE 3 AP #	3 - 121	NT20138	180.00
<b>I</b>	S1250 GE 3 APG #	3 - 121	NT20138	180.00
	S1250 GE 4 1250	3 - 121	NT20138	10250.00
<b>I</b>	S1250 GE 4 AGN #	3 - 121	NT20138	360.00
<b>I</b>	S1250 GE 4 AN #	3 - 121	NT20138	180.00
<b>I</b>	S1250 GE 4 AP #	3 - 121	NT20138	180.00
<b>I</b>	S1250 GE 4 APN #	3 - 121	NT20138	360.00
	S1250NN3	3 - 142	NT20138	7600.00
	S1250NN4	3 - 142	NT20138	8950.00
	S125 GJ 3 100	3 - 28	NT20138	900.00
	S125 GJ 3 100PM	3 - 146	NT20138	1050.00
	S125 GJ 3 125	3 - 28	NT20138	1000.00
	S125 GJ 3 125PM	3 - 146	NT20138	1210.00

CAT. NO.	PAGE	P.S.	PRICE \$
S125 GJ 3 20	3 - 28	NT20138	750.00
S125 GJ 3 32	3 - 28	NT20138	750.00
S125 GJ 3 50	3 - 28	NT20138	750.00
I S125 GJ 3 50PM	3 - 146	NT20138	850.00
S125 GJ 3 63	3 - 28	NT20138	750.00
S125 GJ 3 63PM	3 - 146	NT20138	850.00
S125 GJ 4 100	3 - 28	NT20138	1210.00
S125 GJ 4 125	3 - 28	NT20138	1330.00
S125 GJ 4 20	3 - 28	NT20138	990.00
S125 GJ 4 32	3 - 28	NT20138	990.00
S125 GJ 4 50	3 - 28	NT20138	990.00
S125 GJ 4 63	3 - 28	NT20138	990.00
I S125ND3	3 - 143	NT20138	POA
I S125ND4	3 - 143	NT20138	POA
S125 NF 1 100	3 - 25	NT20138	310.00
S125 NF 1 125	3 - 25	NT20138	310.00
S125 NF 1 16	3 - 25	NT20138	165.00
S125 NF 1 20	3 - 25	NT20138	165.00
S125 NF 1 25	3 - 25	NT20138	165.00
S125 NF 1 32	3 - 25	NT20138	165.00
S125 NF 1 40	3 - 25	NT20138	165.00
S125 NF 1 50	3 - 25	NT20138	165.00
S125 NF 1 63	3 - 25	NT20138	165.00
S125 NF 1 80	3 - 25	NT20138	235.00
S125 NJ 3 100	3 - 27	NT20138	680.00
S125 NJ 3 125	3 - 27	NT20138	810.00
S125 NJ 3 20	3 - 27	NT20138	480.00
S125 NJ 3 20PM	3 - 146	NT20138	850.00
S125 NJ 3 32	3 - 27	NT20138	480.00
S125 NJ 3 32PM	3 - 146	NT20138	850.00
S125 NJ 3 50	3 - 27	NT20138	480.00
S125 NJ 3 63	3 - 27	NT20138	480.00
S125NN3	3 - 142	NT20138	430.00
I S125NN4	3 - 142	NT20138	570.00
S1600 NE 3 1250	3 - 122	NT20138	9820.00
I S1600 NE 3 AG #	3 - 122	NT20138	180.00
I S1600 NE 3 AP #	3 - 122	NT20138	180.00
I S1600 NE 3 APG #	3 - 122	NT20138	180.00
S1600 NE 4 1250	3 - 122	NT20138	11500.00
I S1600 NE 4 AGN #	3 - 122	NT20138	360.00
I S1600 NE 4 AN #	3 - 122	NT20138	180.00
I S1600 NE 4 AP #	3 - 122	NT20138	180.00
I S1600 NE 4 APN #	3 - 122	NT20138	360.00
S1600NN3	3 - 142	NT20138	8700.00
S1600NN4	3 - 142	NT20138	9900.00
S160 GJ 3 100	3 - 44	NT20138	900.00
S160 GJ 3 125	3 - 44	NT20138	1000.00
S160 GJ 3 160	3 - 44	NT20138	1210.00
S160 GJ 3 160PM	3 - 146	NT20138	1440.00

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**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	S160 GJ 3 50	3 - 44	NT20138	750.00
	S160 GJ 3 63	3 - 44	NT20138	750.00
<b>I</b>	S160 GJ 4 100	3 - 44	NT20138	1210.00
	S160 GJ 4 125	3 - 44	NT20138	1330.00
	S160 GJ 4 160	3 - 44	NT20138	1620.00
<b>I</b>	S160 GJ 4 50	3 - 44	NT20138	950.00
<b>I</b>	S160 GJ 4 63	3 - 44	NT20138	990.00
<b>I</b>	S160ND3	3 - 143	NT20138	POA
<b>I</b>	S160ND4	3 - 143	NT20138	POA
	S160 NF 1 100	3 - 42	NT20138	310.00
	S160 NF 1 125	3 - 42	NT20138	310.00
	S160 NF 1 16	3 - 42	NT20138	165.00
	S160 NF 1 160	3 - 42	NT20138	340.00
	S160 NF 1 20	3 - 42	NT20138	165.00
	S160 NF 1 25	3 - 42	NT20138	165.00
	S160 NF 1 32	3 - 42	NT20138	165.00
	S160 NF 1 40	3 - 42	NT20138	165.00
	S160 NF 1 50	3 - 42	NT20138	165.00
	S160 NF 1 63	3 - 42	NT20138	165.00
	S160 NF 1 80	3 - 42	NT20138	220.00
	S160 NJ 3 100	3 - 43	NT20138	680.00
	S160 NJ 3 125	3 - 43	NT20138	810.00
	S160 NJ 3 160	2 - 31	NT20138	1080.00
	S160 NJ 3 160	3 - 43	NT20138	1080.00
	S160 NJ 3 20	3 - 43	NT20138	480.00
	S160 NJ 3 32	3 - 43	NT20138	480.00
	S160 NJ 3 50	3 - 43	NT20138	480.00
	S160 NJ 3 63	3 - 43	NT20138	480.00
	S160 NJ 4 100	3 - 43	NT20138	900.00
	S160 NJ 4 125	3 - 43	NT20138	1090.00
	S160 NJ 4 160	3 - 43	NT20138	1425.00
	S160 NJ 4 20	3 - 43	NT20138	630.00
<b>I</b>	S160 NJ 4 32	3 - 43	NT20138	630.00
	S160 NJ 4 50	3 - 43	NT20138	630.00
	S160 NJ 4 63	3 - 43	NT20138	630.00
	S160NN3	3 - 142	NT20138	500.00
	S160NN4	3 - 142	NT20138	670.00
	S250 GJ 3 250	3 - 49	NT20138	1680.00
<b>I</b>	S250 GJ 3 250M1000	3 - 49	NT20138	1870.00
<b>I A</b>	S250 GJ 3 250MAG	3 - 49	NT20138	1910.00
	S250 GJ 3 250PM	3 - 146	NT20138	1780.00
	S250 GJ 3 SO23160	3 - 49	NT20138	1780.00
	S250 GJ 4 250	3 - 49	NT20138	2240.00
<b>I</b>	S250ND3	3 - 143	NT20138	POA
<b>I</b>	S250ND4	3 - 143	NT20138	POA
	S250NJ	2 - 31	NT20138	1480.00
	S250 NJ 3 250	3 - 48	NT20138	1480.00
	S250 NJ 4 250	3 - 48	NT20138	1860.00
	S250NN3	2 - 31	NT20138	500.00

CAT. NO.	PAGE	P.S.	PRICE \$
S250NN3	3 - 142	NT20138	500.00
S250NN4	3 - 142	NT20138	670.00
S250 PE 3 125	3 - 52	NT20138	1730.00
S250 PE 3 125 AC	3 - 54	NT20138	3760.00
S250 PE 3 250	3 - 52	NT20138	2100.00
S250 PE 3 250 AC	3 - 54	NT20138	3970.00
S250 PE 3 40 AC	3 - 54	NT20138	3560.00
I S250 PE 3 AP 3	3 - 52	NT20138	187.00
I S250 PE 4 125	3 - 52	NT20138	2430.00
I S250 PE 4 125 AC	3 - 54	NT20138	4500.00
S250 PE 4 250	3 - 52	NT20138	2790.00
I S250 PE 4 250 AC	3 - 54	NT20138	4760.00
I S250 PE 4 40 AC	3 - 54	NT20138	4270.00
I S250 PE 4 AN 4	3 - 52	NT20138	187.00
I S250 PE 4 AP 4	3 - 52	NT20138	187.00
I S250 PE 4 APN 4	3 - 52	NT20138	365.00
S400 CJ 3 250	3 - 70	NT20138	1930.00
S400 CJ 3 400	3 - 70	NT20138	1970.00
S400 GE 3 250	3 - 75	NT20138	2550.00
S400 GE 3 250 X1L	3 - 76	NT20138	4650.00
S400 GE 3 250 X1S	3 - 76	NT20138	6550.00
S400 GE 3 400	3 - 75	NT20138	2550.00
S400 GE 3 400PM	3 - 146	NT20138	3010.00
S400 GE 3 400 X1L	3 - 76	NT20138	4900.00
S400 GE 3 400 X1S	3 - 76	NT20138	6800.00
S400 GE 3 AG 400	3 - 75	NT20138	2720.00
I S400 GE 3 AP 400	3 - 75	NT20138	2750.00
I S400 GE 3 APG 400	3 - 75	NT20138	2930.00
I S400 GE 4 250	3 - 75	NT20138	3380.00
S400 GE 4 250 X1L	3 - 76	NT20138	5690.00
S400 GE 4 250 X1S	3 - 76	NT20138	7750.00
S400 GE 4 400	3 - 75	NT20138	3400.00
I S400 GE 4 400 X1L	3 - 76	NT20138	5880.00
I S400 GE 4 400 X1S	3 - 76	NT20138	8160.00
S400 GE 4 AGN 400	3 - 75	NT20138	3780.00
I S400 GE 4 AN 400	3 - 75	NT20138	3590.00
I S400 GE 4 AP 400	3 - 75	NT20138	3590.00
I S400 GE 4 APN 400	3 - 75	NT20138	3780.00
S400 GJ 3 250	3 - 73	NT20138	2310.00
S400 GJ 3 400	3 - 73	NT20138	2310.00
I S400 GJ 4 250	3 - 73	NT20138	3080.00
S400 GJ 4 400	3 - 73	NT20138	3080.00
I S400ND3	3 - 143	NT20138	POA
S400 NE 3 250	3 - 72	NT20138	2180.00
S400 NE 3 400	3 - 72	NT20138	2180.00
S400 NE 4 250	3 - 72	NT20138	2180.00
S400 NE 4 400	3 - 72	NT20138	2890.00
S400 NJ 3 250	3 - 71	NT20138	2020.00
S400 NJ 3 400	3 - 71	NT20138	2020.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	S400 NJ 4 250	3 - 71	NT20138	2700.00
	S400 NJ 4 400	3 - 71	NT20138	2700.00
	S400NN3	2 - 31	NT20138	1650.00
	S400NN3	3 - 142	NT20138	1650.00
	S400NN4	3 - 142	NT20138	2200.00
<b>I</b>	S400 PE 3 250	3 - 79	NT20138	2780.00
	S400 PE 3 400	3 - 79	NT20138	2780.00
<b>I</b>	S400 PE 3 AG 400	3 - 79	NT20138	187.00
<b>I</b>	S400 PE 3 AP +	3 - 79	NT20138	187.00
<b>I</b>	S400 PE 3 APG 400	3 - 79	NT20138	375.00
<b>I</b>	S400 PE 4 250	3 - 79	NT20138	3480.00
<b>I</b>	S400 PE 4 400	3 - 79	NT20138	3480.00
<b>I</b>	S400 PE 4 AGN 400	3 - 79	NT20138	375.00
<b>I</b>	S400 PE 4 AN +	3 - 79	NT20138	187.00
<b>I</b>	S400 PE 4 AP +	3 - 79	NT20138	187.00
<b>I</b>	S400 PE 4 APN +	3 - 79	NT20138	375.00
	S630 CE 3 630	3 - 87	NT20138	2920.00
	S630 CE 4 630	3 - 87	NT20138	3880.00
	S630 GE 3 630	3 - 90	NT20138	3130.00
	S630 GE 3 630PM	3 - 146	NT20138	3600.00
	S630 GE 3 630 X1L	3 - 91	NT20138	5500.00
	S630 GE 3 630 X1S	3 - 91	NT20138	7340.00
	S630 GE 3 AG 630	3 - 90	NT20138	3330.00
<b>I</b>	S630 GE 3 AP 630	3 - 90	NT20138	3330.00
<b>I</b>	S630 GE 3 APG 630	3 - 90	NT20138	3530.00
	S630 GE 4 630	3 - 90	NT20138	4180.00
<b>I</b>	S630 GE 4 630 X1L	3 - 91	NT20138	6600.00
<b>I</b>	S630 GE 4 630 X1S	3 - 91	NT20138	8800.00
	S630 GE 4 AGN 630	3 - 90	NT20138	4570.00
<b>I</b>	S630 GE 4 AN 630	3 - 90	NT20138	4370.00
<b>I</b>	S630 GE 4 AP 630	3 - 90	NT20138	4370.00
<b>I</b>	S630 GE 4 APN 630	3 - 90	NT20138	4570.00
	S630NN3	3 - 142	NT20138	2490.00
	S630NN4	3 - 142	NT20138	3320.00
	S800 CJ 3 630	3 - 103	NT20138	2500.00
	S800 CJ 3 800	3 - 103	NT20138	2550.00
<b>I</b>	S800ND4	3 - 143	NT20138	POA
	S800 NE 3 630	3 - 106	NT20138	3250.00
	S800 NE 3 800	3 - 106	NT20138	3990.00
	S800 NE 4 630	3 - 106	NT20138	3740.00
	S800 NE 4 800	3 - 106	NT20138	4560.00
	S800 NJ 3 630	3 - 104	NT20138	2900.00
	S800 NJ 3 800	3 - 104	NT20138	3150.00
	S800NN3	3 - 142	NT20138	3150.00
	S800NN4	3 - 142	NT20138	3990.00
	S800 RE 3 630	3 - 107	NT20138	3150.00
	S800 RE 3 800	3 - 107	NT20138	4200.00
	S800 RE 3 800 X1L	3 - 108	NT20138	6450.00
	S800 RE 3 800 X1S	3 - 108	NT20138	7900.00

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
I	S800 RE 3 AG #	3 - 107	NT20138	180.00
I	S800 RE 3 AP #	3 - 107	NT20138	180.00
I	S800 RE 3 APG #	3 - 107	NT20138	360.00
	S800 RE 4 630	3 - 107	NT20138	3810.00
	S800 RE 4 800	3 - 107	NT20138	4850.00
I	S800 RE 4 800 X1L	3 - 108	NT20138	7740.00
I	S800 RE 4 800 X1S	3 - 108	NT20138	9480.00
I	S800 RE 4 AGN #	3 - 107	NT20138	360.00
I	S800 RE 4 AN #	3 - 107	NT20138	180.00
I	S800 RE 4 AP #	3 - 107	NT20138	180.00
I	S800 RE 4 APN #	3 - 107	NT20138	360.00
	S800 RJ 3 630	3 - 105	NT20138	3910.00
	S800 RJ 3 800	3 - 105	NT20138	4500.00
	S800 RJ 4 630	3 - 105	NT20138	4350.00
	S800 RJ 4 800	3 - 105	NT20138	4950.00
	SAFET6106	1 - 7	NT10136	61.50
I	SAFET6106SHT	1 - 8	NT10136	190.00
	SAFET6110	1 - 7	NT10136	61.50
	SAFET61100	1 - 7	NT10136	138.00
	SAFET61100NA	1 - 7	NT10136	103.00
I	SAFET61100NASHT	1 - 8	NT10136	225.00
I	SAFET61100SHT	1 - 8	NT10136	270.00
I	SAFET6110SHT	1 - 8	NT10136	190.00
	SAFET6116	1 - 7	NT10136	61.50
	SAFET6116SHT	1 - 8	NT10136	190.00
	SAFET6120	1 - 7	NT10136	61.50
	SAFET6120SHT	1 - 8	NT10136	190.00
	SAFET6125	1 - 7	NT10136	61.50
	SAFET6125SHT	1 - 8	NT10136	190.00
	SAFET6132	1 - 7	NT10136	61.50
	SAFET6132SHT	1 - 8	NT10136	190.00
	SAFET6140	1 - 7	NT10136	61.50
I	SAFET6140SHT	1 - 8	NT10136	190.00
	SAFET6150	1 - 7	NT10136	61.50
I	SAFET6150SHT	1 - 8	NT10136	190.00
	SAFET6163	1 - 7	NT10136	61.50
	SAFET6163NA	1 - 7	NT10136	65.50
I	SAFET6163NASHT	1 - 8	NT10136	184.00
I	SAFET6163SHT	1 - 8	NT10136	190.00
	SAFET6180	1 - 7	NT10136	138.00
I	SAFET6180SHT	1 - 8	NT10136	270.00
	SAFET6206	1 - 7	NT10136	190.00
I	SAFET6206SHT	1 - 8	NT10136	325.00
	SAFET6210	1 - 7	NT10136	190.00
I	SAFET62100	1 - 7	NT10136	355.00
I	SAFET62100NA	1 - 7	NT10136	220.00
I	SAFET62100NASHT	1 - 8	NT10136	350.00
I	SAFET62100SHT	1 - 8	NT10136	475.00
I	SAFET6210SHT	1 - 8	NT10136	325.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	SAFET6216	1 - 7	NT10136	190.00
<b>I</b>	SAFET6216SHT	1 - 8	NT10136	325.00
	SAFET6220	1 - 7	NT10136	190.00
<b>I</b>	SAFET6220SHT	1 - 8	NT10136	325.00
<b>I</b>	SAFET6225	1 - 7	NT10136	190.00
<b>I</b>	SAFET6225SHT	1 - 8	NT10136	325.00
	SAFET6232	1 - 7	NT10136	190.00
<b>I</b>	SAFET6232SHT	1 - 8	NT10136	325.00
	SAFET6240	1 - 7	NT10136	190.00
<b>I</b>	SAFET6240SHT	1 - 8	NT10136	325.00
	SAFET6250	1 - 7	NT10136	190.00
<b>I</b>	SAFET6250SHT	1 - 8	NT10136	325.00
	SAFET6263	1 - 7	NT10136	190.00
<b>I</b>	SAFET6263NA	1 - 7	NT10136	164.00
<b>I</b>	SAFET6263NASHT	1 - 8	NT10136	285.00
<b>I</b>	SAFET6263SHT	1 - 8	NT10136	325.00
	SAFET6280	1 - 7	NT10136	355.00
<b>I</b>	SAFET6280SHT	1 - 8	NT10136	475.00
	SAFET6306	1 - 7	NT10136	225.00
<b>I</b>	SAFET6306SHT	1 - 8	NT10136	350.00
	SAFET6310	1 - 7	NT10136	225.00
	SAFET63100	1 - 7	NT10136	405.00
	SAFET63100NA	1 - 7	NT10136	285.00
	SAFET63100NA	2 - 30	NT10136	285.00
	SAFET63100NASHT	1 - 8	NT10136	425.00
	SAFET63100SHT	1 - 8	NT10136	540.00
	SAFET6310SHT	1 - 8	NT10136	350.00
	SAFET6316	1 - 7	NT10136	225.00
	SAFET6316SHT	1 - 8	NT10136	350.00
	SAFET6320	1 - 7	NT10136	225.00
	SAFET6320SHT	1 - 8	NT10136	350.00
	SAFET6325	1 - 7	NT10136	225.00
	SAFET6325SHT	1 - 8	NT10136	350.00
	SAFET6332	1 - 7	NT10136	225.00
	SAFET6332SHT	1 - 8	NT10136	350.00
	SAFET6340	1 - 7	NT10136	225.00
	SAFET6340SHT	1 - 8	NT10136	350.00
	SAFET6350	1 - 7	NT10136	225.00
	SAFET6350SHT	1 - 8	NT10136	350.00
	SAFET6363	1 - 7	NT10136	225.00
	SAFET6363NA	1 - 7	NT10136	200.00
	SAFET6363NASHT	1 - 8	NT10136	335.00
	SAFET6363SHT	1 - 8	NT10136	350.00
	SAFET6380	1 - 7	NT10136	405.00
	SAFET6380SHT	1 - 8	NT10136	540.00
<b>I</b>	SAFET6406	1 - 7	NT10136	315.00
<b>I</b>	SAFET6406SHT	1 - 8	NT10136	440.00
<b>I</b>	SAFET6410	1 - 7	NT10136	315.00
<b>I</b>	SAFET64100	1 - 7	NT10136	495.00

	CAT. NO.	PAGE	P.S.	PRICE \$
I	SAFET64100NA	1 - 7	NT10136	440.00
I	SAFET64100NASHT	1 - 8	NT10136	560.00
I	SAFET64100SHT	1 - 8	NT10136	630.00
I	SAFET6410SHT	1 - 8	NT10136	440.00
I	SAFET6416	1 - 7	NT10136	315.00
I	SAFET6416SHT	1 - 8	NT10136	440.00
	SAFET6420	1 - 7	NT10136	315.00
I	SAFET6420SHT	1 - 8	NT10136	440.00
I	SAFET6425	1 - 7	NT10136	315.00
I	SAFET6425SHT	1 - 8	NT10136	440.00
	SAFET6432	1 - 7	NT10136	315.00
I	SAFET6432SHT	1 - 8	NT10136	440.00
I	SAFET6440	1 - 7	NT10136	315.00
I	SAFET6440SHT	1 - 8	NT10136	440.00
	SAFET6450	1 - 7	NT10136	315.00
	SAFET6450SHT	1 - 8	NT10136	440.00
	SAFET6463	1 - 7	NT10136	315.00
I	SAFET6463NA	1 - 7	NT10136	285.00
I	SAFET6463NASHT	1 - 8	NT10136	425.00
I	SAFET6463SHT	1 - 8	NT10136	440.00
	SAFET6480	1 - 7	NT10136	495.00
I	SAFET6480SHT	1 - 8	NT10136	630.00
	SAFETLCK 12	1 - 9	NT10136	159.00
	SAFETLCK 24	1 - 9	NT10136	210.00
	SAFE-TPC1	2 - 2	NT10136	18.20
	SAFE-TPC23	2 - 2	NT10136	32.50
	SAFETPF	1 - 9	NT10136	1.80
	SAFETPF	2 - 10	NT10136	1.80
	SAFETPF	2 - 31	NT10136	1.80
	SAFETPF	2 - 51	NT10136	1.80
	SPD1	5 - 28	NT30141	210.00
	SPD1	5 - 29	NT30141	210.00
	SPD3	5 - 28	NT30141	280.00
	SPD3	5 - 29	NT30141	280.00
I	SRCB 1010	1 - 10	NT10136	360.00
	SRCB 1030	1 - 10	NT10136	325.00
	SRCB 1610	1 - 10	NT10136	360.00
	SRCB 1630	1 - 10	NT10136	325.00
	SRCB 2010	1 - 10	NT10136	360.00
	SRCB 2030	1 - 10	NT10136	325.00
	SRCBHA	1 - 10	NT10136	26.40
	SRCBLCK 12	1 - 10	NT10136	275.00
	SRCBLCK 24	1 - 10	NT10136	450.00
	SRCBWA	1 - 10	NT10136	26.40
	SSW2	5 - 28	NB20052	390.00
	SSW2	5 - 29	NB20052	390.00
	SSW3	5 - 28	NB20052	405.00
	SSW3	5 - 29	NB20052	405.00
	STK250ND/TH	2 - 31	NT40143	119.00

**I** Available on indent only.**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	STK250NDTH	2 - 51	NT40143	119.00
	STK250ND/TH	2 - 68	NT40143	119.00
	STK300TH	2 - 31	NT40143	119.00
	STK300TH	2 - 51	NT40143	119.00
	STKCD	2 - 16	NT40143	119.00
	STKCD	2 - 51	NT40143	119.00
	STKCD	2 - 66	NT40143	119.00
<b>T</b>				
	T12CAPLAB	3 - 33	NZ00150	3.50
	T12CAPLAB	3 - 34	NZ00150	3.50
	T12CAPLAB	3 - 34	NZ00150	3.50
	T12CAPLAB	3 - 34	NZ00150	3.50
	T12CAPLAB	3 - 35	NZ00150	3.50
	T12CAPLAB	3 - 35	NZ00150	3.50
	T12CAPLAB	3 - 36	NZ00150	3.50
	T12CAPLAB	3 - 36	NZ00150	3.50
	T12CAPLAB	5 - 36	NZ00150	3.50
	T1HP03R6BNA4	3 - 22	NT20138	141.00
<b>A</b>	T1HP30PALK	3 - 22	NT10136	44.50
<b>A</b>	T1HP40PALK	6 - 11	NT10136	44.50
	T1HP40R6BNA4	6 - 11	NT20138	355.00
<b>A</b>	T1HP80PALK	6 - 26	NT10136	49.50
	T1HP80R6BNA4	6 - 26	NT20138	480.00
<b>A</b>	T1HPX6PALK	6 - 37	NT10136	49.50
	T1HPX6R6BNA4	6 - 37	NT20138	570.00
	T1HS03R5GM	3 - 22	NT20138	240.00
	T1HS40R5GM	6 - 11	NT20138	415.00
<b>A</b>	T1HS80R5GM	6 - 26	NT20138	490.00
<b>A</b>	T1HSX6R5GM	6 - 37	NT20138	570.00
	T25CAPLAB	3 - 60	NZ00150	3.50
	T25CAPLAB	3 - 61	NZ00150	3.50
	T25CAPLAB	3 - 61	NZ00150	3.50
	T25CAPLAB	3 - 62	NZ00150	3.50
	T25CAPLAB	3 - 63	NZ00150	3.50
	T25CAPLAB	5 - 36	NZ00150	3.50
	T2AL00B1STA	3 - 32	NT20138	146.00
	T2AL00B1STA	3 - 59	NT20138	146.00
	T2AL00B1STA	3 - 92	NT20138	146.00
	T2AL00B1STA	3 - 115	NT20138	146.00
	T2AL00B1STA	3 - 123	NT20138	146.00
	T2AL00B2STA	3 - 32	NT20138	146.00
	T2AL00B2STA	3 - 59	NT20138	146.00
	T2AL00B2STA	3 - 92	NT20138	146.00
	T2AL00B2STA	3 - 115	NT20138	146.00
	T2AL00B2STA	3 - 123	NT20138	146.00
	T2AL00M3RTA	3 - 32	NT20138	187.00
	T2AL00M3RTA	3 - 59	NT20138	187.00
	T2AL00M3RTA	3 - 92	NT20138	187.00
	T2AL00M3RTA	3 - 115	NT20138	187.00

CAT. NO.	PAGE	P.S.	PRICE \$
T2AL00M3RTA	3 - 123	NT20138	187.00
T2AL00M3STA	3 - 32	NT20138	134.00
T2AL00M3STA	3 - 59	NT20138	134.00
T2AL00M3STA	3 - 92	NT20138	134.00
T2AL00M3SWA	3 - 32	NT20138	146.00
T2AL00M3SWA	3 - 59	NT20138	146.00
T2AL00M3SWA	3 - 92	NT20138	146.00
T2AL00M4STA	3 - 115	NT20138	129.00
T2AL00M4STA	3 - 123	NT20138	129.00
T2AL00M5SWA	3 - 115	NT20138	141.00
T2AL00M5SWA	3 - 123	NT20138	141.00
T2AX00B1STA	3 - 32	NT20138	146.00
T2AX00B1STA	3 - 59	NT20138	146.00
T2AX00B1STA	3 - 92	NT20138	146.00
T2AX00B1STA	3 - 115	NT20138	146.00
T2AX00B1STA	3 - 123	NT20138	146.00
T2AX00B2STA	3 - 32	NT20138	146.00
T2AX00B2STA	3 - 59	NT20138	146.00
T2AX00B2STA	3 - 92	NT20138	146.00
T2AX00B2STA	3 - 115	NT20138	146.00
T2AX00B2STA	3 - 123	NT20138	146.00
T2AX00M3RTA	3 - 32	NT20138	187.00
T2AX00M3RTA	3 - 59	NT20138	187.00
T2AX00M3RTA	3 - 92	NT20138	187.00
T2AX00M3RTA	3 - 115	NT20138	187.00
T2AX00M3RTA	3 - 123	NT20138	187.00
T2AX00M3STA	3 - 32	NT20138	134.00
T2AX00M3STA	3 - 59	NT20138	134.00
T2AX00M3STA	3 - 92	NT20138	134.00
T2AX00M3STA	3 - 115	NT20138	134.00
T2AX00M3STA	3 - 123	NT20138	134.00
T2AX00M3SWA	3 - 32	NT20138	146.00
T2AX00M3SWA	3 - 59	NT20138	146.00
T2AX00M3SWA	3 - 92	NT20138	146.00
T2AX00M3SWA	3 - 115	NT20138	146.00
T2AX00M3SWA	3 - 123	NT20138	146.00
T2AX00M4SWA	3 - 115	NT20138	146.00
T2AX00M4SWA	3 - 123	NT20138	146.00
I T2AX00M5SWA	3 - 115	NT20138	146.00
I T2AX00M5SWA	3 - 123	NT20138	146.00
T2BA123SHA	3 - 38	NT20138	17.40
T2BA123SHA	4 - 14	NT20138	17.40
T2BA253LHA	3 - 38	NT20138	20.00
T2BA253LHA	3 - 65	NT20138	20.00
T2BA253LHA	4 - 14	NT20138	20.00
T2BA253SHA	3 - 65	NT20138	20.00
T2BA253SHA	4 - 14	NT20138	20.00
I T2BA403LHA	3 - 98	NT20138	POA
T2BA403SHA	3 - 98	NT20138	21.60

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	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	T2BA403SHA	4 - 14	NT20138	21.60
	T2BA803LHA	3 - 118	NT20138	10.00
	T2BA803SHA	3 - 118	NT20138	10.00
	T2BAX63LHA	3 - 126	NT20138	10.00
	T2CB803GHNA	3 - 118	NT20138	170.00
	T2CB804GHNA	3 - 118	NT20138	210.00
	T2CF00L	3 - 38	NT20138	9.10
	T2CF00L	3 - 65	NT20138	9.10
	T2CF00L	3 - 98	NT20138	9.10
	T2CF00L	4 - 14	NT20138	9.10
	T2CF00LA	3 - 118	NT20138	8.80
	T2CF00LA	3 - 126	NT20138	8.80
	T2CF121SLNG	3 - 37	NT20138	35.00
	T2CF121SLNG	4 - 13	NT20138	35.00
	T2CF122SLNG	3 - 37	NT20138	49.50
	T2CF123SLNG	3 - 37	NT20138	64.50
	T2CF123SLNG	4 - 13	NT20138	64.50
<b>I</b>	T2CF123SSNBA	3 - 37	NT20138	60.50
<b>I</b>	T2CF123SSNBA	4 - 13	NT20138	60.50
	T2CF124SLNG	3 - 37	NT30141	73.00
	T2CF124SLNG	4 - 13	NT30141	73.00
<b>I</b>	T2CF124SSNBA	3 - 37	NT20138	71.00
<b>I</b>	T2CF124SSNBA	4 - 13	NT20138	71.00
	T2CF161SLNG	3 - 64	NT20138	40.00
	T2CF161SLNG	4 - 13	NT20138	40.00
	T2CF253LLNG	3 - 37	NT20138	71.00
	T2CF253LLNG	3 - 64	NT20138	71.00
	T2CF253LLNG	4 - 13	NT20138	71.00
	T2CF253SLNG	3 - 64	NT20138	67.00
	T2CF253SLNG	4 - 13	NT20138	67.00
	T2CF253SSNBA	3 - 64	NT20138	67.00
	T2CF253SSNBA	4 - 13	NT20138	67.00
	T2CF254LLNG	3 - 37	NT20138	77.50
	T2CF254LLNG	3 - 64	NT20138	77.50
	T2CF254LLNG	4 - 13	NT20138	77.50
	T2CF254SLNG	3 - 64	NT20138	77.50
	T2CF254SLNG	4 - 13	NT20138	77.50
	T2CF254SSNBA	3 - 64	NT20138	77.50
	T2CF254SSNBA	4 - 13	NT20138	77.50
	T2CF403SLNG	3 - 97	NT20138	190.00
	T2CF403SLNG	4 - 13	NT20138	190.00
	T2CF403SWNG	3 - 97	NT30141	190.00
	T2CF403SWNG	4 - 13	NT30141	190.00
	T2CF404SLNG	3 - 97	NT20138	205.00
	T2CF404SWNG	3 - 97	NT20138	205.00
	T2CF803SLHGA	3 - 118	NT20138	205.00
	T2CF804SLHGA	3 - 118	NT20138	260.00
	T2CFX33SLHGA	3 - 126	NT20138	225.00
	T2CFX34SLHGA	3 - 126	NT20138	280.00

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	T2CLSBB25033	5 - 34	NT30141	550.00
<b>I</b>	T2CLSBB25043	5 - 34	NT30141	760.00
	T2CLSBB25044	5 - 34	NT30141	760.00
	T2CLSBB40033	5 - 34	NT30141	650.00
<b>I</b>	T2CLSBB40043	5 - 34	NT30141	740.00
	T2CLSBB40044	5 - 34	NT30141	880.00
	T2CLSBB63033	5 - 34	NT30141	1180.00
	T2CLSBB63043	5 - 34	NT30141	1400.00
	T2CLSBB63044	5 - 34	NT30141	1540.00
	T2CR123SG	3 - 38	NT20138	44.00
	T2CR123SG	4 - 14	NT20138	44.00
	T2CR124SG	3 - 38	NT20138	55.00
	T2CR124SG	4 - 14	NT20138	55.00
	T2CR253SG	3 - 38	NT20138	54.00
	T2CR253SG	3 - 65	NT20138	54.00
	T2CR253SG	4 - 14	NT20138	54.00
	T2CR254SG	3 - 38	NT20138	60.50
	T2CR254SG	3 - 65	NT20138	60.50
	T2CR254SG	4 - 14	NT20138	60.50
	T2CR403SG	3 - 98	NT20138	93.50
	T2CR403SG	4 - 13	NT20138	93.50
	T2CR403SG	4 - 14	NT20138	93.50
	T2CR404SG	3 - 98	NT20138	111.00
	T2CR404SG	4 - 13	NT20138	111.00
	T2CR803LHGA	3 - 118	NT20138	210.00
	T2CR803SHGA	3 - 118	NT20138	170.00
	T2CR804LHGA	3 - 118	NT20138	240.00
	T2CR804SHGA	3 - 118	NT20138	210.00
	T2CS121SG	3 - 37	NT20138	10.60
	T2CS121SG	4 - 13	NT20138	10.60
	T2CS122SG	4 - 13	NT40143	12.00
	T2CS123SG	3 - 37	NT20138	44.00
	T2CS123SG	4 - 13	NT20138	44.00
	T2CS124SG	3 - 37	NT20138	55.00
	T2CS124SG	4 - 13	NT20138	55.00
	T2CS251SG	3 - 64	NT20138	10.00
	T2CS251SG	4 - 13	NT40143	10.00
	T2CS253SG	3 - 37	NT20138	54.00
	T2CS253SG	3 - 64	NT20138	54.00
	T2CS253SG	4 - 13	NT20138	54.00
	T2CS254SG	3 - 37	NT20138	60.50
	T2CS254SG	3 - 64	NT20138	60.50
	T2CS254SG	4 - 13	NT20138	60.50
	T2DA12A	3 - 41	NT20138	63.00
<b>I</b>	T2DF25A	3 - 41	NT20138	127.00
<b>I</b>	T2DF25A	3 - 68	NT20138	127.00
<b>I</b>	T2DF40A	3 - 101	NT20138	132.00
<b>I</b>	T2DM25A	3 - 41	NT20138	215.00
<b>I</b>	T2DM25A	3 - 68	NT20138	215.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>I</b>	T2DM40A	3 - 101	NT20138	260.00
	T2FB123BA	3 - 39	NT20138	77.50
<b>I</b>	T2FB124BA	3 - 39	NT20138	103.00
<b>I</b>	T2FB251BA	3 - 39	NT20138	26.80
<b>I</b>	T2FB251BA	3 - 39	NT20138	26.80
<b>I</b>	T2FB251BA	3 - 66	NT20138	26.80
	T2FB253BA	3 - 39	NT20138	77.50
	T2FB253BA	3 - 66	NT20138	77.50
	T2FB254BA	3 - 39	NT20138	103.00
	T2FB254BA	3 - 66	NT20138	103.00
	T2FB463BA	3 - 99	NT20138	240.00
	T2FB464BA	3 - 99	NT20138	305.00
<b>I</b>	T2FP12S3B	3 - 41	NT20138	82.50
	T2FP12S4A	3 - 41	NT20138	POA
<b>I</b>	T2FP25S3B	3 - 68	NT20138	82.50
<b>I</b>	T2FP25S4A	3 - 68	NT20138	POA
<b>I</b>	T2FP40S3A	3 - 101	NT20138	280.00
<b>I</b>	T2FP40S4A	3 - 101	NT20138	POA
	T2FW12S3A	3 - 39	NT20138	107.00
<b>I</b>	T2FW12S4A	3 - 39	NT20138	141.00
	T2FW25L3B	3 - 39	NT20138	173.00
	T2FW25L3B	3 - 66	NT20138	173.00
<b>I</b>	T2FW25L4B	3 - 39	NT20138	240.00
<b>I</b>	T2FW25L4B	3 - 66	NT20138	240.00
	T2FW40L3A	3 - 99	NT20138	415.00
	T2FW40L3A	3 - 119	NT20138	415.00
<b>I</b>	T2FW40L4A	3 - 99	NT20138	560.00
<b>I</b>	T2FW40L4A	3 - 119	NT20138	560.00
	T2GB40N04A	3 - 100	NT20138	290.00
	T2GB40N06A	3 - 100	NT20138	440.00
	T2GBX6N12A	3 - 116	NT20138	430.00
	T2GBX6N12A	3 - 126	NT20138	430.00
	T2GBX6N16A	3 - 116	NT20138	430.00
	T2GBX6N16A	3 - 126	NT20138	430.00
	T2HB12UR5BN	3 - 34	NT20138	175.00
	T2HB12UR5RN	3 - 34	NT20138	199.00
	T2HB25UR5BN	3 - 34	NT20138	189.00
	T2HB25UR5BN	3 - 61	NT20138	189.00
	T2HB25UR5RN	3 - 34	NT20138	210.00
	T2HB25UR5RN	3 - 61	NT20138	210.00
	T2HB40UR5BN	3 - 94	NT20138	240.00
	T2HB40UR5RN	3 - 94	NT20138	265.00
	T2HB80UR5BN	3 - 116	NT20138	495.00
	T2HB80UR5RN	3 - 116	NT20138	495.00
	T2HBX6UR5BN	3 - 124	NT20138	560.00
	T2HBX6UR5RN	3 - 124	NT20138	560.00
<b>A</b>	T2HL12CAP	3 - 38	NT20138	33.50
	T2HL25B	3 - 38	NT20138	31.50
	T2HL25B	3 - 65	NT20138	31.50

CAT. NO.	PAGE	P.S.	PRICE \$
<b>A</b> T2HL25CAP	3 - 38	NT20138	33.50
<b>A</b> T2HL25CAP	3 - 65	NT20138	33.50
T2HL40A	3 - 99	NT20138	73.00
T2HL40A	3 - 119	NT20138	73.00
<b>A</b> T2HL40CAP	3 - 99	NT20138	73.00
T2HL80CAP	3 - 119	NT20138	125.00
<b>A</b> T2HLS125NFCAP	3 - 38	NT30141	92.00
<b>A</b> T2HLS160NFCAP	3 - 65	NT30141	92.00
T2HLX6A	3 - 127	NT20138	77.00
T2HLX6CAP	3 - 127	NT20138	165.00
T2HP12R6BN	3 - 34	NT20138	290.00
T2HP12R6RN	3 - 34	NT20138	300.00
<b>A</b> T2HP25PALK	3 - 34	NT30141	49.50
<b>A</b> T2HP25PALK	3 - 34	NT30141	49.50
<b>A</b> T2HP25PALK	3 - 61	NT30141	49.50
T2HP25R6BN	3 - 34	NT20138	290.00
T2HP25R6BN	3 - 61	NT20138	290.00
T2HP25R6RN	3 - 34	NT20138	300.00
T2HP25R6RN	3 - 61	NT20138	300.00
<b>A</b> T2HP40PALK	3 - 94	NT30141	49.50
T2HP40R6BN	3 - 94	NT20138	315.00
T2HP40R6RN	3 - 94	NT20138	330.00
T2HP80PALK	3 - 116	NT20138	47.50
T2HP80R6BN	3 - 116	NT20138	470.00
T2HP80R6ME	3 - 116	NT20138	690.00
T2HP80R6RN	3 - 116	NT20138	470.00
T2HPX6PALK	3 - 124	NT20138	85.00
T2HPX6R6BN	3 - 124	NT20138	550.00
T2HPX6R6ME	3 - 124	NT20138	830.00
T2HPX6R6RN	3 - 124	NT20138	550.00
<b>A</b> T2HS12R5GM	3 - 34	NT20138	280.00
T2HS12R5RM	3 - 34	NT20138	290.00
T2HS250SHAFT	3 - 22	NT20138	47.00
T2HS250SHAFT	3 - 34	NT20138	47.00
T2HS250SHAFT	3 - 34	NT20138	47.00
T2HS250SHAFT	3 - 61	NT20138	47.00
<b>A</b> T2HS25R5GM	3 - 34	NT20138	280.00
<b>A</b> T2HS25R5GM	3 - 61	NT20138	280.00
<b>A</b> T2HS25R5RM	3 - 34	NT20138	290.00
<b>A</b> T2HS25R5RM	3 - 61	NT20138	290.00
T2HS400SHAFT	3 - 94	NT20138	47.00
T2HS400SHAFT	3 - 116	NT20138	47.00
T2HS400SHAFT	3 - 124	NT20138	47.00
T2HS400SHAFT	6 - 11	NT20138	47.00
T2HS400SHAFT	6 - 26	NT20138	47.00
T2HS400SHAFT	6 - 37	NT20138	47.00
<b>A</b> T2HS40R5GM	3 - 94	NT20138	370.00
<b>A</b> T2HS40R5RM	3 - 94	NT20138	315.00
T2HS80R6GM	3 - 116	NT20138	470.00

**I** Available on indent only.**A** Assembled to order.

CAT. NO.	PAGE	P.S.	PRICE \$
T2HS80R6RM	3 - 116	NT20138	470.00
T2HSESC100	3 - 22	NZ00150	18.20
T2HSESC100	3 - 34	NZ00150	18.20
T2HSESC100	3 - 34	NZ00150	18.20
T2HSESC100	3 - 61	NZ00150	18.20
T2HSESC100	3 - 94	NZ00150	18.20
T2HSESC100	3 - 116	NZ00150	18.20
T2HSESC100	3 - 124	NZ00150	18.20
T2HSESC100	6 - 11	NZ00150	18.20
T2HSESC100	6 - 26	NZ00150	18.20
T2HSESC100	6 - 37	NZ00150	18.20
T2HSX6R6GM	3 - 124	NT20138	550.00
T2HSX6R6RM	3 - 124	NT20138	550.00
T2MBX33P	3 - 125	NT20138	850.00
T2MBX34P	3 - 125	NT20138	1130.00
T2MBX63P	3 - 125	NT20138	850.00
T2MBX64P	3 - 125	NT20138	1130.00
T2MC12A10NB	3 - 33	NT20138	1200.00
T2MC12A24NB	3 - 33	NT20138	1200.00
T2MC12D02NB	3 - 33	NT20138	1200.00
<b>I</b> T2MC12D04NB	3 - 33	NT20138	1150.00
T2MC12D10NB	3 - 33	NT20138	1200.00
<b>I</b> T2MC25A10NB	3 - 33	NT20138	1620.00
<b>I</b> T2MC25A10NB	3 - 60	NT20138	1620.00
T2MC25A24NB	3 - 33	NT20138	1630.00
T2MC25A24NB	3 - 60	NT20138	1630.00
T2MC25D02NB	3 - 33	NT20138	1630.00
T2MC25D02NB	3 - 60	NT20138	1630.00
<b>I</b> T2MC25D04NB	3 - 33	NT20138	1620.00
<b>I</b> T2MC25D04NB	3 - 60	NT20138	1620.00
<b>I</b> T2MC25D10NB	3 - 33	NT20138	1620.00
<b>I</b> T2MC25D10NB	3 - 60	NT20138	1620.00
T2MC40A10NB	3 - 93	NT20138	2420.00
T2MC40D02NB	3 - 93	NT20138	2420.00
<b>I</b> T2MC40D10NB	3 - 93	NT20138	2420.00
T2MC80A10NA	3 - 119	NT20138	2570.00
T2MC80D10NA	3 - 119	NT20138	2570.00
T2MCX6A10NA	3 - 127	NT20138	3150.00
T2MCX6A24NA	3 - 127	NT20138	3150.00
T2MCX6D02NA	3 - 127	NT20138	3150.00
T2ML12L3A	3 - 35	NT20138	127.00
T2ML12L4A	3 - 35	NT20138	127.00
T2ML12RA	3 - 35	NT20138	113.00
T2ML25L3A	3 - 35	NT20138	127.00
T2ML25L3A	3 - 62	NT20138	127.00
T2ML25L4A	3 - 35	NT20138	127.00
T2ML25L4A	3 - 62	NT20138	127.00
T2ML25RA	3 - 35	NT20138	113.00
T2ML25RA	3 - 62	NT20138	113.00

CAT. NO.	PAGE	P.S.	PRICE \$
T2ML40L3B	3 - 95	NT20138	133.00
T2ML40L4B	3 - 95	NT20138	133.00
T2ML40RB	3 - 95	NT20138	350.00
T2ML80L3A	3 - 117	NT20138	140.00
T2ML80L4A	3 - 117	NT20138	140.00
T2ML80RA	3 - 117	NT20138	365.00
<b>I A</b> T2MLH40L3B	3 - 95	NT20138	133.00
<b>I A</b> T2MLH40L4B	3 - 95	NT20138	133.00
<b>I A</b> T2MLH40RB	3 - 95	NT20138	350.00
T2MM25L05A	3 - 33	NT20138	60.50
T2MM25L05A	3 - 60	NT20138	60.50
T2MM25L15A	3 - 33	NT20138	73.00
T2MM25L15A	3 - 60	NT20138	73.00
T2MM40L06A	3 - 93	NT20138	60.50
T2MM40L06A	3 - 119	NT20138	60.50
T2MM40L21A	3 - 93	NT20138	80.00
T2MM40L21A	3 - 119	NT20138	80.00
T2MM40S06A	3 - 119	NT20138	58.50
T2MM40S21A	3 - 119	NT20138	70.50
<b>I</b> T2MS123SFA	3 - 36	NT20138	120.00
<b>I</b> T2MS124SFA	3 - 36	NT20138	134.00
T2MS253LFA	3 - 36	NT20138	120.00
T2MS253LFA	3 - 63	NT20138	120.00
<b>I</b> T2MS253SFA	3 - 63	NT20138	120.00
T2MS254LFA	3 - 36	NT20138	134.00
T2MS254LFA	3 - 63	NT20138	134.00
<b>I</b> T2MS254SFA	3 - 63	NT20138	134.00
<b>I</b> T2MS403SFA	3 - 96	NT20138	220.00
<b>I</b> T2MS404SFA	3 - 96	NT20138	210.00
T2MS803LFA	3 - 117	NT20138	260.00
T2MS803SFA	3 - 117	NT20138	240.00
T2MS804LFA	3 - 117	NT20138	280.00
T2MS804SFA	3 - 117	NT20138	260.00
T2MSX63SFA	3 - 125	NT20138	360.00
T2MSX64SFA	3 - 125	NT20138	450.00
T2MW00L	3 - 125	NT20138	70.50
T2MW00LA	3 - 36	NT20138	73.00
T2MW00LA	3 - 63	NT20138	73.00
T2MW00LA	3 - 96	NT20138	73.00
T2MW00LA	3 - 117	NT20138	73.00
T2MW00S	3 - 125	NT20138	60.50
T2MW00SA	3 - 36	NT20138	63.00
T2MW00SA	3 - 63	NT20138	63.00
T2MW00SA	3 - 96	NT20138	63.00
T2MW00SA	3 - 117	NT20138	63.00
T2MW12CA	3 - 36	NT20138	265.00
T2MW25CA	3 - 36	NT20138	275.00
T2MW25CA	3 - 63	NT20138	275.00
T2MW40CB	3 - 96	NT20138	330.00

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**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	T2MW80CA	3 - 117	NT20138	335.00
<b>I A</b>	T2MWH40CB	3 - 96	NT20138	330.00
	T2MWX6CA	3 - 125	NT20138	445.00
	T2PF123BA	3 - 147	NT40143	34.00
<b>I</b>	T2PF124BA	3 - 147	NT20138	46.00
	T2PF253BA	3 - 147	NT20138	71.00
	T2PF254BA	3 - 147	NT20138	94.00
	T2PF403BA	3 - 147	NT20138	215.00
	T2PF404BA	3 - 147	NT20138	280.00
	T2PF803HA	3 - 120	NT20138	235.00
	T2PF804HA	3 - 120	NT20138	290.00
	T2PM12A3A	3 - 146	NT20138	159.00
<b>I</b>	T2PM12A4A	3 - 146	NT20138	200.00
	T2PM25A3A	3 - 146	NT20138	178.00
<b>I</b>	T2PM25A4A	3 - 146	NT20138	235.00
	T2PM40A3A	3 - 146	NT20138	380.00
<b>I</b>	T2PM40A4A	3 - 146	NT20138	510.00
	T2PM80A3A	3 - 120	NT20138	485.00
	T2PM80A4A	3 - 120	NT20138	640.00
	T2RP123SA	3 - 40	NT20138	200.00
	T2RP124SA	3 - 40	NT20138	270.00
	T2RP253LA	3 - 40	NT20138	390.00
	T2RP253LA	3 - 67	NT20138	390.00
	T2RP253SB	3 - 67	NT20138	375.00
	T2RP254LA	3 - 40	NT20138	540.00
	T2RP254LA	3 - 67	NT20138	540.00
	T2RP254SB	3 - 67	NT20138	480.00
<b>I</b>	T2RP403LA	3 - 100	NT20138	670.00
	T2RP403SA	3 - 100	NT20138	650.00
<b>I</b>	T2RP404LA	3 - 100	NT20138	940.00
	T2RP404SA	3 - 100	NT20138	870.00
	T2RP463SA	3 - 100	NT20138	740.00
	T2RP464SA	3 - 100	NT20138	980.00
	T2RP803HA	3 - 119	NT20138	1150.00
	T2RP803MA	3 - 119	NT20138	780.00
	T2RP803NA	3 - 119	NT20138	780.00
	T2RP804HA	3 - 119	NT20138	1440.00
	T2RP804MA	3 - 119	NT20138	840.00
	T2RP804NA	3 - 119	NT20138	840.00
	T2RPX03HA	3 - 119	NT20138	1420.00
	T2RPX04HA	3 - 119	NT20138	1830.00
	T2RPX335B	3 - 127	NT20138	1350.00
	T2RPX345B	3 - 127	NT20138	1940.00
	T2RPX635B	3 - 127	NT20138	1730.00
	T2RPX645B	3 - 127	NT20138	2250.00
	T2SF25NEA	3 - 67	NT20138	26.80
	T2SF25NTA	3 - 40	NT20138	26.80
	T2SF25NTA	3 - 67	NT20138	26.80
	T2SH00A10TA	3 - 32	NT20138	255.00

CAT. NO.	PAGE	P.S.	PRICE \$
T2SH00A10TA	3 - 59	NT20138	255.00
T2SH00A10TA	3 - 92	NT20138	255.00
T2SH00A10TA	3 - 115	NT20138	255.00
T2SH00A10TA	3 - 123	NT20138	255.00
T2SH00A20TA	3 - 32	NT20138	255.00
T2SH00A20TA	3 - 59	NT20138	255.00
T2SH00A20TA	3 - 92	NT20138	255.00
T2SH00A20TA	3 - 115	NT20138	255.00
T2SH00A20TA	3 - 123	NT20138	255.00
T2SH00A40TA	3 - 32	NT20138	255.00
T2SH00A40TA	3 - 59	NT20138	255.00
T2SH00A40TA	3 - 92	NT20138	255.00
T2SH00A40TA	3 - 115	NT20138	255.00
T2SH00A40TA	3 - 123	NT20138	255.00
I T2SH00D01TA	3 - 115	NT20138	255.00
I T2SH00D01TA	3 - 123	NT20138	255.00
T2SH00D02TA	3 - 32	NT20138	255.00
T2SH00D02TA	3 - 59	NT20138	255.00
T2SH00D02TA	3 - 92	NT20138	255.00
T2SH00D02TA	3 - 115	NT20138	255.00
T2SH00D02TA	3 - 123	NT20138	255.00
T2SH00D04TA	3 - 32	NT20138	255.00
T2SH00D04TA	3 - 59	NT20138	255.00
T2SH00D04TA	3 - 92	NT20138	255.00
T2SH00D04TA	3 - 115	NT20138	255.00
T2SH00D04TA	3 - 123	NT20138	255.00
T2SH00D10TA	3 - 32	NT20138	255.00
T2SH00D10TA	3 - 59	NT20138	255.00
T2SH00D10TA	3 - 92	NT20138	255.00
T2SH00D10TA	3 - 115	NT20138	255.00
T2SH00D10TA	3 - 123	NT20138	255.00
T2SH00D20TA	3 - 32	NT20138	255.00
T2SH00D20TA	3 - 59	NT20138	255.00
T2SH00D20TA	3 - 92	NT20138	255.00
T2SH00D20TA	3 - 115	NT20138	255.00
T2SH00D20TA	3 - 123	NT20138	255.00
T2SH16A10WA	3 - 59	NT20138	255.00
T2SH16A20WA	3 - 59	NT20138	255.00
T2SH16D02WA	3 - 59	NT20138	255.00
T2SH16D10WA	3 - 59	NT20138	250.00
T2SH16D20WA	3 - 59	NT20138	250.00
A T2SW3P1251255K	3 - 20	NT20138	900.00
A T2SW3P125TC	3 - 20	NT20138	55.00
A T2SW3P2501505K	3 - 20	NT20138	940.00
A T2SW3P2502505K	3 - 20	NT20138	940.00
A T2SW3P250TC	3 - 20	NT20138	110.00
A T2SW3P250TC	3 - 20	NT20138	110.00
A T2SW3P6304005K	3 - 20	NT20138	1230.00
A T2SW3P6306005K	3 - 20	NT20138	1230.00

# 044 Lytton Road East Brisbane SPS - Electrical Installation OM Mar

**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
<b>A</b>	T2SW3P630TC	3 - 20	NT20138	110.00
<b>A</b>	T2SW3P630TC	3 - 20	NT20138	110.00
<b>I A</b>	T2SW4P1251255K	3 - 20	NT20138	1190.00
<b>I A</b>	T2SW4P125TC	3 - 20	NT20138	66.50
<b>I A</b>	T2SW4P2501505K	3 - 20	NT20138	1230.00
<b>I A</b>	T2SW4P2502505K	3 - 20	NT20138	1230.00
<b>I A</b>	T2SW4P250TC	3 - 20	NT20138	148.00
<b>I A</b>	T2SW4P250TC	3 - 20	NT20138	148.00
<b>I A</b>	T2SW4P6304005K	3 - 20	NT20138	1630.00
<b>I A</b>	T2SW4P6306005K	3 - 20	NT20138	1630.00
<b>I A</b>	T2SW4P630TC	3 - 20	NT20138	160.00
<b>I A</b>	T2SW4P630TC	3 - 20	NT20138	160.00
<b>I</b>	T2TF25LGA	3 - 41	NT20138	189.00
<b>I</b>	T2TF25LGA	3 - 68	NT20138	189.00
<b>I</b>	T2TF25RGA	3 - 41	NT20138	189.00
<b>I</b>	T2TF25RGA	3 - 68	NT20138	189.00
<b>I</b>	T2TF40LGA	3 - 101	NT20138	189.00
<b>I</b>	T2TF40LGA	3 - 119	NT20138	189.00
<b>I</b>	T2TF40RGA	3 - 101	NT20138	189.00
<b>I</b>	T2TF40RGA	3 - 119	NT20138	189.00
	T2TP003A	3 - 120	NT20138	37.00
	T2TP003A	3 - 146	NT20138	37.00
	T2UPX31000	3 - 120	NT20138	950.00
	T2UPX3125	3 - 40	NT20138	305.00
	T2UPX3250	3 - 67	NT20138	330.00
	T2UPX3400	3 - 100	NT20138	405.00
	T2UPX3630	3 - 100	NT20138	770.00
	T2UPX3800	3 - 120	NT20138	690.00
	T2UPXE3250	3 - 40	NT20138	350.00
	T2UPXE3250	3 - 67	NT20138	350.00
	T2UV00A10NTA	3 - 32	NT20138	270.00
	T2UV00A10NTA	3 - 59	NT20138	270.00
	T2UV00A10NTA	3 - 92	NT20138	270.00
	T2UV80A10NTA	3 - 115	NT20138	270.00
	T2UV80A10NTA	3 - 123	NT20138	270.00
	T2UV00A20NTA	3 - 32	NT20138	270.00
	T2UV00A20NTA	3 - 59	NT20138	270.00
	T2UV00A20NTA	3 - 92	NT20138	270.00
	T2UV80A20NTA	3 - 115	NT20138	270.00
	T2UV80A20NTA	3 - 123	NT20138	270.00
	T2UV00A40NTA	3 - 32	NT20138	270.00
	T2UV00A40NTA	3 - 59	NT20138	270.00
	T2UV00A40NTA	3 - 92	NT20138	270.00
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	T2UV80A40NTA	3 - 123	NT20138	270.00
	T2UV00D02NTA	3 - 32	NT20138	270.00
	T2UV00D02NTA	3 - 59	NT20138	270.00
	T2UV00D02NTA	3 - 92	NT20138	270.00
	T2UV80D02NTA	3 - 115	NT20138	270.00

CAT. NO.	PAGE	P.S.	PRICE \$
T2UV80D02NTA	3 - 123	NT20138	270.00
T2UV00D10NTA	3 - 32	NT20138	270.00
T2UV00D10NTA	3 - 59	NT20138	270.00
T2UV00D10NTA	3 - 92	NT20138	270.00
T2UV80D10NTA	3 - 115	NT20138	270.00
T2UV80D10NTA	3 - 123	NT20138	270.00
I T2UV00D20NTA	3 - 32	NT20138	270.00
I T2UV00D20NTA	3 - 59	NT20138	270.00
I T2UV00D20NTA	3 - 92	NT20138	270.00
I T2UV80D20NTA	3 - 115	NT20138	270.00
I T2UV80D20NTA	3 - 123	NT20138	270.00
T40CAPLAB	3 - 93	NZ00150	3.50
T40CAPLAB	3 - 94	NZ00150	3.50
T40CAPLAB	3 - 94	NZ00150	3.50
T40CAPLAB	3 - 95	NZ00150	3.50
T40CAPLAB	3 - 95	NZ00150	3.50
T40CAPLAB	3 - 96	NZ00150	3.50
T40CAPLAB	5 - 36	NZ00150	3.50
T80CAPLAB	3 - 116	NT20138	3.50
TAA5LY	1 - 9	NT10136	3.30
TAL111	1 - 68	NB30088	105.00
TAL111MINI	1 - 68	NB30088	102.00
TAL171	1 - 68	NB30088	148.00
TAL211	1 - 68	NB30088	200.00
TAL211MINI	1 - 68	NB30088	151.00
TAL271	1 - 68	NB30088	215.00
TAL371MP240VAC	1 - 68	NB30088	145.00
TAL371PRO	1 - 68	NB30088	210.00
TAL372PRO	1 - 68	NB30088	330.00
TAL471PRO	1 - 68	NB30088	270.00
TAL472PRO	1 - 68	NB30088	390.00
TAL791PRO	1 - 68	NB30088	430.00
TAL892PLUSTOP	1 - 68	NB30088	760.00
TAL892PLUSTOP	1 - 68	NB30088	760.00
TALCEPLUSTOP	1 - 68	NB30088	365.00
I TDAA2	8 - 14	NT30141	1000.00
I TDAB2	8 - 14	NT30141	1310.00
TDAC2	8 - 14	NT30141	2130.00
TDB50SG12	1 - 9	NT10136	20.20
I TDGA2	8 - 14	NT30141	225.00
TDGB2	8 - 14	NT30141	300.00
TDGC2	8 - 14	NT30141	375.00
TDGD2	8 - 14	NT30141	570.00
TDGE2	8 - 14	NT30141	790.00
TDGF2	8 - 14	NT30141	950.00
TDGH2	8 - 14	NT30141	325.00
TEMRELAY	7 - 32	NT40143	POA
TEMVISIONMAX	7 - 32	NT40143	POA
I A TEMVISIONPRO	7 - 32	NT40143	POA

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**I** Available on indent only.

**A** Assembled to order.

CAT. NO.	PAGE	P.S.	PRICE \$
TFH 22D	6 - 8	NT20138	335.00
TFJ21PB	3 - 22	NT20138	235.00
TFJ22LU	6 - 8	NT20138	355.00
TFJ34XU	6 - 11	NT20138	415.00
TFJ36XU	6 - 26	NT20138	510.00
TFJ38XU	6 - 37	NT20138	610.00
TGPEN181S	2 - 56	NT40143	55.00
TGPEN182S	2 - 56	NT40143	57.00
TGPEN182SEVE	2 - 56	NT40143	62.50
TGPEN182SODD	2 - 56	NT40143	62.50
TGPEN241S	2 - 56	NT40143	65.50
TGPEN242S	2 - 56	NT40143	67.50
TGPEN242SEVE	2 - 56	NT40143	72.50
TGPEN242SODD	2 - 56	NT40143	72.50
TGPEN302S	2 - 56	NT40143	83.00
TGPEN302SEVE	2 - 56	NT40143	88.00
TGPEN302SODD	2 - 56	NT40143	88.00
TGPEN362S	2 - 56	NT40143	93.50
TGPEN362SEVE	2 - 56	NT40143	104.00
TGPEN362SODD	2 - 56	NT40143	104.00
TGPEN422S	2 - 56	NT40143	93.50
TGPEN422SEVE	2 - 56	NT40143	114.00
TGPEN422SODD	2 - 56	NT40143	114.00
TGPEN482S	2 - 56	NT40143	98.50
TGPEN482SEVE	2 - 56	NT40143	125.00
TGPEN482SODD	2 - 56	NT40143	125.00
TGPEN602S	2 - 56	NT40143	135.00
TGPEN722S	2 - 56	NT40143	161.00
TGPEN842S	2 - 56	NT40143	197.00
TGPEN92SEVE	2 - 56	NT40143	41.50
TGPEN92SODD	2 - 56	NT40143	41.50
TGPEN962S	2 - 56	NT40143	235.00
TGPINS	2 - 57	NT40143	8.90
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TH250TOPC	2 - 51	NT10136	0.60
TH250TOPC	2 - 68	NT10136	0.60
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TKC50SG	1 - 9	NT10136	21.20
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TKNHP0A	3 - 39	NB20071	520.00
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TKNHP0A	6 - 37	NB20071	520.00
TKNHP0B	2 - 22	NB20071	520.00
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TKNHP0B	3 - 66	NB20071	520.00
TKNHP0B	3 - 99	NB20071	520.00
TKNHP0B	6 - 27	NB20071	520.00

CAT. NO.	PAGE	P.S.	PRICE \$
TKNHPOB	6 - 37	NB20071	520.00
TKNHPOC	2 - 22	NB20071	520.00
TKNHPOC	3 - 39	NB20071	520.00
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TKNHPOJ	3 - 39	NB20071	520.00
TKNHPOJ	3 - 66	NB20071	520.00
TKNHPOJ	3 - 99	NB20071	520.00
TKNHPOJ	6 - 27	NB20071	520.00
TKNHPOJ	6 - 37	NB20071	520.00

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**A** Assembled to order.

CAT. NO.	PAGE	P.S.	PRICE \$
TKNHPOK	2 - 22	NB20071	520.00
TKNHPOK	3 - 39	NB20071	520.00
TKNHPOK	3 - 66	NB20071	520.00
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TKNHPOS	6 - 27	NB20071	520.00
TKNHPOS	6 - 37	NB20071	520.00
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CAT. NO.	PAGE	P.S.	PRICE \$
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TKNHPKEY0G	2 - 22	NB20071	130.00
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**A** Assembled to order.

CAT. NO.	PAGE	P.S.	PRICE \$
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TKNHPKEY0O	2 - 22	NB20071	130.00
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TKNHPKEY0O	3 - 66	NB20071	130.00

CAT. NO.	PAGE	P.S.	PRICE \$
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TKNHPKEY0T	3 - 39	NB20071	130.00
TKNHPKEY0T	3 - 66	NB20071	130.00
TKNHPKEY0T	3 - 99	NB20071	130.00
TKNHPKEY0T	6 - 27	NB20071	130.00
TKNHPKEY0T	6 - 37	NB20071	130.00
<b>A</b> TL100EM 100 3K	6 - 7	NT20138	2330.00
<b>A</b> TL100EM 15 3K	6 - 7	NT20138	2330.00
<b>A</b> TL100EM 20 3K	6 - 7	NT20138	2330.00
<b>A</b> TL100EM 30 3K	6 - 7	NT20138	2330.00
<b>A</b> TL100EM 40 3K	6 - 7	NT20138	2330.00
<b>A</b> TL100EM 50 3K	6 - 7	NT20138	2330.00
<b>A</b> TL100EM 60 3K	6 - 7	NT20138	2330.00
<b>A</b> TL100EM 75 3K	6 - 7	NT20138	2330.00
TL100EMR5GM	6 - 8	NT20138	390.00
<b>A</b> TL100EMR6BN	6 - 8	NT20138	280.00
TL101240V	5 - 31	NT30141	1900.00
<b>A</b> TL101CIP	5 - 31	NT30141	2990.00
<b>I</b> TL1250NE 1000 3 FC	6 - 34	NT20138	11690.00
<b>I</b> TL1250NE 1000 3 LG	6 - 34	NT30141	12420.00
<b>I</b> TL1250NE 1250 3 FC	6 - 34	NT20138	13080.00
<b>I</b> TL1250NE 1250 3 LG	6 - 34	NT30141	13810.00

# 044 Lytton Road East Brisbane SPS - Electrical Installation OM Mar

**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	TL630NE3LSIG	6 - 32	NT20138	5010.00
<b>I</b>	TL630NE 630 3	6 - 32	NT20138	4280.00
	TL800NE3LSIG	6 - 33	NT20138	9580.00
<b>I</b>	TL800NE 800 3	6 - 33	NT20138	8850.00
	TLC12S	2 - 10	NT40143	164.00
	TLC18S	2 - 10	NT40143	205.00
	TLC6S	2 - 10	NT40143	126.00
	TLCDMA	2 - 10	NT40143	33.00
<b>A</b>	TLP1	5 - 29	NT30141	2250.00
<b>A</b>	TLP2	5 - 28	NT30141	2250.00
<b>I A</b>	TLP2L1CABLE10	5 - 32	NT30141	125.00
<b>I A</b>	TLP2L1CABLE15	5 - 32	NT30141	140.00
<b>I A</b>	TLP2L1CABLE20	5 - 32	NT30141	156.00
<b>I A</b>	TLP2L1CABLE25	5 - 32	NT30141	176.00
<b>I A</b>	TLP2L1CABLE30	5 - 32	NT30141	197.00
<b>A</b>	TLP2L1LCABLE	5 - 31	NT30141	114.00
<b>A</b>	TLP2L1LCABLE	5 - 32	NT30141	114.00
<b>I</b>	TNS2	3 - 67	NT20138	6590.00
<b>I</b>	TNS2110V	3 - 100	NT20138	POA
<b>I</b>	TNS2240V	3 - 100	NT20138	POA
	TPD OSZ	8 - 2	NT20138	102.00
	TX6CAPLAB	3 - 124	NT20138	3.50
<b>I</b>	TXBD0009A	3 - 22	NT20138	36.50
	TXJD0050B	3 - 66	NT20138	75.50
<b>I</b>	TXLD0005A	6 - 26	NT20138	385.00
<b>I</b>	TXLD0006A	6 - 26	NT20138	495.00
	TXLD0012A	6 - 27	NT20138	340.00
<b>I</b>	TXLD0013A	6 - 27	NT20138	425.00
<b>I</b>	TXLD0016A	6 - 27	NT20138	26.80
<b>I</b>	TXLD0016A	6 - 27	NT20138	26.80
	TXRD0003A	3 - 132	NT30141	2030.00
	TXRD0004A	3 - 132	NT30141	2810.00
	TXRD0005A	3 - 132	NT20138	210.00
	TZS-100	8 - 2	NT30141	1610.00
	TZS-15	8 - 2	NT30141	113.00
	TZS-24	8 - 2	NT30141	340.00
	TZS-40	8 - 2	NT30141	630.00
	TZS-68	8 - 2	NT30141	1050.00
	TZS AD120240V	8 - 2	NT30141	680.00
	TZS AD24VAC	8 - 2	NT30141	680.00
	TZS AD415440V	8 - 2	NT30141	680.00
<b>U</b>				
	UPX330PB	3 - 22	NT30141	270.00
	UPX3440	6 - 12	NT30141	355.00
	UPX3800	6 - 27	NT30141	660.00
	UXHB0001B	3 - 132	NT30141	195.00
	UXKB0001A	3 - 132	NT30141	79.00
	UXKB0002A	6 - 26	NT20138	60.50
	UXKB0002A	6 - 26	NT20138	60.50

CAT. NO.	PAGE	P.S.	PRICE \$
UXKB0003A	6 - 37	NT30141	80.00
UXKB0013A	3 - 38	NT20138	61.00
I UXKC0001B	6 - 11	NT20138	560.00
UXKC0002B	6 - 11	NT20138	560.00
I UXKC0003B	6 - 11	NT20138	840.00
UXKC0004A	6 - 26	NT20138	360.00
UXKC0005A	6 - 26	NT20138	520.00
UXKC0006D	6 - 36	NT30141	880.00
UXKC0007D	6 - 36	NT30141	1170.00
UXKC0012A	3 - 132	NT30141	2090.00
I UXKC0013A	3 - 132	NT30141	3120.00
UXKC0020A	3 - 132	NT20138	83.00
UXKC0020A	6 - 11	NT20138	83.00
UXKC0020A	6 - 26	NT20138	83.00
UXKC0020A	6 - 36	NT20138	83.00
UXKC0021B	6 - 11	NT20138	220.00
UXKC0022B	6 - 26	NT20138	310.00
UXKC0023B	6 - 36	NT30141	460.00
UXKC0024B	6 - 36	NT30141	460.00
UXKC0025B	3 - 132	NT30141	650.00
UXKC0026C	6 - 36	NT30141	880.00
I UXKC0027C	6 - 36	NT30141	1170.00
UXKE0030A	6 - 8	NT20138	2.20
I UXLB0006C	3 - 22	NT20138	84.00
I UXLB0008C	3 - 22	NT20138	120.00
UXLB0009D	6 - 10	NT20138	178.00
UXLB0010D	6 - 25	NT20138	181.00
UXLB0011D	6 - 35	NT30141	315.00
I UXLB0012C	3 - 131	NT30141	445.00
UXLB0013D	6 - 10	NT20138	189.00
UXLB0014D	6 - 10	NT20138	220.00
UXLB0015D	6 - 25	NT20138	195.00
UXLB0016D	6 - 25	NT20138	225.00
UXLB0017D	6 - 35	NT30141	385.00
UXLB0018D	6 - 35	NT30141	460.00
I UXLB0019D	3 - 131	NT30141	510.00
UXLB0020C	3 - 131	NT30141	580.00
I UXLB0021C	3 - 131	NT30141	670.00
I UXLB0023C	3 - 131	NT20138	790.00
I UXLB0024D	6 - 35	NT20138	315.00
UXLB0025D	6 - 35	NT20138	385.00
UXLB0026D	6 - 35	NT20138	460.00
I UXMB0006B	3 - 132	NT30141	3820.00
UXMB0008B	3 - 132	NT30141	3820.00
UXMB0009B	3 - 132	NT30141	3820.00
I UXMC0001B	6 - 11	NT20138	2780.00
I UXMC0003B	6 - 11	NT20138	2780.00
I UXMC0004B	6 - 11	NT20138	2780.00
UXMC0005B	6 - 11	NT20138	2780.00

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**I** Available on indent only.

**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	UXMC0006B	6 - 26	NT20138	3550.00
<b>I</b>	UXMC0008B	6 - 26	NT20138	3550.00
<b>I</b>	UXMC0009B	6 - 26	NT20138	3550.00
	UXMC0010B	6 - 26	NT20138	3550.00
	UXMD0001B	6 - 11	NT20138	47.00
	UXMD0002B	6 - 26	NT20138	47.00
	UXOY0001A	6 - 25	NT20138	425.00
	UXOY0002A	6 - 25	NT20138	425.00
	UXOY0003A	6 - 36	NT30141	445.00
	UXOY0004A	6 - 36	NT30141	445.00
	UXOY0005A	6 - 36	NT30141	445.00
	UXOY0006A	3 - 132	NT30141	720.00
<b>I</b>	UXOY0007A	3 - 132	NT30141	880.00
	UXPD0011B	6 - 12	NT20138	190.00
	UXPD0012A	6 - 12	NT20138	245.00
	UXPD0013C	4 - 14	NT20138	220.00
	UXPD0013C	6 - 27	NT20138	220.00
<b>I</b>	UXPD0014B	6 - 27	NT20138	270.00
	UXQH0004B	4 - 14	NT20138	10.40
	UXQH0004B	6 - 12	NT20138	10.40
	UXQH0004B	6 - 27	NT20138	10.40
	UXQH0004B	6 - 37	NT20138	10.40
	UXRC0006C	6 - 11	NT20138	810.00
<b>I</b>	UXRC0007C	6 - 11	NT20138	1090.00
	UXRC0008B	6 - 26	NT20138	1460.00
<b>I</b>	UXRC0009B	6 - 26	NT20138	2040.00
	UXUB0013B	3 - 131	NT20138	113.00
	UXUB0013B	6 - 10	NT20138	113.00
	UXUB0013B	6 - 25	NT20138	113.00
	UXUB0013B	6 - 35	NT20138	113.00
	UXUB0014B	3 - 131	NT20138	113.00
	UXUB0014B	6 - 10	NT20138	113.00
	UXUB0014B	6 - 25	NT20138	113.00
	UXUB0014B	6 - 35	NT20138	113.00
	UXUB0015B	3 - 131	NT20138	113.00
	UXUB0015B	6 - 10	NT20138	113.00
	UXUB0015B	6 - 25	NT20138	113.00
	UXUB0015B	6 - 35	NT20138	113.00
<b>I</b>	UXUB0016B	3 - 131	NT20138	220.00
<b>I</b>	UXUB0016B	6 - 10	NT20138	220.00
<b>I</b>	UXUB0016B	6 - 25	NT20138	220.00
<b>I</b>	UXUB0016B	6 - 35	NT20138	220.00
	UXUB0017B	3 - 131	NT20138	220.00
	UXUB0017B	6 - 10	NT20138	220.00
	UXUB0017B	6 - 25	NT20138	220.00
	UXUB0017B	6 - 35	NT20138	220.00
<b>I</b>	UXUB0018B	3 - 131	NT20138	215.00
<b>I</b>	UXUB0018B	6 - 10	NT20138	215.00
<b>I</b>	UXUB0018B	6 - 25	NT20138	215.00

	CAT. NO.	PAGE	P.S.	PRICE \$
I	UXUB0018B	6 - 35	NT20138	215.00
I	UXUB0038B	3 - 131	NT20138	113.00
I	UXUB0038B	6 - 10	NT20138	113.00
I	UXUB0038B	6 - 25	NT20138	113.00
I	UXUB0038B	6 - 35	NT20138	113.00
	UXXB0001D	3 - 22	NT20138	86.50
	UXXB0003C	3 - 22	NT20138	127.00
	UXXB0004D	6 - 10	NT20138	169.00
	UXXB0005D	6 - 10	NT20138	220.00
	UXXB0006D	6 - 10	NT20138	255.00
	UXXB0007D	6 - 25	NT20138	169.00
	UXXB0008D	6 - 25	NT20138	200.00
	UXXB0009D	6 - 25	NT20138	240.00
	UXXB0010D	6 - 35	NT30141	335.00
	UXXB0011D	6 - 35	NT30141	415.00
	UXXB0012D	6 - 35	NT30141	490.00
	UXXB0013C	3 - 131	NT30141	350.00
	UXXB0014C	3 - 131	NT30141	400.00
I	UXXB0015C	3 - 131	NT30141	465.00
I	UXXB0016C	3 - 131	NT30141	540.00
I	UXXB0017C	3 - 131	NT30141	590.00
I	UXXB0018C	3 - 131	NT30141	640.00
I	UXXB0023D	6 - 35	NT20138	335.00
	UXXB0024D	6 - 35	NT20138	415.00
I	UXXB0025D	6 - 35	NT20138	490.00
I	UXYB0004A	6 - 27	NT20138	54.00
I	UXYB0004A	6 - 27	NT20138	54.00
I	UXYC0005A	6 - 27	NT20138	54.00
I	UXYC0005A	6 - 27	NT20138	54.00
	UXYD0001A	3 - 132	NT20138	26.80
	UXYD0001A	6 - 12	NT20138	26.80
	UXYD0001A	6 - 27	NT20138	26.80
	UXYD0001A	6 - 37	NT20138	26.80
	UXYD0002A	3 - 132	NT20138	2.20
	UXYD0002A	6 - 12	NT20138	2.20
	UXYD0002A	6 - 27	NT20138	2.20
	UXYD0002A	6 - 37	NT20138	2.20
<b>V</b>				
	VS125NJ3100	6 - 5	NT20138	1250.00
	VS125NJ3125	6 - 5	NT20138	1450.00
	VS125NJ320	6 - 5	NT20138	1250.00
	VS125NJ332	6 - 5	NT20138	1250.00
	VS125NJ350	6 - 5	NT20138	1250.00
	VS125NJ363	6 - 5	NT20138	1250.00
	VS250NJ3160	6 - 6	NT20138	1750.00
	VS250NJ3250	6 - 6	NT20138	1850.00
<b>X</b>				
	XA63012U	4 - 3	NT40143	390.00
I	XA63016U4POLE	4 - 5	NT40143	910.00

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**A** Assembled to order.

	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	XA63018U	4 - 3	NT40143	500.00
	XA63024U	4 - 3	NT40143	670.00
<b>I</b>	XA63024U4POLE	4 - 5	NT40143	1320.00
	XA63030U	4 - 3	NT40143	750.00
<b>I</b>	XA63032U4POLE	4 - 5	NT40143	1680.00
	XA63036U	4 - 3	NT40143	900.00
<b>I</b>	XA63040U4POLE	4 - 5	NT40143	2010.00
	XA63042U	4 - 3	NT40143	1020.00
	XA63048U	4 - 3	NT40143	1130.00
<b>I</b>	XA63048U4POLE	4 - 5	NT40143	2360.00
<b>I</b>	XA63056U4POLE	4 - 5	NT40143	2920.00
	XA63060U	4 - 3	NT40143	1380.00
<b>I</b>	XA63064U4POLE	4 - 5	NT40143	3110.00
	XA6306U	4 - 3	NT40143	275.00
	XA63072U	4 - 3	NT40143	1650.00
<b>I</b>	XA6308U4POLE	4 - 5	NT40143	760.00
	XA80012U	4 - 3	NT40143	400.00
<b>I</b>	XA80016U4POLE	4 - 5	NT40143	940.00
	XA80018U	4 - 3	NT40143	540.00
	XA80024U	4 - 3	NT40143	670.00
<b>I</b>	XA80024U4POLE	4 - 5	NT40143	1380.00
	XA80030U	4 - 3	NT40143	800.00
<b>I</b>	XA80032U4POLE	4 - 5	NT40143	1780.00
	XA80036U	4 - 3	NT40143	960.00
	XA80040U4POLE	4 - 5	NT40143	2170.00
	XA80042U	4 - 3	NT40143	1090.00
	XA80048U	4 - 3	NT40143	1180.00
	XA80048U4POLE	4 - 5	NT40143	2600.00
	XA80056U4POLE	4 - 5	NT40143	3020.00
	XA80060U	4 - 3	NT40143	1450.00
	XA80064U4POLE	4 - 5	NT40143	3370.00
	XA8006U	4 - 3	NT40143	285.00
	XA80072U	4 - 3	NT40143	1730.00
	XA8008U4POLE	4 - 5	NT40143	840.00
	XAB2	2 - 51	NT20138	3.80
	XAB2	3 - 41	NT20138	3.80
	XAB3	2 - 51	NT20138	3.80
	XAB3	3 - 68	NT20138	3.80
	XB80012U	4 - 3	NT40143	540.00
<b>I</b>	XB80016U4POLE	4 - 6	NT40143	1170.00
	XB80018U	4 - 3	NT40143	740.00
	XB80024U	4 - 3	NT40143	930.00
<b>I</b>	XB80024U4POLE	4 - 6	NT40143	1630.00
	XB80030U	4 - 3	NT40143	1120.00
<b>I</b>	XB80032U4POLE	4 - 6	NT40143	2100.00
	XB80036U	4 - 3	NT40143	1330.00
<b>I</b>	XB80040U4POLE	4 - 6	NT40143	2540.00
	XB80042U	4 - 3	NT40143	1540.00
	XB80048U	4 - 3	NT40143	1760.00

	CAT. NO.	PAGE	P.S.	PRICE \$
I	XB80048U4POLE	4 - 6	NT40143	3060.00
	XB80060U	4 - 3	NT40143	2130.00
	XB8006U	4 - 3	NT40143	455.00
	XB80072U	4 - 3	NT40143	2710.00
I	XB8008U4POLE	4 - 6	NT40143	930.00
	XBSSL 800 12U	4 - 7	NT40143	750.00
	XBSSL 800 15U	4 - 7	NT40143	890.00
	XBSSL 800 18U	4 - 7	NT40143	1080.00
	XBSSL 800 21U	4 - 7	NT40143	1220.00
	XBSSL 800 24U	4 - 7	NT40143	1760.00
	XBSSL 800 30U	4 - 7	NT40143	2130.00
	XBSSL 800 36U	4 - 7	NT40143	2710.00
I	XBSSL 800 3U	4 - 7	NT40143	370.00
	XBSSL 800 6U	4 - 7	NT40143	440.00
	XBSSL 800 9U	4 - 7	NT40143	590.00
	XBSSR 800 12U	4 - 8	NT40143	750.00
	XBSSR 800 15U	4 - 8	NT40143	890.00
	XBSSR 800 18U	4 - 8	NT40143	1080.00
	XBSSR 800 21U	4 - 8	NT40143	1220.00
	XBSSR 800 24U	4 - 8	NT40143	1760.00
	XBSSR 800 30U	4 - 8	NT40143	2130.00
	XBSSR 800 36U	4 - 8	NT40143	2710.00
I	XBSSR 800 3U	4 - 8	NT40143	370.00
	XBSSR 800 6U	4 - 8	NT40143	440.00
	XBSSR 800 9U	4 - 8	NT40143	590.00
	XC100012U	4 - 9	NT40143	800.00
	XC100018U	4 - 9	NT40143	1110.00
	XC10001X4R12U	4 - 10	NT40143	1490.00
	XC10001X4R24U	4 - 10	NT40143	2100.00
	XC10001X4R36U	4 - 10	NT40143	2800.00
	XC100024U	4 - 9	NT40143	1430.00
	XC10002X4R12U	4 - 10	NT40143	2320.00
	XC10002X4R24U	4 - 10	NT40143	2930.00
	XC10002X4R36U	4 - 10	NT40143	3630.00
	XC100030U	4 - 9	NT40143	1660.00
	XC100036U	4 - 9	NT40143	1980.00
	XC100042U	4 - 9	NT40143	2340.00
I	XC100048U	4 - 9	NT40143	2580.00
	XC10006U	4 - 9	NT40143	710.00
	XCW0840LS13	7 - 6	NZ00150	330.00
	XCW0840LS16	7 - 6	NZ00150	330.00
I	XDM6-3	6 - 27	NT20138	880.00
I	XDM6-4	6 - 27	NT20138	980.00
	XEC1640LS20	7 - 6	NZ00150	330.00
	XEC1640LS25	7 - 6	NZ00150	650.00
	XEC1640LS32	7 - 6	NZ00150	650.00
	XEC1640LS40	7 - 6	NZ00150	1240.00
	XFE10	3 - 132	NT20138	1690.00
I	XH630PJ 400 3	6 - 15	NT20138	4350.00

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	<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
	XH630PJ 630 3	6 - 15	NT20138	4810.00
	XH630SE 630 3	6 - 17	NT20138	3260.00
<b>I A</b>	XH630SE 630 3LSIG	6 - 17	NT20138	4110.00
	XH630SE 630 4	6 - 17	NT20138	4350.00
<b>I</b>	XH630SE 630 4LSIG	6 - 17	NT20138	6420.00
<b>I</b>	XH800PE 800 3	6 - 23	NT20138	4700.00
<b>I</b>	XH800PE 800 4	6 - 23	NT20138	8500.00
	XH800PJ 800 3P	6 - 20	NT20138	4810.00
<b>I</b>	XH800PJ 800 4P	6 - 20	NT20138	6750.00
	XH800SE 800 3	6 - 22	NT20138	4360.00
<b>I A</b>	XH800SE 800 3LSIG	6 - 22	NT20138	5080.00
<b>I</b>	XH800SE 800 4	6 - 22	NT20138	6750.00
<b>I</b>	XH800SE 800 4LSIG	6 - 22	NT20138	7480.00
	XKA4	6 - 11	NT20138	47.00
	XKA6	6 - 26	NT20138	60.50
	XM30PB0.7 3P	3 - 21	NT20138	500.00
	XM30PB10 3P	3 - 21	NT20138	500.00
	XM30PB12 3P	3 - 21	NT20138	500.00
	XM30PB1.4 3P	3 - 21	NT20138	500.00
	XM30PB2.0 3P	3 - 21	NT20138	500.00
	XM30PB2.6 3P	3 - 21	NT20138	500.00
	XM30PB4 3P	3 - 21	NT20138	500.00
	XM30PB5 3P	3 - 21	NT20138	500.00
	XM30PB8 3P	3 - 21	NT20138	500.00
	XM30TSC	3 - 22	NT20138	21.80
<b>I</b>	XS1000ND10003FC	3 - 145	NT20138	9630.00
	XS1250ND12503FC	3 - 145	NT30141	10160.00
<b>A</b>	XS1250OCRSK	6 - 37	NT20138	40.00
<b>I A</b>	XS1250SE 10003LG	6 - 29	NT30141	7870.00
<b>I A</b>	XS1250SE 10004LG	6 - 29	NT30141	8940.00
	XS1250SE 1000 FC3	6 - 29	NT30141	7010.00
	XS1250SE 1000 FC4	6 - 29	NT30141	9220.00
	XS1250SE 12503LG	6 - 29	NT30141	9490.00
<b>I A</b>	XS1250SE 12504LG	6 - 29	NT30141	12230.00
	XS1250SE 1250 FC3	6 - 29	NT30141	8770.00
	XS1250SE 1250 FC4	6 - 29	NT30141	11680.00
<b>I</b>	XS1600ND16003FC	3 - 145	NT30141	16750.00
	XS1600SE 16003LG	6 - 31	NT30141	10780.00
	XS1600SE 16004LG	6 - 31	NT30141	14120.00
	XS1600SE 1600 FC3	6 - 31	NT30141	10050.00
	XS1600SE 1600 FC4	6 - 31	NT30141	13390.00
<b>I</b>	XS2000ND20003RC	3 - 145	NT30141	18460.00
<b>I A</b>	XS2000NE 20003L	3 - 128	NT30141	18250.00
	XS2000NE 20003 RC	3 - 128	NT30141	17400.00
<b>I</b>	XS2000NE 20004L	3 - 128	NT20138	24160.00
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	CAT. NO.	PAGE	P.S.	PRICE \$
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A	XS630SE 6303LSIG	6 - 16	NT20138	3960.00
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I A	XS630SE 6304LSIG	6 - 16	NT20138	6280.00
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A	YASD22D	6 - 8	NT20138	445.00
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	ZS125 GJ 3 63	3 - 135	NT20138	2000.00
	ZS125 GJ 4 100	3 - 135	NT20138	2560.00
	ZS125 GJ 4 100 SN	3 - 135	NT20138	2560.00
	ZS125 GJ 4 125	3 - 135	NT20138	2750.00
	ZS125 GJ 4 125 SN	3 - 135	NT20138	2750.00
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**I** Available on indent only.

**A** Assembled to order.

<b>CAT. NO.</b>	<b>PAGE</b>	<b>P.S.</b>	<b>PRICE \$</b>
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ZS400 GF 3 250	3 - 140	NT20138	3900.00
ZS400 GF 3 300	3 - 140	NT20138	3900.00
ZS400 GF 3 350	3 - 140	NT20138	4150.00
ZS400 GF 3 400	3 - 140	NT20138	4300.00
ZS400 GF 4 250	3 - 140	NT20138	4600.00
ZS400 GF 4 300	3 - 140	NT20138	4600.00
ZS400 GF 4 350	3 - 140	NT20138	4800.00
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ZS630 GF 3 250	3 - 141	NT20138	1640.00
ZS630 GF 3 300	3 - 141	NT20138	1640.00
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- Commissioning

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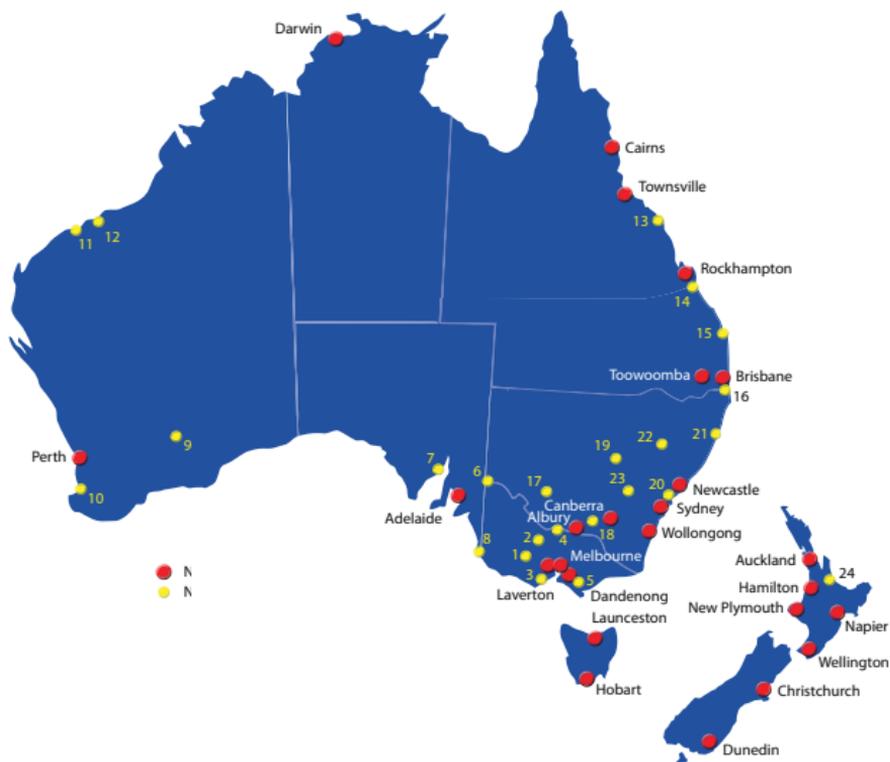
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# TECHNICAL DATA SHEET

**Equipment Type:** Phase Failure Relay

**Location:** Power Distribution

**Model Numbers:** DPB 01CM48W4

**Manufacturer:** Carlo Gavazzi

**Supplier:** NHP Pty Ltd

16 Riverview Place  
Murarrie  
(07) 3909 4999

# Monitoring Relays

## True RMS 3-Phase, 3-Phase+N, Multi-function

### Types DPB01, PPB01

CARLO GAVAZZI



DPB01



PPB01

- TRMS 3-phase over and under voltage, phase sequence and phase loss monitoring relays
- Detect when all 3 phases are present and have the correct phase sequence (except for N versions)
- Available versions (W4) supplied between phase and neutral
- Detect if all the 3-phase-phase or phase-neutral voltages are within the set limits
- Upper and lower limits separately adjustable
- Measure on own power supply
- Selection of measuring range by DIP-switches
- Adjustable voltage on relative scale
- Adjustable delay function (0.1 to 30 s)
- Output: 8 A SPDT relay N.E.
- For mounting on DIN-rail in accordance with DIN/EN 50 022 (DPB01) or plug-in module (PPB01)
- 22.5 mm Euronorm housing (DPB01) or 36 mm plug-in module (PPB01)
- LED indication for relay, alarm and power supply ON

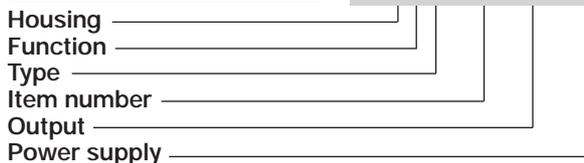
### Product Description

3-phase or 3-phase+neutral line voltage monitoring relay for phase sequence, phase loss, over and under voltage (separately adjustable set

points) with built-in time delay function. Supply ranges from 208 to 480 VAC covered by two multivoltage relays.

### Ordering Key

**DPB 01 C M23**



### Type Selection

Mounting	Phase sequence detection	Output	Supply: 208 to 240 VAC	Supply: 380 to 415 VAC	Supply: 380 to 480 VAC
DIN-rail	yes	SPDT	DPB 01 C M23	DPB 01 C M48 W4	DPB 01 C M48
Plug-in	yes	SPDT	PPB 01 C M23	PPB 01 C M48 W4	
Plug-in	yes	SPDT		PPB 01 C M48	
DIN-rail	no	SPDT	DPB 01 C M23 N	DPB 01 C M48 N W4	DPB 01 C M48 N
Plug-in	no	SPDT	PPB 01 C M23 N	PPB 01 C M48 N W4	
Plug-in	no	SPDT		PPB 01 C M48 N	

### Input Specifications

Input		Ranges	
L1, L2, L3, N	DPB01: Terminals L1, L2, L3, N PPB01: Terminals 5, 6, 7, 11 Measure on own supply	Upper level Lower level	+2 to +22% of the nominal voltage -22 to -2% of the nominal voltage
Note: Connect the neutral only if it is intrinsically at the star centre		Note: The input voltage must not exceed the maximum rated voltage or drop below the minimum rated voltage reported above.	
Measuring ranges		Hysteresis	
208 to 240 VAC	177 to 275 V <sub>L-L</sub> AC M23 versions	Set points from 2 to 5%	1%
380 to 415 VAC	323 to 475 V <sub>L-L</sub> AC PPB01CM48 PPB01CM48N D/P PB01CM48W4 D/P PB01CM48NW4	Set points from 5 to 22%	2%
380 to 480 VAC	323 to 550 V <sub>L-L</sub> AC DPB01CM48 DPB01CM48N		

DPB01, PPB01



## Output Specifications

<b>Output</b> Rated insulation voltage	SPDT relay 250 VAC
<b>Contact ratings</b> (AgSnO <sub>2</sub> )	μ
Resistive loads AC 1	8 A @ 250 VAC
DC 12	5 A @ 24 VDC
Small inductive loads AC 15	2.5 A @ 250 VAC
DC 13	2.5 A @ 24 VDC
<b>Mechanical life</b>	≥ 30 x 10 <sup>6</sup> operations
<b>Electrical life</b>	≥ 10 <sup>5</sup> operations (at 8 A, 250 V, cos φ = 1)
<b>Operating frequency</b>	≤ 7200 operations/h
<b>Dielectric strength</b>	
Dielectric voltage	2 kVAC (rms)
Rated impulse withstand volt.	4 kV (1.2/50 μs)

## Supply Specifications

<b>Power supply</b> Rated operational voltage through terminals:	Overvoltage cat. III (IEC 60664, IEC 60038)
L1, L2, L3, N (DPB01) 5, 6, 7, 11 (PPB01)	
D/P PB01CM23, D/P PB01CM23N	208 to 240 V <sub>L-L</sub> AC ±15% 45 to 65 Hz
D/P PB01CM48W4, D/P PB01CM48NW4, PPB01CM48, PPB01CM48N	380 to 415 V <sub>L-L</sub> AC ±15% (220 to 240 V <sub>L-N</sub> AC ±15%) 45 to 65 Hz
DPB01CM48, DPB01CM48N	380 to 480 V <sub>L-L</sub> AC ±15% (220 to 277 V <sub>L-N</sub> AC ±15%) 45 to 65 Hz
<b>Rated operational power</b>	
DPB01CM23x, PPB01CM23x DPB01CM48x, PPB01CM48x	13 VA @ 230 ΔVAC, 50 Hz 13 VA @ 400 ΔVAC, 50 Hz Supplied by L1 and L2
DPB01CM48xW4 DPB01CM48xW4	13 VA @ 400 ΔVAC, 50 Hz Supplied by L1 and N

## General Specifications

<b>Power ON delay</b>	1 s ± 0.5 s or 6 s ± 0.5 s
<b>Reaction time</b> Incorrect phase sequence or total phase loss Voltage level	< 200 ms (input signal variation from -20% to +20% or from +20% to -20% of set value) < 200 ms (delay < 0.1 s) < 200 ms (delay < 0.1 s)
Alarm ON delay Alarm OFF delay	< 200 ms (delay < 0.1 s) < 200 ms (delay < 0.1 s)
<b>Accuracy</b> Temperature drift Delay ON alarm Repeatability	(15 min warm-up time) ± 1000 ppm/°C ± 10% on set value ± 50 ms ± 0.5% on full-scale
<b>Indication for</b> Power supply ON Alarm ON	LED, green LED, red (flashing 2 Hz during delay time) LED, yellow
Output relay ON	LED, yellow
<b>Environment</b> Degree of protection Pollution degree Operating temperature @ Max. voltage, 50 Hz @ Max. voltage, 60 Hz Storage temperature	IP 20 3 (DPB01), 2 (PPB01) -20 to 60°C, R.H. < 95% -20 to 50°C, R.H. < 95% -30 to 80°C, R.H. < 95%
<b>Housing</b> Dimensions	DPB01 PPB01 22.5 x 80 x 99.5 mm 36 x 80 x 94 mm
<b>Weight</b>	Approx. 120 g
<b>Screw terminals</b> Tightening torque	Max. 0.5 Nm according to IEC 60947
<b>Approvals</b>	UL, CSA (except for W4 versions)
<b>CE Marking</b>	Yes
<b>EMC</b> Immunity Emissions	Electromagnetic Compatibility According to EN 61000-6-2 According to EN 61000-6-3

## Mode of Operation

Connected to the 3 phases (and neutral) DPB01 and PPB01 operate when all 3 phases are present at the same time, the phase sequence is correct (not N versions) and the phase-phase (or phase-neutral) voltage levels are within set limits.

If one or more phase-phase or phase-neutral voltages exceeds the upper set level or drops below the lower set level, the red LED starts

flashing 2 Hz and the output relay releases after the set time period. In any case if phase-neutral measurement is selected both phase-phase and phase-neutral voltages are monitored. If the phase sequence is wrong or one phase is lost, the output relay releases immediately.

Only 200 ms delay occurs. The failure is indicated by the red LED flashing 5 Hz during the alarm condition.

### Example 1 (mains network monitoring)

The relay monitors over and under voltage, phase loss and correct phase sequence. In case of N versions, the relay monitors over and under voltage.

### Example 2 (load monitoring)

The relay releases in case of interruption of one or more phases, when one or more voltages drop below the lower set level or exceed the upper set level.

DPB01, PPB01



## Function/Range/Level and Time Delay Setting

Adjust the input range setting the DIP switches 3 and 4 as shown below.

To access the DIP switches open the grey plastic cover as shown below

**Selection of level and time delay:**

**Centre knob:**  
Setting of upper level on relative scale.

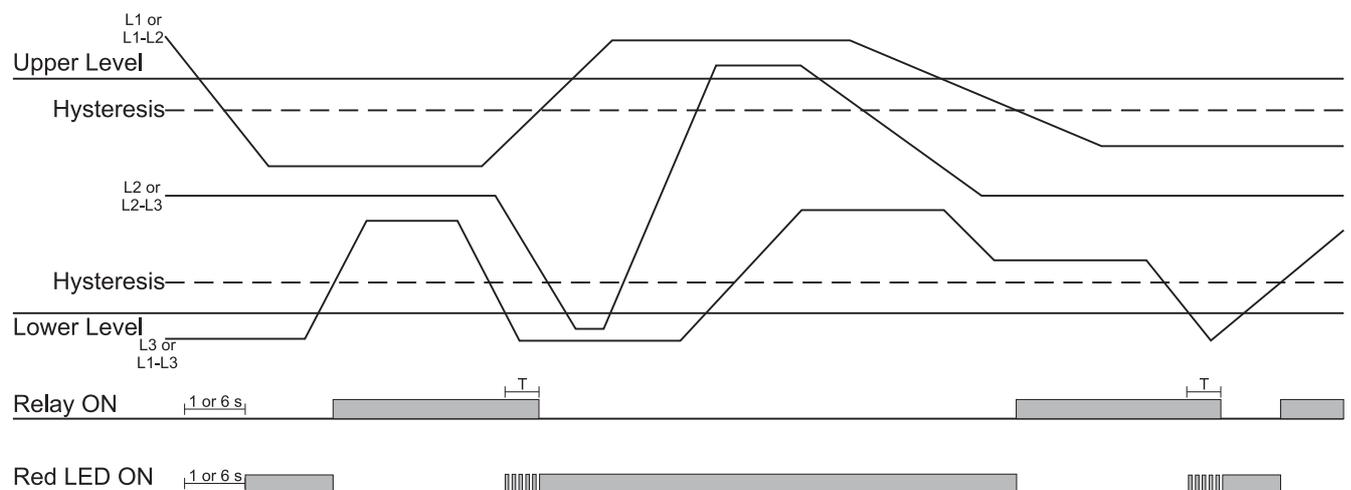
Select the desired function setting the DIP switches 1 and 2 as shown below.

**Upper knob:**  
Setting of lower level on relative scale.

**Lower knob:**  
Setting of delay on alarm time on absolute scale (0.1 to 30 s).

<b>Power ON delay</b>				
ON: 6 s ± 0.5 s				
OFF: 1 s ± 0.5 s				
<b>Monitored voltage</b>				
ON: Phase-Neutral				
OFF: Phase-Phase				
<b>Measuring range</b>				
SW3	ON	ON	OFF	OFF
SW4	ON	OFF	ON	OFF
M23 Ph-Ph Voltage	208 VAC	220 VAC	230 VAC	240 VAC
M48 Ph-Ph Voltage	380 VAC	400 VAC	415 VAC	480 VAC DPB01CM48, DPB01CM48N only
M48 Ph-N Voltage	220 VAC	230 VAC	240 VAC	277 VAC DPB01CM48, DPB01CM48N only

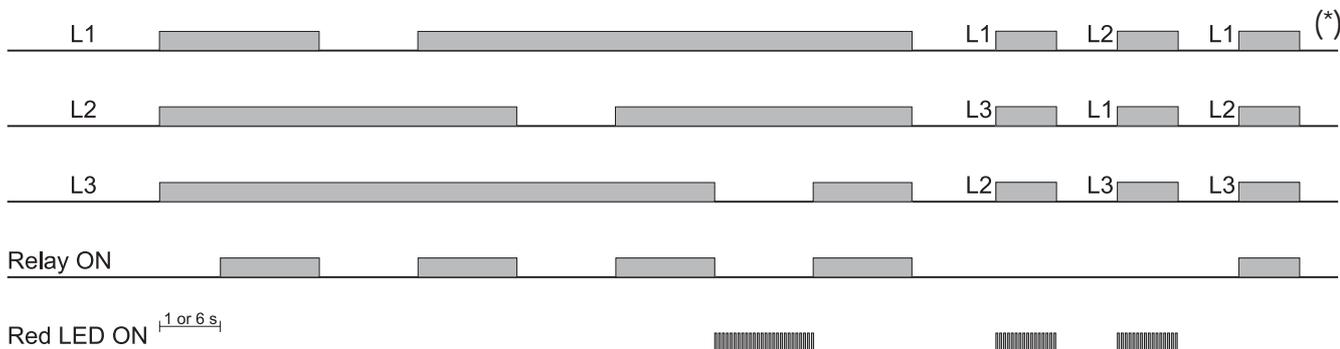
## Operation Diagrams



DPB01, PPB01

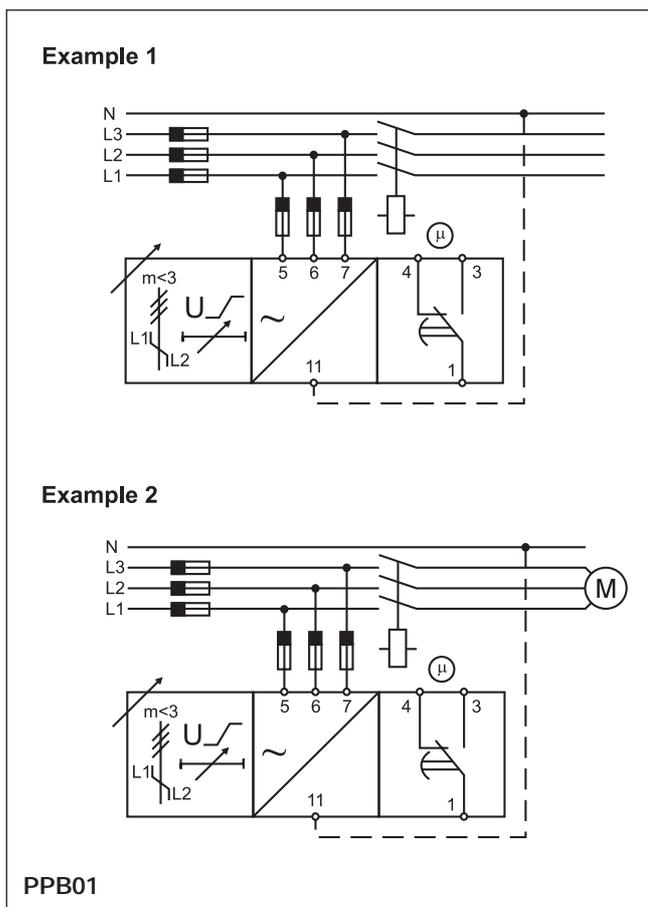
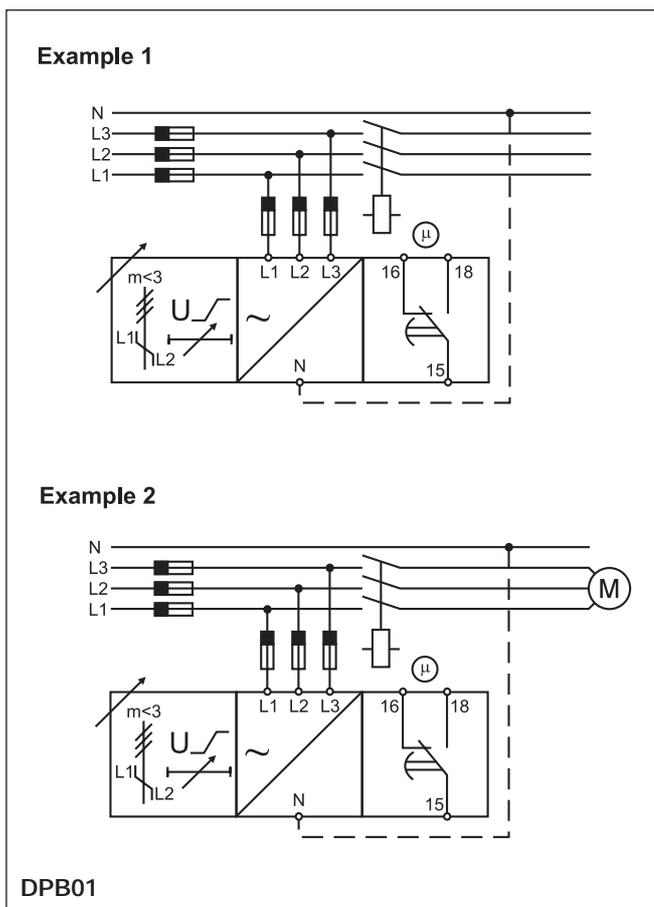


## Operation Diagrams (cont.)



(\*) N versions don't detect incorrect phase sequence.

## Wiring Diagrams



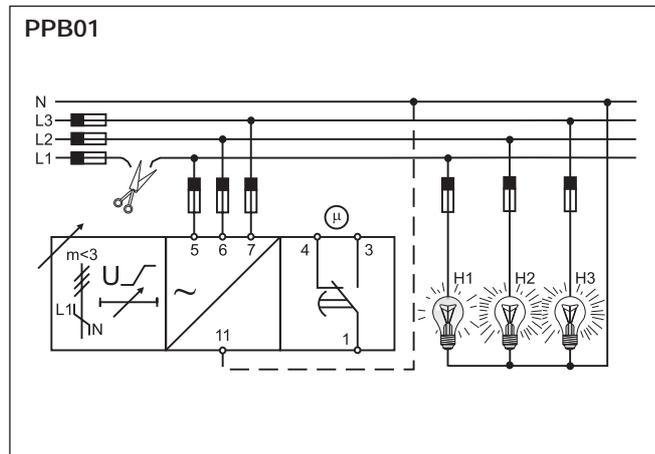
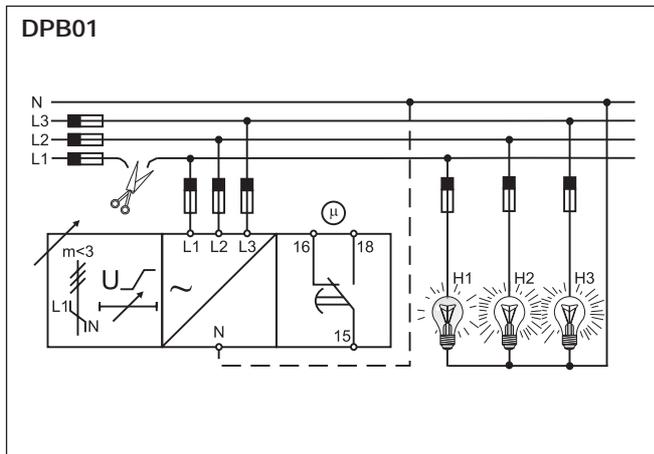
DPB01, PPB01



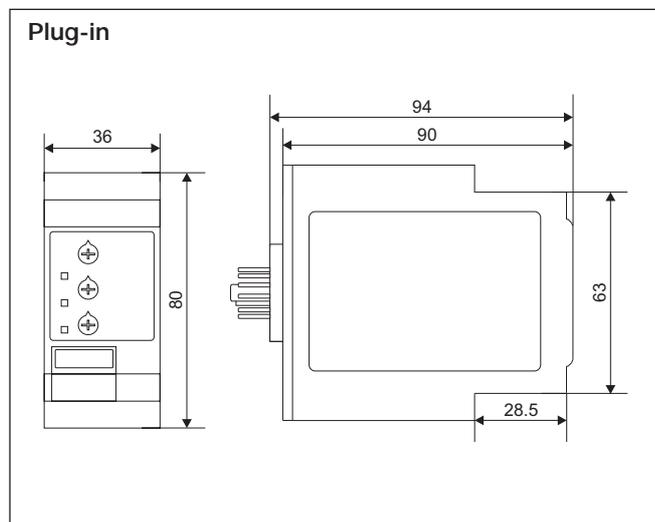
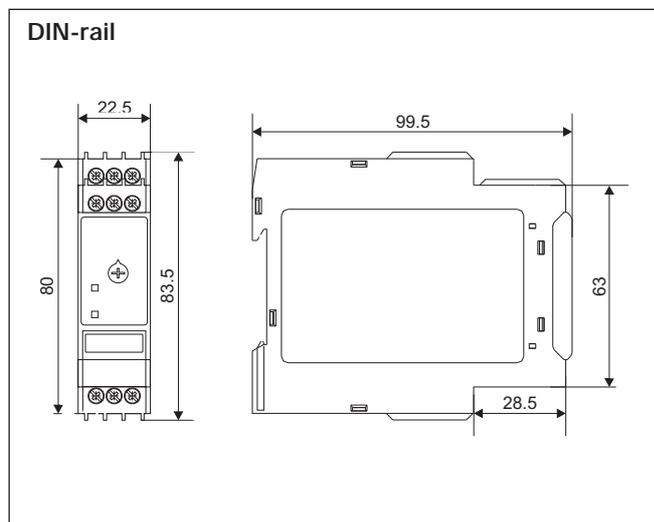
### Note

When DPB01 or PPB01 is used with phase indicator lamps (see examples in the following diagrams), the lamp H1 or H2 might be dimly lit when there is a phase loss in L1 or L2. This might happen if the lamps used are the typical low power indicator lamps, and there are no other loads present.

This fact can be avoided by using W4 models. Note that the neutral must be always connected to the device.



### Dimensions



# TECHNICAL DATA SHEET

**Equipment Type:** Standard load break switches

**Location:** Power Distribution

**Model Numbers:** various

**Manufacturer:** Socomec

**Supplier:** NHP Pty Ltd

16 Riverview Place  
Murarrie  
(07) 3909 4999

## SLB Standard load-break switches COMO M 20 to 100 A

**New Range**



SLB 20...40

The COMO M range of load-break switches offer compact IP 20 finger safe solutions for switching up to and including 100 A. They are ideal for the arduous switching of motors.

Standard mounting is by DIN rail or base mount with screws.

The COMO M comes complete with direct mount handle, or pistol handles and shaft. Fourth pole and auxiliary switching can also be achieved with easy clip-on modules - refer accessories.

### Front operated surface mount (Supplied with direct or external handle)

	AC 22 400 V (A)	AC 23 400 V (A)	AC 23 400 V (kW)	Handle type	Cat. No.
<b>20 A</b>	20	20	9	Direct	SLB 20D 3P
				Pistol	SLB 20P 3P
<b>25 A</b>	25	25	11	Direct	SLB 25D 3P
				Pistol	SLB 25P 3P
<b>32 A</b>	32	32	15	Direct	SLB 32D 3P
				Pistol	SLB 32P 3P
<b>40 A</b>	40	40	18.5	Direct	SLB 40D 3P
				Pistol	SLB 40P 3P
<b>63 A</b>	63	63	30	Direct	SLB 63D 3P
				Pistol	SLB 63P 3P
<b>80 A</b>	80	80	40	Direct	SLB 80D 3P
				Pistol	SLB 80P 3P
<b>100 A</b>	100	80	40	Direct	SLB 100D 3P
				Pistol	SLB 100P 3P



SLB 63...100

## SLB Standard load-break switches

### SIRCO 125 to 4000 A

**New Range**



SLB 125...630

The SIRCO range of load-break switches offer compact solutions for switching from 125 A to 4000 A. Base mounting is standard.

The SIRCO range are a proven, reliable design that more than suit harsh Australian conditions.

The switches come complete with extended shaft and door mountable pistol grip handle. Available in three and four pole versions with a large range of accessories to choose from.

### Front operated surface mount (Supplied with external handle and shaft)

	AC 21 400 V (A)	AC 23 400 V (A)	AC 23 400 V (kW)	No. of poles <sup>1)</sup>	Cat. No.
<b>125 A</b>	125	125	63	3	SLB 125 3P
				4	SLB 125 4P
<b>160 A</b>	160	160	80	3	SLB 160 3P
				4	SLB 160 4P
<b>200 A</b>	200	200	100	3	SLB 200 3P
				4	SLB 200 4P
<b>250 A</b>	250	250	132	3	SLB 250 3P
				4	SLB 250 4P
<b>315 A</b>	315	315	160	3	SLB 315 3P
				4	SLB 315 4P
<b>400 A</b>	400	400	220	3	SLB 400 3P
				4	SLB 400 4P
<b>500 A</b>	500	400	280	3	SLB 500 3P
				4	SLB 500 4P
<b>630 A</b>	630	500	280	3	SLB 630 3P
				4	<input type="checkbox"/> SLB 630 4P
<b>800 A</b>	800	800	450	3	SLB 800 3P
				4	<input type="checkbox"/> SLB 800 4P

Notes: <sup>1)</sup> 6 and 8 pole switches available on indent. Refer NHP.

Available on indent only.



SLB 800...3150

## SLB Standard load-break switches

### SIRCO 125 to 4000 A (cont'd)



The SIRCO range of load-break switches offer compact solutions for switching from 125 A to 4000 A. Base mounting is standard.

The SIRCO switches come complete with extended shaft and door mountable pistol grip handle. Available in three and four pole versions with a large range of accessories to choose from.



SLB 800...3150

### Front operated surface mount (Supplied with external handle and shaft)

	AC 21 400 V (A)	AC 23 400 V (A)	AC 23 400 V (kW)	No. of poles <sup>1)</sup>	Cat. No.
<b>1000 A</b>	1000	1000	560	3	SLB 1000 3P
				4	 SLB 1000 4P
<b>1250 A</b>	1250	1000	560	3	SLB 1250 3P
				4	 SLB 1250 4P
<b>1600 A</b>	1600	1000	560	3	SLB 1600 3P
				4	 SLB 1600 4P
<b>1800 A</b>	1800	1000	560	3	SLB 1800 3P
				4	 SLB 1800 4P
<b>2000 A</b>	2000	1250	710	3	SLB 2000 3P
				4	 SLB 2000 4P
<b>2500 A</b>	2500	1250	710	3	SLB 2500 3P
				4	 SLB 2500 4P
<b>3150 A</b>	3150	1250	710	3	SLB 3150 3P
				4	 SLB 3150 4P
<b>4000 A</b>	4000	1250	710	3	SLB 4000 3P <sup>2)</sup>
				4	 SLB 4000 4P <sup>2)</sup>

**Notes:** <sup>1)</sup> 6 and 8 pole switches available on indent. Refer NHP.

<sup>2)</sup> Supplied with 2 N/O and 2 N/C auxiliaries as standard.

 Available on indent only.



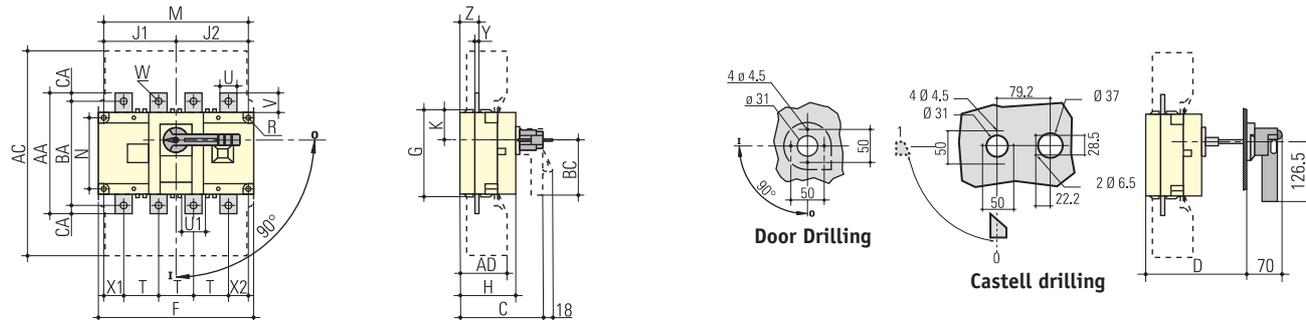
SLB 4000



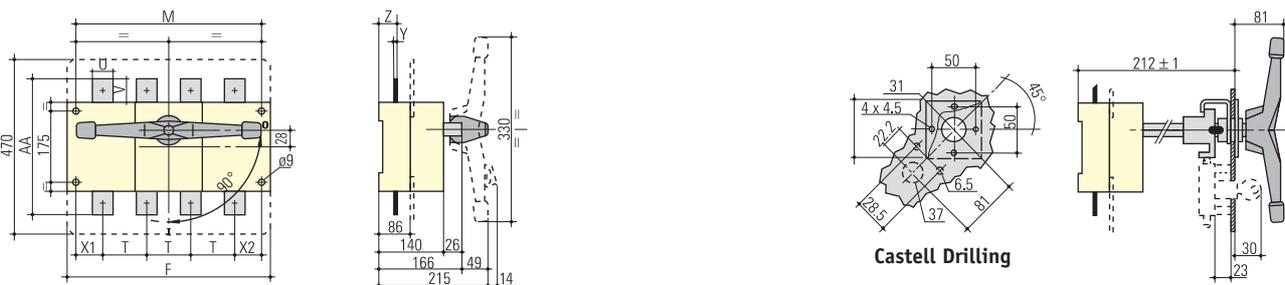
# Technical data and dimensions (mm)

## SIRCO SLB 125 to 2500 A

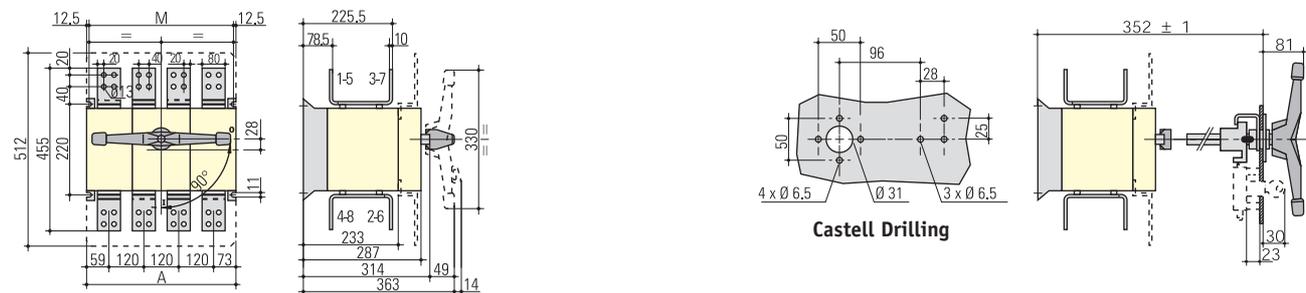
### SIRCO 125 to 2500 A



Rating A	Overall dimensions		Terminal shrouds		Switch body								Switch mounting				Connection terminals													
	C	D	AC	AD	F	F	G	H	J1	J2	K	BC	M	M	N	R	T	U	U1	V	W	X1	X1	X2	Y	Z	AA	BA	CA	
			3p	4p	3p	4p			3p	4p			3p	4p							3p	4p								
125	120	124...354	235	50	140	170	93	65	45	75	75	31.5	80	120	150	65	5.5	36	20	20.5	25	9	28	22	20	3.5	20.5	135	115	10
160	120	124...354	235	50	140	170	93	65	45	75	75	31.5	80	120	150	65	5.5	36	20	20.5	25	9	28	22	20	3.5	20.5	135	115	10
200	130	135...365	290	60	180	230	108	75	55	105	105	34	115	160	210	80	5.5	50	25	25.5	30	11	33	33	27	3.5	22.5	160	130	15
250	130	135...365	290	60	180	230	108	75	55	105	105	34	115	160	210	80	5.5	50	25	25.5	30	11	33	33	27	3.5	22.5	160	130	15
315	165	167...397	401	89	230	290	170	110	75	135	135	55	115	210	270	140	7	65	32	45.5	37.5	11	42.5	37.5	37.5	5	36	235	205	15
400	165	167...397	401	89	230	290	170	110	75	135	135	55	115	210	270	140	7	65	32	45.5	37.5	11	42.5	37.5	37.5	5	36	235	205	15
500	165	167...397	401	89	230	290	170	110	75	135	135	55	115	210	270	140	7	65	32	45.5	37.5	13	42.5	37.5	37.5	5	36	235	205	15
630	165	167...397	400	89	230	290	170	110	75	135	135	55	115	210	270	140	7	65	45	45.5	50	13	42.5	37.5	37.5	5	36	260	220	20



Rating A	Switch body		Switch mounting		T	U	V	Connection terminals				
	F 3p	F 4p	M 3p	M 4p				Y	X1	X2	Z	AA
800	280	360	255	335	80	50	60.5	7	47.5	47.5	46.5	321
1000	280	360	255	335	80	50	60.5	7	47.5	47.5	46.5	321
1250	372	492	347	467	120	90	44	8	53.5	53.5	47.5	288
1600	372	492	347	467	120	90	44	8	53.5	53.5	47.5	288
1800	372	492	347	467	120	90	44	8	53.5	53.5	47.5	288



Rating A	Overall dimensions		Switch mounting	
	A 3p	A 4p	M 3p	M 4p
2000	372	492	347	467
2500	372	492	347	467

## Technical data and dimensions (mm)

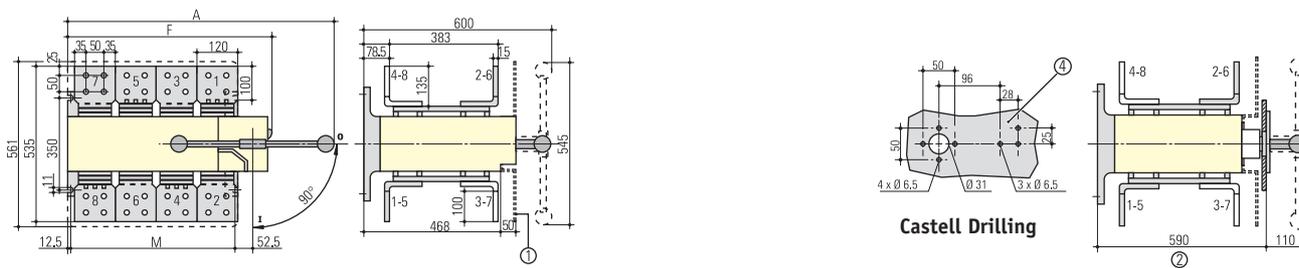
### SIRCO SLB 3150 to 4000 A

#### SIRCO 3150 A



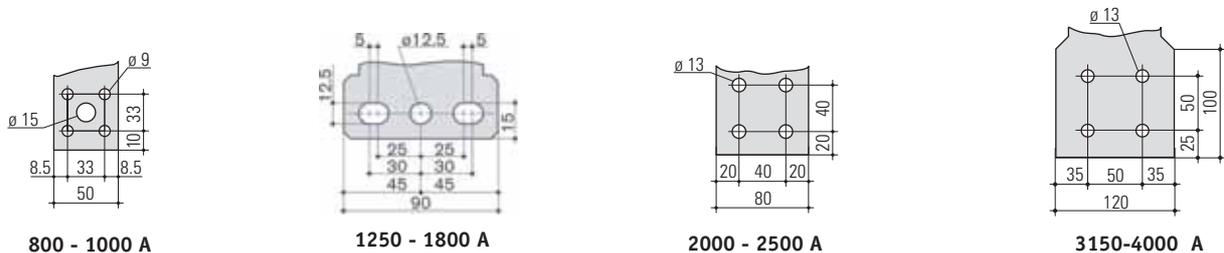
Rating	Overall dimensions		Switch mounting	
A	A 3p	A 4p	M 3p	M 4p
3150	372	492	347	467

#### SIRCO 4000 A



Rating	Overall dimensions		Switch body		Switch mounting	
A	A 3p	A 4p	F 3p	F 4p	M 3p	M 4p
4000	684	804	470	590	347	467

#### SIRCO Connection terminals - 800 to 4000 A



## Technical data and ratings chart

### COMO M SLB 20 to 100 A

### Ratings to AS 3947-3 and IEC 60947-3

			20 A	25 A	32 A	40 A	63 A	80 A	100 A
Rated insulation voltage and rated operation voltage AC 20/DC 20	V		800	800	800	800	800	800	800
Rated impulse withstand voltage	kV		8	8	8	8	8	8	8
Rated operational current									
AC 21A	400 V	A	20	25	32	40	63	80	100
	500 V	A	20	25	32	40	63	80	100
	690 V	A	20	25	32	40	63	80	100
AC 22A	400 V	A	20	25	32	40	63	80	100
	500 V	A	20	25	32	40	63	80	100
	690 V	A	20	25	32	40	63	80	100
AC23A	400 V	A	20	25	32	40	63	80	80
	500 V	A	16	20	25	32	50	63	63
	690 V	A	16	20	20	20	50	50	50
Rated operational current									
DC 21A	400 V	A	Refer NHP						
	500 V	A							
DC 22A	400 V	A							
	500 V	A							
DC 23A	400 V	A							
	500 V	A							
Operational power									
AC 23A	400 V	kW	9	11	15	18.5	30	40	40
	500 V	kW	9	11	15	18.5	33	40	40
	690 V	kW	11	15	15	15	45	45	45
Overload capacity									
Short time withstand current I <sub>cw</sub> (RMS 1s) 690 V	kA		1.26	1.26	1.26	1.26	1.5	1.5	1.5
Breaking capacity AC 23A	400 V	A	160	200	256	320	504	640	640
Fuse protected short circuit withstand. (kA RMS prospective)	400 V AC	kA	50	50	50	50	25	25	25
	Fuse	A	20	25	32	40	63	80	100
Mechanical endurance	Ops		100000	100000	100000	100000	30000	30000	30000
Weight (3 pole)	Kg		0.13	0.13	0.13	0.13	0.25	0.25	0.25
Min. tightening torque	Nm		2	2	2	2	4	4	4
Connection cable size	mm <sup>2</sup>		2.5/16	2.5/16	4/16	6/16	16/50	16/50	25/50

**Note:** 240/415 V ratings suitable for use on 230/400 V in accordance with AS 60038 : 2000.

## Technical data and ratings chart

### SIRCO SLB 125 to 630 A

#### Ratings to AS 3947-3 and IEC 60947-3

			125 A	160 A	200 A	250 A	315 A	400 A	500 A	630 A
Rated insulation voltage and rated operation voltage AC 20/DC 20	V		800	800	800	800	1000	1000	1000	1000
Rated impulse withstand voltage	kV		8	8	8	8	12	12	12	12
Rated operational current										
AC 21A	400 V	A	125	160	200	250	315	400	500	630
	500 V	A	125	160	200	250	315	400	500	630
	690 V	A	125	160	200	250	315	400	500	500
AC 22A	400 V	A	125	160	200	250	315	400	500	630
	500 V	A	125	125	200	250	315	400	500	500
	690 V	A	-	-	-	125	250	250	250	315
AC23A	400 V	A	125	160	200	250	315	400	500	500
	500 V	A	100	100	160	200	315	315	315	315
	690 V	A	-	-	-	100	160	160	160	160
Rated operational current										
DC 21A	400 V	A	125	160	160	250	315	400	400	630
	500 V	A	125	125	160	200	315	400	400	500
DC 22A	400 V	A	125	160	160	200	315	400	400	500
	500 V	A	125	125	160	200	315	315	315	500
DC 23A	400 V	A	125	125	160	200	315	400	400	500
	500 V	A	125	125	160	200	315	400	400	500
Operational power										
AC 23A	400 V	kW	63	80	100	132	160	220	280	280
	500 V	kW	63	63	110	140	220	220	220	220
	690 V	kW	55	55	75	90	150	150	150	150
Overload capacity										
Short time withstand current I <sub>cw</sub> (RMS 1s) 690 V	kA		7	7	9	9	13	13	13	13
Breaking capacity AC 23A	400 V	A	1000	1280	1600	2000	2520	3200	4000	4000
Fuse protected short circuit withstand. (kA RMS prospective)	400 V AC	kA	100	100	80	50	100	100	100	70
	Fuse	A	125	160	200	250	315	400	500	630
Rated capacitor power	kVAr		55	75	90	115	145	185	230	290
Mechanical endurance	Ops		10000	10000	10000	10000	5000	5000	5000	5000
Weight (3 pole)	Kg		1	1.5	2	2	3.5	3.5	3.5	3.5
Min. tightening torque	Nm		6.5	6.5	10	10	15.4	14.5	14.5	14.5
Connection cable size	mm <sup>2</sup>		35/50	50/95	70/95	95/150	150/240	185/240	240/240	2 (150/300)

Note: 240/415 V ratings suitable for use on 230/400 V in accordance with AS 60038 : 2000.

## Technical data and ratings chart

### SIRCO SLB 800 to 4000 A

### Ratings to AS 3947-3 and IEC 60947-3

		800 A	1000 A	1250 A	1600 A	1800 A	2000 A	2500 A	3150 A	4000 A	
Rated insulation voltage and rated operation voltage AC 20/DC 20	V	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Rated impulse withstand voltage	kV	12	12	12	12	12	12	12	12	12	
Rated operational current											
AC 21A	400 V	A	800	1000	1250	1600	1600	2000	2500	3150	3150
	500 V	A	800	1000	1250	1600	1600	2000	2500	3150	3150
	690 V	A	800	1000	1000	1600	1600	2000	2000	2000	2000
AC 22A	400 V	A	800	1000	1250	1250	1250	2000	2000	2500	2500
	500 V	A	800	1000	1000	1250	1250	1600	1600	2000	2000
	690 V	A	800	630	630	800	800	1000	1000	1000	1000
AC 23A	400 V	A	800	1000	1000	1000	1000	1250	1250	1250	1250
	500 V	A	630	800	800	1000	1000	1000	1000	1000	1000
	690 V	A	200	400	400	500	500	800	800	800	800
Rated operational current											
DC 21A	400 V	A	800	1000	1250	1600	1600	2000	2000	2000	2000
	500 V	A	630	1000	1250	1250	1250	1250	1250	1250	1250
DC 22A	400 V	A	800	1000	1250	1250	1250	1250	1250	1250	1250
	500 V	A	800	1000	1250	1250	1250	1250	1250	1250	1250
DC 23A	400 V	A	800	1000	1000	1000	1000	1000	1000	1000	1000
	500 V	A	800	1000	1000	1000	1000	1000	1000	1000	1000
Operational power											
AC 23A	400 V	kW	450	560	560	560	560	710	710	710	710
	500 V	kW	450	560	560	710	710	710	710	710	710
	690 V	kW	185	400	400	475	475	750	750	750	750
Overload capacity											
Short time withstand current I <sub>cw</sub> (RMS 1s) 690 V	kA	26	35 <sup>1)</sup>	50	50	50	50	50	55	70	
Breaking capacity AC 23A	400 V A	6400	8000	8000	8000	8000	10000	10000	10000	10000	
Fuse protected short circuit withstand. (kA RMS prospective)	400 V AC kA	50	100	100	100	100	100	100	-	-	
	Fuse A	800	1000	1250	2x800	2x800	2x1000	2x1000	-	-	
Rated capacitor power	kVAr	365	460	575	-	-	-	-	-	-	
Mechanical endurance	Ops	4000	4000	4000	3000	3000	3000	2500	2500	2500	
Weight (3 pole)	Kg	8	10.5	10.5	16	17	31	32	42	90	
Min. tightening torque	Nm	37	37	37	50	50	60	60	60	110	
Connection cable size	mm <sup>2</sup>	2 (185/300)	2 240/4 185	4 185 max	6 240 max	-	-	-	-	-	

**Notes:** <sup>1)</sup> 50 kA switch available in larger frame size. Refer NHP.  
**240/415 V ratings suitable for use on 230/400 V in accordance with AS 60038 : 2000.**

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Power Supply
<b>Location:</b>	Power Distribution
<b>Model Numbers:</b>	CP M SNT 120W 24V 5A
<b>Manufacturer:</b>	Weidmuller
<b>Supplier:</b>	Ramelec  2/5 Breene Place Morningside Qld 4170  Ph: 07 3899 1322

## Data sheet...

### CP M SNT 120W 24V 5A

**Weidmüller Interface GmbH & Co. KG**

Klingenbergstraße 16

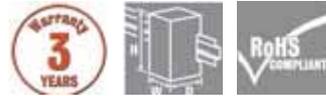
D-32758 Detmold

Germany

Fon: +49 5231 14-0

Fax: +49 5231 14-292083

www.weidmueller.com



#### PRO-M = Power-Reliable-Optimized

The perfectly reliable power supply for automation technology.

The ten different versions for the 24V-DC power supply all feature a solid but thin metal housing which enables them to be installed without any side gaps. This results in less space required on the mounting rail. Wide range of AC/DC inputs and a wide temperature range enable them to be used anywhere. Because of its high efficiency, resistance to overloads and high power reserves, the PRO-M is a trusted power supply for use in any application. The three-phase PRO-M power supply modules continue to function reliably when one phase fails (i.e., in two-phase mode).

#### General ordering data

Type	CP M SNT 120W 24V 5A
Order No.	<a href="#">8951340000</a>
Version	Power supply, switch-mode power supply unit
GTIN (EAN)	4032248742554
Qty.	1 pc(s).

## Data sheet...

## CP M SNT 120W 24V 5A

Weidmüller Interface GmbH &amp; Co. KG

Klingenbergstraße 16

D-32758 Detmold

Germany

Fon: +49 5231 14-0

Fax: +49 5231 14-292083

www.weidmueller.com

## Technical data

## Dimensions and weights

Width	40 mm	Height	130 mm
Depth	125 mm	Weight	0.7 kg
Net weight	724.3 g		

## Temperatures

Operating temperature	-25 °C...+70 °C	Storage temperature	-40 °C...+85 °C
-----------------------	-----------------	---------------------	-----------------

## Input

AC current consumption	1.1 A @ 230 V AC / 2.0 A @ 115 V AC	DC current consumption	0.4 A @ 370 V DC / 1.2 A @ 120 V DC
DC input voltage range	80...370 V DC (Derating @ 120 V DC)	Frequency range AC	47...63 Hz
Input fuse	Yes	Input fuse (internal)	Yes
Input voltage range AC	85...264 V AC (Derating @ 100 V AC)	Inrush current	max. 40 A
Recommended back-up fuse	4 A / DI, safety fuse 6 A, Char. B, circuit breaker 3...5 A, Char. C, circuit breaker	Wire connection method	Screw connection
rated input voltage	100...240 V AC (wide-range input)		

## output

Output current	5 A	Output power	120 W
Output voltage type	DC	Output voltage, max.	29.5 V
Output voltage, min.	22.5 V	Output voltage, note	(adjustable via potentiometer on front)
Overload protection	Yes	Parallel connection option	yes, max. 5
Powerboost @ 24 V DC, 60 °C	6 A for 1 min, ED = 5 %	Rated (nominal) output current @ $U_{Nom}$	5 A @ 60 °C
Wire connection method	Screw connection	continuous output current @ 24 V DC	6.0 A @ 45 °C, 5.3 A @ 55 °C, 3.8 A @ 70 °C
rated output voltage	24 V DC $\pm$ 1 %	residual ripple, breaking spikes	< 50 mV <sub>SS</sub> @ 24 V DC, $I_N$

## General data

AC failure bridging time @ $I_{Nom}$	> 100 ms @ 230 V AC / > 20 ms @ 115 V AC	Current limiting	> 120 % $I_N$
Degree of efficiency	90 % @ 230 V AC / 88 % @ 115 V AC	Housing version	Metal, corrosion resistant
Indication	Operation, green LED	MTBF	> 500,000 h acc. to IEC 1709 (SN29500)
Mounting position, installation notice	Horizontal on TS35 mounting rail, with 50 mm of clearance at top and bottom for air circulation. Can be mounted side by side with no space in between.	Operating temperature	-25 °C...+70 °C
Power factor (approx.)	> 0.5 @ 230 V AC / > 0.6 @ 115 V AC	Protection against over-heating	Yes
Protection against reverse voltages from the load	30...35 V DC	Short-circuit protection	Yes
Weight	0.7 kg		

Creation date August 5, 2013 3:10:33 AM CEST

## Data sheet...

### CP M SNT 120W 24V 5A

**Weidmüller Interface GmbH & Co. KG**

Klingenbergstraße 16

D-32758 Detmold

Germany

Fon: +49 5231 14-0

Fax: +49 5231 14-292083

www.weidmueller.com

## Technical data

### EMC / shock / vibration

Limiting of mains voltage harmonic currents	in accordance with EN 61000-3-2	Noise emission acc. to EN55022	Class B
Interference immunity test acc. to	EN 61000-4-2 (ESD)  EN 61000-4-3 and EN 61000-4-8 (fields)  EN 61000-4-4 (burst)  EN 61000-4-5 (surge)  EN 61000-4-6 (conducted)  EN 61000-4-11 (dips)	Shock resistance IEC 60068-2-27	30 g in all directions

### Insulation coordination

Class of protection	I, with PE connection	Insulation voltage	3 kV input/output; 2 kV input/earth; 0.5 kV output/earth
Pollution severity	2	electrical isolation, input-earth	2 kV
electrical isolation, input-output	3 kV	electrical isolation, output-earth	0.5 kV

### Electrical safety (applied standards)

Electrical machine equipment	Acc. to EN60204	For use with electronic equipment	Acc. to EN50178 / VDE0160
Protection against dangerous shock currents	Acc. to VDE0106-101	Protective separation protection against electrical shock	VDE0100-410 / acc. to DIN57100-410
Safety extra-low voltage	SELV acc. to EN60950, PELV acc. to EN60204	Safety transformers for switch-mode power supplies	Acc. to EN 61558-2-17

### Connection data (input)

Conductor cross-section, AWGcmil , max.	12	Conductor cross-section, AWGcmil , min.	26
Conductor cross-section, flexible , min.	0.5 mm <sup>2</sup>	Conductor cross-section, rigid , max.	6 mm <sup>2</sup>
Conductor cross-section, rigid , min.	0.5 mm <sup>2</sup>	Number of terminals [Input]	3 for L/N/PE
Tightening torque, max.	0.6 Nm	Tightening torque, min.	0.5 Nm
Wire connection cross section, flexible (input), max.	2.5 mm <sup>2</sup>		

### Connection data (output)

Conductor cross-section, AWGcmil , max.	12	Conductor cross-section, AWGcmil , min.	26
Conductor cross-section, flexible , max.	2.5 mm <sup>2</sup>	Conductor cross-section, flexible , min.	0.5 mm <sup>2</sup>
Conductor cross-section, rigid , max.	6 mm <sup>2</sup>	Conductor cross-section, rigid , min.	0.5 mm <sup>2</sup>
Number of terminals [Output]	5 ( ++ / - )	Tightening torque, max.	0.6 Nm
Tightening torque, min.	0.5 Nm		

## Data sheet...

### CP M SNT 120W 24V 5A

**Weidmüller Interface GmbH & Co. KG**  
 Klingenbergstraße 16  
 D-32758 Detmold  
 Germany  
 Fon: +49 5231 14-0  
 Fax: +49 5231 14-292083  
 www.weidmueller.com

## Technical data

### Approvals

Institute (GERMLLOYD)



Certificate No. (GERMLLOYD)

94767-10

Institute (cULus)



Certificate no. (cULus)

E258476VOL1SEC22

Institute (cURus)



Certificate No. (cURus)

E255651VOLX3A13

### Classifications

ETIM 3.0	EC001039	eClass 5.1	27-04-90-02
eClass 6.2	27-04-90-04	eClass 7.1	27-04-90-04

### Approvals

Approvals



ROHS

Conform

### Downloads

Package insert	<a href="#">Operating instructions</a>
Declaration of Conformity	<a href="#">K469_12_11.pdf</a>
PDF	<a href="#">Warranty information</a>
EPLAN	<a href="#">8951340000.ema</a>
<a href="#">3-D model</a>	

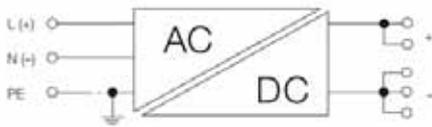
## Data sheet...

### CP M SNT 120W 24V 5A

**Weidmüller Interface GmbH & Co. KG**  
Klingenbergstraße 16  
D-32758 Detmold  
Germany  
Fon: +49 5231 14-0  
Fax: +49 5231 14-292083  
www.weidmueller.com

## Drawings

### Electric symbol



With DC connection, note polarity

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Surge Reduction Filter
<b>Location:</b>	Power Distribution
<b>Model Numbers:</b>	DAR-275V
<b>Manufacturer:</b>	Critec
<b>Supplier:</b>	Energy Correction Options PO Box 431 Kelvin Grove, QLD 4059  Ph: 07 3356 0577 Fax: 07 3356 1432 Web: <a href="http://www.ecoptions.com.au">www.ecoptions.com.au</a>

## INSTALLATION INSTRUCTIONS



**MODEL NUMBER  
DAR 275V**

### 1. PREPARATION



**DANGER:** *Electrical shock or burn hazard. Installation of this device should only be made by qualified personnel. Failure to lockout electrical power during installation or maintenance can result in fatal electrocution or severe burns. Before making any connections be sure that power has been removed from all associated wiring, electrical panels, and other electrical equipment.*



**CAUTION NOTES:**

1. *The installation of this device should follow all applicable electrical codes, such as the National Electrical Code.*
2. *Check to make sure line voltage does not exceed DAR275V voltage ratings.*
3. *Follow all instructions to ensure correct and safe operation.*
4. *Do not attempt to open or tamper with the DAR in any way as this may compromise performance and will void warranty. No user serviceable parts are contained.*

### 2. INTRODUCTION

Selected DSD, TDS & TDF DINLINE Surge Protection Devices include status monitoring circuits which provide visual status display of device capacity. They may also provide a low voltage opto-coupler alarm output circuit that can be connect to the DAR to provide potential free (Form C) change-over contacts. The DAR alarm contacts may be used to provide output to external alarm systems or remote monitoring circuits.

One DAR can be used per DSD/TDS/TDF opto-coupler alarm or up to 16 DSD opto-coupler alarms can be connected in series to the one DAR to provide a common output. It is recommended that the DAR be powered from the same power circuit that feeds the device(s) being monitored, however the DAR can be powered from other circuits. This allows for example, one DAR unit to be connected to separate SPDs that are protecting a three phase circuit.

Note. Depending upon the usage of the DAR output contacts, failure of power to the DAR may be interpreted as a failure of one or more of the SPDs being monitored. Visual inspection of the DAR and SPDs status displays would determine this.

### 3. MOUNTING

The DAR is designed to clip to 35mm (top hat) DIN rails (standard EN50022). Unless otherwise mechanically restrained, use horizontal DIN rails with the DAR module spring clips to the bottom and the label text the correct way up.

**NOTE:** The DAR must be installed in an enclosure or panel that:

- *prevents the DAR temperature from exceeding 131°F (55°C)*
- *provides adequate electrical and safety protection*
- *prevents the ingress of moisture and water*
- *allows DAR status indicators to be inspected*

### 4. ELECTRICAL CONNECTION

The interconnecting wiring should:

- *be of size #10 to #14 AWG (2.5mm<sup>2</sup> to 6mm<sup>2</sup>) solid or stranded conductor.*
- *The wire insulation should be stripped back 5/16" (8mm).*
- **NOTE:** *Do not use greater than 9inlbs (1Nm) of torque when tightening the terminals.*

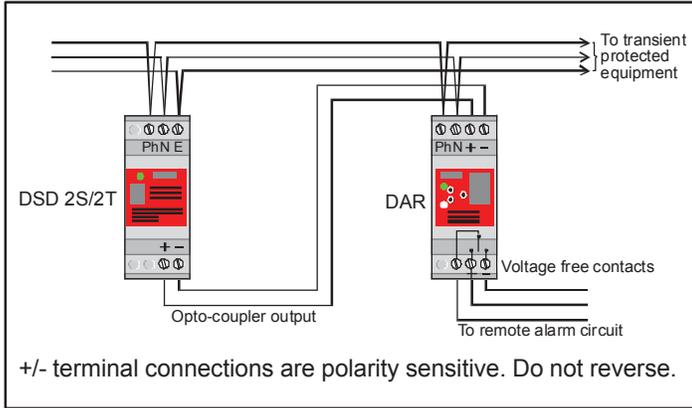
### CONNECTION TO TELECOMMUNICATIONS NETWORKS

The DAR is approved for use in Australia where the alarm contacts may be connected to private lines or building cabling associated with the telecommunications network. NO direct connection to the public switched network should be made.

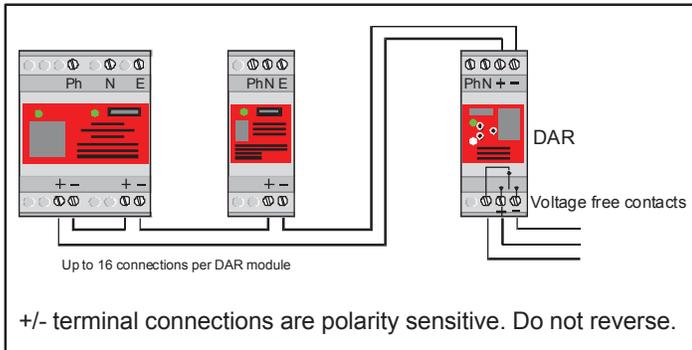
## INSTALLATION INSTRUCTIONS

### 5. INTERCONNECTION

When connecting the DAR to a single opto-coupler output the + terminal of the SPD should connect to the + terminal on the DAR. The – terminal should connect to the – terminal.



When connecting the DAR to multiple opto-couplers the opto-couplers should be connected in series with + terminal of one connected to the – terminal of the next. The DAR + terminal should connect to + SPD terminal at one end of the series connection and the – DAR terminal connect to the – SPD terminal at the other end of the series connection.



### 5. STATUS INDICATION

	✓	!	✗
STATUS	Protection Operational	Protection Alarm	Fault Mode
DISPLAY			
EXPLANATION	Normal operation Normal (green) indicator ON Red indicator OFF Relay is energised Power is supplied	DSD in alarm mode or power to DSD has been removed Normal (green) indicator OFF Red indicator ON Relay is de-energised Power is supplied	Power to DAR removed Protection status unknown Normal (green) indicator OFF Red indicator OFF Relay is de-energised Power is OFF

### 6. FUSING AND ISOLATION

Overcurrent protection must be installed in the upstream circuit of the power supply to the DAR to provide protection to the unit itself and the wiring in case of fault conditions.

The fuse rating should be based on the wiring size used to connect to the DAR Ph & N terminals. Australian regulations AS3000-1991, Table B2 specifies the following upstream protection for single phase circuits, unenclosed in air.

Cable Size	HRC Fuse or	CB Rewirable Fuse
1.5mm <sup>2</sup>	16A	12A
2.5mm <sup>2</sup>	20A	16A
4mm <sup>2</sup>	25A	20A
6mm <sup>2</sup>	32A	25A

Where overcurrent protection of the appropriate rating or smaller is already fitted in the upstream circuit, overcurrent protection at the DAR will not be required

### 6. MAINTENANCE & TESTING

Before removing a DAR unit from service, ensure that the power has been removed. Maintenance, testing and replacement should only be undertaken by qualified personnel.

Testing of a DAR unit which is connected to a fully functional DSD can be accomplished by removing power to the DSD only. The DAR Status indication and output contacts should alter from the Normal to Fault condition.

Testing of the DAR unit alone may be accomplished by disconnecting the + / -connections to the unit. When power is applied the DAR "Fault" Status Indicator should be illuminated. By connecting the + / - terminals together, the "Normal" Status Indicator should be illuminated. The output contacts should alter to the appropriate state.

### 7. USE OF OTHER INTERFACES

Only DAR units are recommended for the interfacing of equipment to the DSD, TDS & TDF opto-coupler alarm output circuit(s). The direct connection of other equipment to these opto-coupler alarm outputs may not provide sufficient isolation or exceed the opto-coupler specifications. This may damage the SPD and/or the connected equipment. Warranty may be voided under such circumstances.

**NOTE:** In connecting to the SPD opto-coupler alarm output(s), do not reverse the +/- connections as damage may occur.

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Surge Filter Alarm Relay
<b>Location:</b>	Power Distribution
<b>Model Numbers:</b>	TDF-10A-240V
<b>Manufacturer:</b>	Critec
<b>Supplier:</b>	Energy Correction Options PO Box 431 Kelvin Grove, QLD 4059  Ph: 07 3356 0577 Fax: 07 3356 1432 Web: <a href="http://www.ecoptions.com.au">www.ecoptions.com.au</a>

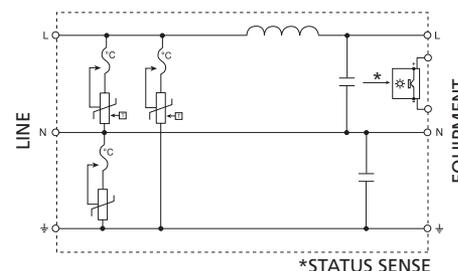
## CRITEC® Transient Discriminating Filter

## Features

- CRITEC® Transient Discriminating (TD) Technology provides increased service life
- In-line series protection
- High efficiency low pass sine wave filtering – ideal for the protection of switched mode power supplies
- Three modes of protection: L-N, L-PE & N-PE
- 35 mm DIN rail mount – simple installation
- LED status indication and opto-isolated output – for remote status monitoring
- CE, UL® 1449 Ed. 3 Listed

The TDF series has been specifically designed for process control applications to protect the switched mode power supply units on devices such as PLC controllers, SCADA systems and motor controllers. Units are UL® Recognized and available for 3A, 10A and 20A loads and suitable for 110-120V ac/dc and 220-240Vac circuits.

The TDF is a series connected, single phase surge filter providing an aggregate surge capacity of 50kA (8/20 $\mu$ s) across L-N, L-PE, and N-PE. The low pass filter provides up to 65dB of attenuation to voltage transients. Not only does this reduce the residual let-through voltage, but it also helps further reduce the steep voltage rate-of-rise providing superior protection for sensitive electronic equipment.



Model	TDF3A120V	TDF3A240V	TDF10A120V	TDF10A240V	TDF20A120V	TDF20A240V
Item Number for Europe	700001	700002	700003	700004	700005	700006
Nominal Voltage, U <sub>n</sub>	110-120 V	220-240 V	110-120 V	220-240 V	110-120 V	220-240 V
Distribution System	TN-C-S, TN-S					
Max Cont. Operating Voltage, U <sub>c</sub>	170VAC	340VAC	170VAC	340VAC	170VAC	340VAC
Stand-off Voltage	240V	400V	240V	400V	240V	400V
Frequency	0-60Hz	50/60Hz	0-60Hz			50/60Hz
Max Line Current, I <sub>L</sub>	3 A		10 A		20 A	
Operating Current @ U <sub>n</sub>	135 mA	250 mA	240 mA	480 mA	240 mA	480 mA
Max Discharge Current, I <sub>max</sub>	10kA 8/20 $\mu$ s N-PE 20kA 8/20 $\mu$ s L-N 20kA 8/20 $\mu$ s L-PE					
Protection Modes	All modes protected					
Technology	In-line series low pass sine wave filter TD Technology					
Voltage Protection Level, U <sub>p</sub>	500V @ 500A 250V @ 3kA	700V @ 500A 600V @ 3kA	500V @ 500A 250V @ 3kA	700V @ 500A 600V @ 3kA	500V @ 500A 250V @ 3kA	700V @ 500A 600V @ 3kA
Filtering	-62dB @ 100kHz		-65dB @ 100kHz		-53dB @ 100kHz	
Status	Green LED. On=Ok. Isolated opto-coupler output					
Dimensions H x D x W: mm (in)	90 x 68 x 72 (3.54 x 2.68 x 2.83)		90 x 68 x 144 (3.54 x 2.68 x 5.67)			
Module Width	4 M		8 M			
Weight: kg (lbs)	0.7 (1.54)		1.48 (3.25)		1.57 (3.46)	
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA®-1)					
Connection	1 mm <sup>2</sup> to 6 mm <sup>2</sup> (#18AWG to #10)					
Mounting	35 mm top hat DIN rail					
Back-up Overcurrent Protection	3A		10A		20A	
Temperature	-35°C to 55°C (-31°F to 131°F)					
Humidity	0% to 90%					
Approvals	C-Tick, CE (NOM 3A, 120V), CSA 22.2, UL® 1283, UL® 1449 Ed 3 Recognized Component Type 2					
Surge Rated to Meet	ANSI/IEEE® C62.41.2 Cat A, Cat B, Cat C					

(1) Opto-coupler output can be connected to DINLINE Alarm Relay (DAR275V) to provide Form C dry contacts.

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Active: 30/09/2015

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Q-Pulse Id: TMS1408

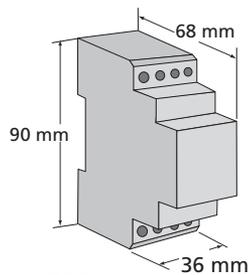
## CRITEC® Dinline Surge Filter

## Features

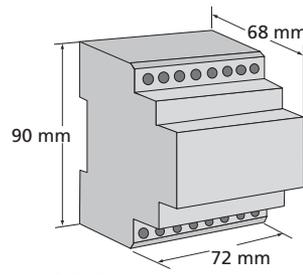
- In-line series protection
- EMI/RFI noise filtering – protects against industrial electrical noise
- Compact design – fits into motor control and equipment panels
- Three modes of protection: L-N, L-PE & N-PE
- 35 mm DIN rail mount – simple installation
- LED power indicator

The “two port” DSF series has been specifically designed for process control applications to protect the switched mode power supply units on devices such as PLC controllers, SCADA systems and motor controllers. The 30V unit is suitable for 12V and 24Vac/dc signaling and control systems.

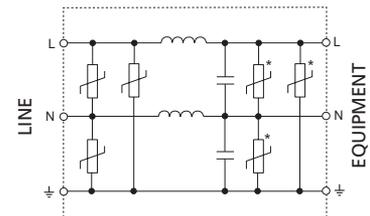
The 6A DSF series incorporates a space efficient, low pass, series filter which provides attenuation to high frequency interference. The larger 20A model provides status indication and a higher surge rating, making this ideal for the protection of higher risk equipment.



DSF6A



DSF20A



\*DSF20A275V only

Model	DSF6A30V	DSF6A150V	DSF6A275V	DSF20A275V
Item Number for Europe	702090	701000	701030	701020
Nominal Voltage, $U_n$	24	110-120 V	220-240 V	
Distribution System	1Ph 2W+G			
System Compatibility	TN-S, TN-C-S			
Max Cont. Operating Voltage, $U_c$	30VAC, 38VDC	150VAC	275VAC	
Frequency	0-60Hz	50/60Hz		
Max Line Current, $I_L$	6 A	20 A		
Operating Current @ $U_n$	7 mA			
Max Discharge Current, $I_{max}$	4kA 8/20 $\mu$ s	16kA 8/20 $\mu$ s	15kA 8/20 $\mu$ s L-N 15kA 8/20 $\mu$ s L-PE 25kA 8/20 $\mu$ s N-PE	
Protection Modes	All modes protected			
Technology	In-line series filter MOV			
Voltage Protection Level, $U_p$	110V @ 3kA	400V @ 3kA	750V @ 3kA	710V @ 3kA
Filtering	-3dB @ 300kHz			-3dB @ 62kHz
Status	LED power indicator			Status indicator
Dimensions H x D x W: mm (in)	90 x 68 x 36 (3.54 x 2.68 x 1.42)	90 x 68 x 72 (3.54 x 2.68 x 2.83)		
Module Width	2 M			4 M
Weight: kg (lb)	0.2 (0.441)			0.7 (1.543)
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)			
Connection	1 mm <sup>2</sup> to 6 mm <sup>2</sup> (#18AWG to #10AWG)			
Mounting	35 mm top hat DIN rail			
Back-up Overcurrent Protection	6A			20A
Temperature	-35°C to 55°C (-31°F to 131°F)			
Humidity	0% to 90%			
Approvals	C-Tick, CE, NOM, UL® 1449 Ed 3 Recognized Component Type 2		C-Tick, CE	
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B			

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# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Surge Diverter
<b>Location:</b>	Power Distribution
<b>Model Numbers:</b>	TDS1100-2SR-277
<b>Manufacturer:</b>	Critec
<b>Supplier:</b>	Energy Correction Options PO Box 431 Kelvin Grove, QLD 4059  Ph: 07 3356 0577 Fax: 07 3356 1432 Web: <a href="http://www.ecoptions.com.au">www.ecoptions.com.au</a>

# CRITEC<sup>®</sup> Transient Discriminating Surge Diverters



# Surge Protection And Surge Ratings

The stress, which an SPD will experience under surge conditions, is a function of many complex and interrelated parameters. These include:

- Location of the SPD(s) within the structure – are they located at the main distribution board or within the facility at secondary board, or even in front of the end-user equipment?
- Method of coupling the lightning strike to the facility – for example, is this via a direct strike to the structures LPS, or via induction onto building wiring due to a nearby strike?
- Distribution of lightning currents within the structure – for example, what portion of the lightning current enters the earthing system and what remaining portion seeks a path to remote grounds via the power distribution system and equipotential bonding SPDs?
- Type of power distribution system – the distribution of lightning current on a power distribution system is strongly influenced by the grounding practice for the neutral conductor. For example, in the TN-C system with its multiple earthed neutral, a more direct and lower impedance path to ground is provided for lightning currents than in a TT system.
- Additional conductive services connected to the facility – these will carry a portion of the direct lightning current and therefore reduce the portion which flows through the power distribution system via the lightning equipotential bonding SPD.
- Type of waveshape – it is not possible to simply consider the peak current which the SPD will have to conduct, one also has to consider the waveshape of this surge. It is also not possible to simply equate the areas under the current-time curves (also referred to as the action integral) for SPDs under different waveshapes.

Many attempts have been made to quantify the electrical environment and “threat level” which an SPD will experience at different locations within a facility. The new IEC<sup>SM</sup> standard on lightning protection, IEC 62305-4 “Protection against lightning - Part 4: Electrical and electronic systems within structures” has sought to address this issue by considering the highest surge magnitude which may be presented to an SPD based on the lightning protection level (LPL) being considered. For example, this standard postulates that under a LPL I the magnitude of a direct strike to the structure’s LPS may be as high as 200kA 10/350. While this level is possible, its statistical probability of occurrence is approximately 1%. In other words, 99% of discharges will be less than this postulated 200 kA peak current level.

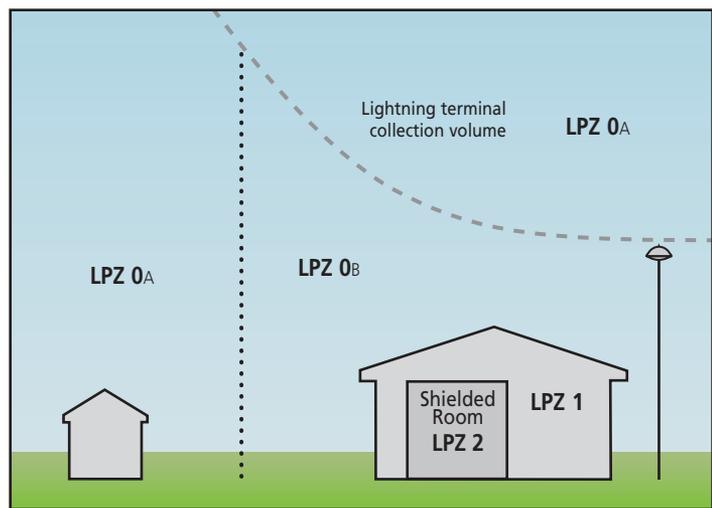
An assumption is made that 50% of this current is conducted via the building’s earthing system, and 50% returns via the equipotential bonding SPDs connected to

a three wire plus neutral power distribution system. It is also assumed that no additional conductive service exists. This implies that the portion of the initial 200 kA discharge experienced by each SPD is 25 kA.

Simplified assumptions of current dispersion are useful in considering the possible threat level, which the SPD(s) may experience, but it is important to keep in context the assumptions being made. In the example above, a lightning discharge of 200kA has been considered. It follows that the threat level to the equipotential bonding SPDs will be less than 25kA for 99% of the time. In addition, it has been assumed that the waveshape of this current component through the SPD(s) will be of the same waveshape as the initial discharge, namely 10/350, while in reality the waveshape have been altered by the impedance of building wiring, etc.

Many standards have sought to base their considerations on field experience collected overtime. For example, the IEEE® guide to the environment C62.41.1 and the recommended practice C62.41.2 present two scenarios of lightning discharge and different exposure levels under each of these depending on the location where the SPD is installed. In this standard, Scenario II depicts a direct strike to the structure, while Scenario I depicts a nearby strike and the subsequent conducted current into a structure via power and data lines. The highest surge exposure considered feasible to an SPD installed at the service entrance to a facility under Scenario I is 10kA 8/20, while under Scenario II it is considered to be 10kA 10/350 (exposure Level 3).

From the above, it is apparent that the selection of the appropriate surge rating for an SPD depends on many complex and interconnected parameters. When addressing such complexities, one needs to keep in mind that one of the more important parameters in selecting an SPD is its limiting voltage performance during the expected surge event, and not the energy withstand which it can handle.



Protection zones defined by specific product application.

# Advanced Technologies – The ERICO® Advantage

## Transient Discriminating Technology

To meet the fundamental requirements of performance, longer service life and greater safety under real world conditions, ERICO has developed Transient Discriminating (TD) Technology.

This quantum leap in technology adds a level of “intelligence” to the Surge Protection Device enabling it to discriminate between sustained abnormal over-voltage conditions and true transient or surge events. Not only does this help ensure safe operation under practical application, but it also prolongs the life of the protector since permanent disconnects are not required as a means of achieving internal over-voltage protection.

### Traditional Technologies

Conventional SPD technologies utilize metal oxide varistors and/or silicon avalanche diodes to clamp or limit transient events. However, these devices are susceptible to sustained 50/60Hz mains over-voltage conditions which often occur during faults to the utility system. Such occurrences present a significant safety hazard when the suppression device attempts to clamp the peak of each half cycle on the mains over-voltage. This condition can cause the device to rapidly accumulate heat and in turn fail with the possibility of inducing a fire hazard.

### The Core of TD Technology

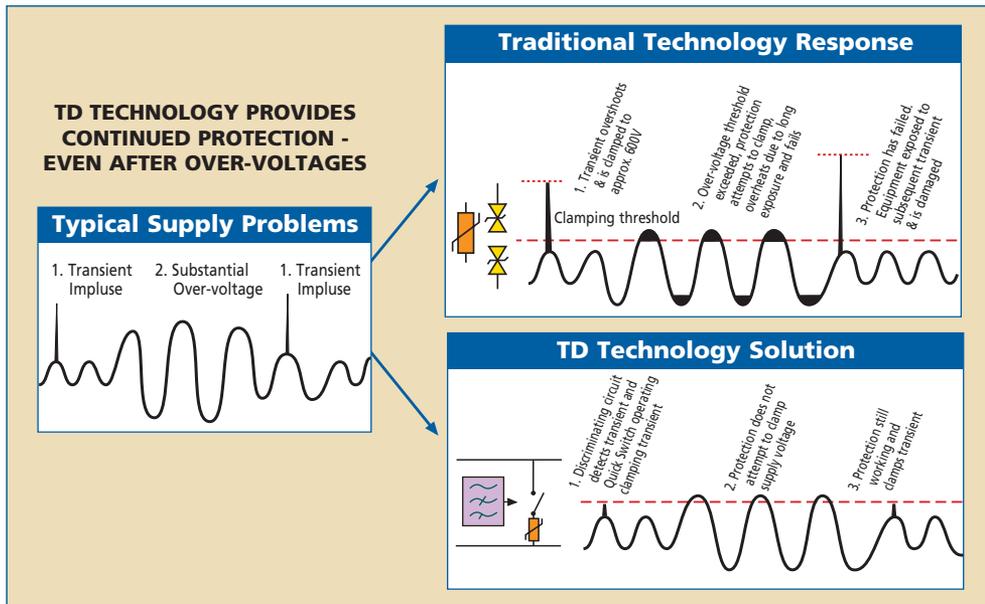
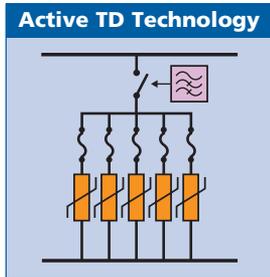
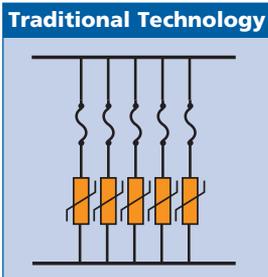
The secret to ERICO’s Transient Discriminating Technology is its *active frequency discrimination* circuit. This patented device can discriminate between a temporary over-voltage (TOV) condition

and a very fast transient, which is associated with lightning or switching-induced surges. When the transient frequencies are detected, the patented Quick-Switch within TD activates to allow the robust protection to limit the incoming transient. The frequency discriminating circuit that controls the Quick-Switch helps ensure that the SPD device is immune to the effects of a sustained 50 or 60Hz TOV. This allows the device to keep operating, in order to help provide safe and reliable transient protection, even after an abnormal over-voltage condition has occurred.

### Meeting & Exceeding UL® Standards

The CRITEC® range of surge protection devices from ERICO® employing TD Technology has been specifically designed to meet and exceed the new safety requirements of UL 1449 Edition 3. To meet the abnormal over-voltage testing of UL 1449 Edition 3, many manufacturers of SPD devices have incorporated fuse or thermal disconnect devices which permanently disconnect all protection from the circuit during an over-voltage event. Transient Discriminating Technology on the other hand will allow the SPD device to experience an abnormal over-voltage up to twice its nominal operating voltage and still remain operational even after this event! This allows the device to help provide safe, reliable and continuous protection to your sensitive electronic equipment. TD Technology is especially recommended for any site where sustained over-voltages are known to occur, and where failure of traditional SPD technologies cannot be tolerated.

The UL 1449 testing standard addresses the safety of an SPD device under temporary and abnormal overvoltage conditions, but does not specifically mandate a design that will give a reliable, long length of service in the real world. Specifically, UL 1449 tests that the SPD remains operational at 10% above nominal supply voltage, allowing SPD manufacturers to design products that permanently disconnect just above that. Most reputable manufacturer’s designs allow for up to a 25% overvoltage, while ERICO’s TD Technology gives even greater overhead.



**CRITEC® TDS Surge Diverter - TDS130 Series****Features**

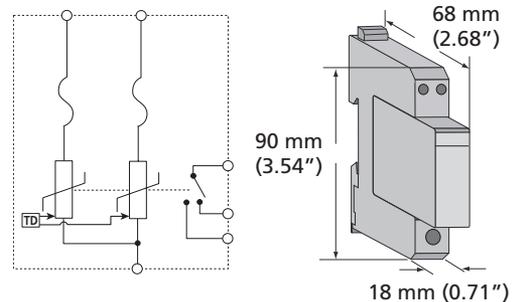
- CRITEC TD Technology with thermal disconnect protection
- Compact package, modular DIN rail mounting for limited space requirements
- Three modes of protection: L-N, L-PE & N-PE
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 15kA 8/20 $\mu$ s surge rating per mode
- CE, UL® 1449 Edition 3 Listed

Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS130 series of surge suppressors provide economical and reliable protection from voltage transients on power distribution systems. The TDS130 is specifically designed for the protection of single phase power supplies within instrumentation and control applications. They are conveniently packaged for easy installation on 35 mm DIN rail within control panels.

CRITEC® TD technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe behavior at end-of life. A visual indicator flag provides user-feedback in the event of such operation. The TDS130 provides a set of optional voltage-free contacts for remote signaling that maintenance is required.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.



Model	TDS1301TR150	TDS1301TR240
Item Number for Europe	702421	702422
Nominal Voltage, $U_n$	120-150 VAC	220-240 VAC
Max Cont. Operating Voltage, $U_c$	170VAC	275VAC
Stand-off Voltage	230VAC	440VAC
Frequency	0-100Hz	
Nominal Discharge Current, $I_n$	8kA 8/20 $\mu$ s per mode	
Max Discharge Current, $I_{max}$	15kA 8/20 $\mu$ s L-N 15kA 8/20 $\mu$ s L-PE	
Protection Modes	L-G, L-N, N-G	
Technology	TD Technology with thermal disconnect	
Short Circuit Current Rating, $I_{sc}$	200kAIC	
Back-up Overcurrent Protection	63AgL, if supply > 63A	
Voltage Protection Level, $U_p$	500V @ 3kA (L+N-G) 800V @ 3kA (L-N)	800V @ 3kA (L+N-G) 1500V @ 3kA (L-N)
Status	N/O, N/C Change-over contact, 250V~/0.5A, max 1.5 mm <sup>2</sup> (#14AWG) terminals Mechanical flag / remote contacts (R model only)	
Module Width	1 M	
Dimensions H x D x W: mm (in)	90 x 68 x 18 (3.54 x 2.68 x 0.71)	
Weight: kg (lbs)	0.12 (0.26)	
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)	
Connection	1 mm <sup>2</sup> to 6 mm <sup>2</sup> (#18AWG to #10AWG) Line and Neutral Terminals $\leq$ 25 mm <sup>2</sup> (#4AWG) stranded $\leq$ 35 mm <sup>2</sup> (#2AWG) solid PE Terminal	
Mounting	35 mm top hat DIN rail	
Temperature	-40°C to 80°C (-40°F to 176°F)	
Humidity	0% to 90%	
Approvals	CE, IEC® 61643-1, UL® 1449 Ed 3 Recognized Component Type 2	
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B IEC 61643-1 Class II UL® 1449 Ed3 In 3kA mode	
Replacement Module	TDS130M150	TDS130M240
Replacement Module (Europe)	702432	702424

## CRITEC® TDS Surge Diverter - TDS150 Series

## Features

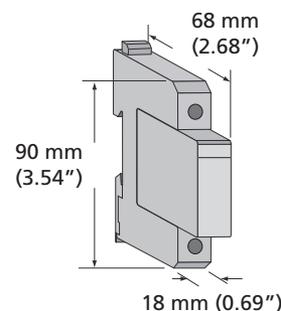
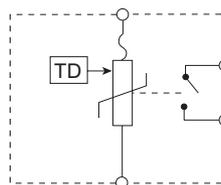
- CRITEC® TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 50kA 8/20 $\mu$ s maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems
- CE, UL® 1449 Edition 3 Listed

Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS150 series of surge suppressors provide economical and reliable protection from voltage transients on power distribution systems. They are conveniently packaged for easy installation on 35 mm DIN rail within main distribution panelboards.

CRITEC® TD technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS150 provides a set of voltage-free contacts for remote signaling that maintenance is required.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.



Model	TDS1501SR150	TDS1501SR240	TDS1501SR277	TDS1501SR560
Item Number for Europe	702404	702406	702407	702408
Nominal Voltage, $U_n$	120-150 VAC	220-240 VAC	240-277 VAC	480-560 VAC
Max Cont. Operating Voltage, $U_c$	170VAC	275VAC	320VAC	610VAC
Stand-off Voltage	240VAC	440VAC	480VAC	700VAC
Frequency	0-100Hz			
Short Circuit Current Rating, $I_{sc}$	200kAIC			
Back-up Overcurrent Protection	125AqL, if supply > 100A			
Technology	TD with thermal disconnect			
Max Discharge Current, $I_{max}$	50kA 8/20 $\mu$ s			
Nominal Discharge Current, $I_n$	25kA 8/20 $\mu$ s	20kA 8/20		
Protection Modes	Single mode (L-G, L-N or N-G)			
Voltage Protection Level $U_p$	400V @ 3kA 1.0kV @ $I_n$	700V @ 3kA 1.2kV @ $I_n$	800V @ 3kA 1.6kV @ $I_n$	1.8kV @ 3kA 2.4kV @ $I_n$
Status	N/O, N/C Change-over contact, 250V~/.05A, max 1.5 mm <sup>2</sup> (#14AWG) terminals Mechanical flag / remote contacts (R model only)			
Dimensions H x D x W: mm (in)	90 x 68 x 18 (3.54 x 2.68 x 0.69)			
Module Width	1 M			
Weight: kg (lbs)	0.12 (0.26)			
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)			
Connection	$\leq$ 25 mm <sup>2</sup> (#4AWG) stranded $\leq$ 35 mm <sup>2</sup> (#2AWG) solid			
Mounting	35 mm top hat DIN rail			
Temperature	-40°C to 80°C (-40°F to 176°F)			
Humidity	0% to 90%			
Approvals	CE, IEC® 61643-1, UL® 1449 Ed 3 Recognized Component Type 2			
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B, Cat C ANSI®/IEEE® C62.41.2 Scenario II, Exposure 2, 50kA 8/20 $\mu$ s IEC 61643-1 Class II UL® 1449 Ed3 In 20kA mode			
Replacement Module	TDS150M150	TDS150M240	TDS150M277	TDS150M560

**CRITEC® TDS Surge Diverter - TDS1100 Series****Features**

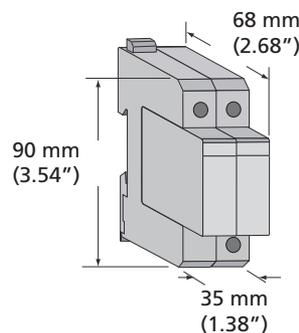
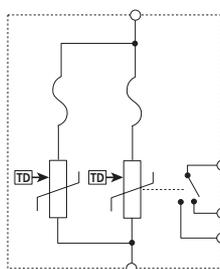
- CRITEC® TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 100kA 8/20 $\mu$ s maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems
- CE, UL® 1449 Edition 3 Listed

Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS1100 series of surge suppressors provide economical and reliable protection from voltage transients on power distribution systems. They are conveniently packaged for easy installation on 35 mm DIN rail within main distribution panelboards.

CRITEC® TD technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS1100 provides a set of voltage-free contacts for remote signaling that maintenance is due.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.



Model	TDS11002SR150	TDS11002SR240	TDS11002SR277	TDS11002SR560
Item Number for Europe	702409	702411	702412	702413
Nominal Voltage, U <sub>n</sub>	120-150 VAC	220-240 VAC	240-277 VAC	480-560 VAC
Max Cont. Operating Voltage, U <sub>c</sub>	170VAC	275VAC	320VAC	610VAC
Stand-off Voltage	240VAC	440VAC	480VAC	700VAC
Frequency	0-100Hz			
Short Circuit Current Rating, I <sub>sc</sub>	200kAIC			
Back-up Overcurrent Protection	125AgL, if supply > 100A			
Technology	TD with thermal disconnect			
Max Discharge Current, I <sub>max</sub>	100kA 8/20 $\mu$ s			
Impulse Current, I <sub>imp</sub>	12.5kA 10/350 $\mu$ s			
Nominal Discharge Current, I <sub>n</sub>	50kA 8/20 $\mu$ s	40kA 8/20 $\mu$ s		
Protection Modes	Single mode (L-G, L-N or N-G)			
Voltage Protection Level, U <sub>p</sub>	400V @ 3kA 1.0kV @ 20kA	700V @ 3kA 1.2kV @ 20kA	800V @ 3kA 1.6kV @ 20kA	1.8kV @ 3kA 2.4kV @ 20kA
Status	N/O, N/C Change-over contact, 250V~/0.5A, max 1.5 mm <sup>2</sup> (#14AWG) terminals Mechanical flag / remote contacts (R model only)			
Dimensions H x D x W: mm (in)	90 x 68 x 35 (3.54 x 2.68 x 1.38)			
Module Width	2 M			
Weight: kg (lbs)	0.24 (0.53)			
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)			
Connection	$\leq$ 25 mm <sup>2</sup> (#4AWG) stranded $\leq$ 35 mm <sup>2</sup> (#2AWG) solid			
Mounting	35 mm top hat DIN rail			
Temperature	-40°C to 80°C (-40°F to 176°F)			
Humidity	0% to 90%			
Approvals	CE, IEC® 61643-1, UL® 1449 Ed 3 Recognized Component Type 2			
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B, Cat C ANSI®/IEEE® C62.41.2 Scenario II, Exposure 3, 100kA 8/20 $\mu$ s, 10kA 10/350 $\mu$ s IEC 61643-1 Class I and Class II UL® 1449 Ed3 In 20kA mode			
Replacement MOV Module	TDS150M150	TDS150M240	TDS150M277	TDS150M560

## CRITEC® TDS Surge Diverter - TDS350 Series

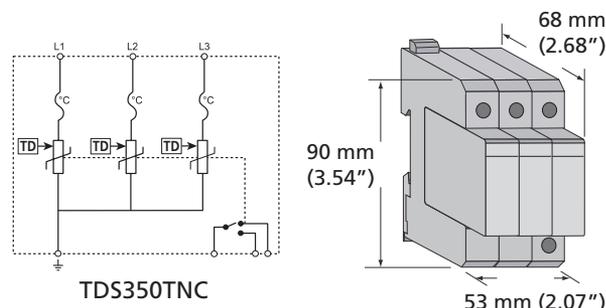
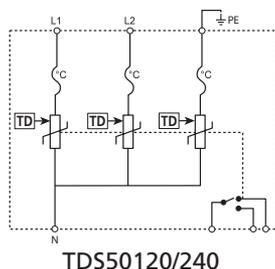
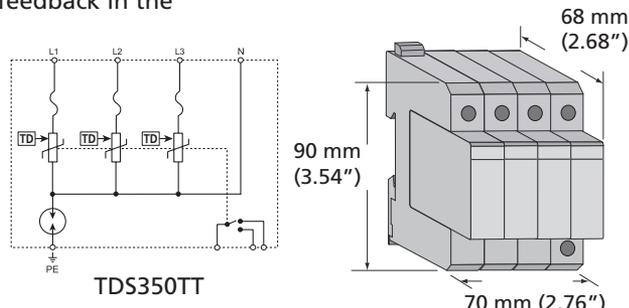
### Features

- CRITEC® TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 50kA 8/20µs maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems
- CE, UL® 1449 Edition 3 Listed

Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

CRITEC® TD technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS provides a set of voltage-free contacts for remote signaling that maintenance is due.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.



Model	TDS350TNC150	TDS50120240	TDS350TNC277	TDS350TT150	TDS350TT277
Item Number for Europe	702414	702419	702417	702416	702418
Nominal Voltage, U <sub>n</sub>	120-150 VAC		240-277 VAC	120-150 VAC	240-277 VAC
Max Cont. Operating Voltage, U <sub>c</sub>	170/295VAC	240/480VAC	320/536VAC	170/295VAC	320/536VAC
Stand-off Voltage	240/415VAC	240/480VAC	480/813VAC	240/415VAC	480/813VAC
Frequency	0-100Hz				
Short Circuit Current Rating, I <sub>sc</sub>	200kAIC				
Back-up Overcurrent Protection	125AgL, if supply > 100A				
Technology	TD with thermal disconnect				
Max Discharge Current, I <sub>max</sub>	50kA 8/20µs			12.5kA 10/350µs N-PE 50kA 8/20µs	
Nominal Discharge Current, I <sub>n</sub>	25kA 8/20µs		20kA 8/20	25kA 8/20µs	20kA 8/20
Protection Modes	L-N	L-N, N-PE	L-N	L-N, N-PE	
Voltage Protection Level, U <sub>p</sub>	400V @ 3kA 1.0kV @ I <sub>n</sub>		800V @ 3kA 1.6kV @ I <sub>n</sub>	400V @ 3kA 1.0kV @ I <sub>n</sub>	800V @ 3kA 1.6kV @ I <sub>n</sub>
Status	N/O, N/C Change-over contact, 250V~/0.5A, max 1.5 mm <sup>2</sup> (#14AWG) terminals Mechanical flag / remote contacts				
Dimensions H x D x W: mm (in)	90 x 68 x 53 (3.54 x 2.68 x 2.07)			90 x 68 x 70 (3.54 x 2.68 x 2.76)	
Module Width	3 M			4 M	
Weight: kg (lbs)	0.36 (0.79)			0.5 (1.10)	
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)				
Connection	≤25 mm <sup>2</sup> (#4AWG) stranded ≤35 mm <sup>2</sup> (#2AWG) solid				
Mounting	35 mm top hat DIN rail				
Temperature	-40°C to 80°C (-40°F to 176°F)				
Humidity	0% to 90%				
Approvals	CE, IEC® 61643-1, UL® 1449 Ed 3 Recognized Component Type 2				
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B, Cat C ANSI®/IEEE® C62.41.2 Scenario II, Exposure 2, 50kA 8/20µs IEC 61643-1 Class II UL® 1449 Ed3 In 20kA mode				
Replacement MOV Module	TDS150M150		TDS150M277	TDS150M150	TDS150M277
Replacement GDT Module	-			SGD112M	
Replacement GDT Module (Europe)	-			702403	



# TECHNICAL DATA SHEET

**Equipment Type:**

Radio

**Location:**

RTU Section

**Model Numbers:**

DR900

**Manufacturer:**

Trio

**Supplier:**

Schneider

80 Schneider Rd Taylor Pl  
Eagle Farm  
1300 369 233

# D Series

## Data Radio Modem

### DR900 - Digital Radios

Trio DataCom's **D Series** are high performance cost effective data radio modems designed as an alternative to hard wired data transport. Transmit your data over radio with a fully integrated data radio modem designed for fixed point-to-point and point-to-multipoint applications.

The **D Series** is available as either a half duplex or a full duplex\* 853-929 MHz +/- 5MHz radio, including a fully integrated 4800 / 9600 bps data modem. These units operate equally well in either a stand-alone configuration, or as part of a large communication system.

This complete package forms an attractively priced product for the transmission of data over radio in fixed applications thus providing a viable alternative to costly networks of buried media.



#### Features:

- ❖ Fully integrated half and full duplex\* radio and modem
- ❖ Transparent and non-intrusive remote diagnostic facilities (Optional)
- ❖ Inbuilt data routing and multiplexing capabilities, multi-port operation
- ❖ Simultaneous delivery of multiple protocols using Trio DataCom's unique MultiStream™ technology
- ❖ Digital Signal Processing (DSP) modem
- ❖ Selectable 300-19,200 bps asynchronous RS232 user interface
- ❖ Built-in antenna diplexer\*
- ❖ Integrated supervisory data channel
- ❖ Unique collision avoidance facility, for unsolicited report-by-exception
- ❖ Software selectable configuration parameters
- ❖ Internal repeater operation
- ❖ Housed in an attractive yet robust metal enclosure
- ❖ Range of ancillary equipment - full duplex base / repeater stations and hot-standby base station

#### Radio

The **D Series** radio has been designed to meet worldwide regulatory guidelines, including FCC, and has adjustable power output up to 5 Watts. This fully synthesised radio is programmable in 6.25/7.5 kHz increments to accommodate various worldwide channel spacings. The receiver section has a wide tuning range with an excellent signal-to-noise ratio. Exceptional frequency stability is achieved by intelligent microprocessor controlled temperature compensation. An extended operating temperature range of -30 to 60°C makes the unit ideal for commercial and industrial applications.

#### Modem

The in-built modem includes a custom DSP developed for data communications over narrow band radio systems.

This system offers minimum occupied bandwidth and optimal data integrity (using the standard HDLC protocol with CCITT CRC error detection) inhibiting the transfer of any rogue unwanted data caused by interference or squelch headers / tails.

The Trio DataCom DSP provides:

- the interface between the asynchronous RS232 user communication and the synchronous radio link layer.
- an inbuilt multiplexer / router which allows for simultaneous transportation of multiple protocols over the one radio network.

#### Applications

The **D Series** is ideal for use in a variety of sophisticated and critical SCADA and Distributed Information Systems, where complex routing of multiple data protocols and remote diagnostics and wireless network management are important factors.

Remote units and a number of full duplex base station / repeater models, suitable for a variety of requirements, make up the **D Series**. At the top of the range, the DH model is a genuine, duplicated hot standby base for systems where nothing short of ultra reliability is acceptable.

**Telemetry Systems** - Utilities (Gas, Water, Electricity), Railways, Mining, Telecommunications, Industry. Where network status, system control, data collection and fault conditions are required.

**Transaction Processing** - Point of Sale Credit Terminals, Stock Control, Direct Order, Banks, Building Societies, Stock Brokers, Gambling Organizations, etc, where Point of Sale, inventory, credit, or transaction data requires collection and distribution.

**Common Carrier Data Services** - The high speed, low cost and spectrum efficiency of this device make it well suited to all forms of common carrier data networking.

**Alarm Monitoring** - Fire, Power, Intrusion & Essential Services Alarm Reporting.

## D Series - Data Radio Modem

### DR900 - Digital Radios

#### Configuration

Configuration using Trio's **D Series** programming software (DRProg) is completely Windows® based for all parameters, such as; frequency, transmitter power, digital mute level, PTT timer, system configurations, port settings.

#### Network Management & Diagnostic (Optional)

A large distributed network, or even a simple point-to-point link, requires comprehensive fault reporting and diagnostics to ensure a high level of availability. Trio **D Series** data radio modem products offer sophisticated in-built diagnostics using the optional **TView™** software. This capability allows the customer to remotely monitor and maintain their system, minimising the likelihood of failures, by pointing out component degradation and decreasing the time to diagnose and repair. There is no necessity to visit the master station or interfere with the host data integrity, other than additional data transfer. For further details, consult the **TView** data sheet.

#### Specifications:

RADIO	
Frequency Range**	853-929 MHz +/- 5MHz
Channel Selection	Fully programmable
Frequency Splits	76 MHz Tx/Rx frequency split available including simplex
Frequency Stability	±1ppm (-10 to 60°C ambient, opt. -30 to 70°C) Higher frequency stability options are available due to intelligent processor controlled temperature compensation
Aging	<= 1ppm/annum
Half / Full Duplex	half duplex or full duplex*
Data Rate (rf)	4800 / 9600 bps
Configuration	All configuration via Windows software
TRANSMITTER	
Tx Power	5 W (+37 dBm) or 1 W* (+30 dBm) (software programmable)
Modulation	Narrow band digital filtering binary GMSK
Occupied Bandwidth	Meets various international regulatory guidelines for point-to-point and point-to-multipoint
Tx Attach Time	< 1 mSecond
Timeout Timer	Programmable 1-255 seconds
Tx Spurious	<= -65 dBm
RECEIVER	
Sensitivity	-115 dBm for 12 dB SINAB
Blocking	> 75 dB (EIA)
Intermodulation	<= 70 dB (EIA)
Spurious Response	<= 70 dB (EIA)
Select. and Desense	70 dB (EIA)
AFC Tracking	±3 kHz tracking @ -90 dBm/attack time <10 mS
Mute	Programmable digital mute

#### Collision Avoidance

A unique fully integrated, yet independent, low speed supervisory data channel embedded within the primary bit-stream provides collision avoidance facilities which are transparent to the user. The use of this feature makes this product ideally suited for reliable, error free data transmissions between stations in high density point-to-multipoint data networks.

The benefits include:

- Multiple asynchronous applications operating on the one radio channel.
- Enhanced performance of report-by-exception networks.

#### Related Products

- ❖ Base Stations (DB900)
- ❖ Hot Standby Base Station (DH900)
- ❖ 9 Port Stream Router Multiplexer (MSR)
- ❖ Network Management and Diagnostic Software (TView™)
- ❖ D Series Programming Software (DRProg™)

CONNECTIONS	
User Data Port	2 x DB9 RS232 female ports
Antenna	SMA female bulkhead (optional N)
Power	2 pin locking. Mating connector supplied
MODEM	
Data Serial Port #1	Full duplex, DB9 RS232, DCE (modem), 300-19,200 bps asynchronous, hardware/software handshaking
Data Serial Port #2	Full duplex, DB9 RS232, 300-9600 bps asynchronous, software handshaking
Data Storage	On-board RAM
Channel Data Rate	4800 / 9600 bps, full duplex
Bit Error Rate	< 1x10 <sup>-6</sup> @ -108 dBm (4800 bps) < 1x10 <sup>-6</sup> @ -105 dBm (9600 bps)
Collision Avoidance	Trio DataCom's unique supervisory channel C/DSMA collision avoidance system
MultiStream™	Trio DataCom's unique simultaneous delivery of multiple data streams (protocols)
GENERAL	
Power Supply	13.8 Vdc nominal (11-16 Vdc)
Transmit Current	600 mA max. @ 1 W 1700 mA max. @ 5 W
Receive Current	175 mA
Dimensions	260 x 161 x 65 mm (robust metal enclosure)
Weight	1.3 kg

\* Available for DR900 full duplex 1 W version (853 ± 5 MHz / 929 ± 5 MHz)

\*\* Various sub-frequency bands available.

Note: Model codes previously known as xxxDR are now depicted as DRxxx.

designs products & solutions

Local regulatory conditions may determine the suitability of individual versions in different countries. It is the responsibility of the buyer to confirm these regulatory conditions.

Performance data indicates typical values related to the described unit. Information subject to change without notice.

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# TECHNICAL DATA SHEET

**Equipment Type:** 3 Phase inlet

**Location:** External

**Model Numbers:** 3658 and 40787

**Manufacturer:** Mennekes

**Supplier:** DKSH

03 9554 666

# Industrial plugs and receptacles



International  
Wiring  
Devices

# Global focus



MENNEKES plugs and receptacles are well known all over the world – and comply with the relevant national and international standards.

More than half of our products are destined for international markets.

This is why MENNEKES also has a global presence, with subsidiaries and agencies in more than 90 countries.

When plugs and receptacles are being tested by independent testing authorities, such as the VDE Testing and Certification Institute, the test reports are compiled according to CCA or CB-II procedures. They then serve as the basis for approvals in other countries, such as those whose national test marks are shown below.

For plugs and receptacles for USA and Canada please contact us.





# CEE receptacles 16A up to 125A

63A: SoftCONTACT, 125A: TorsionSpringCONTACT

Other voltages and frequencies available on request.

**Wall mounted receptacles**



A	P	110V	230V	400V
16	3	1177	1178	—
16	4	—	1267	1268
16	5	—	—	1
32	3	1368	1369	—
32	4	1371	1372	1373
32	5	—	—	2

▲ IP 44

**Wall mounted receptacles**



A	P	110V	230V	400V
16	3	—	—	—
16	4	3030	3034	1418
16	5	3041	3045	1419
32	3	1420	1421	1422
32	4	1423	1424	1425
32	5	1555	1556	1557

▲ IP 44

**Wall mounted receptacles**



A	P	110V	230V	400V
16	3	1193	1192	1211
16	4	1194	1195	1196
16	5	1198	1199	1200
32	3	1201	1202	1203
32	4	1204	1205	1206
32	5	1208	1209	1210

▲▲ IP 67

**Wall mounted receptacles**



A	P	110V	230V	400V
63	3	—	—	—
63	4	—	—	—
63	5	—	—	—
125	3	—	—	—
125	4	137	138	139
125	5	141	142	143

▲▲ IP 67

**Panel mounted receptacles**

straight



A	P	110V	230V	400V
16	3	1365	1366	1367
16	4	1388	1389	1390
16	5	1384	1386	1385
32	3	1394	1395	1396
32	4	1397	1398	1399
32	5	3449	3454	3451

▲ IP 44

**Panel mounted receptacles**

angled 20°



A	P	110V	230V	400V
16	3	1462	1463	1464
16	4	1465	1466	1467
16	5	1471	1472	1473
32	3	1491	1492	1493
32	4	1494	1495	1496
32	5	1498	1499	1500

▲ IP 44

**Panel mounted receptacles**

straight



A	P	110V	230V	400V
63	3	1260	1261	1262
63	4	1246	1247	1248
63	5	1250	1251	1252
125	3	—	—	—
125	4	—	—	—
125	5	—	—	—

▲ IP 44

**Panel mounted receptacles**

angled 20°



A	P	110V	230V	400V
63	3	1146	1147	1148
63	4	1149	1150	1151
63	5	1153	1154	1155
125	3	—	—	—
125	4	—	—	—
125	5	—	—	—

▲ IP 44

**Panel mounted receptacles with standard flange dimensions**

angled 20°, flange: 85 x 85 mm, fixing hole spacing: 70 x 70 mm



A	P	110V	230V	400V
16	3	3031	3036	—
16	4	—	—	3072
16	5	—	—	3093
32	3	3110	3112	—
32	4	—	—	3136
32	5	—	—	3153

**Wall mounted receptacles**



A	P	110V	230V	400V
16	3	100	101	102
16	4	103	104	105
16	5	109	110	111
32	3	—	—	—
32	4	—	—	—
32	5	—	—	—

▲ IP 44

**Wall mounted receptacles**



A	P	110V	230V	400V
63	3	1136	1137	1138
63	4	1139	1140	1141
63	5	1143	1144	1145
125	3	—	—	—
125	4	—	—	—
125	5	—	—	—

▲ IP 44

**Wall mounted receptacles**



A	P	110V	230V	400V
63	3	856	128	129
63	4	130	131	132
63	5	134	135	136
125	3	—	—	—
125	4	—	—	—
125	5	—	—	—

▲▲ IP 67

**Wall mounted receptacles**

with large space for accommodating wiring



A	P	110V	230V	400V
63	3	—	—	—
63	4	—	—	—
63	5	—	—	—
125	3	—	—	—
125	4	—	—	—
125	5	—	—	2162

▲▲ IP 67

**Panel mounted receptacles**

straight



A	P	110V	230V	400V
16	3	217	218	219
16	4	220	221	222
16	5	226	227	228
32	3	229	230	231
32	4	232	233	234
32	5	238	239	240

▲▲ IP 67

**Panel mounted receptacles**

angled 20°



A	P	110V	230V	400V
16	3	1474	1475	1476
16	4	1477	1478	1479
16	5	1483	1484	1485
32	3	1501	1502	1503
32	4	1504	1505	1506
32	5	1489	1490	1551

▲▲ IP 67

**Panel mounted receptacles**

straight



A	P	110V	230V	400V
63	3	1263	1264	1265
63	4	1122	1123	1124
63	5	1126	1127	1128
125	3	—	3380	—
125	4	1455	1456	1457
125	5	1459	1460	1461

▲▲ IP 67

**Panel mounted receptacles**

angled 20°



A	P	110V	230V	400V
63	3	2179	2180	2181
63	4	203	204	205
63	5	207	208	209
125	3	—	3575	—
125	4	210	211	212
125	5	214	215	216

▲▲ IP 67

**Panel mounted receptacles with standard flange dimensions**

angled 20°, flange: 85 x 85 mm, fixing hole spacing: 70 x 70 mm



A	P	110V	230V	400V
16	3	903	905	—
16	4	—	—	1081
16	5	—	—	1103
32	3	3197	3200	—
32	4	—	—	3254
32	5	—	—	3524

▲▲ IP 67

# CEE receptacles 16A and 32A, screwless connection technique



Plugs for the world

Other voltages and frequencies available on request.

**Wall mounted receptacles with TwinCONTACT**

screwless spring terminals

A	P	110V	230V	400V
16	3	1340	1341	—
16	4	—	1342	1343
16	5	—	—	31
32	3	1345	1346	—
32	4	—	1347	1348
32	5	—	—	32

⚠ IP 44

**Wall mounted receptacles with TwinCONTACT**

screwless spring terminals

A	P	110V	230V	400V
16	3	—	—	—
16	4	1750	1751	418
16	5	1755	1756	419
32	3	1851	420	1852
32	4	1855	1856	421
32	5	1860	1861	422

⚠ IP 44

**Panel mounted receptacles with TwinCONTACT**

screwless spring terminals, straight

A	P	110V	230V	400V
16	3	1667	1668	1669
16	4	1672	1673	1674
16	5	1678	1679	3385
32	3	1786	1787	1788
32	4	1789	1790	1791
32	5	1795	1796	1797

⚠ IP 44

**Panel mounted receptacles with TwinCONTACT**

screwless spring terminals, angled 20°

A	P	110V	230V	400V
16	3	1631	1632	1633
16	4	1636	1637	1638
16	5	1642	1643	3473
32	3	1733	1734	1735
32	4	1738	1739	1740
32	5	1744	1745	1746

⚠ IP 44

**Panel mounted receptacles RAPIDO with TwinCONTACT**

screwless spring terminals, central fixing, 61 mm Ø mounting hole

A	P	110V	230V	400V
16	3	1132	997	—
16	4	—	—	—
16	5	—	—	—
32	3	—	—	—
32	4	—	—	—
32	5	—	—	—

⚠ IP 44

**Wall mounted receptacles with TwinCONTACT**

screwless spring terminals

A	P	110V	230V	400V
16	3	1719	1720	1721
16	4	—	1723	1724
16	5	—	1730	3331
32	3	—	—	—
32	4	—	—	—
32	5	—	—	—

⚠ IP 44

**Wall mounted receptacles with TwinCONTACT**

screwless spring terminals

A	P	110V	230V	400V
16	3	1867	241	1868
16	4	1870	1871	242
16	5	1875	1876	200
32	3	1877	243	1878
32	4	1879	1880	244
32	5	1884	1885	245

⚠ IP 67

**Panel mounted receptacles with TwinCONTACT**

screwless spring terminals, straight

A	P	110V	230V	400V
16	3	1707	1708	1709
16	4	1710	1711	1712
16	5	1716	1717	1131
32	3	1809	1810	1811
32	4	1812	1813	1814
32	5	1818	1819	1820

⚠ IP 67

**Panel mounted receptacles with TwinCONTACT**

screwless spring terminals, angled 20°

A	P	110V	230V	400V
16	3	1700	1701	1702
16	4	—	1703	1704
16	5	—	—	3485
32	3	1801	1802	1803
32	4	—	1804	1805
32	5	—	—	1808

⚠ IP 67

**Panel mounted receptacles RAPIDO with TwinCONTACT**

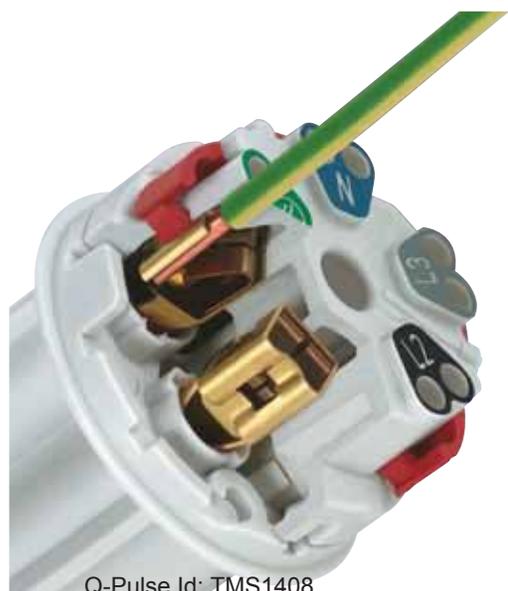
screwless spring terminals, central fixing, 70 mm Ø mounting hole

A	P	110V	230V	400V
16	3	—	—	—
16	4	—	1133	998
16	5	—	—	907
32	3	1135	987	—
32	4	—	1166	988
32	5	—	—	989

⚠ IP 44

## TwinCONTACT Screwless connection technique

without screws, double terminal with split spring for throughwiring.



Q-Pulse Id: TMS1408

## RAPIDO

RAPIDO receptacles are available with screw terminals or with screwless TwinCONTACT.

16A, 3p:  
for mounting holes 61 mm diam. and wall thickness from 2 up to 5 mm.  
16A, 4p + 5p and 32A:  
for mounting holes 70 mm diam. and wall thickness from 2 up to 9 mm.



# CEE plugs and inlets 16A up to 125A

Other voltages and frequencies available on request.

**Plugs AM-TOP**



single part body, screw terminals

A	P	110V	230V	400V
16	3	247	248	249
16	4	250	251	252
16	5	256	257	3
32	3	259	260	261
32	4	262	263	264
32	5	268	269	4

⚠ IP 44

**Plugs StarTOP with SafeCONTACT**



screwless with insulation displacement technique

A	P	110V	230V	400V
16	3	947	948	—
16	4	—	951	952
16	5	—	—	33
32	3	711	712	—
32	4	—	717	719
32	5	—	—	34

⚠ IP 44

**Plugs AM-TOP**



single part body, screw terminals

A	P	110V	230V	400V
16	3	277	278	279
16	4	280	281	282
16	5	286	287	288
32	3	289	290	291
32	4	292	293	294
32	5	298	299	300

⚠ IP 67

**Plugs PowerTOP Xtra**



with rubberized grip area, for toughest conditions

A	P	110V	230V	400V
63	3	13201	13202	13203
63	4	13204	13205	13206
63	5	13210	13211	13212
125	3	13215	13216	—
125	4	13217	13218	13219
125	5	13223	13224	13225

⚠ IP 67

**Panel mounted inlets RAPIDO**



with screw terminals, central fixing, 61 mm Ø mounting hole

A	P	110V	230V	400V
16	3	919	924	—
16	4	—	—	931
16	5	—	—	949
32	3	—	—	—
32	4	—	—	—
32	5	—	—	—

⚠ IP 44

**Wall mounted appliance inlets**



A	P	110V	230V	400V
16	3	843	844	—
16	4	—	—	800
16	5	—	—	801
32	3	—	802	—
32	4	—	—	803
32	5	—	—	804

⚠ IP 44

**Panel mounted appliance inlets**



with hinged lid

A	P	110V	230V	400V
16	3	—	—	—
16	4	392	393	394
16	5	398	399	400
32	3	401	402	403
32	4	404	405	406
32	5	410	411	412

⚠ IP 44

**Panel mounted inlets**



A	P	110V	230V	400V
16	3	810	812	—
16	4	—	837	813
16	5	—	—	815
32	3	816	817	—
32	4	—	838	819
32	5	—	—	821

⚠ IP 44

**Panel mounted inlets**



A	P	110V	230V	400V
16	3	825	826	—
16	4	—	839	827
16	5	—	—	829
32	3	830	831	—
32	4	—	840	832
32	5	—	—	834

⚠ IP 67

**Plugs ProTOP**



split body, screw terminals

A	P	110V	230V	400V
16	3	147	148	149
16	4	—	151	152
16	5	—	—	13
32	3	159	160	—
32	4	—	163	164
32	5	—	—	14

⚠ IP 44

**Plugs PowerTOP Xtra**



with rubberized grip area, for toughest conditions

A	P	110V	230V	400V
63	3	13101	13102	—
63	4	—	13105	13106
63	5	—	13111	13112
125	3	—	—	—
125	4	—	—	—
125	5	—	—	—

⚠ IP 44

**Plugs PowerTOP**



with external strain relief

A	P	110V	230V	400V
16	3	3794	3796	3799
16	4	3807	3811	3809
16	5	3819	3823	3821
32	3	3829	3830	3832
32	4	3839	3844	3841
32	5	3851	3855	3853

⚠ IP 67

**Angled plugs**



\*VarioTOP

A	P	110V	230V	400V
16	3	1410	1411	—
16	4	—	891	315
16	5	3312	3981*	3980*
32	3	—	3306	—
32	4	—	3646	3987
32	5	—	3424	3266

⚠ IP 44

**Panel mounted inlets RAPIDO**



with screw terminals, central fixing, 70 mm Ø mounting hole

A	P	110V	230V	400V
16	3	—	—	—
16	4	—	932	933
16	5	—	—	972
32	3	935	938	—
32	4	—	939	942
32	5	—	—	945

⚠ IP 44

**Wall mounted appliance inlets**



A	P	110V	230V	400V
16	3	331	332	333
16	4	334	335	336
16	5	340	341	342
32	3	343	344	345
32	4	346	347	348
32	5	352	353	354

⚠ IP 44

**Wall mounted appliance inlets**



A	P	110V	230V	400V
63	3	1216	1107	1217
63	4	355	356	357
63	5	359	360	361
125	3	—	—	—
125	4	362	363	364
125	5	366	367	368

⚠ IP 67

**Panel mounted inlets**



A	P	110V	230V	400V
63	3	822	1981	—
63	4	—	1984	1982
63	5	—	—	1688
125	3	—	—	—
125	4	—	—	—
125	5	—	—	—

⚠ IP 44

**Panel mounted inlets**



A	P	110V	230V	400V
63	3	835	836	—
63	4	—	3704	3656
63	5	—	—	3658
125	3	—	3665	—
125	4	—	3413	3583
125	5	—	—	1983

⚠ IP 67

# CEE connectors 16A up to 125A



63A: SoftCONTACT, 125A: TorsionSpringCONTACT

Other voltages and frequencies available on request.

Plugs for the world

**Connectors AM-TOP**

single part body, screw terminals

A	P	110V	230V	400V
16	3	509	510	511
16	4	512	513	514
16	5	518	519	5
32	3	521	522	523
32	4	524	525	526
32	5	530	531	6

⚠ IP 44

**Connectors ProTOP**

split body, screw terminals

A	P	110V	230V	400V
16	3	179	180	181
16	4	—	193	194
16	5	—	—	15
32	3	121	122	—
32	4	—	125	126
32	5	—	—	16

⚠ IP 44

**Connectors StarTOP with SafeCONTACT**

screwless with insulation displacement technique

A	P	110V	230V	400V
16	3	979	980	—
16	4	—	993	994
16	5	—	—	35
32	3	725	731	—
32	4	—	761	763
32	5	—	—	36

⚠ IP 44

**Connectors PowerTOP Xtra**

with rubberized grip area, for toughest conditions

A	P	110V	230V	400V
63	3	14101	14102	—
63	4	—	14105	14106
63	5	—	14111	14112
125	3	—	—	—
125	4	—	—	—
125	5	—	—	—

⚠ IP 44

**Connectors AM-TOP**

single part body, screw terminals

A	P	110V	230V	400V
16	3	539	540	541
16	4	542	543	544
16	5	548	549	550
32	3	551	552	553
32	4	554	555	556
32	5	560	561	562

⚠ IP 67

**Connectors PowerTOP**

with external strain relief

A	P	110V	230V	400V
16	3	3859	3860	3862
16	4	3869	3873	3871
16	5	3879	3883	3881
32	3	3887	3888	3891
32	4	3896	3899	3897
32	5	3905	3909	3907

⚠ IP 67

**Connectors PowerTOP Xtra**

with rubberized grip area, for toughest conditions

A	P	110V	230V	400V
63	3	14201	14202	14203
63	4	14204	14205	14206
63	5	14210	14211	14212
125	3	14215	14216	—
125	4	14217	14218	14219
125	5	14223	14224	14225

⚠ IP 67

**Angled connector**

A	P	110V	230V	400V
16	3	—	1438	—
16	4	—	—	—
16	5	—	—	—
32	3	—	—	—
32	4	—	—	—
32	5	—	—	—

⚠ IP 44

## PowerTOP Xtra



**PowerTOP Xtra** is rubberized for the best grip. Improved impact resistance even under humid conditions. Highly heat-resistant contact carrier, frame terminals, cable gland and sealing, strain relief and protection against kinking. Enclosure with thread lock, two safety slides and plugs with nickel-plated contacts. Connectors 63A with **SoftCONTACT** and 125A with **TorsionSpringCONTACT**.

SoftCONTACT



TorsionSpringCONTACT



## StarTOP



with SafeCONTACT, screwless with insulation displacement technique, cable gland with sealing, strain relief and protection against kinking, 2-part enclosure with thread lock and safety slider.



# CEE receptacles switched, interlocked, 16A up to 125A

63A: SoftCONTACT, 125A: TorsionSpringCONTACT. CEE receptacles with DUO-interlock can be padlocked.

Other voltages and frequencies available on request.

**Wall mounted receptacles with mechanical DUO-interlock**



A	P	110V	230V	400V
16	3	7010	7002	—
16	4	5457	5099	5100
16	5	5459	5102	5103
32	3	5743	5696	—
32	4	5460	5104	5105
32	5	5462	5107	5108

▲ IP 44

**Wall mounted receptacles with mechanical DUO-interlock**



A	P	110V	230V	400V
16	3	7011	7012	—
16	4	—	5599	5600
16	5	—	5602	5603
32	3	5924	5793	—
32	4	—	5604	5605
32	5	—	5607	5608

▲▲ IP 67

**Wall mounted receptacles with mechanical DUO-interlock**



A	P	110V	230V	400V
63	3	6569	6571	—
63	4	—	5955	5956
63	5	—	—	5959
125	3	—	—	—
125	4	—	—	—
125	5	—	—	—

▲ IP 44

**Wall mounted receptacles with mechanical DUO-interlock**



A	P	110V	230V	400V
63	3	5925	5911	—
63	4	—	5109	5110
63	5	—	5112	5113
125	3	7060	7000	—
125	4	—	5887	5691
125	5	—	5888	5692

▲▲ IP 67

**Wall mounted receptacles with mechanical DUO-interlock**



A	P	110V	230V	400V
16	3	7602	7603	—
16	4	—	7604	7605
16	5	—	—	7607
32	3	7611	7612	—
32	4	—	7613	7614
32	5	—	—	7616

▲ IP 44

**Wall mounted receptacles with mechanical DUO-interlock**



A	P	110V	230V	400V
16	3	7620	7621	—
16	4	—	7623	7624
16	5	—	—	7626
32	3	7628	7629	—
32	4	—	7633	7634
32	5	—	—	7636

▲▲ IP 67

**Panel mounted receptacles with mechanical DUO-interlock**



A	P	110V	230V	400V
16	3	7502	7503	—
16	4	—	7504	7505
16	5	—	—	7507
32	3	7511	7512	—
32	4	—	7513	7514
32	5	—	—	7516

▲ IP 44

**Panel mounted receptacles with mechanical DUO-interlock**



A	P	110V	230V	400V
16	3	7520	7521	—
16	4	—	7523	7524
16	5	—	—	7526
32	3	7530	7531	—
32	4	—	7533	7534
32	5	—	—	7536

▲▲ IP 67

**Wall mounted receptacles with mechanical DUO-interlock**

fused, DIN-rail



A	P	110V	230V	400V
16	3	—	7213	—
16	4	—	—	5610
16	5	—	—	5613
32	4	—	—	5615
32	5	—	—	5618
63	4	—	—	6059
63	5	—	—	6062

▲ IP 44

**Wall mounted receptacles with mechanical DUO-interlock**

fused, DIN-rail



A	P	110V	230V	400V
16	3	—	7050	—
16	4	—	—	5630
16	5	—	—	5633
32	4	—	—	5635
32	5	—	—	5638
63	4	—	—	5640
63	5	—	—	5643

▲▲ IP 67

**Wall mounted receptacles with mechanical DUO-interlock**

fused, MCB



A	P	110V	230V	400V
16	3	—	7216	—
16	4	—	—	7217
16	5	—	—	7218
32	4	—	—	7219
32	5	—	—	7220
63	4	—	—	7221
63	5	—	—	7222

▲ IP 44

**Wall mounted receptacles with mechanical DUO-interlock**

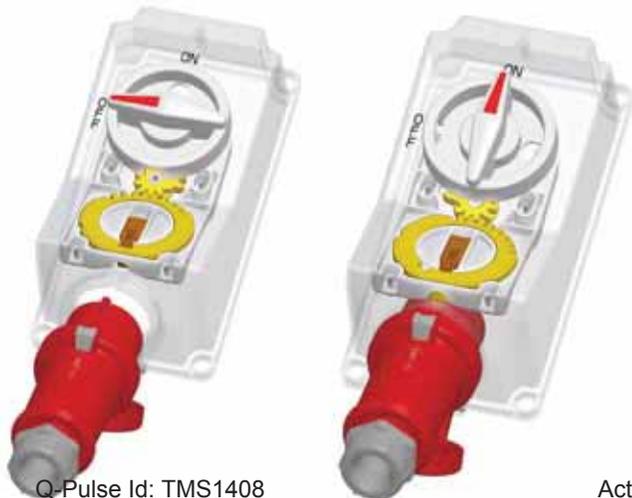
fused, MCB



A	P	110V	230V	400V
16	3	—	7238	—
16	4	—	—	7239
16	5	—	—	7240
32	4	—	—	7241
32	5	—	—	7242
63	4	—	—	7243
63	5	—	—	7244

▲▲ IP 67

## Mechanical DUO-interlock



After insertion and switching on, the plug is interlocked in the ON-position.  
After switching off and withdrawing, the switch is locked in the OFF-position.



# Phase inverter plugs/inlets 16A and 32A

## Plugs and receptacles for low voltage



Plugs for the world

Other voltages and frequencies available on request.

**Phase inverter plugs AM-TOP**

single part body, screw terminals

A	P	110V	230V	400V
16	3	—	—	—
16	4	—	338	339
16	5	—	318	319
32	3	—	—	—
32	4	—	396	397
32	5	—	321	322

⚠ IP 44

**Phase inverter plugs AM-TOP**

single part body, screw terminals

A	P	110V	230V	400V
16	3	—	—	—
16	4	—	3338	3339
16	5	—	—	325
32	3	—	—	—
32	4	—	3340	3341
32	5	—	327	328

⚠ IP 67

**Phase inverter plugs ProTOP**

split body, screw terminals

A	P	110V	230V	400V
16	3	—	—	—
16	4	—	—	—
16	5	—	—	3319
32	3	—	—	—
32	4	—	—	—
32	5	—	—	3322

⚠ IP 44

**Phase inverter plug VarioTOP**

A	P	110V	230V	400V
16	3	—	—	—
16	4	—	—	—
16	5	—	—	859
32	3	—	—	—
32	4	—	—	—
32	5	—	—	—

⚠ IP 44

**Wall mounted phase inverter inlets**

A	P	110V	230V	400V
16	3	—	—	—
16	4	—	—	—
16	5	—	—	3517
32	3	—	—	—
32	4	—	—	—
32	5	—	—	3523

⚠ IP 44

**Wall mounted phase inverter inlets**

A	P	110V	230V	400V
16	3	—	—	—
16	4	—	3342	3343
16	5	—	—	2511
32	3	—	—	—
32	4	—	3345	3346
32	5	—	3347	2478

⚠ IP 44

**Panel mounted phase inverter inlets**

A	P	110V	230V	400V
16	3	—	—	—
16	4	—	3348	3350
16	5	—	—	20970
32	3	—	—	—
32	4	—	3355	3356
32	5	—	3717	21241

⚠ IP 44

**Panel mounted phase inverter inlet**

A	P	110V	230V	400V
16	3	—	—	—
16	4	—	—	—
16	5	—	—	854
32	3	—	—	—
32	4	—	—	—
32	5	—	—	—

⚠ IP 44



**Wall mounted receptacles for low voltage**

A	P	20-25V 50 a. 60 Hz	40-50V 50 a. 60 Hz	20-25V/ 40-50V 100-200 Hz
16	2	1825	1831	—
16	3	1832	1837	1835
32	2	1838	1844	—
32	3	1845	1850	1848

⚠ IP 44

**Wall mounted receptacles for low voltage**

A	P	20-25V 50 a. 60 Hz	40-50V 50 a. 60 Hz	20-25V/ 40-50V 100-200 Hz
16	2	577	578	—
16	3	584	585	586
32	2	590	591	—
32	3	597	598	599

⚠ IP 44

**Panel mounted receptacles for low voltage**

A	P	20-25V 50 a. 60 Hz	40-50V 50 a. 60 Hz	20-25V/ 40-50V 100-200 Hz
16	2	603	604	—
16	3	610	611	612
32	2	616	617	—
32	3	623	624	625

⚠ IP 44

**Panel mounted receptacles for low voltage**

A	P	20-25V 50 a. 60 Hz	40-50V 50 a. 60 Hz	20-25V/ 40-50V 100-200 Hz
16	2	1270	2855	—
16	3	2845	1272	2860
32	2	1271	2864	—
32	3	2870	1273	2852

⚠ IP 44

**Plugs for low voltage**

A	P	20-25V 50 a. 60 Hz	40-50V 50 a. 60 Hz	20-25V/ 40-50V 100-200 Hz
16	2	629	630	—
16	3	636	637	638
32	2	642	643	—
32	3	649	650	651

⚠ IP 44

**Wall mounted appliance inlets for low voltage**

A	P	20-25V 50 a. 60 Hz	40-50V 50 a. 60 Hz	20-25V/ 40-50V 100-200 Hz
16	2	1955	1961	—
16	3	1962	1967	1965
32	2	1968	1974	—
32	3	1975	1980	1978

⚠ IP 44

**Connectors for low voltage**

A	P	20-25V 50 a. 60 Hz	40-50V 50 a. 60 Hz	20-25V/ 40-50V 100-200 Hz
16	2	681	682	—
16	3	688	689	690
32	2	694	695	—
32	3	701	702	—

⚠ IP 44



# Plugs and receptacles 7 pole

Other voltages and frequencies available on request.

Wall mounted receptacles					
	A	P	230V	400V	500V
	16	7	733	734	1035
	32	7	735	736	1040

▲ IP 44

Panel mounted receptacles angled 20°					
	A	P	230V	400V	500V
	16	7	737	738	1045
	32	7	739	740	1050

▲ IP 44

Plugs AM-TOP					
	A	P	230V	400V	500V
	16	7	741	742	1055
	32	7	743	744	1060

▲ IP 44

Wall mounted inlets					
	A	P	230V	400V	500V
	16	7	—	2166	—
	32	7	—	2167	—

▲ IP 44

Connectors AM-TOP					
	A	P	230V	400V	500V
	16	7	745	746	1065
	32	7	747	748	1070

▲ IP 44

Wall mounted receptacles with mechanical DUO-interlock					
	A	P	230V	400V	500V
	16	7	—	5536	—
	32	7	—	7061	—

▲ IP 44

Wall mounted receptacles					
	A	P	230V	400V	500V
	16	7	3240	2746	3262
	32	7	2818	2648	2782

▲▲ IP 67

Panel mounted receptacles angled 20°					
	A	P	230V	400V	500V
	16	7	2883	2459	2296
	32	7	—	2317	2212

▲▲ IP 67

Plugs AM-TOP					
	A	P	230V	400V	500V
	16	7	3776	3777	3913
	32	7	2405	2324	2213

▲▲ IP 67

Panel mounted inlets					
	A	P	230V	400V	500V
	16	7	749	750	1075
	32	7	751	752	1080

▲ IP 44

Connectors AM-TOP					
	A	P	230V	400V	500V
	16	7	3783	3916	3784
	32	7	2406	2255	2460

▲▲ IP 67

Wall mounted receptacles with mechanical DUO-interlock					
	A	P	230V	400V	500V
	16	7	—	5785	—
	32	7	—	6106	—

▲▲ IP 67

## Plugs and receptacles 7 pole for multi functional applications

These plugs and receptacles provide solutions where there are multi functional requirements in industry, farming and commerce.

This number of poles provides solutions in the following fields:

- Star-delta start-up
- Closed loop control
- Open loop control
- Monitoring
- Detection and alarms
- Clearing alarms
- Electrical interlocking



# CEE receptacles Cepex

Other voltages and frequencies available on request.



Plugs for the world

**Wall mounted receptacles**

	grey	<b>A</b>	<b>P</b>	<b>110V</b>	<b>230V</b>	<b>400V</b>
		16	3	4101	4102	—
		16	4	—	4254	4103
		16	5	—	—	4105
		32	3	4106	4107	—
		32	4	—	—	4108
	32	5	—	—	4110	
⚠ IP 44		SCHUKO		4970		

**Wall mounted receptacles**

	grey, with labeling field	<b>A</b>	<b>P</b>	<b>110V</b>	<b>230V</b>	<b>400V</b>
		16	3	—	4132	—
		16	4	—	—	4133
		16	5	—	—	4135
		32	3	—	4137	—
		32	4	—	—	4138
	32	5	—	—	4140	
⚠ IP 44		SCHUKO		4973		

**Wall mounted receptacles**

	grey, with labeling field and lockable cover	<b>A</b>	<b>P</b>	<b>110V</b>	<b>230V</b>	<b>400V</b>
		16	3	—	4162	—
		16	4	—	—	4163
		16	5	—	—	4165
		32	3	—	4167	—
		32	4	—	—	4168
	32	5	—	—	4170	
⚠ IP 44		SCHUKO		4976		

**Panel mounted receptacles**

	alpine white	<b>A</b>	<b>P</b>	<b>110V</b>	<b>230V</b>	<b>400V</b>
		16	3	—	—	—
		16	4	—	—	—
		16	5	—	—	4262
		32	3	—	—	—
		32	4	—	—	—
	32	5	—	—	4263	
⚠ IP 44		SCHUKO		4979		

**Flush mounted receptacles**

	pearl white	<b>A</b>	<b>P</b>	<b>110V</b>	<b>230V</b>	<b>400V</b>
		16	3	—	4122	—
		16	4	—	—	—
		16	5	—	—	4125
		32	3	—	4127	—
		32	4	—	—	—
	32	5	—	—	4130	
⚠ IP 44		SCHUKO		4972		

**Flush mounted installation box**

	for Cepex CEE receptacles 16A and 32A and Cepex SCHUKO receptacles					
	Part no. 41404					

**Panel mounted receptacles**

	pearl white	<b>A</b>	<b>P</b>	<b>110V</b>	<b>230V</b>	<b>400V</b>
		16	3	4111	4112	—
		16	4	—	4233	4113
		16	5	—	—	4115
		32	3	4116	4117	—
		32	4	—	—	4118
	32	5	—	—	4120	
⚠ IP 44		SCHUKO		4971		

**Panel mounted receptacles**

	pearl white, with labeling field	<b>A</b>	<b>P</b>	<b>110V</b>	<b>230V</b>	<b>400V</b>
		16	3	4141	4142	—
		16	4	—	—	4143
		16	5	—	—	4145
		32	3	4146	4147	—
		32	4	—	—	4148
	32	5	—	—	4150	
⚠ IP 44		SCHUKO		4974		

**Panel mounted receptacles**

	pearl white, with labeling field and lockable cover	<b>A</b>	<b>P</b>	<b>110V</b>	<b>230V</b>	<b>400V</b>
		16	3	4171	4172	—
		16	4	—	—	4173
		16	5	—	—	4175
		32	3	—	4177	—
		32	4	—	—	4178
	32	5	—	—	4180	
⚠ IP 44		SCHUKO		4977		

**Panel mounted receptacles**

	alpine white, with labeling field	<b>A</b>	<b>P</b>	<b>110V</b>	<b>230V</b>	<b>400V</b>
		16	3	—	4247	—
		16	4	—	—	4273
		16	5	—	—	4237
		32	3	—	4274	—
		32	4	—	—	4275
	32	5	—	—	4238	
⚠ IP 44		SCHUKO		4980		

**Cepex modular system**

Some versions of Cepex panel mounted receptacles are shown on the left. Further versions you can create using Cepex panel receptacles, shown above, in combination with the installation box 41404.



Cepex SCHUKO panel mounted receptacle with labeling field 4145  
 +  
 flush mounted installation box 41404  
 =  
 flush mounted receptacle

## Perfect in every detail - one fits another

**Anything goes.**

Covers, current rating and colors may be optionally combined: neutral cover, with labeling field, with labeling field and lock, 3 pole, 5 pole and SCHUKO.



**Resistant to ball rebound.**

All Cepex receptacles with neutral covers meet DIN 18032 standards for ball rebound and are suitable for use in

# Plugs and receptacles 200A up to 400A

Plugs and receptacles are available in seawater resistant design on request.

Other voltages and frequencies available on request.

Receptacles								
with cable gland	A	P	230V	400V	500V	690V	1000V	weight
	 IP 67	200	4	75220	75221	75222	75223	75224
200		5	75225	75226	75227	75228	75229	5780
250		4	75020	75021	75022	75023	75024	10510
250		5	75110	75111	75112	75113	75114	11020
400		4	75025	75026	75027	75028	75029	10510
400		5	75115	75116	75117	75118	75119	11020
Panel mounted receptacles								
with cable gland	A	P	230V	400V	500V	690V	1000V	weight
	 IP 67	200	4	75240	75241	75242	75243	75244
200		5	75245	75246	75247	75248	75249	3450
250		4	75040	75041	75042	75043	75044	6800
250		5	75130	75131	75132	75133	75134	7300
400		4	75045	75046	75047	75048	75049	6800
400		5	75135	75136	75137	75138	75139	7300
Receptacles, switched and interlocked								
with cable gland	A	P	230V	400V	500V	690V	1000V	weight
	 IP 55	200	4	75230	75231	75232	75233	75234
200		5	75235	75236	75237	75238	75239	25300
250		4	75030	75031	75032	75033	75034	45000
250		5	75120	75121	75122	75123	75124	46500
400		4	75035	75036	75037	75038	75039	43900
400		5	75125	75126	75127	75128	75129	45400
Plugs								
with cable gland	A	P	230V	400V	500V	690V	1000V	weight
	 IP 67	200	4	75200	75201	75202	75203	75204
200		5	75205	75206	75207	75208	75209	3200
250		4	75000	75001	75002	75003	75004	8290
250		5	75090	75091	75092	75093	75094	8610
400		4	75005	75006	75007	75008	75009	8290
400		5	75095	75096	75097	75098	75099	8610
Connectors								
with cable gland	A	P	230V	400V	500V	690V	1000V	weight
	 IP 67	200	4	75210	75211	75212	75213	75214
200		5	75215	75216	75217	75218	75219	3980
250		4	75010	75011	75012	75013	75014	9160
250		5	75100	75101	75102	75103	75104	9670
400		4	75015	75016	75017	75018	75019	9160
400		5	75105	75106	75107	75108	75109	9670

## Heavy duty versions for industry



Mechanical interlocking. For mobile consumers of rated current > 125A we have included a heavy duty range with 200A, 250A and 400A in our program. This can be supplied for rated voltages of 230V to 1000V and in seawater resistant version.

The heavy duty range is suitable for use in very harsh conditions, e.g. building sites:

- drilling rigs
- tunnel constructions
- gravel pits
- strip mining
- container terminals and crane connections in harbours
- for versatile power supply at large-scale indoor and outdoor events
- power supply to market places
- airports
- quarries

# SCHUKO and grounding-type receptacles



SCHUKO and French/Belgian standard 16A, 230V, 2p + E. British standard 13A, 230V, 2p + E.

Other variations on request.

Plugs for the world

## SCHUKO panel mounted receptacles

	with plug-in terminals or screw-terminals, without shutter	<b>Color</b>	<b>plug-in terminals</b>	<b>screw terminals</b>
		grey	11010	11030
		blue	11011	11031
		black	11012	11032
		red	11013	11033

⚠ IP 54

## Grounding-type panel mounted receptacles French/Belgian standard

	with plug-in terminals, without shutter	<b>Color</b>	<b>plug-in terminals</b>	<b>screw terminals</b>
		grey	11110	—
		blue	11111	—
		black	—	—
		red	—	—

⚠ IP 44

## SCHUKO wall mounted receptacles

	with plug-in terminals, without shutter	<b>Color</b>	<b>plug-in terminals</b>	<b>screw terminals</b>
		grey	10081	—
		blue	10082	—
		black	10083	—
		red	—	—

⚠ IP 44

## Base for wall mounted receptacles

	with cable entry and screws	<b>Part no.</b>	<b>grey</b>	<b>10714</b>
		<b>Part no.</b>	<b>blue</b>	<b>10715</b>
		<b>Part no.</b>	<b>black</b>	<b>10716</b>

## SCHUKO panel mounted receptacles

	with plug-in terminals or screw-terminals, without shutter	<b>Color</b>	<b>plug-in terminals</b>	<b>screw terminals</b>
		grey	—	—
		blue	11511	11531
		black	11512	11532
		red	—	—

IP 20

## Grounding-type panel mounted receptacle British standard

	with screw-terminals, with shutter and matching frame and seal	<b>Color</b>	<b>plug-in terminals</b>	<b>screw terminals</b>
		grey	—	—
		blue	—	—
		black	—	10713
		red	—	—

⚠ IP 44

## SCHUKO plugs with grommet

	combined PE-conductor acc. to German and French/Belgian standards.	<b>Color</b>	
		grey	10749
		black	10754
		orange	10837
		blue	10838
		red	10839
		yellow	10840
	green	10841	

## SCHUKO panel mounted receptacles

	with plug-in terminals or screw-terminals, with shutter	<b>Color</b>	<b>plug-in terminals</b>	<b>screw terminals</b>
		grey	11060	—
		blue	11061	11081
		black	—	—
		red	—	—

⚠ IP 54

## Grounding-type panel mounted receptacles French/Belgian standard

	with plug-in terminals or screw-terminals, with shutter	<b>Color</b>	<b>plug-in terminals</b>	<b>screw terminals</b>
		grey	11160	11180
		blue	11161	11181
		black	11162	11182
		red	11163	11183

⚠ IP 44

## Grounding-type wall mounted receptacle French/Belgian standard

	with plug-in terminals, with shutter	<b>Color</b>	<b>plug-in terminals</b>	<b>screw terminals</b>
		grey	—	—
		blue	10092	—
		black	—	—
		red	—	—

⚠ IP 44

## Modular system for wall mounted receptacle

The combination of the base with one of the panel mounted receptacles shown above, gives a wall mounted receptacle.



## Grounding-type panel mounted receptacles French/Belgian standard

	with plug-in terminals or screw-terminals, without shutter	<b>Color</b>	<b>plug-in terminals</b>	<b>screw terminals</b>
		grey	—	—
		blue	11611	11631
		black	—	—
		red	—	—

IP 20

## Grounding-type panel mounted receptacle British standard

	with screw-terminals, with shutter and seal	<b>Color</b>	<b>plug-in terminals</b>	<b>screw terminals</b>
		grey	—	—
		blue	—	10718
		black	—	—
		red	—	—

⚠ IP 44

## SCHUKO connectors with grommet

		<b>Color</b>	
		grey	10751
		black	10755
		orange	10842
		blue	10843
		red	10844
		yellow	10845
	green	10846	

# AMAXX® receptacle combinations

## Success in series

Extensively configurable receptacle combinations in six different sizes – the AMAXX® range by MENNEKES. With an appealing and unique design in many variations for almost all applications. With our extended program, you now have three good extra reasons to opt for AMAXX® receptacle combinations.

# AMAXX® by MENNEKES



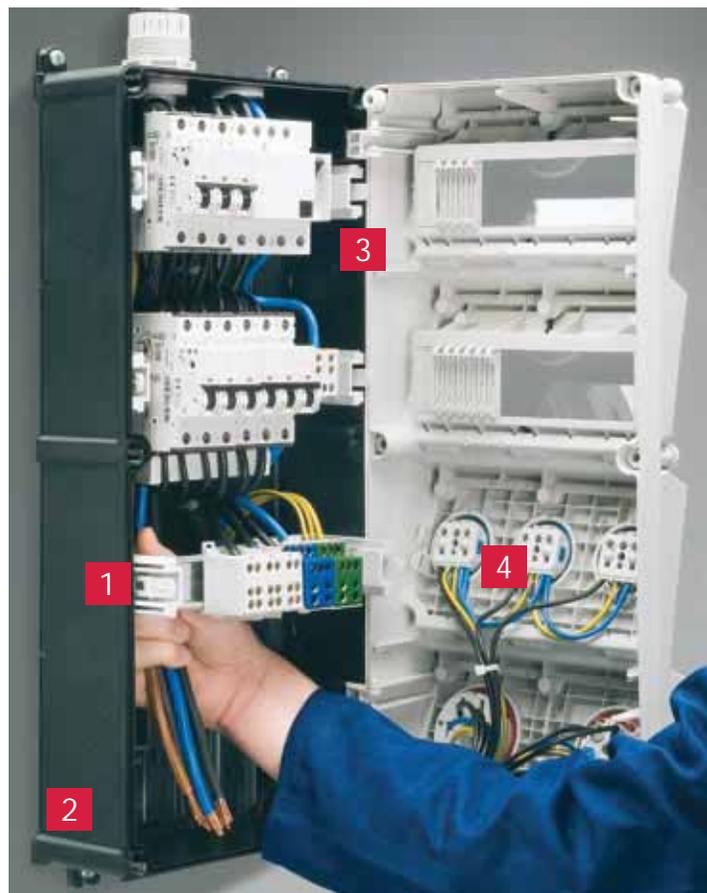
- Protection types: IP 44 and IP 67.
- Enclosure materials: AMAPLAST and especially chemical-resistant AMELAN.
- Colors: bottom part black, top part grey, silver (IP 44), yellow or red.
- Equipped with: CEE receptacles from 16A, 3-poles up to 63A, 5-poles, grounding-type receptacles in accordance with many national standards, DUO receptacles switched and interlocked from 16A, 3p to 32A, 5p as well as fuse elements.

## International



AMAXX® receptacle combinations are also perfectly suited for the international market with many different standards. For example: British, French, German, Danish, Swiss standard as well as the North American (USA and Canada). Contact us.

## Features and benefits



- 1 Lifiable DIN Rails**  
Lifiable DIN rails and a large, smooth wiring space significantly ease the insertion as well as connection of large cables.
- 2 One-man installation**  
Shorter installation times with the new, user-friendly external fixing.
- 3 Hinged cover**  
The hinged cover which opens to one side, eases connection work.
- 4 Ready for application**  
All combinations are pre-wired for installation and tested for electric safety and quality.



Generally angled insertion direction.



Especially fast opening and closing of the enclosure due to captive double-threaded cover screws.



Both hands free because inspection windows fold downwards. Window can be locked with a padlock, enclosure can be sealed.



Standard pre-punched cable entries at the top and at the bottom up to M 40.

## Receptacle combinations for versatile use

### EverGUM receptacle combinations with solid rubber enclosures

Wall mounted, enclosure  
380 x 230 mm or  
380 x 320 mm



Receptacle strip, enclosure  
445 x 135 mm



Portable, enclosure  
300 x 230 x 287.5 mm or  
360 x 340 x 330 mm



Portable, with feeder  
cable, enclosure  
300 x 230 x 287.5 mm or  
360 x 340 x 330 mm



With the EverGUM range MENNEKES provides a solid rubber alternative to enclosures in AMAPLAST, AMELAN and sheet steel. This is an alternative which is suitable for the most diverse environments, especially when there is likely to be exposure to rough handling or aggressive cleaning agents. These products can also be supplied to conform to the standards of other European countries.

### AirKRAFT and 3KRAFT

**AirKRAFT**  
for energy, data,  
compressed air.  
Also available with feeder cable.  
Enclosure  
400 x 229 x 220 mm  
(size without receptacles)



**3KRAFT**  
for energy, data,  
compressed air.  
Also available with feeder cable.  
Enclosure  
diam. 240-264 x H 152 mm  
(depending what receptacles  
are used)



### DELTA-BOX

**DELTA-BOXES**

Enclosure  
114 x 160 x 97 mm  
(size without  
receptacles)



**DELTA-BOXES  
with feeder cable.**

Enclosure  
114 x 160 x 97 mm  
(size without  
receptacles)



#### For ceilings, walls and floors.

Three colors: Signal yellow, red or silver.

**AirKRAFT.** Up to four receptacles, or data, or light, plus compressed air, plus fusing. Ready for connection or with supply cable and plug.

**3KRAFT.** Equipped to suit your requirements: Up to three receptacles, or data, plus compressed air. Ready for connection or with supply cable and plug.

#### DELTA-BOX - the classic unit.

With cable grip. Enclosure and insert from impact and resistant AMAPLAST.

Available in ▲ IP 44, ▲▲ IP 67 and ▲▲▲ IP 68.

# Receptacle combinations for versatile use



Plugs for the world

## Stainless steel surface and flush mounted receptacle combinations



**Safe.**  
**Practical.**  
**Timelessly elegant.**

- Protection type IP 43 or IP 44 with closed door, even when plugs are inserted.
- The cable guard aperture is sufficiently dimensioned for leading through cables.
- Safety lock protects against unauthorized access.

## Power posts

Rugged. Vandalism-proof.  
Steel power posts provide a safe means of energy supply, protection against car-crossing. Hot-dip galvanized and powder coated. Available in various sizes.

## CombiTOWER

Power. Compressed air. Water.  
Outdoors and indoors.  
The solution: CombiTOWER. Short routes to your energy source for industry, workshops, assembly shops, loading platforms, etc.



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3	6	279	6	560	7	924	6	1343	5	1716	5	2845	9	4101	11
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14	6	287	6	584	9	938	6	1365	4	1723	5	2870	9	4107	11
15	7	288	6	585	9	939	6	1366	4	1724	5	2883	10	4108	11
16	7	289	6	586	9	942	6	1367	4	1730	5	3030	4	4110	11
31	5	290	6	590	9	945	6	1368	4	1733	5	3031	4	4111	11
32	5	291	6	591	9	947	6	1369	4	1734	5	3034	4	4112	11
33	6	292	6	597	9	948	6	1371	4	1735	5	3036	4	4113	11
34	6	293	6	598	9	949	6	1372	4	1738	5	3041	4	4115	11
35	7	294	6	599	9	951	6	1373	4	1739	5	3045	4	4116	11
36	7	298	6	603	9	952	6	1384	4	1740	5	3072	4	4117	11
100	4	299	6	604	9	972	6	1385	4	1744	5	3074	4	4118	11
101	4	300	6	610	9	979	7	1386	4	1745	5	3093	4	4120	11
102	4	315	6	611	9	980	7	1388	4	1746	5	3110	4	4122	11
103	4	318	9	612	9	987	5	1389	4	1750	5	3112	4	4125	11
104	4	319	9	616	9	988	5	1390	4	1751	5	3136	4	4127	11
105	4	321	9	617	9	989	5	1394	4	1755	5	3153	4	4130	11
109	4	322	9	623	9	993	7	1395	4	1756	5	3197	4	4132	11
110	4	325	9	624	9	994	7	1396	4	1786	5	3200	4	4133	11
111	4	327	9	625	9	997	5	1397	4	1787	5	3240	10	4135	11
121	7	328	9	629	9	998	5	1398	4	1788	5	3254	4	4137	11
122	7	331	6	630	9	1035	10	1399	4	1789	5	3262	10	4138	11
125	7	332	6	636	9	1040	10	1410	6	1790	5	3266	6	4140	11
126	7	333	6	637	9	1045	10	1411	6	1791	5	3306	6	4141	11
128	4	334	6	638	9	1050	10	1418	4	1795	5	3312	6	4142	11
129	4	335	6	642	9	1055	10	1419	4	1796	5	3319	9	4143	11
130	4	336	6	643	9	1060	10	1420	4	1797	5	3322	9	4145	11
131	4	338	9	649	9	1065	10	1421	4	1801	5	3331	5	4146	11
132	4	339	9	650	9	1070	10	1422	4	1802	5	3338	9	4147	11
134	4	340	6	651	9	1075	10	1423	4	1803	5	3339	9	4148	11
135	4	341	6	681	9	1080	10	1424	4	1804	5	3340	9	4150	11
136	4	342	6	682	9	1081	4	1425	4	1805	5	3341	9	4162	11
137	4	343	6	688	9	1103	4	1438	7	1808	5	3342	9	4163	11
138	4	344	6	689	9	1107	6	1455	4	1809	5	3343	9	4165	11
139	4	345	6	690	9	1122	4	1456	4	1810	5	3345	9	4167	11
141	4	346	6	694	9	1123	4	1457	4	1811	5	3346	9	4168	11
142	4	347	6	695	9	1124	4	1459	4	1812	5	3347	9	4170	11
143	4	348	6	701	9	1126	4	1460	4	1813	5	3348	9	4171	11
147	6	352	6	702	9	1127	4	1461	4	1814	5	3350	9	4172	11
148	6	353	6	703	9	1128	4	1462	4	1818	5	3355	9	4173	11
149	6	354	6	711	6	1131	5	1463	4	1819	5	3356	9	4175	11
151	6	355	6	712	6	1132	5	1464	4	1820	5	3380	4	4177	11
152	6	356	6	717	6	1133	5	1465	4	1825	9	3385	5	4178	11
159	6	357	6	719	6	1135	5	1466	4	1831	9	3413	6	4180	11
160	6	359	6	725	7	1136	4	1467	4	1832	9	3424	6	4233	11
163	6	360	6	731	7	1137	4	1471	4	1835	9	3449	4	4237	11
164	6	361	6	733	10	1138	4	1472	4	1837	9	3451	4	4238	11
179	7	362	6	734	10	1139	4	1473	4	1838	9	3454	4	4247	11
180	7	363	6	735	10	1140	4	1474	4	1844	9	3473	5	4254	11
181	7	364	6	736	10	1141	4	1475	4	1845	9	3485	5	4262	11
193	7	366	6	737	10	1143	4	1476	4	1848	9	3517	9	4263	11
194	7	367	6	738	10	1144	4	1477	4	1850	9	3523	9	4273	11
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212	4	401	6	748	10	1155	4	1493	4	1871	5	3776	10	4979	11
214	4	402	6	749	10	1166	5	1494	4	1875	5	3777	10	4980	11
215	4	403	6	750	10	1177	4	1495	4	1876	5	3783	10	5099	8
216	4	404	6	751	10	1178	4	1496	4	1877	5	3784	10	5100	8
217	4	405	6	752	10	1192	4	1498	4	1878	5	3794	6	5102	8
218	4	406	6	761	7	1193	4	1499	4	1879	5	3796	6	5103	8
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229	4	422	5	812	6	1202	4	1551	4	1967	9	3829	6	5113	8
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244	5	524	7	830	6	1247	4	1667	5	2167	10	3869	7	5607	8
245	5	525	7	831	6	1248	4	1668	5	2179	4	3871	7	5608	8
247	6	526	7	832	6	1250	4	1669	5	2180	4	3873	7	5610	8
248	6	530	7	834	6	1251	4	1672	5	2181	4	3879	7	5613	8
249	6	531	7	835	6	1252	4	1673	5	2212	10	3881	7	5615	8
250	6	539	7	836	6	1260	4	1674	5	2213	10	3883	7	5618	8
251	6	540	7	837	6	1261	4	1678	5	2255	10	3887	7	5630	8
252	6	541	7	838	6	1262	4	1679	5	2296	10	3888	7	5633</	

# References



BMW motorcycle plant, Berlin – Germany



AIDA Bella, Jos. L. Meyer Werft, Papenburg – Germany



Formula 1 circuit, Manama – Bahrain



Constitution, Heerema Marine Contractors – Netherland



Port of Calais - Terminal MS1408



Active: 30/09/2015 - Terminal, Le Havre – France



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Internet [www.MENNEKES.de](http://www.MENNEKES.de)

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MENNEKES Straße 1  
D-09465 Neudorf / Erzgebirge  
Tel. + 49 (0) 3 73 42 / 8 62-0  
Fax + 49 (0) 3 73 42 / 8 62-38  
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# TECHNICAL DATA SHEET

**Equipment Type:** Impulse Suppressor

**Location:** RTU Section

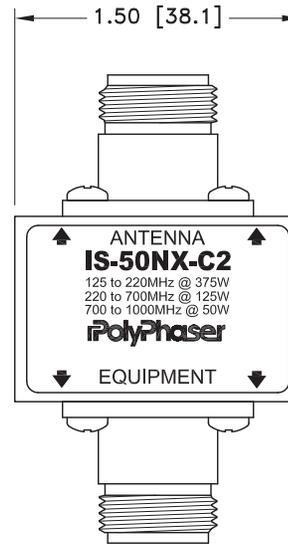
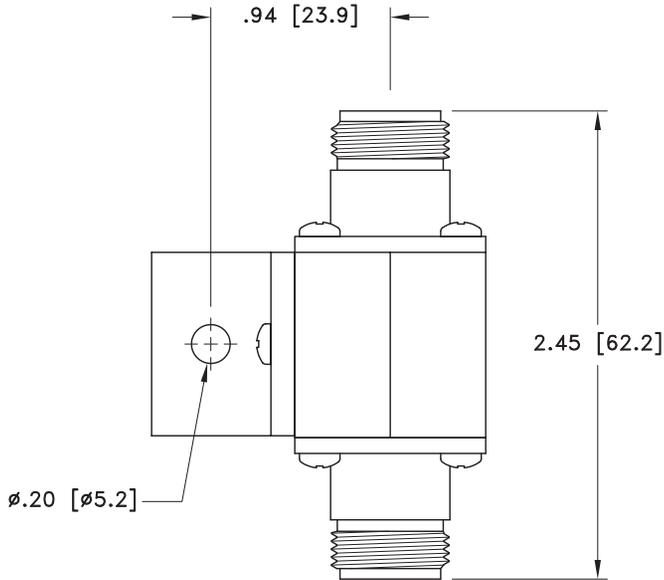
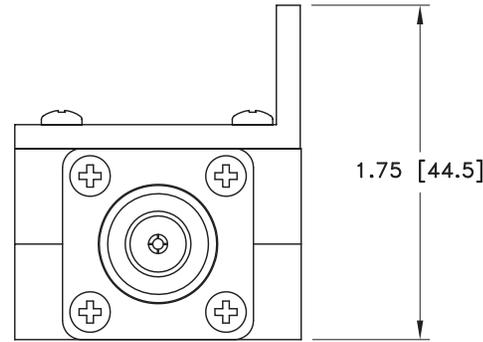
**Model Numbers:** IS-50NX-C2

**Manufacturer:** Polyphaser

**Supplier:** RFI Industries  
30 Raubers Road  
Banyo, QLD 4010  
  
Ph: 07 3621 9400  
Fax: 07 3621 5505  
Web: [www.rfi.com.au](http://www.rfi.com.au)

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REVISIONS				
REV LTR	DATE	ENG	MKTG	Q.A.
A	01/30/96 <sub>PJP</sub>	T. K.	--	R. M.
B	06/30/99 <sub>JCG</sub>	K.C.B.	T.G.F.	R. M.
C	01/16/01 <sub>SH</sub>	KCB	PH	RM
D	11/18/02 <sub>SH</sub>	LC	SD	LJ



**MAXIMUM CHARACTERISTICS**

SURGE:  
50kA IEC 1000-4-5 8/20 $\mu$ s WAVEFORM 500 JOULES  
TURN ON:  
600Vdc  $\pm$ 20%  
TURN ON TIME:  
2.5ns FOR 2kV/ns  
FREQUENCY RANGE:  
125MHz TO 1GHz  
VSWR:  
 $\leq$ 1.1:1 OVER FREQUENCY RANGE  
INSERTION LOSS:  
 $\leq$ 0.1dB OVER FREQUENCY RANGE  
TEMPERATURE:  
-45°C TO +85°C STORAGE/OPERATING +50°C

CUSTOMER APPROVAL: \_\_\_\_\_ DATE: \_\_\_\_\_

ALL DIMENSIONS SHOWN ABOVE ARE FOR REFERENCE ONLY.

DRAFTER J. CALLISTER	DATE 09/21/93	 P.O. BOX 9000, MINDEN, NV 89423-9000 (775) 782-2511 FAX (775) 782-4476 DWG NO/PART NO/DESCRIPTION IS-50NX-C2 CUSTOMER PRINT			
MECH ENGINEER - - - -	DATE - - - -				
ELEC ENGINEER J. JONES	DATE 04/12/95				
MARKETING - - - -	DATE - - - -				
QUALITY DEPT R. MATHEUS	DATE 04/12/95	CAGE CODE 61114	FILE NAME -C1	SCALE 1/1	SHEET 1 OF 1

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Modem/Power Supply
<b>Location:</b>	RTU Section
<b>Model Numbers:</b>	PB251
<b>Manufacturer:</b>	Powerbox
<b>Supplier:</b>	Powerbox Australia Pty Ltd 433 Logan Road Stones Corner, QLD 4120  Ph: 07 3394 8372 Fax: 07 3394 8373 Web: <a href="http://www.powerbox.com.au">www.powerbox.com.au</a>

# PB251 Series

220-330 WATTS DC UPS

## Features

- Ultra-low noise output
- Independent battery charging output
- DC output OK & battery OK alarms & LEDs
- Battery-LVD and alarm
- Over-temperature protection
- Battery fuse fail LED



## Specifications

### INPUT

Voltage:	190 to 264 vac, or 190 to 400VDC
Line regulation:	0.2% typical
Current:	1.4A maximum
Inrush current:	10A maximum
Frequency:	45 to 65 Hz

### OUTPUT

Voltage	See table
Current	See table
Load regulation	0.5% typical
Current limit type - load cct	Constant current
Current limit type - batt. cct	Constant current
Short circuit protection	Indefinite, auto-resetting
Over-voltage protection	17.5 to 20V latching (13.8Vdc output) 31.5 to 39V latching (27.6Vdc output)
Ripple & noise 100 MHz bandwidth	28mVp-p (13.8Vdc output) 55mVp-p (27.6Vdc output)

### ENVIRONMENTAL

Operating temperature	0 to 70°C ambient with derating, 5...90% relative humidity (non-condensing)
Over-temperature protection	Automatic & auto-resetting
Cooling requirement	Natural convection
Efficiency	80% minimum

## Selection Table

MODEL NUMBER	VDC	OUTPUT		OUTPUT POWER
		I <sub>LOAD</sub>	I <sub>BATT</sub>	
PB251-12CM	13.8V	16A	2A	220W
PB251-12CM-H	13.8V	20A	2A	275W
PB251-24CM	27.6V	11A	2A	300W
PB251-24CM-H	27.6V	12A	2A	330W
PB251-12RML	13.8V	20A	4A	275W
PB251-12B	13.8V	20A	4A	275W
PB251-24RML	27.6V	12A	2A	330W

Note: Non standard battery charging current available on request. ie PB251-12CM-H-10 for 10A.

## STANDARDS & APPROVALS

Safety	Complies with AS/NZS 60950, class 1, NSW Office of Fair Trading Approval N20602
EMC	Emissions comply with AS/NZS CISPR11, Group 1, Class B. Complies with ACA EMC Scheme, Safety & EMC Regulatory Compliance Marked
Isolation i/p-o/p i/p-ground o/p-ground	4242VDC for 1 minute 2121VDC for 1 minute 707VDC for 1 minute

## ALARMS & BATTERY FUNCTIONS

Converter ON/OK alarm	Indicated by voltage-free changeover relay contacts &
green LED	ON=PSU OK
Battery low (& fuse) alarm	10.2 to 12.6V for 12V battery, adjustable 20.4 to 25.2V for 24V battery, adjustable Indicated by voltage-free changeover relay contacts & green LED: ON=BATT OK
Low voltage disconnect	9.6 to 12V for 12V battery, adjustable 19.2 to 24V for 24V battery, adjustable
Charger over-load protection	Auto-resetting electronic circuit breaker
Reverse polarity protection	Internal battery fuse
Battery to load voltage drop	0.2 to 0.25V typical

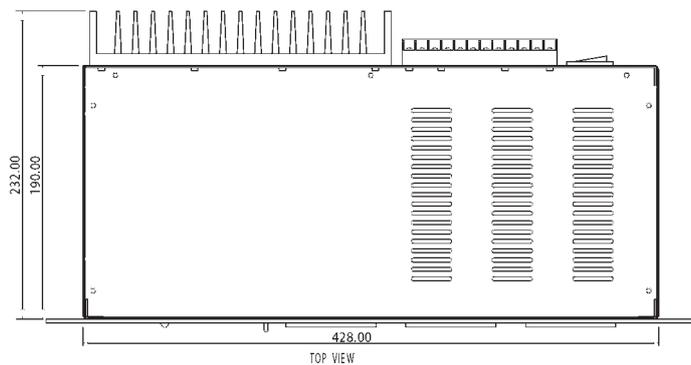
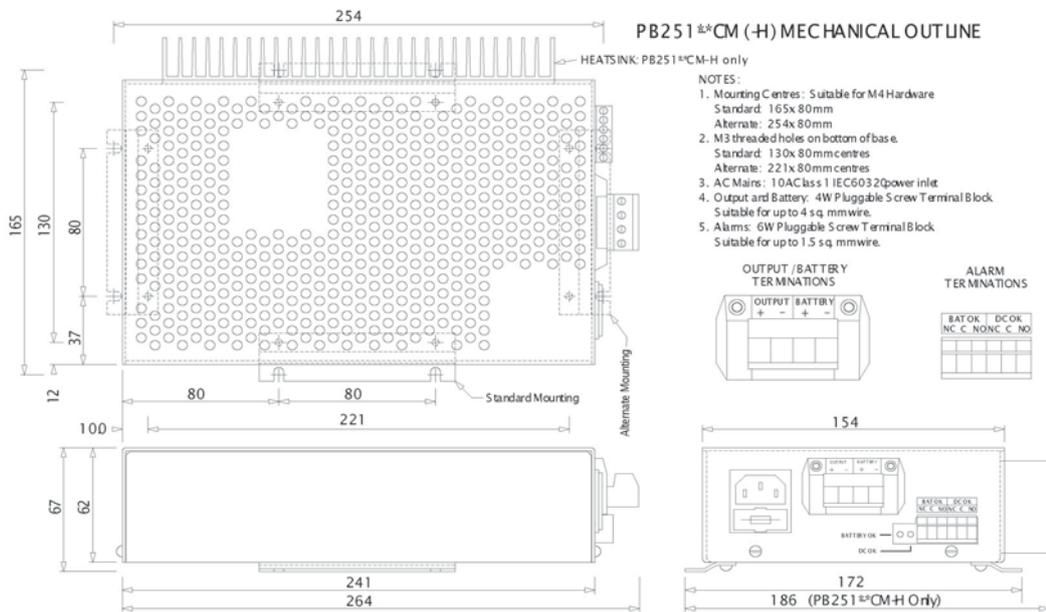
## MECHANICAL

Case size	264 L x 172 W x 67 H mm
Case size with heatsink	264 L x 186 W x 67 H mm
Rack size	232 D x 19" W x 2RU H
Weight	1.9 kg
Weight with heatsink	2.1 kg
Weight (rack mounted version)	5.5 kg

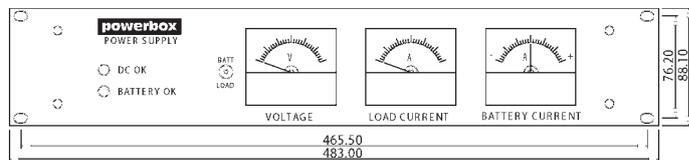
# PB251 Series

275-330 WATTS DC UPS

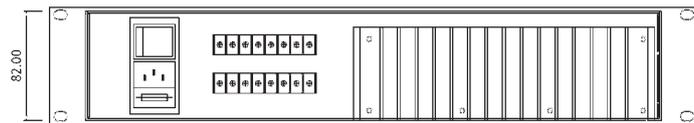
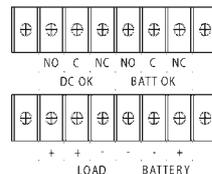
## Technical Illustrations



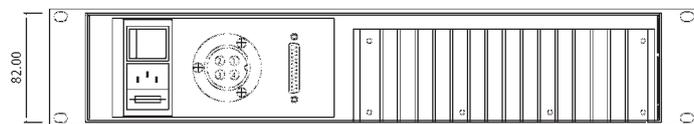
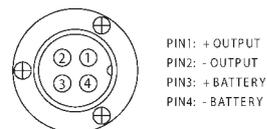
- NOTES:
1. 2RU x 19" rack enclosure per IEC 297
  2. Mounting slots are suitable for M6 hardware.
  3. Input connector is a 10A Class 1 IEC60320 inlet.
  4. 2 meter IEC mains cord with Australian plug is supplied with unit.
  5. PB251-12B alarm terminal is DB25 female.
  6. PB251-12B output and battery connector is Hirose pn. HS 28R-4A. Mating connector is Hirose pn. HS 28P-4A (not supplied).
  7. PB251-2\*RML alarm and output terminals are M3.5 screws suitable for ring or fork lugs up to 8 mm wide.



PB251-2\*RML ALARM AND OUTPUT TERMINALS



PB251-12B OUTPUT & BATTERY CONNECTOR



PB251-12B ALARM CONNECTOR



# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Level Probe
<b>Location:</b>	Common Control
<b>Model Numbers:</b>	020130FSP
<b>Manufacturer:</b>	Multitrode
<b>Supplier:</b>	Brisbane Technology Park Unit 1, 18 Brandl Street P.O. Box 4633 Eight Mile Plains Queensland 4113 Australia 7 3340 7000

# The MultiTrode Probe

MultiTrode probes are unsurpassed for rugged reliability, cost effectiveness and simplicity. Designed for the tough, turbulent conditions found in water, sewage and industrial tanks and sumps, the probes can be found in the simplest and the most complex water and wastewater management systems around the world.

- Low maintenance
- Simple installation
- Excellent in turbulence
- Short & long term cost savings
- Environmentally friendly
- Safe, low sensing voltage
- Unaffected by fat, grease, debris and foam
- Positive pump cut-out
- Safe – MTISB Barrier

## Reliable in all conditions

Operation is unaffected by build up of fat, grease debris and foam, which causes other systems such as floats, bubblers, pressure and ultrasonic transducers to fail. Turbulence does not affect the probe operation. The rugged, streamlined design eliminates tangling and is ideal for confined spaces.

## Positive pump cut-out

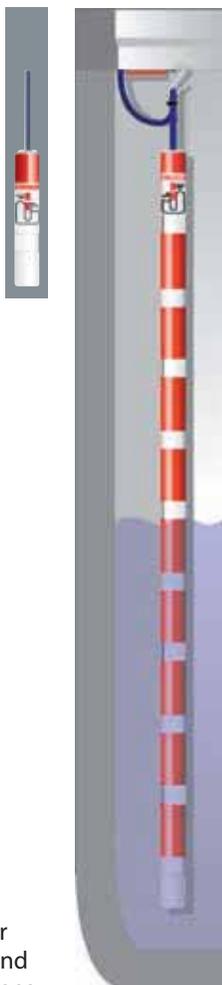
Operational consistency is important to longevity, low maintenance and cost control. The positive pump cut-out ensures pumps are turned off at the same level every time. This avoids damage due to pump over run and the cost of additional control equipment.

## Safe for people and environment

The extra low sensing voltage ensures operators and maintenance staff are protected. All MultiTrode products are environmentally safe, containing no mercury or other harmful contaminants.

## Cost savings

The low cost of equipment, installation and maintenance makes MultiTrode one of the most efficient level control systems available. Plus robust construction and longevity ensures continued cost savings when compared to other systems on the market.



## Standard and custom probes

MultiTrode manufactures a wide range of standard probes, from a single sensor (200mm) to a ten-sensor probe (1000mm increasing to a maximum of nine metres). Custom probes can be manufactured to suit your requirements.

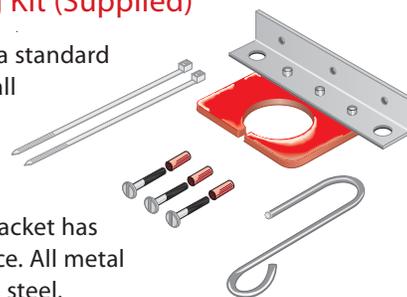
## Installation

Installation is straightforward. Probes are easy to install without entering the wet area. The probe is simply lowered in from the top and suspended by its own cable, using the mounting kit supplied.

## MTAK-1 Mounting Kit (Supplied)

The mounting bracket is a standard accessory supplied with all multi-sensor probes (not standard with 0.2/1-xx single sensor probe).

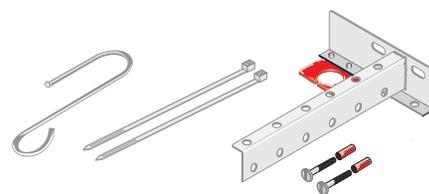
The MTAK-1 mounting bracket has an integral cleaning device. All metal components are stainless steel.



## MTAK-2 Mounting Kit (Optional extra)

This extended bracket provides up to 300mm extra wall clearance.

This bracket is not included as standard with probes.



## Ordering Examples and Information

Model Code	Probe Length (m/in)	Sensor Separation (mm/in)	Cable Length* (m/ft)	Number of Sensors
0.2/1-10	0.2/8	N/A	10/33	1
0.5/3-10	0.5/16	150/6	10/33	3
1.0/10-10	1/40	100/4	10/33	10
1.5/10-30	1.5/60	150/6	30/100	10
2.0/10-30	2/80	200/8	30/100	10
2.5/10-30	2.5/96	250/10	30/100	10
3.0/10-30	3/115	300/12	30/100	10
6.0/10-30	6/224	600/24	30/100	10
9.0/10-30	9/368	900/40	30/100	10

\*Cable Length 10m/33ft or 30m/100ft

Probe Length (meters)	Sensor Points	Cable Length (meters)
2.5	10	10



www.multitrode.com

MultiTrode Pty Ltd · Australia

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 PO Box 4633 Eight Mile Plains Qld 4113  
 Tel: +61 7 3340 7000 Fax: +61 7 3340 7077

MultiTrode Inc · USA

6560 East Rogers Circle  
 Boca Raton Florida 33487  
 Tel: +1 561 994 8090 Fax: +1 561 994 6282

# TECHNICAL DATA SHEET

**Equipment Type:** Pressure Measurement instrument

**Location:**

**Model Numbers:** VEGABAR 52

**Manufacturer:** Vega

**Supplier:** Vega  
398 The Boulevard  
Kerrawee, NSW 2232

Ph: 02 9542 6662

Fax: 02 9542 6665

Web: [www.vega.com/au](http://www.vega.com/au)

# VEGABAR 52

## Profibus PA

### Pressure transmitter with CERTEC® measuring cell



#### Area of application

The VEGABAR 52 pressure transmitter can be used universally for measurement of gases, vapours and liquids. Also substances such as sand are not problem for the abrasion-resistant ceramic measuring cell. The VEGABAR 52 is an economical solution for a multitude of applications in all areas of industry.

#### Advantages

- High plant availability through maximum overload and vacuum resistance of the ceramic measuring cell
- Measurement down to the last drop through extremely small measuring ranges with high accuracy.
- Low costs for maintenance thanks to wear-free ceramic measuring cell

#### Function

The heart of the pressure transmitter is the pressure measuring cell that transforms pressure into an electrical signal. This pressure-dependent signal is converted into a standard output signal by the integrated electronics.

The sensor element is the CERTEC® measuring cell with excellent long-term stability and high overload resistance. The CERTEC® measuring cell is also equipped with a temperature sensor. The temperature value can be displayed via the indicating and adjustment module or processed via the signal output.

#### Technical data

Measuring ranges	-1 ... +72 bar/-100 kPa ... +7200 kPa (-14.5 ... +1044 psig)
Smallest measuring range	+0.1 bar/+10 kPa (+1.45 psig)
Deviation	< 0.075 %, optionally up to < 0.05 %
Process fitting	Thread G $\frac{1}{2}$ (EN 837), thread from G1 $\frac{1}{2}$ (DIN 3852-A), flanges from DN 25 or ANSI 1", fittings for the food processing and paper industry
Process temperature	-40 ... +150 °C (-40 ... +302 °F)
Ambient, storage and transport temperature	-40 ... +80 °C (-40 ... +176 °F)
Betriebsspannung	9 ... 32 V DC

#### Materials

The wetted parts of the instrument are made of 316L, PVDF, Hastelloy, C4-plated or Sapphire-ceramic®. The process seal is available in FKM, FFKM as well as EPDM.

You will find a complete overview of the available materials and seals in the "configurator" on our homepage under [www.vega.com/configurator](http://www.vega.com/configurator).

#### Housing versions

The housings are available as single chamber or double chamber version in plastic, stainless steel or aluminium.

They are available in protection ratings up to IP 68 (25 bar) with external electronics.

#### Electronics versions

The instruments are available in different electronics versions. Apart from the two-wire electronics with 4 ... 20 mA or 4 ... 20 mA/HART, two purely digital versions with Profibus PA and Foundation Fieldbus are available.

#### Approvals

The instruments are suitable for use in hazardous areas and are approved e.g. according to ATEX and IEC. The instruments have also different ship approvals such as e.g. GL, LRS or ABS.

You can find detailed information on the existing approvals in the "configurator" on our homepage under [www.vega.com/configurator](http://www.vega.com/configurator).

## Bedienung

Die Bedienung des Gerätes erfolgt über das optional einsetzbare Anzeige- und Bedienmodul PLICSCOM oder über einen PC mit der Bediensoftware PACTware und entsprechendem DTM. Eine alternative Bedienmöglichkeit ist das herstellerspezifische Bedienprogramm PDM.



- 2 Threaded version G1½ A
- 3 Flange version DN 50

## Information

You can find further information about the VEGA product line on our homepage [www.vega.com](http://www.vega.com).  
In the download section under [www.vega.com/downloads](http://www.vega.com/downloads) you'll find free operating instructions, product information, brochures, approval documents, instrument drawings and much, much more.  
There, you will also find GSD and EDD files for Profibus PA systems as well as DD and CFF files for Foundation Fieldbus systems.

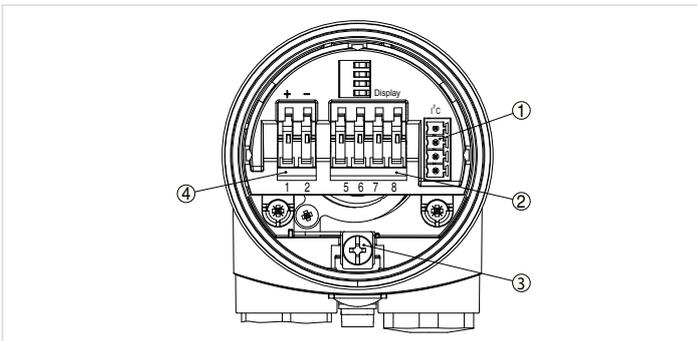
## Instrument selection

With the "finder" you can select the most suitable measuring principle for your application: [www.vega.com/finder](http://www.vega.com/finder).  
You can find detailed information on the instrument versions in the "configurator" on our homepage under [www.vega.com/configurator](http://www.vega.com/configurator).

## Contact

You can find the VEGA agency serving your area on our homepage [www.vega.com](http://www.vega.com).

## Elektrischer Anschluss

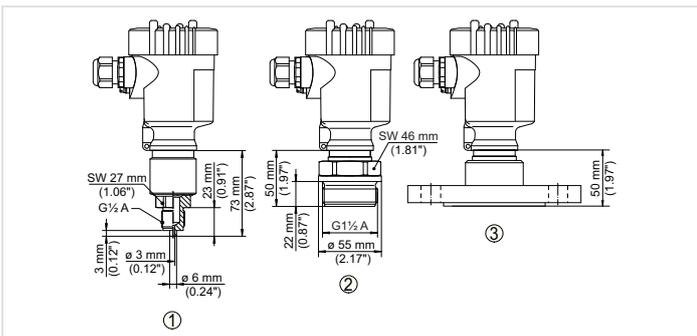


Elektronik- und Anschlussraum Einkammergehäuse

- 1 Steckverbinder für VEGACONNECT (I<sup>2</sup>C-Schnittstelle)
- 2 Federkraftklemmen zum Anschluss der externen Anzeige VEGADIS 61
- 3 Erdungsklemme zum Anschluss des Kabelschirms
- 4 Federkraftklemmen für Spannungsversorgung und Signalausgang

Details zum elektrischen Anschluss finden Sie in der Betriebsanleitung des Gerätes auf unserer Homepage unter [www.vega.com/downloads](http://www.vega.com/downloads).

## Dimensions



Dimensions VEGABAR 52

- 1 Threaded version G1½ A (manometer connection EN 837)

# TECHNICAL DATA SHEET

**Equipment Type:** Valve Measurement instrument

**Location:**

**Model Numbers:** VEGADIS 62

**Manufacturer:** Vega

**Supplier:** Vega  
398 The Boulevard  
Kerrawee, NSW 2232

Ph: 02 9542 6662

Fax: 02 9542 6665

Web: [www.vega.com/au](http://www.vega.com/au)

# VEGADIS 62

## External indicating and adjustment unit without external energy



### Application area

VEGADIS 62 is suitable for measured value indication and adjustment of sensors with HART protocol. The instrument is looped directly into the signal line at any location. VEGADIS 62 can be also used as indicator for bus participants in a HART multidrop system. VEGADIS 62 operates also as a pure indicating instrument in a 4 ... 20 mA current loop.

### Advantages

- Digital and quasianalogue indication of the measured value
- Digital LC display with 4-key adjustment
- Detachable indicating and adjustment module
- Protection rating IP 65

### Function

VEGADIS 62 measures the current in the current loop and indicates the measured value in digital and quasianalogue format. The instrument operates in two modes: in HART mode the instrument listens continuously to the HART communication of the processing system with the sensor. Modifications of units and/or measuring range are adapted automatically. In the basic mode, all settings of VEGADIS 62 are carried out with the keys on the front.

### Technical data

#### General data

##### Materials

- Housing plastic PBT, Alu die-casting, 316L
- Inspection window in housing cover for indicating and adjustment module Polycarbonate (UL-746-C listed)

- Ground terminal 316Ti/316L

Weight approx. 0.35 kg (0.772 lbs)

#### Supply circuit

Voltage supply and data transmission via the signal circuit  
Current range 3.5 ... 22.5 mA

#### Indicating and adjustment module

##### Display

- Principle LCD
  - Measured value presentation 7 segments, 5-digit, height of digits 9 mm (0.354 in), indication range -99999 ... 99999
  - Bar graph 20 segments
  - Info line 14 segments, 6-digit, height of digits 5.5 mm (0.217 in)
- Adjustment elements 4 keys

##### Adjustment elements

##### Materials

- Housing ABS
- Inspection window Polyester foil

#### Ambient conditions

Ambient temperature -20 ... +70 °C (-4 ... +158 °F)  
Storage and transport temperature -40 ... +80 °C (-40 ... +176 °F)

#### Electromechanical data

Cable gland 2 x cable entry M20 x 1.5 (cable: ø 5 ... 9 mm)  
Spring-loaded terminals for wire cross-section  
– Massive wire, cord 0.2 ... 2.5 mm<sup>2</sup> (AWG 24 ... 14)  
– Cord with cable end sleeve 0.2 ... 1.5 mm<sup>2</sup> (AWG 24 ... 16)

#### Electrical protective measures

##### Protection rating

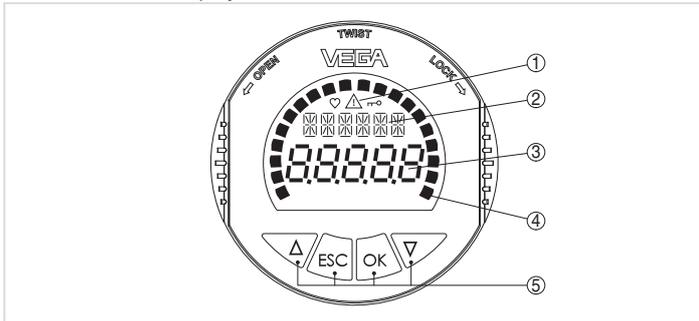
- Housing plastic IP 66/IP 67
- Housing Aluminium, stainless steel IP 66/IP 68 (0.2 bar)

### Approvals

You can find detailed information on the existing approvals in the "configurator" on our homepage under [www.vega.com/configurator](http://www.vega.com/configurator).

**Operation**

The adjustment of VEGADIS 62 is menu-controlled via four keys on the front and one LC display.



Indicating and adjustment elements

- 1 Status information (HART mode, unit lock, warning or error information)
- 2 Unit and information line
- 3 Digital measured value indication
- 3 Bar graph for quasianalogue measured value indication
- 3 Adjustment keys

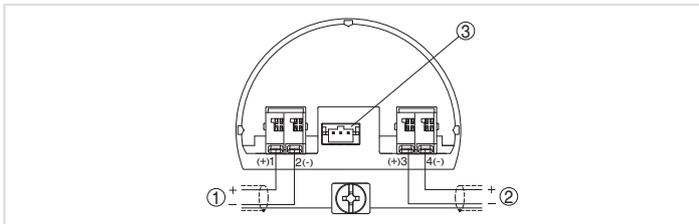
**Information**

You can find further information about the VEGA product line on our homepage [www.vega.com](http://www.vega.com). In the download section under [www.vega.com/downloads](http://www.vega.com/downloads) you'll find free operating instructions, product information, brochures, approval documents, instrument drawings and much, much more.

**Contact**

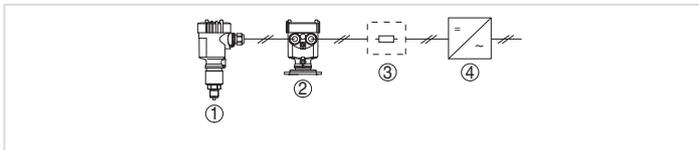
You can find the VEGA agency serving your area on our homepage [www.vega.com](http://www.vega.com).

**Electrical connection**



Wiring plan VEGADIS 62

- 1 To the sensor
- 2 For power supply
- 3 For connection cable to indicating and adjustment module

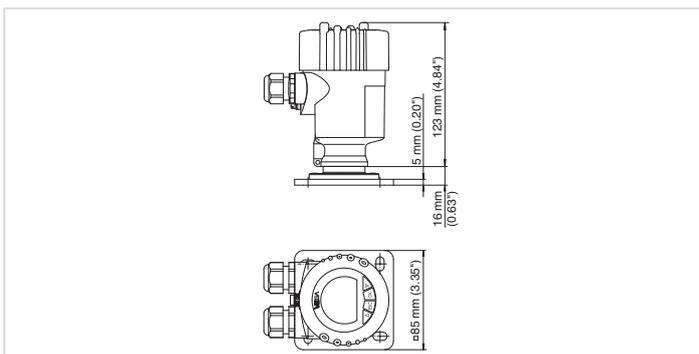


Installation example VEGADIS 62 in conjunction with an individual sensor

- 1 Sensor
- 2 VEGADIS 62
- 3 HART resistance 250 Ω (required depending on the processing)
- 4 Voltage supply/Processing

You can find details on the electrical connection in the operating instructions of the instruments on our homepage under [www.vega.com/downloads](http://www.vega.com/downloads).

**Dimensions**



# TECHNICAL DATA SHEET

**Equipment Type:** Hydrostatic

**Location:**

**Model Numbers:** VEGADIS 62

**Manufacturer:** Vega

**Supplier:** Vega  
398 The Boulevard  
Kerrawee, NSW 2232

Ph: 02 9542 6662

Fax: 02 9542 6665

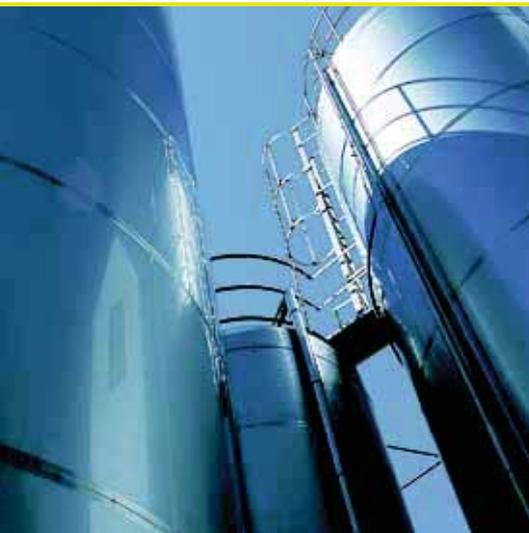
Web: [www.vega.com/au](http://www.vega.com/au)

Process pressure/Hydrostatic

## VEGAWELL 52



## Product Information



# VEGA

## Contents

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### Take note of safety instructions for Ex applications



Please note the Ex specific safety information which you can find on our homepage [www.vega.com/services/downloads](http://www.vega.com/services/downloads) and which comes with every instrument. In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units. The sensors must only be operated on intrinsically safe circuits. The permissible electrical values are stated in the certificate.

## 1 Description of the measuring principle

### Measuring principle

VEGAWELL 52 pressure transmitters work according to the hydrostatic measuring principle, which functions independently of the dielectric properties of the product and is not influenced by foam generation.

The sensor element of VEGAWELL 52 is the dry ceramic-capacitive CERTEC<sup>®</sup> measuring cell in two sizes. Base element and diaphragm consist of high purity sapphire-ceramic<sup>®</sup>.

The hydrostatic pressure of the product causes via the diaphragm a capacitance change in the measuring cell. This capacitance change is converted into an appropriate output signal.

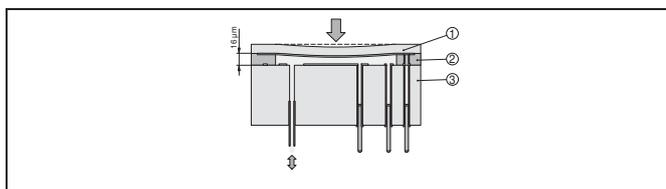


Fig. 1: Configuration of the CERTEC<sup>®</sup> measuring cell with VEGAWELL 52

- 1 Diaphragm
- 2 Soldered glass bond
- 3 Base element

The advantages of the CERTEC<sup>®</sup> measuring cell are:

- Very high overload resistance
- No hysteresis
- Excellent long-term stability
- Completely front flush installation
- Good corrosion resistance
- Very high abrasion resistance

### Wide application range

VEGAWELL 52 is suitable for level measurement in deep wells and ballast tanks as well as for gauge measurement in open flumes. Typical media are drinking water and waste water as well as water containing abrasive substances. All signal outputs are available in 4 ... 20 mA and 4 ... 20 mA/HART - Pt 100.

In the 4 ... 20 mA/HART - Pt 100 version, a temperature sensor Pt 100 in four-wire technology is integrated in the transducer. Power supply or processing are carried out via an external temperature transducer.

## 2 Type overview

### VEGAWELL 52



Measuring cell:	CERTEC®
Media:	drinking water and waste water
Process fitting:	Straining clamp, screw connection, thread
Material process fitting:	316L
Material, suspension cable:	PE, PUR, FEP
Material transmitter:	316L, 1.4462 (Duplex), each also with PE coating, PVDF, Titanium
Diameter transmitter:	depending on material and version at least 22 mm
Measuring range:	0 ... 0.1 bar up to 0 ... 25 bar
Process temperature:	-20 ... +80 °C (-4 ... +176 °F)
Deviation:	< 0.2 %, < 0.1 %
Signal output:	4 ... 20 mA, 4 ... 20 mA/HART
Operation:	depending on the version via PACTware/PC

### 3 Mounting instructions

#### Mounting position

The following illustration shows a mounting example for VEGAWELL 52. The VEGA price list contains suitable mounting brackets under the section Accessories. With these parts, standard mounting arrangements can be realised quickly and reliably.



Fig. 3: VEGAWELL 52 in a pump shaft with VEGABOX 02

VEGAWELL 52 must be mounted in a calm area or in a suitable protective tube. This avoids lateral movements of the transmitter and the resulting corruption of measurement data.



#### Note:

As an alternative to fixing the transmitter, the use of a measuring instrument holder from VEGA's line of mounting accessories is recommended.

Beside the connection and suspension cables, the suspension cable also contains a capillary for atmospheric pressure compensation. All versions can be shortened on site.

With VEGAWELL 52, the electronics is completely integrated in the transmitter. The cable end can be lead directly to a dry connection compartment. Pressure compensation is then carried out via the filter element of the capillaries.



#### Note:

The pressure compensation housing VEGABOX 02 is recommended for connecting VEGAWELL 52.

It contains a high-quality ventilation filter and terminals. A protective cover is optionally available for use outdoors.

#### Mounting versions

The following illustrations show the different mounting versions depending on the instrument type.

#### Mounting with straining clamp

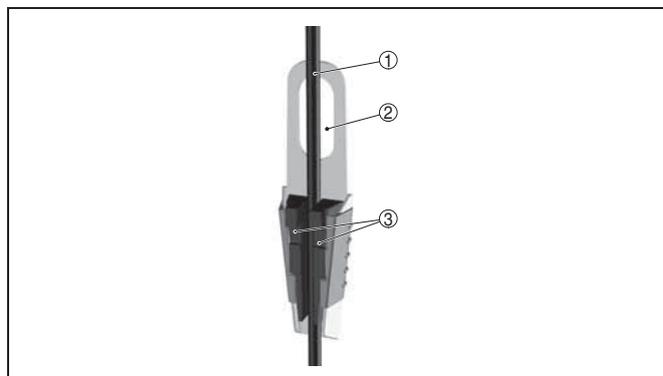


Fig. 5: Straining clamp

- 1 Suspension cable
- 2 Suspension opening
- 3 Clamping jaws

#### Mounting with screw connection

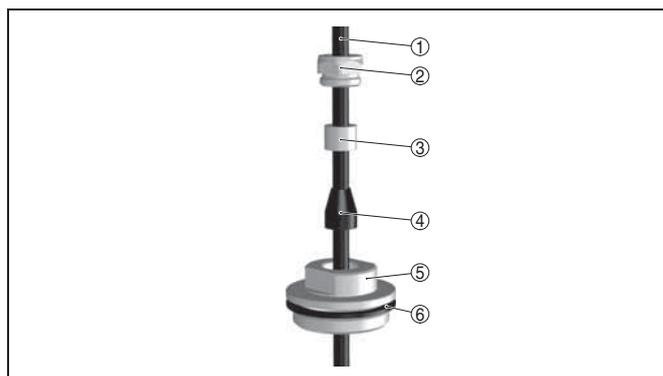


Fig. 6: Screw connection

- 1 Suspension cable
- 2 Seal screw
- 3 Cone bushing
- 4 Seal cone
- 5 Screw connection
- 6 Seal

**Mounting with housing and thread**

Fig. 7: Housing with thread G1½ A

- 1 Housing
- 2 Seal
- 3 Thread

## 4 Electrical connection

### 4.1 General requirements

The supply voltage range can differ depending on the instrument version. You can find exact specifications in chapter "Technical data".

The national installation standards as well as the valid safety regulations and accident prevention rules must be observed.



In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units.

### 4.2 Power supply

Supply voltage and current signal are carried on the same two-wire cable. The requirements on the power supply are specified in chapter "Technical data".

The VEGA power supply units VEGATRENN 149AEx, VEGAS-TAB 690, VEGADIS 371 as well as VEGAMET signal conditioning instruments are suitable for power supply. When one of these instruments is used, a reliable separation of the supply circuits from the mains circuits according to DIN VDE 0106 part 101 is ensured.

### 4.3 Connection cable

#### In general

An outer diameter of 5 ... 9 mm ensures the seal effect of the cable entry. If electromagnetic interference is expected, screened cable should be used for the signal lines.

The sensors are connected with standard two-wire cable without screen.



In Ex applications, the corresponding installation regulations must be noted for the connection cable.

### 4.4 Cable screening and grounding

If screened cable is necessary, the cable screen must be connected on both ends to ground potential. If potential equalisation currents are expected, the connection on the evaluation side must be made via a ceramic capacitor (e.g. 1 nF, 1500 V).

### 4.5 Wiring plan VEGAWELL 52 - 4 ... 20 mA

#### Direct connection

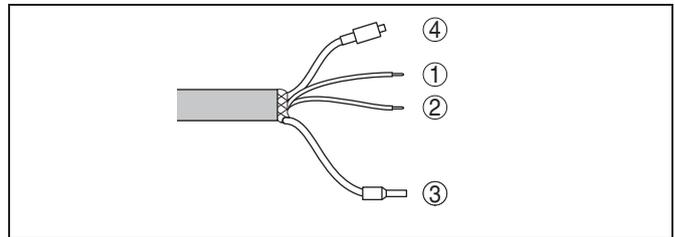


Fig. 8: Wire assignment, suspension cable

- 1 blue (-): to power supply or to the processing system
- 2 brown (+): to power supply or to the processing system
- 3 Shielding
- 4 Breather capillaries with filter element

#### Connection via VEGABOX 02

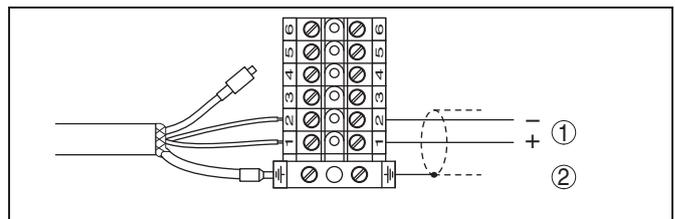


Fig. 9: Terminal assignment VEGABOX 02

- 1 To power supply or the processing system
- 2 Shielding<sup>1)</sup>

#### Connection via housing

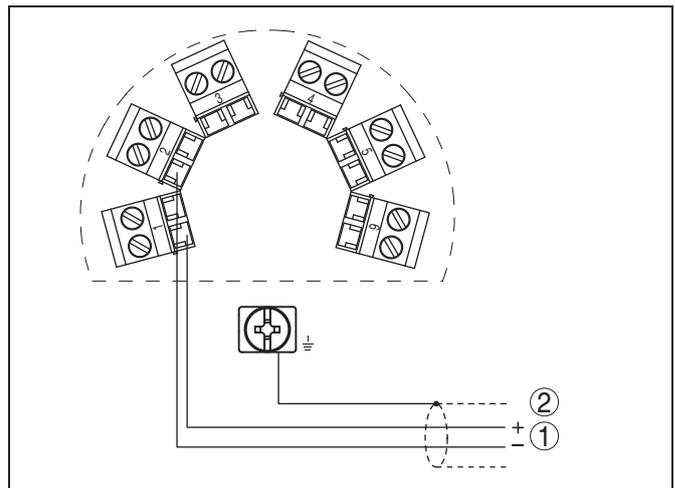


Fig. 10: Terminal assignment of the housing

- 1 To power supply or the processing system
- 2 Shielding<sup>2)</sup>

<sup>1)</sup> Connect screen to ground terminal. Connect ground terminal on the outside of the housing as prescribed. The two terminals are galvanically connected.  
<sup>2)</sup> Connect screen to ground terminal. Connect ground terminal on the outside of the housing as prescribed. The two terminals are galvanically connected.

### 4.6 Wiring plan VEGAWELL 52 - 4 ... 20 mA/ HART - Pt 100

#### Direct connection

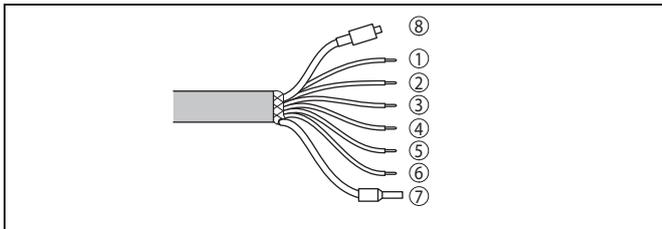


Fig. 11: Wire assignment, connection cable

- 1 blue (-): to power supply or to the processing system
- 2 Brown (+): to power supply or to the processing system
- 3 White: for processing of the integrated Pt 100 (power supply)
- 4 Yellow: for processing of the integrated Pt 100 (measurement)
- 5 Red: for processing of the integrated Pt 100 (measurement)
- 6 Black: for processing of the integrated Pt 100 (power supply)
- 7 Shielding
- 8 Breather capillaries with filter element

#### Connection via VEGABOX 02

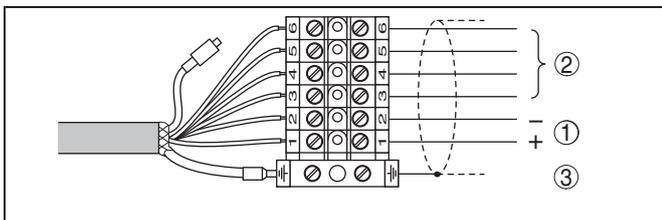


Fig. 12: Terminal assignment VEGABOX 02

- 1 To power supply or the processing system (signal pressure transmitter)
- 2 To power supply or the processing system (connection cables resistance thermometer Pt 100)
- 3 Shielding<sup>3)</sup>

#### Connection via VEGABOX 02 with integrated temperature sensor

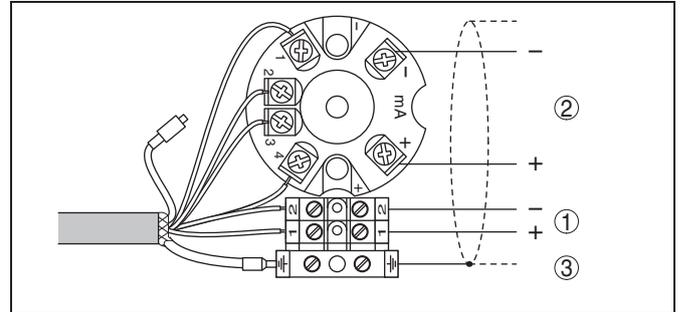


Fig. 13: Terminal assignment VEGABOX 02

- 1 To power supply or the processing system (signal pressure transmitter)
- 2 For voltage supply or to processing system (resistance thermometer Pt 100)
- 3 Shielding<sup>4)</sup>

#### Connection via housing

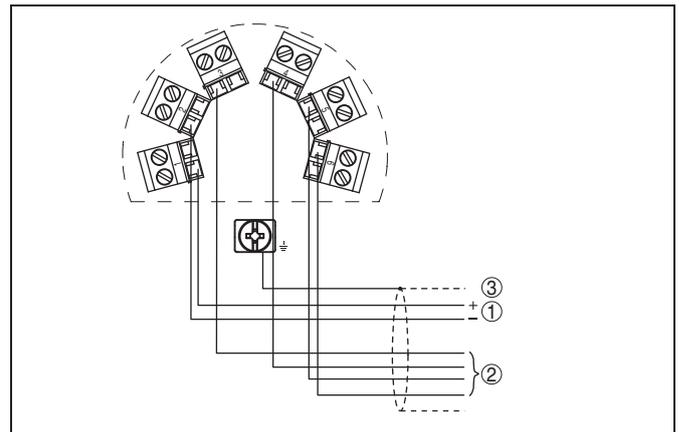


Fig. 14: Terminal assignment of the housing

- 1 To power supply or the processing system (signal pressure transmitter)
- 2 For voltage supply or to processing system (resistance thermometer Pt 100)
- 3 Shielding<sup>5)</sup>

<sup>3)</sup> Connect screen to ground terminal. Connect ground terminal on the outside of the housing as prescribed. The two terminals are galvanically connected.  
<sup>4)</sup> Connect screen to ground terminal. Connect ground terminal on the outside of the housing as prescribed. The two terminals are galvanically connected.  
<sup>5)</sup> Connect screen to ground terminal. Connect ground terminal on the outside of the housing as prescribed. The two terminals are galvanically connected.

## 5 Operation

### 5.1 Overview

#### VEGAWELL 52 4 ... 20 mA

VEGAWELL 52 - 4 ... 20 mA has no adjustment options.

#### VEGAWELL 52 4 ... 20 mA/HART - Pt 100

- Adjustment software according to FDT/DTM standard, e.g. PACTware and PC
- HART handheld

### 5.2 Adjustment with PACTware

#### Connecting the PC to the signal cable

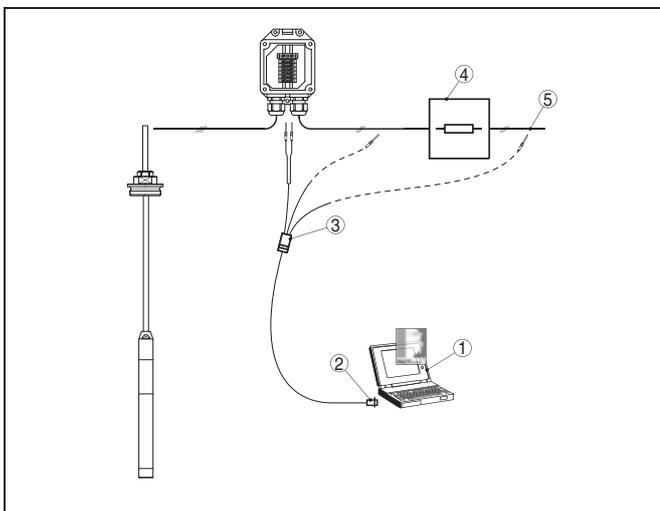


Fig. 15: Connection of the PC to VEGABOX 02 or communication resistor

- 1 PC with PACTware
- 2 RS232 interface (with VEGACONNECT 3), USB interface (with VEGACONNECT 4)
- 3 VEGACONNECT 3 or 4
- 4 Communication resistor 250  $\Omega$
- 5 Power supply unit

#### Necessary components:

- VEGAWELL 52
- PC with PACTware and suitable VEGA DTM
- VEGACONNECT with HART adapter cable
- HART resistor approx. 250  $\Omega$
- Power supply unit



#### Note:

With power supply units with integrated HART resistance (internal resistance approx. 250  $\Omega$ ), an additional external resistance is not necessary (e. g. VEGATRENN 149A, VEGAMET 381/624/625, VEGASCAN 693). In such cases, VEGACONNECT can be connected parallel to the 4 ... 20 mA cable.

## 6 Technical data

### Materials and weights

Materials, wetted parts	
– Transmitter	316L, 316L with PE coating, 1.4462 (Duplex), 1.4462 with PE coating, PVDF, Titanium
– Diaphragm	sapphire ceramic® (99.9 % oxide ceramic)
– Measuring cell seal	FKM (VP2/A) - FDA and KTW approved, FFKM (Perlast G75S), EPDM (A+P 75.5/KW75F)
– Suspension cable	PE (FDA and KTW-approved), FEP, PUR
– Cable gland on the transmitter	316L
– Process fitting	316L
– Straining clamp	1.4301
– Unassembled screw connection	316L, PVDF
– Threaded connection on the housing	316L
Materials, non-wetted parts	
– Housing	plastic PBT (Polyester), 316L
Weight approx.	
– Basic weight	0.8 kg (1.764 lbs)
– Suspension cable	0.1 kg/m (0.07 lbs/ft)
– Straining clamp	0.2 kg (0.441 lbs)
– Screw connection	0.4 kg (0.882 lbs)
– Plastic housing	0.8 kg (1.764 lbs)
– Stainless steel housing	1.6 kg (3.528 lbs)

### Input variable

Measured value	Level
Measuring range	see product code
Recommended max. turn down	10 : 1

### Output variable

<b>4 ... 20 mA</b>	
Output signal	4 ... 20 mA
Signal resolution	2 µA
Failure signal	< 3.6 mA
Max. output current	22 mA
Run-up time	2 s
Step response time	100 ms (ti: 0 s, 0 ... 63 %)
Fulfilled NAMUR recommendations	NE 43
<b>4 ... 20 mA/HART - Pt 100</b>	
Output signal	4 ... 20 mA/HART
Signal resolution	2 µA
Failure signal	< 3.6 mA; 20.5 mA; 22 mA; unchanged (adjustable via PACTware)
Max. output current	22 mA
Run-up time	15 s
Step response time	200 ms (ti: 0 s, 0 ... 63 %)
Fulfilled NAMUR recommendations	NE 43

### Additional output parameter - temperature

integrated resistance thermometer	Pt 100 according to DIN EN 60751
Range	-50 ... +100 °C (-58 ... +212 °F)
Resolution	1 °K

### Deviation for 4 ... 20 mA version<sup>6)</sup>

Specifications refer to the set span. Turn down (TD) = nominal measuring range/set span.

Deviation with version < 0.2 %

– Turn down 1 : 1 up to 5 : 1	< 0.2 %
– Turn down > 10 : 1	< 0.04 % x TD

<sup>6)</sup> Determined according to the limit point method according to IEC 60770, incl. non-linearity, hysteresis and non-repeatability.

Deviation with version < 0.1 %	
– Turn down 1 : 1 up to 5 : 1	< 0.1 %
– Turn down > 10 : 1	< 0.02 % x TD

#### Deviation for version 4 ... 20 mA/HART - Pt 100<sup>7)</sup>

Applies to **digital** HART interface as well as to **analogue** current output 4 ... 20 mA. Specifications refer to the set span. Turn down (TD) is the relation nominal measuring range/set span.

Deviation with version < 0.2 %	
– Turn down 1 : 1 up to 5 : 1	< 0.2 %
– Turn down > 10 : 1	< 0.04 % x TD
Deviation with version < 0.1 %	
– Turn down 1 : 1 up to 5 : 1	< 0.1 %
– Turn down > 10 : 1	< 0.02 % x TD

#### Influence of the product or ambient temperature

Applies to **digital** HART interface as well as to **analogue** current output 4 ... 20 mA. Specifications refer to the set span. Turn down (TD) is the relation nominal measuring range/set span.

##### Average temperature coefficient of the zero signal

In the compensated temperature range of 0 ... +80 °C (+32 ... +176 °F), reference temperature 20 °C (68 °F).

Average temperature coefficient of the zero signal

– Turn down 1 : 1	< 0.05 %/10 K
– Turn down 1 : 1 up to 5 : 1	< 0.1 %/10 K
– Turn down > 10 : 1	< 0.15 %/10 K

Outside the compensated temperature range

Average temperature coefficient of the zero signal

– Turn down 1 : 1	typ. < 0.05 %/10 K
-------------------	--------------------

#### Long-term stability (similar to DIN 16086, DINV 19259-1 and IEC 60770-1)

Applies to **digital** HART interface as well as to **analogue** current output 4 ... 20 mA. Specifications refer to the set span. Turn down (TD) is the relation nominal measuring range/set span.

Long-term drift of the zero signal	< (0.1 % x TD)/year
------------------------------------	---------------------

#### Ambient conditions

Ambient temperature

– Connection cable PE	-40 ... +60 °C (-40 ... +140 °F)
– Connection cable PUR, FEP	-40 ... +85 °C (-40 ... +185 °F)
Storage and transport temperature	-20 ... +80 °C (-4 ... +176 °F)

#### Process conditions

##### Process pressure

Max. process pressure, transmitter<sup>8)</sup>

– Measuring range 0.1 bar (1.45 psig)	15 bar (218 psig)
– Measuring range 0.2 bar (2.9 psig)	20 bar (290 psig)
– Measuring range ≤ 0.4 bar (5.8 psig)	25 bar (363 psig)

Pressure stage, process fitting

– Unassembled screw connection	316L: PN 3, PVDF: unpressurized
– Thread on the housing	PN 3

Product temperature, depending on the version

<sup>7)</sup> Determined according to the limit point method according to IEC 60770, incl. non-linearity, hysteresis and non-repeatability.

<sup>8)</sup> Limited by the overpressure resistance of the measuring cell.

Suspension cable	Transmitter	Product temperature
PE	All	-20 ... +60 °C (-4 ... +140 °F)
PUR	All	-20 ... +80 °C (-4 ... +176 °F)
PUR	PE coating	-20 ... +60 °C (-4 ... +140 °F)
FEP	All	-20 ... +80 °C (-4 ... +176 °F)
FEP	PE coating	-20 ... +60 °C (-4 ... +140 °F)

Vibration resistance

mechanical vibrations with 4 g and 5 ... 100 Hz<sup>9)</sup>**Electromechanical data**

Suspension cable

– Configuration

six wires, one suspension cable, one breather capillary, screen braiding, foil, mantle

– Tensile strength

≥ 1200 N (270 pound force)

– Max. length

1000 m (3280 ft)

– Min. bending radius

25 mm (with 25 °C/77 °F)

– Diameter approx.

8 mm (0.315 in)

– colour (non-Ex/Ex) - PE

black/blue

– colour (non-Ex/Ex) - PUR, FEP

blue/blue

Cable entry housing or VEGABOX 02

1 x cable gland M20 x 1.5 (cable: ø 5 ... 9 mm), 1 x blind stopper M20 x 1.5 for wire cross section 1.5 mm<sup>2</sup> (AWG 16), screen up to 4 mm<sup>2</sup> (AWG 12)

Screw terminals

**Supply voltage - 4 ... 20 mA**

Operating voltage

8 ... 36 V DC

Permissible residual ripple

– &lt; 100 Hz

 $U_{ss} < 1 V$ 

– 100 Hz ... 10 kHz

 $U_{ss} < 10 mV$ 

Load

see diagram

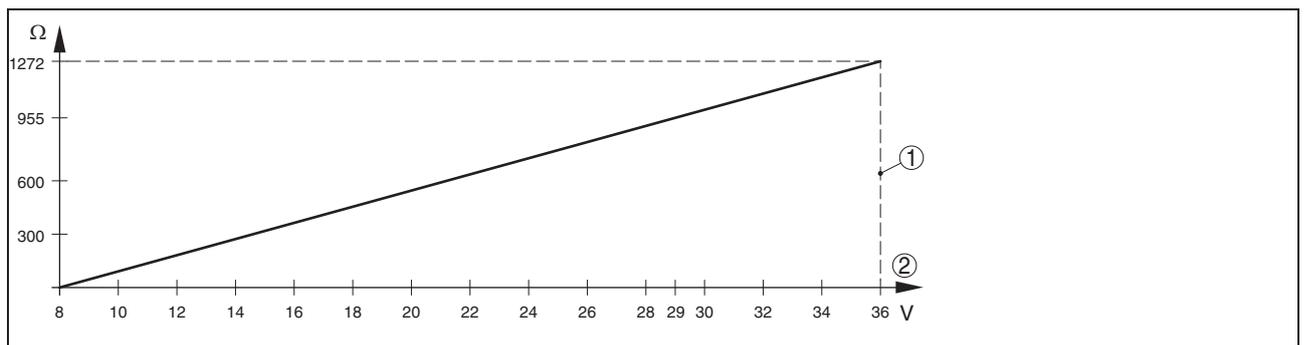


Fig. 16: Voltage diagram

1 Voltage limit

2 Operating voltage

**Supply voltage - 4 ... 20 mA/HART - Pt 100**

Operating voltage

9.6 ... 36 V DC

Permissible residual ripple

– &lt; 100 Hz

 $U_{ss} < 1 V$ 

– 100 Hz ... 10 kHz

 $U_{ss} < 10 mV$ 

Load

see diagram

<sup>9)</sup> Tested according to the regulations of German Lloyd, GL directive 2.

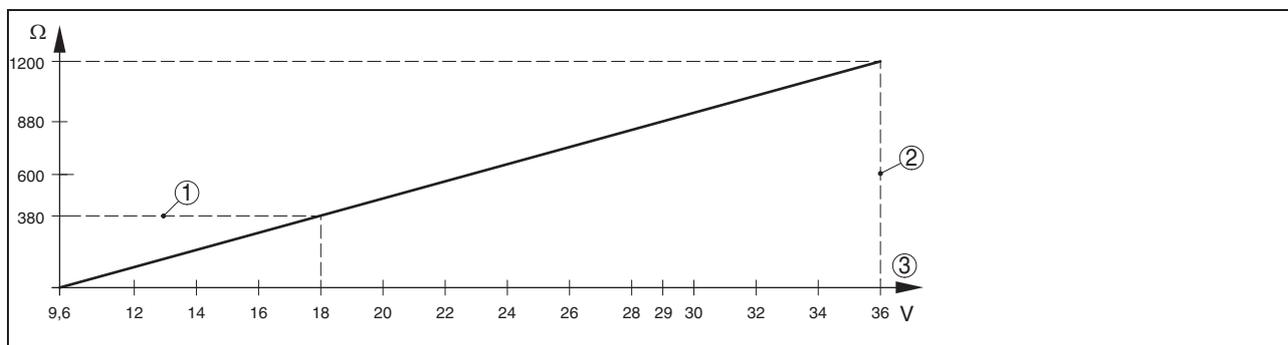


Fig. 17: Voltage diagram

- 1 HART load
- 2 Voltage limit
- 3 Operating voltage

### Electrical protective measures

Protection	
– Transmitter	IP 68 (30 bar)
– Housing	IP 66/IP 67
– VEGABOX 02	IP 65
Overvoltage category	III
Protection class	III

### Existing approvals or approvals applied for

Gas explosion protection	e.g. according to ATEX and IEC
Fire-damp protection	e.g. according to ATEX
Overfill protection	e.g. according to WHG
Ship approval	e.g. according to GL, LRS, ABS, RINA

The available approvals can be selected via the configurator on [www.vega.com](http://www.vega.com).

Depending on the version, instruments with approvals can have different technical data. For these instruments, please note the corresponding approval documents. They can be downloaded in the download section on [www.vega.com](http://www.vega.com).

### CE conformity

EMC (2004/108/EG)	EN 61326-1: 2006
LVD (2006/95/EG)	EN 61010-1: 2001

### Environmental instructions

VEGA environment management system	certified according to DIN EN ISO 14001
You can find detailed information under <a href="http://www.vega.com">www.vega.com</a> .	

## 7 Dimensions

### VEGAWELL 52 - suspension cable 1

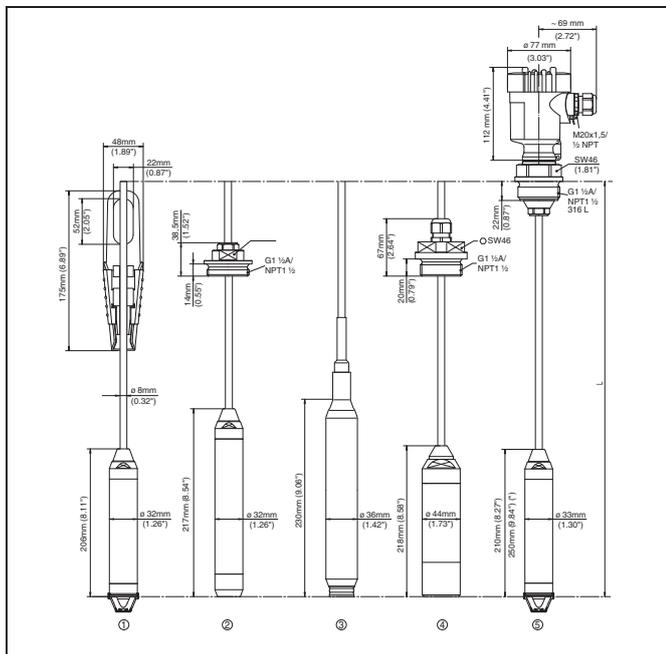


Fig. 18: VEGAWELL 52 - suspension cable

- 1 Transmitter Duplex, with straining clamp
- 2 Transmitter Duplex for deep wells, with unassembled screw connection G1 1/2 A (1 1/2 NPT) and closing cap
- 3 Transmitter Duplex, with PE coating
- 4 Transmitter with screwed connection of PVDF
- 5 Transmitter Titanium/Titanium with glass leadthrough, with thread G1 A (1 NPT) and plastic housing

### VEGAWELL 52 - threaded fitting

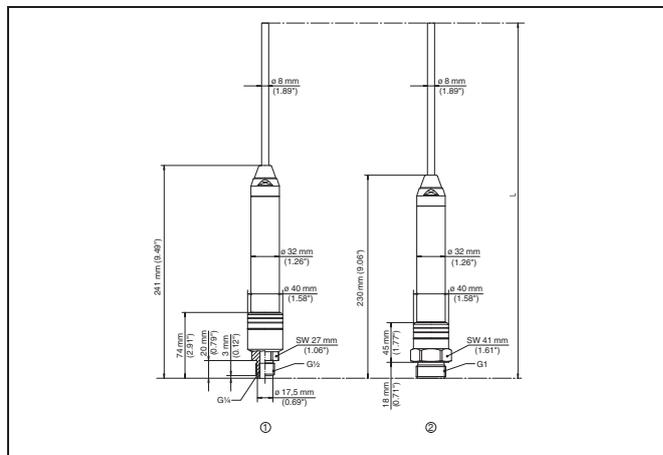


Fig. 22: VEGAWELL 52 - thread

- 1 Threaded fitting G1/2 inner G1/4
- 2 Threaded fitting G1

### VEGAWELL 52 - suspension cable 2

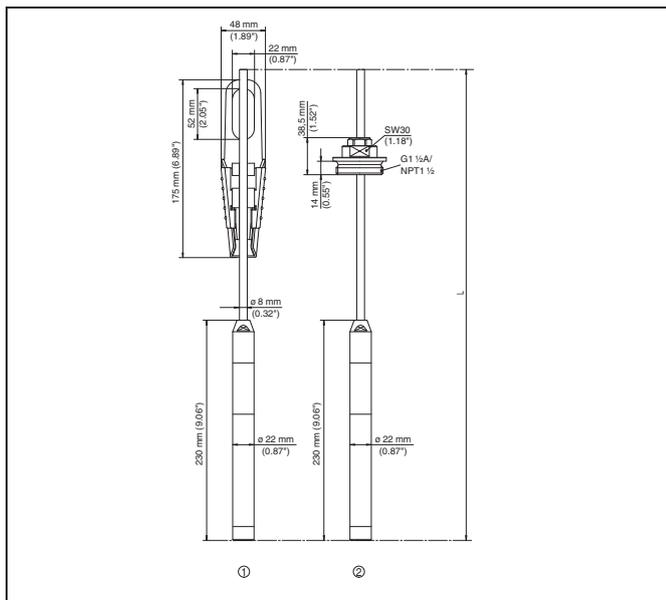


Fig. 20: VEGAWELL 52 - suspension cable

- 1 Transmitter 316L, with straining clamp
- 2 Transmitter Titanium, with unassembled screw connection G1 A (1 NPT)

## 8 Product code

### VEGAWELL 52

<p><b>Approval</b>  <b>XX</b> without  <b>XM</b> Ship approval  <b>AX</b> ATEX II 2G EEx ia IIC T6  <b>AM</b> ATEX II 2G EEx ia IIC T6 + Ship approval  <b>AI</b> IEC Ex ia IIC T6</p> <p><b>Fastening / Material</b>  <b>X4</b> without  <b>A4</b> Straining clamp / 1.4301(304)  <b>GA</b> Threaded fitting, unassembled G1½A PN3 / 316L  <b>NP</b> Threaded fitting, unassembled G1½A PN0,2 / PVDF  <b>GC</b> Threaded fitting, unassembled G1A PN3 / 316L  <b>GK</b> Thread G1½A PN3 / 316L with plastic housing  <b>GV</b> Thread G1½A PN3 / 316L w.hous. StSt (precision casting)</p> <p><b>Version / Process temperature</b>  <b>A</b> Suspension cable PE / -20...60°C  <b>D</b> Suspension cable PUR / -20...80°C  <b>B</b> Suspension cable FEP / -20...80°C</p> <p><b>Length</b>  <b>K</b> 6 m suspension cable PE  <b>L</b> 12 m suspension cable PE  <b>M</b> 27 m suspension cable PE  <b>T</b> individually selectable length (PE/PUR/FEP)</p> <p><b>Transmitter material / Diameter</b>  <b>D</b> Duplex 1.4462 / 32mm  <b>V</b> 316L / 22mm  <b>K</b> Duplex 1.4462 with PE coating / 35mm  <b>P</b> PVDF / 44 mm</p> <p><b>Seal measuring cell</b>  <b>1</b> FKM (VP2/A)  <b>3</b> EPDM (A+P 75.5/KW75F)  <b>P</b> FFKM (Perlast G75S)</p> <p><b>Measuring range</b>  <b>A</b> rel. / 0...0.1 bar (0...10 kPa)  <b>B</b> rel. / 0...0.2 bar (0...20 kPa)  <b>C</b> rel. / 0...0.4 bar (0...40 kPa)  <b>D</b> rel. / 0...1 bar (0...100 kPa)  <b>E</b> rel. / 0...2.5 bar (0...250 kPa)  <b>F</b> rel. / 0...5 bar (0...500 kPa)  <b>G</b> rel. / 0...10 bar (0...1000 kPa)  <b>2</b> abs. 0...2.5 bar (0...250kPa)  <b>3</b> abs. 0...5.0 bar (0...500kPa)</p> <p><b>Electronics</b>  <b>C</b> 4...20mA  <b>D</b> 4...20mA/HART® + PT100 4-wire</p> <p><b>Deviation in characteristic</b>  <b>1</b> 0.20  <b>2</b> 0.10</p> <p><b>Transmitter options</b>  <b>X</b> without  <b>V</b> for deep wells</p>	
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35400-EN-090130



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You can find at [www.vega.com](http://www.vega.com) downloads of the following

- operating instructions manuals
- menu schematics
- software
- certificates
- approvals

and much, much more

*Subject to change without prior notice*

35400-EN-090130

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Control Relays
<b>Location:</b>	RTU Section
<b>Model Numbers:</b>	Various
<b>Manufacturer:</b>	Specher & Schuh
<b>Supplier:</b>	NHP Pty Ltd  16 Riverview Place Murarrie (07) 3909 4999

## Control & Timing Relays

<b>CS7 Industrial Control Relays</b> .....	G2
<i>Technical Information</i> .....	G14
<b>CS8 Industrial Control Relays</b> .....	G18
<i>Technical Information</i> .....	G21
<b>RZ7-FS Electronic Timing Relays</b> .....	G24
<i>Technical Information</i> .....	G34
<b>RZ7-FE Electronic Timing Relays</b> .....	G36
<i>Technical Information</i> .....	G42

## Relpol Ice Cube Relays

<b>R2/R4 Plug-in Power Relays</b> .....	G46
<i>Technical Information</i> .....	G51
<b>R15 Plug-in Power Relays</b> .....	G56
<i>Technical Information</i> .....	G60
<b>RUC Plug-in Power Relays</b> .....	G64
<i>Technical Information</i> .....	G67
<b>RY2 Plug-in Power Relays</b> .....	G70
<i>Technical Information</i> .....	G72
<b>PI84/PI85 Interface Relays</b> .....	G75
<i>Technical Information</i> .....	G77
<b>PIR6W Interface Terminal Block Relays</b> .....	G82
<i>Technical Information</i> .....	G84

# G

# Control, Timing + Ice Cube Relays

# CS7 Industrial Control Relays

Control &  
Timing Relays

CS7

Reliable, general purpose relays for heavy duty applications



CS7 Industrial Control Relays share the same design as our modern CA7 contactor range. They are compact and designed for heavy duty industrial control applications where reliability and versatility are essential.

## Introducing Three CS7 Models for any Control Application

The standard CS7 relay utilizes x-stamped contact technology that reliably switches typical control circuits up to 10A (AC-15). For master relay circuits requiring higher amp capacity, the CS7-M Master Relay is designed for control circuits up to 15A (AC-15).

For applications requiring low energy switching such as PLC's or other electronic circuits, the CS7-B relay with bifurcated contacts is designed for 20 million operations down to a signal level of 5V @ 3mA.

The bifurcated H-bridge design divides each movable gold contact into two sections at the tip of the spanner which provides a higher degree of reliability for low signal applications.

## Auxiliary components provide a range of options

CS7 auxiliary components convert the basic four pole relay into a:

- 5, 6, 7, 8, 9, 10, 11 or 12 pole relay
- 4, 5, 6, 7 or 8 pole latched relay
- 4, 5, 6, 7 or 8 pole relay with two pneumatic time delay contacts
- Mechanically latched 4, 5, 6, 7 or 8 pole relay
- Also available are top mounted bifurcated auxiliary contacts which operate down to 5V @ 3mA.

Since the CS7 uses the same auxiliary components as our CA7 contactors, inventory is reduced.



## Mechanically linked contacts for safety

CS7 control relays are perfect for fail-safe control circuits. An interlock contact design, which maintains minimum 0.3mm clearance, prevents the NC contact from reclosing if the NO contact is welded when in operation. This feature not only includes the base contact poles, but extends to the front and/or side mounted auxiliary contacts. This is a requirement in safety circuits and is backed by SUVA-PRO certification.

## Maximum convenience and safety

CS7 relays are designed for fast and trouble free installation and maintenance. All components are modular and snap-on without the use of tools. The relays are DIN-rail mountable so they can be installed, moved or replaced quickly. All terminals are "captive" and are shipped in the open position, saving you an operation. The entire line is UL Listed, CSA Certified and CE marked and offers finger and back of hand protection to the strictest international standards.

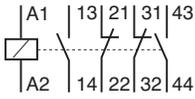
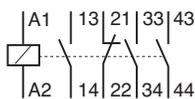
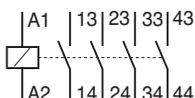
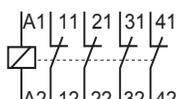
## Effortless installation

CS7 relays are DIN-rail mountable for instant installation and modification. Fittings are also included for base mounting. All terminals are clearly marked and ready for installation with either manual or power screwdrivers. A complete identification system is also available using self-adhesive labels, paper tags or plastic clip-on tags.



The base four pole CS7 relay can be expanded up to twelve poles with the addition of front and side mount auxiliaries

**Series CS7 Standard Control Relays - 4 Pole ①④**

CS7 Relay	Contact Arrangement and Numbering	Contacts ①		AC Operation		Electronic DC ⑥	
		NO	NC	Catalog Number	Price	Catalog Number	Price
 CS7-31E		2	2	CS7-22E-*	92	CS7E-22E-*	127
		3	1	CS7-31E-*		CS7E-31E-*	
		4	0	CS7-40E-*		CS7E-40E-*	
		0	4	CS7-04E-*		CS7E-04E-*	

Control & Timing Relays  
CS7

**Contact Ratings (Per UL508/NEMA A600 & P600)**

Standard	Circuit Voltage	Make (Amps/VA)	Break (Amps/VA)	Continuous Amps
A600	120AC	60A/7200VA	6A/720VA	10
	240AC	30A/7200VA	3A/720VA	
	480AC	15A/7200VA	1.5A/720VA	
	600AC	12A/7200VA	1.2A/720VA	
P600	125DC ②	1.1A/138VA	1.1A/138VA	5
	250DC ②	0.55A/138VA	0.55A/138VA	
	301-600DC ②	0.2A/138VA	0.2A/138VA	

**Other UL Ratings**

*Maximum Voltage* 600 volts AC or DC  
*General Purpose Amps*  
 CS7 25 amps  
 Auxiliaries (@ 40°C) 10 amps  
 Auxiliaries (@ 60°C) 6 amps

**AC Coil Codes ③**

AC Coil Code	Voltage Range	
	50 Hz	60 Hz
24Z	24V	24V
120	110V	120V
208	~	208V
220W	200V-220V	208V-240V
240	220V	240V
277	240V	277V
380	380V-400V	440V
480	440V	480V
600	550V	600V

**DC Coil Codes ⑤**

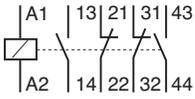
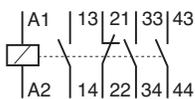
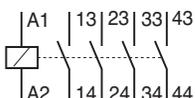
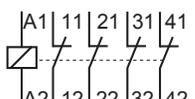
DC Coil Codes	Voltage
12E	12V
24E	24V
48E ⑥	48-72V
110E ⑥	110-125V
220E ⑥	220-250V

**Ordering Instructions**

Specify Catalog Number	
Replace (*) with Coil Code	See Coil Codes on this page

- ① Side mounted and/or top auxiliaries may be field installed to increase the number of available poles, limitations apply. Refer to page G12 for ordering and restriction details. Please note that side mount auxiliary terminal markings may conflict with base relay and/or top mount auxiliary terminal markings.
- ② DC rating for CS7 base control relay.
- ③ Other voltages available, see page G13. *Non-standard coil voltages not listed here must be ordered and installed separately as renewal parts.*
- ④ Positively-Guided/Mechanically-Linked Contacts per IEC 947-5-1 Annex L on 4 main poles.
- ⑤ CS7E electronic coils are not interchangeable with non-electronic DC or AC coils.
- ⑥ Not applicable with Electronic Timer accessories (CRZ\_7).

**Series CS7-B Control Relays - 4 Pole, Bifurcated Contacts for Lower Level Signals ①④**

CS7-B Relay	Contact Arrangement and Numbering	Contacts ①		AC Operation		Electronic DC ⑤	
		NO	NC	Catalog Number	Price	Catalog Number	Price
 <p>CS7-B22E</p>		2	2	CS7-B22E-*	117	CS7E-B22E-*	190
		3	1	CS7-B31E-*		CS7E-B31E-*	
		4	0	CS7-B40E-*		CS7E-B40E-*	
		0	4	CS7-B04E-*		CS7E-B04E-*	

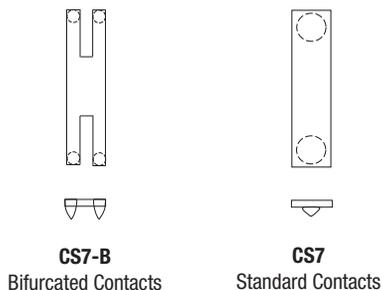
**Contact Ratings (Per UL508/NEMA A600 & Q600)**

Standard	Circuit Voltage	Make (Amps/VA)	Break (Amps/VA)	Continuous Amps
A600	120AC	60A/7200VA	6A/720VA	10
	240AC	30A/7200VA	3A/720VA	
	480AC	15A/7200VA	1.5A/720VA	
	600AC	12A/7200VA	1.2A/720VA	
Q600	125DC ②	0.55A/69VA	0.55A/69VA	2.5
	250DC ②	0.27A/69VA	0.27A/69VA	
	301-600DC ②	0.1A/69VA	0.1A/69VA	

**CS7-B Bifurcated Control Relay**

- Gold plated bifurcated contacts for low level switching application, min 5V, 3mA
- Maximum voltage 600V AC or DC
- General purpose amps - 10 amps
- Positively guided/mechanically-linked main contacts

**Principle moving contact designs:**



**AC Coil Codes ③**

AC Coil Code	Voltage Range	
	50 Hz	60 Hz
120	110V	120V

**DC Coil Codes ⑤**

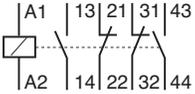
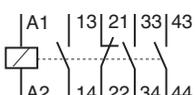
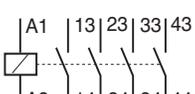
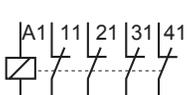
DC Coil Codes	Voltage
12E	12V
24E	24V
48E ⑥	48-72V
110E ⑥	110-125V
220E ⑥	220-250V

**Ordering Instructions**

Specify Catalog Number	
Replace (*) with Coil Code	See Coil Codes on this page

- ① Side mounted and/or top auxiliaries may be field installed to increase the number of available poles, limitations apply. Refer to page G12 for ordering and restriction details. Please note that side mount auxiliary terminal markings may conflict with base relay and/or top mount auxiliary terminal markings.
- ② DC rating for CS7-B base control relay.
- ③ Other AC voltages available, see page G13. *Non-standard coil voltages not listed here must be ordered and installed separately as renewal parts.*
- ④ Positively-Guided/Mechanically-Linked Contacts per IEC 947-5-1 Annex L on 4 main poles.
- ⑤ CS7E electronic coils are not interchangeable with non-electronic DC or AC coils.
- ⑥ Not applicable with Electronic Timer accessories (CRZ\_7).

Series CS7 Master Control Relays - 4 Pole ①④

CS7-M Relay	Contact Arrangement and Numbering	Contacts ①		AC Operation		Electronic DC ⑥	
		NO	NC	Catalog Number	Price	Catalog Number	Price
 CS7-M22E		2	2	CS7-M22E-*	168	CS7E-M22E-*	239
		3	1	CS7-M31E-*		CS7E-M31E-*	
		4	0	CS7-M40E-*		CS7E-M40E-*	
		0	4	CS7-M04E-*		CS7E-M04E-*	

Control & Timing Relays  
CS7-M

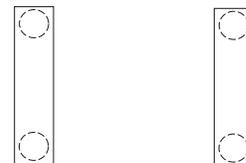
Contact Ratings (Per UL508/NEMA A600 & P600)

Standard	Circuit Voltage	Make (Amps/VA)	Break (Amps/VA)	Continuous Amps
A600	120AC	60A/7200VA	6A/720VA	20
	240AC	30A/7200VA	3A/720VA	
	480AC	15A/7200VA	1.5A/720VA	
	600AC	12A/7200VA	1.2A/720VA	
P600	125DC ②	1.1A/138VA	1.1A/138VA	5
	250DC ②	0.55A/138VA	0.55A/138VA	
	301-600DC ②	0.2A/138VA	0.2A/138VA	

CS7-M Master Control Relays

- Excellent replacement for heavy duty NEMA master relay users.
- Maximum voltage 600V AC or DC
- General purpose rating 30 amps (2X A600 for CS7-M Base Relay)

Principle moving contact designs:



CS7-M  
Contacts For  
Master Control Relay

CS7  
Standard Contacts

AC Coil Codes ③

AC Coil Code	Voltage Range	
	50 Hz	60 Hz
120	110V	120V

DC Coil Codes ⑤

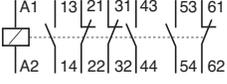
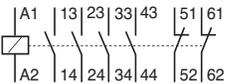
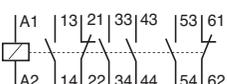
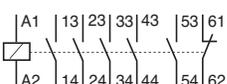
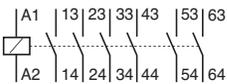
DC Coil Codes	Voltage
12E	12V
24E	24V
48E ⑦	48-72V
110E ⑦	110-125V
220E ⑦	220-250V

Ordering Instructions

Specify Catalog Number	
Replace (*) with Coil Code	See Coil Codes on this page

- ① Side mounted and/or top auxiliaries may be field installed to increase the number of available poles, limitations apply. Refer to page G12 for ordering and restriction details. Please note that side mount auxiliary terminal markings may conflict with base relay and/or top mount auxiliary terminal markings.
- ② DC rating for CS7-M base control relay.
- ③ Other AC voltages available, see page G13. *Non-standard coil voltages not listed here must be ordered and installed separately as renewal parts.*
- ④ Positively-Guided/Mechanically-Linked Contacts per IEC 947-5-1 Annex L on 4 main poles.
- ⑤ CS7E electronic coils are not interchangeable with non-electronic DC or AC coils.
- ⑦ Not applicable with Electronic Timer accessories (CRZ\_7).

**CS7 Complete Assemblies - 6 Pole, AC Control ①⑤**

CS7 Relay	Contact Arrangement and Numbering	Contacts ①		AC Operation	
		NO	NC	Catalog Number	Price
 <p>CS7-33Y</p>		3	3	<b>CS7-33Y-*</b>	<b>122</b>
		4	2	<b>CS7-42E-*</b>	
		4	2	<b>CS7-42Y-*</b>	
		5	1	<b>CS7-51E-*</b>	
		6	0	<b>CS7-60E-*</b>	

**AC Coil Codes ④**

AC Coil Code	Voltage Range	
	50 Hz	60 Hz
24Z	24V	24V
120	110V	120V
208	~	208V
220W	200V-220V	208V-240V
240	220V	240V
277	240V	277V
380	380V-400V	440V
480	440V	480V
600	550V	600V

**Contact Ratings (Per UL508/NEMA A600, P600 & Q600)**

Standard	Circuit Voltage	Make (Amps/VA)	Break (Amps/VA)	Continuous Amps
<b>A600</b>	120AC	60A/7200VA	6A/720VA	10
	240AC	30A/7200VA	3A/720VA	
	480AC	15A/7200VA	1.5A/720VA	
	600AC	12A/7200VA	1.2A/720VA	
<b>P600</b>	125DC ②	1.1A/138VA	1.1A/138VA	5
	250DC ②	0.55A/138VA	0.55A/138VA	
	301-600DC ②	0.2A/138VA	0.2A/138VA	
<b>Q600</b>	125DC ③	0.55A/69VA	0.55A/69VA	2.5
	250DC ③	0.27A/69VA	0.27A/69VA	
	301-600DC ③	0.1A/69VA	0.1A/69VA	

**Other UL Ratings**

*Maximum Voltage*  
600 volts AC or DC

*General Purpose Amps*

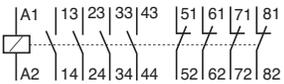
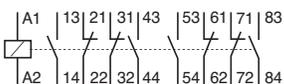
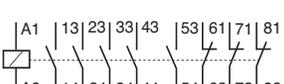
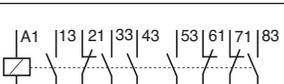
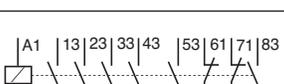
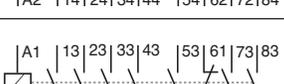
CS7 25 A  
Aux. (@40°C) 10 A  
Aux. (@60°C) 6 A

**Ordering Instructions**

Specify Catalog Number	
Replace (*) with Coil Code	<b>See Coil Codes on this page</b>

- ① Side mounted and/or top auxiliaries may be field installed to increase the number of available poles, limitations apply. Refer to page G12 for ordering and restriction details. Please note that side mount auxiliary terminal markings may conflict with base relay and/or top mount auxiliary terminal markings.
- ② DC rating for CS7 base control relay.
- ③ DC rating for CS7 auxiliary blocks.
- ④ Other voltages available, see page G13. *Non-standard coil voltages not listed here must be ordered and installed separately as renewal parts.*
- ⑤ Positively-Guided/Mechanically-Linked Contacts per IEC 947-5-1 Annex L on 4 main poles and auxiliaries.

CS7 Complete Assemblies - 8 Pole, AC Control ①⑤

CS7 Relay	Contact Arrangement and Numbering	Contacts ①		AC Operation	
		NO	NC	Catalog Number	Price
 <p>CS7-44E</p>		4	4	CS7-44E-*	150
		4	4	CS7-44Y-*	
		5	3	CS7-53E-*	
		5	3	CS7-53Y-*	
		6	2	CS7-62E-*	
		7	1	CS7-71E-*	
		8	0	CS7-80E-*	

Control & Timing Relays  
CS7

AC Coil Codes ④

AC Coil Code	Voltage Range	
	50 Hz	60 Hz
24Z	24V	24V
120	110V	120V
208	~	208V
220W	200V-220V	208V-240V
240	220V	240V
277	240V	277V
380	380V-400V	440V
480	440V	480V
600	550V	600V

Contact Ratings (Per UL508/NEMA A600, P600 & Q600)

Standard	Circuit Voltage	Make (Amps/VA)	Break (Amps/VA)	Continuous Amps
A600	120AC	60A/7200VA	6A/720VA	10
	240AC	30A/7200VA	3A/720VA	
	480AC	15A/7200VA	1.5A/720VA	
	600AC	12A/7200VA	1.2A/720VA	
P600	125DC ②	1.1A/138VA	1.1A/138VA	5
	250DC ②	0.55A/138VA	0.55A/138VA	
	301-600DC ②	0.2A/138VA	0.2A/138VA	
Q600	125DC ③	0.55A/69VA	0.55A/69VA	2.5
	250DC ③	0.27A/69VA	0.27A/69VA	
	301-600DC ③	0.1A/69VA	0.1A/69VA	

Other UL Ratings

Maximum Voltage  
600 volts AC or DC

General Purpose Amps

CS7 25 A  
Aux. (@40°C) 10 A  
Aux. (@60°C) 6 A

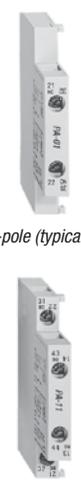
Ordering Instructions

Specify Catalog Number	
Replace (*) with Coil Code	See Coil Codes on this page

- ① Side mounted and/or top auxiliaries may be field installed to increase the number of available poles, limitations apply. Refer to page G12 for ordering and restriction details. Please note that side mount auxiliary terminal markings may conflict with base relay and/or top mount auxiliary terminal markings.
- ② DC rating for CS7 base control relay.
- ③ DC rating for CS7 auxiliary blocks.
- ④ Other voltages available, see page G13. *Non-standard coil voltages not listed here must be ordered and installed separately as renewal parts.*
- ⑤ Positively-Guided/Mechanically-Linked Contacts per IEC 947-5-1 Annex L on 4 main poles and auxiliaries.

Control & Timing Relays  
CS7

**Side Mount Auxiliary Contact Blocks (1 & 2 Pole) ①②**

Contact Block	Description	NO	NC	Contact Arrangement	For use with...	Standard Contacts Catalog Number	Price
 <p>1-pole (typical)</p> <p>2-pole (typical)</p>	<p><b>Auxiliary Contact Blocks for Side Mounting ②③</b></p> <ul style="list-style-type: none"> <li>• 1 and 2-pole</li> <li>• Two way numbering for right or left mounting on the contactor</li> <li>• Snap-on design - mounts without tools</li> <li>• Electronic compatible contacts 17V, 10mA</li> <li>• Late break / early make (L) available</li> <li>• Mirror contact performance to control relay poles</li> </ul>	0	1		CS7 all	CA7-PA-01	17
		1	0		CS7 all	CA7-PA-10	17
		0	2		CS7 all	CA7-PA-02	27
		1	1		CS7 all	CA7-PA-11	27
		2	0		CS7 all	CA7-PA-20	27
		1L	1L		CS7 all	CA7-PA-L11	37

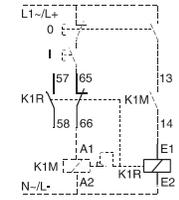
**Top Mount Auxiliary Contact Blocks (2 & 4 Pole) ②**

Contact Block	Description	NO	NC	Contact Arrangement	For use with...	Standard Contacts Catalog Number	Price	Bifurcated Contacts Catalog Number	Price
 <p>2-pole (typical)</p> <p>4-pole (typical)</p>	<p><b>Auxiliary Contact Blocks for Top Mounting ②</b></p> <ul style="list-style-type: none"> <li>• 2 and 4 pole</li> <li>• Snap-on design - mounts without tools</li> <li>• Electronic compatible standard contacts down to 17V, 5mA, bifurcated version 5V, 3mA</li> <li>• Mechanically linked between N.O. and N.C. poles and to the control relay poles (excluding L types).</li> <li>• Several terminal numbering choices even for models with equal function</li> <li>• Late break / early make (L) available</li> </ul>	0	2		CS7 all	CS7-PV-02	27	CS7-PVB-02	42
		1	1		CS7 all	CS7-PV-11	27	CS7-PVB-11	42
		2	0		CS7 all	CS7-PV-20	27	CS7-PVB-20	42
		2	2		CS7 all	CS7-PV-22	53	CS7-PVB-22	80
		3	1		CS7 all	CS7-PV-31	53	CS7-PVB-31	80
		1	3		CS7 all	CS7-PV-13	53	CS7-PVB-13	80
		4	0		CS7 all	CS7-PV-40	53	CS7-PVB-40	80
		0	4		CS7 all	CS7-PV-04	53	CS7-PVB-04	80
		1+1L	1+1L		CS7 all	CS7-PV-L22	74	Not Available	~

① Side mounted auxiliaries may be field installed to increase the number of available poles. Please note that terminal markings may conflict with base relay and/or top mount auxiliary terminal markings.

② Max. number of auxiliary contacts that may be mounted:  
AC and Electronic DC Coil relays -max. 4 N.O. contacts on the front of the relay, 2-N.O. contacts on the side, 4-N.C. front or side: 6 total

**Control Modules**

Module	Description	For use with...	Connection Diagrams	Catalog Number	Price
	<p><b>Mechanical Latch</b> Following relay latching, the relay coil is immediately de-energized by the NC auxiliary contact (65-66).</p> <ul style="list-style-type: none"> <li>• Electrical or manual release</li> <li>• 1 NO + 1 NC auxiliary switch</li> <li>• Suitable for all CS7 relays</li> </ul>	CS7 all		<p><b>CV7-11-*</b> Replace * with coil code below (See Application Note)</p>	94

Control & Timing Relays  
CS7

**CV7 Mechanical Latch Coil Codes ①②③**

Coil Code	Application Range			Latch & Contactor Coil Rating
	50 Hz	60 Hz	VDC	
24Z	24 VAC	24 VAC	12 VDC	24V 50/60 Hz
48Z	48 VAC	48 VAC	24 VDC	48V 50/60 Hz
110	100 VAC	110 VAC	48 or 60VDC	110V50/110V60
120	110 VAC	120 VAC	~	110V50/120V60
220W	~	208...240 VAC	~	208...240V60
230Z	230 VAC	230 VAC	110 VDC	230V 50/60 Hz
240Z	240 VAC	240 VAC	125 VDC	240V 50/60 Hz
277	240 VAC	277 VAC	~	240V50/277V60
380	380...400 VAC	440 VAC	~	380...400V50/440V60
400Z	400 VAC	400 VAC	220 VDC	400V 50/60 Hz
415	400...415 VAC	~	~	400...415 V50 Hz
480	440 VAC	480 VAC	~	440V50/480V60
600	550 VAC	600 VAC	~	550V50/600V60

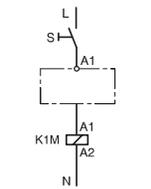
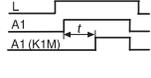
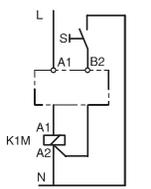
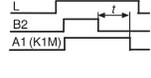
**APPLICATION NOTE:**

The CV7 Mechanical Latch for CS7 Control Relay may be used for both AC and DC applications; however when using DC control circuit the user must apply the following rules for coil selection of the control relay and latch combination:

- When DC control circuits are required use CS7 control relay with AC coil and latch with AC coil. From column "VDC" in the table on the left, identify the required application DC control voltage and then select its specific Coil Code. Enter this Coil Code to complete the catalog numbers for both the control relay and latch (i.e.: 125V DC control circuit should use a 240Z coil code in both the CS7 and CV7). This works because both coils are only momentary energized and coil clearing contacts breaks the circuit after closing or opening.
- The CS7E control relay uses an electronic DC coil and the CV7 latch coil code should be chosen from the table on the left. (i.e.: 24V DC control circuit select CS7E with code 24E and CV7 latch uses a 48Z AC coil code).

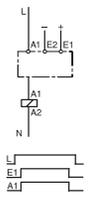
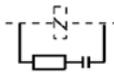
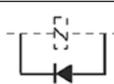
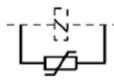
- ① Other voltages available. Contact your Sprecher + Schuh representative.
- ② CV7 must be wired for momentary impulse operation only.
- ③ Command duration 0.03...15 seconds.
- ④ Use 600V AC when 575 V is required.

**Control Modules**

Module	Description	For use with...	Connection Diagrams	Function	Catalog Number	Price
	<p><b>Pneumatic Timing Module –</b> The contacts in the Pneumatic Timing Element switch after the delay time. The contacts on the relay continue to operate without delay.</p> <ul style="list-style-type: none"> <li>Continuous adjustment range</li> </ul>	CS7 all		<p><b>ON-Delay</b> .3...30s 1.8...180s</p>	<p><b>CZE7-30</b> <b>CZE7-180</b></p>	<p><b>160</b></p>
				<p><b>OFF-Delay</b> 0.3...30s 1.8...180s</p>	<p><b>CZA7-30</b> <b>CZA7-180</b></p>	<p><b>160</b></p>
	<p><b>Electronic Timing Module – ON-Delay ❶</b> The relay is energized at the end of the delay time.</p>	CS7 all		<p>110...240V 50/60Hz 110...250VDC0. 0.1...3s 1...30s 10...180s</p>	<p><b>CRZE7-3-110/240</b> <b>CRZE7-30-110/240</b> <b>CRZE7-180-110/240</b></p>	<p><b>98</b></p>
				<p>24...48VDC 0.1...3s 1...30s 10...180s</p>	<p><b>CRZE7-3-24/48VDC</b> <b>CRZE7-30-24/48VDC</b> <b>CRZE7-180-24/48VDC</b></p>	<p><b>104</b></p>
	<p><b>Electronic Timing Module – OFF-Delay ❶</b> After interruption of the control signal, the relay is de-energized at the end of the delay time.</p>	CS7 all		<p>110...240V 50/60Hz 0.3...3s 1...30s 10...180s</p>	<p><b>CRZA7-3-110/240</b> <b>CRZA7-30-110/240</b> <b>CRZA7-180-110/240</b></p>	<p><b>112</b></p>
				<p>24V AC 50/60Hz 0.3...3s 1...30s 10...180s</p>	<p><b>CRZA7-3-24VAC</b> <b>CRZA7-30-24VAC</b> <b>CRZA7-180-24VAC</b></p>	<p><b>112</b></p>

❶ Not available for use on CS7E coil voltage 48V...220V.

**Control Modules (continued)**

Module	Description	For use with...	Connection Diagrams	Function		Catalog Number	Price
				Input	Output		
	<b>Electronic Interface –</b> Interface between the DC control signal from a PLC and the AC operating mechanism of the relay. <ul style="list-style-type: none"> <li>Requires no additional surge suppression for the coils</li> <li>Switching capacity 200VA</li> <li>Suitable for all CS7 relays</li> </ul>	CS7 all (with AC control)		24V DC 18...30V DC 48V DC	110... 240V AC	<b>CR17E-24</b> <b>CR17E-12</b> <b>CR17E-48</b> <i>Indicates special order</i>	72 72 72
	<b>Surge Suppressors -</b> Limits coil switching transients. <ul style="list-style-type: none"> <li>Plug-in, coil mounted</li> <li>Suitable for all CS7 contactors</li> </ul>	CS7 all		<b>RC Module -</b> AC Control (50/60Hz) 24...48V 110...280V 380...480V		<b>CRC7-48</b> <b>CRC7-280</b> <b>CRC7-480</b>	34
				<b>Diode Module -</b> DC Control 12-250VDC		<b>CRD7-250</b> Ⓣ	34
				<b>Varistor Module -</b> AC/DC Control 12...55VAC/ 12...77VDC 56...136VAC/ 78...180VDC 137...277VAC/ 181...350VDC 278...575VAC		<b>CRV7-55</b> Ⓣ <b>CRV7-136</b> Ⓣ <b>CRV7-277</b> Ⓣ <b>CRV7-575</b> Ⓣ	34

**Assembly Components**

Component	Description	For Use With...	Pkg. Qty.	Catalog Number	Price Each
	<b>Protective Covers -</b> Protects against unintended manual operation.	CS7 all	1	<b>CA7-SCC</b>	See page A54
	<b>Protective Covers -</b> For front mounted auxiliary contacts, pneumatic timers and latches.	CS7-PV, CA7-PV, CZE7, CZA7, CV7	1	<b>CA7-SCF</b>	
	<b>Spade Connectors -</b> Dual stab for coil terminals (0.250 inch)	All CS7	20	<b>CA7-SC2</b>	1.75

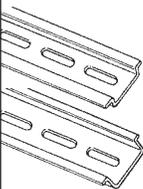
① Minimum order quantity is one package of 10. Price each x 10 = total price.

② Electronic DC Control Relays (CS7E) include internal surge protection and do not require additional external surge protection.

## Marking Systems

Component	Description	Pkg. Qty.	Catalog Number	Price Each
	<b>Label Sheet –</b> 1 sheet with 105 self-adhesive paper labels each, 6 x 17mm	1	CA7-FMS	See page A54
	<b>Marking Tag Sheet -</b> 1 sheet with 160 perforated paper labels each, 6 x 17mm. To be used with transparent cover.	1	CA7-FMP	
	<b>Transparent Cover -</b> To be used with Marking Tag Sheets.	100 ①	CA7-FMC	
	<b>Tag Carrier -</b> For marking with Series V7 Terminal Clip-on Tags.	100 ①	CA7-FMA2	

## Mounting Accessories

Accessory	Description	Catalog Number	Price
	<b>DIN-rail – 2 meter lengths (6' 6")</b>  Top Hat, low profile (price per rail) Top Hat, high profile (price per rail)	  3F 3AF	See page A54

① Minimum order quantity is one package of 100. Price each x 100 = total price.

Prices Effective 5/11/13

**Renewal Coils - AC ①②**

AC Control Voltages			AC Coil Codes ↓ ②	Catalog No.
50 Hz	60 Hz	50/60 Hz		
	12V		12B	TA006
12V			12A	TA404
	24V		24B	TA013
24V			24A	TA407
		24V	24Z	TA855
32V	36V		36	TA481
36V			36A	TA410
42V	48V		48	TA482
48V			48A	TA414
		48V	48Z	TA860
100V	100...110V		110	TA861
110V	120V		120	TA473
		110V	110Z	TA856
120V			120A	TA425
127V			127A	TA428
200V	200...220V	200V	220	TA862
	208V		208	TA049
	208V...240V		220W	TA296
220V	240V		240	TA474
220V...230V	260V		230A	TA441
		200...230V	230W	TA864
		230V	230Z	TA851
230V...240V			240A	TA440
240V	277V		277	TA480
		240V	240Z	TA858
	347V		347	TA065
	380V		380B	TA067
380V...400V	440V		380	TA071
		400V	400Z	TA863
400V...415V			415	TA457
440V	480V		480	TA475
		440V	440Z	TA859
500V			500A	TA479
550V	600V		600	TA476
<b>Price</b>				<b>59</b>



CS7 AC coil (typical)

**Renewal Coils - DC ①②⑤**

DC Control Voltages	DC Coil Codes ↓ ②	Electronic DC Coils ③	True DC Coils	Two Winding DC Coils ⑤
		Cat. No.	Cat. No.	Cat. No.
9V ④	9D	~	TA766	TA766Y
12V	12E	TC708E	~	~
12V	12D	~	TA708	TA708Y
24V	24E	TC714E	~	~
24V ④	24D	~	TA714	TA714Y
24V Diode ④	24DD	~	TA714M	TA714Y
36V	36D	~	TA719	TA719Y
48-72V	48E	TC724E	~	~
48V	48D	~	TA724	TA724Y
60V	60D	~	TA774	TA774Y
64V	64D	~	TA727	TA727Y
72V	72D	~	TA728	TA728Y
80V	80D	~	TA729	TA729Y
110-150V	110E	TC733E	~	~
110V	110D	~	TA733	TA733Y
115V	115D	~	TA734	TA734Y
125V	125D	~	TA737	TA737Y
220-250V	220E	TC747E	~	~
220V	220D	~	TA747	TA747Y
230V	230D	~	TA749	TA749Y
250V	250D	~	TA751	TA751Y
<b>Price (no diode)</b>		~	<b>138</b>	~
<b>Price (with diode)</b>		<b>202</b>	<b>202</b>	<b>134</b>



12V & 24V Electronic DC coil ③



48V, 110V & 220V Electronic DC coil with Back Pack ⑤



Two Winding DC coil (typical) ⑤

- ① Other coil voltages available. Contact your Sprecher + Schuh representative for information.
- ② Coil Codes in bold letters indicate coils that are standard stocked items.
- ③ Voltage operating range:  $0.65 \dots 1.3 \times U_n$ .
- ④ Voltage operating range:  $0.7 \dots 1.25 \times U_n$ .

- ⑤ CS7-...YY(EY) two winding coils are sold for renewal parts only and are not interchangeable with standard CS7-Y(E) AC coil relays or CS7C...Y(E) true DC coil relays. CS7-...YY(EY) relays should be tested following a coil swap to insure functionality of the timed auxiliary.
- ⑥ Electronic DC Coils are not interchangeable with non-electronic DC or AC coils.

**Technical Information**

	Mounted Standard Auxiliary	Standard Control Relay CS7	Front Mounted Standard Auxiliary Contacts	Bifurcated Control Relay CS7-B	Front Mounted Bifurcated Auxiliary Contacts	Master Relay CS7-M	Side Mounted Contacts
<b>Electrical Contact Ratings - NEMA</b>		A600, P600	A600, Q600			2x A600, P600	A600, Q600
<b>Min. Contact Rating</b>		17V, 10 mA	17V, 5 mA	5V, 3 mA			17V, 10 mA
<b>Contact Ratings - IEC AC-15 (solenoids, contactors) rated voltage IEC 60947-5-1</b>	24V	10 A	6 A	3 A	3 A	15 A	6 A
	48V	10 A	6 A	3 A	3 A	15 A	6 A
	120V	10 A	6 A	3 A	3 A	15 A	6 A
	240V	10 A	5 A	3 A	3 A	15 A	5 A
	400V	6 A	3 A	2 A	2 A	7.5 A	3 A
	480V/500V	2.5 A	1.6 A	1.2 A	1.2 A	5 A	1.6 A
	600V	1 A	1 A	0.7 A	0.7 A	2 A	1 A
690V	1 A	1 A	0.7 A	0.7 A	2 A	1 A	
<b>AC-12 (Control of resistive loads) IEC 60947-5-1</b>	<b>40 °C</b>	$I_{th}$	20 A	10 A	10 A	10 A	20 A
		230V	8 kW				
		400V	14 kW				
		690V	24 kW				
	<b>60 °C</b>	$I_{th}$	20 A	6 A	6 A	6 A	20 A
		230V	8 kW				
	400V	14 kW					
	690V	24 kW					
<b>DC-12 Switching DC Loads</b> $t_{rh} < 1$ ms, Resistive Loads IEC 60947-5-1	24V	15 A	10 A	6 A	6 A	20 A	6 A
	48V	10 A	9 A	3.2 A	3.2 A	20 A	3.2 A
	110V	6 A	3.5 A	1.0 A	1.0 A	8 A	1.0 A
	220V	1.0 A	0.7 A	0.5 A	0.5 A	1.5 A	0.5 A
	440V	0.4 A	0.2 A	0.2 A	0.2 A	0.4 A	0.2 A
<b>DC-13 IEC 60947-5-1, Solenoids and contactors</b>	24V	5 A	5 A	2.5 A	2.5 A	5 A	5 A
	48V	3 A	3 A	1.5 A	1.5 A	3 A	2.5 A
	110V	1.2 A	1.2 A	0.6 A	0.6 A	1.2 A	0.68 A
	220V	0.6 A	0.6 A	0.3 A	0.3 A	0.6 A	0.32 A
	440V	0.3 A	0.15 A	0.15 A	0.15 A	0.3 A	0.15 A

**Mechanically Linked Contacts ②**

Location of welded NO contacts	State of NC contacts if NO contact welds			
	Main	Front mount auxiliary	Left side auxiliary	Right side auxiliary
Main	Open	Open ①	Open ②	Open ③
Front auxiliary	Open	Open ①	Open ②	Open ③
Left side aux.	Open	Open ①	Open ②	Open ③
Right side aux.	Open	Open ①	Open ②	Open ③

DC Switching Ratings for CS7 Main Poles in Series (Resistive Load at 60 °C)

	1 pole	2 poles	3 poles
<b>24/48 V</b>	25/20 A	25 A	25 A
<b>125 V</b>	6 A	25 A	25 A
<b>220 V</b>	1.5 A	8 A	25 A
<b>440 V</b>	0.4 A	1 A	3 A

**Standards Compliance**

UL 508  
 CSA C22.2 NO. 14  
 EN/IEC 60947-1, -5-1  
 Meets the material restrictions for European Directive 2002/95/EC - EU-RoHS.

	CS7 Relays	Front Mount Auxiliaries & Pneumatic Timer Contacts
<b>Mechanical</b>		
<b>Mechanical Life</b>	[Mil]	15
<b>Electrical Life</b>		
AC-15 (240V, 3A) AC Operations	[Mil]	1.5
<b>Weight</b>	[g]	390
<b>Terminal Cross-Sections</b>		
<b>Terminal Type</b>		
<b>Terminal Size per IEC 947-1</b>		
	Flexible with Wire	1 Cond. [mm <sup>2</sup> ] 1...4
	End Ferrule	2 Cond. [mm <sup>2</sup> ] 1...4
	Solid/Stranded	1 Cond. [mm <sup>2</sup> ] 1.5...6
		2 Cond. [mm <sup>2</sup> ] 1.5...6
<b>Max. Wire Size per UL/CSA</b>	[AWG]	16...10
<b>Tightening Torque</b>	[Nm]	1.5...2.5
	[lb-in]	13...22

**Certifications**

cULus Listed (File No. E33916, Guide NKCR/NKCR7)  
 CE Marked

- ① If the accessory is a Pneumatic Timer or latch, there is no positive guidance; the accessory contacts are independent.
- ② Defined in IEC 947-5-1 annex L. Mechanically linked is a relationship between contacts of opposite types (i.e., NO and NC).
- ③ Side mounted auxiliary contacts provide "mirror contact" performance with main poles only.

Technical Information

CS7 Relays			
<b>Control Circuit Operating Voltage</b>			
AC 50/60 Hz	Pickup	[x U <sub>s</sub> ]	0.85...1.1
	Dropout	[x U <sub>s</sub> ]	0.3...0.6
Electronic DC	Pickup	[x U <sub>s</sub> ]	0.7...1.25
	Dropout	[x U <sub>s</sub> ]	0.1...0.6
<b>Coil Consumption</b>			
AC 50/60 Hz	Inrush	[VA/W]	70 / 50
	Seal	[VA/W]	8 / 2.6
Electronic DC	Inrush	[W]	10 / 17
	Seal	[W]	1.7
<b>Operating Times</b>			
AC- 50/60 Hz	Pickup Time	[ms]	15...30
	Dropout Time	[ms]	10...60
Electronic DC	Pickup Time	[ms]	25...50
	Dropout Time	[ms]	25...50
<b>Latch Attachment Release, CV7-11</b>			
Coil Consumption	AC	[VA/W]	45 / 40
	DC	[W]	25
<b>Contact Signal Duration</b> [min/max] 0.03...15s			
<b>Timing Attachment, CRZE7, CRZA7</b>			
Reset Time	at min. time setting	[ms]	10
	at max. time setting	[ms]	70
	Repeat Accuracy		± 10%

CS7 Relays	
<b>General</b>	
<b>Rated Insulation Voltage U<sub>i</sub></b>	
IEC	690V
UL; CSA	600V
<b>Rated Impulse Strength U<sub>imp</sub></b>	
	6 kV
<b>High Test Voltage</b>	
1 minute (per IEC 947-4)	2500V
<b>Rated Voltage U<sub>e</sub></b>	
AC	115, 230, 400, 500, 690V
DC	24, 48, 110, 220, 440V
<b>Rated Frequency</b>	
	50/60 Hz, DC
<b>Ambient Temperature</b>	
Storage	-55...+80°C (-67...176°F)
Operation at nominal current	-25...+60°C (-13...140°F)
Conditioned 15% current reduction after AC-1 at > 60°C	-25...+70°C (-13...158°F)
<b>Corrosion Resistance</b>	
	humid-alternating climate, cyclic, per IEC 68-2-30 and DIN 50 016, 56 cycles
<b>Altitude</b>	
	2000m above main sea level, per IEC 947-4
<b>Type of Protection</b>	
IP 2X (IEC 60529 and DIN 40050)	in connected state
<b>Finger Protection</b>	
	safe from touch by fingers and back of hand per VDE 0106, Part 100
<b>Shock Protection</b>	
IEC 68-2: Half Sinusoidal shock 11ms	30G (in 3 directions)
<b>Vibration Resistance</b>	
IEC 68-2: static >2G in normal position	no malfunction <5G

Control & Timing Relays  
CS7

Utilization Category Table from EN 947-5-1

Verification of Making and Breaking Capacities of Switching Elements Under Normal Conditions Corresponding to the Utilization Categories ①

Utilization Category	Normal Condition of Use								
	Make ②			Break ②			Number & Rate of Making & Breaking Operations		
	I / I <sub>e</sub>	U / U <sub>e</sub>	COS Ψ	I / I <sub>e</sub>	U / U <sub>e</sub>	COS Ψ	No. of operating cycles ③	Operating cycles per minute	ON time(s) ⑤
AC-12 ⑥	1	1	0.9	1	1	0.9	6050	6	0.05
AC-13 ⑥	2	1	0.65	1	1	0.65	6050	6	0.05
AC-14 ⑥	6	1	0.3	1	1	0.3	6050	6	0.05
AC-15 ⑥	10	1	0.3	1	1	0.3	6050	6	0.05
DC			T <sub>0.95</sub>			T <sub>0.95</sub>			
DC-12	1	1	1ms	1	1	1ms	6050	6	0.05 ⑤
DC-13	1	1	6 x P ④	1	1	6 x P ④	6050	6	0.05 ⑤
DC-14 ⑥	10	1	15ms	1	1	15ms	6050	6	0.05 ⑤

I<sub>e</sub> Rated operational current P=U<sub>e</sub>I<sub>e</sub> steady-state power consumption (W)  
 U<sub>e</sub> Rated operational voltage. Current to be made or broken.  
 T<sub>0.95</sub> Time to reach 95% of the steady-state current (ms) UVoltage before make

- ① See sub-clause 8.3.3.5.2
- ② For tolerances on test quantities, see sub-clause 8.3.2.2
- ③ The first 50 operating cycles shall be run at U/U<sub>e</sub>=1.1 with the loads set at U<sub>e</sub>
- ④ The value "6 x P" results from an empirical relationship which is found to represent most DC magnetic loads to an upper limit of P = 50W, i.e. 6 x P = 300ms.
- ⑤ The ON time shall be at least equal to T<sub>0.95</sub>
- ⑥ Where the break current differs from the make current value, the ON time refers to the make current value after which the current is reduced to break current value for a suitable period e.g., 0.05 s.

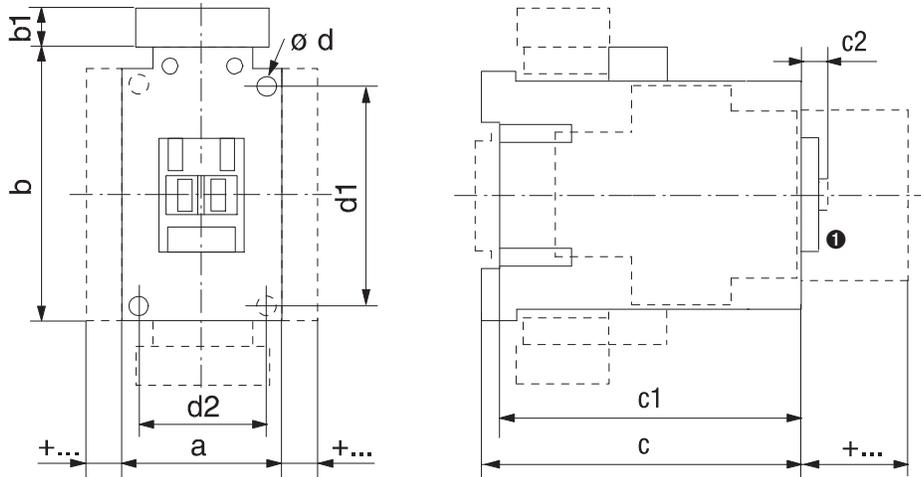
**NEMA Ratings and Test Values for AC (50 and 60Hz) and DC Control Circuits Contacts**

Designation ❶	Utilization Category	Therm. Continuous Test Current (A)	Maximum Current								VA	
			120V		240V		480V		600V			
AC			Make	Break	Make	Break	Make	Break	Make	Break	Make	Break
A150	AC-15	10	60	6.00	~	~	~	~	~	~	7200	720
A300	AC-15	10	60	6.00	30	3.00	~	~	~	~	7200	720
A600	AC-15	10	60	6.00	30	3.00	15	1.50	12	1.20	7200	720
B150	AC-15	5	30	3.00	~	~	~	~	~	~	3600	360
B300	AC-15	5	30	3.00	15	1.50	~	~	~	~	3600	360
B600	AC-15	5	30	3.00	15	1.50	7.5	0.75	6	0.60	3600	360
C150	AC-15	2.5	15	1.50	~	~	~	~	~	~	1800	180
C300	AC-15	2.5	15	1.50	7.5	0.75	~	~	~	~	1800	180
C600	AC-15	2.5	15	1.50	7.5	0.75	3.75	0.375	3	0.30	1800	180
D150	AC-14	1.0	3.60	0.60	~	~	~	~	~	~	432	72
D300	AC-14	1.0	3.60	0.60	1.8	0.30	~	~	~	~	432	72
E150	AC-14	0.5	1.80	0.30	~	~	~	~	~	~	216	36
2 x A300	AC-15	20	120	12	60	6.00	~	~	~	~	14400	1440
2 x A600	AC-15	20	120	12	60	6.00	30	3.00	24	2.40	14400	1440
DC			5...28V		125V		250V		301...600V		Make or Break at 300V or less [VA]	
N150	DC-13	10	10		2.2		~		~		275	
N300	DC-13	10	10		2.2		1.1		~		275	
N600	DC-13	10	10		2.2		1.1		0.40		275	
P150	DC-13	5.0	5.0		1.1		~		~		138	
P300	DC-13	5.0	5.0		1.1		0.55		~		138	
P600	DC-13	5.0	5.0		1.1		0.55		0.20		138	
Q300	DC-13	2.5	2.5		0.55		0.27		0.11		69	
Q600	DC-13	2.5	2.5		0.55		0.27		0.11		69	
2 x P600	DC-13	10	102.2		2.2		1.1		0.40		275	

❶ This is the NEMA Contact Rating Designation, where the letter stands for the conventional thermal current and identifies AC or DC: e.g., B = 5A AC. The number that follows is the rated insulation voltage.

**Series CS7 Industrial Control Relays (AC and Electronic DC)**

Dimensions are in millimeters (inches). Dimensions not intended for manufacturing purposes.

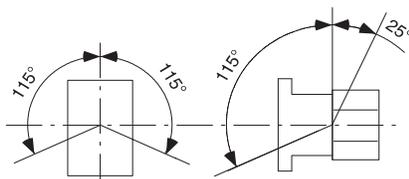


Catalog Number	Coil Code	a	b	b1	c	c1	c2	Ød	d1	d2
CS7 (AC)		45 (1-25/32)	81 (3-3/16)		80.5 (3-11/64)	75.5 (3-3/32)	6 (1/4)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-25/64)
	12E	45 (1-25/32)	81 (3-3/16)	~	80.5 (3-11/64)	75.5 (2-31/32)	6 (15/64)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-3/8)
CA7-9E...CA7-23E, CAN7-12E...CAN7-16E	24E	45 (1-25/32)	81 (3-3/16)	~	80.5 (3-11/64)	75.5 (2-31/32)	6 (15/64)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-3/8)
	48E	45 (1-25/32)	81 (3-3/16)	24 (15/16)	80.5 (3-11/64)	75.5 (2-31/32)	6 (15/64)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-3/8)
	110E	45 (1-25/32)	81 (3-3/16)	24 (15/16)	80.5 (3-11/64)	75.5 (2-31/32)	6 (15/64)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-3/8)
	220E	45 (1-25/32)	81 (3-3/16)	24 (15/16)	80.5 (3-11/64)	75.5 (2-31/32)	6 (15/64)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-3/8)
		45 (1-25/32)	81 (3-3/16)	24 (15/16)	80.5 (3-11/64)	75.5 (2-31/32)	6 (15/64)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-3/8)

**Relays & Accessories (+...)**

Relays with...		Dim. [mm]	Dim. [inches]
auxiliary contact block for front mounting	2-, or 4-pole	c/c1 + 39	c/c1 + 1-37/64
auxiliary contact block for side mounting	1-, or 2-pole	a + 9	a + 23/64
pneumatic timing module		c/c1 + 58	c/c1 + 2-23/64
electronic timing module	on coil terminal side	b + 24	b + 15/16
mechanical latch		c/c1 + 61	c/c1 + 2-31/64
interface module	on coil terminal side	b + 9	b + 23/64
surge suppressor	on coil terminal side	b + 3	b + 1/8
● Labeling with...	label sheet	+ 0	+ 0
	marking tag sheet with clear cover	+ 0	+ 0
	marking tag adapter for V7 Terminals	+ 5.5	+ 7/32

**Mounting Position**



AC & Electronic DC control relays

Control & Timing Relays  
CS7

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Push Buttons
<b>Location:</b>	RTU Section
<b>Model Numbers:</b>	Various
<b>Manufacturer:</b>	Specher & Schuh
<b>Supplier:</b>	NHP Pty Ltd 16 Riverview Place Murarrie (07) 3909 4999



[CATALOGUE D7-CAT]

# D7 Pushbuttons



sprecher+schuh

INDUSTRIAL SWITCHGEAR & AUTOMATION SPECIALISTS



**PUT YOUR CONTROL AND SWITCHING SOLUTIONS IN OUR HANDS**

*Experience a Touch of Quality*

**D7**



## New D7... Experience a Touch of Quality



Introducing the all new D7 range from Sprecher + Schuh. The D7 range is the latest in a long line of quality 22.5 mm control and signalling equipment from a company with a long built reputation for combining high quality manufacturing skills and attention to detail to produce only the finest quality products.

Available in both thermoplastic and metal variations, the D7 range incorporates all the features that you have come to expect from Sprecher + Schuh and raises the bar one step further with a functional low profile design and all new stylish appearance.

Once you get past the new appearance you will find the D7 range has some unique features incorporated, such as improved operational feel on the pushbuttons for a positive “tactile” response and a new positive detent on selector switches. In addition optional time saving cage style termination on contact blocks, improved LED illumination on pilot lights and hard wearing laser engraving have also been included.

Utilising state of the art modelling technologies and finite element analysis, you can be sure every component used in the D7 range has been optimised for durability and reliability with the aim of providing the ultimate in control and indication.

Designed and manufactured to meet the most exacting performance, the new D7 range is **the** pushbutton to use in today’s demanding environments.



## D7 at a glance...



### “Auto Break” Safety contacts

Separation of the contact block assembly from the front operator or mounting latch can prevent an Emergency Stop from shutting down the controlled process in an emergency. Correct contact block installation is critical to ensure that the normally closed contacts will open when the emergency stop operator is active. The exclusive Sprecher + Schuh “Auto Break” contact block monitors itself to ensure it is always correctly installed.

A normally open “Auto Break” contact is physically moulded and wired in series with a standard set of normally closed contacts. When correctly installed the operator creates a maintained pressure on the normally open “Auto Break” contact and automatically closes the contact. In this state the normally closed contact operates as normal.

If the contact block assembly should separate from the front operator, the pressure releases and the “Auto Break” contact will automatically open. Because the “Auto Break” contact is wired in series with the normally closed, the opening of either set of contacts will open the circuit controlled by the emergency stop operator.



### Coupling plates and contact blocks

- Choice of metal or plastic coupling plates
- Rotating collar with “snap secure” system ensures fast one-hand removal
- Contact blocks snap-fit and are hinged at one end for easy installation
- Colour coded contact block plungers for easy identification
- H-bridge contact design and the option of gold contacts provides cleaner current flow for maximum reliability at lower voltages
- Bifurcated contacts provide excellent wiping and optimal switching reliability
- Option of Cage style wire termination or Screw clamp
- Live components are shrouded and touch safe to IP 20



### Inscription caps and diffusers

- Durable abrasion-proof press plates
- 6 colour choices
- Ergonomically contoured design
- Diffusers constructed in two colour moulded assembly
- Durable wear resistant laser printing available



### Enclosures



- Metal and plastic enclosures
- In choices to accommodate up to 6 x 22.5 mm operators
- Yellow thermoplastic pendant style enclosure available for up to 2 operators
- 20 mm metric cable entry
- Suitable for base or panel mount contact blocks
- Accepts two piece snap-in legend

### Illumination



- Modern and compact integrated LED lamp modules
- Superior illumination qualities
- 5 colour choices
- 11 year lamp life (100,000 hrs)
- Maintenance free
- Vibration and shock resistant
- 24 V AC/DC, 110 V AC and 240 V AC

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### Design

- Functional low profile appearance
- Ergonomic easy to operate handles
- Reduced depth contact blocks
- Improved positive “tactile” operation on pushbuttons
- Improved “positive detent” on rotary selector switches
- Durable two colour plastic caps and laser engraving

### Improved safety

- Unique “Auto break” self-monitoring emergency contact system
- IP 20 touch protection
- Tamperproof rear fixing nut

### Time saving

- New design snap-lock, twist-to-reset rotating collar on coupling plates for easier mounting and assembly
- Snap-on components
- Redesigned anti-rotation tab

### Flexibility

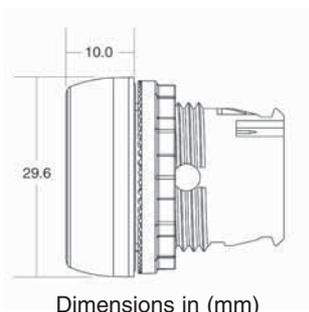
- Thermoplastic or metal operators
- Latching or impulse operators
- Five different colour choices
- Maximum of six contact blocks
- Full voltage and transformer lamp blocks

### Improved reliability

- IP 65/66 sealing across the range for reliability in dusty and wet conditions
- Improved vibration resistance
- Continuous wiping contact for improved reliability
- Tested to IEC 947
- Positive detent on rotary switches which ensures operation will not “hang up” between positions

### Contact blocks

- Improved mounting from “Snapsecure” snap fit mounting system
- Colour coded plungers for easy identification
- Optional Quadfurcated Gold contacts for improved low voltage switching
- Optional spring clamp termination on contact blocks for reduced wiring time

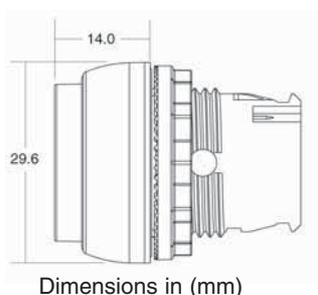


**Non-Illuminated Momentary Pushbuttons**

- Metal or plastic options
- Improved momentary action for fast response
- Low mounting depth from panel

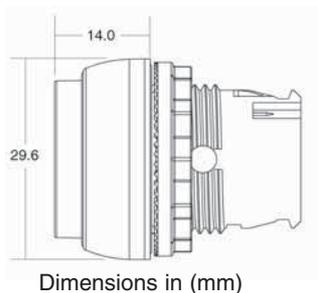


Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>Flush Pushbutton</b> with Green insert		D7P-F3-PX10 <sup>1)</sup>	D7M-F3-MX10 <sup>1)</sup>
with Red insert		D7P-F4-PX01 <sup>1)</sup>	D7M-F4-MX01 <sup>1)</sup>
with Blue insert		D7P-F6-PX10 <sup>1)</sup>	D7M-F6-MX10 <sup>1)</sup>



Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>Extended Pushbutton</b> with Red insert		D7P-E4-PX01 <sup>1)</sup>	D7M-E4-MX01 <sup>1)</sup>

**Non-Illuminated Momentary Pushbuttons with labelled Press Plates**



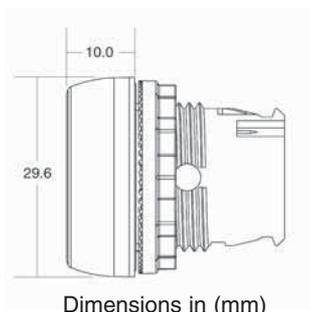
- Laser etched markings for improved abrasion resistance



Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>Flush Pushbutton</b> with Green insert labelled "Start"		D7P-F301-PX10 <sup>1)</sup>	D7M-F301-MX10 <sup>1)</sup>
with Red insert labelled "Stop"		D7P-F402-PX01 <sup>1)</sup>	D7M-F402-MX01 <sup>1)</sup>
with Blue insert labelled "Reset"		D7P-F607-PX10 <sup>1)</sup>	D7M-F607-MX10 <sup>1)</sup>
with extended Red press plate labelled "Stop"		D7P-E402-PX01 <sup>1)</sup>	D7M-E402-MX01 <sup>1)</sup>

Note: <sup>1)</sup> Add suffix "bx" for special box/hang-sell packaging eg: D7P-F3-PX10bx.

**Illuminated Momentary Flush Pushbuttons with integrated LED Lamp Block**

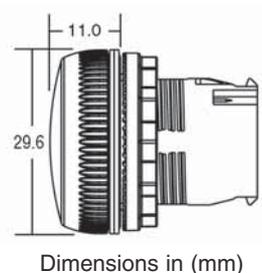


- Long life integrated LED illumination
- 24 V and 240 V versions
- Supplied complete with contact blocks



Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>24 V AC/DC</b>			
Green pushbutton with Green LED		D7P-LF3-PN3G-X10 <sup>1)</sup>	D7M-LF3-MN3G-X10 <sup>1)</sup>
Red pushbutton with Red LED		D7P-LF4-PN3R-X01 <sup>1)</sup>	D7M-LF4-MN3R-X01 <sup>1)</sup>
Blue pushbutton with Blue LED		D7P-LF6-PN3B-X10 <sup>1)</sup>	D7M-LF6-MN3B-X10 <sup>1)</sup>
Yellow pushbutton with Yellow LED		D7P-LF5-PN3Y-X10 <sup>1)</sup>	D7M-LF5-MN3Y-X10 <sup>1)</sup>
<b>240 V AC</b>			
Green pushbutton with Green LED		D7P-LF3-PN7G-X10 <sup>1)</sup>	D7M-LF3-MN7G-X10 <sup>1)</sup>
Red pushbutton with Red LED		D7P-LF4-PN7R-X01 <sup>1)</sup>	D7M-LF4-MN7R-X01 <sup>1)</sup>
Blue pushbutton with Blue LED		D7P-LF6-PN7B-X10 <sup>1)</sup>	D7M-LF6-MN7B-X10 <sup>1)</sup>
Yellow pushbutton with Yellow LED		D7P-LF5-PN7Y-X10 <sup>1)</sup>	D7M-LF5-MN7Y-X10 <sup>1)</sup>

**Pilot Light with integrated LED Lamp Block**



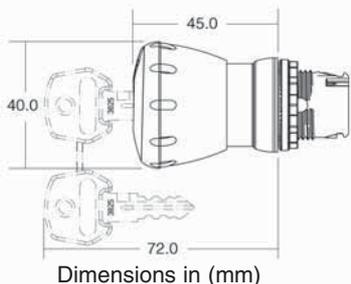
- Superior LED illumination qualities
- Scratch resistant lenses
- Modern low profile bodies



Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>24 V AC/DC</b>			
Green pilot light with Green LED		D7P-P3-PN3G <sup>1)</sup>	D7M-P3-MN3G <sup>1)</sup>
Red pilot light with Red LED		D7P-P4-PN3R <sup>1)</sup>	D7M-P4-MN3R <sup>1)</sup>
Blue pilot light with Blue LED		D7P-P6-PN3B <sup>1)</sup>	D7M-P6-MN3B <sup>1)</sup>
Yellow pilot light with Yellow LED		D7P-P5-PN3Y <sup>1)</sup>	D7M-P5-MN3Y <sup>1)</sup>
Translucent pilot light with White LED		D7P-P7-PN3W <sup>1)</sup>	D7M-P7-MN3W <sup>1)</sup>
<b>240 V AC</b>			
Green pilot light with Green LED		D7P-P3-PN7G <sup>1)</sup>	D7M-P3-MN7G <sup>1)</sup>
Red pilot light with Red LED		D7P-P4-PN7R <sup>1)</sup>	D7M-P4-MN7R <sup>1)</sup>
Blue pilot light with Blue LED		D7P-P6-PN7B <sup>1)</sup>	D7M-P6-MN7B <sup>1)</sup>
Yellow pilot light with Yellow LED		D7P-P5-PN7Y <sup>1)</sup>	D7M-P5-MN7Y <sup>1)</sup>
Translucent pilot light with White LED		D7P-P7-PN7W <sup>1)</sup>	D7M-P7-MN7W <sup>1)</sup>

Note: <sup>1)</sup> Add suffix "bx" for special box/hang-sell packaging eg: D7P-LF3-PN3GX10bx.

**Emergency Stop Operators**



- Choice of “Auto Break” or Standard normally closed contacts
- 30, 40 or 60 mm Mushroom head
- Extra security key release



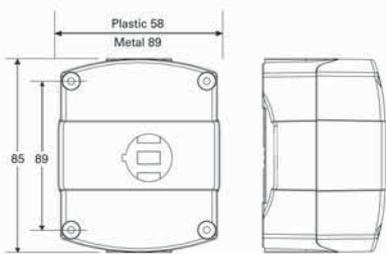
D7P-MT64-PX01S



D7M-MK44-MX01S

Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>Twist To Reset with Standard Contact Blocks</b>			
30 mm Operator		D7P-MT34-PX01 <sup>1)</sup>	D7M-MT34-MX01 <sup>1)</sup>
40 mm Operator		D7P-MT44-PX01 <sup>1)</sup>	D7M-MT44-MX01 <sup>1)</sup>
60 mm Operator		D7P-MT64-PX01 <sup>1)</sup>	D7M-MT64-MX01 <sup>1)</sup>
<b>Key To Reset with Standard Contact Blocks</b>			
40 mm Operator		D7P-MK44-PX01 <sup>1)</sup>	D7M-MK44-MX01 <sup>1)</sup>
<b>Twist To Reset with “Auto Break” Safety Contact Blocks</b>			
30 mm Operator		D7P-MT34-PX01S <sup>1)</sup>	D7M-MT34-MX01S <sup>1)</sup>
40 mm Operator		D7P-MT44-PX01S <sup>1)</sup>	D7M-MT44-MX01S <sup>1)</sup>
60 mm Operator		D7P-MT64-PX01S <sup>1)</sup>	D7M-MT64-MX01S <sup>1)</sup>
<b>Key To Reset with “Auto Break” Safety Contact Blocks</b>			
40 mm Operator		D7P-MK44-PX01S <sup>1)</sup>	D7M-MK44-MX01S <sup>1)</sup>

**Enclosed Emergency Stop Operators**



Dimensions in (mm)

- Modern low profile enclosures
- Supplied complete
- 20 mm metric cable entry
- Plastic or Metal enclosures



D71YM1

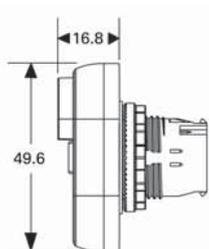


D71MM1

Description	Contact	Cat. No.
<b>Plastic Enclosures with Emergency Stop “Twist To Reset” Operator</b>		
Yellow enclosure 40 mm plastic operator		D71YM1
<b>Plastic Enclosures with Emergency Stop “Twist Key To Reset” Operator</b>		
Yellow enclosure 40 mm plastic operator		D71Y4
<b>Metal Enclosures with Emergency Stop “Twist To Reset” Operator</b>		
Grey enclosure 40 mm metal operator		D71MM1
<b>Metal Enclosures with Emergency Stop “Twist Key To Reset” Operator</b>		
Grey enclosure 40 mm metal operator		D71MM4

**Note:** <sup>1)</sup> Add suffix “bx” for special box/hang-sell packaging eg: D7P-MT34-PX01bx.

**Multi Function Operators**



Dimensions in (mm)

**Time saving**

- Central nut fixing
- Snap fitting of components

**Space efficient**

- 2 or 3 functions in a minimum of space
- Single 22.5 mm hole mounting

**Economical**

- Negates the need for 3 separate devices
- Less mounting time

**Flexible**

- Uses standard D7 rear elements
- 2 contact levels possible
- Choice of plastic or metal body
- IP 66 protection



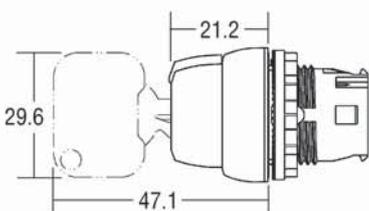
D7P-U2E4F3-PX11



D7M-U2E4F3-MX11

Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>Maintained Operation</b> Blank press plates (Red / Green)		D7P-U2E4F3-PX11 <sup>1)</sup>	D7M-U2E4F3-MX11 <sup>1)</sup>
O-I (Red "Stop" / Green "Start")		D7P-U2EFFE-PX11 <sup>1)</sup>	D7M-U2EFFEMX11 <sup>1)</sup>

**Short lever Rotary Switches and Key Operated Rotary Switches**



Dimensions in (mm)

- Improved sealing
- Raised detent for improved switching capabilities
- Ergonomic handles
- Key release at off position

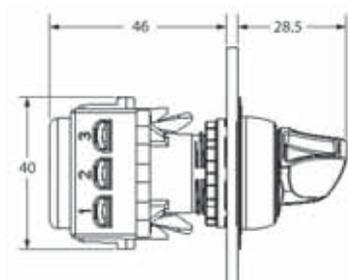


D7P-SM22-PX10



D7M-KM31-MX20

Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>Maintained Operation</b> 2 pos Rotary SW 90°		D7P-SM22-PX10 <sup>1)</sup>	D7M-SM22-MX10 <sup>1)</sup>
3 pos Rotary SW 2 x 60°		D7P-SM32-PX20 <sup>1)</sup>	D7M-SM32-MX20 <sup>1)</sup>
2 pos Key SW 90°		D7P-KM21-PX10 <sup>1)</sup>	D7M-KM21-MX10 <sup>1)</sup>
3 pos Key SW 2 x 60°		D7P-KM31-PX20 <sup>1)</sup>	D7M-KM31-MX20 <sup>1)</sup>



Dimensions in (mm)

**Potentiometer**

- Supplied complete with resistive elements
- Thermoplastic body



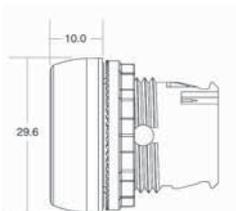
D7P-POT

Description	Contact	Plastic Body Cat. No.
Operator without resistive element		D7P-POT
Operator with 1000 Ω resistive		D7P-POT3
Operator with 5000 Ω resistive		D7P-POT5
Operator with 10000 Ω resistive		D7P-POT6

Note: <sup>1)</sup> Add suffix "bx" for special box/hang-sell packaging eg: D7P-U2E4F3-PX11bx.

- D7PF** Flush frame, non-illuminated plastic pushbutton operators
- D7PLF** Flush frame, illuminated plastic pushbutton operators
- D7MF** Flush frame, non-illuminated metal pushbutton operators
- D7MLF** Flush frame, illuminated metal pushbutton operators

- Protection class IP 66
- Individually packaged
- 2 part ordering **2**



Dimensions in (mm)

**1**



D7P-F301



D7M-F6



D7PL-F4



D7ML-F5

Description	Non Illuminated Plastic Cat. No.	Non Illuminated Metal Cat. No.	Illuminated Plastic Cat. No. <sup>3)</sup>	Illuminated Metal Cat. No. <sup>3)</sup>
Operator only - no insert	D7P-F9	D7M-F9	D7PL-F9	D7ML-F9
Operator with White / Clear insert	D7P-F1	D7M-F1	D7PL-F1	D7ML-F1
Operator with Black insert	D7P-F2	D7M-F2	-	-
Operator with Green insert	D7P-F3	D7M-F3	D7PL-F3	D7ML-F3
Operator with Red insert	D7P-F4	D7M-F4	D7PL-F4	D7ML-F4
Operator with Yellow insert	D7P-F5	D7M-F5	D7PL-F5	D7ML-F5
Operator with Blue insert	D7P-F6	D7M-F6	D7PL-F6	D7ML-F6
Operator with Green "Start" insert	D7P-F301	D7M-F301	-	-
Operator with Green "I" insert	D7P-F306	D7M-F306	-	-
Operator with Red "STOP" insert	D7P-F402	D7M-F402	-	-
Operator with Red "O" insert	D7P-F405	D7M-F405	-	-
Operator with Black "→" insert	D7P-F208	D7M-F208	-	-



**2**

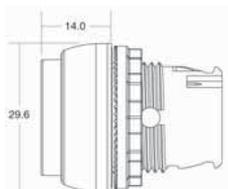
**D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate

**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11
1 N/O and 1 N/C contact block and incandescent lamp block	D7PD <sup>1)</sup> CX11	D7PD <sup>1)</sup> CQ11	D7MD <sup>1)</sup> CX11	D7MD <sup>1)</sup> CQ11
1 N/O and 1 N/C contact block and integrated LED lamp block	D7PN <sup>1)</sup> <sup>2)</sup> X11	D7PQ <sup>1)</sup> <sup>2)</sup> Q11	D7MN <sup>1)</sup> <sup>2)</sup> X11	D7MQ <sup>1)</sup> <sup>2)</sup> X11

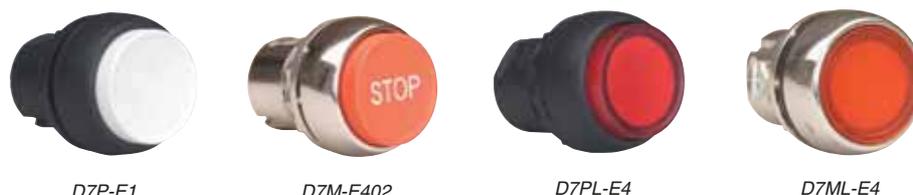
**Notes:** <sup>1)</sup> Enter voltage 6 V AC/DC = **1**, 12 V AC/DC = **2**, 24 V AC/DC = **3**, 48 V AC/DC = **4**, 120 V AC/DC = **5**, 240 V AC/DC = **7**  
 Example D7PD3CX11 = 24 V AC/DC Incandescent lamp block, lamp ordered separately (24, 110, 240 available with LED).  
<sup>2)</sup> Enter lamp colour **C** = clear (incandescent), **R** = Red LED, **G** = Green LED, **Y** = Yellow LED, **W** = White LED, **B** = Blue LED - Example D7PN3RX11 = 24 V AC/DC RED integrated LED lamp block.  
<sup>3)</sup> A full range of labelled press plates available separately refer to page 37.

- Protection class IP 66
- Individually packaged
- 2 part ordering



Dimensions in (mm)

- D7PE** Extended frame, non-illuminated plastic pushbutton operators
- D7PLE** Extended frame, illuminated plastic pushbutton operators
- D7ME** Extended frame, non-illuminated metal pushbutton operators
- D7MLE** Extended frame, illuminated metal pushbutton operators



Description	Non Illuminated Plastic Cat. No.	Non Illuminated Metal Cat. No.	Illuminated Plastic Cat. No. <sup>3)</sup>	Illuminated Metal Cat. No. <sup>3)</sup>
Operator only - no insert	D7P-E9	D7M-E9	D7PL-E9	D7ML-E9
Operator with White / Clear insert	D7P-E1	D7M-E1	D7PL-E1	D7ML-E1
Operator with Black insert	D7P-E2	D7M-E2	-	-
Operator with Green insert	D7P-E3	D7M-E3	D7PL-E3	D7ML-E3
Operator with Red insert	D7P-E4	D7M-E4	D7PL-E4	D7ML-E4
Operator with Yellow insert	D7P-E5	D7M-E5	D7PL-E5	D7ML-E5
Operator with Blue insert	D7P-E6	D7M-E6	D7PL-E6	D7ML-E6
Operator with Green "Start" insert	D7P-E301	D7M-E301	-	-
Operator with Green "I" insert	D7P-E306	D7M-E306	-	-
Operator with Red "STOP" insert	D7P-E402	D7M-E402	-	-
Operator with Red "O" insert	D7P-E405	D7M-E405	-	-
Operator with Black "→" insert	D7P-E208	D7M-E208	-	-



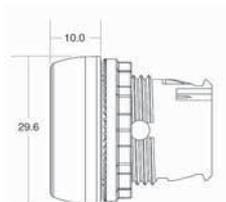
- D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate
- D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11
1 N/O and 1 N/C contact block and incandescent lamp block	D7PD <sup>1)</sup> CX11	D7PD <sup>1)</sup> CQ11	D7MD <sup>1)</sup> CX11	D7MD <sup>1)</sup> CQ11
1 N/O and 1 N/C contact block and integrated LED lamp block	D7PN <sup>1)</sup> <sup>2)</sup> X11	D7PQ <sup>1)</sup> <sup>2)</sup> Q11	D7MN <sup>1)</sup> <sup>2)</sup> X11	D7MQ <sup>1)</sup> <sup>2)</sup> X11

**Notes:** <sup>1)</sup> Enter voltage 6 V AC/DC = 1, 12 V AC/DC = 2, 24 V AC/DC = 3, 48 V AC/DC = 4, 120 V AC/DC = 5, 240 V AC/DC = 7  
 Example D7PD3CX11 = 24 V AC/DC Incandescent lamp block, lamp ordered separately (24, 110, 240 available with LED).  
<sup>2)</sup> Enter lamp colour **C** = clear (incandescent), **R** = Red LED, **G** = Green LED, **Y** = Yellow LED, **W** = White LED, **B** = Blue LED - Example D7PN3RX11 = 24 V AC/DC RED integrated LED lamp block.  
<sup>3)</sup> A full range of labelled press plates available separately refer to page 37.

- D7PG** Guarded frame, non-illuminated plastic pushbutton operators
- D7PLG** Guarded frame, illuminated plastic pushbutton operators
- D7MG** Guarded frame, non-illuminated metal pushbutton operators
- D7MLG** Guarded frame, illuminated metal pushbutton operators

- Protection class IP 66
- Individually packaged
- 2 part ordering



**1** Dimensions in (mm)



D7P-G4



D7M-G4



D7PL-G5



D7ML-G4

Description	Non Illuminated Plastic Cat. No.	Non Illuminated Metal Cat. No.	Illuminated Plastic Cat. No. <sup>3)</sup>	Illuminated Metal Cat. No. <sup>3)</sup>
Operator only - no insert	D7P-G9	D7M-G9	D7PL-G9	D7ML-G9
Operator with White / Clear insert	D7P-G1	D7M-G1	D7PL-G1	D7ML-G1
Operator with Black insert	D7P-G2	D7M-G2	-	-
Operator with Green insert	D7P-G3	D7M-G3	D7PL-G3	D7ML-G3
Operator with Red insert	D7P-G4	D7M-G4	D7PL-G4	D7ML-G4
Operator with Yellow insert	D7P-G5	D7M-G5	D7PL-G5	D7ML-G5
Operator with Blue insert	D7P-G6	D7M-G6	D7PL-G6	D7ML-G6
Operator with Green "Start" insert	D7P-G301	D7M-G301		
Operator with Green "I" insert	D7P-G306	D7M-G306		
Operator with Red "STOP" insert	D7P-G402	D7M-G402		
Operator with Red "O" insert	D7P-G405	D7M-G405		
Operator with Black "→" insert	D7P-G208	D7M-G208		



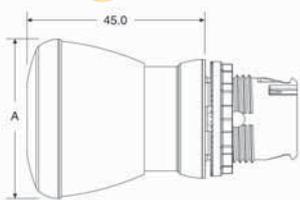
**2**

- D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate
- D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11
1 N/O and 1 N/C contact block and incandescent lamp block	D7PD <sup>1)</sup> CX11	D7PD <sup>1)</sup> CQ11	D7MD <sup>1)</sup> CX11	D7MD <sup>1)</sup> CQ11
1 N/O and 1 N/C contact block and integrated LED lamp block	D7PN <sup>1) 2)</sup> X11	D7PQ <sup>1) 2)</sup> Q11	D7MN <sup>1) 2)</sup> X11	D7MN <sup>1) 2)</sup> Q11

**Notes:** <sup>1)</sup> Enter voltage 6 V AC/DC = **1**, 12 V AC/DC = **2**, 24 V AC/DC = **3**, 48 V AC/DC = **4**, 120 V AC/DC = **5**, 240 V AC/DC = **7**  
 Example D7PD3CX11 = 24 V AC/DC Incandescent lamp block, lamp ordered separately (24, 110, 240 available with LED).  
<sup>2)</sup> Enter lamp colour **C** = clear (incandescent), **R** = Red LED, **G** = Green LED, **Y** = Yellow LED, **W** = White LED, **B** = Blue LED - Example D7PN3RX11 = 24 V AC/DC RED integrated LED lamp block.  
<sup>3)</sup> A full range of labelled press plates available separately refer to page 37.

- Protection class IP 66
- Individually packaged
- 2 part ordering



**1** Dimensions in (mm)

- D7PMM** 40 mm and 60 mm, non-illuminated momentary plastic mushroom operators
- D7PLMM** 40 mm and 60 mm, illuminated momentary plastic mushroom operators
- D7MMM** 40 mm and 60 mm, non-illuminated momentary metal mushroom operators
- D7MLMM** 40 mm and 60 mm, illuminated momentary metal mushroom operators



D7P-MM62



D7M-MM44



D7P-LMM43



D7M-LMM46

Description	Non Illuminated Plastic Cat. No.	Non Illuminated Metal Cat. No.	Illuminated Plastic Cat. No.	Illuminated Metal Cat. No.
40 mm operator with Clear insert	-	-	D7P-LMM42	D7M-LMM42
40 mm operator with Black insert	D7P-MM42	D7M-MM42	-	-
40 mm operator with Green insert	D7P-MM43	D7M-MM43	D7P-LMM43	D7M-LMM43
40 mm operator with Red insert	D7P-MM44	D7M-MM44	D7P-LMM44	D7M-LMM44
40 mm operator with Yellow insert	D7P-MM45	D7M-MM45	D7P-LMM45	D7M-LMM45
40 mm operator with Blue insert	D7P-MM46	D7M-MM46	D7P-LMM46	D7M-LMM46
60 mm operator with Clear insert	-	-	D7P-LMM62	D7M-LMM62
60 mm operator with Black insert	D7P-MM62	D7M-MM62	-	-
60 mm operator with Green insert	D7P-MM63	D7M-MM63	D7P-LMM63	D7M-LMM63
60 mm operator with Red insert	D7P-MM64	D7M-MM64	D7P-LMM64	D7M-LMM64
60 mm operator with Yellow insert	D7P-MM65	D7M-MM65	D7P-LMM65	D7M-LMM65
60 mm operator with Blue insert	D7P-MM66	D7M-MM66	D7P-LMM66	D7M-LMM66



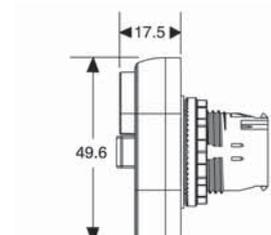
**2** **D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate  
**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11
1 N/O and 1 N/C contact block and incandescent lamp block	D7PD <sup>1)</sup> CX11	D7PD <sup>1)</sup> CQ11	D7MD <sup>1)</sup> CX11	D7MD <sup>1)</sup> CQ11
1 N/O and 1 N/C contact block and integrated LED lamp block	D7PN <sup>1)</sup> <sup>2)</sup> X11	D7PQ <sup>1)</sup> <sup>2)</sup> Q11	D7MN <sup>1)</sup> <sup>2)</sup> X11	D7MQ <sup>1)</sup> <sup>2)</sup> Q11

**Notes:** <sup>1)</sup> Enter voltage 6 V AC/DC = 1, 12 V AC/DC = 2, 24 V AC/DC = 3, 48 V AC/DC = 4, 120 V AC/DC = 5, 240 V AC/DC = 7  
 Example D7PD3CX11 = 24 V AC/DC Incandescent lamp block, lamp ordered separately (24, 110, 240 available with LED).  
<sup>2)</sup> Enter lamp colour **C** = clear (incandescent), **R** = Red LED, **G** = Green LED, **Y** = Yellow LED, **W** = White LED, **B** = Blue LED - Example D7PN3RX11 = 24 V AC/DC RED integrated LED lamp block.

- D7PU2 / D7PLU2** 2 Position plastic illuminated and non-illuminated multifunction operators
- D7MU2 / D7MLU2** 2 Position metal illuminated and non-illuminated multifunction operators
- D7PU3** 3 Position plastic non-illuminated multifunction operators
- D7MU3** 3 Position metal non-illuminated multifunction operators

- Protection class IP 66
- Individually packaged
- 3 part ordering



**1** Dimensions in (mm)



D7P-U2X <sup>1)</sup>



D7M-U2X



D7P-U3X

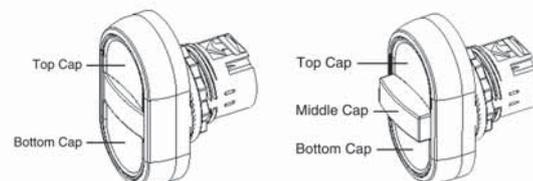


D7M-U3X

Description	Two Position Plastic Operator Cat. No.	Two Position Metal Operator Cat. No.	Three Position Plastic Operator Cat. No.	Three Position Metal Operator Cat. No.
Non-illuminated operator without insert	D7P-U2X	D7M-U2X	D7P-U3X	D7M-U3X
Illuminated operator without insert	D7P-LU2X	D7M-LU2X	D7P-LU3X	D7M-LU3X

**2** Blank inserts for top or bottom cap  
To suit 2 or 3 position operators

	Flush Cat. No.	Extended Cat. No.	Two Position <sup>3)</sup> Multi-Function	Three Position <sup>3)</sup> Multi-Function
White Blank	D7-AFU1	D7-AEU1		
Black Blank	D7-AFU2	D7-AEU2		
Green Blank	D7-AFU3	D7-AEU3		
Red Blank	D7-AFU4	D7-AEU4		
Yellow Blank	D7-AFU5	D7-AEU5		
Blue Blank	D7-AFU6	D7-AEU6		



Engraved inserts To suit 2 or 3 position operators	Flush plate for top cap	Flush plate for bottom cap	Extended plate for bottom cap
Green I	D7-AFCU3CU909	D7-AFAU3CU909	-
Green II	D7-AFCU3CU230	D7-AFAU3CU230	-
Green O	-	D7-AFAU3CU910	-
Green Start	D7-AFCU3CU208	-	-
Red Stop	-	-	D7-AEAU4CU910
Red O	-	-	D7-AEAU4CU212



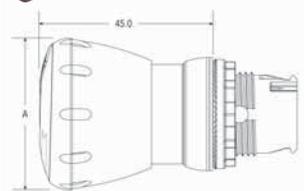
**3**

- D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plates
- D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plates

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11
1 N/O and 1 N/C contact block and integrated LED lamp block	D7PN <sup>1)</sup> <sup>2)</sup> X11	D7PQ <sup>1)</sup> <sup>2)</sup> Q11	D7MN <sup>1)</sup> <sup>2)</sup> X11	D7MQ <sup>1)</sup> <sup>2)</sup> Q11

**Notes:** <sup>1)</sup> Enter voltage 6 V AC/DC = 1, 12 V AC/DC = 2, 24 V AC/DC = 3, 48 V AC/DC = 4, 120 V AC/DC = 5, 240 V AC/DC = 7, Example D7PD3CX11 = 24 V AC/DC Incandescent lamp block, lamp ordered separately (24, 110, 240 available with LED)  
<sup>2)</sup> Enter lamp colour **C** = clear (incandescent), **R** = Red LED, **G** = Green LED, **Y** = Yellow LED, **W** = White LED, **B** = Blue LED, Example D7PN3RX11 = 24 V AC/DC RED integrated LED lamp block.  
 Full list of labelled press plates refer to page 37.  
<sup>3)</sup> Shown fitted with inserts.

- Protection class IP 66
- Individually packaged
- 2 part ordering



Dimensions in (mm)

- D7PMT** Plastic twist to release emergency stop operators
- D7MMT** Metal twist to release emergency stop operators
- D7PLMT** Plastic twist to release illuminated emergency stop operators
- D7MLMT** Metal twist to release illuminated emergency stop operators



D7P-MT44

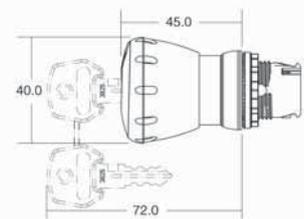
D7M-MT64

D7P-LMT44

D7M-LMT64

Description	Non Illuminated Plastic Cat. No.	Non Illuminated Metal Cat. No.	Illuminated Plastic Cat. No.	Illuminated Metal Cat. No.
30 mm Red operator	D7P-MT34	D7M-MT34	N/A	N/A
40 mm Red operator	D7P-MT44	D7M-MT44	D7P-LMT44	D7M-LMT44
60 mm Red operator	D7P-MT64	D7M-MT64	D7P-LMT64	D7M-LMT64

- D7PMK** Plastic key-release emergency stop operators
- D7MMK** Metal key-release emergency stop operators



Dimensions in (mm)



D7P-MK44

D7M-MK44

40 mm Red operator	D7P-MK44	D7M-MK44		
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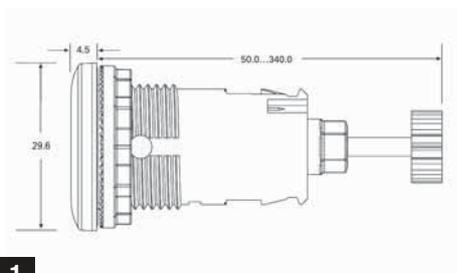
- D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate
- D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11
1 N/O and 1 N/C contact block and incandescent lamp block	D7PD <sup>1)</sup> CX11	D7PD <sup>1)</sup> CQ11	D7MD <sup>1)</sup> CX11	D7MD <sup>1)</sup> CQ11
1 N/O and 1 N/C contact block and integrated LED lamp block	D7PN <sup>1) 2)</sup> X11	D7PQ <sup>1) 2)</sup> Q11	D7MN <sup>1) 2)</sup> X11	D7MN <sup>1) 2)</sup> Q11

**Notes:** 1) Enter voltage 6 V AC/DC = 1, 12 V AC/DC = 2, 24 V AC/DC = 3, 48 V AC/DC = 4, 120 V AC/DC = 5, 240 V AC/DC = 7  
 Example D7PD3CX11 = 24 V AC/DC Incandescent lamp block, lamp ordered separately (24, 110, 240 available with LED)  
 2) Enter lamp colour C = clear (incandescent), R = Red LED, G = Green LED, Y = Yellow LED, W = White LED, B = Blue LED - Example D7PN3RX11 = 24 V AC/DC RED integrated LED lamp block  
 Safety auto break contact available, refer to page 28.

**D7P-R/D7M-R** Flush frame reset rod operators - Mechanical and/or electrical reset, momentary operation

- Protection class IP 66
- Individually packaged
- 2 part ordering



**1** Dimensions in (mm)



D7P-R611



D7M-R607



Description	Legend / Text	Plastic <sup>1)</sup> Cat. No.	Metal <sup>1)</sup> Cat. No.
Blue operator	<b>R</b>	<b>D7P-R611</b>	<b>D7M-R611</b>
Blue operator	<b>RESET</b>	<b>D7P-R607</b>	<b>D7M-R607</b>
Blue operator	<b>Blank</b>	<b>D7P-R6</b>	<b>D7M-R6</b>

**D7-ATR** Adjustable threaded reset rod

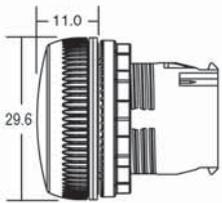


D7-ATR06

Rod Length <sup>2)</sup>	Rod length adjustability	Cat. No.
40 mm	34...52 mm	<b>D7-ATR01</b>
55 mm	50...67 mm	<b>D7-ATR02</b>
85 mm	80...98 mm	<b>D7-ATR04</b>
115 mm	110...128 mm	<b>D7-ATR06</b>
145 mm	141...195 mm	<b>D7-ATR08</b>
315 mm	157...326 mm	<b>D7-ATR19 <sup>3)</sup></b>

**Notes:** <sup>1)</sup> For electrical operation, operator will accept coupling plate and up to four circuit contact blocks or two dual level contact blocks. (Refer to page 28 for contact blocks).  
<sup>2)</sup> If contact blocks are used, they must have a minimum rod length of 55 mm for one level of contact blocks and 85 mm for two levels of contact blocks.  
<sup>3)</sup> Rod is threaded along its entire length. Fully threaded rod can be provided after cutting.

- Protection class IP 66
- Individually packaged
- 2 part ordering



**1** Dimensions in (mm)

**D7PP / D7MM** Superior illumination qualities  
 Scratch resistant lens  
 Modern low profile bodies



D7P-P3



D7M-M4

Description	Plastic Cat. No.	Metal Cat. No.
Pilot light with Clear lens	D7P-P7	D7M-P7
Pilot light with Green lens	D7P-P3	D7M-P3
Pilot light with Red lens	D7P-P4	D7M-P4
Pilot light with Yellow lens	D7P-P5	D7M-P5
Pilot light with Blue lens	D7P-P6	D7M-P6



**D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate

**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

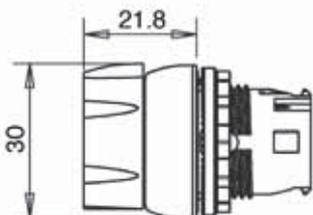
Description	Plastic Screw Cat. No.	Plastic Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
Integrated LED lamp block White	D7PN '1)W	D7PQ '1)W	D7MN '1)W	D7MQ '1)W
Integrated LED lamp block Green	D7PN '1)G	D7PQ '1)G	D7MN '1)G	D7MQ '1)G
Integrated LED lamp block Red	D7PN '1)R	D7PQ '1)R	D7MN '1)R	D7MQ '1)R
Integrated LED lamp block Yellow	D7PN '1)Y	D7PQ '1)Y	D7MN '1)Y	D7MQ '1)Y
Integrated LED lamp block Blue	D7PN '1)B	D7PQ '1)B	D7MN '1)B	D7MQ '1)B
Ba9s incandescent lamp block - lamp supplied separately <sup>2)</sup>	D7PDOC	-	D7MDOC	-

**Notes:** <sup>1)</sup> Enter voltage 24 V AC/DC = 3, 110 V AC/DC = 5, 240 V AC/DC = 7  
<sup>2)</sup> Refer page 31 for full lamp selections.

**D7PSJ** Plastic, selector jog operators 2 or 3 position

**D7MSJ** Metal, selector jog operators 2 or 3 position

- Protection class IP 66
- Individually packaged
- 2 part ordering



**1** Dimensions in (mm)



D7M-SJ23

Description	Plastic operator Cat. No.	Metal operator Cat. No.
Black 2 position	<b>D7P-SJ22</b>	<b>D7M-SJ22</b>
Green 2 position	<b>D7P-SJ23</b>	<b>D7M-SJ23</b>
Black 3 position	<b>D7P-SJ32</b>	<b>D7M-SJ32</b>
Green 3 position	<b>D7P-SJ33</b>	<b>D7M-SJ33</b>

Target Table and Operator Position (2-Position) <sup>1)</sup>					
Contact Type	Position On Mounting Latch	↙		↗	
		Selector Left Free	Selector Left Depressed	Selector Right Free	Selector Right Depressed
N/O	Left	O	X	O	O
N/O	Right	O	O	O	X
N/O	Centre	O	X	O	X
N/C	Left	X	O	X	X
N/C	Right	X	X	X	O
N/C	Centre	X	O	X	O

Target Table and Operator Position (3-Position) <sup>1)</sup>							
Contact Type	Position On Mounting Latch	↙		↑		↗	
		Selector Left Free	Selector Left Depressed	Selector Right Free	Selector Right Depressed	Selector Right Free	Selector Right Depressed
N/O	Left	O	X	O	X	O	O
N/O	Right	O	O	O	X	O	X
N/O	Centre	O	X	O	X	O	X
N/C	Left	X	O	X	O	X	X
N/C	Right	X	X	X	O	X	O
N/C	Centre	X	O	X	O	X	O

Note: <sup>1)</sup> X = Closed 0 = Open



**2**

**D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate  
**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

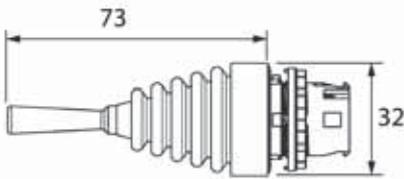
Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	<b>D7PX10</b>	<b>D7PQ10</b>	<b>D7MX10</b>	<b>D7MQ10</b>
1 N/C contact block	<b>D7PX01</b>	<b>D7PQ01</b>	<b>D7MX01</b>	<b>D7MQ01</b>
1 N/O and 1 N/C contact block	<b>D7PX11</b>	<b>D7PQ11</b>	<b>D7MX11</b>	<b>D7MQ11</b>

- Protection class IP 66
- Individually packaged
- 2 part ordering



**D7MJM / JR2**  
**D7MJM / JR4**

Metal, 2 position joystick operator  
Metal, 4 position joystick operator



**1** Dimensions in (mm)



D7M-JM2



D7M-JM4

Description	Cat. No.	Cat. No.	Cat. No.
Metal 2 position Maintained	<b>D7M-JM2</b>	Metal 4 position Maintained	<b>D7M-JM4</b>
Metal 2 position Spring Return	<b>D7M-JR2</b>	Metal 4 position Spring Return	<b>D7M-JR4</b>

Target Table and Operator Position (2-Position) <sup>1)</sup>				
Contact Type	Position on Mounting Latch	 Toggle Left	 Centre	 Toggle Right
N/O	Left	O	O	X
N/O	Right	X	O	O
N/O	Centre	X	O	X
N/O	Left	X	X	O
N/O	Right	O	X	X
N/O	Centre	O	X	O

Note: <sup>1)</sup> X = Closed O = Open

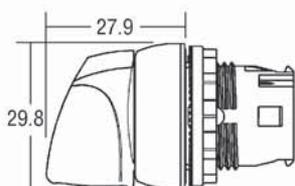


**D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate  
**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	<b>D7PX10</b>	<b>D7PQ10</b>	<b>D7MX10</b>	<b>D7MQ10</b>
1 N/C contact block	<b>D7PX01</b>	<b>D7PQ01</b>	<b>D7MX01</b>	<b>D7MQ01</b>
1 N/O and 1 N/C contact block	<b>D7PX11</b>	<b>D7PQ11</b>	<b>D7MX11</b>	<b>D7MQ11</b>

- D7PS / D7MS** Non illuminated short handle 2 position selector switch operators
- D7PLS / D7MLS** Illuminated short handle 2 position selector switch operators

- Protection class IP 66
- Individually packaged
- 2 part ordering



**1**

Dimensions in (mm)



D7P-SM22



D7M-SL22



D7P-LSM26



D7M-LSM25

Description	Non Illuminated Plastic Cat. No.	Non Illuminated Metal Cat. No.	Illuminated Plastic Cat. No.	Illuminated Metal Cat. No.
Stayput 60°	D7P-SM22	D7M-SM22	D7P-LSM2 <sup>1)</sup>	D7M-LSM2 <sup>1)</sup>
Stayput 90°	D7P-SN22	D7M-SN22	N/A	N/A
Spring return from Left 60°	D7P-SL22	D7M-SL22	D7P-LSL2 <sup>1)</sup>	D7M-LSL2 <sup>1)</sup>
Spring return from Right 60°	D7P-SR22	D7M-SR22	D7P-LSR2 <sup>1)</sup>	D7M-LSR2 <sup>1)</sup>

**Note:** <sup>1)</sup> Illuminated operators available in a choice of six different knob colours.

Green = 3, Red = 4, Yellow = 5, Blue. = 6, Clear = 7

**Example D7P-LSM24 = Red Knob**

**2**



**D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate

**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11
1 N/O and 1 N/C contact block and incandescent lamp block	D7PD <sup>2)</sup> CX11	D7PD <sup>2)</sup> CQ11	D7MD <sup>2)</sup> CX11	D7MD <sup>2)</sup> CQ11
1 N/O and 1 N/C contact block and integrated LED lamp block	D7PN <sup>2)</sup> <sup>3)</sup> X11	D7PQ <sup>2)</sup> <sup>3)</sup> Q11	D7MN <sup>2)</sup> <sup>3)</sup> X11	D7MQ <sup>2)</sup> <sup>3)</sup> Q11

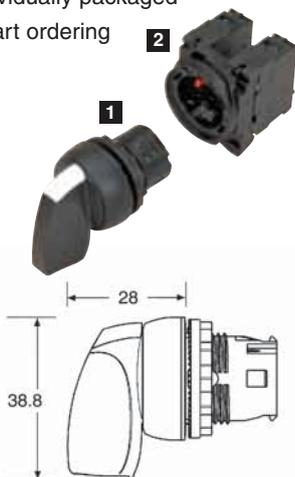
**Notes:** <sup>1)</sup> Enter voltage 6 V AC/DC = 1, 12 V AC/DC = 2, 24 V AC/DC = 3, 48 V AC/DC = 4, 120 V AC/DC = 5, 240 V AC/DC = 7

Example D7PD3CX11 = 24 V AC/DC Incandescent lamp block, lamp ordered separately (24, 110, 240 available with LED)

<sup>2)</sup> Enter lamp colour **C** = clear (incandescent), **R** = Red LED, **G** = Green LED, **Y** = Yellow LED, **W** = White LED,

**B** = Blue LED - Example D7PN3RX11 = 24V AC/DC RED integrated LED lamp block.

- Protection class IP 66
- Individually packaged
- 2 part ordering



**1** Dimensions in (mm)

**D7PH / D7MH** Non-illuminated long lever 2 position selector switch operators



D7P-HM22

D7M-HM22

Description	Non Illuminated Plastic Cat. No.	Non Illuminated Metal Cat. No.
Stayput 60°	D7P-HM22	D7M-HM22
Stayput 90°	D7P-HN22	D7M-HN22
Spring return from Left 60°	D7P-HL22	D7M-HL22
Spring return from Right 60°	D7P-HR22	D7M-HR22

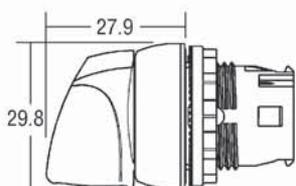


**2** **D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate  
**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11

**D7PS / D7MS** Non-illuminated short lever 3 position selector switch operators  
**D7PLS / D7MLS** Illuminated short lever 3 position selector switch operators

- Protection class IP 66
- Individually packaged
- 2 part ordering



1 Dimensions in (mm)				
Description	Non Illuminated Plastic Cat. No.	Non Illuminated Metal Cat. No.	Illuminated Plastic Cat. No.	Illuminated Metal Cat. No.
Stayput 60°	D7P-SM32	D7M-SM32	D7P-LSM3_ 1)	D7M-LSM3_ 1)
Spring return from Left 60°	D7P-SL32	D7M-SL32	D7P-LSL3_ 1)	D7M-LSL3_ 1)
Spring return from Right 60°	D7P-SR32	D7M-SR32	D7P-LSR3_ 1)	D7M-LSR3_ 1)
Spring return from Left and Right 60°	D7P-SB32	D7M-SB32	D7P-LSB3_ 1)	D7M-LSB3_ 1)

**Note:** 1) Illuminated operators available in a choice of six different knob colours.  
 Green = 3, Red = 4, Yellow = 5, Blue. = 6, Clear = 7

**Example D7P-LSM34 = Red Knob**

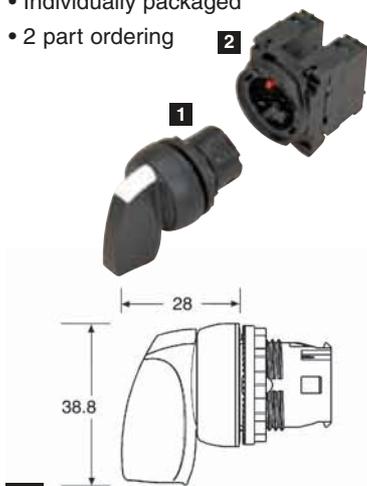


**D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate  
**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11
1 N/O and 1 N/C contact block and incandescent lamp block	D7PD <sup>2)</sup> CX11	D7PD <sup>2)</sup> CQ11	D7MD <sup>2)</sup> CX11	D7MD <sup>2)</sup> CQ11
1 N/O and 1 N/C contact block and integrated LED lamp block	D7PN <sup>2)</sup> <sup>3)</sup> X11	D7PQ <sup>2)</sup> <sup>3)</sup> Q11	D7MN <sup>2)</sup> <sup>3)</sup> X11	D7MQ <sup>2)</sup> <sup>3)</sup> Q11

**Notes:** 2) Enter voltage 6 V AC/DC = 1, 12 V AC/DC = 2, 24 V AC/DC = 3, 48 V AC/DC = 4, 120 V AC/DC = 5, 240 V AC/DC = 7  
 Example D7PD3CX11 = 24 V AC/DC Incandescent lamp block, lamp ordered separately (24, 110, 240 available with LED)  
 3) Enter lamp colour C = clear (incandescent), R = Red LED, G = Green LED, Y = Yellow LED, W = White LED,  
 B = Blue LED - Example D7PN3RX11 = 24V AC/DC RED integrated LED lamp block

- Protection class IP 66
- Individually packaged
- 2 part ordering



**1** Dimensions in (mm)

**D7PH / D7MH** Non illuminated long lever 3 position selector switch operators



*D7P-HM32*                      *D7M-HM32*

Description	Non Illuminated Plastic Cat. No.	Non Illuminated Metal Cat. No.
Stayput 60°	<b>D7P-HM32</b>	<b>D7M-HM32</b>
Spring return from Left 60°	<b>D7P-HL32</b>	<b>D7M-HL32</b>
Spring return from Right 60°	<b>D7P-HR32</b>	<b>D7M-HR32</b>
Spring return from Left and Right 60°	<b>D7P-HB32</b>	<b>D7M-HB32</b>

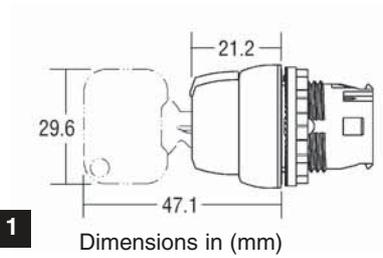


**D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate  
**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	<b>D7PX10</b>	<b>D7PQ10</b>	<b>D7MX10</b>	<b>D7MQ10</b>
1 N/C contact block	<b>D7PX01</b>	<b>D7PQ01</b>	<b>D7MX01</b>	<b>D7MQ01</b>
1 N/O and 1 N/C contact block	<b>D7PX11</b>	<b>D7PQ11</b>	<b>D7MX11</b>	<b>D7MQ11</b>

**D7PK / D7MK** Key operated 2 position selector switch operators

- Protection class IP 66
- Individually packaged
- 2 part ordering



D7P-KM21

D7M-KL22

Description	Key Removable	Illuminated Plastic Cat. No.	Illuminated Metal Cat. No.
Stayput 60°	Key removable Left	D7P-KM21	D7M-KM21
	Key removable Right	D7P-KM22	D7M-KM22
	Key removable Both	D7P-KM23	D7M-KM23
Spring return from Left 60°	Key removable Right	D7P-KL22	D7M-KL22
Spring return from Right 60°	Key removable Left	D7P-KR21	D7M-KR21

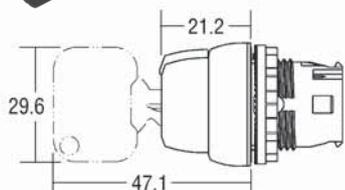


**D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate

**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11

- Protection class IP 66
- Individually packaged
- 2 part ordering



**1** Dimensions in (mm)

**D7PK / D7MK** Key operated 3 position selector switch operators



D7P-KM33

D7P-KR31

Description	Key Removable	Illuminated Plastic Cat. No.	Illuminated Metal Cat. No.
Stayput 60°	Key removable Left	D7P-KM31	D7M-KM31
	Key removable Both	D7P-KM33	D7M-KM33
	Key removable Centre	D7P-KM34	D7M-KM34
	Key removable Left and Centre	D7P-KM35	D7M-KM35
Spring return from Left 60°	Key removable Centre	D7P-KL34	D7M-KL22
Spring return from Right 60°	Key removable Left	D7P-KR31	D7M-KR31
	Key removable Centre	D7P-KR34	D7M-KR34
	Key removable Left and Centre	D7P-KR35	D7M-KR35
Spring return from Left and right 60°	Key removable Left and Centre	D7P-KB34	D7M-KB34



**2**

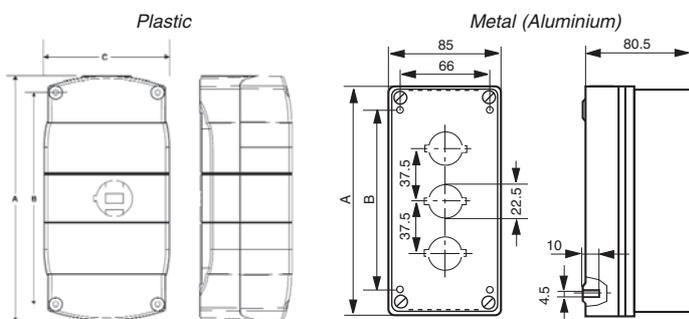
**D7PX / D7PQ** Pre-assembled clip-on rear elements with plastic coupling plate  
**D7MX / D7MQ** Pre-assembled clip-on rear elements with metal coupling plate

Description	Screw Cat. No.	Spring Clamp Cat. No.	Metal Screw Cat. No.	Metal Spring Clamp Cat. No.
1 N/O contact block	D7PX10	D7PQ10	D7MX10	D7MQ10
1 N/C contact block	D7PX01	D7PQ01	D7MX01	D7MQ01
1 N/O and 1 N/C contact block	D7PX11	D7PQ11	D7MX11	D7MQ11

**Enclosures**

Enclosures with 22.5 mm cut-outs

• Individually packaged



Dimensions in (mm)

No. of Units (Holes)	A	B
1	85	89
2	124	79
3	155	79
4 / 5	186	79
6	248	87



D7-3PM



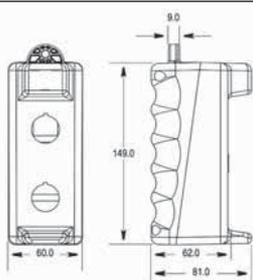
D7-5MM

**Enclosures**

Grey plastic enclosures <sup>1)</sup>  
 Degree of protection IP 65 to IEC 529  
 Water jet protected to SEV 3047  
 Empty, with 22.5 mm ø holes and 2 cable entries  
 21.5 mm ø, top with knock-out, bottom with cable sleeve

No. of Cut-Outs	Plastic Cat. No.	Metal Cat. No.
1	<b>D7-1PM</b>	<b>D7-1MM</b>
2	<b>D7-2PM</b>	<b>D7-2MM</b>
3	<b>D7-3PM</b>	<b>D7-3MM</b>
4	<b>D7-4PM</b>	-
5	-	<b>D7-5MM</b>
6	<b>D7-6MP</b>	-
1	<b>D7-1YM</b>	- <sup>3)</sup>

Yellow plastic (as above)



Dimensions in (mm)



D7-P25

**Pendant Enclosures - Yellow Plastic <sup>2)</sup>**

1 Hole in Face  
 2 Holes in Face

No. of Cut-Outs	Cat. No.
1	<b>D7-P15</b>
2	<b>D7-P25</b>



D7-N2

**Blanking Plugs**

Round blanking plug (PG 16 mm) with grey fixing nut,  
 used to fill 22.5 mm ø mounting holes and cable entry holes

Colour	Cat. No.
Black	<b>D7-N2</b>
Grey	<b>D7-N8</b>

**Note:** <sup>1)</sup> Legend plates refer page 41-42.  
<sup>2)</sup> Buttons supplied separately, enclosures supplied without buttons.  
<sup>3)</sup> Yellow metal enclosure due late 2006.

- Back of panel components for base or panel mounting
- Each component supplied separately



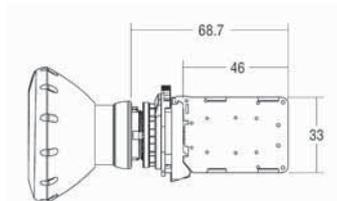
**D7-ALP / D7-ALM**

Contact block coupling plates

- Time saving snap-on twist to release operation
- Suitable for 3 contacts in one level
- Available in metal or plastic



Description	Cat. No.
Plastic coupling plate	D7-ALP
Metal coupling plate	D7-ALM

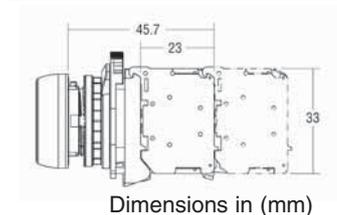


**D7-X / D7-Q  
D7-BX / D7-BQ**

Panel mount contact blocks

Base mount contact blocks

- Option of screw or spring clamp termination
- Self-cleaning operation for long life
- Colour coded operators for easy identification
- Small dimensions
- Panel mount can be mounted to metal or plastic coupling plate



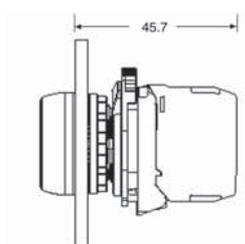
Description	Operator Colour	Panel Mount Cat. No.	Base Mount Cat. No.
Normally open contact block	Green	D7-X10	D7-B10
Normally closed contact block	Red	D7-X01	D7-B01
Normally open contact block with spring clamp terminals	Green	D7-Q10	D7-BQ10
Normally closed contact block with spring clamp terminals	Red	D7-Q01	D7-BQ01
Normally open early make	Green	D7-X10E	D7-BX10E
Normally closed late brake	Red	D7-X01L	D7-BX01L
Normally open low voltage (Quadfurcated gold contacts)	Blue	D7-X10V	D7-BX10V
Normally closed low voltage (Quadfurcated gold contacts)	Blue	D7-X01V	D7-BX01V
Dual circuit 2 normally open	Green	D7-X20D	N/A
Dual circuit 2 normally closed	Red	D7-X02D	N/A
Autobreak safety contact block for emergency stop operators	Yellow	D7-X01S	N/A

**D7-DOC / BDOC** Incandescent lamp module for panel and base mount applications

**D7-N / D7-BN** Integrated LED lamp module for panel and base mount applications

- Supplied less coupling plate
- Option of screw or spring clamp termination <sup>3)</sup>
- Self cleaning operation for long life
- Small dimensions
- High illumination qualities

- Back of panel components for base or panel mounting
- Each component supplied separately



Dimensions in (mm)



D7-DOC



D7-N5B



D7-BN7R

Description	Colour	Panel Mount Cat. No.	Base Mount Cat. No.
Incandescent lamp module (without Ba9s lamp)		D7-DOC <sup>1)</sup>	-
Integrated LED module 24 V AC/DC <sup>2)</sup>	Yellow	D7-N3Y	D7-BN3Y
	Green	D7-N3G	D7-BN3G
	Red	D7-N3R	D7-BN3R
	Blue	D7-N3B	D7-BN3B
	White	D7-N3W	D7-BN3W
Integrated LED module 120 V AC/DC <sup>2)</sup>	Yellow	D7-N5Y	D7-BN5Y
	Green	D7-N5G	D7-BN5G
	Red	D7-N5R	D7-BN5R
	Blue	D7-N5B	D7-BN5B
	White	D7-N5W	D7-BN5W
Integrated LED module 240 V AC/DC <sup>2)</sup>	Yellow	D7-N7Y	D7-BN7Y
	Green	D7-N7G	D7-BN7G
	Red	D7-N7R	D7-BN7R
	Blue	D7-N7B	D7-BN7B
	White	D7-N7W	D7-BN7W

Spring - clamp termination is available for the integrated LED lamp block upon request. Substitute **N** for **Q** in the catalogue number.

#### Example D7-Q3R

**Notes:** <sup>1)</sup> Ba9s lamps supplied separately. Refer page 31.

<sup>2)</sup> For best results LED should match lens colour.

<sup>3)</sup> Spring clamp terminations only available on integrated LED lamp block.

- For standard and extended pushbutton operators and pilot lights
- Each component supplied separately



**Replacement Len's and colour caps**

**Coloured inserts**



D7-AE5



D7-AF3

Description	To suit Extended operator Cat. No.	To suit Flush and Guarded operator Cat. No.
Non-illuminated inserts		
White	D7-AE1	D7-AF1
Black	D7-AE2	D7-AF2
Green	D7-AE3	D7-AF3
Red	D7-AE4	D7-AF4
Yellow	D7-AE5	D7-AF5
Blue	D7-AE6	D7-AF6



**Lens caps**



D7-ALF6



D7-ALE2



D7-AP5

Description	To suit Flush operator Cat. No.	To suit Extended Guarded operator Cat. No.	To suit Pilot Light operator Cat. No.
Illuminated lens cap and pilot light lenses			
Green	D7-ALF3	D7-ALE1	D7-AP3
Red	D7-ALF4	D7-ALE2	D7-AP4
Yellow	D7-ALF5	D7-ALE3	D7-AP5
Blue	D7-ALF6	D7-ALE4	D7-AP6
Clear	D7-ALF7	D7-ALE5	D7-AP7

**Diffuser for illuminated pushbuttons and pilot lights**



D7-AD2



D7-AD4



D7-AD3

Description	To suit Flush operator Cat. No.	To suit Extended Guarded operator Cat. No.	To suit Pilot Light operator Cat. No.
Spare lens diffuser	D7-AD2	D7-AD4	D7-AD3

**Spare lamps**

- Incandescent, multi-cluster LED and neon lamps
- Each component supplied separately

**Incandescent lamps for pilot lights**

Ba9s style for full voltage lamp block D7-DOC



Voltage	Typical Current	1.2 Watt Cat. No.	2 Watt Cat. No.
6 V	150 mA	BA9S-I3-6V-1.2W	BA9S-I3-6V-2W
12 V	80 mA	BA9S-I3-12V-1.2W	BA9S-I3-12V-2W
24 V	70 mA	BA9S-I3-24V-1.2W	BA9S-I3-24V-2W
36 V	60 mA	BA9S-I3-36V-1.2W	BA9S-I3-36V-2W
48 V	50 mA	BA9S-I3-48V-1.2W	BA9S-I3-48V-2W
60 V	22 mA	BA9S-I3-60V-1.2W	BA9S-I3-60V-2W

**Neon lamps**

Ba9s style for full voltage lamp block D7-DOC



Voltage	Typical Current	Cat. No.
110 V...127 V Clear	22 mA	BA9S-CN3-110V
220 V...240 V Clear	22 mA	BA9S-CN3-240V

**Multi-Cluster LED lamp Ba9s style**

**Ultra bright extended life (typical 50,000 + hours) multi-cluster Ba9s style.**

Available in White (WL), Red (RL), Green (GL), Yellow (YL), Blue (BL)

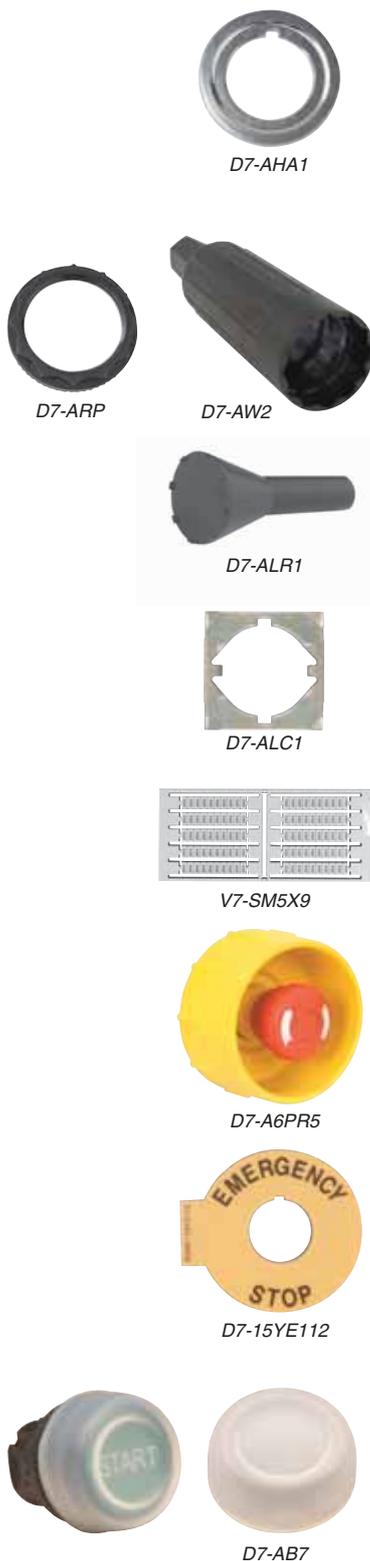
eg: Ba9s-WL-8VACDCM



Voltage	Typical Current	Cat. No. <sup>1)</sup>	Ultra Bright Style Cat. No. <sup>1)</sup>
8 V AC/DC	72 mA	BA9S- _ -8VACDCM	
12 V AC/DC	20 mA	BA9S- _ -12VACDCM	
24 V AC/DC	20 mA	BA9S- _ -24VACDCM	BA9S- _ -24VACDC
48 V AC/DC	20 mA	BA9S- _ -48VACDCM	BA9S- _ -48VACDC
110 V AC/DC	4.8 mA	BA9S- _ -110VACM	BA9S- _ -110VAC
240 V AC/DC	2.5 mA	BA9S- _ -240VACM	BA9S- _ -240VAC

Notes: <sup>1)</sup> Add colour code (shown above) to Cat. No.

**General accessories**



Description	Cat. No.
-------------	----------

**Adaptor**

Allows a 22.5 mm pushbutton operator to be installed into a panel with existing 30.5 mm mounting hole

Shiny metal IP 66 **D7-AHA1**

**Lock nuts**

For fixing front elements

Plastic **D7-ARP**

Metal **D7-ARM**

Mounting ring tool

Plastic **D7-AW2**

**Lens / lamp removal tool**

To remove incandescent lamps or neon lamps and for fixing the lens

Plastic **D7-ALR1**

**Anti-rotation washer**

Metal

**D7-ALC1**

**Snap-in contact marker (Blank)**

For circuit identification of back of panel components (card 100) (Marking available).

**V7-SM5X9**

**85 mm Protective guard yellow**

Suit 40 + 60 mm illuminated and non-illuminated Emergency Stop

**D7-A6PR5**

**Emergency stop rings**

- Blank 60 mm diameter **D7-15Y**

- Blank 90 mm diameter **D7-16Y**

Printed "Emergency Stop" 60 mm diameter **D7-15YE112**

Printed "Emergency Stop" 90 mm diameter **D7-16YE112**

**Sealing caps**

For flush pushbuttons IP 66 **D7-AB7**

For multi-function operators Flush IP 66 **D7-AB3**

Pos. A extended IP 66 **D7-AB2**

Pos. B extended IP 66 **D7-AB1**

## General accessories



D7-ABJS

Description		Cat. No.
<b>Replacement Boot</b> for Joystick operator	Silicone	<b>D7-ABJS</b>



D7-N2

<b>Hole Plug</b> used to plug 22.5 mm holes	Black plastic	<b>D7-N2</b>
---	---------------	--------------



D7-30WN

<b>Potentiometer Legend Plate</b> scale 1-10	-	<b>D7-30WN</b>
<b>Note:</b> Sold in multiples of 10. Order (quantity of) 10 to receive one packet of 10 pieces		



D7-30WG

<b>Potentiometer Legend Plate</b>	-	<b>D7-30WG</b>
Graphical scale		
<b>Note:</b> Sold in multiples of 10. Order (quantity of) 10 to receive one packet of 10 pieces		



D7-AC3

	Resistance	Cat. No.
<b>Replacement Resistive Elements</b> for the 800FP Potentiometer operator	150 $\Omega$	<b>D7-AC1</b>
	500 $\Omega$	<b>D7-AC2</b>
	1000 $\Omega$	<b>D7-AC3</b>
	2500 $\Omega$	<b>D7-AC4</b>
	5000 $\Omega$	<b>D7-AC5</b>
	10000 $\Omega$	<b>D7-AC6</b>

• Type 304 stainless steel <sup>2)</sup>

**Padlocking attachments**



D7-AFL1



D7-AEL1



D7-AML2



D7-AL01



D7-AMRG



D7-ASL3C

Description	Cat. No.
-------------	----------

**Padlocking attachments for pushbutton operators**

Flush standard padlocking attachment <sup>1)</sup>	D7-AFL1
--	---------

Extended standard padlocking attachment <sup>1)</sup>	D7-AEL1
---	---------

Mushroom padlocking attachments <sup>1)</sup>	
For 40 mm Mushroom operators	D7-AML1
For 40 mm Emergency Stop operators	D7-AML2

Locking cover	D7-AL01
For use on flush, extended, guarded and latched pushbuttons, short knob selector switches and potentiometer operators	

40 mm protective ring	D7-AMRG
For use on 2 position push-pull operators only	

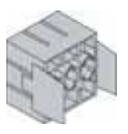
**Selector switch padlocking attachment**

Left lock position	D7-ASL2L
Centre lock position	D7-ASL3C

**Note:** <sup>1)</sup> When the operator is activated

- N/C contacts are held open.
- N/O contacts may or may not be held open.
- N/C.L.B. contacts may or may not be held closed.
- N/O.E.M. contacts are held closed.

**General accessories**

	Description	Cat. No.																																																
 D7-ALP	<b>Plastic Coupling Plate</b> <b>Note:</b> Sold only in multiples of 10. Order (quantity of) 10 to receive one package of 10 pieces.	<b>D7-ALP</b>																																																
 D7-ALM	<b>Metal Coupling Plate</b> These are zinc-plate, metal die cast coupling plates. <b>Note:</b> Sold only in multiples of 10. Order (quantity of) 10 to receive one package of 10 pieces.	<b>D7-ALM</b>																																																
 D7-AGS1	<b>Ground Screws</b> These are self-tapping #6-32 (M3.5) ground screws for metal coupling plates. <b>Note:</b> Sold only in multiples of 10. Order (quantity of) 10 to receive one package of 10 pieces.	<b>D7-AGS1</b>																																																
 D7-ATK2	<b>Stab Terminals</b> <b>Note:</b> Sold only in multiples of 10. Order (quantity of) 10 to receive one package of 10 pieces.	<b>D7-ATK2</b>																																																
 D7-AGS2	<b>Ground Screws</b> This accessory is used for grounding on D7 plastic enclosures only.	<b>D7-AGS2</b>																																																
 D7-ATW1	<b>Replacement Trim Washer</b> This accessory comes standard with all enclosures. It must be utilised if using base-mounted contact blocks/power modules without legend plates.	<b>D7-ATW1</b>																																																
 D7-A3BA	<b>Replacement Base Mount Adaptor</b> This accessory comes standard with all metal enclosures. It is required when using metal enclosures with base-mounted contact blocks or base-mounted power modules.	<b>D7-A3BA</b>																																																
	<b>Replacement Ronis Key</b> Standard replacement key is <b>Cat. No. D7-AKR3825</b>  <b>NOTE:</b> These are spare keys supplied in set of two to suit key operated devices with same lock number	<table border="1"> <thead> <tr> <th>Description</th> <th>Ronis Key</th> <th>Cat. No.</th> </tr> </thead> <tbody> <tr><td></td><td>3825</td><td><b>D7-AKR3825</b></td></tr> <tr><td></td><td>455</td><td><b>D7-AKR455</b></td></tr> <tr><td></td><td>3801</td><td><b>D7-AKR3801</b></td></tr> <tr><td></td><td>3802</td><td><b>D7-AKR3802</b></td></tr> <tr><td></td><td>3803</td><td><b>D7-AKR3803</b></td></tr> <tr><td></td><td>3804</td><td><b>D7-AKR3804</b></td></tr> <tr><td></td><td>3805</td><td><b>D7-AKR3805</b></td></tr> <tr><td></td><td>3806</td><td><b>D7-AKR3806</b></td></tr> <tr><td></td><td>4001</td><td><b>D7-AKR4001</b></td></tr> <tr><td></td><td>4002</td><td><b>D7-AKR4002</b></td></tr> <tr><td></td><td>4003</td><td><b>D7-AKR4003</b></td></tr> <tr><td></td><td>4004</td><td><b>D7-AKR4004</b></td></tr> <tr><td></td><td>4005</td><td><b>D7-AKR4005</b></td></tr> <tr><td></td><td>4006</td><td><b>D7-AKR4006</b></td></tr> <tr><td></td><td>4007</td><td><b>D7-AKR4007</b></td></tr> </tbody> </table>	Description	Ronis Key	Cat. No.		3825	<b>D7-AKR3825</b>		455	<b>D7-AKR455</b>		3801	<b>D7-AKR3801</b>		3802	<b>D7-AKR3802</b>		3803	<b>D7-AKR3803</b>		3804	<b>D7-AKR3804</b>		3805	<b>D7-AKR3805</b>		3806	<b>D7-AKR3806</b>		4001	<b>D7-AKR4001</b>		4002	<b>D7-AKR4002</b>		4003	<b>D7-AKR4003</b>		4004	<b>D7-AKR4004</b>		4005	<b>D7-AKR4005</b>		4006	<b>D7-AKR4006</b>		4007	<b>D7-AKR4007</b>
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	4006	<b>D7-AKR4006</b>																																																
	4007	<b>D7-AKR4007</b>																																																

**Laser-Engraved Caps and Diffusers**

**Standard Text / Symbols Configurator 1, 2, 3**

D7 - A		F	3	C	E 166
		Type	Colour	Suffix No.	
<b>Code</b>			<b>Code</b>		See pages 37 for laser engraved text / symbol options. Insert suffix code Exx / Uxx as shown.
<b>E</b>	Pushbutton extended cap	<b>1</b>	White		
<b>F</b>	Pushbutton flush cap	<b>2</b>	Black		
<b>FAU</b>	Multi-function flush cap (for bottom cap)	<b>3</b>	Green		
<b>EAU</b>	Multi-function extended cap (for bottom cap)	<b>4</b>	Red		
<b>FCU</b>	Multi-function flush cap (for top cap)	<b>5</b>	Yellow		
<b>ECU</b>	Multi-function extended cap (for top cap)	<b>6</b>	Blue		
<b>D</b>	Pilot light diffuser	<b>3</b>	Default code for pilot light diffusers		
<b>D</b>	Illuminated pushbutton diffuser, flush	<b>2</b>	Default code for flush diffusers		
<b>D</b>	Illuminated pushbutton diffuser, extended	<b>4</b>	Default code for extended diffusers		

**Ordering Information for Standard Text / Symbols**

1. Select the Cat. No. for the appropriate product type and colour from the Configurator Table on this page.
2. Complete the Cat. No. by adding the appropriate suffix no. selected from pages per letter.
3. List price for non-standard text / symbols, laser engraved caps and diffusers, per letter.

Example: **Cat. No. D7-AF3CE166** identifies a pushbutton flush cap, green cap with laser engraved text "ON".



**Customer laser-Engraved Caps and Diffusers Form 2 / 3**

Customer: _____		Date: _____	
Quantity: _____		Delivery Date: _____	
Cust. Order No. _____			
<b>Customer Laser-Engraved Caps and diffusers - (3 steps required)</b>			
<b>Step 1 - Insert Type code from the table: (example "E", Pushbutton extended cap)</b>			
<input type="text"/>	<input type="text"/>	<input type="text"/>	Type code
<b>Step 2 - Insert Colour code from the table: (example "4", Red cap)</b>			
<input type="text"/>	Colour/Diffuser code		
<b>Step 3 - Enter quantity and customer text:</b>			
Qty: _____	Small font size, 12 pt.	Line 1	<input type="text"/>
Qty: _____	Standard font size, 16 pt.	Line 1	<input type="text"/>
Qty: _____	Large font size, 20 pt.	Line 1	<input type="text"/>

- Notes:**
1. Package quantity of one for all standard laser-engraved caps and diffusers.
  2. Standard font is Arial Narrow.
  3. Font size is automatically determined by the number of characters. Seven characters maximum allowable.

## Standard Engraved

### Pushbutton inserts and diffusers with text

Description	Cat. No. Flush Non Illuminated	Cat. No. Extended Non Illuminated	Cat. No. Diffuser for Flush Illum. Pushbutton	Cat. No. Diffuser for Extended Illum. Pushbutton	Cat. No. Diffuser for Pilot Light
START	D7-AF_CE208	D7-AF_CE208	D7-AD2CE208	D7-AD4CE208	D7-AD3CE208
STOP	D7-AF_CE212	D7-AF_CE212	D7-AD2CE212	D7-AD4CE212	D7-AD3CE212
ON	D7-AF_CE166	D7-AF_CE166	D7-AD2CE166	D7-AD4CE166	D7-AD3CE166
OFF	D7-AF_CE163	D7-AF_CE163	D7-AD2CE163	D7-AD4CE163	D7-AD3CE163
I	D7-AF_CU229	D7-AF_CU229	D7-AD2CE229	D7-AD4CE229	D7-AD3CE229
O	D7-AF_CU228	D7-AF_CU228	D7-AD2CE228	D7-AD4CE228	D7-AD3CE228
RESET	D7-AF_CE186	D7-AF_CE186	D7-AD2CE186	D7-AD4CE186	D7-AD3CE186
R	D7-AF_CU924	D7-AF_CU924	D7-AD2CE924	D7-AD4CE924	D7-AD3CE924
UP	D7-AF_CE223	D7-AF_CE223	D7-AD2CE223	D7-AD4CE223	D7-AD3CE223
DOWN	D7-AF_CE110	D7-AF_CE110	D7-AD2CE110	D7-AD4CE110	D7-AD3CE110
OPEN	D7-AF_CE110	D7-AF_CE110	D7-AD2CE170	D7-AD4CE170	D7-AD3CE170
CLOSE	D7-AF_CE107	D7-AF_CE107	D7-AD2CE107	D7-AD4CE107	D7-AD3CE107
RAISE	D7-AF_CE182	D7-AF_CE182	D7-AD2CE182	D7-AD4CE182	D7-AD3CE182
LOWER	D7-AF_CE152	D7-AF_CE152	D7-AD2CE152	D7-AD4CE152	D7-AD3CE152
RIGHT	D7-AF_CE191	D7-AF_CE191	D7-AD2CE191	D7-AD4CE191	D7-AD3CE191
LEFT	D7-AF_CE145	D7-AF_CE145	D7-AD2CE145	D7-AD4CE145	D7-AD3CE145
FORWARD	D7-AF_CE120	D7-AF_CE120	D7-AD2CE120	D7-AD4CE120	D7-AD3CE120
REVERSE	D7-AF_CE188	D7-AF_CE188	D7-AD2CE188	D7-AD4CE188	D7-AD3CE188
FAST	D7-AF_CE114	D7-AF_CE114	D7-AD2CE114	D7-AD4CE114	D7-AD3CE114
SLOW	D7-AF_CE210	D7-AF_CE210	D7-AD2CE201	D7-AD4CE201	D7-AD3CE201
RUN	D7-AF_CE193	D7-AF_CE193	D7-AD2CE193	D7-AD4CE193	D7-AD3CE193
TEST	D7-AF_CE219	D7-AF_CE219	D7-AD2CE219	D7-AD4CE219	D7-AD3CE219
AUTO	D7-AF_CE219	D7-AF_CE219	D7-AD2CE101	D7-AD4CE101	D7-AD3CE101

### Spare Blank diffusers for pilot lights and illuminated pushbuttons

Description	Diffuser for Flush Illum. Pushbutton Cat. No.	Diffuser for Extended Illum. Pushbutton Cat. No.	Diffuser for Pilot Light Cat. No.
Blank	D7-AD2	D7-AD4	D7-AD3

- Notes:**
1. Not all combinations are held in stock. Indent items are engraved to order allow 1-2 days.
  2. Supplied with white engraving (black with white lettering). Add insert colour code as follows eg: D7-AF3CE208 is green.
  3. Diffusers are supplied clear with black lettering.

## Engraving / Legend plates and colour caps

For standard multi-function operators <sup>1)</sup>

Description	Pos. C Green symbol white text Cat. No.	Pos. A Green symbol white text Cat. No.	Pos. A Red symbol white text Cat. No.	Pos. A Red symbol white text Cat. No.
→	D7-AFAU3CU700			
←		D7-AFAU3CU700		
+	D7-AFAU3CU730	D7-AFAU3CU730		
-	D7-AFAU3CU731	D7-AFAU3CU731		
I	D7-AFAU3CU909	D7-AFAU3CU909		
II	D7-AFAU3CU602	D7-AFAU3CU602		
↑	D7-AFAU3CU712			
↓		D7-AFAU3CU713		
O			D7-AEAU4CU910	D7-AEAU4CU910
UP	D7-AFAU3CU223			
DOWN		D7-AFAU3CU110		
RIGHT	D7-AFAU3CU191			
LEFT		D7-AFAU3CU145		
FORWARD	D7-AFAU3CU120			
REVERSE		D7-AFAU3CU188		
START	D7-AFAU3CU208			
STOP			D7-AEAU4CU212	D7-AEAU4CU212

## Legend plates with symbol

Description	Plastic black, inscription white, for legend plate carrier D7-110 30 x 40 mm <sup>2)</sup> Cat. No.	Plastic black, inscription white, for legend plate carrier D7-RO 30 x 50 mm <sup>3)</sup> Cat. No.	Aluminium, inscription black, for legend plate carrier D7-120 & D7-200 30 x 50 mm <sup>4)</sup> Cat. No.
O . I	D7-17BU231	D7-18BU231	D7-18AU231
I . II	D7-17BU229	D7-18BU229	D7-18AU229
I O II	D7-17BU234	D7-18BU234	D7-18AU234
O . I	D7-17BU255	D7-18BU255	D7-18AU255
← O I	D7-17BU252	D7-18BU252	D7-18AU252
← O →	D7-17BU253	D7-18BU253	D7-18AU253
O →	D7-17BU256	D7-18BU256	D7-18AU256

Notes: <sup>1)</sup> Operators, refer page 15.  
<sup>2)</sup> Legend plate size 27 x 6 mm.  
<sup>3)</sup> Legend plate size 27 x 16 mm.  
<sup>4)</sup> Legend plate size 26 x 15 mm.

**Legend plates**

Dimensions	Component	Description	Cat. No.
		<b>Legend Plate Frame</b> 30 x 40 mm	<b>D7-110</b>
		<b>Legend Plate Frame</b> 30 x 50 mm	<b>D7-120</b>
		<b>Legend Plate Frame</b> (for use with multi-function operator) 30 x 60 mm	<b>D7-110</b>
		<b>Legend Plate Frame</b> (for use with multi-function operator) 50 x 50 mm	<b>D7-110</b>
		<b>Legend Plate (blank)</b> 30 x 40 mm White plastic Black plastic Aluminium	<b>D7-34WE100</b> <b>D7-34BE100</b> <b>D7-34AE100</b>
		<b>Legend Plate (blank)</b> 30 x 50 mm White plastic Black plastic Aluminium	<b>D7-35WE100</b> <b>D7-35BE100</b> <b>D7-35AE100</b>
		<b>Legend Plate - for D7-110</b> <b>Legend Plate Frame 30 x 40 mm</b> White with black text Black with white text Aluminium with black text	<sup>1)</sup> <b>D7-17WE100</b> <b>D7-17BE100</b> <b>D7-17AE100</b>
		<b>Legend Plate - for D7-120 &amp; D7-200</b> <b>Legend Plate Frame 30 x 50 mm</b> White with black text Black with white text Aluminium with black text	<sup>1)</sup> <b>D7-18WE100</b> <b>D7-18BE100</b> <b>D7-18AE100</b>
		<b>Legend Plate - for D7-400</b> <b>Legend Plate Frame <sup>2)</sup></b> White with black text Black with white text Aluminium with black text	<sup>1)</sup> <b>D7-42WE100</b> <b>D7-42BE100</b> <b>D7-42AE100</b>

**Note:** <sup>1)</sup> Supplied blank refer to page 40 - 41 for available legends.  
<sup>2)</sup> Three snap-in legend plates are required for each D7-400 legend plate frame.

Custom legend plates

**D7 Custom Legend Plate ordering Form** (for text/symbols not found on other pages)

Customer: \_\_\_\_\_ Date: \_\_\_\_\_  
 Quantity: \_\_\_\_\_ Delivery Date: \_\_\_\_\_ Cust. Order No. \_\_\_\_\_

**Customer Legend Plate Ordering Instructions - (3 steps required)**

**Step 1 - Check legend frame type:**

- 2-piece legend frames     D7-110     D7-120     D7-200     D7-400  
 1-piece legend plate     D7-34...     D7-35...

**Step 2 - Check legend plate type:**

- White with black type     Black with white type     Aluminium

**Step 3 - Enter quantity and custom text:**

See table below for maximum lines/characters per selected legend plate in Step 1:

Qty: _____ Small font size, 0.08"	Line 1	<input type="text"/>
	Line 2	<input type="text"/>
	Line 3	<input type="text"/>
	Line 4	<input type="text"/>
	Line 5	<input type="text"/>
Qty: _____ Standard font size, 0.10"	Line 1	<input type="text"/>
	Line 2	<input type="text"/>
	Line 3	<input type="text"/>
Qty: _____ Large font size, 0.14"	Line 1	<input type="text"/>
	Line 2	<input type="text"/>
	Line 3	<input type="text"/>

Font Size	One-Piece			Two-Piece			Special Multi-Function	
	Max. Char. per Line	Max. No. of Lines		Max. Char. per Line	Max. No. of Lines		Max. Char. per Line	Max. No. of Lines
		D7-34...	D7-35...		D7-110	D7-120 & D7-200		
Small, size 0.08"	16	2	5	15	2	5	7	3
Standard, size 0.10"	14	2	3	13	1	3	6	3
Large, size 0.14"	10	1	3	9	1	3	4	2

D7-110



D7-120



D7-200



D7-400



D7-34...



D7-35...



Two-Piece

Multi-Function

One-Piece

Note: 1). Three snap-in legend plates are required for each D7-400 legend plate frame.

## Engraving / legend plates with text

Description	Plastic black, inscription white, for legend plate carrier D7-110 30 x 40 mm <sup>1)</sup>	Plastic black, inscription white, for legend plate carrier D7-120 30 x 50 mm <sup>2)</sup>	Aluminium, inscription black, for legend plate carrier D7-150 & D7-200 30 x 50 mm <sup>3)</sup>		
AUTO	D7-17BE101	D7-18BE101	-		
CLOSE	D7-17BE107	D7-18BE107	-		
DOWN	D7-17BE110	D7-18BE110	-		
EMERGENCY STOP	D7-17BE112	D7-18BE112	-		
FAULT	D7-17BE113	D7-18BE113	-		
FAST	D7-17BE114	D7-18BE114	-		
FORWARD	D7-17BE120	D7-18BE120	-		
HAND	D7-17BE126	D7-18BE126	-		
HIGH	D7-17BE129	D7-18BE129	-		
IN	D7-17BE132	D7-18BE132	-		
INCH	D7-17BE134	D7-18BE134	-		
JOG	D7-17BE138	D7-18BE138	-		
LEFT	D7-17BE145	D7-18BE145	-		
LOW	D7-17BE148	D7-18BE148	-		
LOWER	D7-17BE152	D7-18BE152	-		
OFF	D7-17BE163	D7-18BE163	-		
ON	D7-17BE166	D7-18BE166	-		
OPEN	D7-17BE170	D7-18BE170	-		
OUT	D7-17BE173	D7-18BE173	-		
RAISE	D7-17BE182	D7-18BE182	-		
REVERSE	D7-17BE188	D7-18BE188	-		
RIGHT	D7-17BE191	D7-18BE191	-		
SLOW	D7-17BE201	D7-18BE201	-		
START	D7-17BE208	D7-18BE208	-		
STOP	D7-17BE212	D7-18BE212	-		
UP	D7-17BE223	D7-18BE223	-		
I	O	AUTO	D7-17BU250	D7-18BU250	D7-30AU250
HAND	O	AUTO	D7-17BU251	D7-18BU251	D7-30AU251
MAN	O	AUTO	D7-17BE238	D7-18BE238	D7-30AE238
ON	OFF	AUTO	D7-17BE300	D7-18BE300	D7-30AE300
MAN		AUTO	D7-17BE301	D7-18BE301	D7-30AE301
HAND		AUTO	D7-17BE127	D7-18BE127	D7-30AE127
FROW.	OFF	REV.	D7-17BE261	D7-18BE261	D7-30AE261
SET-UP		RUN	D7-17BE302	D7-18BE302	D7-30AE302
FROW.		REV.	D7-17BE303	D7-18BE303	D7-30AE303
UP		DOWN	D7-17BE224	D7-18BE224	D7-30AE224
OFF		ON	D7-17BE165	D7-18BE165	D7-30AE165
STOP		START	D7-17BE305	D7-18BE305	D7-30AE305
BLANK LEGEND PLATE			D7-17BE100	D7-18BE100	D7-30AE100

Notes: <sup>1)</sup> Legend plate size 27 x 6 mm.  
<sup>2)</sup> Legend plate size 27 x 16 mm.  
<sup>3)</sup> Legend plate size 26 x 15 mm.

### Engraving / legend plates with text

Description			Plastic black, inscription white, for legend plate carrier D7-110 30 x 40 mm <sup>1)</sup>	Plastic black, inscription white, for legend plate carrier D7-120 30 x 50 mm <sup>2)</sup>
HIGH		LOW	D7-17BE130	D718BE130
INCH		REVERSE	D7-17BE135	D7-18BE135
JOG		FORWARD	D7-17BE255	D7-18BE255
JOG		REVERSE	D7-17BE256	D7-18BE256
JOG		RUN	D7-17BE142	D7-18BE142
LEFT		RIGHT	D7-17BE146	D7-18BE146
OFF		ON	D7-17BE165	D7-18BE165
OPEN		CLOSE	D7-17BE171	D7-18BE171
RAISE		LOWER	D7-17BE183	D7-18BE183
SLOW		FAST	D7-17BE204	D7-18BE204
UP		DOWN	D7-17BE224	D7-18BE224
FORWARD	STOP	REVERSE	D7-17BE254	D7-18BE254
HAND	OFF	AUTO	D7-17BE128	D7-18BE128
JOB	STOP	RUN	D7-17BE144	D7-18BE144
FORWARD	OFF	REVERSE	D7-17BE261	D7-18BE261
LOW	OFF	HIGH	D7-17BE150	D7-18BE150
RAISE	OFF	LOWER	D7-17BE184	D7-18BE184
SLOW	OFF	FAST	D7-17BE205	D7-18BE205
SLOW	OFF	START	D7-17BE207	D7-18BE207

Notes: <sup>1)</sup> Legend plate size 27 x 6 mm.  
<sup>2)</sup> Legend plate size 27 x 16 mm.

## Front-of-Panel (Operators) (1)

Mechanical Ratings		
Description	Plastic (D7P)	Metal (D7M)
Vibration (assembled to panel)	(G) Tested at 10...2000 Hz, 1.52 mm displacement (peak-to-peak) max./G max. for 3 hr duration, no damage	
Shock	(G) Tested at 1/2 cycle sine wave for 11 ms; no damage at 100 G	
Degree of protection <sup>2)</sup>	UL Type 3/3R/4/4X/12/13 (IP 65/66)	UL Type 3/3R/4/12/13 (IP 65/66)
Mechanical durability per EN 60947 (Annex C)	10,000,000 Cycles 1,000,000 Cycles 500,000 Cycles 300,000 Cycles	Pushbuttons, momentary mushroom Multi-function Push-pull mushroom E-stops, selector switches
Operating forces (typical with one contact block)	(N)	Flush/extended = 5N E-stop = 36N Mushroom = 9N
Operating torque (typical application with one contact block) (N-m)		Selector switch = 0.25 N-m
Environmental		
Temperature range (operating) <sup>3)</sup>	(°C)	-25...+70 °C (-13...+158 °F)
Temperature range (short-term storage)	(°C)	-25...+85 °C (-13...+185 °F)
Humidity	(%)	50...95 % RH from 25...60 °C (77...140 °F) per: procedure IV of MIL-STD-810C, Method 507.1 cycling test

## Back-of-Panel Components <sup>1)</sup>

Electrical Ratings		
Standard contact block rating		A600, Q600 600 V AC AC 15, DC 13 to EN 60947-5-1 and UL 508, 17 V, 5 mA min.
Low voltage contact block <sup>4)</sup>		5 V, 1 mA DC min. C300, R150, AC 15, DC 13 to EN 60947-5-1 and UL 508
Thermal current	(A)	10 A max. enclosed (40 °C ambient) to UL 508, EN 60947-5-1
Wire capacity		#18...12 AWG (0.75...2.5 mm <sup>2</sup> )
	Screw terminal (AWG)	Max. (2) #14 AWG or (1) #12 AWG
	Spring-clamp terminal (AWG)	#18...14 AWG (0.75...1.5 mm <sup>2</sup> )
Insulation voltage	(Ui)	Ui = 680 V (screw terminal) Ui = 300 V (screwless terminal)
Dielectric strength (minimum)		(V) 2200 V for one minute
External short circuit protection	Standard blocks Low voltage contact blocks	10 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 348-4) 6 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 348-4)
Electrical shock protection		Finger-safe conforming to IP2X
Mechanical Ratings		
Vibration (assembled to panel)	(G)	10...2000 Hz, 1.52 mm displacement (peak-to-peak) max./10 G max. 6 hr
Shock	(G)	Tested at 1/2 cycle sine wave for 11 ms and no damage at 100 G max.
Contact durability per EN 60947-5-1 (Annex C)		10,000,000 cycles
Contact operation	NO NC NOEM NCLB	Slow make, double break Slow make, double break (positive opening) Early make, double break Late break, double break (positive opening)
Opening forces (typical)	(N)	3.4 N: each single circuit contact block 5...6.6 N: each dual circuit contact block

**Notes:** <sup>1)</sup> Performance data given in this publication is provided only as a guide for the user in determining suitability and do not constitute a performance warranty of any kind. Such data may represent the results of accelerated testing at elevated stress levels, and the user is responsible for correlating the data to actual application requirements. ALL WARRANTIES AS TO ACTUAL PERFORMANCE, WHETHER EXPRESS OR IMPLIED, ARE EXPRESSLY DISCLAIMED.

<sup>2)</sup> Momentary mushroom operators are IP 65, multi-function operators have no Type 13 rating. Plastic operators with keys have no Type 4X rating.

<sup>3)</sup> Operating temperatures below 0 °C (32 °F) are based on the absence of freezing moisture and liquids.

<sup>4)</sup> Low voltage contacts are recommended for applications below 17 V, 5 mA.

### Back-of-Panel Components <sup>1)</sup>, continued

Illumination		Plastic (D7P)	Metal (D7M)
LED dominant wavelength	Green	(nm)	525 nm
	Red		629 nm
	Yellow		590 nm
	Blue		470 nm
	White		
LED luminous intensity	Green	(mcd)	890 mcd
	Red		890 mcd
	Yellow		690 mcd
	Blue		193 mcd
	White		412 mcd
Incandescent maximum wattage		(W)	1 W
<b>Environmental</b>			
Temperature range (operating) <sup>2)</sup>		(°C)	-25...+70 °C (-13...+158 °F)
Temperature range (short-term storage)		(°C)	-25...+85 °C (-13...+185 °F)
Humidity		(%)	tested at 50...95 % relative humidity from 25...60 °C (77...140 °F) per: procedure IV of MIL-STD-810C, Method 507.1 cycling test
<b>Materials</b>			
Springs		Stainless steel and zinc coated music wire	
Electrical contacts	Standard	Silver-nickel	
	Low voltage	Gold-plated over silver	
Terminals	Screw	Brass	
	Screwless	Silver-plated copper	

**Environmental Approval Note:** Front elements UL Recognised; Complete assemblies UL Approved.  
See Table A2 (below) for your application.

This table is extracted from Sprecher + Schuh's UL 508A file and can be used to determine which D7 Pilot Device is approved for a particular enclosure type.

TABLE A2 - Openings in Enclosure	
Enclosure Type	Openings May Be Closed By Equipment Marked...
2	2, 3, 3R, 3S, 4, 4X, 6, 6P, 11, 12, 12K, 13
3	3, 3R, 3S, 4, 4X, 6, 6P
3R	3, 3R, 3S, 4, 4X, 6, 6P
3S	3, 3R, 3S, 4, 4X, 6, 6P
4	4, 4X, 6, 6P
4X	4X
6	6, 6P
6P	6P
11	11
12, 12K	12, 12K, 13
13	13

### Product Certification

Certifications	UL, UR, CSA, CCC, CE
Standards	NEME ICS-5; UL 508, EN 418, EN 60947-1, EN 60947-5-1, EN 60947-5-5
Terminal Identification	IEC 60947-1
Shipping Approvals	RINA, LR, ABS

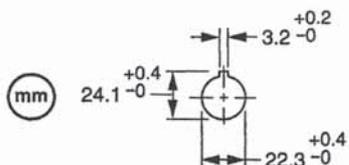
**Notes:** <sup>1)</sup> Performance data given in this publication is provided only as a guide for the user in determining suitability and do not constitute a performance warranty of any kind. Such data may represent the results of accelerated testing at elevated stress levels, and the user is responsible for correlating the data to actual application requirements. ALL WARRANTIES AS TO ACTUAL PERFORMANCE, WHETHER EXPRESS OR IMPLIED, ARE EXPRESSLY DISCLAIMED.

<sup>2)</sup> Operating temperatures below 0 °C (32 °F) are based on the absence of freezing moisture and liquids.

## Material Listing

Component	For Use With	Material Used
Panel gasket	All operators	Nitrile
Diaphragm seal	Illuminated pushbutton, non-illuminated pushbutton	Automotive acceptable silicone
K-seal	Selector switch, key selector switch, push/twist-to-release E-stop, key E-stop, push/pull mushroom	Nitrile
Diaphragm retainer, return spring I	Illuminated pushbutton, non-illuminated pushbutton, momentary mushroom, push/twist-to-release E-stop, key E-stop, push/pull mushroom	Stainless steel
Return spring II	Reset, selector switch, key selector switch	Zinc coated music wire
Button cap/mushroom head	Non-illuminated pushbutton, momentary mushroom, reset, push/twist-to-release E-stop, key E-stop, push/pull mushroom, multi-function	PBT/polycarbonate blend
2-colour moulded button insert	Non-illuminated pushbutton	PBT/polycarbonate blend
Lens	Multi-function	Acetal
Lens, knob	Illuminated pushbutton, illuminated momentary mushroom, illuminated selector switch	Polyamide
Plastic bezel/bushing I	Non-illuminated pushbutton, illuminated pushbutton, momentary mushroom, selector switch, key selector switch, push/twist-to-release E-stop, key E-stop, push/pull mushroom, multi-function	Glass-filled polyamide
Plastic bezel/bushing II, jam nut, knob	Reset, non-illuminated selector switch, pilot light	Glass-filled polyamide
Metal bezel/bushing	All metal operators	Zinc
Diffuser	Illuminated pushbutton, pilot light	Polycarbonate
Legend frames	-	Glass-filled nylon
Plastic mounting ring	All plastic operators	Glass-filled polyamide
Metal mounting ring	All metal operators	Chromated zinc
Plastic coupling plate	-	Glass-filled nylon
Metal coupling plate	-	Chromated zinc + stainless steel
Plastic enclosures	-	PBT/polycarbonate blend
Metal enclosure	-	Aluminium
Terminal screws	LED module, incandescent module, contact blocks	Zinc-plated steel with chromate
Terminals	LED module, incandescent module, contact blocks	Brass with silver-nickel contacts
Screwless	LED module, incandescent module, contact blocks	Stainless steel
Lamp socket	Incandescent module	Brass
Housing	Incandescent module, LED module	Glass-filled nylon
Low voltage terminals	Contact blocks	Gold-plated brass with silver-nickel contacts
Low voltage spanner	Contact blocks	Gold-plated brass with silver-nickel contacts
Spanner	Contact blocks	Brass with silver-nickel contacts

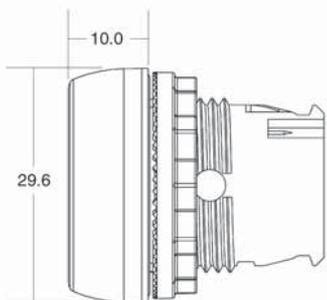
**Dimensions (mm) and panel hole spacing**



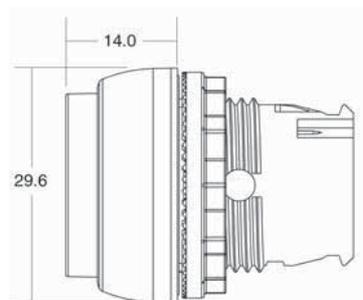
**Panel Hole Spacing**

	40	50	40	50	40/60	50/60	60/90	70	50	40
	30		48		40/60		60/90	30	50	50

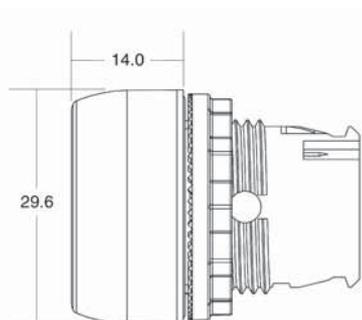
Non-Illuminated and Illuminated Momentary Flush pushbutton Operators



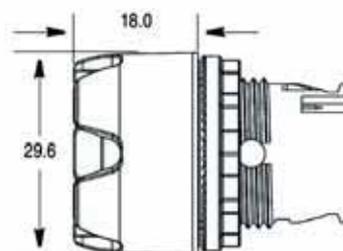
Illuminated and Non-Illuminated Momentary Extended pushbutton Operators



Non-Illuminated Guarded, Illuminated and Non-Illuminated Alternate Action pushbutton Operators

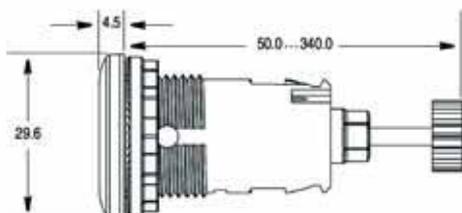


Illuminated Momentary Guarded pushbutton Operators

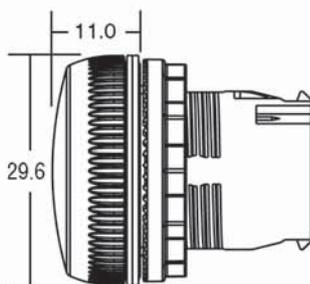


**Dimensions (mm)**

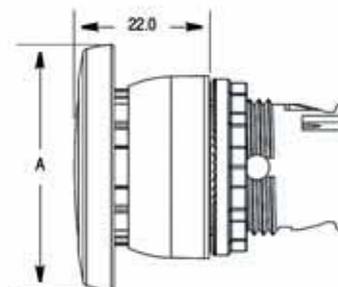
Reset Operators with Reset Rod



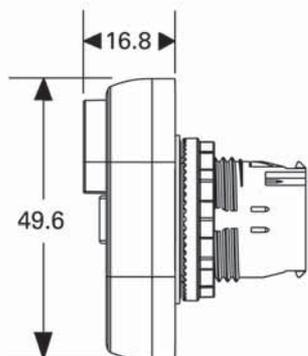
Pilot Light Operators



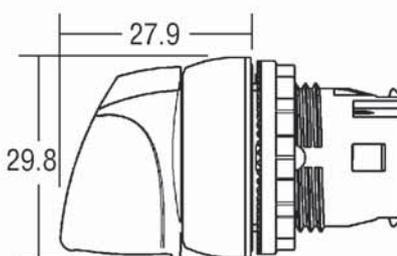
Illuminated and Non-Illuminated Momentary Mushroom Operators 40 mm and 60 mm



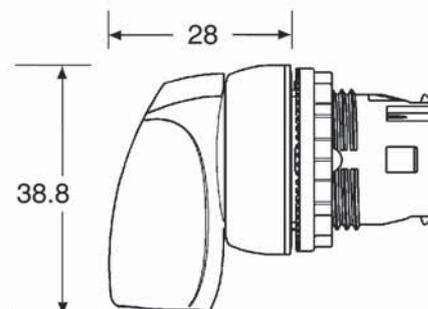
Illuminated and Non-Illuminated 2-Position Multi-Function Operators



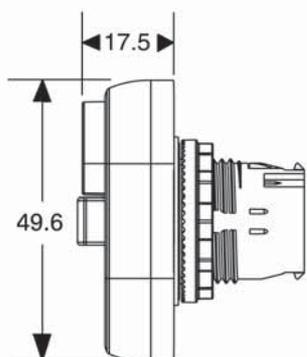
Illuminated and Non-Illuminated Knob Selector Switch and Potentiometer Operators



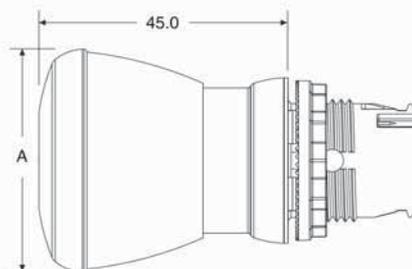
Non-Illuminated Knob Lever Selector Switch Operators



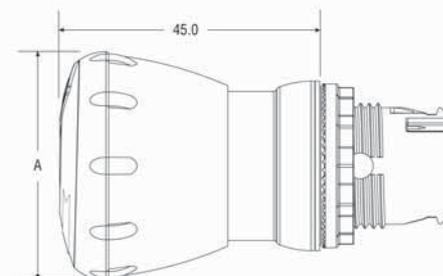
Non-Illuminated 3-Position Multi-Function Operators



Illuminated and Non-Illuminated Push-Pull Mushroom Operators 30 mm, 40 mm and 60 mm



Illuminated and Non-Illuminated Twist-to-Release Operators 30 mm, 40 mm and 60 mm

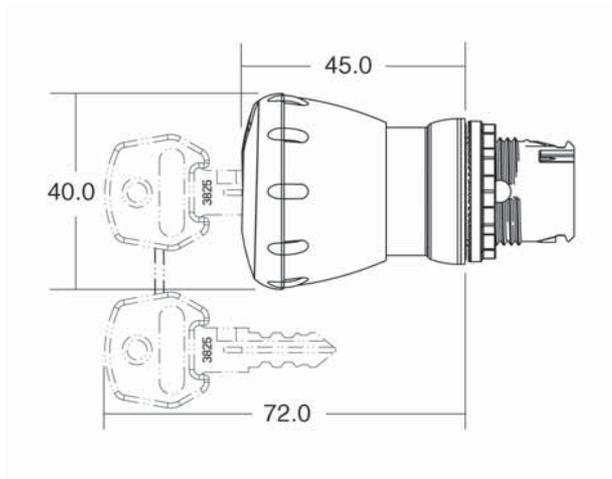


Operator	A
30 mm	30.0
40 mm	40.0
60 mm	60.0

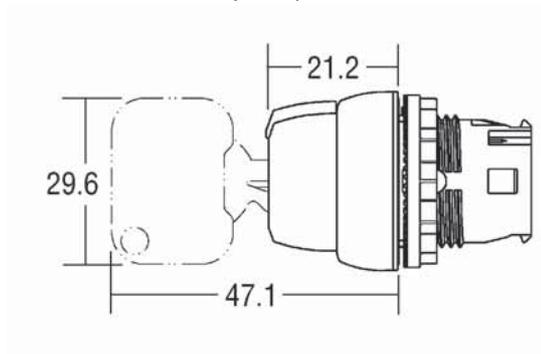
Operator	A
30 mm	30.0
40 mm	40.0
60 mm	60.0

**Dimensions (mm)**

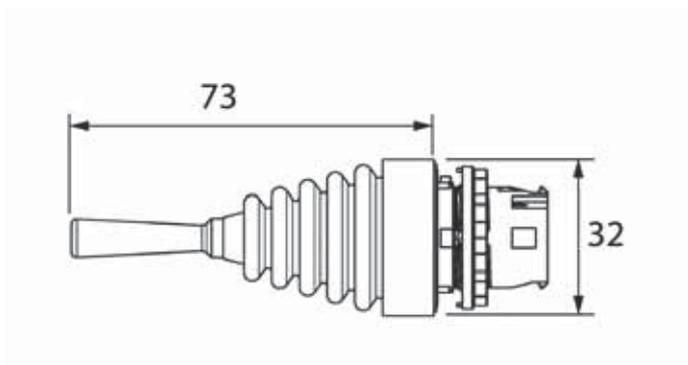
Mushroom Key Release Operator  
40 mm



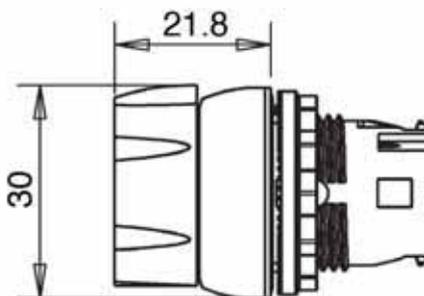
Key Selector Switch and Key Ejected  
SenseEject Operators



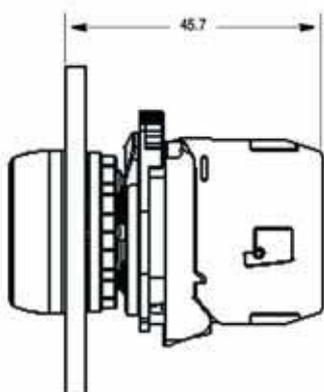
Joystick Operators



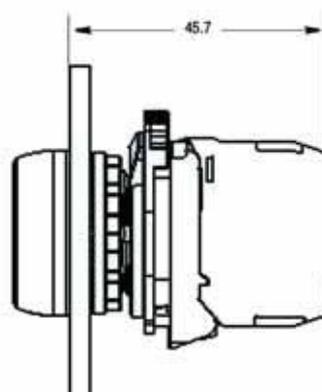
Selector Jog Operators



Back-of-Panel Components -  
Incandescent Module with coupling plate

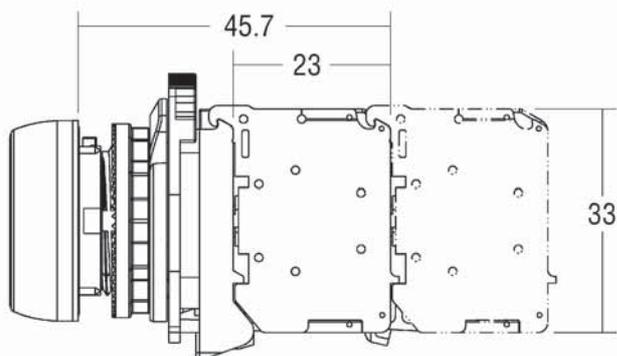


Back-of-Panel Components -  
LED Module with coupling plate

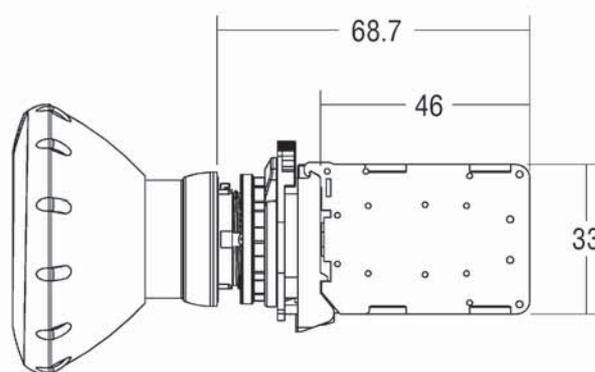


**Dimensions (mm)**

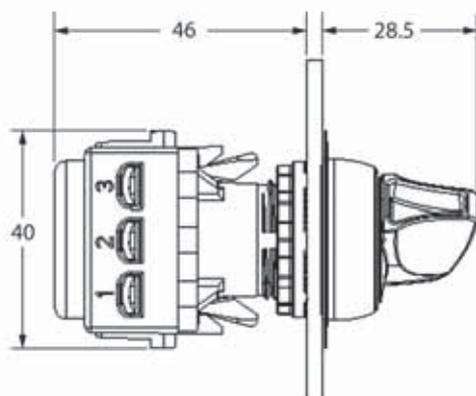
Back-of-Panel Components -  
Contact Cartridges with coupling plate



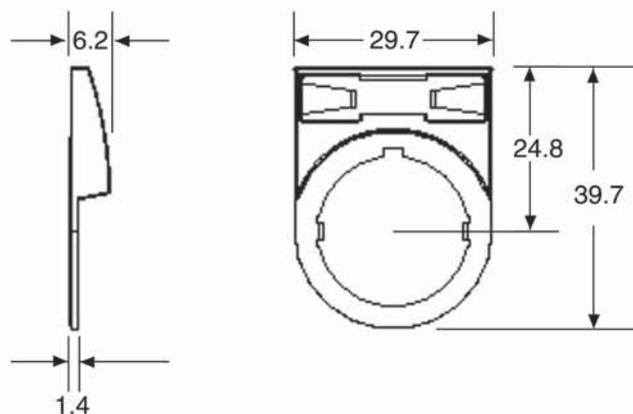
Back-of-Panel Components -  
Dual Circuit Contact Block or SMBC Contact Block  
(Max. of 1 Deep)



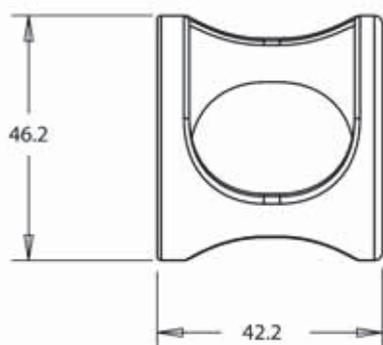
Potentiometer with Resistive Element



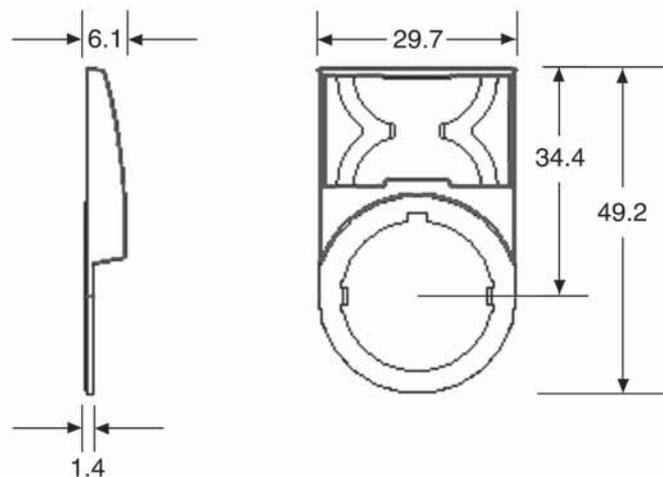
30 x 40 mm Snap-In Legend Plate



Protective Ring

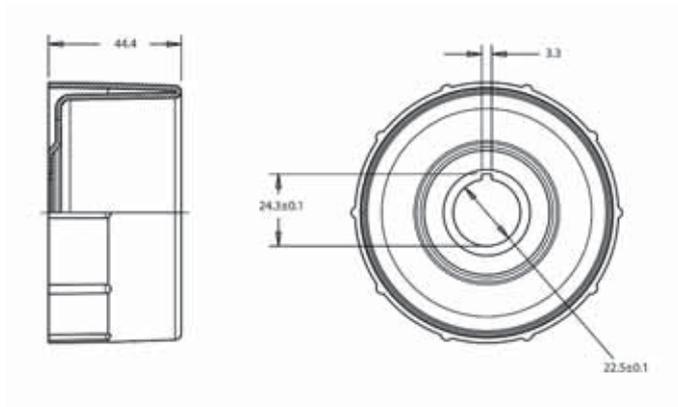


30 x 50 mm Snap-In Legend Plate

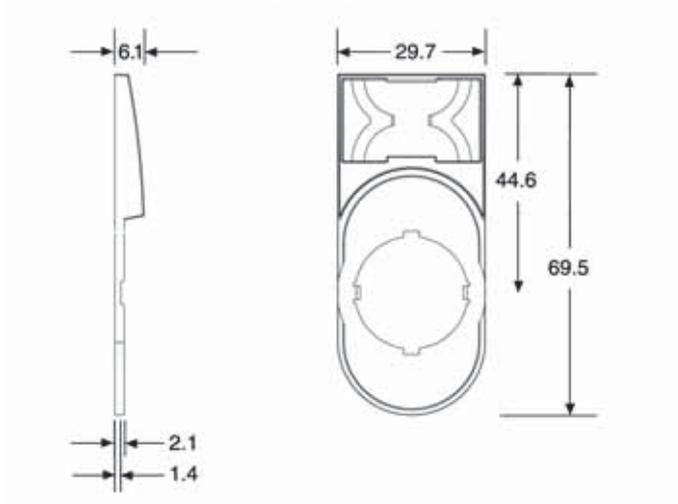


**Dimensions (mm)**

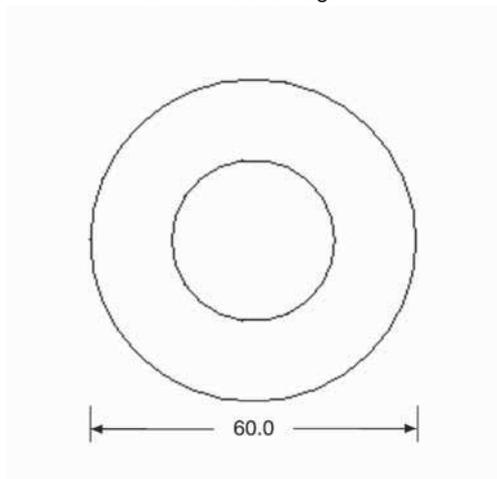
Plastic Guard



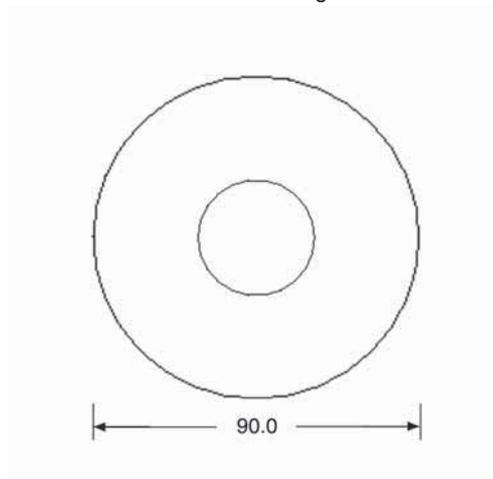
30 x 60 mm Snap-In Legend Plate



60 mm Round Legend



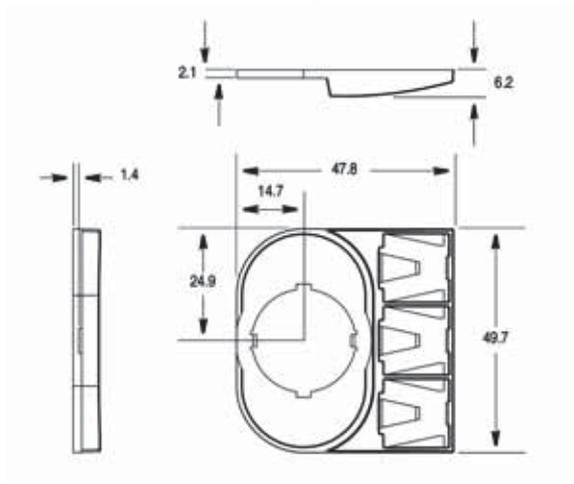
90 mm Round legend



Potentiometer Legend Plate

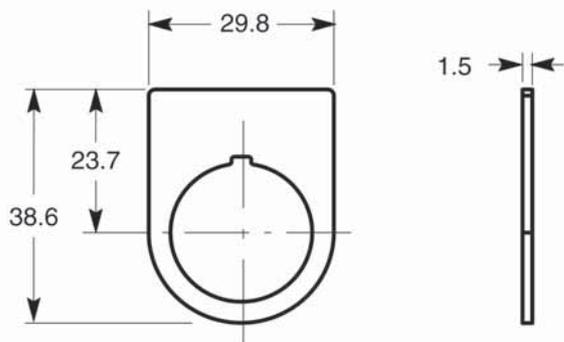


Special Multi-Function Snap-In Legend Plate

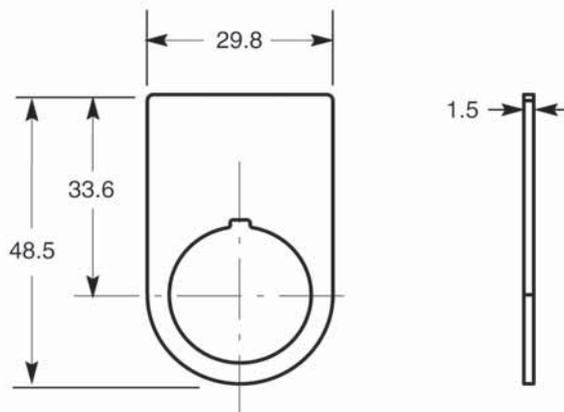


**Dimensions (mm)**

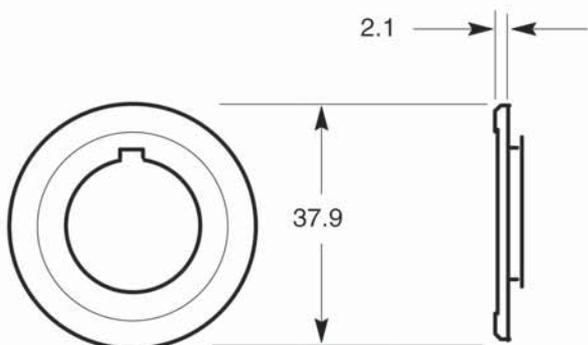
30 x 40 mm One-Piece Legend Plate



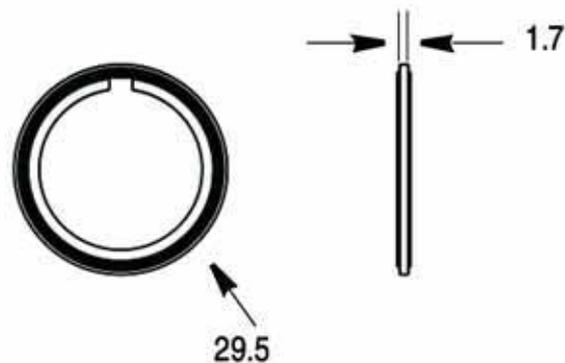
30 x 50 mm One-Piece Legend Plate



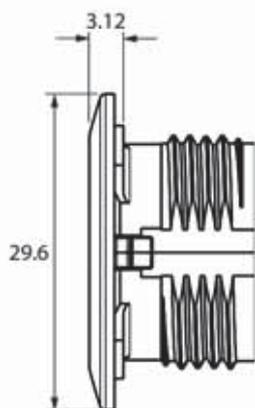
30 to 22.5 mm Hole Adaptor



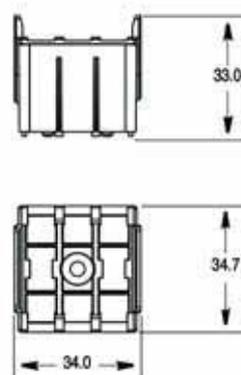
Trim Washer



Hole Plug

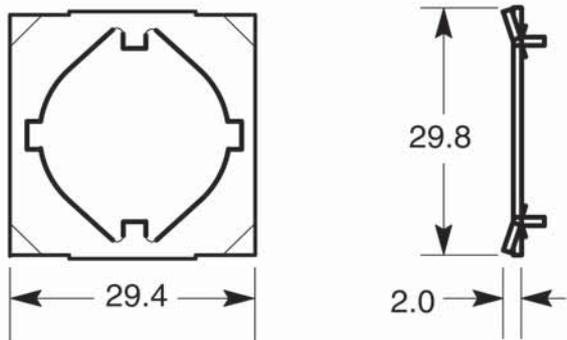


Base Mount Adaptor

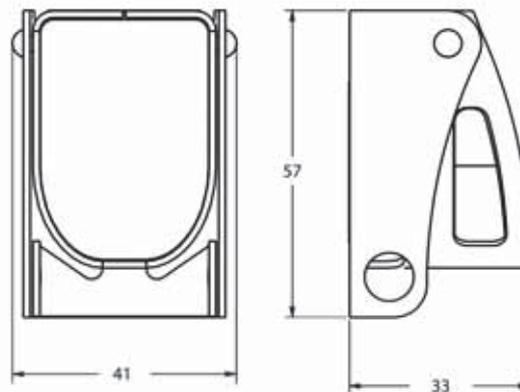


**Dimensions (mm)**

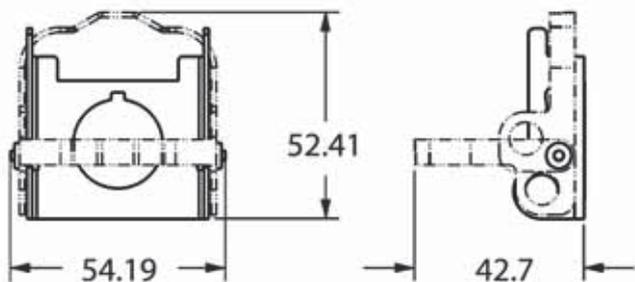
Anti-Rotation Washer



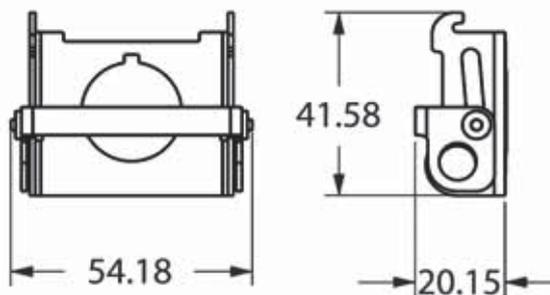
Locking Cover



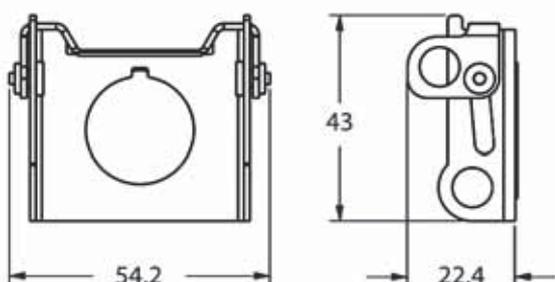
Maintained Mushroom Locking Attachment



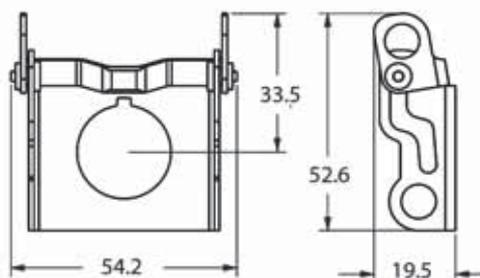
Momentary Mushroom Locking Attachment



Extended Non-Illuminated locking Attachment

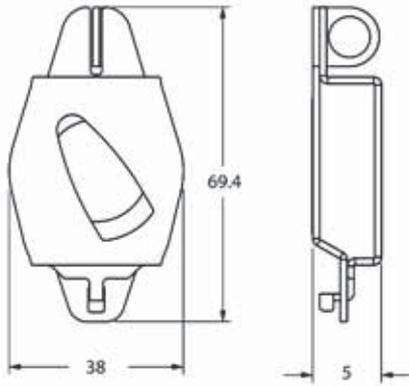


Flush Non-Illuminated Locking Attachment

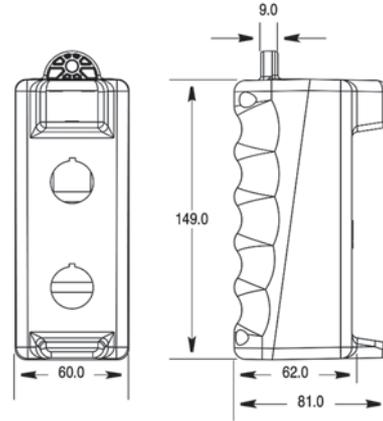


**Dimensions (mm)**

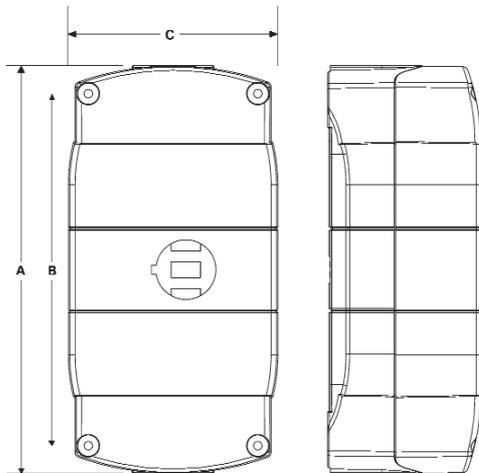
Selector Switch Locking Cover  
(Same for all Lock Positions)



Pendant Stations

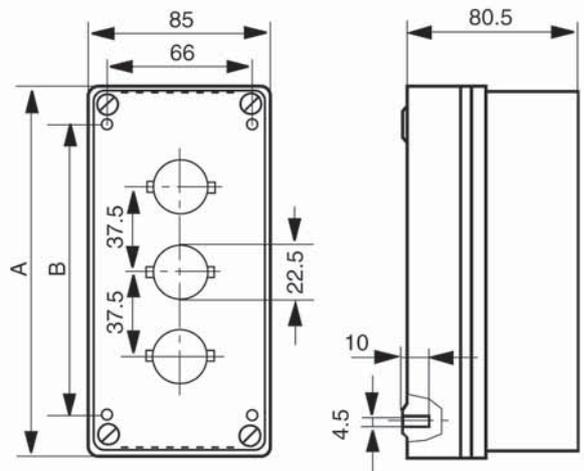


Plastic Enclosures



Cat. No.	No. of Units (Holes)	A	B	C
D7F-1PM	1	85	89	58
D7F-2PM	2	124	79	58
D7F-3PM	3	155	79	58
D7F-4PM	4	186	79	58
D7F-6PM	6	248	87	64

Metal Enclosures



Cat. No.	No. of Units (Holes)	A	B
D7F-1MM	1	85	89
D7F-2MM	2	124	79
D7F-3MM	3	155	79
D7F-5MM	5	186	79

## Product selection made easy

Until now, NHP has been easily recognisable by its logo **NHP**. However, we realise that, as a customer you need to locate the products and information most relevant to you quickly and easily. That's why we're phasing in our new product icons, to help you differentiate the product information you need amongst the clutter that is business today.

You may have already come across these icons, prominent on the front of our literature as new catalogues and flyers become available. These brightly coloured icons in an obvious location mean no longer will you have to worry about searching for product information amongst the mounds of promotional literature. No more flicking through pages of catalogues, wondering where the things you need might be. We've done the searching for you. Just look for the icon that suits your product needs.....your guide to save yourself time.....so that you can get back to your business.



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When it comes to motor control, our product package is by far the most technically advanced and comprehensive. This includes the leading Sprecher+Schuh motor starting and protection products, well known for their reliability in service.



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NHP offers an extensive range of power quality products to maintain and protect your power distribution network. All our products, from Terasaki circuit protection devices through to our load-break and switch-fuses, offer high levels of security and reliability.



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Automation and communication systems are central to your productivity and efficiency. Our range consists of the world's best and proven products, from Hitachi drives to the technically advanced Adroit SCADA system.



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Our control and switching range keeps the risk of human error to a minimum with pushbuttons, cam switches, pendant controllers, foot switches, relays and timers.



We are specialists in safety products and our vast range reflects that. From Schmersal safety switches through to Sunx light curtains, our safety and protection products enable you to provide and maintain 'Safety in the Workplace'. Our range also includes sirens, sounders and bells.



Our power quality range helps you to condition your power supply through power factor correction, surge protection and filtering, reducing your power consumption costs and saving you money while also protecting valuable equipment.



The NHP Ex Hazardous area equipment range helps you protect people and property in areas such as petro-chemical and grain handling. Products include Exde control equipment and Ex Lighting products.



If it's there, our sensing and detection products will see it, touch it, or find it. From beam sensors and magnetic reed switches to limit switches, we offer numerous variations of each sensor type.



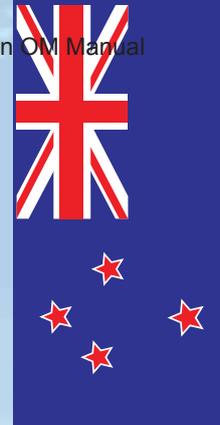
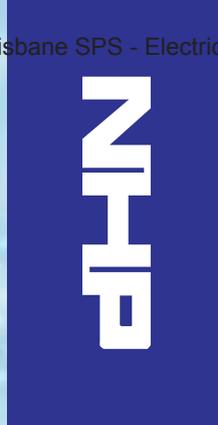
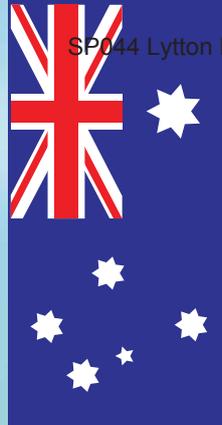
When you need to know how high or low a level is, how much you have used or how long there is to go, NHP offers a vast series of measuring and display instruments, for panel, base or DIN rail mounting.



Our enclosures and termination products answer all your housing and cabling needs. The range includes insulated, weatherproof and stainless steel enclosures, slotted and solid cable duct and DIN rail mounting terminals.



These products are sold exclusively through electrical wholesaling outlets, and include such items as the BelMate conduit bell tool and the TestPro range of voltage and continuity testers.



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**Telephone +64 3 377 4407**  
*Fax +64 3 377 4405*  
 Email [sales@nhp-nz.com](mailto:sales@nhp-nz.com)

# TECHNICAL DATA SHEET

**Equipment Type:** Switches

**Location:** RTU Section

**Model Numbers:** Various

**Manufacturer:** Kraus & Naimer

**Supplier:** Kraus & Naimer

22 Brookes St Bowen Hills QLD  
4006  
(07) 3252 8344



# Kraus & Naimer Pty.Ltd.

BLUE LINE switchgear

2013

Short Form Catalogue



FOR COMPLETE PRODUCT RANGE VISIT  
[www.krausnaimer.com.au](http://www.krausnaimer.com.au)



# Kraus & Naimer

## BLUE LINE switchgear

The development of the Blue Line rotary switch, load break switch disconnecter, contactor and motor starter product ranges is based on One Hundred years experience by Kraus & Naimer. In the Design and manufacture of electrical switchgear, Kraus and Naimer have pioneered the introduction of the cam operated rotary switch, and continues to be recognised as the world leader in that product field.

## BLUE LINE

Blue Line products are protected by numerous patents throughout the industrial world. They are built to national and international standards and designed to withstand adverse temperatures and climates.

Blue Line products are accepted and universally recognised for their quality and workmanship. They are supported by the world-wide sales and service organisation.

The Kraus & Naimer Registered Trademark



## WORLDWIDE SYMBOL FOR QUALITY SWITCHGEAR

**Rotary Cam Switches 10A - 2400A**

4 - 12

- Control, Instrument, Motor Switches
- Infinite number of switch programmes
- CA / CG / CH Switches with fingerproof terminals
- CA / CG / CH Switches with captive plus-minus terminal screws
- CAD Switches having self-cleaning "H" Bridge with 'cross wire' contacts
- CHR Switches with captive terminal screws for use with ring terminals
- Special Switches designed to any contact programme

**UPS Maintenance Bypass Switches**

13

**Smart Switches (Available from wholesalers)**

14 -15

**Enclosed KG Main Switches 20A - 315A**

16 - 18

- Padlockable maintenance and safety switches
- Enclosed IP 65 protection in Plastic or Stainless Steel
- 3, 4, 6 and 8 pole models available
- Enclosure cable entries top, bottom, sides and rear, or blank

**KG Main Switches 20A - 315A**

16 - 18

- Padlockable main and emergency switches
- Modular frame sizes
- 3, 4, 6 and 8 pole models available
- Forced positive contact movement
- Cam operated auxilliary contacts

**Application Guide AS/NZS 947 - 3 3F Lockout Isolators**

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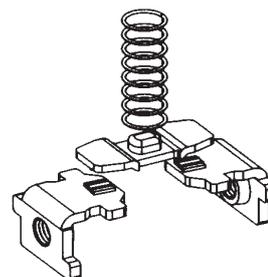
# Technical Data

u Rated Operational Current		1V	6V	12V	24V	48V	110V	240V
Multi cross point contacts								
<b>CA4/CG4</b>	AC21A	-	-	-	10	10	10	10
	DC21 B	-	-	10	6	0.7	0.2	
H-Bridge cross wire contacts								
<b>CGD4 - 1</b>	AC21A	5	2	1.2	0.7	0.45	0.25	0.15
	DC21B	3	0.7	0.4	0.25	0.13	0.08	
<b>CAD11</b>	AC21A	5	3	2	1	0.8	0.4	0.2
	DC21B	4	1.5	0.8	0.3	0.2	0.1	
<b>CAD12</b>	AC21A	-	5	5	5	4	3	2
	DC21B	-	4	3	2.2	1.2	0.6	0.3

## Special Contact Systems

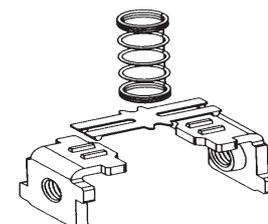
### CA4/CG4 (@1µ gold plating)

A high contact reliability is achieved by the use of multiple crosspoint contacts, having a fourpoint contact face to minimise contact resistance. Terminals on the CA series are accessible from both sides, and the terminals on the CG series are accessible from the rear. Both switches have finger proof terminals. These are the smallest cam switch 30mm sq.



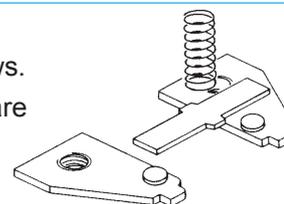
### CAD11/CAD12 / CGD4 - 1

H-bridge cross wire contact system. The moving contact is made of spring type material to absorb possible contact bounce. These corrosive resistant contacts are capable of operating on systems voltages as low as 1 volt. CAD11 = Gold contacts. CAD12 = Silver contacts. Both switches have screw driver guides, finger proof terminals and captive plus-minus terminal screws capable of accepting two variant cable sizes.



### C/CA

Switches C/CA have finger proof terminals and captive plus-minus terminal screws. Each stage contains two rigid, double-break silver alloy contacts. The terminals are accessible from both sides. Ranging from 20 ~ 315 amperes these switches will accept a wide range of "optional extras".



**KG/KH Switches:** This durable switch line possesses high short circuit withstand capabilities, with positive movement during both making and breaking functions. The **KG/KH** range of isolators and changeover switches exhibit excellent AC-3 and AC-23 making and breaking capabilities.

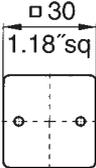
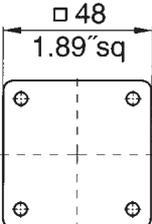
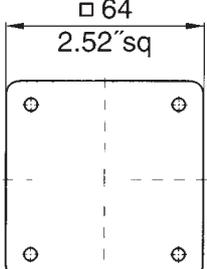
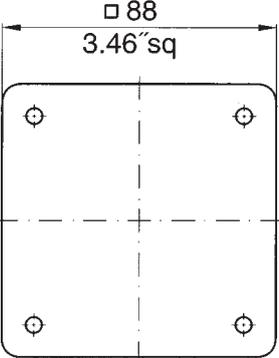
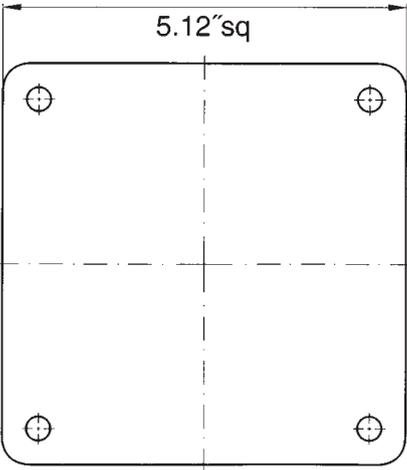
This 'Short Form' catalogue illustrates only a small selection of the KRAUS & NAIMER switches. Other switches available are:- A11, A14, A30, AD11, AD12, CH10 ~ CHR16B, D10 ~ D14R, DH, DHR, DK, DKR, L350 ~ L1251, X63 ~ X630. Additional information available on request.

**G20 (S) DC SWITCHING WITH KNIFE CONTACTS**

Refer Page 33

**Rotary Cam Switches**

**Rated Values**

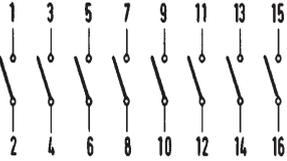
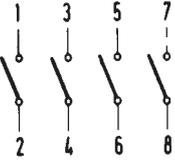
Escutcheon Plate Dimensions Note: for drilling details refer to pages 31 & 32		TYPE	According to IEC 60947-3/VDE 0660, part 107						
			Cable mm <sup>2</sup>	Nominal Voltage U <sub>i</sub> v	Thermal Current I <sub>u</sub> /I <sub>th</sub> A	Motor Rating 3 x 380 V - 440 V AC-23A AC-3 kW kW			
<b>S00</b>		<b>CA4</b>	2 x 1.5	440	10	3	2.2		
		<b>CG4</b>	2 x 1.5	440	10	3	2.2		
<b>S0</b>		<b>CG 8</b>	2 x 2.5	690	20	7.5	5.5		
		<b>CA10</b>	2 x 2.5	690	20	7.5	5.5		
		<b>CA20</b>	2 X 4	690	25	11	7.5		
		<b>CA25</b>	2 x 6	690	32	15	11		
		<b>CH10</b>	2 x 4	690	20	7.5	5.5		
		<b>CH16</b>	2 x 4	690	25	11	7.5		
<b>S1</b>		<b>CA10B</b>	2 x 2.5	690	20	7.5	5.5		
		<b>CA20B</b>	2 x 4	690	25	11	7.5		
		<b>CA25B</b>	2 x 6	690	32	15	11		
		<b>CA40</b>	1 x 16	690	40	18.5	15		
		<b>CA50</b>	1 x 16	690	50	22	18.5		
		<b>CA63</b>	1 x 16	690	63	30	18.5		
		<b>C26</b>	2 x 6	690	32	15	11		
		<b>C32</b>	2 x 10	690	50	22	15		
		<b>C42</b>	2 x 16	690	63	30	18.5		
		<b>CHR10B</b>	Ring	690	20	7.5	5.5		
<b>S2</b>		<b>CHR20B</b>	Ring	690	25	11	7.5		
		<b>C43</b>	2 x 16	690	63	30	18.5		
		<b>C80</b>	35	690	115	45	30		
		<b>C125</b>	70	690	150	75	37		
		<b>C200-4</b>	M8	690	200	75	37		
		<b>S3</b>		<b>C315</b>	M12	690	315	132	55
				<b>C316</b>	M12	1000	315	132	55
				<b>L400</b>	M12	690	500	132	55
<b>L600</b>	M16			690	800	132	55		
<b>L800</b>	M16			690	1100	132	55		
<b>L1200</b>	M16			690	1450	132	55		
<b>L1600</b>	2 X M16			690	1900	132	55		
<b>L2000</b>	2 X M16			690	2400	132	55		

For further technical details, refer to Catalogue 100 and 120. Gold contacts and quick connects see Catalogue 100 P4.

For Safety and Maintenance Switches Refer Page 16-19

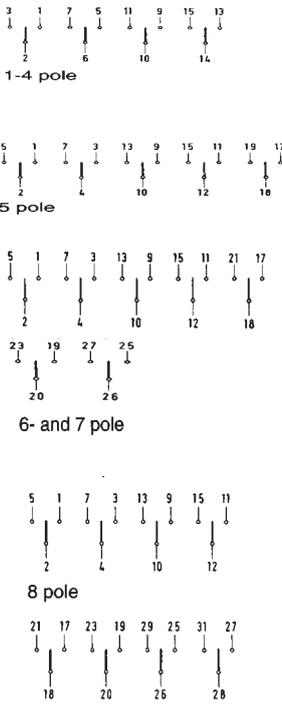
## Rotary Cam Switches - Panel Mounting

 <p>CG4 A290 FS2      CA10 A291 E</p>	<b>Selection Data</b> IEC 60947-3, EN 60947, VDE 0660			CG 4	CG 8 CH 10	CA20	C26	C32		
				CA 4	CA 10	CA20B	CA25	CA 40	CA 50	
	Rated Thermal Current		$I_U = I_{th}$	A	10	20	25	32	40	50
	Rated Category	3 x 380 V/440 V	AC-23A	kW	3	7.5	11	15	18.5	22
				C 42 CA 63	C 80	C125	C200-4	C315	L400	
Rated Thermal Current		$I_U = I_{th}$	A	63	115	150	200	315	500	
Rated Category	3 x 380 V/440 V	AC-23A	kW	30	45	75	75	132	132	

Function	Front Plate	Code No.	No. of Stages	Code No.	No. of Stages
<b>OFF / ON Switches 90° Switching</b>  Waterproof switches to IP 65 available in E24 Mounting - no additional price    1 - 8 Pole		<b>1 Pole</b>		<b>2 Pole</b>	
		CG 4    A290-621 E	1	CG 4    A291-621 E	1
		CA 10    A290-621 E	1	CA 10    A291-621 E	1
		CH 10    A290-621 E	1	CH 10    A291-621 E	1
		CA20    A290-621 E	1	CA20    A291-621 E	1
		CA25    A290-621 E	1	CA25    A291-621 E	1
		CA40/C26 A290-621 E	1	CA40/C26 A291-621 E	1
		CA50/C32 A290-621 E	1	CA50/C32 A291-621 E	1
		CA63/C42 A290-621 E	1	CA63/C42 A291-621 E	1
		C80    A290-621 E	1	C80    A291-621 E	1
		C125    A290-621 E	1	C125    A291-621 E	1
		C200-4 A290-621 E	1	C200-4 A291-621 E	1
		C315    A290-621 E	1	C315    A291-621 E	1
		<b>3 Pole</b>		<b>4 Pole</b>	
		CG 4    A292-621 E	2	CG 4    A324-621 E	2
		CA10    A292-621 E	2	CA10    A324-621 E	2
		CH10    A292-621 E	2	CH10    A324-621 E	2
		CA20    A292-621 E	2	CA20    A324-621 E	2
		CA25    A292-621 E	2	CA25    A324-621 E	2
		CA40/C26 A292-621 E	2	CA40/C26 A324-621 E	2
		CA50/C32 A292-621 E	2	CA50/C32 A324-621 E	2
		CA63/C42 A292-621 E	2	CA63/C42 A324-621 E	2
		C80    A292-621 E	2	C80    A324-621 E	2
		C125    A292-621 E	2	C125    A324-621 E	2
C200-4 A292-621 E	2	C200-4 A324-621 E	2		
C315    A292-621 E	2	C315    A324-621 E	2		
<b>6 Pole</b>		<b>8 Pole - 60°</b>			
CG 4    A326-621 E	3	CG 4    A344-620 E	4		
CA10    A326-621 E	3	CA10    A344-620 E	4		
CH10    A326-621 E	3	CH10    A344-620 E	4		
CA20    A326-621 E	3	CA20    A344-620 E	4		
CA25    A326-621 E	3	CA25    A344-620 E	4		
CA40/C26 A326-621 E	3	CA40/C26 A344-621 E	4		
CA50/C32 A326-621 E	3	CA50/C32 A344-621 E	4		
CA63/C42 A326-621 E	3	CA63/C42 A344-621 E	4		
C80    A326-621 E	3	C80    A344-620 E	4		
C125    A326-621 E	3	C125    A344-620 E	4		
C200-4 A326-621 E	3	C200-4 A344-620 E	4		
C315    A326-621 E	3	C315    A344-620 E	4		
<b>OFF / ON Switches 60° Switching</b>    1 - 4 Pole		<b>1 Pole</b>		<b>3 Pole</b>	
		CG 4    A200-620 E	1	CG 4    A202-620 E	2
		CA 10    A200-620 E	1	CA 10    A202-620 E	2
		CH 10    A200-620 E	1	CH 10    A202-620 E	2
		CA20    A200-620 E	1	CA20    A202-620 E	2
		CA25    A200-620 E	1	CA25    A202-620 E	2
		CA40/C26 A200-620 E	1	CA40/C26 A202-620 E	2
		CA50/C32 A200-620 E	1	CA50/C32 A202-620 E	2
		CA63/C42 A200-620 E	1	CA63/C42 A202-620 E	2
		C80    A200-620 E	1	C80    A202-620 E	2
		C125    A200-620 E	1	C125    A202-620 E	2
		C200-4 A200-620 E	1	C200-4 A202-620 E	2
		C315    A200-620 E	1	C315    A202-620 E	2

### Rotary Cam Switches - Panel Mounting

 <p>CG4 A210 FS2      CA10 A211 E</p>	<b>Selection Data</b> IEC 60947-3, EN 60947, VDE 0660	<b>CG 4</b> <b>CG 8</b> <b>CA20</b> <b>C26</b> <b>C32</b> <b>CA 4</b> <b>CH 10</b> <b>CA20B</b> <b>CA25</b> <b>CA 40</b> <b>CA 50</b>
	Rated Thermal Current $I_U = I_n$ <b>A</b> 10    20    25    32    40    50 Rated Category              3 x 380 V/440 V    AC-23A <b>kW</b> 3    7.5    11    15    18.5    22	Rated Thermal Current $I_U = I_n$ <b>A</b> <b>C 42</b> <b>C 80</b> <b>C125</b> <b>C200-4</b> <b>C315</b> <b>L400</b> Rated Category              3 x 380 V/440 V    AC-23A <b>CA 63</b> 63    115    150    200    315    500 <b>kW</b> 30    45    75    75    132    132

Function	Front Plate	Code No.	No of Stages	Code No.	No. of Stages
<b>Changeover Switches with Centre "OFF" 60° Switching</b> 		<b>1 Pole</b>		<b>2 Pole</b>	
		CG4    A210-620 E	1	CG4    A211-620 E	2
		CA10    A210-620 E	1	CA10    A211-620 E	2
		CH10    A210-620 E	1	CH10    A211-620 E	2
		CA20    A210-620 E	1	CA20    A211-620 E	2
		CA25    A210-620 E	1	CA25    A211-620 E	2
		CA40/C26    A210-620 E	1	CA40/C26    A211-620 E	2
		CA50/C32    A210-620 E	1	CA50/C32    A211-620 E	2
		CA63/C42    A210-620 E	1	CA63/C42    A211-620 E	2
		C80    A210-620 E	1	C80    A211-620 E	2
		C125    A210-620 E	1	C125    A211-620 E	2
		C200-4    A210-620 E	1	C200-4    A211-620 E	2
		C315    A210-620 E	1	C315    A211-620 E	2
		<b>3 Pole</b>		<b>4 Pole(1)</b>	
		CG4    A212-620 E	3	CG4    A213-620 E	4
		CA10    A212-620 E	3	CA10    A213-620 E	4
		CH10    A212-620 E	3	CH10    A213-620 E	4
		CA20    A212-620 E	3	CA20    A213-620 E	4
		CA25    A212-620 E	3	CA25    A213-620 E	4
		CA40/C26    A212-620 E	3	CA40/C26    A213-620 E	4
CA50/C32    A212-620 E	3	CA50/C32    A213-620 E	4		
CA63/C42    A212-620 E	3	CA63/C42    A213-620 E	4		
C80    A212-620 E	3	C80    A213-620 E	4		
C125    A212-620 E	3	C125    A213-620 E	4		
C200-4    A212-620 E	3	C200-4    A213-620 E	4		
C315    A212-620 E	3	C315    A213-620 E	4		
<b>6 Pole</b>		<b>8 Pole</b>			
CA10    A362-620 E	6	CA10    WAA364-620 E	8		

#### Gang Switches - Sequence Switching

Function	Code No.	Function	Code No.
<b>OFF / A / A + B</b> <b>60° Switching</b>	<b>1 Pole</b> CA10    A310-620 E	<b>OFF / A / A + B</b> <b>60° Switching</b>	<b>3 Pole</b> CA10    WAA314-620 E
	<b>2 Pole</b> CA10    A312-620 E		<b>Without Bridges</b> CA10    A311-620 E
<b>OFF / A / A + B</b> <b>60° Switching</b>		<b>OFF/A/A+B/A+B+C</b> <b>30° Switching</b>	

### Special Application Switches:-

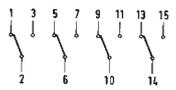
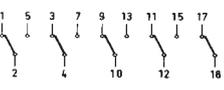
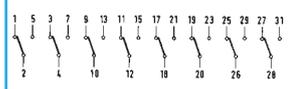
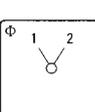
Ship To Shore Switches, UPS Bypass Switches\*, Series Parallel Switches, Special Meters Switches, For further information, contact your nearest KRAUS & NAIMER stockist.

\*(see p13)

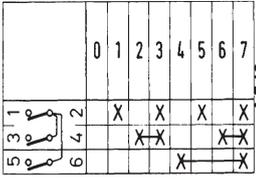
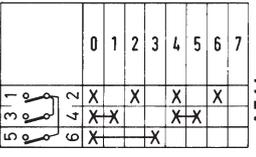
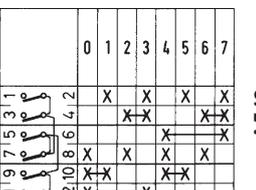
(1) If Preclosing 4th Pole Required Change A213 To A663

## Rotary Cam Switches - Panel Mounting

 <p>KG Switch See P17~ P20</p> <p>CA10 A220 E</p>	<b>Selection Data</b> IEC 60947-3, EN 60947, VDE 0660			CG 4	CG 8	CA20	C26	C32		
				CA 4	CH 10	CA20B	CA25	CA 40	CA 50	
	Rated Thermal Current		$I_U = I_{th}$	A	10	20	25	32	40	50
	Rated Category	3 x 380 V/440 V	AC-23A	kW	3	7.5	11	15	18.5	22
				C 42	C 80	C125	C200-4	C315	L400	
Rated Thermal Current		$I_U = I_{th}$	A	63	115	150	200	315	500	
Rated Category	3 x 380 V/440 V	AC-23A	kW	30	45	75	75	132	132	

Function	Front Plate	Code No.	No of Stages	Code No.	No. of Stages
<p><b>Changeover Switches without Centre "OFF" 60° Switching</b></p>  <p>1-4 pole</p>  <p>5 pole</p>  <p>6- and 7 pole</p>  <p>8 Pole</p>		<b>1 Pole</b>		<b>2 Pole</b>	
		CG4 A220-600 E	1	CG4 A221-600 E	2
		CA10 A220-600 E	1	CA10 A221-600 E	2
		CH10 A220-600 E	1	CH10 A221-600 E	2
		CA20 A220-600 E	1	CA20 A221-600 E	2
		CA25 A220-600 E	1	CA25 A221-600 E	2
		CA40/C26 A220-600 E	1	CA40/C26 A221-600 E	2
		CA50/C32 A220-600 E	1	CA50/C32 A221-600 E	2
		CA63/C42 A220-600 E	1	CA63/C42 A221-600 E	2
		C80 A220-600 E	1	C80 A221-600 E	2
		C125 A220-600 E	1	C125 A221-600 E	2
		C200-4 A220-600 E	1	C200-4 A221-600 E	2
		C315 A220-600 E	1	C315 A221-600 E	2
		<b>3 Pole</b>		<b>4 Pole (1)</b>	
		CG4 A222-600 E	3	CG4 A223-600 E	4
		CA10 A222-600 E	3	CA10 A223-600 E	4
		CH10 A222-600 E	3	CH10 A223-600 E	4
		CA20 A222-600 E	3	CA20 A223-600 E	4
		CA25 A222-600 E	3	CA25 A223-600 E	4
		CA40/C26 A222-600 E	3	CA40/C26 A223-600 E	4
		CA50/C32 A222-600 E	3	CA50/C32 A223-600 E	4
		CA63/C42 A222-600 E	3	CA63/C42 A223-600 E	4
		C80 A222-600 E	3	C80 A223-600 E	4
		C125 A222-600 E	3	C125 A223-600 E	4
C200-4 A222-600 E	3	C200-4 A223-600 E	4		
C315 A222-600 E	3	C315 A223-600 E	4		
<b>6 Pole</b>		<b>8 Pole</b>			
CA10 A370-600 E	6	CA10 A372-600 E	8		

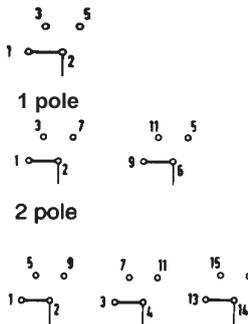
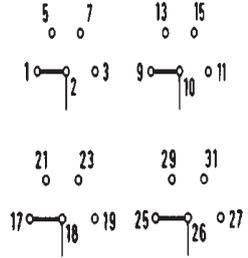
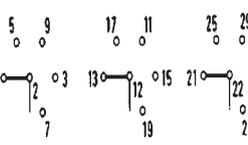
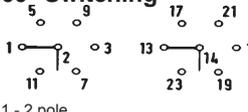
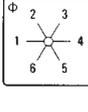
**Binary Coded Decimal Switches - from 1 Volt. For PLC and Electronic Applications.** Additional positions and combinations available on request. CG4-1 = Gold Plated Contact POA CAD11 = Gold Wiping H-bridge Contacts CAD12 = Silver Wiping H-bridge Contacts

Front Plate	Code No.	No of Stages	Code No.	No. of Stages
 <p>A540</p>  <p>A541</p>  <p>A542</p>	<b>0-7 Binary</b>		<b>0-11 Binary</b>	
	CAD11 A540-600 E	2	CAD11 A543-600 E	2
	CAD12 A540-600 E	2	CAD12 A543-600 E	2
	<b>0-7 Complement</b>		<b>0-9 Binary</b>	
	CAD11 A541-600 E	2	CAD11 A550-600 E	2
	CAD12 A541-600 E	2	CAD12 A550-600 E	2
	<b>0-7 + Complement</b>		<b>0-9 Complement</b>	
	CAD11 WAA542-600 E	3	CAD11 A551-600 E	2
	CAD12 WAA542-600 E	3	CAD12 A551-600 E	2

(1) If Preclosing 4th Pole Required Change A223 To A673

## Rotary Cam Switches - Panel Mounting

 <p>CG4 A230 FS2      CA10 A251 E</p>	<b>Selection Data</b> IEC 60947-3, EN 60947, VDE 0660			CG 4	CG 8	CA20	C26	C32	
				CA 4	CH 10	CA20B	CA25	CA 40	CA 50
	Rated Thermal Current	$I_U = I_n$	A	10	20	25	32	40	50
	Rated Category	3 x 380 V/440 V	AC-23A	kW	3	7.5	11	15	18.5
				C 42	C 80	C125	C200-4	C315	L400
Rated Thermal Current	$I_U = I_n$	A	63	115	150	200	315	500	
Rated Category	3 x 380 V/440 V	AC-23A	kW	30	45	75	75	132	132

Function	Front Plate	Code No.	No. of Stages	Code No.	No. of Stages
<b>3 Step Switches without "OFF" 60° Switching</b>  1 pole 2 pole 3 pole 1 - 3 Pole Drawing for 4 - 6 Pole on Request		<b>1 Pole</b>		<b>2 Pole</b>	
		CG 4 A230-600 E	2	CG 4 A250-600 E	3
		CA10 A230-600 E	2	CA10 A250-600 E	3
		CH10 A230-600 E	2	CH10 A250-600 E	3
		CA20 A230-600 E	2	CA20 A250-600 E	3
		<b>3 Pole</b>		<b>4 Pole</b>	
		CG 4 A270-600 E	5	CG 4 A476-600 E	6
		CA10 A270-600 E	5	CA10 A476-600 E	6
		CH10 A270-600 E	5	CH10 A476-600 E	6
		CA20 A270-600 E	5	CA20 A476-600 E	6
<b>5 Pole</b>		<b>6 Pole</b>			
CA10 WAA484-600E	8	CA10 WAA489-600E	9		
<b>4 Step Switches without "OFF" 60° Switching</b>  1 - 4 Pole		<b>1 Pole</b>		<b>2 Pole</b>	
		CG 4 A231-600 E	2	CG 4 A251-600 E	4
		CA10 A231-600 E	2	CA10 A251-600 E	4
		CH10 A231-600 E	2	CH10 A251-600 E	4
		CA20 A231-600 E	2	CA20 A251-600 E	4
		<b>3 Pole</b>		<b>4 Pole</b>	
		CG 4 A271-600 E	6	CG 4 A477-600 E	8
		CA10 A271-600 E	6	CA10 A477-600 E	8
		CH10 A271-600 E	6	CH10 A477-600 E	8
		CA20 A271-600 E	6	CA20 A477-600 E	8
<b>5 Step Switches without "OFF" 60° Switching</b>  1 - 3 Pole		<b>1 Pole</b>		<b>2 Pole</b>	
		CG 4 A232-600 E-V	3	CG 4 A252-600 E	5
		CA10 A232-600 E	3	CA10 A252-600 E	5
		CH10 A232-600 E	3	CH10 A252-600 E	5
		CA20 A232-600 E	3	CA20 A252-600 E	5
		<b>3 Pole</b>		Refer to catalogue or enquire for details on additional 'standard' switches.	
		CG 4 WAA272-600E	8		
		CA10 WAA272-600E	8		
		CH10 WAA272-600E	8		
		CA20 WAA272-600E	8		
<b>6 Step Switches without "OFF" 60° Switching</b>  1 - 2 pole		<b>1 Pole</b>			<b>2 Pole</b>
		CG 4 A233-600 E	3	CG 4 WAA253-600E	6
		CA10 A233-600 E	3	CA10 WAA253-600E	6
		CH10 A233-600 E	3	CH10 WAA253-600E	6
		CA20 A233-600 E	3	CA20 WAA253-600E	6

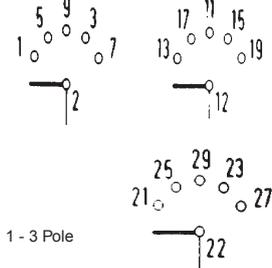
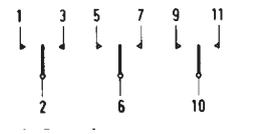
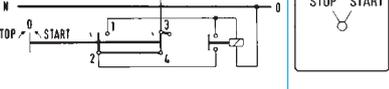
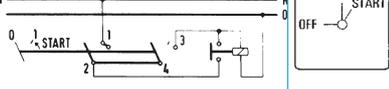
## Rotary Cam Switches - Panel Mounting

 <p>CG4 A240 FS2    CA10 A280 E</p>	<b>Selection Data</b> IEC 60947-3, EN 60947, VDE 0660			CG 4	CG 8	CA20	C26	C32		
				CA 4	CH 10	CA20B	CA25	CA 40	CA 50	
	Rated Thermal Current		$I_U = I_{th}$	A	10	20	25	32	40	50
	Rated Category	3 x 380 V/440 V	AC-23A	kW	3	7.5	11	15	18.5	22
				C 42	C 80	C125	C200-4	C315	L400	
Rated Thermal Current		$I_U = I_{th}$	A	CA 63	63	115	150	200	315	500
Rated Category	3 x 380 V/440 V	AC-23A	kW	30	45	75	75	132	132	

Function	Front Plate	Code No.	No. of Stages	Code No.	No. of Stages
<b>6 Step Switches cont.</b>  3 Pole		<b>3 Pole</b>			
		CA10 WAA273-600 E	9	Refer to catalogue or enquire for details on additional 'standard' switches.	
		CH10 WAA273-600 E	9		
CA20 WAA273-600 E	9				
<b>2 Step Switches with "OFF"</b> <b>60° Switching</b>  1 - 4 Pole		<b>1 Pole</b>		<b>2 Pole</b>	
		CG 4 A240-620 E	1	CG 4 A260-620 E	2
		CA10 A240-620 E	1	CA10 A260-620 E	2
		CH10 A240-620 E	1	CH10 A260-620 E	2
		CA20 A240-620 E	1	CA20 A260-620 E	2
		<b>3 Pole</b>		<b>4 Pole</b>	
CG 4 A280-620 E	3	CG 4 WAA480-620 E	4		
CA10 A280-620 E	3	CA10 WAA480-620 E	4		
CH10 A280-620 E	3	CH10 WAA480-620 E	4		
CA20 A280-620 E	3	CA20 WAA480-620 E	4		
<b>3 Step Switches with "OFF"</b> <b>45° Switching</b>  1- and 2 pole  1 - 3 Pole 4 Pole Drawing on Request		<b>1 Pole</b>		<b>2 Pole</b>	
		CG 4 A241-620 E	2	CG 4 A261-620 E	3
		CA10 A241-620 E	2	CA10 A261-620 E	3
		CH10 A241-620 E	2	CH10 A261-620 E	3
		CA20 A241-620 E	2	CA20 A261-620 E	3
		<b>3 Pole</b>		<b>4 Pole</b>	
CG 4 A281-620 E	5	CG 4 WAA481-620 E	6		
CA10 A281-620 E	5	CA10 WAA481-620 E	6		
CH10 A281-620 E	5	CH10 WAA481-620 E	6		
CA20 A281-620 E	5	CA20 WAA481-620 E	6		
<b>4 Step Switches with "OFF"</b> <b>30° Switching</b>  1 - 4 Pole		<b>1 Pole</b>		<b>2 Pole</b>	
		CG 4 A242-620 E	2	CG 4 WAA262-620 E	4
		CA10 A242-620 E	2	CA10 WAA262-620 E	4
		CH10 A242-620 E	2	CH10 WAA262-620 E	4
		CA20 A242-620 E	2	CA20 WAA262-620 E	4
				4 Pole drawing on request	
		<b>3 Pole</b>		<b>4 Pole</b>	
		CG 4 WAA282-620 E	6	CG 4 WAA482-620 E	8
CA10 WAA282-620 E	6	CA10 WAA482-620 E	8		
CH10 WAA282-620 E	6	CH10 WAA482-620 E	8		
CA20 WAA282-620 E	6	CA20 WAA482-620 E	8		
This catalogue lists some of the many common 'Standard Switches' available. For additional selection refer to catalogue 100 or enquire.					

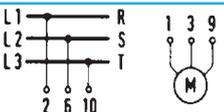
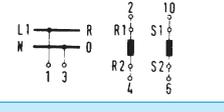
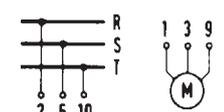
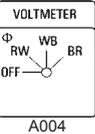
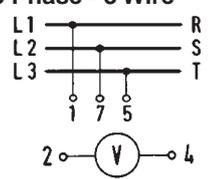
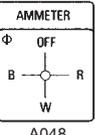
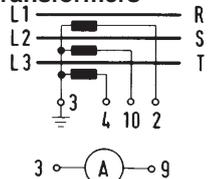
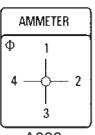
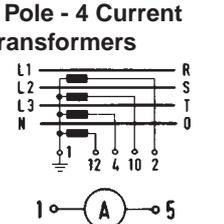
## Rotary Cam Switches - Panel Mounting

 <p>CG4 A244 FS2    CA10 A263 E-V</p>	<b>Selection Data</b> IEC 60947-3, EN 60947, VDE 0660			CG 4	CG 8	CA20	C26	C32		
				CA 4	CH 10	CA20B	CA25	CA 40	CA 50	
	Rated Thermal Current		$I_U = I_{th}$	A	10	20	25	32	40	50
	Rated Category	3 x 380 V/440 V	AC-23A	kW	3	7.5	11	15	18.5	22
				C 42	C 80	C125	C200-4	C315	L400	
Rated Thermal Current		$I_U = I_{th}$	A	CA 63	63	115	150	200	315	500
Rated Category	3 x 380 V/440 V	AC-23A	kW	30	45	75	75	132	132	

Function	Front Plate	Code No.	No. of Stages	Code No.	No. of Stages
<b>5 Step Switches with "OFF" 30° Switching</b>  <p>1 - 3 Pole</p>		<b>1 Pole</b>	3	<b>2 Pole</b>	5
		CG 4 A243-620 E		CG 4 WAA263-620 E	
		CA10 A243-620 E		CA10 WAA263-620 E	
		CH10 A243-620 E		CH10 WAA263-620 E	
		CA20 A243-620 E		CA20 WAA263-620 E	
		<b>3 Pole</b>	8	Refer to catalogue or enquire for details on additional 'standard' switches.	5
		CG 4 WAA283-620 E			
		CA10 WAA283-620 E			
		CH10 WAA283-620 E			
		CA20 WAA283-620 E			
<b>6 Step Switches with "OFF" 30° Switching</b>  <p>1 - 3 Pole</p>		<b>1 Pole</b>	3	<b>2 Pole</b>	6
		CG 4 A244-620 E		CG 4 WAA264-620 E	
		CA10 A244-620 E		CA10 WAA264-620 E	
		CH10 A244-620 E		CH10 WAA264-620 E	
		CA20 A244-620 E		CA20 WAA264-620 E	
		<b>3 Pole</b>	9	Refer to catalogue or enquire for details on additional 'standard' switches.	6
		CA10 WAA284-620 E			
		CH10 WAA284-620 E			
		CA20 WAA284-620 E			
<b>Double Throw Spring Return to "OFF" 30° Switching</b>  <p>1 - 3 Pole</p>		<b>1 Pole</b>	1	<b>2 Pole</b>	2
		CA10 A214-620 E		CA10 A215-620 E	
		CH10 A214-620 E		CH10 A215-620 E	
		<b>3 Pole</b>	3	Refer to catalogue or enquire for details on additional 'standard' switches.	2
		CA10 A216-620 E			
		CH10 A216-620 E			
<b>Stop Start Switch 30° Switching</b> 		<b>1 Pole</b>	1	<b>2 Pole</b>	2
		CA10 A176-600 E		CA10 WAA183-600 E	
		CH10 A176-600 E		CH10 WAA183-600 E	
<b>Stop Start Switch Spring return to "RUN"</b> 		<b>1 Pole</b>	1	Refer to catalogue or enquire for details on additional 'standard' switches.	2
		CA10 A178-620 E			

## Rotary Cam Switches - Panel Mounting

 <p>CA10 AU9Y96-600FT2</p>	<b>Selection Data</b> IEC 60947-3, EN 60947, VDE 0660			CG 4	CG 8 CH 10	CA20	C26	C32		
				CA 4	CA 10	CA20B	CA25	CA 40	CA 50	
	Rated Thermal Current		$I_u = I_n$	A	10	20	25	32	40	50
	Rated Category	3 x 380 V/440 V	AC-23A	kW	3	7.5	11	15	18.5	22
				C 42 CA 63	C 80	C125	C200-4	C315	L400	
Rated Thermal Current		$I_u = I_n$	A	63	115	150	200	315	500	
Rated Category	3 x 380 V/440 V	AC-23A	kW	30	45	75	75	132	132	

Function	Front Plate	Code No.	No. of Stages	Code No.	No. of Stages
<b>Motor Reversing</b> 3 Phase 60° Switching			3	<b>Single or Three phase</b> 90° Enclosed IP65 Single Phase Rev.	3
		CA10 A401-620 E CA40/C26 A401-620 E			
<b>Split Phase</b>			3	3 Phase Rev.	3
		CA10 WAA622-600 E CA20B WAA622-600 E			
<b>Motor Reversing</b> 3 Phase Spring Return			3	<b>Off-Star-Delta</b>	4
		CA10 A228-600 E CA40/C26 A228-600 E			
<b>Meter/Motor Switches</b>		<b>3 Phase - 3 Wire</b> 	2	<b>Δ Tap wound Motor</b>	4
		CA10 A004-625 E CH10 A004-625 E			
<b>Meter Switches</b>		<b>1 Pole - 3 Current Transformers</b> 	3	<b>3 Ph - Ph / 3 Ph - N</b>	3
		CA10 A058/AUN0180 E CH10 A058/AUN0180 E			
		<b>1 Pole - 4 Current Transformers</b> 	4	<b>2 Pole - 3 Current Transformers</b> (Can be used for direct reading)	5
		CA10 WAA036-620 E CH10 WAA036-620 E			

## UPS – Maintenance Bypass Switches

### Maintenance Bypass Switches

Kraus & Naimer Maintenance Bypass Switches are an accepted industrial standard wherever emergency power equipment is installed and maintained.

The Maintenance Bypass Switch can be utilized as a simple method of isolating a UPS without interrupting the power source. This allows servicing of the UPS with complete safety to maintenance personnel. A wide range of models has been established, while a broad selection of designer specified options is available on request.

### Options Include

Maintenance Bypass Switches are available as - Switch only, Enclosed or Enclosed wired to terminals.

1. Key interlock (V760) with auxiliaries for signal confirmation on locking/unlocking or to shut down the inverter of a UPS prior to switching to the bypass position.
2. Push button interlock with auxiliaries (V400). Switching only possible if push button is depressed, simultaneously closing or opening auxiliaries for signal confirmation to the UPS.
3. A solenoid interlock device (V140) that prevents the operation of the switch except under predetermined electrical conditions.
4. Automatic changeover switches also available.

Current rating to AC22A – 240v	amps	max. cable size	KVA ratings to AC22A – 240v	KVA
CA10B	16	2.5mm	CA10B	3.68
C26	32	6mm	C26	7.3
C42	63	16mm	C42	14
Current rating to AC22A – 415V	amps	max. cable size	KVA ratings to AC22A – 415v	KVA
CA10B	16	2.5mm	CA10B	11.5
C26	32	6mm	C26	23
C42	63	16mm	C42	45
C80	100	35mm	C80	72
C125	150	70mm	C125	107
C200-4	200	M8 95mm	C200-4	143
C315	315	M12 185mm	C315	225



**Enclosed & Wired to Terminals**

**Be smart look for them NOW, at your nearest Wholesaler.**

# Get smart with Smart Switch

The complete switch solution- First time everytime.

**IP 65 22.5mm**  
PROTECTION MOUNTING

control switches suitable for all applications.

## SMART SWITCH STOCK LIST

Product	Description	Barcode	Trade Price
KN11	Smart Body - On Off 1 Pole	9004257083664	
KN12	Smart Body - On Off 2 Pole	9004257083671	
KN13	Smart Body - On Off 3 Pole	9004257083688	
KN14	Smart Key - For KN11, KN12,KN13	9004257083572	
KN15	Smart Padlock Yellow - For KN11, KN12,KN13	9004257083596	
KN25	Smart Padlock Black - For KN11, KN12,KN13	9004257091942	
KN27	Smart Main Switch - 32A 3 Pole	9004257092680	
KN16	Smart Body - Auto Off Man 1 Pole	9004257083626	
KN17	Smart Body - Auto Off Man 3 Pole	9004257083633	
KN18	Smart Key - For KN16, KN17	9004257083589	
KN19	Smart Body - C/O w/out Off 1 Pole	9004257083640	
KN20	Smart Body - C/O w/out Off 3 Pole	9004257083657	
KN21	Smart Key - For KN19, KN20	9004257083701	
KN26	Smart Reverser - 1 & 3 Phase	9004257091959	
KN31	Smart Contactor - 20A AC1, 4kW AC3	9004257092703	
KN22	Smart Handle - Bezel Only	9004257083602	
KN23	Smart Handle - With Frame & Plate	9004257083619	
KN24	Smart Box - IP65 Enclosure	9004257091966	
KN28	Smart Header Plate - For KN22	9004257092710	
KN29	Smart Header Plate - For KN23	9004257092727	
KN30	Smart DIN Mount	9004257092697	

**FOR PRICING REFER TO YOUR NEAREST WHOLESALER**

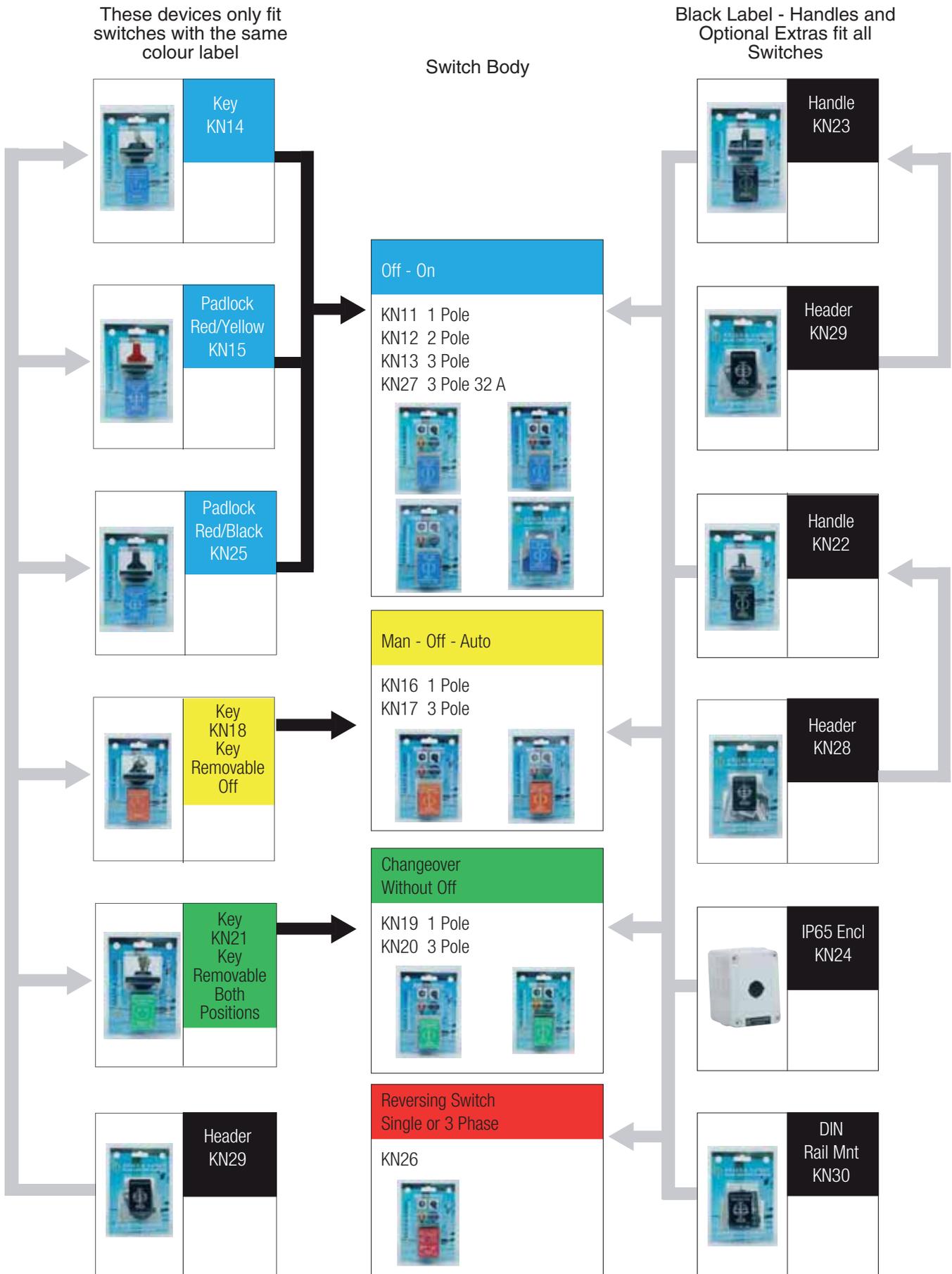
Simply select a contact body and match it to the operator of your choice.



**Make perfect contact...**

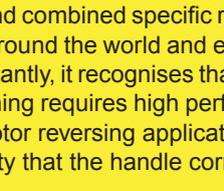
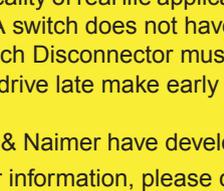
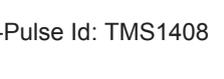
## Smart Switch

Match the label colours (blue to blue, yellow to yellow) to ensure the switch body and handle, key or padlock device are compatible.



**KG Main Switches**

**Nominal Ratings**

	Frame Size	Type	IEC 60947-3/VDE 0660, part 107				
			Cable Size mm <sup>2</sup>	Thermal Current I <sub>t</sub> /I <sub>th</sub> A	Operational Current AC-21A A	Utilization AC-23A 3 x 380 V - 440 V kW	Category AC-3 kW
S0 = 48mm x 48mm 	S0/S1	KG10A/KG10B	2.5	20	20	5.5	3.7
	S0/S1	KG20A/KG20B	6	25	25	7.5	5.5
	S0/S1	KG32A/KG32B	6	32	32	11	7.5
S1 = 64mm x 64mm 	S0/S1	KG41/KG41B	16	40	40	15	11
	S0/S1	KG64/KG64B	16	63	63	22	18.5
	S1	KG80	50	80	80	30	22
	S1	KG100	50	100	100	37	30
	S1	KG105	50	125	125	45	37
S2 = 88mm x 88mm               	S2	KG125 (Tunnel)	95				
	S2	KG126 (Lugs)	M10	125	125	45	37
	S2	KG127 (Both)	Both				
	S2	KG160 (Tunnel)	95				
	S2	KG161 (Lugs)	M10	160	160	55	45
	S2	KG162 (Both)	Both				
	S2	KG210 (Tunnel)	185				
	S2	KG211 (Lugs)	M12	200	200	75	55
	S2	KG212 (Both)	Both				
	S2	KG250 (Tunnel)	185				
S2	KG251 (Lugs)	M12	250	250	90	55	
S2	KG252 (Both)	Both					
S2	KG315 (Tunnel)	185					
S2	KG316 (Lugs)	M12	315	315	110	75	
S2	KG317 (Both)	Both					

**FOR HIGHER CURRENT RATINGS**

Please contact your nearest KRAUS & NAIMER stockist.

**IEC 60947-3 SWITCHES - DISCONNECTORS - SWITCH DISCONNECTORS**

IEC 60947 is a safety and performance standard for low voltage switchgear (up to 1000V) which has universally replaced IEC 408 and combined specific requirements of many individual national standards. IEC 60947 is a uniform standard for most countries around the world and establishes a truly global marketplace. IEC 60947-3 is a section of the standard specific to switches. Importantly, it recognises that devices for the switching function and isolating function require very different performance criteria. Switching requires high performance of current carrying parts to make and break loads under normal and overload conditions, ie., motor reversing applications. Isolation requires high insulation, sufficient spacing of current carrying parts and mechanical integrity that the handle corresponds to actual contact position for the safety of maintenance personnel.

Practicality of real life applications calls for three definitions within IEC 60947-3; Switches, Disconnectors and Switch Disconnectors. A switch does not have to satisfy the isolation and mechanical strength tests, and a disconnector likewise the load tests. A Switch Disconnector must satisfy all tests and is suitable for safety switch applications. A switch disconnector must have a direct drive late make early break auxiliary contact in series with a load breaking device to be suitable as a safety switch.

Kraus & Naimer have developed complete products which satisfy all IEC 60947 criteria, some of which are listed overleaf. For further information, please contact our offices.

### KG Main Switches - Padlockable Panel Mount, Enclosed Plastic or Stainless Steel

Selection Data			Switch Type							KG125	KG160	KG210	KG250	KG315	
			KG10	KG20	KG32	KG41	KG64			KG126	KG161	KG211	KG251	KG316	
IEC 60947, EN 60947, VDE 0660			KG10B	KG20B	KG32B	KG41B	KG64B	KG80	KG100	KG105	KG127	KG162	KG212	KG252	KG317
IEC 204, EN 60204, VDE 0113															
Nominal Voltage	$U_i$	V	690	690	690	690	690	690	690	690	1000 <sup>(2)</sup>				
Thermal Current	$I_U / I_{th}$	A	20	25	32	40	63	80	100	125	125	160	200	250	315
Enclosed Thermal Current	$I_{the}$	A	20	25	32	40	50	63	80	100	100	140	200	250	315
Operational Current AC21A	$I_e$	A	20	25	32	40	63	80	100	125	125	160	200	250	315
Utilisation Category		kW	5,5	7,5	11	15	22	30	37	45	45	55	75	90	110

Product	Code No.	Code No.
Panel Mount IP65 Red / Yellow Padlock Handle - V840G/D C/W Off . On Escutcheon 	<b>Panel Mount - Lockable 3 Pole</b> KG10B K300*AU2100 E KG20B K300*AU2100 E KG32B K300*AU2100 E KG41B K300*AU2100 E KG64B K300*AU2100 E KG80 K300*AU2100 E KG100 K300*AU2100 E KG105 K300*AU2100 E KG126 K300*AU2100 E KG161 K300*AU2100 E KG211 K300*AU2100 E KG251 K300*AU2100 E KG316 K300*AU2100 E	<b>Enclosed - Plastic - Lockable 3 Pole</b> KG20A T203/AU1902 PFE1 KG32A T203/AU1902 PFE1 KG41 K302-PFE1 AUS0001 KG41 K302*AU0162*KL12 KG64 K302-PFE1 AUS0001 KG64 K302*AU0162*KL12 KG80 K302*AU0163*KL12 KG100 K302*AU0163*KL12 KG126 K302*AU0760*6FE KG161 K302*AU0760*6FE KG211 K302*AU0171*6FE KG251 K302*AU0171*6FE KG316 K302*AU0171*6FE
	<b>Panel Mount - Lockable 3 Pole .</b> KG10B K302*AU2100 E KG20B K302*AU2100 E KG32B K302*AU2100 E KG41B K302*AU2100 E KG64B K302*AU2100 E KG80 K302*AU2100 E KG100 K302*AU2100 E KG105 K302*AU2100 E KG126 K302*AU2100 E KG161 K302*AU2100 E KG211 K302*AU2100 E KG251 K302*AU2100 E KG316 K302*AU2100 E	<b>Enclosed - Plastic - Lockable 3 Pole</b> KG20B K302*AU0160*KL12 KG32B K302*AU0160*KL12 KG41B K302*AU0152*KL12 KG64B K302*AU0152*KL12 KG80 K302*AU0153*6FE KG100 K302*AU0153*6FE KG126 K302*AU0761*6FE KG161 K302*AU0761*6FE KG211 K302*AU0172*6AE <sup>metal</sup> KG251 K302*AU0172*6AE <sup>metal</sup> KG316 K302*AU0171*6AE <sup>metal</sup>
	<b>Panel Mount - Lockable 4 Pole</b> KG10B K400*AU2100 E KG20B K400*AU2100 E KG32B K400*AU2100 E KG41B K400*AU2100 E KG64B K400*AU2100 E KG80 K400*AU2100 E KG100 K400*AU2100 E KG105 K400*AU2100 E KG126 K400*AU2100 E KG161 K400*AU2100 E KG211 K400*AU2100 E KG251 K400*AU2100 E KG316 K400*AU2100 E	(1) <b>Enclosed - Plastic - Lockable 3 Pole C/O with centre OFF</b> KG20B K900*AU0157*KL12 KG32B K900*AU0157*KL12 KG41B K900*AU0158*KL12 KG64B K900*AU0158*KL12 KG80 K900*AU0159*6FE KG100 K900*AU0159*6FE
Plastic Enclosure IP65 Red / Yellow Padlock Handle - V845 	<b>Enclosed - Lockable Stainless Steel 3 pole</b> KG41B K302*AU1150*6SH1 KG64B K302*AU1150*6SH1 KG80 K302*AU1148*6SH1 KG100 K302*AU1148*6SH1 KG125 K302*AU1145*6SH2 KG161 K302*AU1145*6SH2 KG211 K302*AU1151*6SH3 KG251 K302*AU1151*6SH3 KG316 K302*AU1151*6SH3	<b>Enclosed - Lockable Stainless Steel 3 pole</b> KG41B K302*AU1150*6SH1 KG64B K302*AU1150*6SH1 KG80 K302*AU1148*6SH1 KG100 K302*AU1148*6SH1 KG125 K302*AU1145*6SH2 KG161 K302*AU1145*6SH2 KG211 K302*AU1151*6SH3 KG251 K302*AU1151*6SH3 KG316 K302*AU1151*6SH3
Stainless Steel Enclosure IP65 	<b>Enclosed - Lockable Stainless Steel 3 Pole</b> KG20A K302*AUN0478*6SS0 KG32A K302*AUN0478*6SS0 KG41B K302*AUN0479*6SS1 KG64B K302*AUN0479*6SS1 KG80 K302*AUN0479*6SS1 KG100 K302*AUN0479*6SS1 KG125 K302*AUN0480*6SS2 KG161 K302*AUN0480*6SS2 Variations on request:- Stop/Start Pushbuttons. Control & Changeover Switches. Selection of auxiliary contacts.	<b>Stainless Steel Enclosures. . .</b> Marine Grade 316 IP65 N/O contact late make early break. Finish:- Bead Blast or Food Industry.(FI) Available on request:- Integrated Rain Hood. Hinged Door. Mounting Flanges Stainless Steel Padlock Device

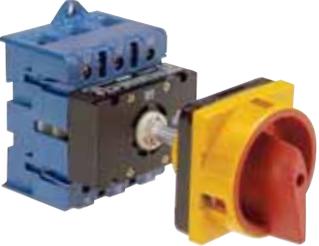
(1) 4 Pole changeover enclosed. Refer page 20.

For Panel and Base mount 4 Pole changeover Refer to page 20.

(2) Suitable for no load switching (AC-20A) above 690v.

### KG Main Switches - Base Mounted Padlockable with Extension Shafts

Selection Data		Switch Type								KG125	KG160	KG210	KG250	KG315	
IEC 60947-3, EN 60947, VDE 0660		KG10	KG20	KG32	KG41	KG64				KG126	KG161	KG211	KG251	KG316	
IEC 204, EN 60204, VDE 0113		KG10B	KG20B	KG32B	KG41B	KG64B	KG80	KG100	KG105	KG127	KG162	KG212	KG252	KG317	
Nominal Voltage	$U_i$ V	690	690	690	690	690	690	690	690	1000 <sup>(1)</sup>					
Thermal Current	$I_U / I_{th}$ A	20	25	32	40	63	80	100	125	125	160	200	250	315	
Enclosed Thermal Current	$I_{the}$ A	20	25	32	40	50	63	80	100	100	140	200	250	315	
Operational Current AC21A	$I_e$ A	20	25	32	40	63	80	100	125	125	160	200	250	315	
Utilisation Category	3 x 380V / 440V AC-23A/B	kW	5,5	7,5	11	15	22	30	37	45	45	55	75	90	110

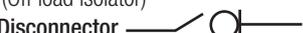
Product	Code No.			Code No.		
KG10B - KG100 = Base/DIN Mount  Base Mounted with Door Clutch M280E Padlock Device V840G/D  	Door Clutch <b>M280E/EF</b> P'lockable Handle <b>V840G/D</b> Esc. plate <b>OFF - ON</b> <b>3 Pole</b>			Door Clutch <b>M280E/EF</b> P'lockable Handle <b>V840G/D</b> Esc. plate <b>OFF - ON</b> <b>3 Pole + 1N/O 1 N/C aux.</b> (N/O aux. early break)		
	KG10B K300*AUN0481 VE KG20B K300*AUN0481 VE KG32B K300*AUN0481 VE KG41B K300*AUN0481 VE KG64B K300*AUN0481 VE KG80 K300*AUN0481 VE KG100 K300*AUN0481 VE KG105 K300*AUN0481 VE KG126 K300*AUN0481 VE KG161 K300*AUN0481 VE KG211 K300*AUN0481 VE KG251 K300*AUN0481 VE KG316 K300*AUN0481 VE			KG10B K302*AUN0483VE KG20B K302*AUN0483VE KG32B K302*AUN0483VE KG41B K302*AUN0483VE KG64B K302*AUN0483VE KG80 K302*AUN0483 VE KG100 K302*AUN0483 VE KG105 K302*AUN0483 VE KG126 K302*AUN0483 VE KG161 K302*AUN0483 VE KG211 K302*AUN0483 VE KG251 K302*AUN0483 VE KG316 K302*AUN0483 VE		
KG10B - KG100 = Base/DIN Mount  Base Mounted with Door Clutch M280E & V845  	Door Clutch <b>M280E/EF</b> P'lockable Handle <b>V845</b> Esc. plate <b>OFF - ON</b>  <b>3 Pole</b> (without aux's)			Door Clutch <b>M280E/EF</b> P'lockable Handle <b>V840G/D</b> Esc. plate <b>OFF - ON</b>  <b>4 Pole</b>		
	KG10B K300*AUN0482 VE KG20B K300*AUN0482 VE KG32B K300*AUN0482 VE KG41B K300*AUN0482 VE KG64B K300*AUN0482 VE KG80 K300*AUN0482 VE KG100 K300*AUN0482 VE KG105 K300*AUN0482 VE KG126 K300*AUN0482 VE KG161 K300*AUN0482 VE KG211 K300*AUN0482 VE KG251 K300*AUN0482 VE KG316 K300*AUN0482 VE			KG10B K400*AUN0481VE KG20B K400*AUN0481VE KG32B K400*AUN0481VE KG41B K400*AUN0481VE KG64B K400*AUN0481VE KG80 K400*AUN0481VE KG100 K400*AUN0481VE KG105 K400*AUN0481VE KG126 K400*AUN0481VE KG161 K400*AUN0481VE KG211 K400*AUN0481VE KG251 K400*AUN0481VE KG316 K400*AUN0481VE		
6 Pole Isolator  	<b>6 Pole Isolator</b> Panel Mounted Escutcheon plate OFF-ON			<b>3 Pole Change Over</b> Panel Mounted with OFF Escutcheon 1/OFF/2		
	KG20B K600*AU2103 E KG32B K600*AU2103 E KG41B K600*AU2103 E KG64B K600*AU2103 E KG80 K600*AU2103 E KG100 K600*AU2103 E KG126 K600*AU2103 E KG161 K600*AU2103 E			KG20B K900-620 E KG32B K900-620 E KG41B K900-620 E KG64B K900-620 E KG80 K900-620 E KG100 K900-620 E KG126 K900-620 E KG161 K900-620 E		
Aux. Contacts fitted on request 8 Pole Isolators and 4 Pole c/o also available						
<b>TERMINATION:</b> KG10 ~ KG125, KG160, KG210 KG250 & KG315 <b>Tunnel.</b> KG126, KG161, KG211, KG251 & KG316 <b>Lugs.</b> KG127, KG162, KG212, KG252 & KG317 <b>Tunnel &amp; Lugs.</b>						

(1) Suitable for no load switching (AC-20A) above 690v.

Note: EF = Supplied with IP65 seal

# Application Guide AS/NZS 947-3 3F Lockout Isolators

Get a Handle on Safety with your Eyes Closed

<b>Product Features</b>	
<b>M700 Door Interlock</b>	
<ul style="list-style-type: none"> <li>• Padlockable in 'OFF' only - safety requirement according to AS/NZS 947-3</li> <li>• In 'ON' the door interlock is engaged - the cabinet cannot be opened</li> <li>• In 'ON' the door interlock can be defeated by using a tool - authorised entry only</li> <li>• The door interlock re-engages when the door is closed after authorised defeat in 'ON'</li> <li>• In 'OFF' and padlocked, the door interlock defeat is disabled - no access</li> <li>• When the door is opened the handle position is locked - assured alignment</li> <li>• Mechanical Position Indicator on the switch module - visible when the door is open</li> <li>• Internal Padlock Device on switch module</li> <li>• Robust, keyed, floating head on switch shaft</li> </ul>	
<b>KG Switch Disconnectors</b>	
<ul style="list-style-type: none"> <li>• 13/14mm contact gap. 690v - 1000v insulation</li> <li>• High AC3 and AC23 ratings</li> <li>• Large, finger proof IP20 box type terminals</li> <li>• Double break forced opening safety rated auxiliary contacts. Silver or Gold 1 to 6 N/O - N/C</li> <li>• Positive drive make and break main contacts. 3 to 8 poles OFF ON, 3 or 4 pole C/O</li> <li>• IEC 947-3 3F disconnecter handle. Isolation is assured 'OFF' is 'OFF'</li> </ul>	
<b>General Features</b>	
<ul style="list-style-type: none"> <li>• Custom colours and engraving for escutcheon plates and header labels</li> <li>• Scratch-proof reverse engraving</li> <li>• IP65 dust and water protection</li> <li>• Robust, double insulated handle</li> <li>• Asymmetric shaft and interlock profiles ensure the handle position matches the switch position</li> <li>• Fixed length shaft ensures shaft must engage with the handle</li> </ul>	
<i>Telephone now for a demonstration</i>	
<b>IEC 947-1</b>	
<b>Equipment Suitable For Isolation - The Following Clauses Apply</b>	
<b>Clause 7.1.6</b> Additional constructional requirements for equipment suitable for isolation	
<b>Clause 7.1.6.1</b> Additional constructional requirements	
Equipment suitable for isolation shall provide, in the open position (see 2.4.21) an isolation distance in accordance with the requirements necessary to satisfy the isolation function (see 7.2.3.1 and 7.2.2) (dielectric test)	
Indication of the position of the mains contacts shall be provided by one or more of the following means:	
(1) The position of the actuator (2) A separate mechanical indicator (3) Visibility of the moving contacts	
The effectiveness of each of the means of indication provided on the equipment and its mechanical strength shall be verified in accordance with clause 8.2.5	
<b>Clause 8.2.5</b> Verification of the effectiveness of indication of the main contact position of equipment suitable for isolation	
To verify the effectiveness of the indication of the main contact position, all means of indication of contact position shall continue to function correctly after the operational performance type tests, and special durability type tests (if performed).	
<b>Switch Classifications</b>	
All low voltage switches installed in Australia and New Zealand shall meet AS/NZS 60947 and carry the appropriate easily identifiable symbol depending on the switch classification.	
<b>Switch</b> 	
A mechanical switching device capable of making and breaking currents under normal conditions, which may include specified overload conditions according to the duty, and abnormal circuit conditions such as short-circuit. (motor reversing switches, control switches, start delta switches, etc)	
<b>Disconnecter</b> 	
A mechanical switching device which in the open position, complies with the requirements specified for the isolating function (Off load isolator)	
<b>Switch Disconnecter</b> 	
A 'Switch' which in the open position, complies with the requirements specified for the isolating function (On load isolator)	



## Changeover Switches Base Mount & Enclosed

Product	Base Mount Code No.		Base Mount Code No.	
 <p><b>VE2-Mounting</b></p>  <p><b>VE-Mounting</b></p>  <p><b>Enclosed- Plastic</b></p>	<p><b>2 Pole Changeover</b>  <b>Din Rail Mtg - MCB cut out</b>  <b>Eng: Mains Off Gen</b></p>		<p><b>Enclosed Code No.</b></p> <p><b>3 Pole Changeover</b>  <b>Enclosed - Plastic IP65</b>  <b>Eng: Mains Off Gen</b></p>	
	<p>KH32 T902*NZ0001 VE2                  KH40 T902*NZ0001 VE2                  KH63 T902*NZ0001 VE2                  KH80 T902*NZ0001 VE2</p>		<p>KG20B K900*AUN0115*KL12                  KG32B K900*AUN0115*KL12                  KG41B K900*AUN0116*KL12                  KG64B K900*AUN0116*KL12                  KG 80 K900*AUN0117*6FE                  KG100 K900*AUN0117*6FE                  KG126 K900*AUN0118*6FE                  KG161 K900*AUN0118*6FE</p>	
	<p><b>3 Pole Changeover</b>  <b>Din Rail Mtg - MCB cut out</b>  <b>Eng: Mains Off Gen</b></p>		<p><b>3 Pole Changeover</b>  <b>Enclosed - Plastic IP65</b>  <b>Eng: Mains Off Aux</b></p>	
	<p>KG32A T903*NZ0001 VE2                  KG41B T903*NZ0001 VE2                  KG64B T903*NZ0001 VE2                  KG80 T903*NZ0001 VE2                  KG100 T903*NZ0001 VE2</p>		<p>KG20B K900*AUV0290*KL12                  KG32B K900*AUV0290*KL12                  KG41B K900*AUV0290*KL12                  KG64B K900*AUV0290*KL12                  KG 80 K900*AUV0290*6FE                  KG100 K900*AUV0290*6FE                  KG126 K900*AUV0290*6FE                  KG161 K900*AUV0290*6FE</p>	
	<p><b>3 Pole Changeover</b>  <b>Din Rail Mtg - MCB cut out</b>  <b>Eng: Mains Off Aux</b></p>		<p><b>4 Pole Changeover</b>  <b>Enclosed - Plastic IP65/ * Metal IP65</b>  <b>Eng: Mains Off Gen</b></p>	
	<p>KG32A T903*AUV0290 VE2                  KG41B T903*AUV0290 VE2                  KG64B T903*AUV0290 VE2                  KG80 T903*AUV0290 VE2                  KG100 T903*AUV0290 VE2</p>		<p>KG20B K950*AUN0119*6FE                  KG32B K950*AUN0119*6FE                  KG41B K950*AUN0120*6FE                  KG64B K950*AUN0120*6FE                  KG 80 K950*AUN0121*6FE                  KG100 K950*AUN0121*6FE                  KG126 K950*AUN0122*6FE                  KG161 K950*AUN0122*6FE                  6KF252 K950*AUN0128*6AE(250A) *                  6KF402 K950*AUN0129*6IP (400A) *</p>	
	<p><b>4 Pole Changeover</b>  <b>Din Rail Mtg - MCB cut out</b>  <b>Eng: Mains Off Gen</b></p>			
	<p>KG32A T904*AUN0127 VE2                  KG41B T904*AUN0127 VE2                  KG64B T904*AUN0127 VE2                  KG 80 T904*AUN0127 VE2                  KG100 T904*AUN0127 VE2</p>			

For Further Information Regarding The Range of Enclosed Isolators

Refer to the Kraus & Naimer “Enclosed Switch Catalogue” on [www.krausnaimer.com.au](http://www.krausnaimer.com.au)

## Changeover Switches Base Mount & Enclosed

Product	Base Mount Code No.	Base Mount Code No.				
 <p><b>6AE-Enclosure Mains Off Gen Metal Enclosure</b></p>	<p><b>3 Pole changeover (unenclosed) with M280E door clutch Eng: Mains Off Gen</b></p> <p>KG20B K900*AUN0123 VE                      KG32B K900*AUN0123 VE                      KG41B K900*AUN0123 VE                      KG64B K900*AUN0123 VE                      KG 80 K900*AUN0123 VE                      KG100 K900*AUN0123 VE                      KG126 K900*AUN0124 VE                      KG161 K900*AUN0124 VE</p>	<p><b>Enclosure for Domestic / Commercial Installations</b></p> <table border="1"> <tr> <td>Suitable for VE2 2 &amp; 3 Pole Changeover To 63 Amp <b>IP40</b></td> <td>64CC6</td> </tr> <tr> <td>Suitable for VE2 2 Pole Changeover</td> <td>6FKV</td> </tr> </table>	Suitable for VE2 2 & 3 Pole Changeover To 63 Amp <b>IP40</b>	64CC6	Suitable for VE2 2 Pole Changeover	6FKV
	Suitable for VE2 2 & 3 Pole Changeover To 63 Amp <b>IP40</b>	64CC6				
Suitable for VE2 2 Pole Changeover	6FKV					
 <p><b>ENCL: 6AE Mains Off Gen Metal Enclosure C/W Right Angle Drive</b></p>	<p><b>3 Pole changeover (unenclosed) with M280E door clutch Eng: Mains Off Aux</b></p> <p>KG20B K900*AUV0291 VE                      KG32B K900*AUV0291 VE                      KG41B K900*AUV0291 VE                      KG64B K900*AUV0291 VE                      KG 80 K900*AUV0291 VE                      KG100 K900*AUV0291 VE                      KG126 K900*AUV0291 VE                      KG161 K900*AUV0291 VE</p>	 <p><b>64CC6</b></p> <p><b>6FKV</b></p>				
	<p><b>4 Pole Changeover (unenclosed) with M280E door clutch Eng: Mains Off Gen</b></p> <p>KG20B K950*AUN0125 VE                      KG32B K950*AUN0125 VE                      KG41B K950*AUN0125 VE                      KG64B K950*AUN0125 VE                      KG 80 K950*AUN0125 VE                      KG100 K950*AUN0125 VE                      KG126 K950*AUN0126 VE                      KG161 K950*AUN0126 VE                      6KF252 K950*AUN0130 VE(250A)                      6KF402 K950*AUN0130 VE(400A)</p>					
		<p><b>Enclosure &amp; cable size</b></p> <p><b>For 3 Pole changeover</b>                      KG20B - 190 x 100 x 90 - 6mm                      KG32B - 190 x 100 x 90 - 6mm                      KG41B - 250 x 145 x 100 - 16mm                      KG64B - 250 x 145 x 100 - 16mm                      KG KG80 - 280 x 190 x 130 - 35mm                      KG100 - 280 x 190 x 130 - 35mm                      KG126 - 560 x 380 x 180 - M10 (Lugs) - 95mm                      KG161 - 560 x 380 x 180 - M10 (Lugs) - 95mm</p> <p><b>For 4 Pole changeover</b>                      KG20B - 190 x 190 x 130 - 6mm                      KG32B - 190 x 190 x 130 - 6mm                      KG41B - 280 x 190 x 130 - 16mm                      KG64B - 280 x 190 x 130 - 16mm                      KG 80 - 380 x 280 x 130 - 35mm                      KG100 - 380 x 280 x 130 - 35mm                      KG126 - 560 x 380 x 180 - M10 (Lugs) - 95mm                      KG161 - 560 x 380 x 180 - M10 (Lugs) - 95mm                      6KF252 - 600 x 600 x 350 Metal - M10 (Lugs) - 150mm                      6KF402 - 800 x 600 x 400 Metal - M10 (Lugs) - 240mm</p>				

For Further Information Regarding The Range of Enclosed Isolators Refer to the Kraus & Naimer “Enclosed Switch Catalogue” on [www.krausnaimer.com.au](http://www.krausnaimer.com.au)

**Optional Extras**

Keylocks	Code	Mounting Units	Code
Direct drive operator	V750/A9 	Panel mount 2 or 4 screw	E 
For base mounting	V750D/VE21 	Panel mount 2 or 4 screw IP65	EFA 
IP66 For single hole 22mm Standard K&N Key	V750D/3 	Base mounting 4 screw mount	VE 
Direct Drive Key Operator Mounted in a IP66 Hinged / Flip Lid Enclosure	V755/6CL 	Base mount DIN rail	VE1 
Direct Drive Key Operator <u>Nominate key barrel:-</u> 570 Lockwood, Bi-Lock, Lock Focus, KabaQuattro, Efco, Schlage, CL, etc..... <u>Customised key systems:-</u> Key Indication, cylinder removable from front (RL), Electronic key interlocks etc. <u>Nominate Mounting:-</u> Panel mount, Wall Plate mounting, enclosed (plastic, s/steel etc),	6S0LW V755/A 	Base mount DIN rail with MCB cut out	VE2 
Separate Drive Key Lock Programmable locking positions using <u>Strebor</u> barrel	V760/A.E 	Double end mount 4 screw fixing	ER 
Separate Drive Key Lock Programmable locking positions for: Lockwood 5-6 pin barrels C4 (201). Bi - Lock.(specify) Includes: <i>australian solenoid co pty ltd.</i> standard barrel:- 6S1 V760 S (Lockwood type).	V760/A 	Double end mount for fixing of plate with DIN mounting	VE1E 
		IP66 Single hole without plate 16/22mm 22/30mm	FS1 FT1 
		IP66 Single hole square pte 16/22mm 22/30mm	FS2 FT2 
<b>Mounting Units</b>	<b>Code</b>		
Right Angle Drive	K3 M330/A K3 M330/B 	Next size up handle and plate	EG 
<b>Terminal Covers</b>			
<b>3 main contacts</b> KG 20 - KG 100 KG 126 / KG 161 KG 251 / KG 316	M160 / 3 M160 / 33 M160 / 4 	Single hole with plate 16/22mm Rectangle 30 x 39 Single hole with plate 16/22mm Rectangle 48 x 59 Single hole with plate 16/22mm Rectangle 64 x 78 Header 2 Lines Header 3 Lines	FS4  FT6 
<b>4 main contacts</b> KG 20 - KG 100 KG 126 / KG 161 KG 251 / KG 316	M160 / 43 M160 / 43 M160 / 41 		FH4 PRC PRA 

### Optional Extras

Padlock	Code	Door Clutch & Shaft Extensions	Code
The padlock is an integral part of the switch handle	V840A 	Door clutch for misaligned doors with locking handle <small>Note: Knowledgeable personnel using a simple tool are able to defeat the interlock</small> Refer to Page 19	M700 
Locking handle for DIN cutout handles	V840B 	Door clutch with shaft extension Interlocked or Non Interlocked Available	M280E 
For a padlocks	V845 	IP66 Single hole 22mm door clutch and locking handle	V840G/B 
Padlock with integral flat or raised handle - 2 padlock	V840D 	IP66 Single hole 22mm door clutch and locking handle	V840G 
Padlock with integral flat or raised handle - 3 padlock	V840G/B 	IP66 Single hole 22mm door clutch and locking handle	V845 
Padlock with integral flat or raised handle - 4 padlock	V840G 	Single hole 22mm door clutch and locking handle	V840E 
Padlock device	V850 	Single hole 22mm door clutch	M295A 
Shaft locking device	V840VE 	IP66/67 Single hole mounting with integrated door clutch *Override fuction in On-Postion	M800 
Heavy Duty Stainless Steel Lock-out safety device	6SS V840 	Shaft extensions asymmetric profile	M004D 
Clip on aux contacts - base mount for KG20 -KG32 for KG41 - KG64	KO-H010/A11-VE K1-H010/A11-VE	Shaft extensions square profile	L100A/M004E 
Clip on aux contacts - panel mount for KG20 -KG32 for KG41 - KG64	KO-H010/A11-E K1-H010/A11-E		

## Special Drive Options & Enclosures

Special Drives	Description	Optional Code No.	CG 4    CA10    CA10B    C 43    C315 - CA 4   - CA25   - C 42   - C125   - L2000
	<p><b>Heavy Duty Drive</b> Create your own handle/drive unit and weld it onto the removable plate. Long rods, T-bars, etc.</p> <p>E Panel Mount, PK Plastic Encl. GK Aluminum Enclosure</p>	G800/A	PRICES AVAILABLE ON REQUEST
	<p><b>Limit Switch</b> Heavy duty roller &amp; actuator for spring return or stepping applications.</p> <p>E Panel Mount PK Plastic Enclosure GK Aluminum Enclosure</p> <p>Also Available in 6CL 56 Plastic Enclosure.</p>	G800/B	PRICES AVAILABLE ON REQUEST
	<p><b>Rope Operator</b></p> <p>Heavy duty for GK / PK or 6CL 56 series enclosures.</p> <p>Drive Only Also Available in 6CL 56 Plastic Enclosure</p>	G900/B	PRICES AVAILABLE ON REQUEST
	<p><b>Aluminium Enclosures for Drives</b></p> <p>Switch length 4 stages.</p> <p>Various sizes available on request.</p>	GK	PRICES AVAILABLE ON REQUEST
	<p><b>Plastic Enclosures for Drives</b></p> <p>Switch length 4 stages.</p> <p>Various sizes available on request.</p>	PK	PRICES AVAILABLE ON REQUEST
	<p><b>HAZARDOUS AREAS</b></p> <p>Dust Ignition Proof</p> <p>Flame Proof</p>	DIP Ex d	PRICES AVAILABLE ON REQUEST
	<p><b>Stainless Steel Enclosures Marine Grade 316</b></p> <p>208H x 113W x 96D 240H x 140W x 120D 350H x 230W x 170D 500H x 320W x 175D 710H x 320W x 175D C/W rain hood</p> <p>(Other sizes available on request)</p>	6S	<p><b>Finish:-</b> Bead Blast or Food Industry. (Nº 4)</p> <p><b>Options:-</b> Rain Hood. Hinge Door.</p> <p><b>Variations on request:-</b> Stop / Start Pushbuton. Control &amp; Changeover Switches. Selection of auxillary contacts.</p>

## Standard Enclosures

### Enclosure Information

The following options can be included by substituting suffix code "E" for the optional code number.. **PF, KS, KL, 6CL...**

**Note: KG enclosed isolators listed complete on page 17**

**Example:** 3pole 20Amp Off/On Switch  
Enclosed with Padlockable handle

CA 10 A292-621 **PF**  
**V840G**

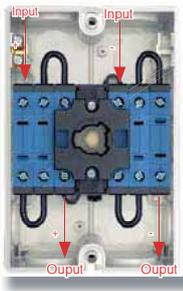
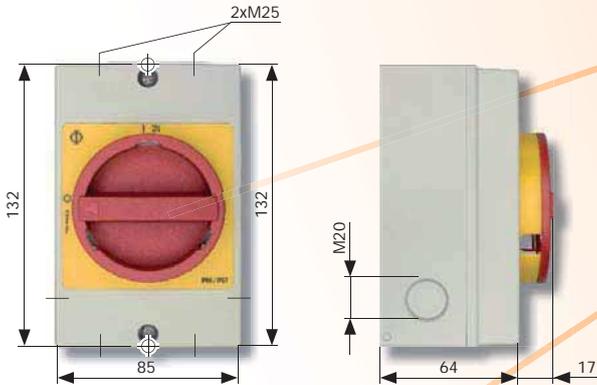
Enclosures	Description	Code No.	CG 4 - CA 4	CA10 - CA20	CA10B - C 42	C 43 - C125	C315 - L2000
 KS enclosure	<b>CG 4 &amp; CA 4 Switches</b> Material - Very high UV resistance - High chemical resistance Dimensions mm 1 stage - 90L x 70W x 60H 2 stage - 90L x 70W x 72.5H	<b>KS</b> <b>KS</b>					<b>PRICES AVAILABLE ON REQUEST</b>
 PF enclosure	<b>Standard without Cover Interlock</b> Very high UV resistance Excellent chemical resistance	<b>PF</b>					<b>PRICES AVAILABLE ON REQUEST</b>
 6 CL 56/98 enclosure	<b>Industrial Enclosure IP66</b> Dimensions mm - 101L x 101W x 91H /98 series - 198L x 101W x 91H /195 series  Chemical resistant orange available on request. (Nominate entries preferred).	<b>6 CL 56/98</b> <b>6 CL 56/98-4</b> <b>6 CL 56/195</b>				Flip Lid	<b>PRICES AVAILABLE ON REQUEST</b>
 6 FE enclosure	<b>General Purpose ABS Enclosures</b> Excellent Chemical resistance IP67.  6FE B85AG - 110H x 80W x 85D  6FE C65AG - 140H x 80W x 65D  6FE C85AG - 140H x 80W x 85D  6FE D85AG - 170H x 60W x 85D  6FE M95AG - 230H x 140W x 95D	<b>6FE B85AG</b>  <b>6FE C65AG</b>  <b>6FE C85AG</b>  <b>6FE D85AG</b>  <b>6FE M95AG</b>					<b>PRICES AVAILABLE ON REQUEST</b>
 6 FEC enclosure	<b>Polycarbonate Enclosures IP67</b> 6FEC - 190H x 190W x 130D 6FEC - 190H x 190W x 180D 6FEC - 280H x 190W x 130D 6FEC - 280H x 190W x 180D 6FEC - 280H x 280W x 130D 6FEC - 380H x 280W x 130D 6FEC - 380H x 280W x 180D 6FEC - 560H x 380W x 180D 6FEC - 560H x 380W x 230D						<b>PRICES AVAILABLE ON REQUEST</b>
 AE enclosure	<b>Metal Enclosures IP67</b> Switches mounted to gear tray with door interlock. 6AE 1033/300 x 300 x 210 6AE 1385/380 x 380 x 250 6AE 1338/600 x 380 x 350 Additional metal enclosures available	<b>6AE 1033</b> <b>6AE 1385</b> <b>6AE 1338</b>					<b>PRICES AVAILABLE ON REQUEST</b>

FOR FURTHER INFORMATION ON LARGER ENCLOSURES  
PLEASE TELEPHONE YOUR NEAREST BRANCH



DC Disconnectors for Solar Photovoltaic (PV) Power Supply System  
acc. to IEC 60364-7-712:2002

Disconnectors for  
**Photovoltaic**



Connecting diagram	Tightening torque for terminal screws	Strip length
	KFD25 1,25 Nm	KFD25 9

Contact development: 2 pole, 6 contacts per circuit (2 x 3 in series)

**General Data**

Switch Disconnector according to EN 60947-3 respectively VDE 0660 Part 107

Utilization Category: for Photovoltaic Application with rapid handle operation **DC-21B** (Switching of resistive loads, including moderate overloads)

Overvoltage category III, pollution degree II

Terminal Lugs finger-proof according to VDE 0660-514 and BGV A3, IP 20

Maximum permissible wire size (use copper wire only)  
single core wire or stranded wire  
flexible wire

KFD25: 6 mm<sup>2</sup>  
KFD25: 4 mm<sup>2</sup>, or 6 mm<sup>2</sup> flexible wire with a diameter not larger than 3,9mm after the insulation has been removed and the end has been reshaped.

**Mounting**

Plastic Enclosures, Protection IP66/67, totally insulated, threaded entries,

OFF-position lockable with padlocks, cover coupling with interlock

**Rated Value/Order Number**

Operational Current (enclosed up to 50 °C) DC-21B	19 A	23 A	25 A
1,2 x Voc 2 pol	1380 V	1200 V	1020 V
1,2 x Voc on each side	690 V	600 V	510 V
Insulation Voltage	1500 V	1500 V	1500 V

Order Number

<----- KFD25 T206/AUP0013 KT11V ----->

## New Product

### G20 (S) - DC Switch With Knife Contacts

Kraus and Naimer have developed and designed a new DC Switch; the G20(S)

The 'Knife contacts' have been designed in a new way resulting in a switching capacity of 20 Amps at 690V DC (DC-22A) and high short circuit withstand capability.

Finger-proof terminals according to EN 50274 and protection degree IP20 offer maximum safety.

With a standard latching mechanism, the G20 complies with all regulations required for main switches according to IEC/EN 60204.

In addition the G20 is also ideal for AC applications with high short circuit fault levels, as well as electronic circuitry with low current and voltages.

- Self-cleaning and vibration resistant knife contacts
- Compact design
- High DC switching capacity
- Highest contact reliability (better than any H-bridge contact system)
- High short circuit withstand capability
- Finger-proof terminals (IP20) even if jumper leads are used
- Terminal extensions (accessory item) for ring type cable lugs (max. width 6mm) and quick connect lugs available
- Heat resistant contact system according to standard EN 12101-3

G20 - with normal latching (in preparation)

G20S - with snap action latching



Utilisation Category	No. of Series Contacts G20S Total Voltage in Volts						Rated Operational Current Ie/A
	1	2	3	4	5	6	
DC-21A	250	500	750	1000	-	-	20
	440	880	-	-	-	-	13
DC-22A	250	500	750	1000	-	-	20
	330	660	990	-	-	-	10
	440	880	-	-	-	-	5
DC-23A	48	96	144	192	240	144	20
	60	120	180	240	300	288	15
	110	220	330	440	550	360	12
	160	320	480	640	-	-	8
	250	500	750	1000	-	-	5
	330	660	990	-	-	-	3
	440	880	-	-	-	-	1

### KF Switch Range 1 Pole per module (16-32A)

The innovative modular system is both simple and very safe while offering enormous flexibility.

The position of the various modules in relation to each other can be defined by the user.

Than assembled in the factory

Rotating contact movement (instead of the classical vertical lifting) allows

- Big contact gaps
- High mechanical life expectancy
- Very precise movement sequence
- Self cleaning contacts
- Forced opening and closing of contacts
- Compact (very shallow design)
- Up to 1000V insulation voltage according to IEC possible
- Lateral drive possible (latching module not in the centre but on left or right hand side)
- Coupling profile determines pre-closing function of switched 4th pole
- Visible contacts (windows) available on request
- Design allows a big variation of terminal markings



*Telephone now for a demonstration*

## New Product

# Maintenance Switches For EMC - Frequency Regulated Motor

According to IEC 60204 and VDE 0113



# Kraus & Naimer

BLUE LINE switchgear

since 1907

Maintenance Switches for

***EMC-compliant connection***



**DOWNLOAD NOW FROM**  
[www.krausnaimer.com.au](http://www.krausnaimer.com.au)



**Kraus & Naimer** Ltd.

BLUE LINE switchgear

NZ

since 1907

# New from Kraus & Naimer



3 & 4 POLE CONTACTORS 4kW—160kW

DC CONTACTORS

MOTOR STARTERS—DOL, STAR -DELTA & REVERSING

MODULAR CONTACTORS

EXTRAS INCLUDE—THERMAL OVERLOADS, CLIP ON AUX (TOP AND SIDE MOUNT), MECHANICAL INTERLOCKS, COIL SUPPRESSOR, MECHANICAL LATCH

AC & DC COILS - SPECIAL COIL VOLTAGES AVAILABLE ON REQUEST



Phone: NSW 02 9797 7333

VIC 03 9720 9777

QLD 07 32528344

S.A 08 8371 1443

web: [www.krausnaimer.com.au](http://www.krausnaimer.com.au) e-mail: [salesaus@krausnaimer.com](mailto:salesaus@krausnaimer.com)

### Control & Signalling Units 22mm - Assembled Units

Item	Code No.	Item	Code No.
<b>Push Button</b> IP67/IP69K  Green Red Yellow Blue White	1 Normally Open AC - 15 240v 6A	<b>Push Button</b> IP67/IP69K  Green Red Yellow Blue White	1 Normally Closed AC - 15 240v 6A
	PSN-WD0001 PSN*NZ0007 PSN*NZ0015 PSN*AUN0148 PSN*NZ0017		PSN-NZ0018 PSN-WD0002 PSN*NZ0019 PSN*NZ0009 PSN*NZ0020
<b>Pilot Light</b> IP67/IP69K  Green Red Yellow Blue White	c/w 24V LED	<b>Pilot Light</b> IP67/IP69K  Green Red Yellow Blue White	c/w 240V LED
	PSN-WD0003 PSN-WD0004 PSN*NZ0021 PSN*NZ0022 PSN*NZ0023		PSN-WD0005 PSN-WD0006 PSN*NZ0004 PSN*NZ0012 PSN*NZ0013
<b>Double - Push Button</b> IP67/IP69K 	c/w 240V LED	<b>Emergency Stop</b> <b>Non-Illuminated</b> IP67/IP69K 	*Reset by twisting 1 Normally Closed
	PSN/DDDL/GR/X1-XO-K11		
	c/w 24V LED		
	PSN*AUN0144		PSN*NZ0006 (enclosure available on request)

For further information refer to Catalogue 302

\*NOTE ALSO AVAILABLE AS RESET BY PULLING OR KEY OPERATION

### Palm Push Buttons AC-15 230v 6A, IP66

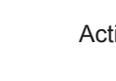
Foot & Palm Switch Red & Yellow Reset By Pulling			Foot & Palm Switch Spring Return Black & White Enclosed with Red Operator		
1 x N/C	PFT/R-V-KC01-1Y		N/O x N/C	PFT/R-KC11-1	

### Potentiometer Units Heavy Duty & Standard 22mm Mounting

Heavy Duty With K&N Switch Front IP65 Reinforced Stop. Optional Keyed or Stepping 48mm Square Front Engraved With Swoop			Standard IP66 3 Screw Terminals P max = 0.5 watt		
1k	CA10NZQ172*02FT2		1.0k Ohm	PSN/R1k	
2.2	CA10NZU606*01FT2		4.7k Ohm	PSN/R4K7	
4.7k	CA10NZU607*01FT2		10k Ohm	PSN/R10K	
10k	CA10NZV049*02FT2				
64mm Square Front Engraved With Swoop					
1k	CA10NZQ172*02FH3				
2.2k	CA10NZU606*01FH3				
4.7k	CA10NZQ607*01FH3				
10k	CA10NZQ049*02FH3				

**Heavy Duty Pot Units.**  
 Developed by Kraus & Naimer for use in industrial applications.  
 The 270° single turn pot drive features a HEAVY DUTY drive, large operator handle and sealing to IP65. With easy mount 22mm single hole mounting the drive has smooth stepless operation and comes complete with a header label. Options include keys and additional contacts

## Control & Signalling Units 22mm - Loose Components

<b>Push Buttons AC-15 230v 6A, IP67/IP69K</b>				
<b>Push Buttons Front Element Flush Illuminated</b>			<b>Push Buttons Front Element Flush Illuminated</b>	
Green	PSN/DL/G		Green	
Red	PSN/DL/R		Red	
			PSN/DLH/G	
			PSN/DLH/R	
<b>Push Buttons AC-15 230v 6A, IP67/IP69K</b>				
<b>Push Buttons Front Element Flush Non Illuminated</b>			<b>Push Buttons Front Element Flush Non Illuminated</b>	
Green	PSN/D/G		Green	
Red	PSN/D/R		Red	
			PSN/DH/G	
			PSN/DH/R	
<b>Rotary Switches AC-15 230v 6A, IP66</b>				
<b>Rotary Switch Front Element Latching Non Illuminated (changeable to spring return)</b>			<b>Rotary Switch Front Element Latching Non Illuminated (changeable to spring return)</b>	
2 Position	PSN/WRK		2 Position	
2 Position	PSN/WKV		2 Position	
3 Position	PSN/WRK3		2 Position	
			*Specify colour - G,R,Y,B,O	
<b>Rotary Switch Front Element Latching Key Operated (changeable to spring return)</b>				<b>Rotary Switch Front Element Latching Key Operated (changeable to spring return)</b>
2 Position (1)	PSN/WRS			Colour
2 Position (2)	PSN/WKS/A1			Green - G
3 Position (3)	PSN/WRS3			Red - R
3 Position (2)	PSN/WRS3/A1			Yellow - Y
		Blue - B		
<b>Key Removable Programme (1) Both Pos (2) Centre Off Pos (3) Three Pos</b>			Opaque - O	
<b>Double Push Buttons AC-15 230v 6A, IP66 Colour Cap Opaque</b>				
<b>Double Push Button Non Illuminated</b>			<b>Double Push Button Non Illuminated</b>	
Red/Green	PSN/DDL/GR		Black/Black	
Red/Green	PSN/DDL/GR/X1-X0		Arrow/Arrow	
Red/Green			PSN/DDL/S/X7-X7	
STOP START	PSN/DDL/GR/GB1-GB0		Black/White	
			PSN/DDL/WS	
<b>Pilot Lights IP67/69K</b>				
<b>Flush</b>			<b>Extended (conical)</b>	
Green	PSN/L/G		Green	
Red	PSN/L/R		Red	
Yellow	PSN/L/Y		Yellow	
Blue	PSN/L/B		Blue	
Opaque	PSN/L/W		Opaque	
			PSN/LH/W	
<b>Push Buttons Pilot Lights Accessories</b>				
<b>Contact Blocks Front Mounting</b>			<b>Contact Blocks Base Mounting</b>	
N/O	PSN/K10		N/O	
N/C	PSN/K01		N/C	
<b>LED Pilot Assemblies 12-30v AC/DC</b>			<b>LED Pilot Assemblies 85-260v AC/DC</b>	
Green	PSN/LED/G		Green	
Red	PSN/LED/R		Red	
White	PSN/LED/W		White	
			DIN Rail Mounting	
			PSN/IVS	
<b>Coupling Plate</b>			<b>Protection Extras (not with legend carriers)</b>	
PB's & Lights	PSN/A		Single PB's	
			PSN/T/D	
<b>Legend Carrier W/O Legend</b>			Double PB's	
			PSN/T/DD	
			Shroud	
			PSN/XGWK	
<b>PB's Lights</b>			Bulb Extractor	
Double PB's	PSB/STDD/X		PSN/LG	
Legend Insert	PSN/XST		Blank Plug	
Engraving	F*AU		PSN/B	
<b>Plastic Enclosure</b>			<b>Emergency Stop Extras</b>	
Top Yellow, Bottom Black		Shroud		
1 x 22.5mm	PSN/IY1	Plate 60mm		
		PSN/XAK1		
		Plate 90mm		
		PSN/XBK1		
		<b>LED Test Elements For Press To Test</b>		
		12v to 30v		
		PSN/XLED/T		
		85v to 260v		
		PSN/XLED230/T		
		<b>Resistor Element</b>		
		42v -60v		
		PSN/XLED60		

## Castell & Fortress Trapped Key Interlocking Systems

Products	Applications
Panel Door Interlock Multiple Panel Door Interlock	As part of an interlock system, the locks are used to control access to areas, e.g. switchgear panels or machines where hazards may be present, until a safe condition has been achieved.
Key Operated Rotary Switches	As part of an interlock system, the switch units are used for the direct control or isolation of control or power circuits controlling the plant or machinery.
Solenoid Controlled Interlock Unit	As above with a solenoid facility to integrate with other electronic control processes within the system.
Key Operated Rotary Switch for Use in Hazardous Areas	A key operated rotary switch for use as part of an interlocked system, in areas where explosive/flammable gases or dust particles may be present. BASEEFA certified (EExdIIc T6 Zones 1 & 2.)
H31 Basic Interlock and Keys	This form of basic interlock is normally used in the mechanical interlocking of electrical switchgear. Used in conjunction with other interlocking systems.
Door Interlock	Specifically designed for sliding doors.
Interlock Deadlock	Single or multi-keyed deadlocks, with either claw bolt or limit switch.
Mechanical Key Exchange Boxes	A range of mechanical key exchange units into which any sequence of trapped and freed keys can be incorporated.
Electronic Time Delay Rotation Sensing Unit Temperature Sensing	As part of an interlock system, the locks are used to control access to areas, e.g. switchgear panels or machines where hazards may be present, until a safe condition has been achieved.
Other Products	Fortress Amgard Modular Safety Systems. Castell Products. Smith Ellis – Valve Interlocks. HF Securite Products. Load banks

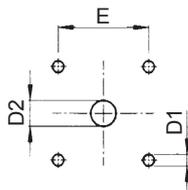
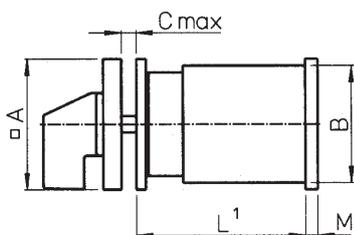


**Handles**

Type	Colour	Code	Size 00 0 1 2 3	Type	Colour	Code	Size 00 0 1 2 3
<b>I - Handle</b> <i>“Standard Handle”</i> 	Black	<b>G251</b>	√ √ √ √ -	<b>R - Handle</b> 	Black	<b>G001</b>	- √ √ √ √
	Red	<b>G252</b>	√ √ √ √ -		Red	<b>G002</b>	- √ √ √ √
	Electro-grey	<b>G257</b>	√ √ √ √ -		Electro-grey	<b>G007</b>	- √ √ √ √
<b>F - Handle</b> 	Black	<b>G221</b>	√ √ √ √ -	<b>B - Handle</b> 	Black	<b>G521</b>	- √ √ - -
	Red	<b>G222</b>	√ √ √ √ -		Red	<b>G522</b>	- √ √ - -
	Electro-grey	<b>G227</b>	√ √ √ √ -		Electro-grey	<b>G257</b>	- √ √ - -
					White (For UE mtg)	<b>G258</b>	- - √ - -
<b>K - Handle</b> 	Black	<b>G411</b>	- - √ √ √	<b>P - Handle</b> 	Black	<b>G211</b>	- √ √ √ √
	Red	<b>G412</b>	- - √ √ √		Red	<b>G212</b>	- √ √ √ √
	Electro-grey	<b>G417</b>	- - √ √ √		Electro-grey	<b>G217</b>	- √ √ √ √
<b>L Handle</b> 	Black	<b>G501</b>	- - √ - -	S0	S1 ~ S3		
	Red	<b>G502</b>	- - √ - -	<b>S Handle</b> 	Black	<b>G301</b>	- √ √ - -
	Electro-grey	<b>G507</b>	- - √ - -		Red	<b>G302</b>	- √ √ - -
<b>Handwheel</b> 	Black		- - - - √	S0	S1		
				The Handles listed are for the Kraus & Naimer standard profile shafts, enquire for Handle code numbers suitable for square shafts.			

**Dimensions mm**

**Rotary Cam Switches - Panel Mounting**



**E Panel Mounting**  
Size 0 - Size 3

	CG4	CAD's CA10	CA20	CA25	CA63 CA50 CA40 C26	C32	C42	C80	C200-4 C125	C315 L400
<b>A</b>	30	48	48	48	64	64	64	88	88	130
<b>B</b>	28	43	45	46	45/58	60	66	84	88	126
<b>C</b>	4	4	4	4	4	4	4	5,5	5,5	7
<b>D1</b>	3,2	5	5	5	5	5	5	6	6	7
<b>D2</b>	8	8	8	10	10	10	10	13	13	16
<b>E</b>	-	36	36	36	48	48	48	68	68	104
<b>M</b>	-	4,5	4,5	5,5	6,5	7,5	7,5	9,4	9,4	11,9

**Length L**

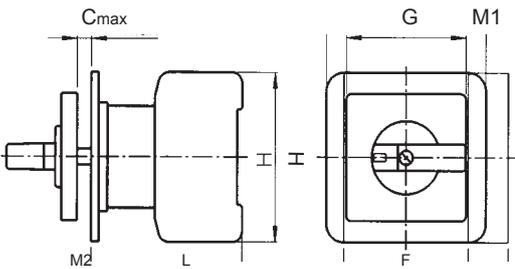
Stages	CG4	CAD's CA10	CA20	CA25	CA63 CA50 CA40 C26	C32	C42	C80	C200-4 C125	C315 L-switches Size S3
<b>1</b>	38,5	31,7	35,9	37,2	41	45,8	49,8	61,5	67,5	78,6
<b>2</b>	50	41,2	48,6	51,2	53,7	63,3	71,3	88	100	117,2
<b>3</b>	62,5	50,7	61,3	65,2	66,4	80,8	92,8	114,5	132,5	155,8
<b>4</b>	74,5	60,2	74	79,2	79,1	98,3	114,3	141	165	194,4
<b>5</b>	86,5	69,7	86,7	93,2	91,8	115,8	135,8	167,5	197,5	233
<b>6</b>	94,5	79,2	99,4	107,2	104,5	133,3	157,3	194	230	271,6
<b>7</b>	110,5	88,7	112,1	121,2	117,2	150,8	178,8	220,5	262,5	310,2
<b>8</b>	122,5	98,2	124,8	135,2	129,9	168,3	200,3	247	295	348,8
<b>9</b>	-	107,7	137,5	149,2	142,6	185,8	221,8	273,5	327,5	387,4
<b>10</b>	-	117,2	150,2	163,2	155,3	203,3	243,3	300	360	426
<b>11</b>	-	126,7	162,9	177,2	168	220,8	264,8	326,5	392,5	464,6
<b>12</b>	-	136,2	175,6	191,2		238,3	286,3	353	425	503,2

Dimensions mm

**KG Main Switches**

**Panel Mounting**

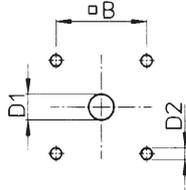
3 and 4 Pole



- KG10A
- KG20A, KG32A
- KG20B, KG32B
- KG41B, KG64B
- KG80, KG100, KG105
- KG126, KG161
- KG251, KG316

A	B	C	D1	D2	F	G	H	L	M1	M2	M3
48	36	4	11	5	48	48	50	48.2			
48	36	4	10	5	48	42	54	53.8			
64	48	4	10	5	64	42	54	53.8	13.5	9	2
64	48	4	10	5	64	50	64	60.5	16	12.5	16
64	48	4	10	5	70	70	80	70.6	22	10	25
88	68	5.5	13	6	-	112	108	96	38	21	22
88	68	5.5	13	6	-	145	126	103	52.5	21	24.5 x 2

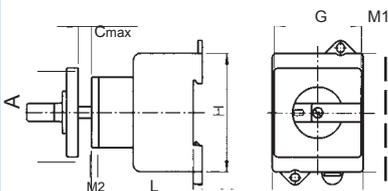
M1 = Extra Length 4th Pole / Neutral Contact / Earth Block  
 M2 = Extra Length Top Mounted Auxilliary Contacts  
 M3 = Extra Length Terminal Cover



**Base Mounted**

3 and 4 Pole

Note : 6 Pole Width = 3 Pole Width x 2



- KG10
- KG20A, KG32A
- KG20B, KG32B
- KG41B, KG64B
- KG80, KG100, KG105
- KG126, KG161
- KG251, KG316

A	B	C	D1	D2	G	H	L	M1	M2	M3
48	36	12	8	5	48	50	49.2			
48	36	12	8	5	42	54	50			
64	48	13.5	10	5	42	54	50	13.5	-	20
64	48	13.5	10	5	50	64	61	16	10	16
64	48	13.5	10	5	70	80	68	22	10	25
88	68	16	13	6	112	108	91	38	0	22
88	68	16	13	6	145	126	98	52.5	0	24.5 x 2

M1 = Extra Length 4th Pole / Neutral Contact / Earth Block  
 M2 = Extra Length Top Mounted Auxilliary Contacts  
 M3 = Extra Length Terminal Cover

**Padlock Device V840G**

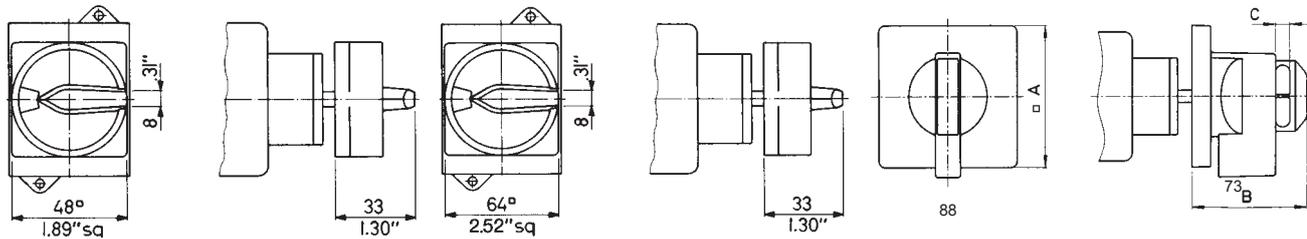
36 mm sq. Fixation  
 KG10, KG20, KG32

**Padlock Device V840G**

48 mm sq. Fixation  
 KG10B, KG20B, KG32B, KG41B, KG64B,  
 KG80, KG100, KG105

**Padlock Device V845**

68mm sq. Fixation  
 KG126, KG161, KG251, KG316



**Door Interlock M280E 48mm sq.**

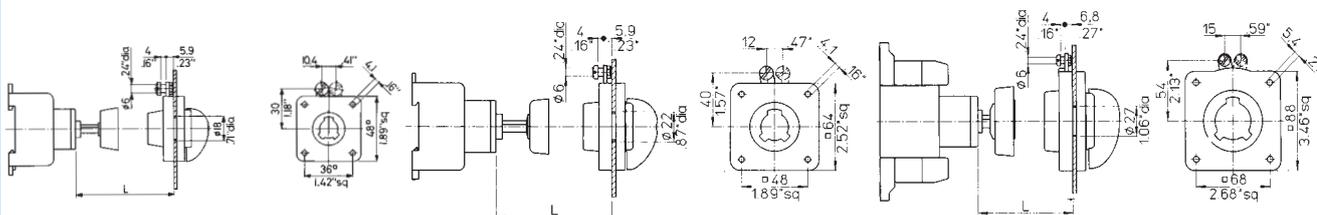
36 mm sq. Fixation  
 KG10, KG20, KG32

**Door Interlock M280E 64mm sq.**

48mm sq. Fixation  
 KG10, KG20, KG32, KG41, KG64, KG80, KG100, KG105

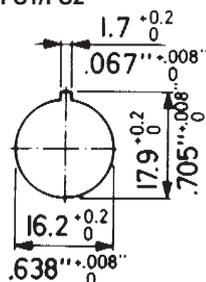
**Door Interlock M280E 88mm sq.**

68mm sq. Fixation  
 KG126, KG161, KG251, KG316



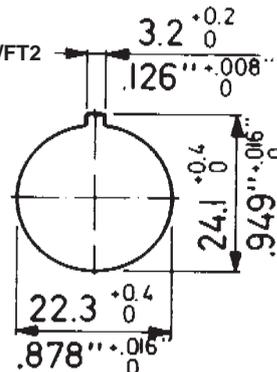
**Single Hole Mounting FS1/FS2 (Size 00)**

To accommodate  
 16.2 in 22.3 Hole  
 S00 T160 - 01



**Single Hole Mounting FT1/FT2 (Size 0)**

To accommodate  
 22.3 in 30.5 Hole  
 S0E T160 - 01



**SWITCH ORDERING CHART**

**Mounting Requirements**

- |  |   |
|--|---|
| <input type="checkbox"/> <b>E</b> Panel Mount. (5 hole mount)                              | <input type="checkbox"/> <b>L100</b> Various shaft lengths (metal)          |
| <input type="checkbox"/> <b>VE</b> Base mount suitable for door clutch etc.                | <input type="checkbox"/> <b>M004</b> Adjustable shaft (advise length).      |
| <input type="checkbox"/> <b>E - V</b> Panel Mount.(vertical access to terminals            | <input type="checkbox"/> <b>PF</b> Enclosure ABS IP56                       |
| <input type="checkbox"/> <b>E22</b> Panel mount. ( 3 hole, size 0)                         | <input type="checkbox"/> <b>GK</b> Enclosure aluminium IP54.                |
| <input type="checkbox"/> <b>ER</b> Combined panel square base plates.                      | <input type="checkbox"/> <b>M280E</b> Door clutch (specify depth required). |
| <input type="checkbox"/> <b>T146 K</b> DIN rail mounting plate. (size 0 and size 1)        | <input type="checkbox"/> <b>6 CL</b> Enclosure 56 series.                   |
| <input type="checkbox"/> <b>FT1</b> Single hole mtg. w/o esc. plate IP65. (S0 = 22.3mm)    | <input type="checkbox"/> <b>6 SS</b> Enclosure stainless steel.             |
| <input type="checkbox"/> <b>FT2</b> Single hole mtg. with square plate IP65. (S0 = 22.3mm) | <input type="checkbox"/> <b>KS/KL</b> Enclosures IP65.                      |
| <input type="checkbox"/> <b>EF</b> Panel seal IP65. (mounts between switch and panel).     | <input type="checkbox"/> <b>6S115 x 70</b> Wall plate stainless or Plastic  |
| <input type="checkbox"/> <b>KD/KN</b> Heavy duty mounting plate and metal shaft.           | <input type="checkbox"/> Other, nominate type of mounting required.         |

**Handle Operation**

- |   |  |
|---|--|
| <input type="checkbox"/> Normal/standard handle (G251) or .....               | <input type="checkbox"/> <b>V840A/</b> Padlockable handle (S0 & S1). |
| <input type="checkbox"/> <b>V750D</b> Key operator size 00 ~ 0.               | <input type="checkbox"/> <b>V845</b> Padlock Handle. (c/w esc.plate) |
| <input type="checkbox"/> <b>V755A</b> or <b>C</b> Key operator (530 series) . | <input type="checkbox"/> <b>V840G</b> Padlock device.                |
| <input type="checkbox"/> <b>V750/A9</b> Key operator size 0 switch.(Lockwood) | <input type="checkbox"/> <b>V850</b> Padlockable with handle device  |
| <input type="checkbox"/> <b>6SOLW V750</b> Key operator (201 Lockwood etc.)   | <input type="checkbox"/> <b>V400</b> Push-button interlock device.   |
| <input type="checkbox"/> <b>V760</b> Seperate key and handle (programmable).  | <input type="checkbox"/> Other specify                               |

**Essential Data**

1. Switch/circuit requirement. . . . . Amp ..... Volts ..... kW .....
2. Cable size ..... or limiting dimensions .....
3. AC or DC (DC voltage required).....Duty:- AC21/AC22/AC23/AC11 or other.
4. **PLC**/Electronic circuit/dry circuit or standard switch.

KRAUS & NAIMER “The Switchgear Innovators“

# Ohm's Law

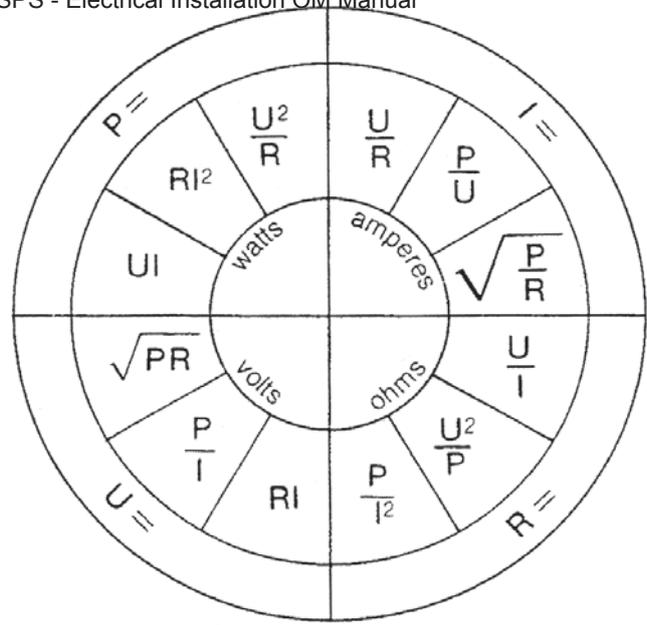
## SYMBOLS

**U = Voltage in volts**

**I = Current in amperes**

**R = Resistance on ohms**

**P = Power in watts**



## Useful Formulae

$kW = kVA \times pF$	$Line\ Amps = \frac{hp \times 746}{Line\ volts \times 1.732 \times Eff \times pF}$
$kW = \frac{hp \times 746}{1000 \times Eff} = \frac{hp \times 746 \times 100}{1000 \times \%Eff}$	$Horsepower = \frac{kVA \times 1000 \times Eff}{746}$ (hp)
$kW = \frac{Line\ amps \times Line\ volts \times 1.732 \times pF}{1000}$	$hp = \frac{kVA \times 1000 \times Eff \times pF}{746}$
$kVA = \frac{kW}{pF}$	$hp = \frac{Line\ amps \times Line\ volts \times 1.732 \times Eff \times pF}{746}$
$kVA = \frac{hp \times 756}{1000 \times Eff \times pF}$	1 Watt = 1 joule/second
$kVA = \frac{Line\ amps \times Line\ volts \times 1.732}{1000}$	1 hp = 746 Watts
$Line\ Amps = \frac{kVA \times 1000}{Line\ volts \times 1.732}$	1 hp = 746 joules/second
$Line\ Amps = \frac{kW \times 1000}{Line\ volts \times 1.732 \times pF}$	

### VOLT-DROP Single Phase

Service Voltage = 240V

$$Max\ Permissible\ Vd = \frac{240 \times 2.5}{100} \quad (2.5\% \text{ Service Voltage})$$

$$= 6V$$

$$Max\ Unit\ Vd = \frac{Max\ Vd \times 1000}{1 \times distance} \quad (\text{Length of cable run})$$

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**AC-1**  
**Resistive** or low inductive loads.

**AC-3**  
**Direct** on line starting, star delta starting.

**AC-4**  
**Direct** on line starting, reversing, plugging and inching.

**AC-21**  
**Switching** of resistive loads, including moderate overloads.

**AC-23A**  
**Frequent** switching of motors or other highly inductive loads (selection criteria for main switches).

**AC-22**  
**Isolation** of 6 Pole star delta motor circuits

POWER Motor Size		CURRENT three phase 50-60 Hz	
kW	h.p.	415V	440V
0.37	0.5	1.2	1
0.55	0.75	1.6	1.3
0.75	1	2	1.68
1.1	1.5	2.5	2.37
1.5	2	3.5	3.06
2.2	3	5	4.42
3	4	6.5	5.77
4	5.5	7.5	7
5.5	7.5	11	10.4
7.5	10	14	13.7
10	13.5	19	16.5
11	15	21	20.1
15	20	28	26.5
18.5	25	35	32.8
22	30	40	39
30	40	55	51.5
37	50	66	64
45	60	80	76.3
55	75	100	90
75	100	135	125
90	125	165	156
110	150	200	186
132	175	230	216
160	220	280	256
200	270	340	321
220	300	385	353
250	350	450	400
315	430	535	500

## IP Ratings

IP65 - where 6 means complete protection against accidental contact with live or internal moving parts. Protection against the ingress of dust (dust tight). Where 5 means water projected by nozzle against the equipment from any direction shall have no harmful effect.

IP66 - where 6 means complete protection against accidental contact with live or internal moving parts. Protection against the ingress of dust (dust tight). Where 6 means water projected by powerful jets against the enclosure from any direction shall have no harmful effect.

IP69K - where 6 means complete protection against accidental contact with live or internal moving parts. Protection against the ingress of dust (dust tight). Where 9K means where water directed against the enclosure under extremely high pressure from any direction must not have any harmful effect. Water pressure of 100 bar. Water temperature of 80 deg C.

## The Range of **Blue Line** Switchgear

Technical Catalogues for the following products are available from our website. [www.krausnaimer.com.au](http://www.krausnaimer.com.au)

<b>Main Switches and Main Switches with Emergency Function 16 A-315 A</b> <b>Maintenance Switches 20 A-315 A</b> <b>Switch Disconnectors 20 A-315 A</b> According to IEC 60947 - 3, EN 60947 - 3, VDE 0660 part 107, IEC 60204, EN 60204 and VDE 0113	500
<b>CL SWitches 10 A-20 A</b> <b>C, CA and CAD Switches 10 A-315 A and L Switches 350 A-2400 A</b> C, CA and CAD switches are designed for universal application. They are recommended for instrument, isolator, double-throw and motor control. L switches are designed for load and off-load applications. They are used to switch resistive or low inductive loads.	100
<b>Optional Extras and Enclosures</b> The complete product line, a large number of optional extras is available, including door interlocks, push-pull devices, cylinder and padlock attachments, control and indicator devices, Ac motor drives, as well as enclosures, both insulated and metal.	101
<b>A and AD Switches 6 A-25 A</b> A and AD Switches have 4 contacts in each switching stage. These switches provide an extensive range of switch functions and require a minimum mounting depth. Up to 36 switching positions are possible, with availability of 48 contacts per 12 stage column.	110
<b>CG, CH and CHR Switches 10 A-25 A</b> Ultra compact CG, CH and CHR switches are ideally suited for control and instrumentation applications. Switch terminals are 'finger-proof' and conveniently accessible for wiring and are delivered open. All CG4 switches offer specially designed gold plated contacts or H-bridges with 'cross-wire' contact systems, which facilitates their use in electronic circuitry and chemically aggressive environments.	120
<b>DH, DHR, DK and DKR Switches 6 A-16 A</b> DH, DHR, DK, and DKR switches incorporate unique corrosion resistant contacts that permit operation on system voltage as low as 1 V. They have fully enclosed and protected contacts which can be operated either by rotary and/or lateral handle movement. D switches are used in calibration and semiconductor circuits. They are also used for relay and contactor control.	130
<b>X Switches 80 A-630 A</b> X switches can be applied for load, tap and gang duties. They incorporate 6 contacts in each switching stage. Their compact design provides a minimum length dimension for mounting purpose.	140
<b>KG Switches 20 A-315 A and KH and KHR Switches 16 A-80 A</b> KC, KG, KH and KHR switches are excellent circuit interruptors. They have high through fault and fault making capacities and are especially designed for use as isolators and safety switches for machine tools, distribution panels and switchboards. KG ON/OFF switches offer unusually high dimensioned air and creepage distances between terminals which are designed for time saving 'straight-line' wiring. ON/OFF switches are available with up to 8 poles and double-throw switches are available with up to 4 poles. KC switches offer spring cage terminals for greater termination security.	150
<b>Push Buttons and Pilot Lights, 22.5 mm Ø</b> A complete range of state-of-the-art push buttons and pilot lights represent an ideal combination of functional security economical efficiency in a modular design.	302
<b>Disconnectors for Photovoltaic</b>	
<b>Maintenance Switches for EMC - Compliant Connection</b> Frequency regulated motors.	

We reserve the right to make technical and dimensional changes without prior notice. Any errors or omissions are not binding.



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Distributor:

The Cam Switch Creators and Innovators.

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	RTU
<b>Location:</b>	RTU Section
<b>Model Numbers:</b>	ACE 3600
<b>Manufacturer:</b>	Motorola
<b>Supplier:</b>	Australian Utilities and Scada Technologies  Brisbane Qld 07 3342 7011

ACE3600 is a state-of-the-art high performance Remote Terminal Unit (RTU) with exceptional communication capability. The unit is designed to provide scalability and modularity to optimize the performance of any control system. The unit's rugged design offers compliance for the requirements of most demanding SCADA system environments. Motorola has developed this innovative RTU to provide a cost effective RTU solution by minimizing the installation and configuration time.

#### Main Features:

- Power PC based processor provides very high performance
- VX-Works based real-time operating system
- Up to three Ethernet ports
- Up to four serial communication ports
- Up to two radio modem ports
- 0,3,5,7 or 8 I/O slot wall mount frames, 19" rack mount on 8 slot frame
- Expansion frames allow up to 110 I/O modules in a single RTU.
- Single and double density I/O modules
- Mixed analog input and output modules
- Hot Swap I/O replacement
- Wide operating temperature range -40 to +70 °C
- NEMA 4 / IP65 Housing, 40 x 40 cm and 50 x 50 cm
- Two-way/trunking/ digital radio models
- AC and DC controlled power supply
- 6.5 or 10 Ah Backup battery, smart battery charger
- GPS and NTP for time synchronization
- System building tool for configuration and programming
- Remote firmware and program download
- Compatible with MOSCAD family of RTUs



# ACE3600

## Advanced Control Equipment

*The ACE3600 is a powerful Remote Terminal Unit (RTU) in Motorola's family of Supervisory Control And Data Acquisition (SCADA) products.*

*ACE3600 provides an advanced data collection and processing unit with the intelligence required to operate in sophisticated SCADA systems.*

*Advanced communication and networking capabilities include data transfer via two-way radio, trunked radio, digital radio, data radio, cellular modems, IP networks, line modem and more.*

**LOCAL INTELLIGENCE**

ACE3600 is a microprocessor-based RTU with large memory capacity that can make control decisions on-site, based on status conditions and values from local and remote sources.

Local intelligence permits control decisions without the need for real-time messages from other supervisory centers; ACE3600 can operate in sophisticated control systems.

**PROGRAMMABLE**

ACE3600 uses an advanced symbolic ladder logic application language to develop the data base conditions, values, and RTU profile that must exist for each control action, message transmission, etc. to occur. Routines written in 'C' may be executed as a whole or part of the total application.

Powerful applications may easily be defined using industry accepted ladder logic and 'C'. The task is made easier by using the SCADA application development software and a PC-style computer.

**PROTOCOLS**

ACE3600 uses the OSI-based MDLC communication protocol for all data signaling. Third party MODBUS, DNP 3.0 DF1 (Allen Bradley) and IEC 60870-5 protocols are also supported.

MDLC was specifically developed for radio use but is completely applicable to Ethernet, wireline, and other media. It permits large volumes of data to be quickly transferred between units using packet transmission techniques.

The MDLC protocol enables adding the ACE3600 easily to existing MOSCAD systems where system expansion is required.

**COMMUNICATIONS**

ACE3600 permits communication to occur RTU-to-central and RTU-to-RTU (peer-to-peer). Communication may occur between individual units or may be broadcast to several units simultaneously. Store-&-forward may be employed to pass messages RTU-to-RTU throughout the system. Direct communication, where possible, or repeated messaging over one or multiple communication media, may be intermixed within the system.

**UPLOAD/DOWNLOAD**

ACE3600, via the MDLC data transfer capability, uploads the data collected and

calculated by the application program to a central site. It also receives downloaded changes to the application program and/or to the parameters that control how the application operates.

The process being supervised does not need to be static; operational variables and limits, and the process definition itself, can be easily changed and transmitted to the RTU from anywhere in the system's network.

A unique feature of ACE3600, also enables remote firmware safe download from anywhere in the system's network. This allows remote firmware upgrades.

The above features minimize site visits by maintenance personnel after the unit's initial installation.

**COMMUNICATION PORTS**

Connectors on the various CPU modules permit the connection for local application programming, or connection to other on-site devices to supervise their operation, and to the communication media device.

Multiple connectors, multiple communication types, and variable data speeds allow practically all external data devices to be connected to the CPU module.

**CHASSIS AND ENCLOSURES**

ACE3600 can be provided on a metal chassis or in a painted steel NEMA 4 (IP56) rated outdoor enclosure that can hold the RTU frame, modules, battery and up to two radios (depending on enclosure size). An optional tamper switch can be ordered with the enclosure.

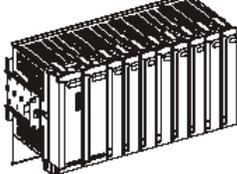
**19" RACK MOUNT**

ACE3600 may be ordered with frame and mounting accessories that permit direct mounting onto standard 19" equipment racks. The frame contains space for power supply, CPU module and up to eight I/O modules. Optionally, a 19" metal chassis can be ordered for installation of backup battery, accessories and up to two radios.

**I/O EXPANSION**

The ACE3600 RTU can be expanded to include up to 110 I/O modules controlled from the CPU. The I/O expansion is based on Ethernet LAN connection between the CPU module and the I/O expansion frames. The I/O expansion frames can be co-located with RTU on the main frame (installed in the same 19" rack or cabinet) or distributed in the same site up to 50 meters from the main frame location.

**ACE3600 GENERAL SPECIFICATIONS**

Frames	No I/O slots - PS and CPU modules only, wall mount 117 W x 209 H x 198* D mm (4.61" x 5.30" x 7.80**), 0.95 Kg (2.1 Lb)	
	3 I/O slots - PS, CPU and up to 3 I/O modules, wall mount 234 W x 244 H x 198* D mm (9.21" x 9.61" x 7.80" *), Approx. 1.9 Kg (4.19 Lb)	
	5 I/O slots - PS, CPU and up to 5 I/O modules, wall mount 314 W x 244 H x 198* D mm (12.36" x 9.61" x 7.80" *), Approx. 2.4 Kg (5.3 Lb)	
	7 I/O slots - PS, CPU and up to 7 I/O modules 391 W x 244 H x 198* D mm (15.39" x 9.61" x 7.80" *), 3. Kg (6.6 Lb)	
	8 I/O slots - PS, CPU and up to 8 I/O modules, wall mount or 19" rack 435 W x 244 H x 198* D mm (17" x 9.61" x 7.80" *), Approx. 3.3 Kg (7.3 Lb)	
* Depth including module panel Note: All frames except No I/O Slots can be used for I/O expansion.		
I/O Expansion Frame	Number of I/O slots - 3, 5, 7, or 8 Default power supply - Expansion power supply Compatible power supplies - All except: 10.8-16V DC low-tier power supply	
Metal Chassis	Large - for PS, CPU and up to 7 I/O slot frame, two radios and 6.5 or 10 Ah backup battery, wall mount , 448 x 468 mm x 200* D mm (17.64" x 18.43" x 7.88") Small - for PS, CPU and up to 3 I/O slot frame, one radio and 6.5 Ah backup battery, wall mount, 335 W x 355 H x 198* D mm (17.64" x 18.43" x 7.80") * Depth Including Frame and Module	
Housing	Large NEMA 4/IP65 painted metal - up to 7 I/O slot frame, two radios and 6.5 or 10 Ah, backup battery, 500 W x 500 H x 210 D mm (19.7" x 19.7" x 8.26" ) Small NEMA 4/IP65 painted metal - up to 3 I/O slot frame one radio and 6.5 Ah backup battery, 380 W x 380 H x 210 D mm (15" x 15" x 8.26")	
Power Supply	10.8-16 V DC 10.8-16 V DC low-tier 18-72 V DC 18-72 V DC with 12 V smart battery charger 100- 240 V AC, 50-60 Hz 100- 240 V AC, 50-60 Hz, with 12 V smart battery charger	
Backup Battery	6.5 Ah - Sealed Lead-Acid 10 Ah - Sealed Lead-Acid	
Operating Temperature	-40 °C to +70 °C (-40 °F to 158 °F) Notes: (1) when using a metal housing option, the maximum operating temp. outside the housing is +60 °C (140 °F). (2) Motorola radios and ACT module operating temp. range is: -30 °C to +60 °C (-22 °F to 140 °F)	
Storage Temperature	-55 °C to +85 °C (-67 °F to 185 °F)	
Operating Humidity	5% to 95% RH @ 50 °C without condensation	
Mechanical Vibrations	Per EIA/TIA 603 Base station, Sinusoidal 0.07mm @ 10 to 30 Hz, 0.035 mm @ 30-60 Hz	
Operating Altitude	-400m to +4000 meter (-1312 ft to + 13120 ft) above sea level Note:100-240 V AC and 18-72 V DC PS operating altitude is -400m to +3000 meter (-1312 ft to + 6560 ft)	

**REGULATORY STANDARDS**

Safety	<ul style="list-style-type: none"> <li>UL 60950-1:2001</li> <li>CSA 22.2-60950-1</li> <li>IEC 60950-1</li> <li>AS/NZS 60950</li> <li>FM/cFM certified as Nonincendive Class I, Division 2 - standard FM 3611</li> <li>(Note: FM approval refers to model F7509 only and most of the ACE3600 options.)</li> </ul>
Emission	<ul style="list-style-type: none"> <li>Emission standards per:</li> <li>CFR 47 FCC part 15, subpart B (class A)</li> <li>EN55022:2003 Class A</li> <li>EN61000-3-2</li> <li>EN61000-3-3</li> </ul>
Immunity	<ul style="list-style-type: none"> <li>Immunity standards for industrial environments per EN50082-2 /IEC 61000-6-2</li> <li>IEC 61000-4-2</li> <li>IEC 61000-4-3</li> <li>IEC 61000-4-4</li> <li>IEC 61000-4-5</li> <li>IEC 61000-4-6</li> <li>IEC 61000-4-8</li> <li>IEC 61000-4-11</li> </ul>

**COMMUNICATIONS**

Communication Ports:	<ul style="list-style-type: none"> <li>Up to 5 ports per CPU</li> <li>Serial - up to 4 x RS-232 ports</li> <li>Multi-drop – up to 3 x RS-485 ports</li> <li>Ethernet - up to 2 x 10/100 MB ports and 1 x 10 MB port</li> <li>Two-way radio/analog trunked radio - up 2 x modem ports</li> </ul>
Motorola Radio Support	<ul style="list-style-type: none"> <li>Mobile conventional two-way radios - CM200, CM340, GM3188, EM200, CDM750</li> <li>Portable conventional two way radios – HT750, GP320, GP328, PRO5150</li> <li>Analog Trunk radios – XTL5000, XTL2500</li> <li>Digital Trunk radios – XTL5000, XTL2500, XTS2500, MTM800 (Tetra)</li> </ul>
Third Party Radio Support	Two way radios, data radios, TETRA radio (PD)
Modem Support	Dial-up modems, cellular modems (dial mode & PD)
Protocols	MDLC, TCP, UDP, IP, PPP, NTP, DHCP
Third Party Protocol Support	<ul style="list-style-type: none"> <li>MODBUS RTU: master on RS-232 / RS-485 / Ethernet, slave on RS-232 / RS-485 / Ethernet</li> <li>DF1 (Allen Bradley): master on RS-232</li> <li>DNP 3.0 Plus: master &amp; slave on RS-232 / RS-485 / Ethernet</li> <li>IEC 60870-5-101: slave on RS-232</li> </ul>
User Protocol (user program)	Possible on RS-232, RS-485 and Ethernet ports

**CPU 3610/CPU 3640 MODULES SPECIFICATIONS**

Microprocessor	Freescale – Power PC II, MPC8720, 32-bit, extended communication capability, DMA and floating point calculation support
Microprocessor Clock	200 MHz
Memory	Flash: 16 MB DRAM: 32 MB SRAM plug-in board (optional): 4 MB
Real-Time Clock	Full calendar with leap year support (Year, Month, Day, Hours, Minutes, Seconds) Time drift: max. 2.5 seconds per day (when power is on)
SRAM and RTC Retention	3 V Rechargeable lithium backup battery
Serial Port 1	Configurable RS-232C or RS-485 port: - RS-232C: A synch, Full Flow Control, up to 230.4 kb/s, GPS receiver interface - RS-485, multi-drop 2-Wire up to 230.4 kb/s
Serial Port 2	RS-232C, Asynch, Full Flow Control, up to 230.4 kb/s, GPS receiver interface
Plug-In Port 1	Supports the following Plug-In ports: - Radio Modem, DPSK 1.2 kb/s, FSK 1.2 / 1.8 / 2.4 kb/s, DFM 2.4/3.6/4.8 kb/s - RS-232, Sync/Asynch, Full Flow Control, up to 230.4 kb/s, GPS receiver interface - RS-485, multi-drop 2-wire, up to 230.4 kb/s - Ethernet 10/100 Mb/s
Plug-In Port 2	Supports the following Plug-In ports: - Radio Modem, DPSK 1.2 kb/s, FSK 1.2 / 1.8 / 2.4 kb/s, DFM 2.4/3.6/4.8 kb/s and - RS-232, Sync/Asynch, Full Flow Control, up to 230.4 kb/s, GPS receiver interface - RS-485, multi-drop 2-Wire up to 230.4 kb/s - Ethernet 10 Mb/s
Ethernet Port 1	10/100 Mb/s, (on CPU 3640 only)
LEDs Display	4 CPU diagnostics LEDs, port status LEDs and user application LEDs
Power Consumption	See ACE3600 Maximum Power Ratings below.
Operating Voltage	10. 8 -16 V DC (from the motherboard connector)
Dimensions	56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D)
Weight	Approx. 0.38 Kg (0.84 Lb)

**12 V DC POWER SUPPLY MODULE (DEFAULT)**

Input Voltage	10.8 - 16 V DC
Outputs	Motherboard connector (to CPU and I/O modules): equal to input voltage, max. 4 A AUX1A/AUX1B: equal to input voltage, max. 8 A, on/off controlled by user program AUX2A/AUX2B (configurable): equal to input voltage (default), max. 8A, or 3.3, 5, 7.5, 9 V DC $\pm 10\%$ , max. 2.5A, on/off controlled by user program <b>Note:</b> max. 8 A total current consumption from all outputs
No Load power consumption	Max. 50 mA
Diagnostics LEDs	Status LED for: input voltage, AUX1 and AUX2 outputs, 12V control for DO modules
Input Protection	Internal Line Fuse, replaceable
Output Protection	AUX2A/B Short Circuit, automatic recovery on 3.3, 5, 7.5, 9 V
Dimensions	56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D)
Weight	Approx. 0.43Kg (0.95 Lb)

**12 V DC LOW-TIER POWER SUPPLY MODULE**

Input Voltage	10.8 - 16 V DC
Outputs	Motherboard connector (to CPU and I/O modules): The same as input voltage / max. 4 A AUX1A/AUX1B: equal to input voltage max. 8A <b>Note:</b> max. 8 A total current consumption from all outputs
Input Protection	Internal Line Fuse, replaceable
Dimensions	56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D)
Weight	Approx. 0.4Kg (0.9 Lb)

**18-72 V DC POWER SUPPLY MODULES**

Input Voltage	18-72 V DC
Total Power	18-72 V DC: Max. 60 Watt continuous, Max. 105 Watt peak @ 25% duty cycle
Outputs	Motherboard connector (to CPU and I/O modules): 13.2 V DC $\pm$ 20%, max. 4 A AUX1A/AUX1B: equal to input voltage, max. 8 A, on/off controlled by user program AUX2A/AUX2B (configurable): equal to input voltage (default), max. 8A, or 3.3, 5, 7.5, 9 V DC $\pm$ 10%, max. 2.5A, on/off controlled by user program <b>Note:</b> max. 8 A total current consumption from all outputs
Battery Charger	12 V Lead-Acid battery charger (in PS model with charger) Automatic charging of 6.5 or 10 Ah backup battery, battery temperature sensing, overcharging protection, battery capacity test and diagnostics, automatic battery switch-over
Diagnostics LEDs	Status LED for: input voltage, AUX1 and AUX2 outputs, 12V control for DO modules and battery
No Load power consumption	Max. 250 mA
Efficiency	80% typical, 76% with full load
In-rush Current	10 A maximum, for 2 mSec. Max, cold start at 25°C
Protection	Internal line input fuse (replaceable), Short Circuit automatic recover
Output Protection	AUX2A/B Short Circuit, automatic recovery on 3.3, 5, 7.5, 9 V
Insulation	Input to case: 500 V DC, input to output: 500 V DC
Dimensions	56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D)
Weight	Approx. 1Kg (2.2 Lb)

**AC POWER SUPPLY MODULES**

Input Voltage	100-240 V AC, 50/60 Hz
Total Power	Max. 60 Watt continuous, Max. 105 Watt peak @ 25% duty cycle
Outputs	Motherboard connector (to CPU and I/O modules): 13.2 V DC $\pm 20\%$ , max. 4 A AUX1A/AUX1B user connectors: 13.2V DC $\pm 20\%$ , max. 8 A, on/off controlled by user program AUX2A/AUX2B: 13.2 V DC $\pm 20\%$ , max. 8A or 3.3, 5, 7.5, 9 V DC $\pm 10\%$ (configurable), max. 2.5A , on/off controlled by user program <b>Note:</b> max. 8 A total current consumption from all outputs
Battery Charger	12 V Lead-Acid battery charger (in PS with charger) Automatic charging of 6.5 or 10 Ah backup battery, battery temperature sensing, overcharging protection, battery capacity test and diagnostics, automatic battery switch-over
Diagnostics LEDs	Status LED for: input voltage, AUX1 and AUX2 outputs, 12V control for DO modules and battery
No Load power consumption	130 mA @ 220 V AC
Efficiency	80% typical @230 V AC, 76% typical @115 V AC (full load)
Inrush Current	25 A maximum, for 2 mSec. Max, cold start at 25°C
Power Factor	0.98 typical at 230 V AC, 0.99 typical at 115 V AC
Protection	Internal Line Fuse, replaceable
Output Protection	AUX2A/B Short Circuit, automatic recovery on 3.3, 5, 7.5, 9 V
Insulation	Input to case: 1500 V AC, input to output: 3000 V AC
Dimensions	56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D)
Weight	Approx. 1Kg (2.2 Lb)

**24 V DC PLUG-IN POWER SUPPLY**

Input Voltage	10.8-16V (from I/O module)
Output	24V floating, max. 150 mA
Efficiency	75% typical
Protection	Automatic output shut down on over-voltage and over-current
Insulation	Input to output: 1500 V AC
Dimensions	78 mm W x 15 mm H x 68 mm D (3.1" W x 0.6" H x 2.7" D)
Weight	Approx. 0.04 Kg (0.09 Lb)

**EXPANSION POWER SUPPLY**

See below.

**16/32 DI FAST 24 V MODULES**

Total Number of Inputs	16 DI 32 DI
Input Arrangement	Isolated groups of 16 inputs with shared common
Fast Counter Inputs	Inputs that can be used as fast counters: - All inputs in 16 DI module - First 20 inputs in 32 DI module
AC Input Frequency	45 – 65 Hz
AC Input Delay	Maximum 0.2 mS
Fast Counter Input Frequency	0 - 12.5 KHz, minimum pulse width 40 $\mu$ S
Max. DC Input Voltage	Max. $\pm$ 40 V DC (relative to input common)
“ON” DC Voltage Range	+9 to +30 V DC, -30 to -9 V DC
“OFF” DC Voltage Range	-3 to +3 V DC
“ON” AC Voltage Range	10 to 27 V AC (RMS)
“OFF” AC Voltage Range	0 to 5 V AC (RMS)
Input Current	Max. 3.5 mA
Fast Capture Resolution	1 mS (Interrupt upon change of state)
Event Time Tagging Resolution	1 mS (Interrupt upon change of state)
Input Filtering	0 to 50.8 mS (DC, programmable in 0.2 mSec steps)
Counter Input Filtering	0 to 12.75 mS (Programmable in 0.05 mSec steps for inputs configured as high speed counters)
24 V DC Output	Supports optional isolated 24 V plug-in “Wetting” Power Supply (One in 16 DI, two in 32 DI)
Diagnostics LEDs	Status LED per each input, module error LED, Plug-In 24V status LED
User Connection	2 or 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG
Cable & TB Holder	20 or 40 Wire cable with Terminal Block Holder connector, 26 AWG wires
Module Replacement	Hot swap replacement – module extraction/insertion under voltage
Input Isolation	2.5 k V RMS between input and module logic per IEC60255-5
Input Insulation	Insulation resistance 100 M $\Omega$ @ 500 V DC, per IEC60255-5
Operating Voltage	10.8 -16 V DC and 3.3 V DC (from the motherboard connector)
Power Consumption	See ACE3600 Maximum Power Ratings below.
Dimensions	37 mm W x 225 mm H x 180 mm D (1.5” W x 8.7” H x 7.1” D)
Weight	16 DI: approx. 0.28 Kg (0.62 Lb), 32 DI: approx. 0.29 Kg (0.63 Lb)

**16/32 DIGITAL INPUT FAST 24 V IEC 61131-2 TYPE II MODULES**

Total Number of Inputs	16 DI 32 DI
Input Arrangement	Isolated Groups of 16 inputs with shared common
Fast Counter Inputs	Inputs that can be used as fast counters: - All inputs in 16 DI - First 20 inputs in 32 DI
Fast Counter Input Frequency	0 - 10 KHz, minimum pulse width 50 $\mu$ S
Max. DC Input Voltage	Max. $\pm$ 40 V DC
"ON" DC Voltage Range	+11 to +30 V DC, -30 to -11 V DC
"OFF" DC Voltage Range	-5 to +5 V DC
Input Current	6-10 mA
Fast Capture Resolution	1 mS (Interrupt upon change of state)
Event Time Tagging Resolution	1 mS (Interrupt upon change of state)
Input Filtering	0 to 50.8 mS (DC, programmable in 0.2 mSec steps)
Counter Input Filtering	0 to 12.75 mS (Programmable in 0.05 mSec steps for inputs used as high speed counters)
24 V DC Output	Supports isolated 24 V plug-in "Wetting" Power Supply (one in 16 DI, two in 32 DI)
Diagnostics LEDs	LED per each input status, module error LED, 24V Plug-In status LED
User Connection	2 or 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG
Cable & TB Holder	20 or 40 Wire Cable with Terminal Block Holder connector, 26 AWG
Module Replacement	Hot swap replacement– module extraction/insertion under voltage
Input Isolation	2.5 kV RMS between input and module logic per IEC60255-5
Input Insulation	Insulation resistance 100 M $\Omega$ @ 500 V DC, per IEC60255-5
Operating Voltage	10.8 -16 V DC and 3.3 V DC (from the motherboard connector)
Power Consumption	See ACE3600 Maximum Power Ratings below.
Dimensions	37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D)
Weight	16 DI: approx. 0.28 Kg (0.62 Lb), 32 DI: approx. 0.29 Kg (0.63 Lb)

**16 DIGITAL INPUT 120/230V MODULE**

Total Number of Inputs	16 DI
Input Characteristics	IEC 61131-2 Type 1
Input Arrangement	Two isolated groups of 6 inputs and one isolated group of 4 inputs.
AC Input Frequency	47 - 63 Hz
AC Input Delay	Maximum 25.0 mS
Max. DC Input Voltage	Max. $\pm 264$ V DC (relative to input common)
"ON" DC Voltage Range	+79.0 V DC to +264.0 V DC, -79.0 V DC to -264.0 V DC
"OFF" DC Voltage Range	-40 to +40 V DC
"ON" AC Voltage Range	79.0 to 264.0 V AC (RMS)
"OFF" AC Voltage Range	0 to +40 V AC (RMS)
Input Current	At 110VDC      1.0 to 3.0 mA At 230VDC      0.4 to 2.0 mA At 110VAC      > 2.0 mA RMS At 230VAC      > 3.0 mA RMS
Input Filtering	0 to 50.8 mS (DC, programmable in 0.2 mSec steps), minimum effective filter value - 7.0 msec.
Diagnostics LEDs	LED per each input status, module error LED
User Connection	3 Terminal Blocks (5.00mm pitch), Maximum 14 AWG
Cable & TB Holder	30 Wire Cable with Terminal Block Holder connector, 20 AWG wires
Module Replacement	Hot swap replacement– module extraction/insertion under voltage
Input Isolation	2.5 kV RMS between input and module logic per IEC60255-5
Input Insulation	Insulation resistance 100 M $\Omega$ @ 500 V DC
Operating Voltage	10.8 -16 V DC and 3.3 V DC $\pm 10\%$ (from the motherboard connector)
Power Consumption	See ACE3600 Maximum Power Ratings below.
Dimensions	37 mm W x 225 mm H x 180 mm D      (1.5" W x 8.7" H x 7.1" D)
Weight	approx. 0.367 Kg (0.80 Lb)

**8/16 RELAY OUTPUT MODULES**

Total Number of Outputs	8 EE relay outputs 16 EE relay outputs 8 ML relay outputs 16 ML relay outputs
Output Arrangement	8 DO: 3 X Form C (SPDT) and 5 X Form A (SPST) 16 DO: 6 X Form C (SPDT) and 10 X Form A (SPST)
Contact Voltage Ratings	Max. 60 V DC, or 30 V AC RMS (42.4 V peak).
Contact Power Ratings	2A @ 30 V DC, 0.6A @ 60V DC or 0.6A @ 30V AC (resistive load)
Relay Back Indication	Contact position - hardware back indication
DO Frequency	Max. 10 Hz
Diagnostics LEDs	LED per each output status, module error LED
User Connection	2 or 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG
Cable & TB Holder	20 or 40 Wire Cable with Terminal Block Holder connector, 26 AWG
Fail State	Configurable relay state on CPU fail: On, Off or 'last value'
All Relays Disable/Enable	Selectable per module, controlled from the power supply
Module Replacement	Hot swap replacement— module extraction/insertion under voltage
Output Isolation	Between open contacts: 1kV, between contact and coil: 1.5 kV, between contact sets: 1.5 kV
Insulation	Insulation resistance 100 M $\Omega$ @ 500 V DC per IEC60255-5, Insulation impulse 1.5 kV per IEC60255-5
Operating Voltage	10.8 -16 V DC and 3.3 V DC (from the motherboard connector)
Power Consumption	See ACE3600 Maximum Power Ratings below.
Dimensions	37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D)
Weight	8 DO: approx. 0.29 Kg (0.64 Lb), 16 DO: approx. 0.32 Kg (0.7 Lb)

**12 RELAY OUTPUT 120/230V MODULES**

Total Number of Outputs	12 EE relay outputs 12 ML relay outputs
Output Arrangement	12 x 1 Form A
Contact Power Ratings	3A @ 250 V AC, 3A @ 30 V DC, or 0.20A @ 125 V DC (resistive load).
Minimum Contact Load Current	10.0 mA @+5.00 V DC.
Maximum Switching Current	3.00 A
Relay Back Indication	Contact position - hardware back indication
DO Frequency	Max. 10 Hz (resistive load)
Diagnostics LEDs	LED per each output status, module error LED
User Connection	3 Terminal Blocks (5.00mm pitch), Maximum 14 AWG
Cable & TB Holder	30 Wire Cable with Terminal Block Holder connector, 20 AWG wires
Fail State	Configurable relay state on CPU fail: On, Off or 'last value'
All Relays Disable/Enable	Selectable per module, controlled from the power supply
Module Replacement	Hot swap replacement– module extraction/insertion under voltage
Output Isolation	Between output and module logic: 2.5 kV, per IEC60255-5
Insulation	Insulation resistance 100 M $\Omega$ @ 500 V DC per IEC60255-5, Insulation impulse 5 kV per IEC60255-5
Operating Voltage	10.8 -16 V DC and 3.3 V DC $\pm$ 10% (from the motherboard connector)
Power Consumption	See ACE3600 Maximum Power Ratings below.
Dimensions	37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D)
Weight	approx. 0.423 Kg (0.90 Lb)

**8/16 ANALOG INPUT MODULES**

Total Number of Inputs	8 AI, $\pm 20$ mA 16 AI, $\pm 20$ mA 8 AI, $\pm 5$ V 16 AI, $\pm 5$ V
Input Configuration	Isolated (floating) analog inputs
A to D Resolution	16 Bit (including sign)
Input Accuracy	$\pm 0.1\%$ of full scale
Input Sampling Time	10 mSec @ 50 Hz filtering 8.33 mSec @ 60 Hz filtering
Smoothing	Selectable input averaging: 1, 2, 4, 8, 16, 320, 64 or 128 samples (x10 mS)
Permitted potential between Inputs	75 V DC, 60 V AC (RMS)
Input Impedance	$\pm 20$ mA input: $R_{in} < 250 \Omega$ $\pm 5$ V input: $R_{in} > 1 M\Omega$
Crosstalk Rejection	Better than 80 dB between any pair of inputs
Temperature Stability	Better than $\pm 25$ PPM/ $^{\circ}$ C
Interference Suppression	Selectable 50 or 60 Hz filtering, Common mode rejection $> 80$ dB, Differential mode rejection $> 50$ dB
24 V DC Output	Supports optional isolated 24V Plug-in Power Supply (one in 8 DI, two in 16 DI)
Diagnostics LEDs	Overflow and Underflow LED per each input, module error LED, 24V Plug-In status LED The module Overflow and Underflow levels can be configured to: Current inputs: $\pm 20$ mA/4-20 mA Voltage inputs: $\pm 5$ V/0-5 V/1-5 V
User Connection	2 or 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG
Cable & TB Holder	20 or 40 Wire Cable with Terminal Block Holder connector, 26 AWG
Module Replacement	Hot swap replacement– module extraction/insertion under voltage
Input Isolation	1.5 kV RMS between input and module logic, per IEC60255-5
Input Insulation	Insulation resistance 100 M $\Omega$ @ 500 V DC, per IEC60255-5
Operating voltage	10.8-16 V DC and 3.3 V DC (from the motherboard connector)
Power Consumption	See ACE3600 Maximum Power Ratings below.
Dimensions	37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D)
Weight	8 AI: approx. 0.32 Kg (0.71 Lb), 16 AI: approx. 0.34 Kg (0.75 Lb)

**4 ANALOG OUTPUT MODULE**

Total Number of Outputs	4
Output Configuration	Isolated floating channels, each channel can be connected as 0 -20 mA or 0-10 V DC voltage
D to A Resolution	14 Bit
Output Accuracy	±0.1% of full scale @25°C
Temperature Stability	Better than ±25 PPM/°C
Internal Settling Time	Max. 1 ms
Output Load	Voltage: > 1.0 kΩ, < 1.0 μf, Current: < 750 Ω (internal power source)
Crosstalk Rejection	Better than 50 dB between any pair of outputs
Interference Suppression	Common Mode Rejection: > 60 dB
Output protection	Voltage output: short-circuit current, max. 30 mA Current output: No-load voltage max. 22 V DC
Diagnostics LEDs	Module Error LED, Voltage mode LED, Current mode LED, Calibration LED per channel
User Connection	2 Terminal Blocks (3.5mm pitch), Maximum 18 AWG
Cable & TB Holder	20 Wire Cable with Terminal Block Holder connector, 26 AWG
Module Replacement	Hot swap replacement– module extraction/insertion under voltage
Isolation	1.5 kV between output and module logic
Insulation	Insulation resistance 100 MΩ @ 500 V DC, per IEC60255-5
Operating voltage	10.8 -16 V DC and 3.3 V DC (from the motherboard connector)
Power Consumption	See ACE3600 Maximum Power Ratings below.
Dimensions	37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D)
Weight	0.29 Kg (0.64 Lb)

**MIXED 4 ANALOG OUTPUT 8 ANALOG INPUT MODULES**

Total Number of I/Os	4 AO + 8 AI (AI: $\pm 20$ mA or $\pm 5$ V DC)
I/O Arrangement	AO - each channel can be connected as 0 -20 mA or 0-10 V, AI - Isolated (floating) analog inputs
AO D to A Resolution	14 Bit
AO Accuracy	$\pm 0.1\%$ of full scale @25°C
AO Temperature Stability	Better than $\pm 25$ PPM/°C
AO Internal Settling Time	Max. 1 ms
AO Load	Voltage: > 1.0 k $\Omega$ , < 1.0 $\mu$ f, Current: < 750 $\Omega$
AO Crosstalk Rejection	Better than 50 dB between any pair of outputs
AO Interference Suppression	Common Mode Rejection: > 60 dB
AO Voltage Output Protection	Short-circuits protection, max. 30 mA (all other operating channels remain fully functional)
AO Current output no-load voltage	Max. 22 V DC
AO Isolation	1.5 kV between output and module logic
AO Insulation	Insulation resistance 100 M $\Omega$ @ 500 V DC, per IEC60255-5
AI A to D Resolution	16 Bit (including sign)
AI Accuracy	$\pm 0.1\%$ of full scale @ -40°C to +70°C
AI Sampling Time	10 mSec @ 50 Hz filtering 8.33 mSec @ 60 Hz filtering
AI Smoothing	Selectable input averaging: 1, 2, 4, 8, 16, 32, 64 or 128 samples (x10 mS)
Permitted Potential between Inputs	75 V DC, 60 V AC (RMS)
AI Input Impedance	$\pm 20$ mA input: Rin < 250 $\Omega$ $\pm 5$ V input: Rin > 1 M $\Omega$
AI Crosstalk Rejection	Better than 80 dB between any pair of inputs
AI Temperature Stability	Better than $\pm 25$ PPM/°C
AI Interference Suppression	Selectable 50 or 60 Hz filtering, Common mode rejection > 80 dB, Differential mode rejection > 50 dB
24 V DC Output	Supports one optional isolated 24V Plug-in Power Supply
Diagnostics LEDs	AO - Voltage mode LED, Current mode LED, Calibration LED per channel AI - Overflow and Underflow LED per each input, 24V Plug-in status LED The module Overflow and Underflow levels can be configured to: $\pm 20$ mA/4-20 mA or $\pm 5$ V/0-5 V/1-5 V General - Module error LED
AI Input Isolation	1.5 kV between input and module logic
AI Input Insulation	Insulation resistance 100 M $\Omega$ @ 500 V DC, per IEC60255-5
User Connection	4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG
Cable & TB Holder	40 Wire Cable with Terminal Block Holder connector, 26 AWG
Module Replacement	Hot swap replacement– module extraction/insertion under voltage
Operating Voltage	10.5-16 V DC and 3.3 V DC (from the motherboard connector)
Power Consumption	See ACE3600 Maximum Power Ratings below.
Dimensions	37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D)
Weight	Approx. 0.34 Kg (0.75 Lb)

**16/32 DIGITAL OUTPUT/DIGITAL INPUT MODULES (16/32 DO/DI)**

Total Number of Inputs/Outputs	16/32
I/O Arrangement	2/4 groups of 8 I/Os with shared common Each group can be configured to function as FET DO or dry contact DI
Counter Inputs	20 first inputs can be used as counter inputs
Counter Input Frequency	0 - 1 KHz, minimum pulse width 500 $\mu$ S
Max. DC Input Voltage	Max. 30 V DC (relative to input common)
Input "ON" Resistance	0-4 k $\Omega$
Input "OFF" Resistance	$\geq$ 50 k $\Omega$
Fast Capture Resolution	1 mS (Interrupt upon change of state)
Event Time Tagging Resolution	1 mS (Interrupt upon change of state)
Input Current	Max. 0.3 mA (when the input is shorted)
Input Filtering	0 to 50.8 mS (programmable in 0.2 mSec steps) Not relevant, minimum allowed is 1mSec
Counter Input Filtering	0 to 12.75 mS (programmable in 0.05 mSec steps) Not relevant, minimum allowed is 1mSec
Output Type	MOSFET
Output Voltage Range	5-30 V DC (user-supplied voltage)
DO Frequency	Max. 1 KHz (resistive load)
DO Output current	Max. 500 mA sink current (resistive load)
Output Fail State	Configurable output state on CPU fail: On, Off or 'last value'
Diagnostics LEDs	LED per each input/output status, module error LED
User Connection	4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG
Cable & TB Holder	20 or 40 Wire Cable with Terminal Block Holder connector, 26 AWG
Module Replacement	Hot swap replacement– module extraction/insertion under voltage
Input/Output Isolation	2.5 kV between input/output and module logic
Input Insulation	Insulation resistance 100 M $\Omega$ @ 500 V DC per IEC60255-5
Operating Voltage	10.8-16 V DC and 3.3 V DC (from the motherboard connector)
Power Consumption	See ACE3600 Maximum Power Ratings below.
Dimensions	37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D)
Weight	Approx. 0.25 Kg (0.55 Lb)

**MIXED I/O 16DI + 4DO + 4AI MODULES**

Total Number of Inputs/Outputs	16 Digital Inputs + 4 EE Relay Outputs + 4 Analog Inputs, $\pm 20$ mA 16 Digital Inputs + 4 ML Relay Outputs + 4 Analog Inputs, $\pm 20$ mA
I/O Arrangement	1 group of 16 DIs with shared common, 4 relay outputs - Form C, 4 isolated analog inputs
DI Counter Inputs	The first 12 inputs can be configured as fast counters.
DI Frequency	0 - 1 KHz
DI Fast Counter Frequency	0 - 5 KHz minimum pulse width 100 $\mu$ S
DI Max. DC Voltage	Max. 40 V DC
DI "ON" DC Voltage Range	+11 to +30 V DC, -30 to -11 V DC
DI "OFF" DC Voltage Range	-5 to +5 V DC
DI Current	6-10 mA
Fast Capture Resolution	1 mS (Interrupt upon change of state)
Event Time Tagging Resolution	1 mS (Interrupt upon change of state)
DI Filtering	0 to 50.8 mS (DC, programmable in 0.2 mSec steps)
DI Counter Filtering	0 to 12.75 mS (programmable in 0.05 mSec steps for inputs configured as high speed counters)
DO Contact Voltage Ratings	Max. 60 V DC or 30 V AC RMS (42.4 V peak).
DO Contact Power Ratings	2A @ 30 V DC, 0.6A @ 60V DC or 0.6A @ 30V AC (resistive load)
DO Relay Back Indication	Contact position - hardware back indication
DO Fail State	Configurable relay state on CPU fail: On, Off or 'last value'
AI Resolution	16 Bit (including sign)
AI Accuracy	$\pm 0.1\%$ @ -40°C to +70°C
AI Sampling time	10 mSec @ 50 Hz filtering, 8.33 mSec @ 60 Hz filtering
AI Smoothing	Selectable input averaging: 1, 2,4,8, 16, 32, 64 or 128 samples (x10 mS)
AI max. Potential between Als	75 V DC, 60 V AC (RMS)
AI Impedance	Rin < 250 $\Omega$
AI Crosstalk Rejection	Better than 80 dB between any pair of inputs
AI Temperature Stability	Better than $\pm 25$ PPM/°C
AI Interference Suppression	Selectable 50 or 60 Hz filtering, common mode rejection > 80 dB, differential mode rejection > 50 dB
Diagnostics LEDs	LED per each input/output status, module error LED, 24V Plug-in status LED
24 V DC Output	Supports one isolated 24V plug-in "Wetting" Power Supply
User Connection	4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG
Cable & TB Holder	40 Wire Cable with Terminal Block Holder connector, 26 AWG
Module Replacement	Hot swap replacement– module extraction/insertion under voltage
Input / Output Isolation	DI: 2.5 kV RMS between input and module logic per IEC60255-5 DO: Between open contacts: 1kV, between output and module logic: 1.5 kV, per IEC60255-5 AI: 1.5 kV between input and module logic per IEC60255-5
Input Insulation	Insulation resistance 100 M $\Omega$ @ 500 V DC per IEC60255-5
Operating Voltage	10.8-16 V DC and 3.3 V DC (from the motherboard connector)
Power Consumption	See ACE3600 Maximum Power Ratings below. EE Relay on : 0.2 W typical (15 mA @ 13.8 V DC at PS) (Not including 24 V Plug-in Power Supply)
Dimensions	37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D)
Weight	Approx. 0.31 Kg (0.68 Lb)

**EXPANSION POWER SUPPLY MODULE**

Input Voltage	DC 10.8-16 V
Outputs	To Motherboard connector – +10.80 to +16.00 VDC, max. 4A To cascaded expansion power supply - +10.80 to +16.00 VDC, max. 8A
Over Current Protection	4.0 A (Slow blow fuse), protecting the expansion frame 8.0 A (Slow blow fuse), protecting the cascaded expansion power supply
Maximum Current via Power IN/OUT circuit	8.0 A (Slow blow fuse)
Over Voltage Protection	+17.00 ±1 VDC (protecting the expansion frame)
Absolute Maximum Voltage	+18.00 VDC
Dimensions	56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D)
Weight	Approx. 0.43Kg (0.94 Lb)

**EXPANSION MODULE**

Microprocessor	Freescale – Power PC II, MPC8720, 32-bit
Microprocessor Clock	200 MHz
Serial Port	RS232C Asynch, Full Flow Control port, up to 230.4 kb/s; used for STS only
Ethernet Port	10/100 Mb/s – connection to the main frame
LAN Cable	Category 5E shielded (FTP), up to 50 meter
LEDs Display	4 CPU diagnostic LEDs, Port status LEDs and Expansion Address LEDs
Power Consumption	See ACE3600 Maximum Power Ratings below.
Operating Voltage	10.8-16 V DC (from the motherboard connector)
Dimensions	56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D)
Weight	Approx. 0.38 Kg (0.84 Lb)

**EXPANSION LAN SWITCH**

Ethernet Port 1-8	8 on board 10/100 Mb/s Ethernet ports (Auto crossover)
LEDs Display	Error LED, Port status LEDs
Power Consumption	See ACE3600 Maximum Power Ratings below.
Module Replacement	Hot swap replacement – module extraction/insertion under voltage
Operating Voltage (from the motherboard connector)	10.8-16 V DC, 3.30 VDC +/-10%
User Connection (Ethernet Ports)	8 shielded RJ45 connectors
LAN Cable	Category 5E shielded (FTP), up to 50 meter
Operating Voltage	10.8-16 V DC (from the motherboard connector)
Dimensions	37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D)
Weight	Approx 0.32 Kg (0.7 Lb)

**ACE3600 MAXIMUM POWER RATINGS**

The tables below list the typical maximum power consumption (at room temperature) for each of the ACE3600 RTU building blocks (CPU, Power Supply, I/O modules, radios, etc.) and the maximum peak power allowed for a fully loaded RTU, based on the housing type.

The values in the tables below are derived by using the power supply (AC: 100 to 240 VAC or DC: 18 to 72 VDC and 13.8 VDC) and have the power supply efficiency factor included in them.

Before deploying your RTU, add up the power consumption of all components of your system to verify that it is within the maximum peak power for your housing type. In systems with I/O expansion, consider all modules which consume power from their respective AC/DC main power sources when calculating the required power requirements.

**Maximum Peak Power Allowed for Fully Loaded RTU**

Housing Type Description	Maximum Input Power into Power Supply Module (Watts)
19" Rack (w/out metal enclosure)	100
Large NEMA metal housing (50x50 cm)	120*
Small NEMA metal housing (40x40 cm)	105*

**Power Consumption per RTU Module**

Module Name	Self Power Consumption, no active I/O (Watts)	Maximum Power Consumption, per Active I/O (Watts)	Self Power Consumption, no active I/O (Watts)	Maximum Power Consumption, per Active I/O (Watts)	Maximum Power Consumption, all I/Os, LEDs Active (Watts)
	<b>AC: 100 to 240 VAC DC: 18 to 72 VDC</b>		<b>Vin = +13.8 VDC</b>		
Power Supply (maximum)	12.60	N/A	2.20 (156 mA) (12 VDC Power Supply Module ONLY)	N/A	N/A
Power Supply (Expansion)	0.0	N/A	0.0	N/A	N/A
CPU (3640/3610)	5.20	N/A	4.20 (304 mA)	N/A	4.00 (290 mA)
Expansion Module	5.20	N/A	4.20 (304 mA)	N/A	4.00 (290 mA)
Expansion LAN Switch	1.50	0.220	1.20 (87 mA)	0.176 (12.75 mA)	3.10 (225 mA) (x8 ports ON)
Digital Input Fast 24V (x16/x32)	0.100	0.100 (powered by internal 24V PS)	0.080 (5.8 mA)	0.100 (7 mA) (powered by internal 24V PS)	3.50 (254 mA) (x32 inputs ON powered by x1 internal 24V PS)
Digital Input Fast 24V IEC Type 2 (x16/x32)	0.100	0.230 (powered by internal 24V PS)	0.080 (5.8 mA)	0.230 (17 mA) (powered by internal 24V PS)	8.20 (594 mA) (x32 inputs ON powered by x2 internal 24V PS)
Digital Input 120/230V	0.100	0.015	0.080 (5.8 mA)	0.012 (1 mA)	0.524 (38 mA) (x16 inputs ON)
Digital Output ML Relay (x8/x16)	0.120	0.010	0.100 (7.2 mA)	0.008 (0.5 mA)	0.483 (35 mA) (x16 relays ON)
Digital Output EE Relay (x8/x16)	0.170	0.200	0.136 (10 mA)	0.160 (11.6 mA)	3.26 (236 mA) (x16 relays ON)
Digital Output ML Relay 120/230V	0.200	0.006	0.160 (11.6 mA)	0.005 (0.4 mA)	0.248 (18.0 mA) (x12 relays ON)
Digital Output EE Relay 120/230V	0.290	0.260	0.232 (17 mA)	0.210 (0.15 mA)	3.12 (226 mA) (x12 relays ON)

Module Name	Self Power Consumption, no active I/O (Watts)	Maximum Power Consumption, per Active I/O (Watts)	Self Power Consumption, no active I/O (Watts)	Maximum Power Consumption, per Active I/O (Watts)	Maximum Power Consumption, all I/Os, LEDs Active (Watts)
	<b>AC: 100 to 240 VAC DC: 18 to 72 VDC</b>		<b>Vin = +13.8 VDC</b>		
FET Digital Output/Digital Input	0.120	DI = 0.014 (per input channel) DO = 0.014 (per output channel)	0.100 (7.2 mA)	DI = 0.011 (per input channel) DO = 0.011 (per output channel)	0.552 (40 mA) (x32 LEDs/ inputs ON)
Mixed I/O (DO ML +DI IEC Type 2)	0.480	DI = 0.250 (powered by internal 24V PS) DO = 0.010	0.384 (28 mA)	DI = 0.250 (powered by internal 24V PS) DO = 0.008	4.70 (341 mA) (x4 relays ON, x16 inputs ON, x4 AI ON, powered by internal 24V PS)
Mixed I/O (DO EE + DI IEC Type 2)	0.480	DI = 0.250 (powered by internal 24V PS) DO = 0.200	0.384 (28 mA)	DI = 0.250 (powered by internal 24V PS) DO = 0.160	5.50 (400 mA) (x4 relays ON, x16 inputs ON, x4 AI ON, powered by internal 24V PS)
Analog Output	1.10	0.600 (per output channel @20.0 mA)	0.880 (64 mA)	0.480 (35 mA) (per output channel @20.0 mA)	3.33 (241 mA) (x4 outputs sourcing 20.0 mA)
Mixed Analog Current/Voltage	1.40	0.600 (per output channel @20.0 mA)	1.12 (81 mA)	0.480 (35 mA) (per output channel @20.0 mA)	3.61 (261 mA) (x4 outputs sourcing 20.0 mA)
Analog Input Current/Voltage (x8/x16)	0.530	N/A	0.440 (32.0 mA)	N/A	0.870 (63.0 mA)
24V Floating Plug-In Power Supply (No load)	0.410	N/A	0.328 (24 mA)	N/A	N/A
24V Floating Plug-In Power Supply (externally loaded 150 mA)	4.80	N/A	3.84 (278 mA)	N/A	N/A

## Ordering Information

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Note: For detailed ordering information, refer to the ACE3600 Catalog.

### ACE3600 MODELS

All RTU models include no I/O slots frame, 10.8-15.5 V DC PS and CPU3610. All radio models require Metal Chassis or Housing option.

#### No Radio Model

- ACE3600 Basic Model No Radio F7509

#### Conventional VHF Radio Models

- ACE3600 CM200/CM140/EM200/GM3188 VHF F7573
- ACE3600 with CDM750 136-174 MHz F7563
- ACE3600 with HT750/GP320/GP328 /PRO5150 VHF F7553

#### Conventional UHF Radio Models

- ACE3600 with CM200/CM140/EM200/GM3188 UHF F7574
- ACE3600 with CDM750 403-512 MHz F7564
- ACE3600 with HT750/GP320/GP328 /PRO5150 UHF F7554

#### Analog Trunked VHF Radio Models

- ACE3600 with XTL2500 136-174 MHz Analog F7533
- ACE3600 with XTL2500 136-174 MHz Digital F7593
- ACE3600 with XTS2500 136-174 MHz Digital F7543

#### Trunked UHF Radio Models

- ACE3600 with XTL2500 380-520 MHz Analog F7534
- ACE3600 with XTL2500 380-520 MHz Digital F7594
- ACE3600 with XTS2500 380-520 MHz Digital F7544

#### Trunked 800 MHz Radio Models

- ACE3600 with XTL2500 800 MHz Analog F7538
- ACE3600 with XTL2500 800 MHz Digital F7598
- ACE3600 with XTS2500 800 MHz Digital F7548

#### I/O Expansion

- ACE3600 Expansion Frame Unit F7510

#### Software Tools

- ACE3600 System Tools Suite (STS) F7500
- ACE3600 C Toolkit (CTK) F7600
- ACE3600 Enhanced PID FVN5680

#### STS add-on Software

- ACE3600 AGA 7+8 CD FVN5510
- ACE3600 DNP 3.0 Plus Master Drivers CD FVN5511
- ACE3600 DNP 3.0 Plus Slave Drivers CD FVN5512
- ACE3600 IEC60870-5-101 Slave driver CD FVN5513

**ACE3600 OPTIONS****Regional Radio Options****CM200/CM140/EM200/CM3188**

One of the following options must be ordered for models F7573 and F7574:

- CM200 V851
- CM140 V852
- GM3188 V853
- EM200 V854

**HT750/GP320/GP328/PRO5150**

One of the following options must be ordered for models F7553 and F7554.

- HT750 V951
- GP320 V952
- GP328 V953
- PRO5150 V954

**Frames**

- 3 I/O slots frame V103
- 5 I/O slots frame V105
- 7 I/O slot frame V107
- 8 I/O slots frame V108
- 19" rack brackets for 8 I/O slots frame V051

**Metal Chassis**

- 48 x 48 cm Metal Chassis (up to 7 I/O slots) V056
- 38 x 38 cm Metal Chassis (up to 3 I/O slots) V214
- 8 I/O (19") Metal Chassis V269

**Housing**

- 50 x 50 cm Metal Housing (up to 7 I/O slots) V228
- 50 x 50 cm Metal Housing with padlock accessory VA00405
- 40 x 40 cm Metal Housing (up to 3 I/O slots) V276
- 40 x 40 cm Metal Housing with padlock accessory VA00406
- Housing Tamper Switch V224

**Power Supply, Battery Charger and Backup Battery**

*Note: The default PS is 10.8-16 V DC input*

- AC Power Supply 100-240 V V346
- AC PS 100-240 V with Battery charger V261
- DC Power Supply 18-72 V V251
- DC PS 18-72 V with Battery charger V367
- DC Low Tier PS 10.8 -16 V V149
- 6.5 Ah Backup Battery V114
- 10 Ah Backup Battery V328

**CPU Upgrade**

*Note: The default CPU is CPU3610*

- ACE CPU3640 V446

**CPU Plug-in Ports / Memory**

- Plug-in RS-232 Port V184
- Plug-in RS 485 Port V440
- Plug-in Ethernet 10 M Port V204
- Plug-in Ethernet 10/100 M Port V212
- Plug-in Radio Port VA00362
- Plug-in 4 MB SRAM V447

**Digital Input Modules**

- 16 DI FAST 24V DC V265
- 32 DI FAST 24V DC V379
- 16 DI FAST 24V IEC TP2 V117
- 32 DI FAST 24V IEC TP2 V959
- 16 DI 120/230V VA00331AA

**Relay Output Modules**

- 8 DO EE relay 2A V508
- 16 DO EE relay 2A V616
- 8 DO ML relay 2A V314
- 16 DO ML relay 2A V516
- 12 DO EE 120/230V VA00348
- 12 DO ML 120/230V VA00332

**Analog Modules**

- 8 AI  $\pm 20$  mA V318
- 16AI  $\pm 20$  mA V463
- 8 AI  $\pm 5$  V V741
- 16AI  $\pm 5$  V V742
- 4 AO V118
- 4 AO / 8 AI (AI =  $\pm 20$  mA) V562
- 4 AO / 8 AI (AI =  $\pm 5$  V) V460

**Mixed Input/Output Modules**

- 16 DI/DO FET V480
- 32 DI/DO FET V481
- 16 DI 4 DO EE 4 AI,  $\pm 20$  mA V245
- 16 DI 4 DO ML 4 AI,  $\pm 20$  mA V453

**I/O Modules Cables and Accessories**

- 20 wire cable with TB holder 3 m V253
- 30 wire cable with TB holder 3 m V202
- 40 wire cable with TB holder 3 m V358
- 20 pin TB holder kit V158
- 30 pin TB Holder kit V203
- 40 pin TB holder kit V153
- Blank I/O module V20

**I/O Expansion**

- Expansion LAN Switch VA00226
- LAN Cable 60cm length V529
- LAN Cable 2m length V648
- LAN Cable 3m length V666
- LAN Cross Cable V665

**Communications Interface**

- RS-485 Junction Box V186

**Radio Installation Kits**

- CM200/CM140/EM200/GM3188 Installation kit V148
- CDM750 Installation kit V143
- HT750/GP320/GP328 /PRO5150 Installation kit V154
- XTL5000/XTL2500 Digital Installation kit V681
- XTL5000/XTL2500 Analog Installation kit V157
- XTS2500 Digital Installation kit V156
- MDS X710/9810 installation kit V152
- MDS iNET900/Transnet Installation Kit V680
- Transnet 900 OEM Installation Kit VA00225

**Software License (RTU options)**

- 3<sup>rd</sup> Party Protocol License (ModBus, DF1) V377
- AGA 8 License V284
- DNP3 License master/slave - RTU V283
- IEC 60870-5 License V242

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Batteries
<b>Location:</b>	Battery Compartment
<b>Model Numbers:</b>	NP 7 12
<b>Manufacturer:</b>	Yuasa
<b>Supplier:</b>	Battery Specialties 6/10 Argon St Sumner Park (07) 3279 4375

# NP SERIES - NP7-12

## Reliability is your Security

Utilizing the latest advance design Oxygen Recombination Technology, Yuasa have applied their 80 years of experience in the lead acid battery field to produce the optimum design of Sealed Lead Acid batteries.

### FEATURES

- Superb recovery from deep discharge.
- Electrolyte suspension system.
- Gas Recombination.
- Multipurpose: Float or Cyclic use.
- Usable in any orientation
- Superior energy density.
- Lead calcium grids for extended life.
- Manufactured World wide.
- Application specific designs.

### Technical Features

#### Sealed Construction

Yuasa's unique construction and sealing technique ensures no electrolyte leakage from case or terminals.

#### Electrolyte Suspension System

All NP batteries utilize Yuasa's unique electrolyte suspension system incorporating a microfine glass mat to retain the maximum amount of electrolyte in the cells. The electrolyte is retained in the separator material and there is no free electrolyte to escape from the cells. No gels or other contaminants are added.

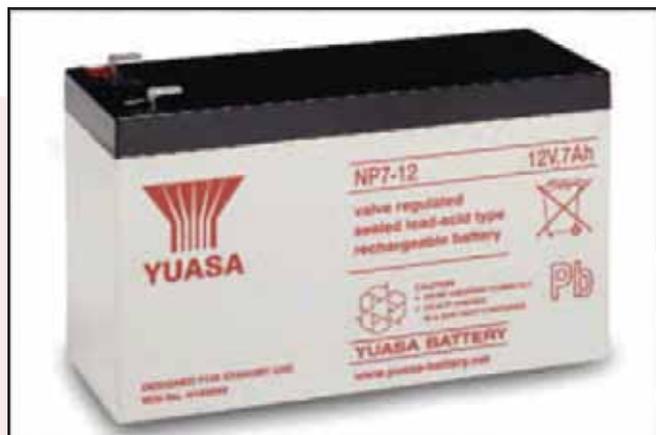
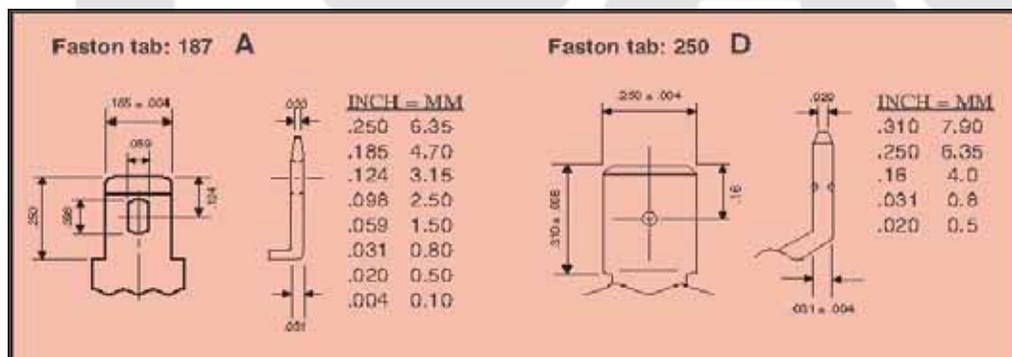
#### Control of Gas Generation

The design of Yuasa's NP batteries incorporates the very latest oxygen recombination technology to effectively control the generation of gas during normal use.

#### Low Maintenance Operation

Due to the perfectly sealed construction and the recombination of gasses within the cell, the battery is almost maintenance free.

### Terminals



### Terminals

NP batteries are manufactured using a range of terminals which vary in size and type. Please refer to details as shown.

### Operation in any Orientation

The combination of sealed construction and Yuasa's unique electrolyte suspension system allows operation in any orientation, with no loss of performance or fear of electrolyte leakage.

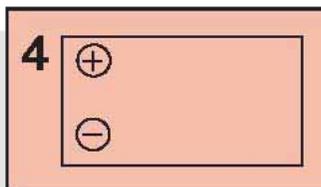
### Valve Regulated Design

The batteries are equipped with a simple, safe low pressure venting system which releases excess gas and automatically reseals should there be a build up of gas within the battery due to severe overcharge. Note. On no account should the battery be charged in a sealed container.

### General Specifications

Nominal Capacity (Ah)	NP7-12
20hr to 1.75vpc 30°C	7
1 0hr to 1.75vpc 20°C	6.4
5hr to 1.70vpc 20°C	5.9
1 hr to 1.60vpc 20°C	4.2
Voltage	12
Energy Density (Wh.L.20hr)	91
Specific Energy (Wh.kg.20hr)	32
Int. Resistance (m.Ohms)	25
Maximum discharge (A)	40/75
Short Circuit current (A)	210
<b>Dimensions (mm)</b>	
Length	151
Width	65
Height overall	97.5
Weight (Kg)	2.65
Terminal	A/D
Layout	4
Terminal Torque Nm	-

### Layout



# NP SERIES - NP7-12

## Lead Calcium Grids

The heavy duty lead calcium alloy grids provide an extra margin of performance and life in both cyclic and float applications and give unparalleled recovery from deep discharge.

## Long Cycle Service Life

Depending upon the average depth of discharge, over a thousand discharge/charge cycles can be expected.

## Float Service Life

The expected service life is five years in float standby applications.

## Separators

The use of the special separator material provides a very efficient insulation between plates preventing inter-plate short circuits and prohibiting the shedding of active materials.

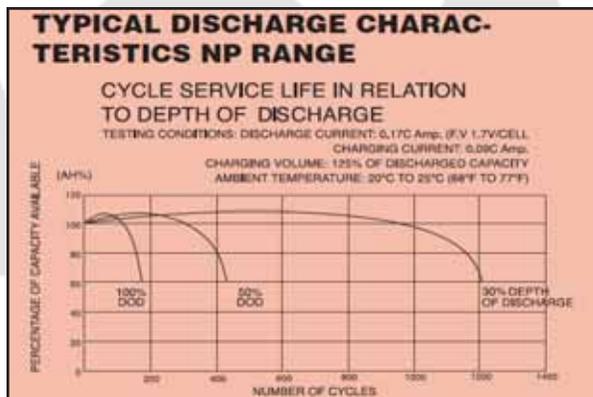
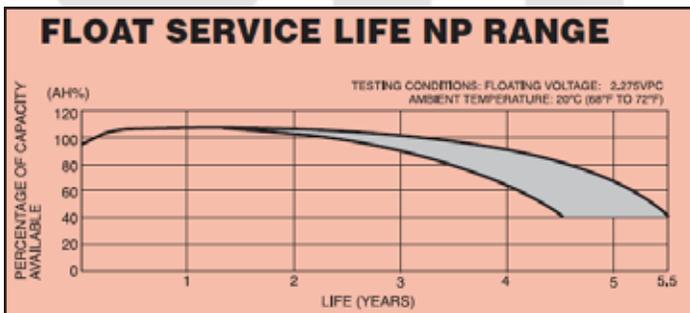
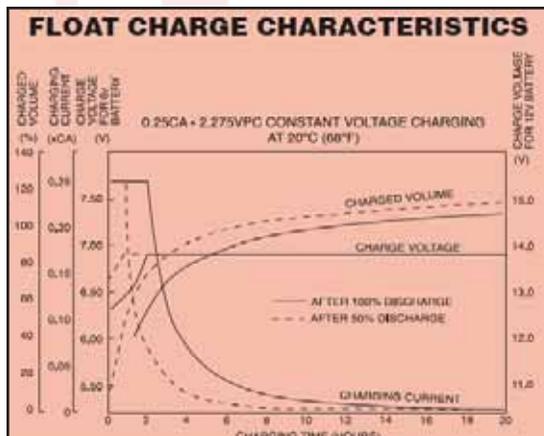
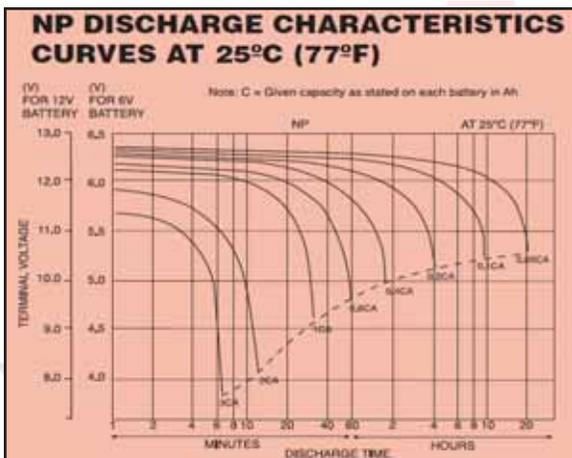
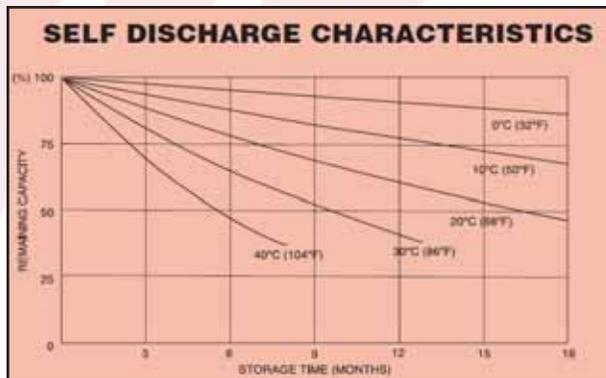
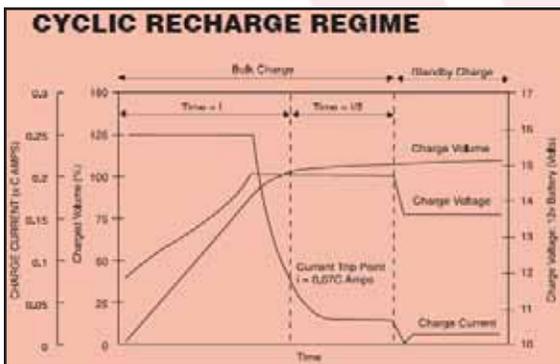
## Long shelf Life

The extremely low self discharge rate allows the battery to be stored for extended periods up to one year at normal ambient temperatures with no permanent loss of capacity.

## Operating Temperature Range

The batteries can be used over a broad temperature range permitting considerable flexibility in system design and location.

- Charge – 15°C to 50°C
- Discharge – 20°C to 60°C
- Storage – 20°C to 50°C (fully charged battery)

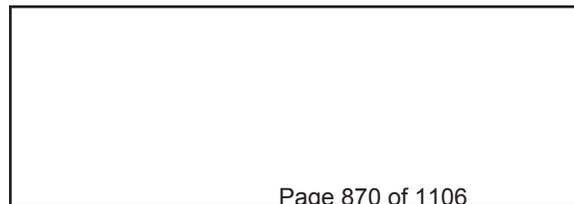


**Yuasa Battery Inc.**  
2901 Montrose Ave  
Laureldale, PA 19605  
www.yuasabatteries.com

Registered number 1548820

Cat. No. NP7-12 January 16 Active: 30/09/2015

Distributed by



# TECHNICAL DATA SHEET

**Equipment Type:**

LED Lights

**Location:**

**Model Numbers:**

Lumifa LF1B-N Series

**Manufacturer:**

IDEC

**Supplier:**

IPD Australia Pty Ltd  
Unit 17  
104 Ferntree Gully Road  
Oakleigh, Victoria 3166,

Ph: 03 8523 5900

Fax: 03 8523 5999

Web: [www.idec.com](http://www.idec.com)

Think Automation and beyond...



# LF1B Series

## LED Illumination Units

LUMIFA™

Low heat generation.  
Four lengths & four illumination colors available.

Heat generation reduced by 70%\*

Slim, space-saving design (only 16mm thick)

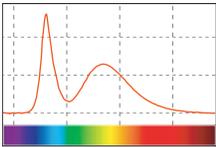
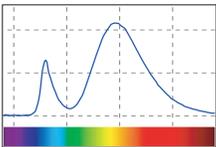
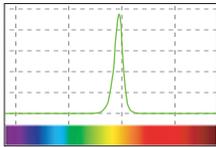
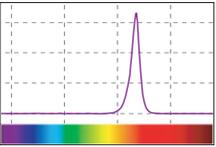
Less power consumption & 71% less CO<sub>2</sub> emission\*

5 times longer life\*

\*Compared to 20W fluorescent lamps.

IDEC CORPORATION

## Illumination Colors & Application Examples

Illumination Color	Cool White	Warm White	Yellow	Red
Power Voltage	24V DC			
Appearance	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div>			
Spectrum	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div>			
Features	Suppressing glare, the bright, clear cool white illumination color lights up a target object clearly. This illumination color gives off a color temperature of 5500K.	Warm color similar to that of incandescent lamps. This illumination color gives off a color temperature of 2800K.	Yellow illumination color gives off an emission spectrum with a dominant wavelength of 590 nm.	Red illumination color gives off an emission spectrum with a dominant wavelength of 625 nm.
Applications	<ul style="list-style-type: none"> <li>Control panel</li> <li>Plant equipment</li> <li>Refrigerator/freezer</li> <li>Inspection/test equipment</li> <li>Advertising display/board</li> <li>Machine tool</li> </ul> 	<ul style="list-style-type: none"> <li>Food processing machines</li> <li>Cosmetic plants</li> <li>Chemical plants</li> <li>Showcases</li> <li>Food display cases</li> </ul> 	<ul style="list-style-type: none"> <li>Manufacturing equipment</li> <li>IC foundries</li> </ul> 	<ul style="list-style-type: none"> <li>Photosensitive materials</li> <li>Semiconductor manufacturing equipment</li> </ul> 

### Features

- Brightness: 62.5 Lumens/Watt
- Low heat generation.
- Less energy usage, longer operation life, smaller mounting space, and no electrical noise.
- 71% reduction of power and CO<sub>2</sub> emission when compared to 20W fluorescent lamps (LF1B-C/D)
- Thin and slim style fits into compact spaces.
- Two cover colors: clear and white (diffused light)
- Cool white, warm white, yellow and red illumination colors available.
- UL Listed & IP54 protection against dust and water splash (IEC 60529)



### Part No. Development

LF1B- C 3 S - 2 THWW4

<p><b>LED Module Arrangement</b></p> <p>A: 3 LEDs x 1 row                  B: 6 LEDs x 1 row                  C: 12 LEDs x 1 row                  D: 24 LEDs x 1 row</p>	<p><b>Rated Voltage</b> 2: 24V DC</p> <p><b>Degree of Protection</b> S: IP54</p> <p><b>Cover</b> 3: Clear plastic 4: White plastic</p>	<p><b>LED Illumination Color</b></p> <p>THWW4: Cool white                  TLWW4: Warm white                  SHY6: Yellow                  SHR6: Red</p>
--	--	---

### LED Optics Specifications

Illumination Color	Cool White	Warm White	Yellow	Red
Luminous Intensity (typ.) (Single LED module)	5000 mcd	4500 mcd	2300 mcd	1800 mcd
Color Temperature (typ.)/Dominant Wavelength (typ.)	5500K	2800K	590 nm	625 nm
Reference Illuminance (typ.) at 500 mm (clear cover)	3 LEDs x 1 row	90 lx	60 lx	20 lx
	6 LEDs x 1 row	170 lx	110 lx	40 lx
	12 LEDs x 1 row	330 lx	200 lx	75 lx
	24 LEDs x 1 row	560 lx	350 lx	125 lx

Note: Illumination colors and illuminance may vary. Specifications shown in the above table are typical values and may vary depending upon actual environment.

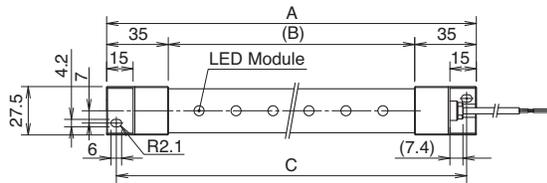
## LF1B Series Illumination Units

### Performance Specifications

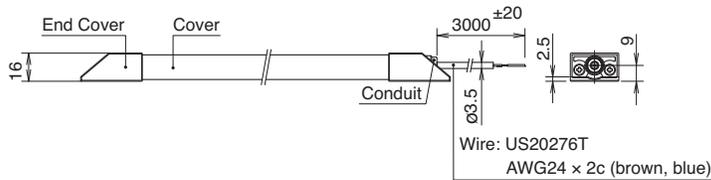
Rated Voltage	24V DC (non-polarized)	
Input Current (typ.) (at the rated voltage)	LF1B-A	30mA
	LF1B-B	60mA
	LF1B-C	120mA
	LF1B-D	240mA
Power Consumption (typ.) (at the rated voltage)	LF1B-A	0.8W
	LF1B-B	1.5W
	LF1B-C	2.9W
	LF1B-D	5.8W
Insulation Resistance	100MΩ minimum (500V DC megger)	
Dielectric Strength	1000V AC, 1 minute (between live and dead parts)	
Vibration Resistance (damage limits)	Frequency: 5 to 55 Hz Amplitude: 0.5 mm	
Shock Resistance (damage limits)	1000m/s <sup>2</sup>	
Operating Temperature	-30 to +55°C (no freezing)	
Operating Humidity	45 to 85% RH (no condensation)	
Storage Temperature	-35 to +70°C (no freezing)	
Operating Atmosphere	No corrosive gas	
Life	40000 hours (The total illumination duration in which the luminance maintains a minimum of 70% of the initial value.)	
Degree of Protection	IP54	
Material	End cover, conduit: polyamide Cover: polycarbonate Wire: US20276T AWG24 x 2C	
Weight (approx.)	LF1B-A	95g
	LF1B-B	125g
	LF1B-C	165g
	LF1B-D	255g

- Do not use the LF1B illumination units in environments subject to corrosive gases, otherwise illuminance may deteriorate.

### Dimensions

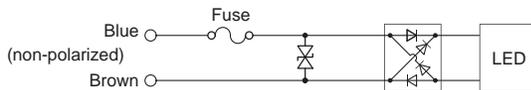


Type No.	A	B	C
LF1B-A	134	64	123
LF1B-B	210	140	199
LF1B-C	330	260	319
LF1B-D	580	510	569



All dimensions in mm.

### Internal Circuit



# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Radio Power Supply
<b>Location:</b>	RTU Section
<b>Model Numbers:</b>	PBIH
<b>Manufacturer:</b>	Powerbox
<b>Supplier:</b>	Powerbox Australia Pty Ltd 433 Logan Road Stones Corner, QLD 4120  Ph: 07 3394 8372 Fax: 07 3394 8373 Web: <a href="http://www.powerbox.com.au">www.powerbox.com.au</a>

# PBIH Series

15-150 WATTS DC/DC SINGLE OUTPUT

DC-DC CONVERTERS

## FEATURES

- Wide selection of models
- 4 input voltage ranges
- High efficiency
- Low output ripple
- Proven reliability
- Good thermal margins

## SPECIFICATIONS

INPUT	
Input voltage	12VDC (9.2–16) 24VDC (19–32) 48VDC (38–63) 110VDC (85–140)
Inrush current	20A max. for 110V only
OUTPUT	
Output voltage	See table
Voltage adjustment	±10%, ±5% for PBIH-F
Output current	See table
Ripple & noise	Output Volts x 1% + 50mV to -100mV pk-pk
Line regulation	0.8% over input range
Load regulation	0.9%, 0%–100% load
Temperature coefficient	0°C to 50°C, 0.03% per °C
Overvoltage protection	O.V. clamp, PBIH-F Output shutdown, PBIH-G, J, M, R – input must be switched off for at least 30S to reactivate
Overcurrent protection	Fold back – PBIH-F Current limiting, PBIH-G, J, M, R (PBIH-R series is adjustable); PBIH110xxR models are not adjustable
Drift	Output V x 0.5% + 15(mV) per 8 hrs after 1 hr warm-up
Rise Time	200ms max. – PBIH-F, M, R 100ms max. – PBIH-G, J (at 25°C)
Holdup time	10ms (only 110V input)
Remote sense	PBIH-R Series only



OPERATING	
Efficiency	70%–89%
Safety isolation (1 minute)	Type – 12, 24, 48V input Input – Output: 1500VAC Input– Case: 1500VAC Output– Case: 500VAC Type– 110V input Input– Output: 2000VAC Input– Case: 2000VAC Output– Case: 500VAC
Insulation resistance	50M $\Omega$ (500VDC) Input – Case
Parallel operation	Consult sales office for details
Remote control	PBIH-R Series: Open link: output normal Short link: output off
ENVIRONMENTAL	
Operating temperature	0°C to 70°C.
Temperature derating	Derate 100% load from 50°C - 70°C at 1.5% per °C to 30% load.
Cooling	Convection cooled
Storage temperature	-20°C to +85°C
Humidity	85%
Shock	30G, PBIH-F, G and J
Vibration	(5Hz–10Hz, 10mm), (10Hz–50Hz) 2G, PBIH-F, G and J
STANDARDS AND APPROVALS	
Safety	Designed to UL1950
C-Tick	AS/NZS CISPR11 Group 1, Class A
MECHANICAL	
Weight	PBIH-F : 250g PBIH-G : 380g PBIH-J : 410g PBIH-M : 800g PBIH-R : 1.4kg

# PBIH Series

## 15-150 WATTS DC/DC SINGLE OUTPUT

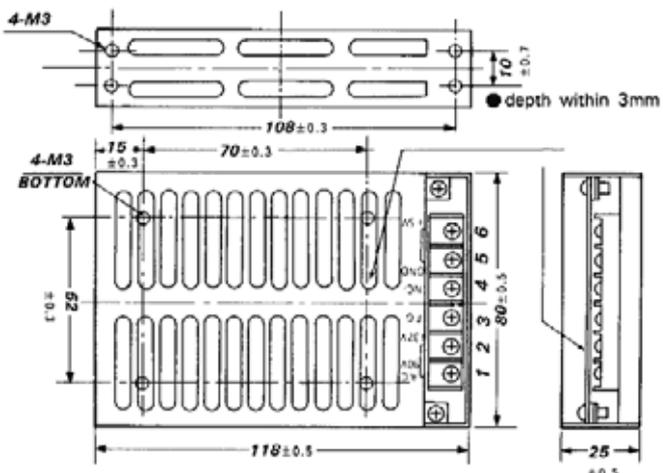
### SELECTION TABLE

MODEL NUMBER	INPUT	OUTPUT	OUTPUT POWER
PBIH-1205F	9.2-16V	5V 3A	15W
PBIH-1212F	9.2-16V	12V 1.2A	15W
PBIH-1215F	9.2-16V	15V 1A	15W
PBIH-1224F	9.2-16V	24V 0.62A	15W
PBIH-2405F	19-32V	5V 3A	15W
PBIH-2412F	19-32V	12V 1.2A	15W
PBIH-2415F	19-32V	15V 1A	15W
PBIH-2424F	19-32V	24V 0.62A	15W
PBIH-4805F	38-63V	5V 3A	15W
PBIH-4812F	38-63V	12V 1.2A	15W
PBIH-4815F	38-63V	15V 1A	15W
PBIH-4824F	38-63V	24V 0.62A	15W
PBIH-11005F	85-140V	5V 3A	15W
PBIH-11012F	85-140V	12V 1.2A	15W
PBIH-11015F	85-140V	15V 1A	15W
PBIH-11024F	85-140V	24V 0.62A	15W
PBIH-1205G	9.2-16V	5V 5A	25W
PBIH-1212G	9.2-16V	12V 2.1A	25W
PBIH-1215G	9.2-16V	15V 1.7A	25W
PBIH-1224G	9.2-16V	24V 1.1A	25W
PBIH-1248G	9.2-16V	48V 0.5A	25W
PBIH-2405G	19-32V	5V 5A	25W
PBIH-2412G	19-32V	12V 2.1A	25W
PBIH-2415G	19-32V	15V 1.7A	25W
PBIH-2424G	19-32V	24V 1.1A	25W
PBIH-2448G	19-32V	48V 0.5A	25W
PBIH-4805G	38-63V	5V 5A	25W
PBIH-4812G	38-63V	12V 2.1A	25W
PBIH-4815G	38-63V	15V 1.7A	25W
PBIH-4824G	38-63V	24V 1.1A	25W
PBIH-4848G	38-63V	48V 0.5A	25W
PBIH-11005G	85-140V	5V 5A	25W

MODEL NUMBER	INPUT	OUTPUT	OUTPUT POWER
PBIH-11012G	85-140V	12V 2.1A	25W
PBIH-11015G	85-140V	15V 1.7A	25W
PBIH-11024G	85-140V	24V 1.1A	25W
PBIH-11048G	85-140V	48V 0.5A	25W
PBIH-1205J	9.2-16V	5V 8A	40W
PBIH-1212J	9.2-16V	12V 3.3A	40W
PBIH-1215J	9.2-16V	15V 2.7A	40W
PBIH-1224J	9.2-16V	24V 1.7A	40W
PBIH-1248J	9.2-16V	48V 0.8A	40W
PBIH-2405J	19-32V	5V 10A	50W
PBIH-2412J	19-32V	12V 4.3A	50W
PBIH-2415J	19-32V	15V 3.4A	50W
PBIH-2424J	19-32V	24V 2.5A	50W
PBIH-2448J	19-32V	48V 1A	50W
PBIH-4805J	38-63V	5V 10A	50W
PBIH-4812J	38-63V	12V 4.3A	50W
PBIH-4815J	38-63V	15V 3.4A	50W
PBIH-4824J	38-63V	24V 2.5A	50W
PBIH-4848J	38-63V	48V 1A	50W
PBIH-11005J	85-140V	5V 10A	50W
PBIH-11012J	85-140V	12V 4.3A	50W
PBIH-11015J	85-140V	15V 3.4A	50W
PBIH-11024J	85-140V	24V 2.5A	50W
PBIH-11048J	85-140V	48V 1A	50W
PBIH-1205M	9.2-16V	5V 18A	100W
PBIH-1212M	9.2-16V	12V 9A	100W
PBIH-1215M	9.2-16V	15V 7A	100W
PBIH-1224M	9.2-16V	24V 4.5A	100W
PBIH-1248M	9.2-16V	48V 2A	100W
PBIH-2405M	19-32V	5V 20A	100W
PBIH-2412M	19-32V	12V 9A	100W
PBIH-2415M	19-32V	15V 7A	100W

MODEL NUMBER	INPUT	OUTPUT	OUTPUT POWER
PBIH-2424M	19-32V	24V 5A	100W
PBIH-2448M	19-32V	48V 2A	100W
PBIH-4805M	38-63V	5V 20A	100W
PBIH-4812M	38-63V	12V 9A	100W
PBIH-4815M	38-63V	15V 7A	100W
PBIH-4824M	38-63V	24V 5A	100W
PBIH-4848M	38-63V	48V 2A	100W
PBIH-11005M	85-140V	5V 20A	100W
PBIH-11012M	85-140V	12V 9A	100W
PBIH-11015M	85-140V	15V 7A	100W
PBIH-11024M	85-140V	24V 5A	100W
PBIH-11048M	85-140V	48V 2A	100W
PBIH-1205R	9.2-16V	5V 27A	150W
PBIH-1212R	9.2-16V	12V 13A	150W
PBIH-1215R	9.2-16V	15V 10A	150W
PBIH-1224R	9.2-16V	24V 6.5A	150W
PBIH-1248R	9.2-16V	48V 3.3A	150W
PBIH-2405R	19-32V	5V 30A	150W
PBIH-2412R	19-32V	12V 14A	150W
PBIH-2415R	19-32V	15V 11A	150W
PBIH-2424R	19-32V	24V 7A	150W
PBIH-2448R	19-32V	48V 3.5A	150W
PBIH-4805R	38-63V	5V 30A	150W
PBIH-4812R	38-63V	12V 14A	150W
PBIH-4815R	38-63V	15V 11A	150W
PBIH-4824R	38-63V	24V 7A	150W
PBIH-4848R	38-63V	48V 3.5A	150W
PBIH-11005R	85-140V	5V 30A	150W
PBIH-11012R	85-140V	12V 14A	150W
PBIH-11015R	85-140V	15V 11A	150W
PBIH-11024R	85-140V	24V 7A	150W
PBIH-11048R	85-140V	48V 3.5A	150W

### PBIH-F



• Dimensions in mm

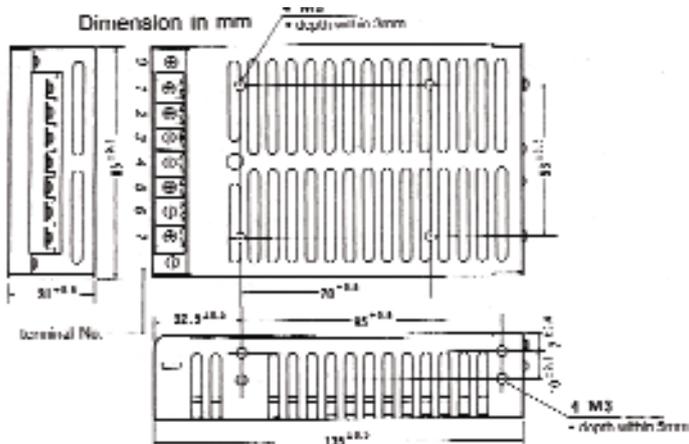
terminal No.	
1	0 V (DC in)
2	+V (DC in)
3	FG
4	NO Connection
5	-V out
6	+V out

# PBIH Series

15-150 WATTS SINGLE OUTPUT

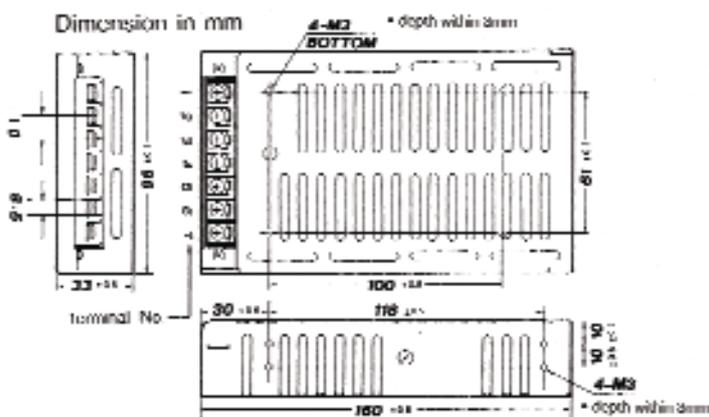
DC-DC CONVERTERS

## PBIH-G



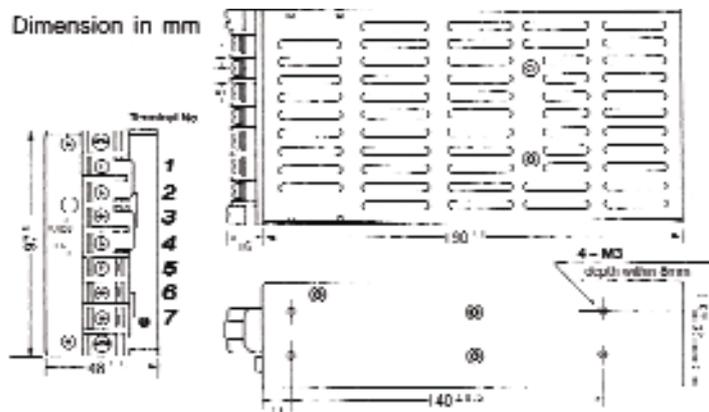
Terminal	Connection
0	FG
1	DC +V in
2	0V in
3	LFC
4	NO
5	NO
6	-V out
7	+V out

## PBIH-J



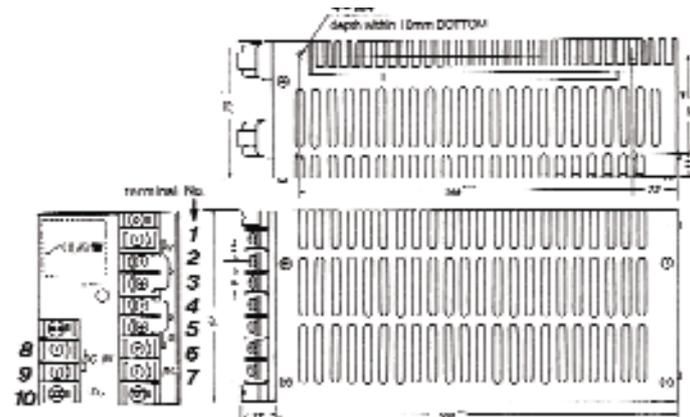
Terminal	Connection
1	FG
2	DC +V in
3	0V in
4	LFC
5	-V out
6	+V out
7	NC

## PBIH-M



Terminal	Connection
1	+V out
2	+V out
3	-V out
4	-V out
5	FG
6	-V in
7	+V in

## PBIH-R



Terminal	Connection
1, 2	+V out
3	+S
4	-S
5, 6	V out
7	Remote Control
8	DC +V in
9	DC 0V in
10	FG

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	VSD
<b>Location:</b>	Motor Starter Section
<b>Model Numbers:</b>	FC202
<b>Manufacturer:</b>	Danfoss
<b>Supplier:</b>	<b>Queensland</b> Unit 26/67 Depot Street Banyo, QLD 4014 Tel: +61 7 3292 3600 Fax: +61 7 3266 4571



# Operating Instructions

## VLT<sup>®</sup> AQUA Drive FC 202 Low Harmonic Drive





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# 1 Introduction

## 1.1 Purpose of the Manual

The purpose of this manual is to provide information for the installation and operation of a VLT<sup>®</sup> Low Harmonic Drive. The manual includes relevant safety information for installation and operation. *Chapter 1 Introduction* and *chapter 2 Safety* introduce the unit function and cover proper mechanical and electrical installation procedures. There are chapters on start-up and commissioning, applications and basic troubleshooting. *Chapter 8 Specifications* provides a quick reference for ratings and dimensions, as well as other operating specifications. This manual provides a basic knowledge of the unit and explains setup and basic operation.

VLT<sup>®</sup> is a registered trademark.

## 1.2 Additional Resources

Other resources are available to understand advanced functions and programming.

- The *VLT<sup>®</sup> AQUA Drive FC 202 Operating Instructions* provide details on installation and operation of the frequency converter.
- The *VLT<sup>®</sup> AQUA Drive FC 202 Programming Guide* provides greater detail on working with parameters and many application examples.
- The *VLT<sup>®</sup> AQUA Drive FC 202 Design Guide* provides detailed capabilities and functionality to design motor control systems.
- Supplemental publications and manuals are available from Danfoss.  
See [www.danfoss.com/BusinessAreas/DrivesSolutions/Documentations/Technical+Documentation.htm](http://www.danfoss.com/BusinessAreas/DrivesSolutions/Documentations/Technical+Documentation.htm) for listings.
- Optional equipment may change some of the procedures described. Reference the instructions supplied with those options for specific requirements. Contact the local Danfoss supplier or visit the Danfoss website: [www.danfoss.com/BusinessAreas/DrivesSolutions/Documentations/Technical+Documentation.htm](http://www.danfoss.com/BusinessAreas/DrivesSolutions/Documentations/Technical+Documentation.htm), for downloads or additional information.
- The *VLT<sup>®</sup> Active Filter AAF00x Operating Instructions* provide additional information about the filter portion of the Low Harmonic Drive.

## 1.3 Product Overview

### 1.3.1 Intended Use

A frequency converter (also called a drive) is an electronic motor controller that converts DC into a variable AC waveform output. The frequency and voltage of the output are regulated to control the motor speed or torque. The frequency converter can vary the speed of the motor in response to system feedback, such as with position sensors on a conveyor belt. The frequency converter can also regulate the motor by responding to remote commands from external controllers.

The frequency converter

- monitors the system and motor status
- issues warnings or alarms for fault conditions
- starts and stops the motor
- optimises energy efficiency

Operation and monitoring functions are available as status indications to an outside control system or serial communication network.

A Low Harmonic Drive (LHD) is a single unit that combines the frequency converter with an advanced active filter (AAF) for harmonic mitigation. The frequency converter and filter are 2 separate pieces packaged together in an integrated system, but each functions independently. In this manual, there are separate specifications for the frequency converter and the filter. Since the frequency converter and filter are together in the same enclosure, the unit is transported, installed, and operated as a single entity.

### 1.3.2 Working Principle

The VLT Low Harmonic Drive is a high-power frequency converter with an integrated active filter. An active filter is a device that actively monitors harmonic distortion levels and injects compensative harmonic current onto the line to cancel the harmonics.

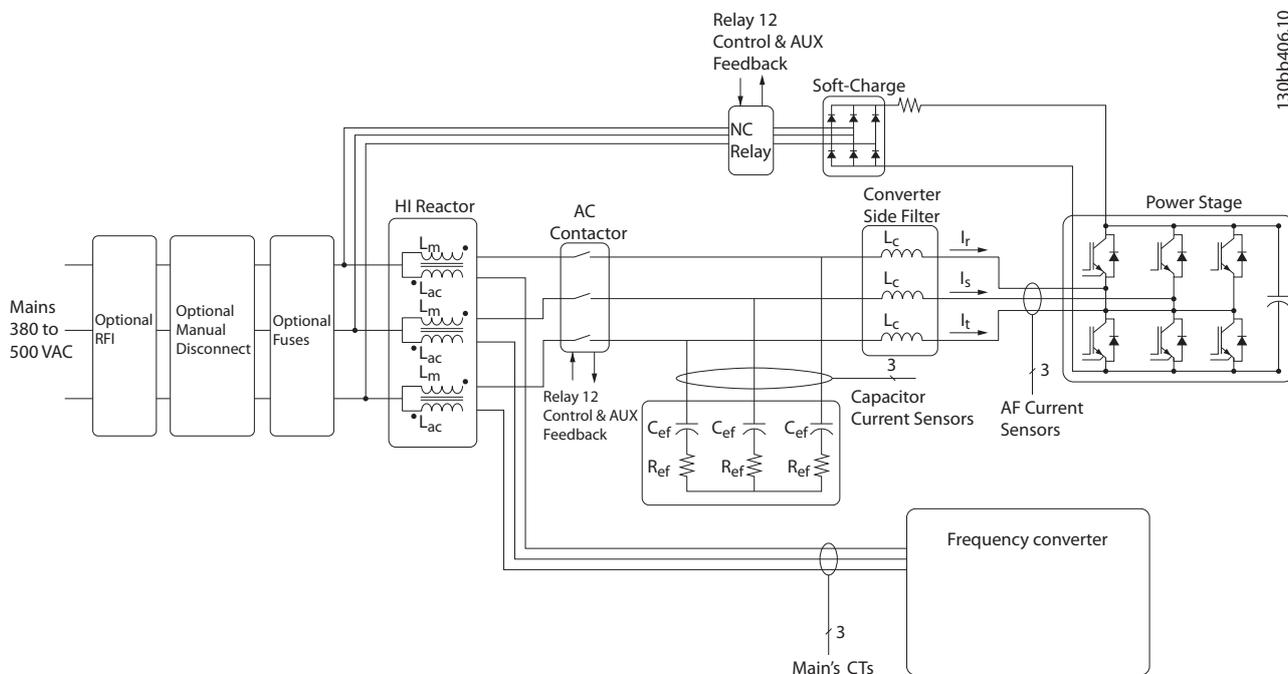
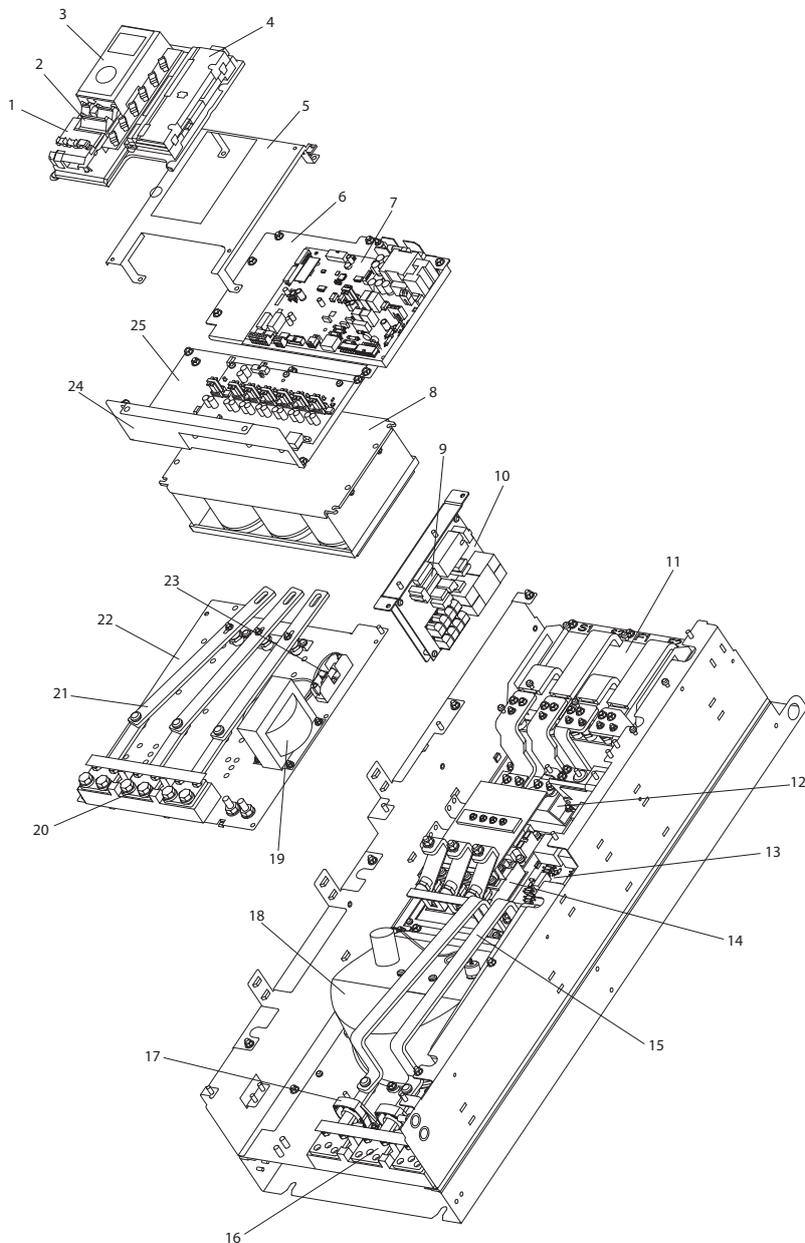


Illustration 1.1 Basic Layout for the Low Harmonic Drive

Low Harmonic Drives are designed to draw an ideal sinusoidal current waveform from the supply grid with a power factor of 1. Where traditional non-linear load draws pulse-shaped currents, the Low Harmonic Drive compensates that via the parallel filter path, lowering the stress on the supply grid. The Low Harmonic Drive meets the highest harmonic standards with a THiD less than 5% at full load for <3% pre-distortion on a 3% unbalanced 3-phase grid.

1

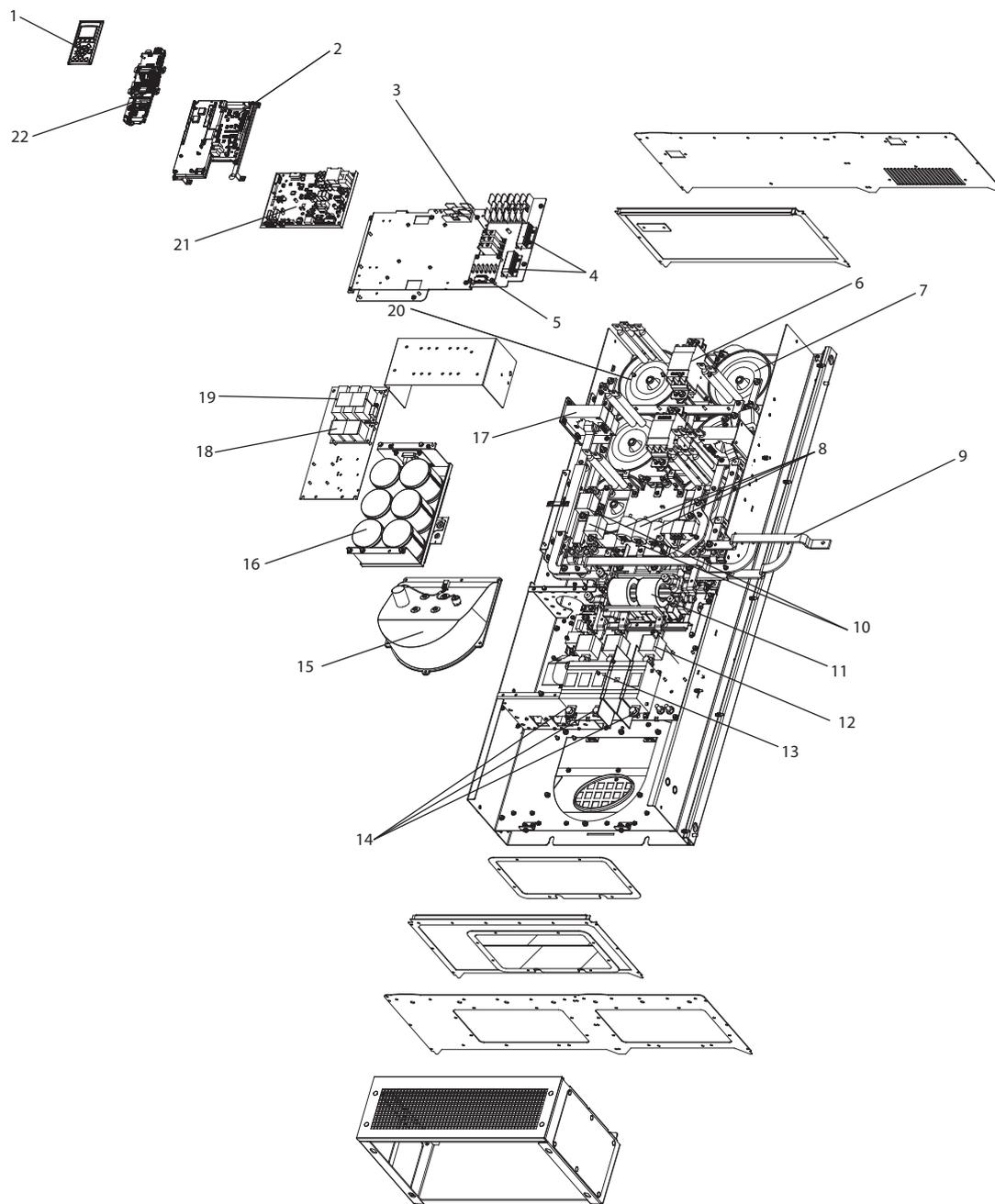
1.3.3 Exploded View Drawings



1.308X1 67.10

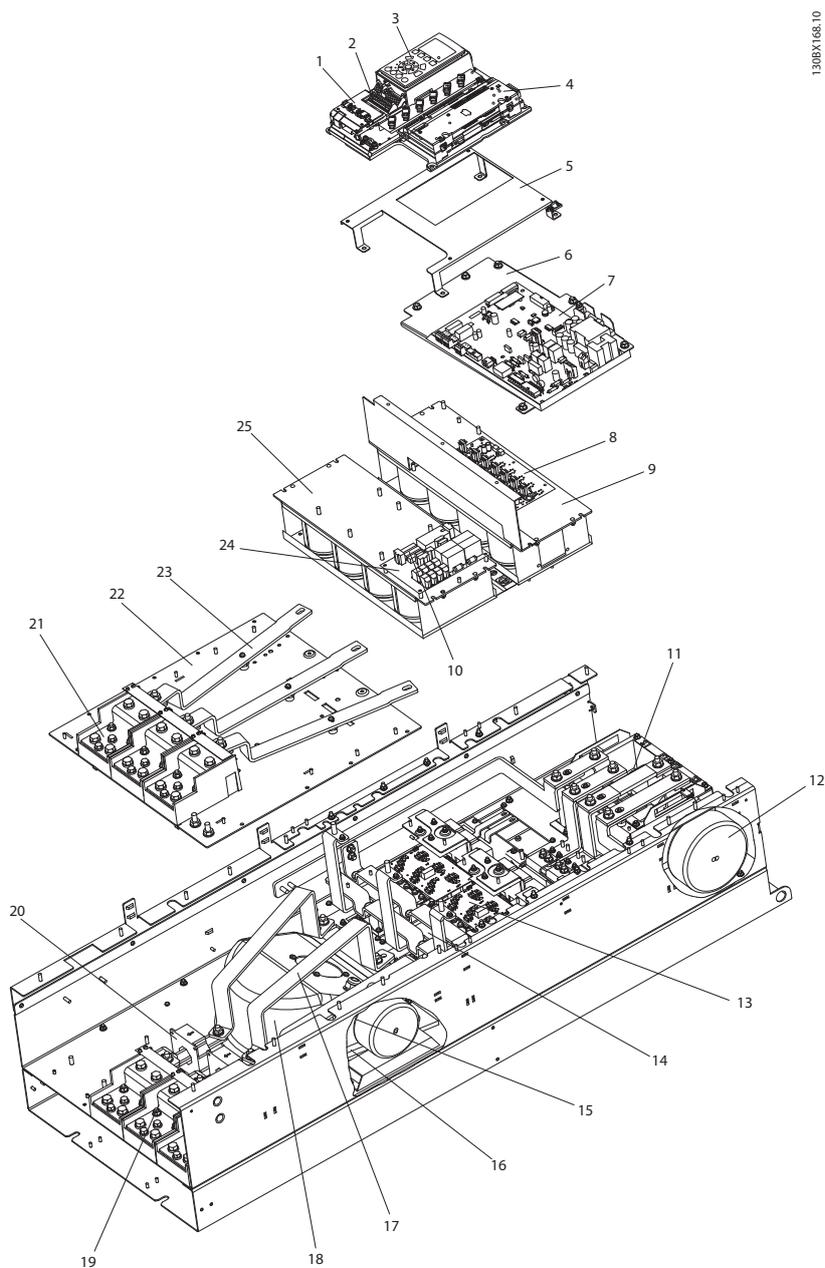
1	Control card	14	SCR/diode module
2	Control input terminals	15	IGBT output bus bar
3	Local control panel (LCP)	16	Output motor terminals
4	Control card C option	17	Current sensor
5	Mounting bracket	18	Fan assembly
6	Power card mounting plate	19	Fan transformer
7	Power card	20	AC input terminals
8	Capacitor bank assembly	21	AC input bus bar
9	Soft charge fuses	22	Input terminal mounting plate assembly
10	Soft charge card	23	Fan fuse
11	DC inductor	24	Capacitor bank cover plate
12	Soft charge module	25	IGBT gate drive card
13	IGBT module		

Illustration 1.2 Frame Size D13 Drive Enclosure



1	Local control panel (LCP)	13	Mains fuses
2	Active filter card (AFC)	14	Mains disconnect
3	Metal oxide varistor (MOV)	15	Mains terminals
4	Soft charge resistors	16	Heat sink fan
5	AC capacitors discharge board	17	DC capacitor bank
6	Mains contactor	18	Current transformer
7	LC inductor	19	RFI differential mode filter
8	AC capacitors	20	RFI common mode filter
9	Mains bus bars to drive input	21	HI inductor
10	IGBT fuses	22	Power card
11	RFI		

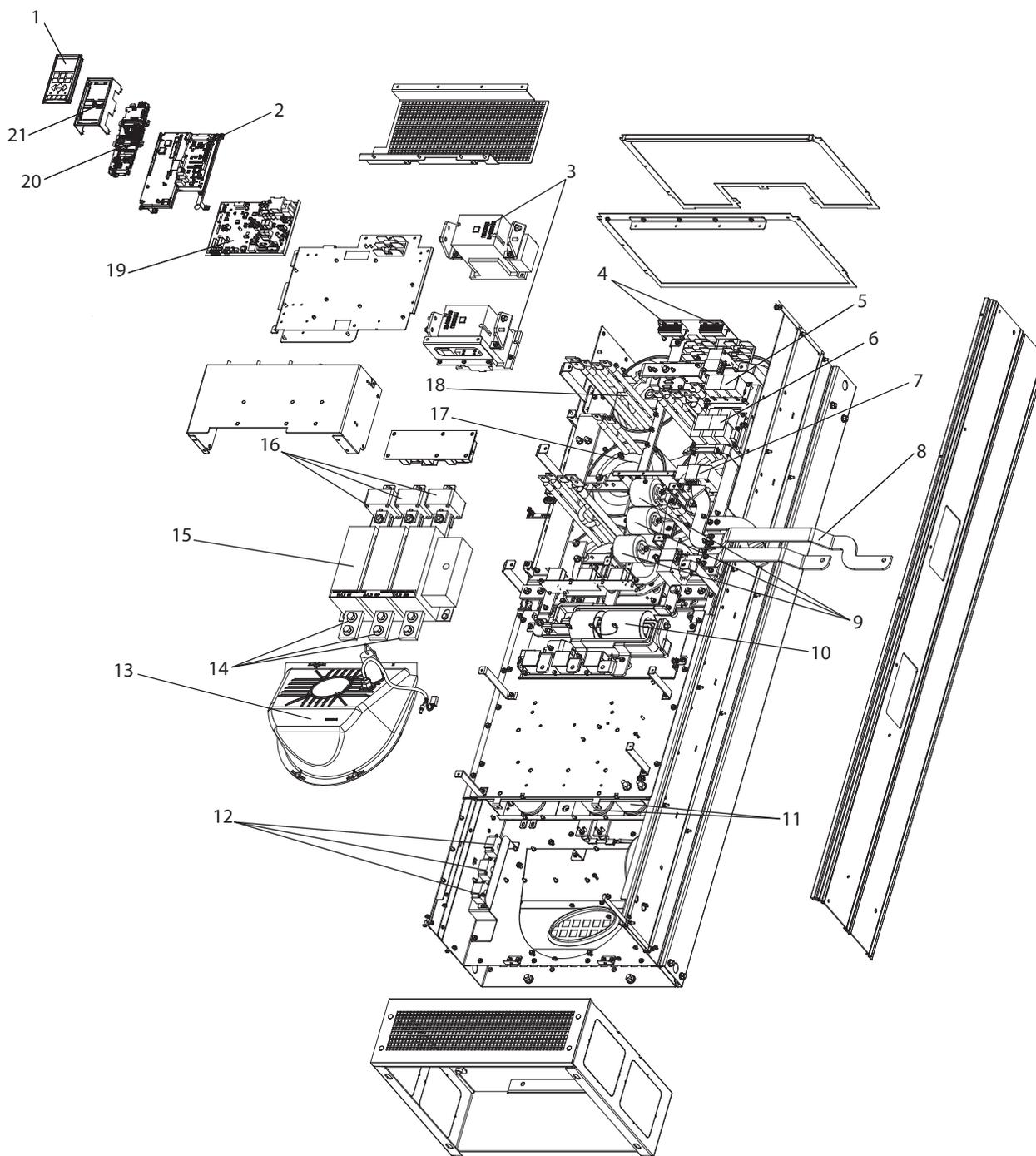
Illustration 1.3 Frame Size D13 Filter Enclosure



1308X168.10

1	Control card	14	SCR and diode
2	Control input terminals	15	Fan inductor (not on all units)
3	Local control panel (LCP)	16	Soft charge resistor assembly
4	Control card C option	17	IGBT output bus bar
5	Mounting bracket	18	Fan assembly
6	Power card mounting plate	19	Output motor terminals
7	Power card	20	Current sensor
8	IGBT gate drive card	21	Main AC power input terminals
9	Upper capacitor bank assembly	22	Input terminal mounting plate
10	Soft charge fuses	23	AC input bus bar
11	DC inductor	24	Soft charge card
12	Fan transformer	25	Lower capacitor bank assembly
13	IGBT module		

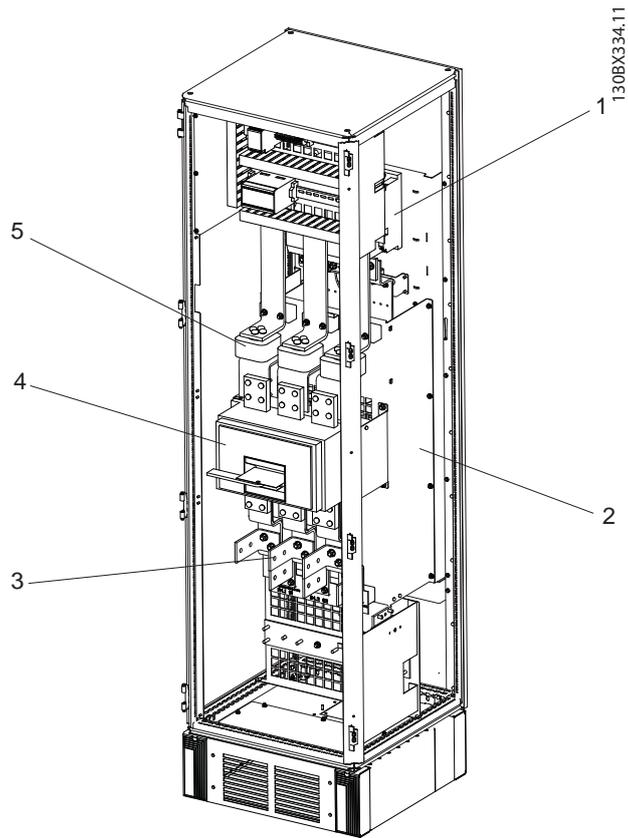
Illustration 1.4 Frame Size E9 Drive Enclosure



1	Local control panel (LCP)	12	AC capacitor current transducers
2	Active filter card (AFC)	13	Heat sink fan
3	Mains contactors	14	Mains terminals
4	Soft charge resistors	15	Mains disconnect
5	RFI differential mode filter	16	Mains fuses
6	RFI common mode filter	17	LC inductor
7	Current transformer (CT)	18	HI inductor
8	Mains bus bars to drive output	19	Power card
9	AC capacitors	20	Control card
10	RFI	21	LCP cradle
11	Lower DC capacitor bank		

Illustration 1.5 Frame Size E9 Filter Enclosure

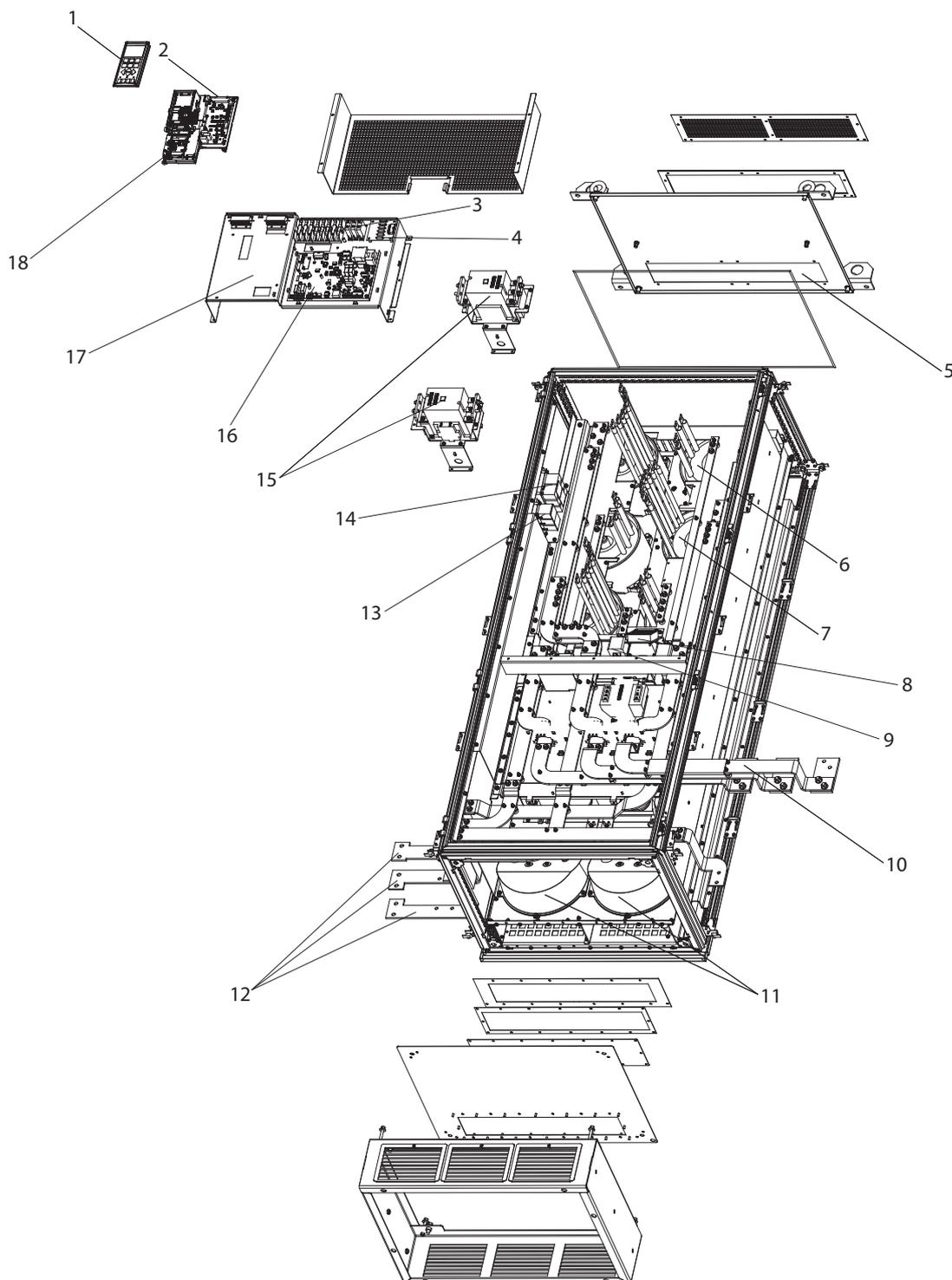
1



1	Contactor	4	Circuit breaker or disconnect (if purchased)
2	RFI filter	5	AC mains/line fuses (if purchased)
3	Mains AC power input terminals		

Illustration 1.6 Frame Size F18 Options Cabinet\*

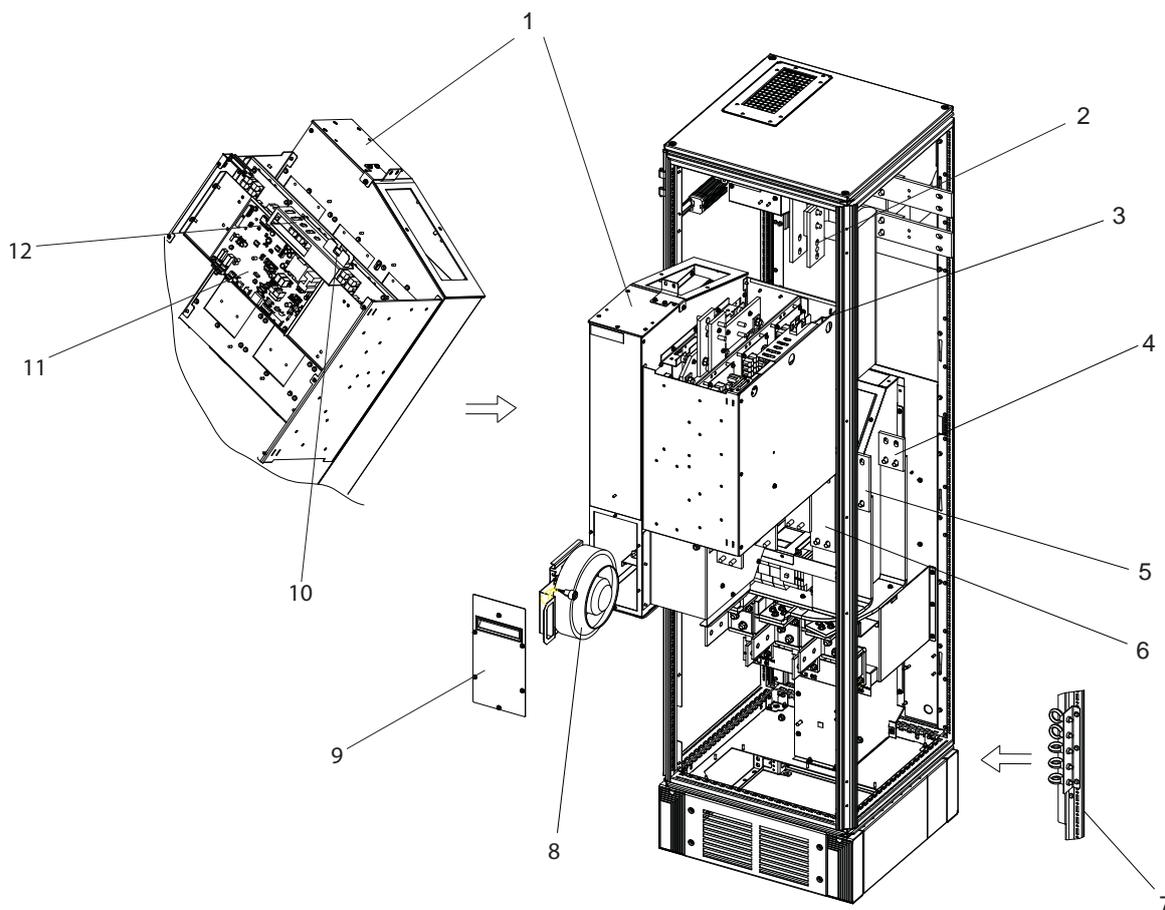
\*The options cabinet is not optional for the LHD. The ancillary equipment is stored in the cabinet.



1	Local control panel (LCP)	10	Mains bus bars to drive input
2	Active filter card (AFC)	11	Heat sink fans
3	Soft charge resistors	12	Mains terminals (R/L1, S/L2, T/L3) from options cabinet
4	Metal oxide varistor (MOV)	13	RFI differential mode filter
5	AC capacitors discharge board	14	RFI common mode filter
6	LC inductor	15	Mains contactor
7	HI inductor	16	Power card
8	Mixing fan	17	Control card
9	IGBT fuses	18	LCP cradle

Illustration 1.7 Frame Size F18 Filter Cabinet

1

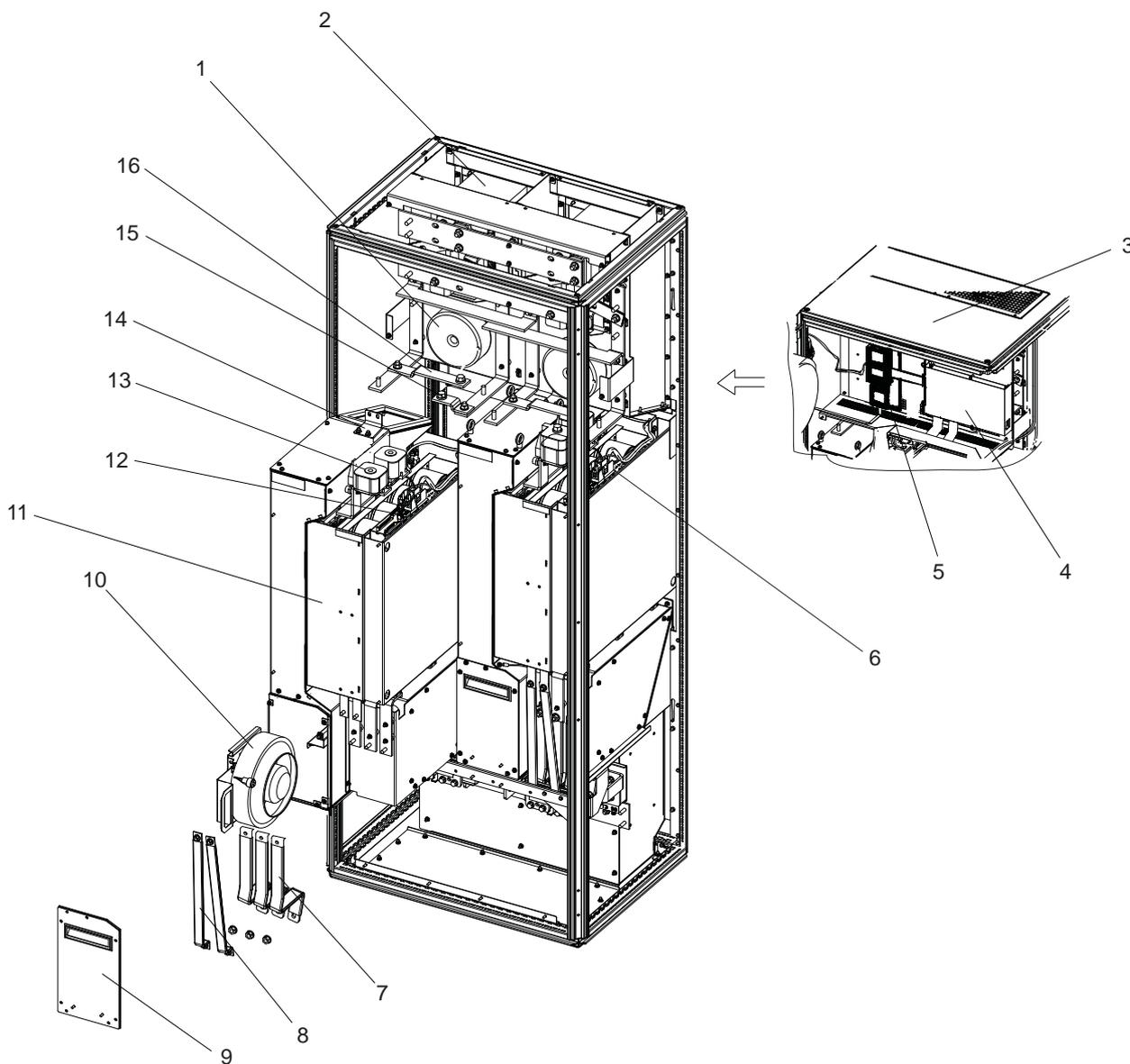


130BX331.11

1	Rectifier module	7	Module lifting eye bolts (mounted on a vertical strut)
2	DC bus bar	8	Module heat sink fan
3	SMPS fuse	9	Fan door cover
4	(Optional) back AC fuse mounting bracket	10	SMPS fuse
5	(Optional) middle AC fuse mounting bracket	11	Power card
6	(Optional) front AC fuse mounting bracket	12	Panel connectors

Illustration 1.8 Frame Size F18 Rectifier Cabinet

130BX330.10



1	Fan transformer	9	Fan door cover
2	DC link inductor	10	Module heat sink fan
3	Top cover plate	11	Inverter module
4	MDCIC board	12	Panel connectors
5	Control card	13	DC fuse
6	SMPS fuse and fan fuse	14	Mounting bracket
7	Motor output bus bar	15	(+) DC bus bar
8	Brake output bus bar	16	(-) DC bus bar

Illustration 1.9 Frame Size F18 Inverter Cabinet

## 1.4 Enclosure Types and Power Ratings

Frame size		D13	E9	F18
Enclosure protection	IP	21/54	21/54*	21/54
	NEMA	Type 1/Type 12	Type 1/Type 12	Type 1/Type 12
High overload rated power - 160% overload torque		160-250 kW at 400 V (380-480 V)	315-450 kW at 400 V (380-480 V)	500-710 kW at 400 V (380-480 V)
Drive dimensions [mm/inch]	Height	1780.570.1	2000.7/78.77	2278.4/89.70
	Width	1021.9 mm/40.23	1200/47.24	2792/109.92
	Depth	377.8/14.87	493.5/19.43	605.8/23.85
Drive dimensions [kg/lbs]	Max Weight	390/860	676/1490	1900/4189
	Shipping Weight	454/1001	840/1851	2345/5171

Table 1.1 Mechanical Dimensions and Rated Power, D, E and F Frames

## 1.5 Approvals and Certifications

### 1.5.1 Approvals



Table 1.2 Compliance Marks: CE, UL, and C-Tick

### 1.5.2 Compliance with ADN

For compliance with the European Agreement concerning International Carriage of Dangerous Goods by Inland Waterways (ADN), refer to *ADN-compliant Installation* in the *Design Guide*.

## 2 Safety

### 2.1 Safety Symbols

The following symbols are used in this document:



Indicates a potentially hazardous situation which could result in death or serious injury.



Indicates a potentially hazardous situation which could result in minor or moderate injury. It may also be used to alert against unsafe practices.

#### **NOTICE**

Indicates important information, including situations that may result in damage to equipment or property.

### 2.2 Qualified Personnel

Correct and reliable transport, storage, installation, operation and maintenance are required for the safe operation of the frequency converter. Only qualified personnel are allowed to install or operate this equipment.

Qualified personnel is defined as trained staff, who are authorised to install, commission, and maintain equipment, systems and circuits in accordance with pertinent laws and regulations. Additionally, qualified personnel are familiar with the instructions and safety measures described in this document.

### 2.3 Safety Precautions



#### **HIGH VOLTAGE**

Frequency converters contain high voltage when connected to AC mains input power. Qualified personnel only should perform installation, start up, and maintenance. Failure to perform installation, start up, and maintenance by qualified personnel could result in death or serious injury.



#### **UNINTENDED START**

When the frequency converter is connected to AC mains, the motor may start at any time. The frequency converter, motor, and any driven equipment must be in operational readiness. Failure to be in operational readiness when the frequency converter is connected to AC mains could result in death, serious injury, equipment, or property damage.



#### **DISCHARGE TIME**

Frequency converters contain DC-link capacitors that can remain charged even when the frequency converter is not powered. To avoid electrical hazards, disconnect AC mains, any permanent magnet type motors, and any remote DC-link power supplies, including battery back-ups, UPS, and DC-link connections to other frequency converters. Wait for the capacitors to fully discharge before performing any service or repair work. The amount of wait time is listed in the *Discharge Time* table. Failure to wait the specified time after power has been removed before doing service or repair could result in death or serious injury.

Voltage [V]	Power range [kW]	Minimum waiting time (minutes)
380-500	132-250 kW*	20
	315-630 kW	40

Table 2.1 Discharge Times

\*Power ranges are for normal overload operation.

### 3 Mechanical Installation

# 3

#### 3.1 Equipment Pre-Installation Checklist

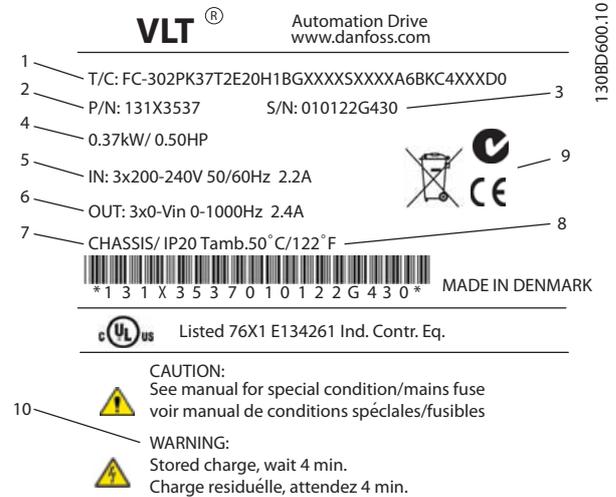
- Before unpacking the frequency converter, examine the packaging for signs of damage. If the unit is damaged, refuse delivery and immediately contact the shipping company to claim the damage.
- Before unpacking the frequency converter, locate it as close as possible to the final installation site
- Compare the model number on the nameplate to what was ordered to verify the proper equipment
- Ensure each of the following are rated for the same voltage:
  - Mains (power)
  - Frequency converter
  - Motor
- Ensure the output current rating is equal to or greater than the motor full load current for peak motor performance.
  - Motor size and frequency converter power must match for proper overload protection.
  - If frequency converter rating is less than that of the motor, full motor output is impossible.

#### 3.2 Unpacking

##### 3.2.1 Items Supplied

Items supplied may vary according to product configuration.

- Make sure the items supplied and the information on the nameplate correspond to the order confirmation.
- Check the packaging and the frequency converter visually for damage caused by inappropriate handling during shipment. File any claim for damage with the carrier. Retain damaged parts for clarification.



1	Type code
2	Order number
3	Serial number
4	Power rating
5	Input voltage, frequency and current (at low/high voltages)
6	Output voltage, frequency and current (at low/high voltages)
7	Enclosure type and IP rating
8	Maximum ambient temperature
9	Certifications
10	Discharge time (Warning)

Illustration 3.1 Product Nameplate (Example)

### NOTICE

**Do not remove the nameplate from the frequency converter (loss of warranty).**

### 3.3 Installation Environment

#### 3.3.1 Planning the Installation Site

Select the best possible operation site by considering the following (see details on the following pages, and in the *Design Guide*):

- Ambient operating temperature
- Installation method
- Cooling
- Position of the unit
- Cable routing
- Voltage and current supply from power source
- Current rating within range
- Fuse ratings if not using built-in fuses

### 3.4 Mounting

#### 3.4.1 Cooling and Airflow

##### Cooling

Cooling can be obtained in different ways, by using the cooling ducts in the bottom and the top of the unit, by taking air in and out the back of the unit or by combining the cooling possibilities.

##### Back cooling

The backchannel air can also be ventilated in and out the back of a Rittal TS8 enclosure for frame size F18 LHD. This offers a solution where the backchannel could take air from outside the facility and return the heat losses outside the facility thus reducing air-conditioning requirements.

##### **NOTICE**

A door fan(s) is required on the enclosure to remove the heat losses not contained in the backchannel of the drive and any additional losses generated from other components installed inside the enclosure. The total required air flow must be calculated so that the appropriate fans can be selected. Some enclosure manufacturers offer software for performing the calculations (i.e. Rittal Therm software).

##### Airflow

The necessary airflow over the heat sink must be secured. The flow rate is shown in *Table 3.1*.

Enclosure protection	Frame size	Door fan/top fan airflow Total airflow of multiple fans	Heat sink fan Total airflow for multiple fans
IP21/NEMA 1 IP54/NEMA 12	D13 (LHD120)	3 door fans, 510 m <sup>3</sup> /h (300 cfm) (2+1, 3x170=510)	2 heat sink fans, 1530 m <sup>3</sup> /h (900 cfm) (1+1, 2x765=1530)
	E9 P315-P400 (LHD210)	4 door fans, 680 m <sup>3</sup> /h (400 cfm) (2+2, 4x170=680)	2 heat sink fans, 2675 m <sup>3</sup> /h (1574 cfm) (1+1, 1230+1445=2675)
	F18 (LHD330)	6 door fans, 3150 m <sup>3</sup> /h (1854 cfm) (6x525=3150)	5 heat sink fans, 4485 m <sup>3</sup> /h (2639 cfm) 2+1+2, ((2x765)+(3x985)=4485)

Table 3.1 Heat Sink Air Flow

3

**NOTICE**

For the drive section, the fan runs for the following reasons:

- AMA
- DC Hold
- Pre-Mag
- DC Brake
- 60% of nominal current is exceeded
- Specific heat sink temperature exceeded (power size dependent)
- Specific power card ambient temperature exceeded (power size dependent)
- Specific control card ambient temperature exceeded

Once the fan is started, it runs for minimum 10 minutes.

**NOTICE**

For the active filter, the fan runs for the following reasons:

- Active filter running
- Active filter not running, but mains current exceeding limit (power size dependent)
- Specific heat sink temperature exceeded (power size dependent)
- Specific power card ambient temperature exceeded (power size dependent)
- Specific control card ambient temperature exceeded

Once the fan is started, it runs for minimum 10 minutes.

**External ducts**

If additional duct work is added externally to the Rittal cabinet, the pressure drop in the ducting must be calculated. Use the charts below to derate the frequency converter according to the pressure drop.

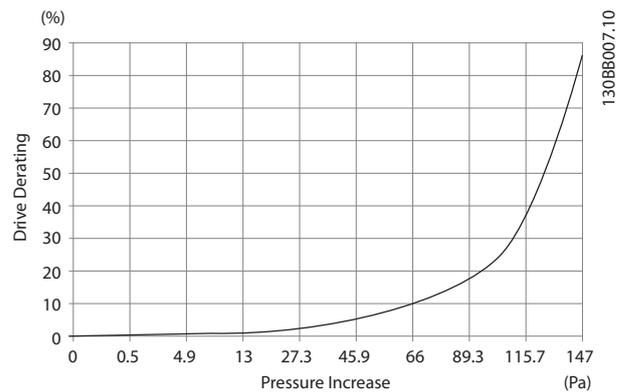


Illustration 3.2 D-Frame Derating vs. Pressure Change  
Drive Air Flow: 450 cfm (765 m<sup>3</sup>/h)

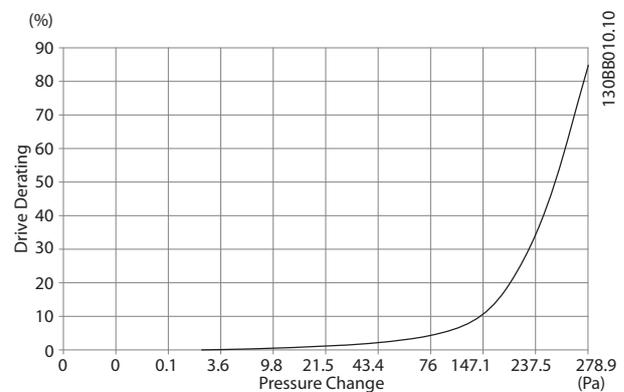


Illustration 3.3 E-Frame Derating vs. Pressure Change (Small Fan), P315  
Drive Air Flow: 650 cfm (1105 m<sup>3</sup>/h)

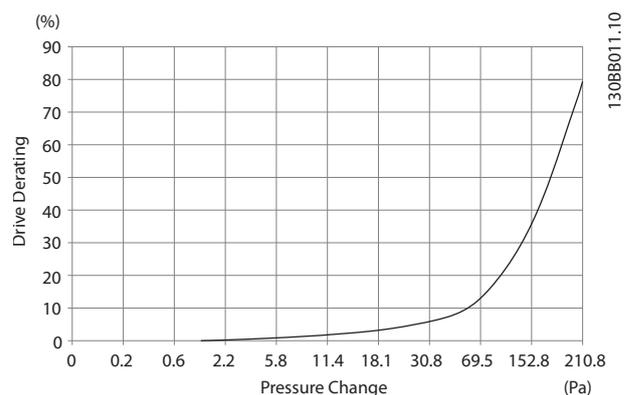


Illustration 3.4 E-Frame Derating vs. Pressure Change (Large Fan) P355-P450  
Drive Air Flow: 850 cfm (1445 m<sup>3</sup>/h)

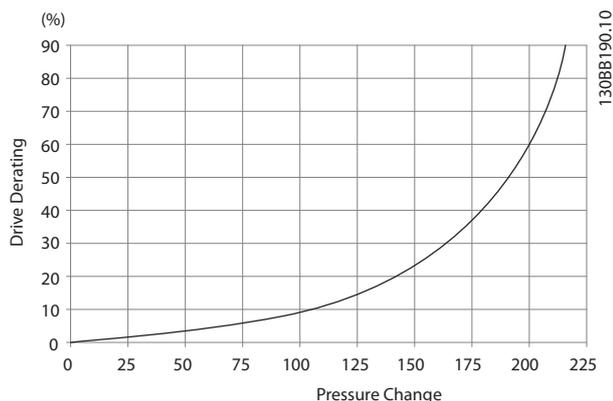
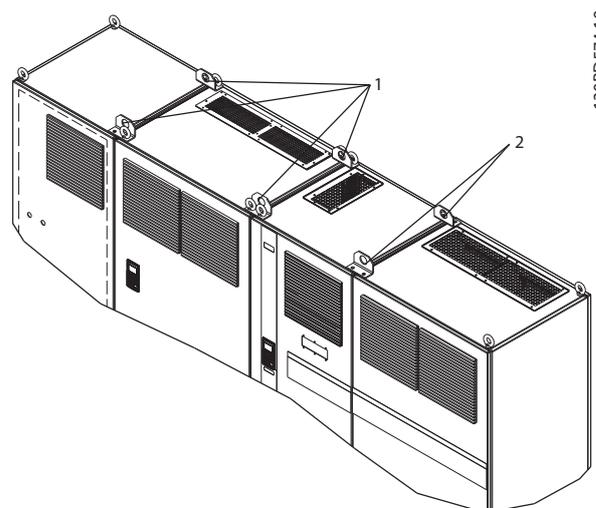


Illustration 3.5 F-Frame Derating vs. Pressure Change

Drive Air Flow: 580 cfm (985 m<sup>3</sup>/h)



1	Lifting holes for the filter
2	Lifting holes for the frequency converter

Illustration 3.8 Recommended Lifting Method, Frame Size F18

### 3.4.2 Lifting

Lift the frequency converter using the dedicated lifting eyes. For all D-frames, use a bar to avoid bending the lifting holes of the frequency converter.

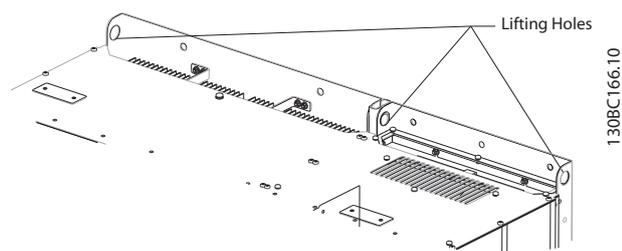


Illustration 3.6 Recommended Lifting Method, Frame Size D13

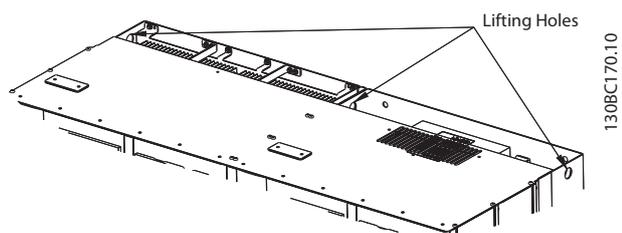


Illustration 3.7 Recommended Lifting Method, Frame Size E9

## ⚠ WARNING

The lifting bar must be able to handle the weight of the frequency converter. See *chapter 8.2 Mechanical Dimensions* for the weight of the different frame sizes. Maximum diameter for bar is 2.5 cm (1 inch). The angle from the top of the frequency converter to the lifting cable should be 60° or greater.

## NOTICE

A spreader bar is also an acceptable way to lift the F-frame.

## NOTICE

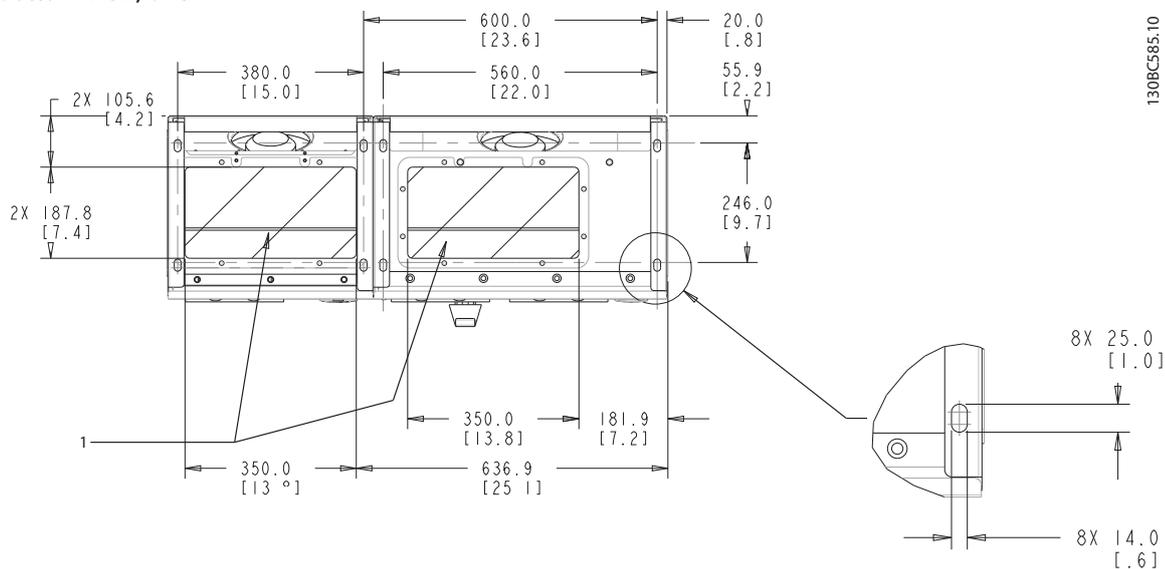
The F18 pedestal is packaged separately and included in the shipment. Mount the frequency converter on the pedestal in its final location. The pedestal allows proper airflow and cooling.

### 3.4.3 Cable Entry and Anchoring

Cables enter the unit through gland plate openings in the bottom. The illustrations in this section show gland entry locations and detailed views of anchoring hole dimensions.

3

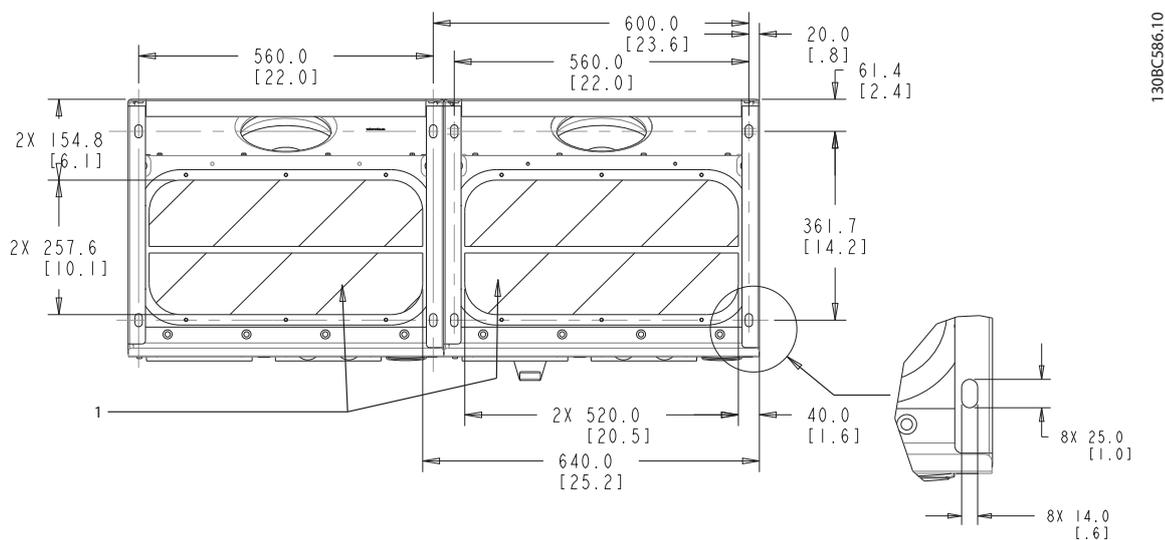
#### Bottom View, D13



1	Cable entry locations
---	-----------------------

Illustration 3.9 Cable Entry Diagram, D13

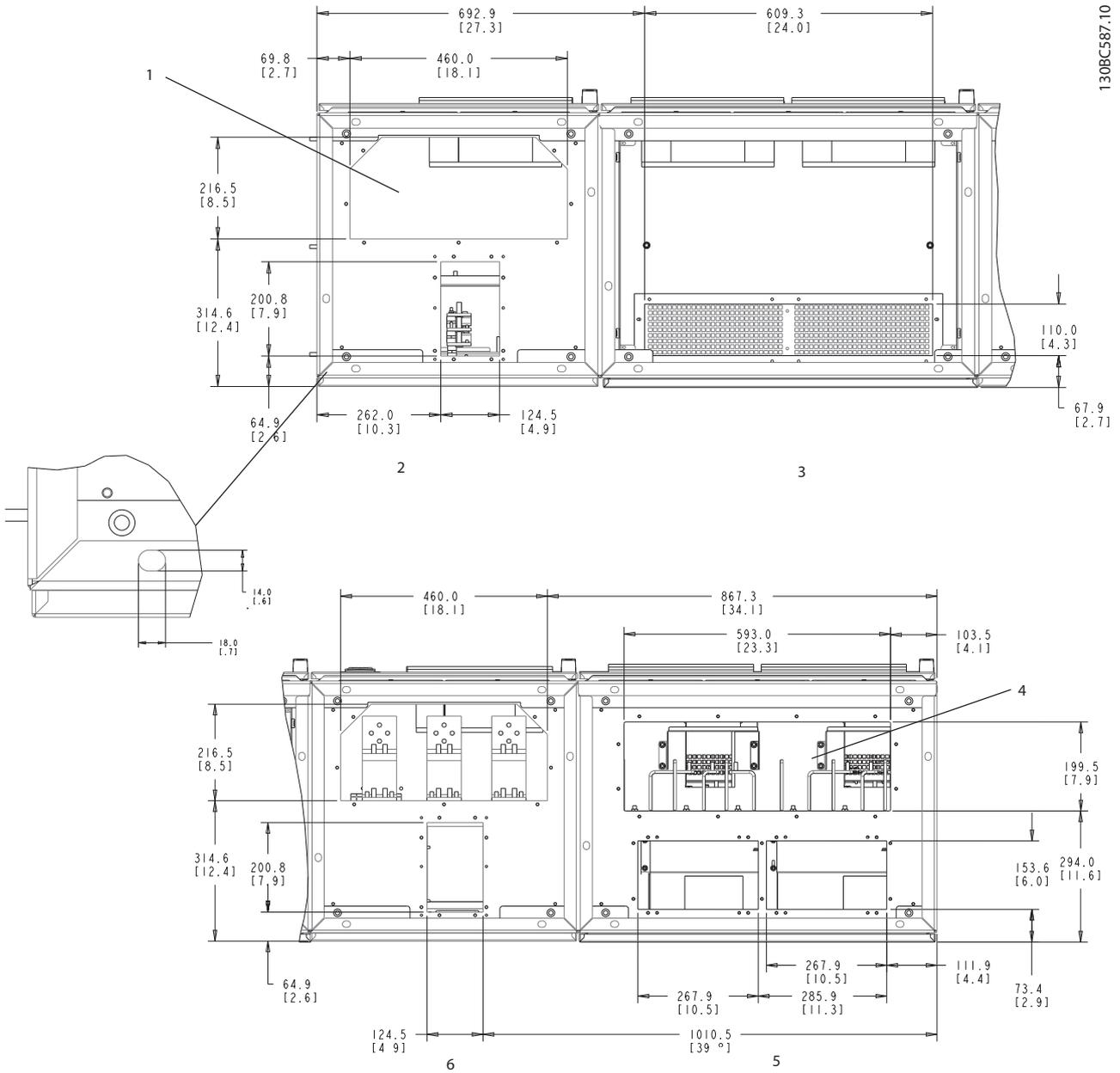
#### Bottom View, E9



1	Cable entry locations
---	-----------------------

Illustration 3.10 Cable Entry Diagram, E9

Bottom View, F18



1	Mains cable entry	4	Motor cable entry
2	Option enclosure	5	Inverter enclosure
3	Filter enclosure	6	Rectifier enclosure

Illustration 3.11 Cable Entry Diagram, F18

### 3.4.4 Terminal Locations for Frame Size D13

3

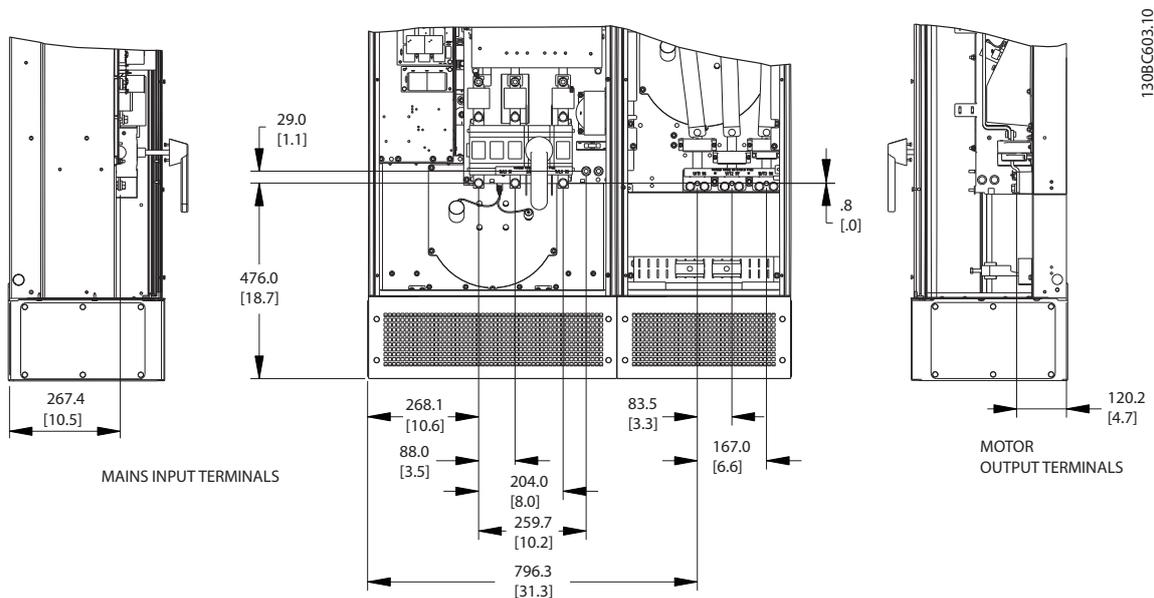


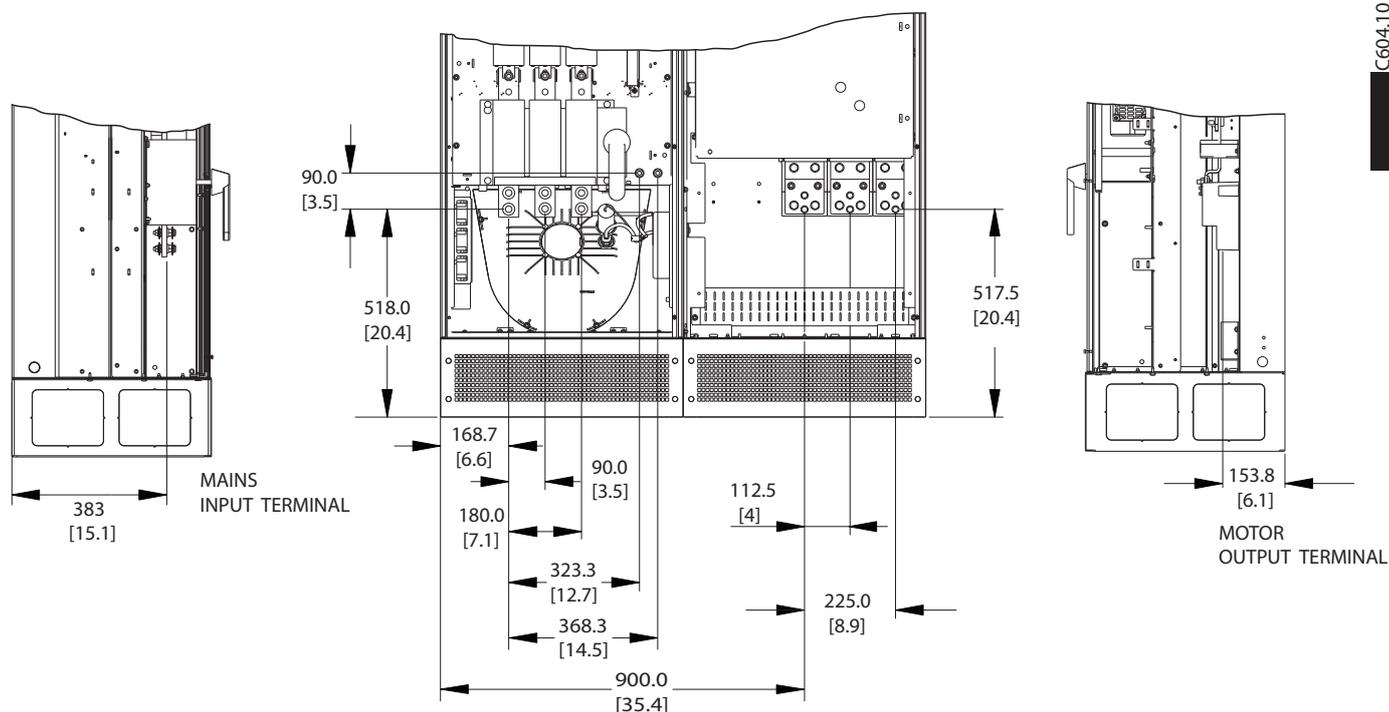
Illustration 3.12 Frame Size D13 Terminal Locations

Allow for bend radius of heavy power cables.

**NOTICE**

All D-frames are available with standard input terminals, fuse, or disconnect switch.

### 3.4.5 Terminal Locations for Frame Size E9



C604.10

3

Illustration 3.13 Frame Size E9 Terminal Locations

Allow for bend radius of heavy power cables.

**NOTICE**

All E-frames are available with standard input terminals, fuse, or disconnect switch.

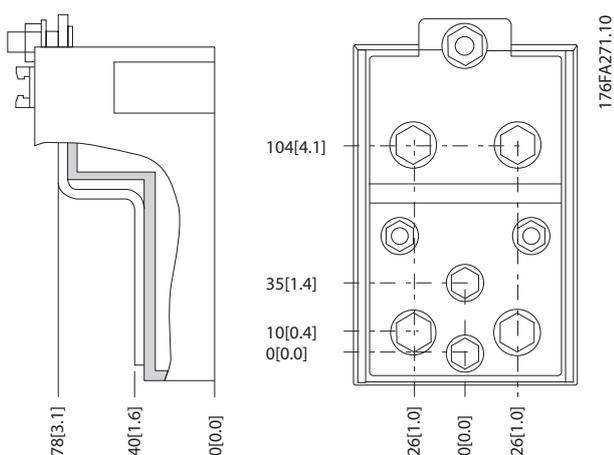


Illustration 3.14 Close-up Terminal Diagrams

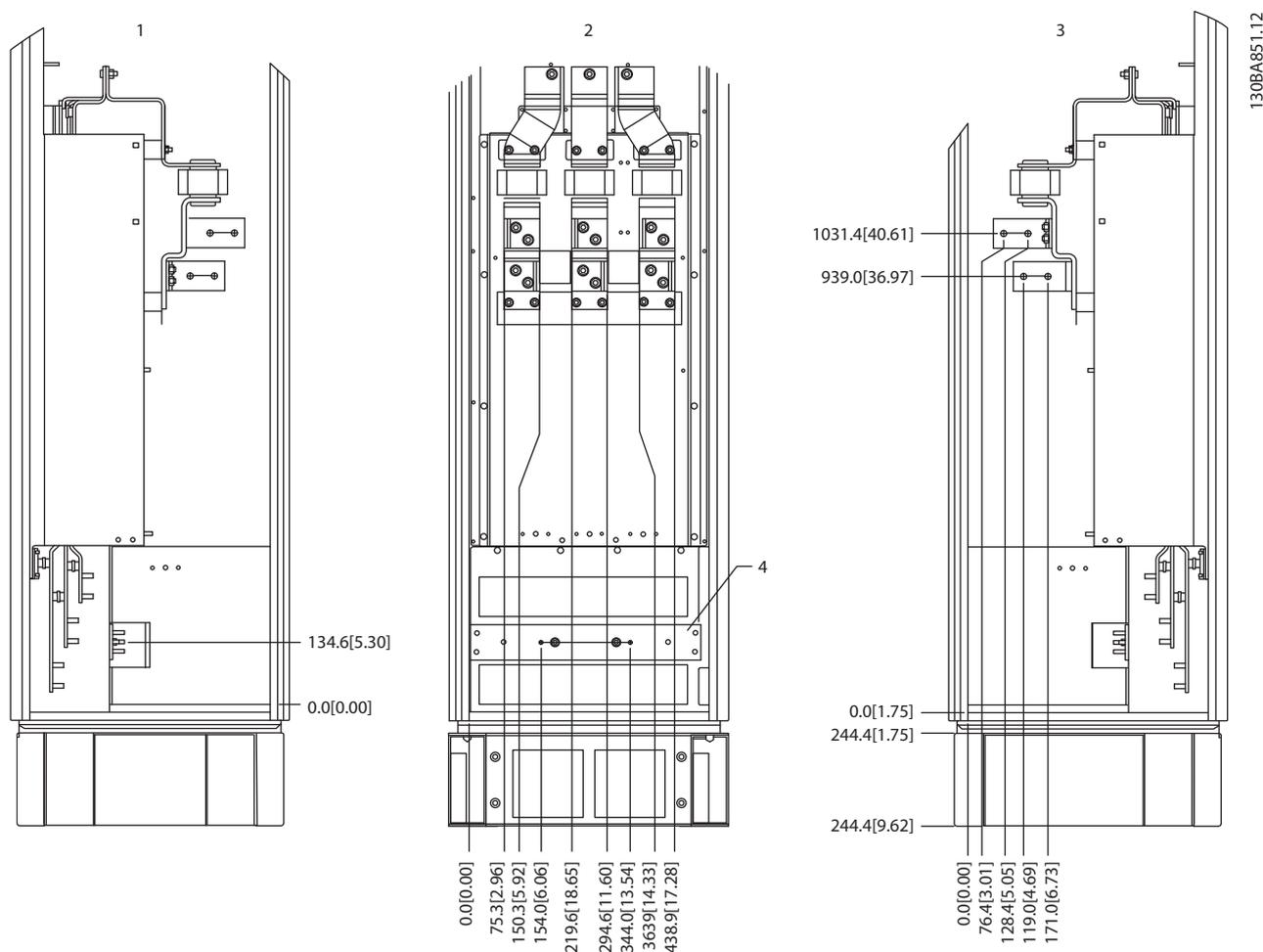
### 3.4.6 Terminal Locations for Frame Size F18

Consider the position of the terminals when designing the cable access.

F-frame units have 4 interlocked cabinets:

- Input options cabinet (not optional for LHD)
- Filter cabinet
- Rectifier cabinet
- Inverter cabinet

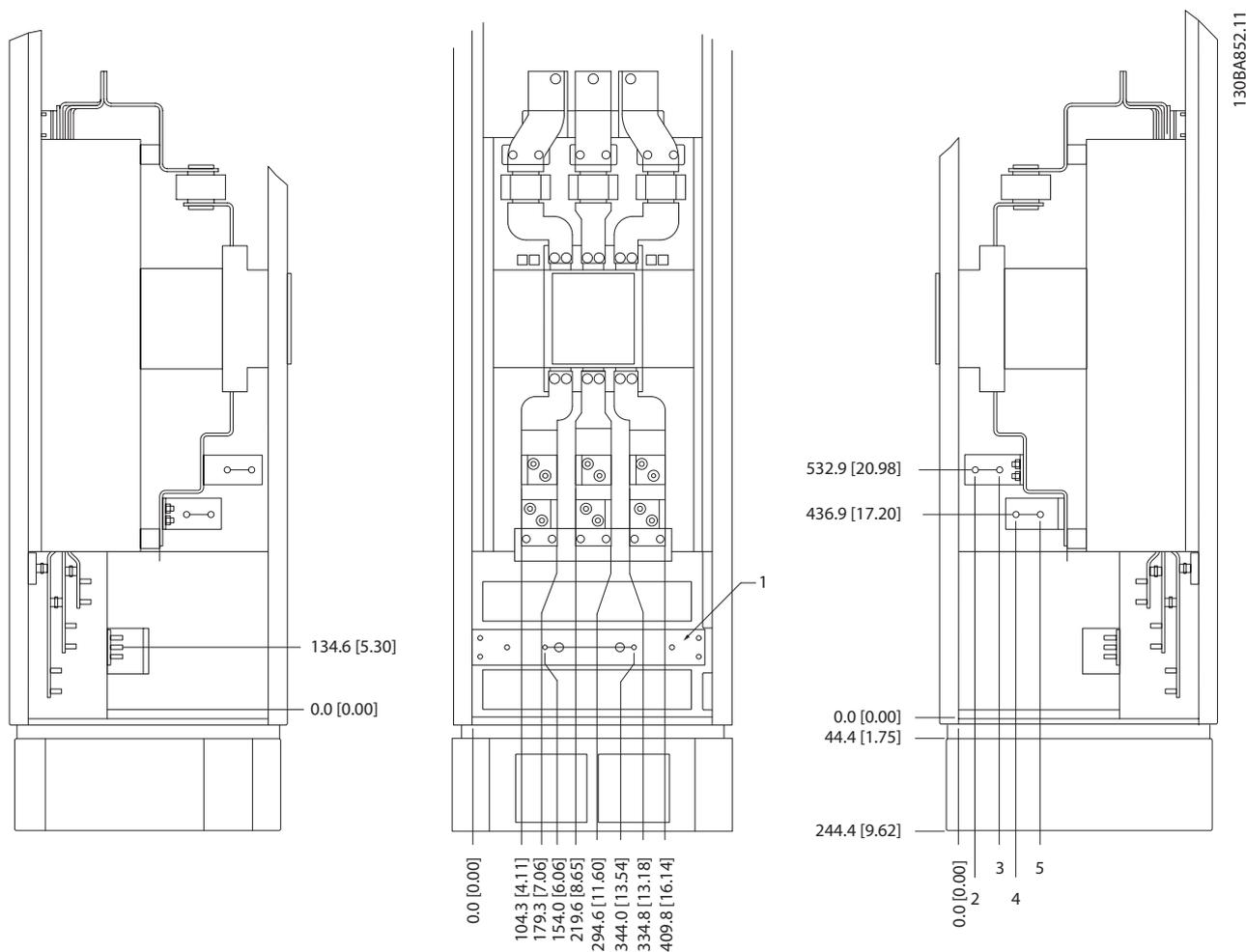
See *chapter 1.3.3 Exploded View Drawings* for exploded views of each cabinet. Mains inputs are located in the input option cabinet, which conducts power to the rectifier via interconnecting bus bars. Output from the unit is from the inverter cabinet. No connection terminals are located in the rectifier cabinet. Interconnecting bus bars are not shown.



1	Right side cut-away	3	Left side cut-away
2	Front view	4	Ground bar

Illustration 3.15 Frame Size F18 Input Option Cabinet - Fuses Only

The gland plate is 42 mm below the 0 level. Shown are the left side view, front, and right.



3

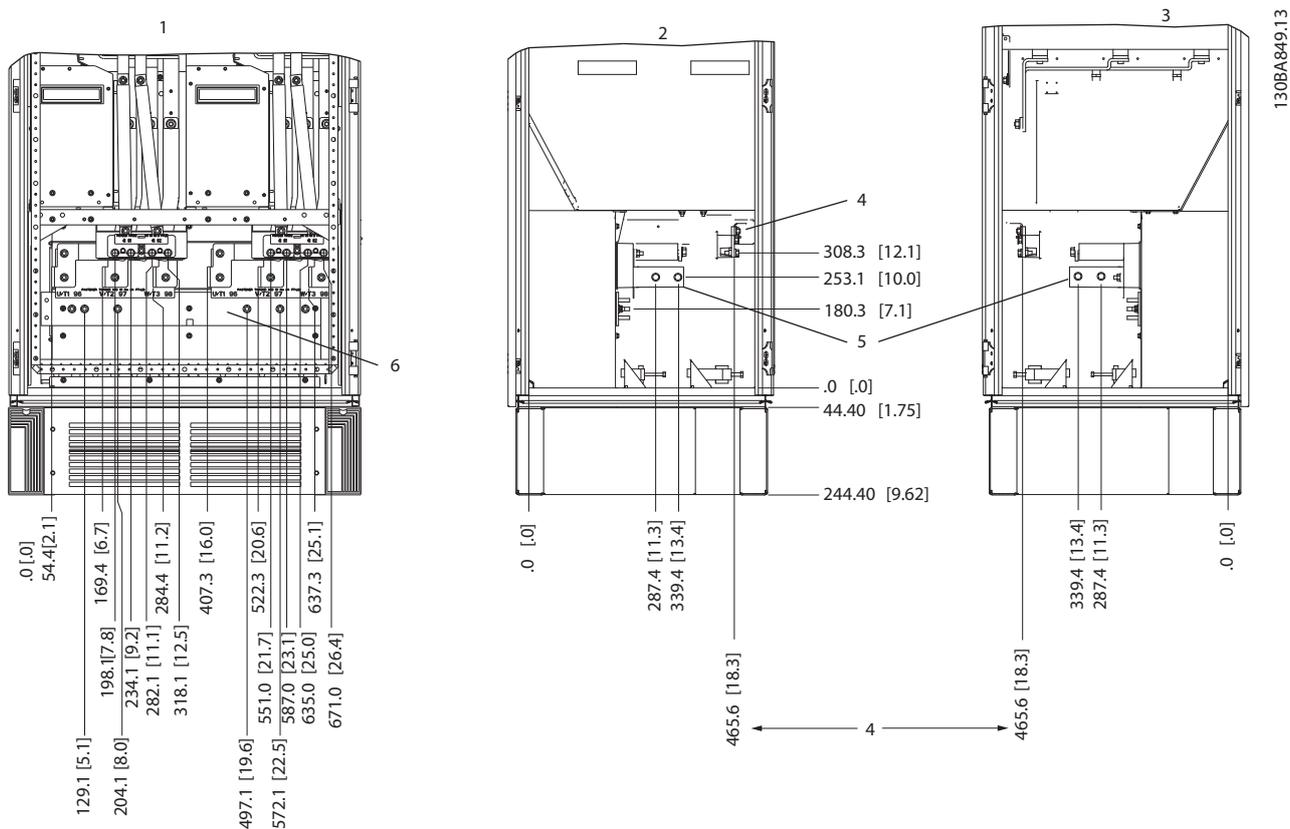
	500 kW (mm [in.])	560-710 kW (mm [in.])
1	Ground Bar	
2	34.9 [1.4]	46.3 [1.8]
3	86.9 [3.4]	98.3 [3.9]
4	122.2 [4.8]	119 [4.7]
5	174.2 [6.9]	171 [6.7]

\*Disconnect location and related dimensions vary with kilowatt rating

Illustration 3.16 Frame Size F18 Input Option Cabinet with Circuit Breaker

The gland plate is 42 mm below the 0 level. Shown are the left side view, front, and right.

3



1	Front View	5	Motor output bus bar
2	Left Side View	6	Ground bar
3	Right Side View	7	Screen clamp
4	Brake Terminals		

Illustration 3.17 Frame Size F18 Inverter Cabinet

The gland plate is 42 mm below the 0 level. Shown are the left side view, front, and right.

### 3.4.7 Torque

Correct torque is imperative for all electrical connections. Incorrect torque results in a bad electrical connection. Use a torque wrench to ensure correct torque.

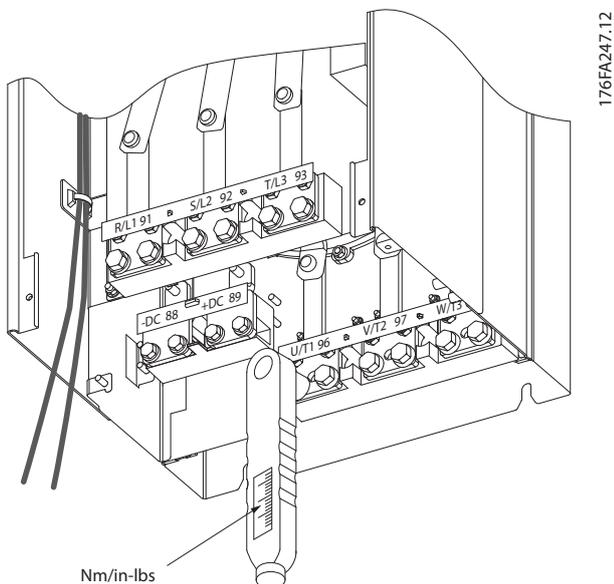


Illustration 3.18 Use a Torque Wrench to Tighten the Bolts

Frame size	Terminal	Torque [Nm] (in-lbs)	Bolt size
D	Mains	19–40	M10
	Motor	(168–354)	
	Load sharing Brake	8.5–20.5 (75–181)	M8
E	Mains	19–40	M10
	Motor	(168–354)	
	Load sharing Brake	8.5–20.5 (75–181)	M8
F	Mains	19–40	M10
	Motor	(168–354)	
	Load sharing	19–40 (168–354)	M10
	Brake	8.5–20.5 (75–181)	M8
	Regen	8.5–20.5 (75–181)	M8

Table 3.2 Torque for Terminals

## 4 Electrical Installation

### 4.1 Safety Instructions

See *chapter 2 Safety* for general safety instructions.

#### **WARNING**

##### INDUCED VOLTAGE

Induced voltage from output motor cables that run together can charge equipment capacitors even with the equipment turned off and locked out. Failure to run output motor cables separately or use screened cables could result in death or serious injury.

- Run output motor cables separately, or
- use screened cables

#### **CAUTION**

##### SHOCK HAZARD

The frequency converter can cause a DC current in the PE conductor. Failure to follow the recommendation below means the RCD may not provide the intended protection.

- When a residual current-operated protective device (RCD) is used for protection against electrical shock, only an RCD of Type B is permitted on the supply side.

##### Overcurrent Protection

- Additional protective equipment such as short circuit protection or motor thermal protection between frequency converter and motor is required for applications with multiple motors.
- Input fusing is required to provide short circuit and overcurrent protection. If not factory-supplied, fuses must be provided by the installer. See maximum fuse ratings in *chapter 8.5 Fuses*.

##### Wire Type and Ratings

- All wiring must comply with local and national regulations regarding cross-section and ambient temperature requirements.
- Power connection wire recommendation: Minimum 75 °C rated copper wire.

See *chapter 8.1 Power-Dependent Specifications* and *chapter 8.3 General Technical Data - Frequency Converter* for recommended wire sizes and types.

### 4.2 EMC Compliant Installation

To obtain an EMC-compliant installation, follow the instructions provided in *chapter 4.4 Grounding*, *chapter 4.5 Input Options*, *chapter 4.6 Motor Connection*, and *chapter 4.8 Control Wiring*.

### 4.3 Power Connections

#### **NOTICE**

##### Cables-General Information

All cabling must comply with national and local regulations on cable cross-sections and ambient temperature. UL applications require 75 °C copper conductors. For non-UL applications, 75 and 90 °C copper conductors are thermally acceptable.

The power cable connections are situated as shown in *Illustration 4.1*. Dimension cable cross-section in accordance with the current ratings and local legislation. See *chapter 8.3.1 Cable lengths and cross-sections* for details.

For protection of the frequency converter, use the recommended fuses if there are no built-in fuses. Fuse recommendations are provided in *chapter 8.5 Fuses*. Ensure that proper fusing is made according to local regulation.

The mains connection is fitted to the mains switch, if included.

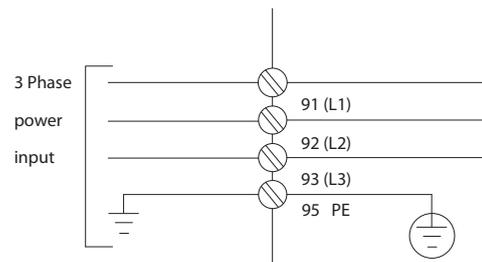


Illustration 4.1 Power Cable Connections

#### **NOTICE**

To comply with EMC emission specifications, screened/armoured cables are recommended. If an unscreened/unarmoured cable is used, see *chapter 4.7.3 Power and Control Wiring for Unscreened Cables*.

See *chapter 8 Specifications* for correct dimensioning of motor cable cross-section and length.

**Screening of cables**

Avoid installation with twisted screen ends (pigtailed). They spoil the screening effect at higher frequencies. If breaking the screen is necessary to install a motor isolator or contactor, continue the screen at the lowest possible HF impedance.

Connect the motor cable screen to both the de-coupling plate of the frequency converter and to the metal housing of the motor.

Make the screen connections with the largest possible surface area (cable clamp). Use the installation devices within the frequency converter.

**Cable-length and cross-section**

The frequency converter has been EMC tested with a given length of cable. Keep the motor cable as short as possible to reduce the noise level and leakage currents.

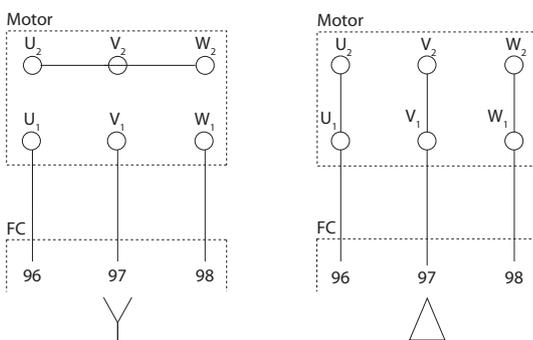
**Switching frequency**

When frequency converters are used together with sine-wave filters to reduce the acoustic noise from a motor, the switching frequency must be set according to 14-01 Switching Frequency.

Term. no.	96	97	98	99	
	U	V	W	PE <sup>1)</sup>	Motor voltage 0–100% of mains voltage. 3 wires out of motor
	U1	V1	W1	PE <sup>1)</sup>	Delta-connected 6 wires out of motor
	W2	U2	V2		
	U1	V1	W1	PE <sup>1)</sup>	Star-connected U2, V2, W2 U2, V2, and W2 to be interconnected separately.

**Table 4.1 Terminal Connections**

1) Protective Earth Connection



**Illustration 4.2 Y and Delta Terminal Configurations**

**4.4 Grounding**

**Consider the following basic issues for electromagnetic compatibility (EMC) during installation:**

- Safety grounding: The frequency converter has a high leakage current and must be grounded appropriately for safety reasons. Apply local safety regulations.
- High-frequency grounding: Keep the ground wire connections as short as possible.

Connect the different ground systems at the lowest possible conductor impedance. Keep the conductor as short as possible and use the greatest possible surface area for the lowest possible conductor impedance.

The metal cabinets of the different devices are mounted on the cabinet rear plate using the lowest possible HF impedance. Doing so avoids different HF voltages for individual devices and the risk of radio interference currents running in connection cables between the devices. The radio interference is reduced.

To obtain a low HF impedance, use the fastening bolts of the devices as HF connection to the rear plate. Remove insulating paint or similar from the fastening points.

**4.5 Input Options**

**4.5.1 Extra Protection (RCD)**

ELCB relays, multiple protective grounding, or standard grounding provide extra protection, if local safety regulations are followed.

In the case of a ground fault, a DC component develops in the fault current.

If using ELCB relays, observe local regulations. Relays must be suitable for protection of 3-phase equipment with a bridge rectifier and for a brief discharge on power-up.

**4.5.2 RFI Switch**

**Mains supply isolated from ground**

If the frequency converter is supplied from an isolated mains source or TT/TN-S mains with grounded leg, turn off the RFI switch via 14-50 RFI Filter on both frequency converter and the filter. For further reference, see IEC 364-3. When optimum EMC performance is needed, parallel motors are connected, or the motor cable length is above 25 m, set 14-50 RFI Filter to [ON].

In OFF, the internal RFI capacitors (filter capacitors) between the chassis and the intermediate circuit are cut off to avoid damage to the intermediate circuit and reduce ground capacity currents (IEC 61800-3).

Refer to the application note *VLT on IT mains*. It is important to use isolation monitors that work together with power electronics (IEC 61557-8).

### 4.5.3 Shielded Cables

It is important to connect shielded cables properly to ensure high EMC immunity and low emissions.

Connection can be made using either cable glands or clamps:

- EMC cable glands: Generally available cable glands can be used to ensure an optimum EMC connection.
- EMC cable clamp: Clamps allowing easy connection are supplied with the unit.

4

### 4.6 Motor Connection

#### 4.6.1 Motor Cable

Connect the motor to terminals U/T1/96, V/T2/97, W/T3/98, on the far right of the unit. Ground to terminal 99. All types of 3-phase asynchronous standard motors can be used with a frequency converter. The factory setting is for clockwise rotation with the frequency converter output connected as follows:

Terminal No.	Function
96, 97, 98	Mains U/T1, V/T2, W/T3
99	Ground

Table 4.2 Terminal Functions

- Terminal U/T1/96 connected to U-phase
- Terminal V/T2/97 connected to V-phase
- Terminal W/T3/98 connected to W-phase

The direction of rotation can be changed by switching 2 phases in the motor cable or by changing the setting of 4-10 *Motor Speed Direction*.

Motor rotation check can be performed via 1-28 *Motor Rotation Check* and following the steps shown in the display.

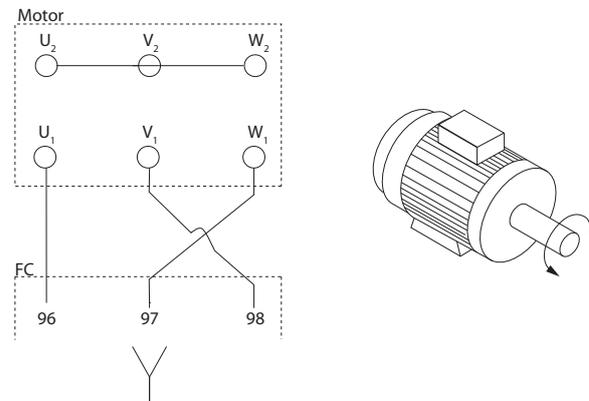
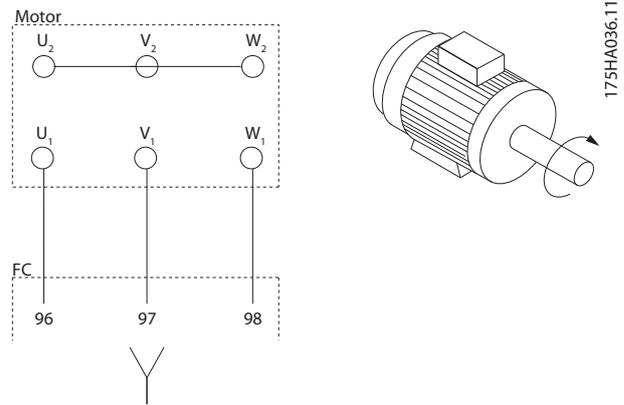


Illustration 4.3 Motor Rotation Check

#### F-frame requirements

Use motor phase cables in quantities of 2, resulting in 2, 4, 6, or 8 to obtain an equal number of wires on both inverter module terminals. The cables are required to be equal length within 10% between the inverter module terminals and the first common point of a phase. The recommended common point is the motor terminals.

#### Output junction box requirements

The length, minimum 2.5 m, and quantity of cables must be equal from each inverter module to the common terminal in the junction box.

#### NOTICE

If a retrofit application requires an unequal number of wires per phase, consult the factory or use the top/bottom entry side cabinet option, instruction 177R0097.

#### 4.6.2 Brake Cable

Frequency converters with factory installed brake chopper option

(Only standard with letter B in position 18 of type code).

The connection cable to the brake resistor must be screened and the max. length from frequency converter to the DC bar is limited to 25 m.

Terminal No.	Function
81, 82	Brake resistor terminals

Table 4.3 Terminal Functions

The connection cable to the brake resistor must be screened. Connect the screen with cable clamps to the conductive back plate of the frequency converter and the metal cabinet of the brake resistor.

Size the brake cable cross-section to match the brake torque. See also *Brake Instructions* for further information regarding safe installation.

## ⚠ WARNING

Note that voltages up to 790 V DC, depending on the supply voltage, are possible on the terminals.

### F-frame requirements

The brake resistors must be connected to the brake terminals in each inverter module.

### 4.6.3 Brake Resistor Temperature Switch

The input for the brake resistor temperature switch can be used to monitor the temperature of an externally connected brake resistor. If the connection between 104 and 106 is removed, the frequency converter trips on warning/alarm 27, Brake IGBT.

Install a Klixon switch that is 'normally closed' in series with the existing connection on either 106 or 104. Any connection to this terminal must be double insulated against high voltage to maintain PELV.

Normally closed: 104–106 (factory installed jumper).

Terminal No.	Function
106, 104, 105	Brake resistor temperature switch.

Table 4.4 Terminal Functions

## ⚠ CAUTION

If the temperature of the brake resistor is too high and the thermal switch drops out, the frequency converter stops braking. The motor coasts.

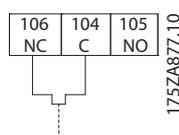


Illustration 4.4 Factory-installed Jumper

### 4.6.4 Motor Insulation

For motor cable lengths  $\leq$  the maximum cable length, the motor insulation ratings listed in *Table 4.5* are recommended. The peak voltage can be twice the DC-link voltage or 2.8 times mains voltage, due to transmission line effects in the motor cable. If a motor has lower insulation rating, use a dU/dt or sine wave filter.

Nominal Mains Voltage	Motor Insulation
$U_N \leq 420$ V	Standard $U_{LL} = 1,300$ V
$420$ V < $U_N \leq 500$ V	Reinforced $U_{LL} = 1,600$ V

Table 4.5 Recommended Motor Insulation Ratings

### 4.6.5 Motor Bearing Currents

Motors with a rating 110 kW or higher combined with frequency converters are best with NDE (Non-Drive End) insulated bearings to eliminate circulating bearing currents caused by motor size. To minimise DE (Drive End) bearing and shaft currents, proper grounding is required for:

- Frequency converter
- Motor
- Motor-driven machine
- Motor to the driven machine

Although failure due to bearing currents is infrequent, use the following strategies to reduce the likelihood:

- Use an insulated bearing
- Apply rigorous installation procedures
- Ensure that the motor and load motor are aligned
- Strictly follow the EMC Installation guideline
- Reinforce the PE so the high frequency impedance is lower in the PE than the input power leads
- Provide a good high frequency connection between the motor and the frequency converter
- Ensure that the impedance from frequency converter to building ground is lower than the grounding impedance of the machine. Make a direct ground connection between the motor and load motor.
- Apply conductive lubrication
- Try to ensure that the line voltage is balanced to ground.
- Use an insulated bearing as recommended by the motor manufacturer (note: Motors from reputable manufacturers typically have insulated bearings as standard in motors of this size)

If found to be necessary and after consultation with Danfoss:

- Lower the IGBT switching frequency
- Modify the inverter waveform, 60° AVM vs. SFAVM
- Install a shaft grounding system or use an isolating coupling between motor and load
- Use minimum speed settings if possible
- Use a dU/dt or sinus filter

#### 4.6.6 Motor Thermal Protection

The electronic thermal relay in the frequency converter has received UL-approval for single motor protection, when *1-90 Motor Thermal Protection* is set for *ETR Trip* and *1-24 Motor Current* is set to the rated motor current (see the motor name plate).

For thermal motor protection, it is also possible to use the MCB 112 PTC Thermistor Card option. This card provides ATEX certificate to protect motors in explosion hazardous areas, Zone 1/21 and Zone 2/22. When *1-90 Motor Thermal Protection*, set to [20] *ATEX ETR*, is combined with the use of MCB 112, it is possible to control an Ex-e motor in explosion hazardous areas. Consult the *Programming Guide* for details on how to set up the frequency converter for safe operation of Ex-e motors.

### 4.7 AC Mains Connection

#### 4.7.1 Mains Connection

Mains must be connected to terminals 91, 92 and 93 on the far left of the unit. Ground is connected to the terminal on the right of terminal 93.

Terminal No.	Function
91, 92, 93	Mains R/L1, S/L2, T/L3
94	Ground

Table 4.6 Terminal Functions

Ensure that the power supply can supply the necessary current to the frequency converter.

If the unit is without built-in fuses, ensure that the appropriate fuses have the correct current rating.

#### 4.7.2 External Fan Supply

If the frequency converter is supplied by DC or the fan must run independently of the power supply, use an external power supply. Make the connection on the power card.

Terminal No.	Function
100, 101	Auxiliary supply S, T
102, 103	Internal supply S, T

Table 4.7 Terminal Functions

The connector on the power card provides the connection of line voltage for the cooling fans. The fans are connected from the factory to be supplied from a common AC line (jumpers between 100–102 and 101–103). If external power supply is needed, remove the jumpers and connect the supply to terminals 100 and 101. Protect with a 5 A. In UL applications, use a Littelfuse KLK-5 or equivalent.

#### 4.7.3 Power and Control Wiring for Unscreened Cables

##### **WARNING**

###### INDUCED VOLTAGE

Induced voltage from coupled output motor cables charges equipment capacitors even with the equipment turned off and locked out. Run motor cables from multiple frequency converters separately. Failure to run output cables separately could result in death or serious injury.

##### **CAUTION**

###### COMPROMISED PERFORMANCE

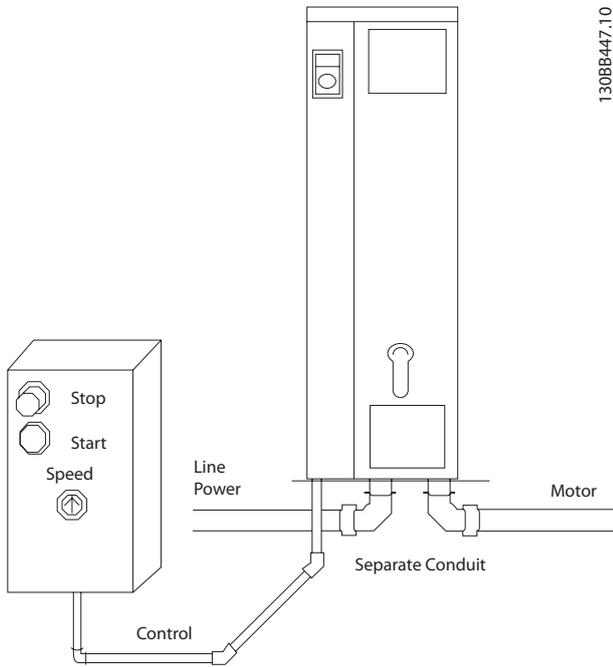
The frequency converter runs less efficiently if wiring is not isolated properly. To isolate high frequency noise, the following in separate metallic conduits:

- power wiring
- motor wiring
- control wiring

Failure to isolate these connections could result in less than optimum controller and associated equipment performance.

Because the power wiring carries high frequency electrical pulses, it is important to run input power and motor power in separate conduit. If incoming power wiring is in the same conduit as motor wiring, these pulses can couple electrical noise back onto the power grid. Isolate control wiring from high-voltage power wiring.

When screened/armoured cable is not used, at least 3 separate conduits are connected to the panel option (see *Illustration 4.5*).



**Illustration 4.5 Proper Electrical Installation Using Conduit**

#### 4.7.4 Mains Disconnects

Frame size	Power & Voltage	Type
D	P132-P200 380-500 V	OT400U12-9 or ABB OETL-NF400A
E	P250 380-500 V	ABB OETL-NF600A
E	P315-P400 380-500 V	ABB OETL-NF800A
F	P450 380-500 V	Merlin Gerin NPJF36000S12AAYP
F	P500-P630 380-500 V	Merlin Gerin NRK36000S20AAYP

Table 4.8 Recommended Mains Disconnects

#### 4.7.5 F-Frame Circuit Breakers

Frame size	Power & Voltage	Type
F	P450 380-500 V	Merlin Gerin NPJF36120U31AABSCYP
F	P500-P630 380-500 V	Merlin Gerin NRJF36200U31AABSCYP

Table 4.9 Recommended Circuit Breakers

#### 4.7.6 F-Frame Mains Contactors

Frame size	Power & Voltage	Type
F	P450-P500 380-500 V	Eaton XTCE650N22A
F	P560-P630 380-500 V	Eaton XTCEC14P22B

Table 4.10 Recommended Contactors

## 4.8 Control Wiring

### 4.8.1 Control Cable Routing

Tie down all control wires to the designated control cable routing as shown in *Illustration 4.6*, *Illustration 4.7*, and *Illustration 4.8*. Remember to connect the shields in a proper way to ensure optimum electrical immunity.

#### Fieldbus connection

Connections are made to the relevant options on the control card. For details, see the relevant fieldbus instruction. The cable must be placed in the provided path inside the frequency converter and tied down together with other control wires (see *Illustration 4.6* and *Illustration 4.7*).

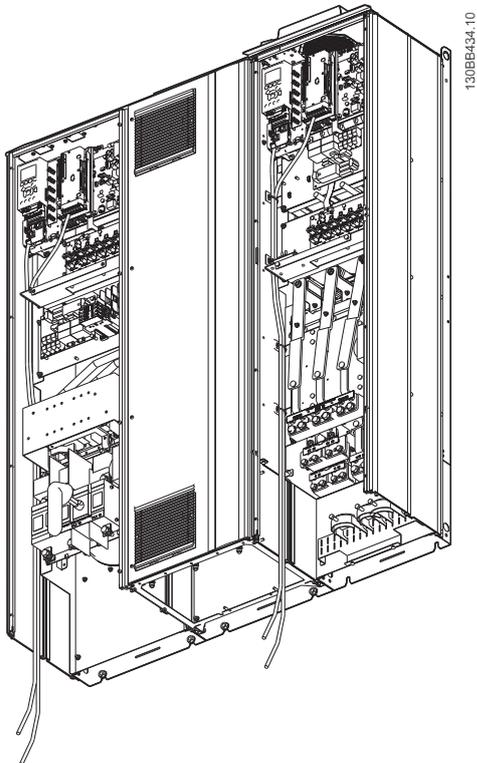


Illustration 4.6 Control Card Wiring Path for Frame Size D13

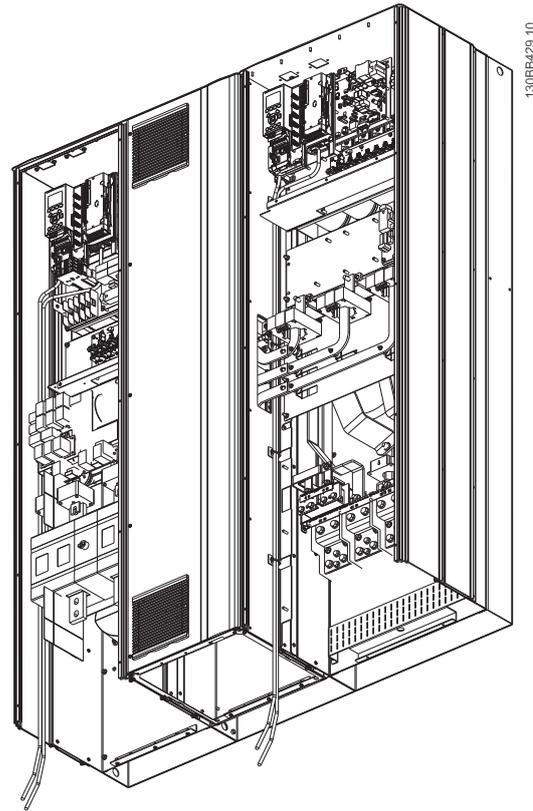
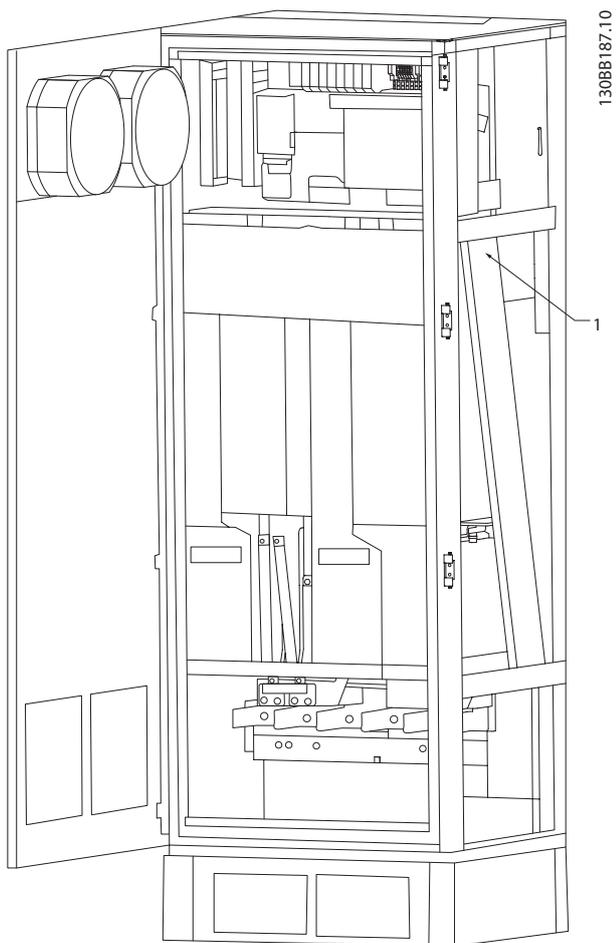


Illustration 4.7 Control Card Wiring Path for Frame Size E9



1 Routing path for the control card wiring, inside the frequency converter enclosure.

Illustration 4.8 Control Card Wiring Path for Frame Size F18

### 4.8.2 Access to Control Terminals

All terminals to the control cables are located beneath the LCP (both filter and frequency converter LCPs). They are accessed by opening the door of the unit.

### 4.8.3 Electrical Installation, Control Terminals

To connect the cable to the terminal:

1. Strip insulation by about 9–10 mm

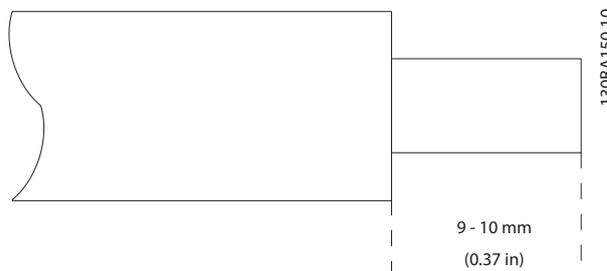


Illustration 4.9 Length to Strip the Insulation

2. Insert a screwdriver (max. 0.4x2.5 mm) in the square hole.
3. Insert the cable in the adjacent circular hole.

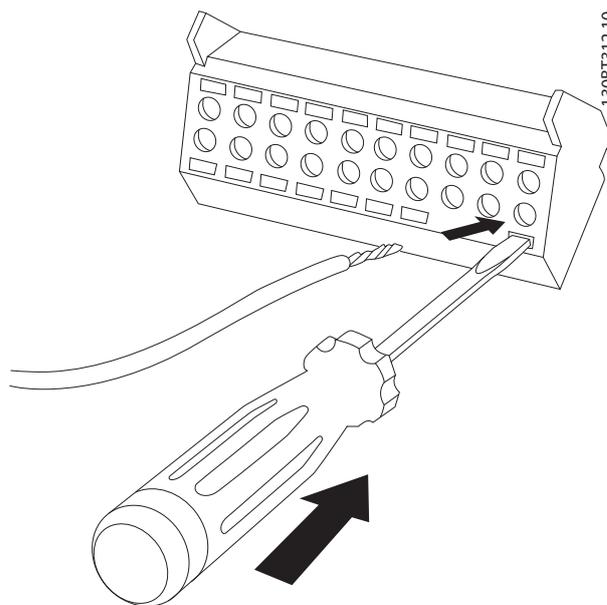


Illustration 4.10 Inserting the Cable in the Terminal Block

4. Remove the screwdriver. The cable is now mounted in the terminal.

**To remove the cable from the terminal:**

1. Insert a screwdriver (max. 0.4 x 2.5 mm) in the square hole.
2. Pull out the cable.

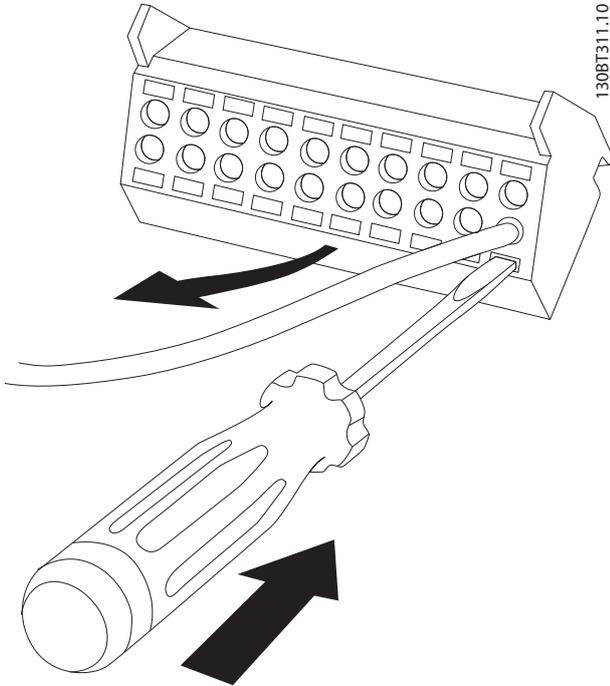


Illustration 4.11 Removing the Screwdriver after Cable Insertion

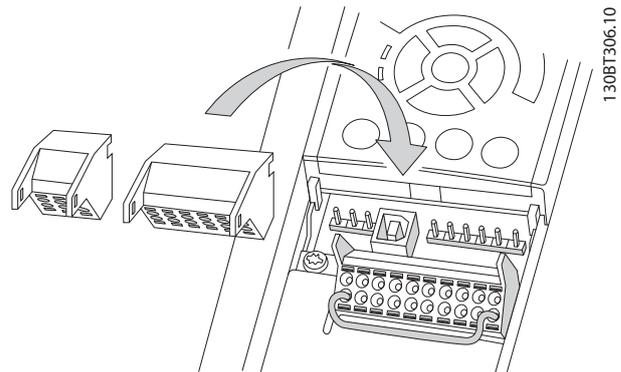


Illustration 4.12 Control Terminal Locations

4.8.4 Electrical Installation, Control Cables

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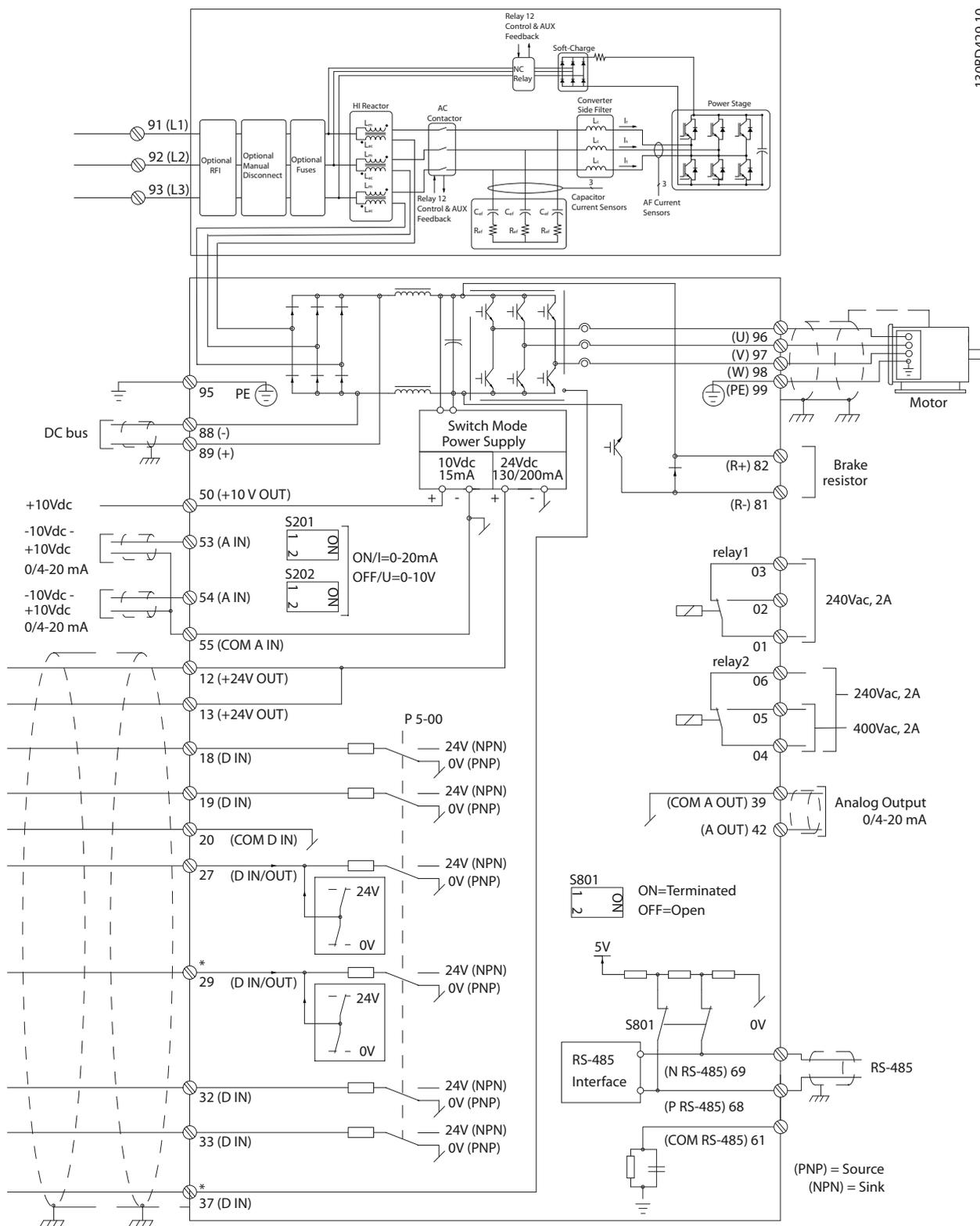


Illustration 4.13 Terminal Diagram

Long control cables and analog signals may result in 50/60 Hz ground loops due to noise from mains supply cables.

If ground loops occur, break the screen or insert a 100 nF capacitor between screen and chassis, if needed.

Connect the digital and analog inputs and outputs to the control cards of the units separately to avoid ground currents. These connections are on terminals 20, 55, and 39 for both the filter and frequency converter sections.

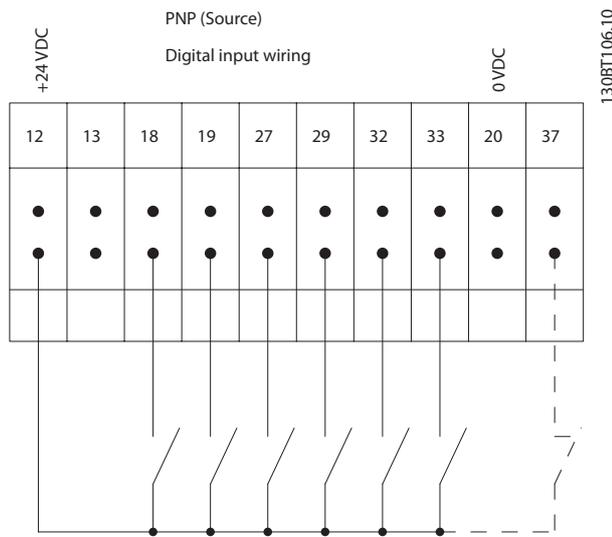


Illustration 4.14 Input Polarity of Control Terminals, PNP

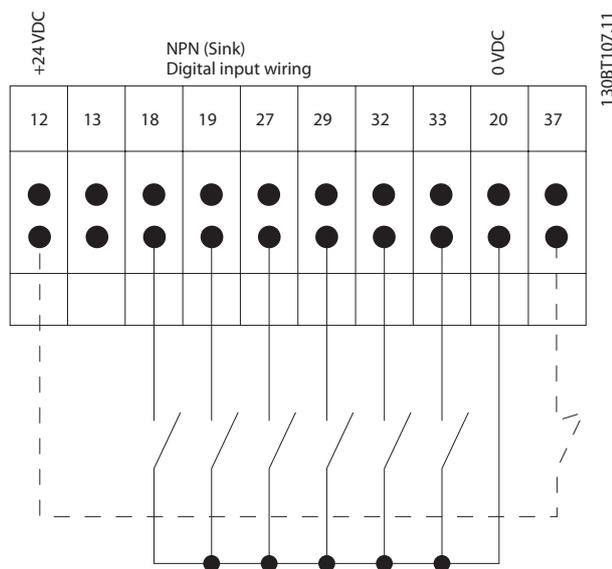


Illustration 4.15 Input Polarity of Control Terminals, NPN

**NOTICE**

To comply with EMC emission specifications, screened/ armoured cables are recommended. If using unscreened/ unarmoured cable, see *chapter 4.7.3 Power and Control Wiring for Unscreened Cables*. If using unscreened control cables, use ferrite cores to improve EMC performance.

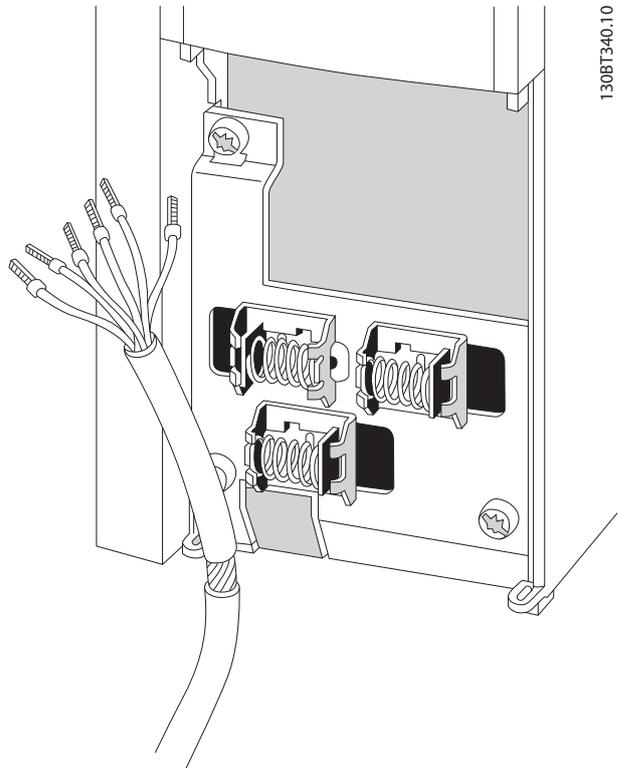


Illustration 4.16 Connecting Shielded Cables

Connect the shields in a proper way to ensure optimum electrical immunity.

4.9 Additional Connections

4.9.1 Mechanical Brake Control

In hoisting/lowering applications, it is necessary to be able to control an electro-mechanical brake:

- Control the brake using any relay output or digital output (terminal 27 or 29).
- Keep the output closed (voltage-free) as long as the frequency converter is unable to 'support' the motor, due to the load being too heavy, for example.
- Select [32] *Mechanical brake control* in parameter group 5-4\* *Relays* for applications with an electro-mechanical brake.
- The brake is released when the motor current exceeds the preset value in 2-20 *Release Brake Current*.

- The brake engages when the output frequency is less than the frequency set in 2-21 *Activate Brake Speed [RPM]* or 2-22 *Activate Brake Speed [Hz]*, only if the frequency converter completes a stop command.

If the frequency converter is in alarm mode or in an overvoltage situation, the mechanical brake immediately cuts in.

## 4

#### 4.9.2 Parallel Connection of Motors

The frequency converter can control several parallel-connected motors. The total current consumption of the motors must not exceed the rated output current  $I_{M,N}$  for the frequency converter.

#### **NOTICE**

Installations with cables connected in a common joint as in *Illustration 4.17*, is only recommended for short cable lengths.

#### **NOTICE**

When motors are connected in parallel, 1-29 *Automatic Motor Adaptation (AMA)* cannot be used.

#### **NOTICE**

The electronic thermal relay (ETR) of the frequency converter cannot be used as motor protection for the individual motor in systems with parallel-connected motors. Provide further motor protection with thermistors in each motor or individual thermal relays. Circuit breakers are not suitable as protection.

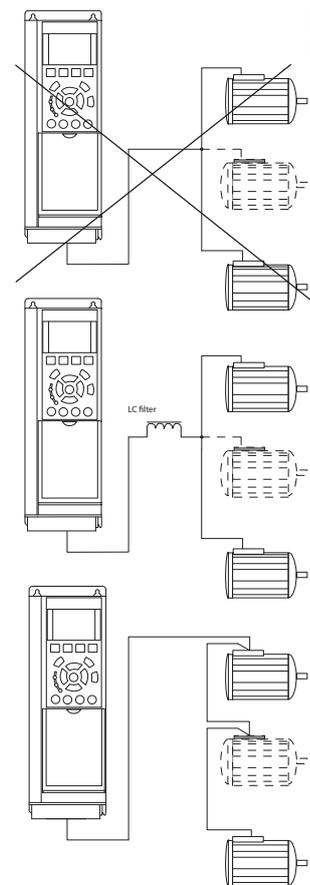


Illustration 4.17 Installations with Cables Connected in a Common Joint

Problems are possible at start and at low RPM values if motor sizes vary widely. The relatively high ohmic resistance in the stator of small motors calls for a higher voltage at start and at low RPM values.

#### 4.9.3 Motor Thermal Protection

The electronic thermal relay in the frequency converter has received UL-approval for single motor protection, when 1-90 *Motor Thermal Protection* is set for [4] *ETR Trip 1* and 1-24 *Motor Current* is set to the rated motor current (see motor name plate).

For thermal motor protection, it is also possible to use the VLT® PTC Thermistor Card MCB 112. This card provides ATEX certification to protect motors in explosion hazardous areas, Zone 1/21 and Zone 2/22. When 1-90 *Motor Thermal Protection* is set to [20] *ATEX ETR* and MCB 112 are combined, it is possible to control an Ex-e motor in explosion hazardous areas. Consult the *Programming Guide* for details on how to set up the frequency converter for safe operation of Ex-e motors.

#### 4.9.4 Safe Torque Off (STO)

To run Safe Torque Off, additional wiring for the frequency converter is required. Refer to *VLT® Frequency Converters Safe Torque Off Operating Instructions* for further information.

#### 4.9.5 Switches S201, S202, and S801

Use switches S201 (A53) and S202 (A54) to select a current (0-20 mA) or a voltage (-10 V to 10 V) configuration of the analog input terminals 53 and 54.

Switch S801 (BUS TER.) can be used to enable termination on the RS-485 port (terminals 68 and 69).

See *Illustration 4.13*.

##### Default setting:

S201 (A53) = OFF (voltage input)

S202 (A54) = OFF (voltage input)

S801 (Bus termination) = OFF

#### NOTICE

When changing the function of S201, S202 or S801 do not use force for the switch-over. Remove the LCP cradle when operating the switches. The switches must not be operated with power on the frequency converter.

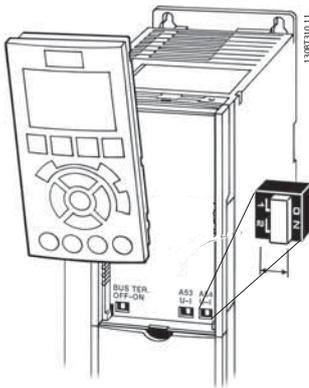


Illustration 4.18 Remove the LCP Cradle to Access Switches

#### 4.9.6 Serial Communication

RS-485 is a 2-wire bus interface compatible with multi-drop network topology, i.e. nodes can be connected as a bus, or via drop cables from a common trunk line. A total of 32 nodes can be connected to one network segment. Repeaters divide networks.

#### NOTICE

Each repeater functions as a node within the segment in which it is installed. Each node connected within a given network must have a unique node address, across all segments.

Terminate each segment at both ends, using either the termination switch (S801) of the frequency converters or a biased termination resistor network. Always use screened twisted pair (STP) cable for bus cabling, and always follow good common installation practice. Low-impedance ground connection of the screen at every node is important, including at high frequencies. Thus, connect a large surface of the screen to ground, for example with a cable clamp or a conductive cable gland. It may be necessary to apply potential-equalizing cables to maintain the same ground potential throughout the network - particularly in installations with long cables. To prevent impedance mismatch, always use the same type of cable throughout the entire network. When connecting a motor to the frequency converters, always use screened motor cable.

Cable	Screened twisted pair (STP)
Impedance	120 Ω
Cable length [m]	Max. 1200 (including drop lines) Max. 500 station-to-station

Table 4.11 Cable Recommendations

#### 4.9.7 F-frame Options

##### Space heaters and thermostat

There are space heaters mounted on the cabinet interior of F-frame frequency converters. These heaters are controlled by an automatic thermostat and help control humidity inside the enclosure. The thermostat default settings turn on the heaters at 10 °C (50 °F) and turn them off at 15.6 °C (60 °F).

##### Cabinet light with power outlet

A light mounted on the cabinet interior of F-frame frequency converters increases visibility during servicing and maintenance. The housing includes a power outlet for temporarily powering tools or other devices, available in 2 voltages:

- 230 V, 50 Hz, 2.5 A, CE/ENEC
- 120 V, 60 Hz, 5 A, UL/cUL

### Transformer tap set-up

If the cabinet light and outlet and/or the space heaters and thermostat are installed, transformer T1 requires its taps to be set to the proper input voltage. A 380-480/500 V frequency converter is initially set to the 525 V tap and a 525-690 V frequency converters is set to the 690 V tap to ensure no overvoltage of secondary equipment occurs if the tap is not changed before applying power. See *Table 4.12* to set the proper tap at terminal T1 located in the rectifier cabinet.

Input voltage range [V]	Tap to select [V]
380 V-440	400
441 V-490	460
491 V-550	525
551 V-625	575
626 V-660	660
661 V-690	690

Table 4.12 Transformer Tap Set-up

### NAMUR terminals

NAMUR is an international association of automation technology users in the process industries, primarily chemical and pharmaceutical industries in Germany. Selecting this option provides terminals organised and labeled to the specifications of the NAMUR standard for frequency converters input and output terminals. This requires VLT<sup>®</sup> PTC Thermistor Card MCB 112 VLT<sup>®</sup> Extended Relay Card MCB 113.

### RCD (Residual Current Device)

Uses the core balance method to monitor ground fault currents in grounded and high-resistance grounded systems (TN and TT systems in IEC terminology). There is a pre-warning (50% of main alarm set-point) and a main alarm set-point. Associated with each set-point is an SPDT alarm relay for external use. Requires an external "window-type" current transformer (supplied and installed by the customer).

- Integrated into the frequency converter safe torque off circuit
- IEC 60755 Type B device monitors AC, pulsed DC, and pure DC ground fault currents
- LED bar graph indicator of the ground fault current level from 10–100% of the set-point
- Fault memory
- TEST/RESET button

### Insulation Resistance Monitor (IRM)

Monitors the insulation resistance in ungrounded systems (IT systems in IEC terminology) between the system phase conductors and ground. There is an ohmic pre-warning and a main alarm set-point for the insulation level. An SPDT alarm relay for external use is associate with each setpoint.

## NOTICE

Only one insulation resistance monitor can be connected to each ungrounded (IT) system.

- Integrated into the frequency converter safe torque off circuit
- LCD display of the ohmic value of the insulation resistance
- Fault memory
- INFO, TEST, and RESET buttons

### IEC emergency stop with Pilz safety relay

Includes a redundant 4-wire emergency-stop push button mounted on the front of the enclosure and a Pilz relay that monitors it in conjunction with the frequency converter STO circuit and the mains contactor located in the options cabinet.

### Manual motor starters

Provide 3-phase power for electric blowers often required for larger motors. Power for the starters is provided from the load side of any supplied contactor, circuit breaker, or disconnect switch. Power is fused before each motor starter, and is off when the incoming power to the frequency converters is off. Up to 2 starters are allowed (one if a 30 A, fuse-protected circuit is ordered), and are integrated into the frequency converter STO circuit.

Unit features include:

- Operation switch (on/off)
- Short-circuit and overload protection with test function
- Manual reset function

### 30 A, fuse-protected terminals

- 3-phase power matching incoming mains voltage for powering auxiliary customer equipment
- Not available if 2 manual motor starters are selected
- Terminals are off when the incoming power to the frequency converter is off
- Power for the fused protected terminals is provided from the load side of any supplied contactor, circuit breaker, or disconnect switch

In applications where the motor is used as a brake, energy is generated in the motor and sent back into the frequency converter. If the energy cannot be transported back to the motor, it increases the voltage in the frequency converter DC line. In applications with frequent braking and/or high inertia loads, this increase may lead to an overvoltage trip in the frequency converter and finally a shut down. Brake resistors are used to dissipate the excess energy resulting from the regenerative braking. The resistor is selected based on its ohmic value, its power dissipation rate and its physical size. Danfoss offers a wide

variety of different resistors that are specifically designed for Danfoss frequency converters.

**Load sharing**

Load sharing is a feature on standard frequency converters, but is not available on the LHD unit.

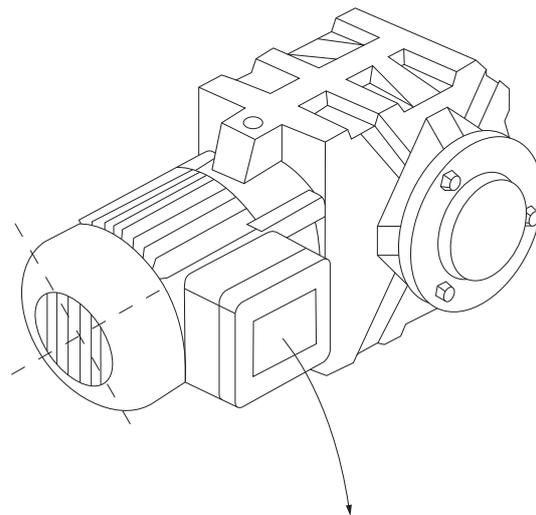
**4.10 Final Set-up and Test**

Before operating the frequency converter, perform a final test of the installation:

1. Locate the motor name plate to find out whether the motor is star- (Y) or delta- connected ( $\Delta$ ).
2. Enter the motor name plate data in the parameter list. Access the list by pressing the [Quick Menu] key and selecting Q2 Quick Set-up. See *Table 4.13*.

1.	Motor Power [kW] or Motor Power [HP]	1-20 Motor Power [kW] 1-21 Motor Power [HP]
2.	Motor Voltage	1-22 Motor Voltage
3.	Motor Frequency	1-23 Motor Frequency
4.	Motor Current	1-24 Motor Current
5.	Motor Nominal Speed	1-25 Motor Nominal Speed

**Table 4.13 Quick Set-up Parameters**



130BT307.10

BAUER D-7 3734 ESLINGEN					
3~ MOTOR NR. 1827421 2003					
S/E005A9					
1,5		KW			
n <sub>2</sub> 31,5	/min.	400	Y	V	
n <sub>1</sub> 1400	/min.	50		Hz	
COS $\theta$ 0,80		3,6		A	
1,7L					
B	IP 65	H1/1A			

**Illustration 4.19 Motor Name Plate**

3. Perform an Automatic Motor Adaptation (AMA) to ensure optimum performance.
  - 3a Connect terminal 27 to terminal 12 or set 5-12 Terminal 27 Digital Input to [0] No operation.
  - 3b Activate the AMA 1-29 Automatic Motor Adaptation (AMA).
  - 3c Select either complete or reduced AMA. If an LC filter is mounted, run only the reduced AMA, or remove the LC filter during the AMA procedure.
  - 3d Press [OK]. The display shows "Press [Hand On] to start."
  - 3e Press [Hand On]. A progress bar indicates whether the AMA is in progress.
  - 3f Press [Off] - the frequency converter enters into alarm mode and the display shows that the user terminated AMA.

### Stop the AMA during operation

#### Successful AMA

- The display shows "Press [OK] to finish AMA".
- Press [OK] to exit the AMA state.

#### Unsuccessful AMA

- The frequency converter enters into alarm mode. A description of the alarm can be found in *chapter 7.5 Troubleshooting*.
- "Report Value" in the alarm log shows the last measuring sequence carried out by the AMA, before the frequency converter entered alarm mode. This number, along with the description of the alarm, helps with troubleshooting. Mention the number and alarm description when contacting Danfoss service personnel.

Unsuccessful AMA is the result of incorrectly registered motor name plate data or too large a difference between the motor power size and the frequency converter power size.

### Set up the desired limits for speed and ramp time

Minimum Reference	3-02 <i>Minimum Reference</i>
Maximum Reference	3-03 <i>Maximum Reference</i>

**Table 4.14 Reference Parameters**

Motor Speed Low Limit	4-11 <i>Motor Speed Low Limit [RPM]</i> or 4-12 <i>Motor Speed Low Limit [Hz]</i>
Motor Speed High Limit	4-13 <i>Motor Speed High Limit [RPM]</i> or 4-14 <i>Motor Speed High Limit [Hz]</i>

**Table 4.15 Speed Limits**

Ramp-up Time 1 [s]	3-41 <i>Ramp 1 Ramp Up Time</i>
Ramp-down Time 1 [s]	3-42 <i>Ramp 1 Ramp Down Time</i>

**Table 4.16 Ramp Times**

## 5 Commissioning

### 5.1 Safety Instructions

See *chapter 2 Safety* for general safety instructions.

#### **⚠ WARNING**

##### HIGH VOLTAGE

Frequency converters contain high voltage when connected to AC mains input power. Failure to perform installation, start-up, and maintenance by qualified personnel could result in death or serious injury.

- Installation, start-up, and maintenance must be performed by qualified personnel only.

##### Before applying power:

1. Close cover properly.
2. Check that all cable glands are firmly tightened.
3. Ensure that input power to the unit is OFF and locked out. Do not rely on the frequency converter disconnect switches for input power isolation.
4. Verify that there is no voltage on input terminals L1 (91), L2 (92), and L3 (93), phase-to-phase and phase-to-ground.
5. Verify that there is no voltage on output terminals 96 (U), 97 (V), and 98 (W), phase-to-phase and phase-to-ground.
6. Confirm continuity of the motor by measuring ohm values on U-V (96-97), V-W (97-98), and W-U (98-96).
7. Check for proper grounding of the frequency converter as well as the motor.
8. Inspect the frequency converter for loose connections on terminals.
9. Confirm that the supply voltage matches voltage of frequency converter and motor.

## CAUTION

Before applying power to the unit, inspect the entire installation as detailed in *Table 5.1*. Check mark those items when completed.

Inspect for	Description	<input checked="" type="checkbox"/>
Auxiliary equipment	<ul style="list-style-type: none"> <li>• Look for auxiliary equipment, switches, disconnects, or input fuses/circuit breakers on the input power side of the frequency converter or output side to the motor. Ensure that they are ready for full speed operation.</li> <li>• Check function and installation of any sensors used for feedback to the frequency converter</li> <li>• Remove power factor correction caps on motors, if present</li> </ul>	
Cable routing	<ul style="list-style-type: none"> <li>• Use separate metallic conduits for each of the following: <ul style="list-style-type: none"> <li>• input power</li> <li>• motor wiring</li> <li>• control wiring</li> </ul> </li> </ul>	
Control wiring	<ul style="list-style-type: none"> <li>• Check for broken or damaged wires and loose connections</li> <li>• Check that control wiring is isolated from power and motor wiring for noise immunity</li> <li>• Check the voltage source of the signals, if necessary</li> <li>• The use of shielded cable or twisted pair is recommended. Ensure that the shield is terminated correctly</li> </ul>	
Cooling clearance	<ul style="list-style-type: none"> <li>• Measure that top and bottom clearance is adequate to ensure proper air flow for cooling</li> </ul>	
EMC considerations	<ul style="list-style-type: none"> <li>• Check for proper installation regarding electromagnetic compatibility</li> </ul>	
Environmental considerations	<ul style="list-style-type: none"> <li>• See equipment label for the maximum ambient operating temperature limits</li> <li>• Humidity levels must be 5–95% non-condensing</li> </ul>	

Inspect for	Description	<input checked="" type="checkbox"/>
Fusing and circuit breakers	<ul style="list-style-type: none"> <li>• Check for proper fusing or circuit breakers</li> <li>• Check that all fuses are inserted firmly and in operational condition and that all circuit breakers are in the open position</li> </ul>	
Grounding	<ul style="list-style-type: none"> <li>• The unit requires a ground wire from its chassis to the building ground</li> <li>• Check for good ground connections that are tight and free of oxidation</li> <li>• Grounding to conduit or mounting the back panel to a metal surface is not a suitable ground</li> </ul>	
Input and output power wiring	<ul style="list-style-type: none"> <li>• Check for loose connections</li> <li>• Check that motor and mains are in separate conduit or separated screened cables</li> </ul>	
Panel interior	<ul style="list-style-type: none"> <li>• Inspect that the unit interior is free of debris and corrosion</li> </ul>	
Switches	<ul style="list-style-type: none"> <li>• Ensure that all switch and disconnect settings are in the proper positions</li> </ul>	
Vibration	<ul style="list-style-type: none"> <li>• Check that the unit is mounted solidly or that shock mounts are used, as necessary</li> <li>• Check for an unusual amount of vibration</li> </ul>	

Table 5.1 Start-up Checklist

## 5.2 Applying Power

### **WARNING**

#### HIGH VOLTAGE!

Frequency converters contain high voltage when connected to AC mains. Installation, start-up and maintenance should be performed by qualified personnel only. Failure to comply could result in death or serious injury.

### **WARNING**

#### UNINTENDED START!

When the frequency converter is connected to AC mains, the motor may start at any time. The frequency converter, motor, and any driven equipment must be in operational readiness. Failure to comply could result in death, serious injury, equipment, or property damage.

1. Confirm that the input voltage is balanced within 3%. If not, correct input voltage imbalance before proceeding.
2. Ensure that optional equipment wiring, if present, matches the installation application.
3. Ensure that all operator devices are off. Panel doors should be closed or cover mounted.
4. Apply power to the unit. Do not start the frequency converter at this time. For units with a disconnect switch, turn the switch on to apply power.

### **NOTICE**

If the status line at the bottom of the LCP reads **AUTO REMOTE COASTING** or **Alarm 60 External Interlock** is displayed, this indicates that the unit is ready to operate but is missing an input signal on terminal 27.

## 5.3 Local Control Panel Operation

### 5.3.1 Local Control Panel

The local control panel (LCP) is the combined display and keypad on the front of the unit.

The LCP has several user functions:

- Start, stop, and control speed when in local control
- Display operational data, status, warnings and cautions
- Programming frequency converter functions
- Manually reset the frequency converter after a fault when auto-reset is inactive

An optional numeric LCP (NLCP) is also available. The NLCP operates in a manner similar to the LCP. See the *Programming Guide* for details on use of the NLCP.

### **NOTICE**

For commissioning via PC, install MCT 10 Set-up Software. The software is available for download (basic version) or for ordering (advanced version, order number 130B1000). For more information and downloads, see [www.danfoss.com/BusinessAreas/DrivesSolutions/Software+MCT10/MCT10+Downloads.htm](http://www.danfoss.com/BusinessAreas/DrivesSolutions/Software+MCT10/MCT10+Downloads.htm).

### 5.3.2 LCP Layout

The LCP is divided into 4 functional groups (see *Illustration 5.1*).

- Display area
- Display menu keys
- Navigation keys and indicator lights (LEDs)
- Operation keys and reset

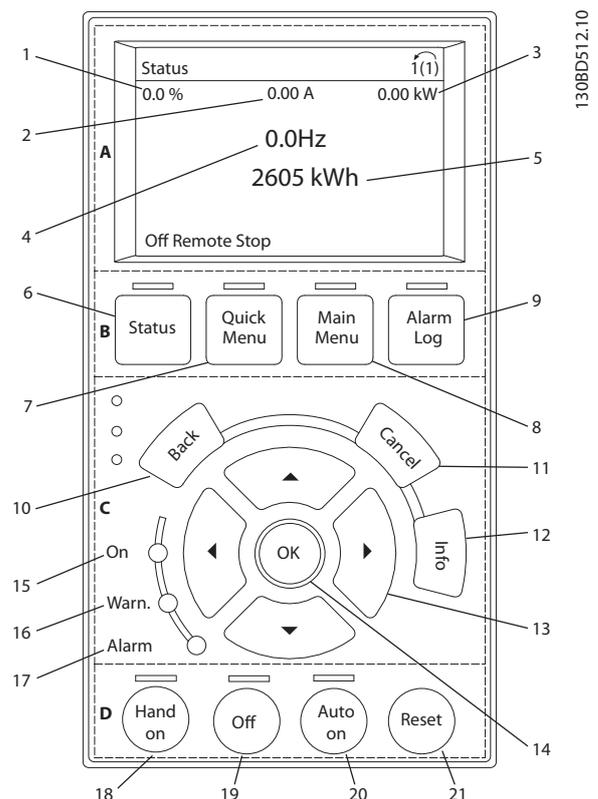


Illustration 5.1 Local Control Panel (LCP)

#### A. Display Area

The display area is activated when the frequency converter receives power from mains voltage, a DC bus terminal, or an external 24 V DC supply.

The information displayed on the LCP can be customised for user application. Select options in the Quick Menu Q3-13 *Display Settings*.

Callout	Display	Parameter number	Default setting
1	1.1	0-20	Reference %
2	1.2	0-21	Motor current
3	1.3	0-22	Power [kW]
4	2	0-23	Frequency
5	3	0-24	kWh counter

Table 5.2 Legend to *Illustration 5.1, Display Area*

### B. Display Menu Keys

Menu keys are used for menu access for parameter set-up, toggling through status display modes during normal operation, and viewing fault log data.

Callout	Key	Function
6	Status	Shows operational information.
7	Quick Menu	Allows access to programming parameters for initial set-up instructions and many detailed application instructions.
8	Main Menu	Allows access to all programming parameters.
9	Alarm Log	Displays a list of current warnings, the last 10 alarms, and the maintenance log.

Table 5.3 Legend to *Illustration 5.1, Display Menu Keys*

### C. Navigation Keys and Indicator Lights (LEDs)

Navigation keys are used for programming functions and moving the display cursor. The navigation keys also provide speed control in local (hand) operation. There are also 3 frequency converter status indicator lights in this area.

Callout	Key	Function
10	Back	Reverts to the previous step or list in the menu structure.
11	Cancel	Cancels the last change or command as long as the display mode has not changed.
12	Indo	Press for a definition of the function being displayed.
13	Navigation keys	Press to move between items in the menu.
14	OK	Press to access parameter groups or to enable a choice.

Table 5.4 Legend to *Illustration 5.1, Navigation Keys*

Callout	Indicator	Light	Function
15	ON	Green	The ON light activates when the frequency converter receives power from mains voltage, a DC bus terminal, or an external 24 V supply.
16	WARN	Yellow	When warning conditions are met, the yellow WARN light comes on and text appears in the display area identifying the problem.
17	ALARM	Red	A fault condition causes the red alarm light to flash and an alarm text is displayed.

Table 5.5 Legend to *Illustration 5.1, Indicator Lights (LEDs)*

### D. Operation Keys and Reset

Operation keys are located at the bottom of the LCP.

Callout	Key	Function
18	Hand On	Starts the frequency converter in local control. <ul style="list-style-type: none"> <li>An external stop signal by control input or serial communication overrides the local hand on</li> </ul>
19	Off	Stops the motor but does not remove power to the frequency converter.
20	Auto On	Puts the system in remote operational mode. <ul style="list-style-type: none"> <li>Responds to an external start command by control terminals or serial communication</li> </ul>
21	Reset	Resets the frequency converter manually after a fault has been cleared.

Table 5.6 Legend to *Illustration 5.1, Operation Keys and Reset*

## NOTICE

The display contrast can be adjusted by pressing [Status] and [▲]/[▼] keys.

### 5.3.3 Parameter Settings

Establishing the correct programming for applications often requires setting functions in several related parameters.

Programming data are stored internally in the frequency converter.

- For back-up, upload data into the LCP memory
- To download data to another frequency converter, connect the LCP to that unit and download the stored settings
- Restoring factory default settings does not change data stored in the LCP memory

### 5.3.4 Uploading/Downloading Data to/from the LCP

1. Press [Off] to stop the motor before uploading or downloading data.
2. Go to [Main Menu] *0-50 LCP Copy* and press [OK].
3. Select [*1*] *All to LCP* to upload data to LCP or select [*2*] *All from LCP* to download data from the LCP.
4. Press [OK]. A progress bar shows the uploading or downloading process.
5. Press [Hand On] or [Auto On] to return to normal operation.

### 5.3.5 Changing Parameter Settings

Parameter settings can be accessed and changed from the [Quick Menu] or from the [Main Menu]. The [Quick Menu] only gives access to a limited number of parameters.

1. Press [Quick Menu] or [Main Menu] on the LCP.
2. Press [▲] [▼] to browse through the parameter groups, press [OK] to select a parameter group.
3. Press [▲] [▼] to browse through the parameters, press [OK] to select a parameter.
4. Press [▲] [▼] to change the value of a parameter setting.
5. Press [◀] [▶] to shift digit when a decimal parameter is in the editing state.
6. Press [OK] to accept the change.
7. Press either [Back] twice to enter Status, or press [Main Menu] once to enter Main Menu.

#### View changes

*Quick Menu Q5 - Changes Made* lists all parameters changed from default settings.

- The list shows only parameters which have been changed in the current edit-setup.
- Parameters which have been reset to default values are not listed.
- The message *Empty* indicates that no parameters have been changed.

### 5.3.6 Restoring Default Settings

#### **NOTICE**

**Risk of losing programming, motor data, localisation, and monitoring records by restoration of default settings. To provide a back-up, upload data to the LCP before initialisation.**

Restoring the default parameter settings is done by initialisation of the frequency converter. Initialisation is carried out through *14-22 Operation Mode* (recommended) or manually.

- Initialisation using *14-22 Operation Mode* does not reset frequency converter settings such as operating hours, serial communication selections, personal menu settings, fault log, alarm log, and other monitoring functions.
- Manual initialisation erases all motor, programming, localisation, and monitoring data and restores factory default settings.

#### Recommended initialisation procedure, via *14-22 Operation Mode*

1. Press [Main Menu] twice to access parameters.
2. Scroll to *14-22 Operation Mode* and press [OK].
3. Scroll to *Initialisation* and press [OK].
4. Remove power to the unit and wait for the display to turn off.
5. Apply power to the unit.

Default parameter settings are restored during start-up. This may take slightly longer than normal.

6. Alarm 80 is displayed.
7. Press [Reset] to return to operation mode.

#### Manual initialisation procedure

1. Remove power to the unit and wait for the display to turn off.
2. Press and hold [Status], [Main Menu], and [OK] at the same time while applying power to the unit (approximately 5 s or until audible click and fan starts).

Factory default parameter settings are restored during start-up. This may take slightly longer than normal.

Manual initialisation does not reset the following frequency converter information:

- *15-00 Operating hours*
- *15-03 Power Up's*
- *15-04 Over Temp's*
- *15-05 Over Volt's*

## 5.4 Basic Programming

### 5.4.1 Commissioning with SmartStart

The SmartStart wizard enables fast configuration of basic motor and application parameters.

- At first power up or after initialisation of the frequency converter, SmartStart starts automatically.
- Follow on-screen instructions to complete commissioning of the frequency converter. Always reactivate SmartStart by selecting *Quick Menu Q4 - SmartStart*.
- For commissioning without use of the SmartStart wizard, refer to *chapter 5.4.2 Commissioning via [Main Menu]* or the *Programming Guide*.

#### **NOTICE**

Motor data are required for the SmartStart set-up. The required data are normally available on the motor nameplate.

### 5.4.2 Commissioning via [Main Menu]

Recommended parameter settings are intended for start-up and checkout purposes. Application settings may vary.

Enter data with power ON, but before operating the frequency converter.

1. Press [Main Menu] on the LCP.
2. Press the navigation keys to scroll to parameter group 0-\*\* *Operation/Display* and press [OK].

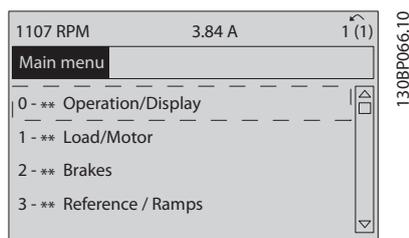


Illustration 5.2 Main Menu

3. Press navigation keys to scroll to parameter group 0-0\* *Basic Settings* and press [OK].

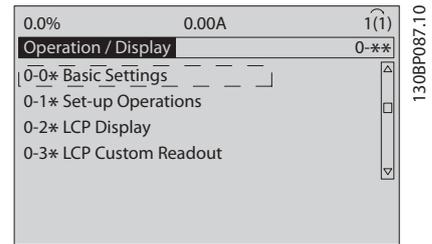


Illustration 5.3 Operation/Display

4. Press navigation keys to scroll to 0-03 *Regional Settings* and press [OK].

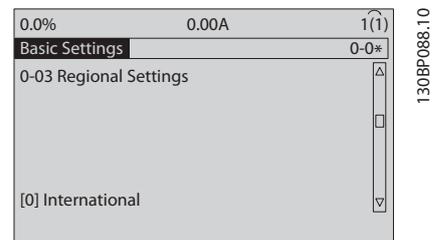


Illustration 5.4 Basic Settings

5. Press navigation keys to select [0] *International* or [1] *North America* as appropriate and press [OK]. (This changes the default settings for a number of basic parameters).
6. Press [Main Menu] on the LCP.
7. Press the navigation keys to scroll to 0-01 *Language*.
8. Select language and press [OK].
9. If a jumper wire is in place between control terminals 12 and 27, leave 5-12 *Terminal 27 Digital Input* at factory default. Otherwise, select *No Operation* in 5-12 *Terminal 27 Digital Input*.
10. 3-02 *Minimum Reference*
11. 3-03 *Maximum Reference*
12. 3-41 *Ramp 1 Ramp Up Time*
13. 3-42 *Ramp 1 Ramp Down Time*
14. 3-13 *Reference Site*. Linked to Hand/Auto Local Remote.

### 5.4.3 Asynchronous Motor Set-up

Enter the motor data in parameter *1-20 Motor Power [kW]* or *1-21 Motor Power [HP]* to *1-25 Motor Nominal Speed*. The information can be found on the motor nameplate.

1. *1-20 Motor Power [kW]* or *1-21 Motor Power [HP]*
2. *1-22 Motor Voltage*
3. *1-23 Motor Frequency*
4. *1-24 Motor Current*
5. *1-25 Motor Nominal Speed*

### 5.4.4 Permanent Magnet Motor Set-up

#### **NOTICE**

**Only use permanent magnet (PM) motor with fans and pumps.**

#### Initial Programming Steps

1. Activate PM motor operation *1-10 Motor Construction*, select (1) PM, non salient SPM
2. Set *0-02 Motor Speed Unit* to [0] RPM

#### Programming motor data

After selecting PM motor in *1-10 Motor Construction*, the PM motor-related parameters in parameter groups *1-2\* Motor Data*, *1-3\* Adv. Motor Data* and *1-4\** are active. The necessary data can be found on the motor nameplate and in the motor data sheet.

Program the following parameters in the listed order

1. *1-24 Motor Current*
2. *1-26 Motor Cont. Rated Torque*
3. *1-25 Motor Nominal Speed*
4. *1-39 Motor Poles*
5. *1-30 Stator Resistance (Rs)*  
Enter line to common stator winding resistance (Rs). If only line-line data are available, divide the line-line value with 2 to achieve the line to common (starpoint) value.  
It is also possible to measure the value with an ohmmeter, which takes the resistance of the cable into account. Divide the measured value by 2 and enter the result.
6. *1-37 d-axis Inductance (Ld)*  
Enter line to common direct axis inductance of the PM motor.  
If only line-line data are available, divide the line-line value with 2 to achieve the line-common (starpoint) value.  
It is also possible to measure the value with an inductancemeter, which takes the inductance of

the cable into account. Divide the measured value by 2 and enter the result.

7. *1-40 Back EMF at 1000 RPM*  
Enter line to line back EMF of PM Motor at 1000 RPM mechanical speed (RMS value). Back EMF is the voltage generated by a PM motor when no drive is connected and the shaft is turned externally. Back EMF is normally specified for nominal motor speed or for 1000 RPM measured between 2 lines. If the value is not available for a motor speed of 1000 RPM, calculate the correct value as follows: If back EMF is e.g. 320 V at 1800 RPM, it can be calculated at 1000 RPM as follows: Back EMF = (Voltage / RPM)\*1000 = (320/1800)\*1000 = 178. This is the value that must be programmed for *1-40 Back EMF at 1000 RPM*.

#### Test motor operation

1. Start the motor at low speed (100 to 200 RPM). If the motor does not turn, check installation, general programming and motor data.
2. Check if start function in *1-70 PM Start Mode* fits the application requirements.

#### Rotor detection

This function is the recommended choice for applications where the motor starts from standstill, e.g. pumps or conveyors. On some motors, an acoustic sound is heard when the impulse is sent out. This does not harm the motor.

#### Parking

This function is the recommended choice for applications where the motor is rotating at slow speed eg. windmilling in fan applications. *2-06 Parking Current* and *2-07 Parking Time* can be adjusted. Increase the factory setting of these parameters for applications with high inertia.

Start the motor at nominal speed. If the application does not run well, check the VVC<sup>+</sup> PM settings. Recommendations in different applications can be seen in *Table 5.7*.

Application	Settings
Low inertia applications $I_{Load}/I_{Motor} < 5$	1-17 <i>Voltage filter time const.</i> to be increased by factor 5 to 10 1-14 <i>Damping Gain</i> should be reduced 1-66 <i>Min. Current at Low Speed</i> should be reduced (<100%)
Low inertia applications $50 > I_{Load}/I_{Motor} > 5$	Keep calculated values
High inertia applications $I_{Load}/I_{Motor} > 50$	1-14 <i>Damping Gain</i> , 1-15 <i>Low Speed Filter Time Const.</i> and 1-16 <i>High Speed Filter Time Const.</i> should be increased
High load at low speed <30% (rated speed)	1-17 <i>Voltage filter time const.</i> should be increased 1-66 <i>Min. Current at Low Speed</i> should be increased (>100% for a prolonged time can overheat the motor)

Table 5.7 Recommendations in Different Applications

If the motor starts oscillating at a certain speed, increase 1-14 *Damping Gain*. Increase the value in small steps. Depending on the motor, a good value for this parameter can be 10% or 100% higher than the default value.

Starting torque can be adjusted in 1-66 *Min. Current at Low Speed*. 100% provides nominal torque as starting torque.

### 5.4.5 Automatic Energy Optimisation (AEO)

#### **NOTICE**

AEO is not relevant for permanent magnet motors.

Automatic Energy Optimisation (AEO) is a procedure that minimises voltage to the motor, reducing energy consumption, heat, and noise.

To activate AEO, set parameter 1-03 *Torque Characteristics* to [2] *Auto Energy Optim. CT* or [3] *Auto Energy Optim. VT*.

### 5.4.6 Automatic Motor Adaptation (AMA)

#### **NOTICE**

AMA is not relevant for PM motors.

Automatic motor adaptation (AMA) is a procedure that optimises compatibility between the frequency converter and the motor.

- The frequency converter builds a mathematical model of the motor for regulating output motor current. The procedure also tests the input phase balance of electrical power. It compares the

motor characteristics with the data entered in parameters 1-20 to 1-25.

- The motor shaft does not turn and no harm is done to the motor while running the AMA.
- Some motors may be unable to run the complete version of the test. In that case, select [2] *Enable reduced AMA*.
- If an output filter is connected to the motor, select *Enable reduced AMA*.
- If warnings or alarms occur, see chapter 7 *Diagnostics and Troubleshooting*.
- Run this procedure on a cold motor for best results.

#### To run AMA

- Press [Main Menu] to access parameters.
- Scroll to parameter group 1-\*\* *Load and Motor* and press [OK].
- Scroll to parameter group 1-2\* *Motor Data* and press [OK].
- Scroll to 1-29 *Automatic Motor Adaptation (AMA)* and press [OK].
- Select [1] *Enable complete AMA* and press [OK].
- Follow on-screen instructions.
- The test runs automatically and indicate when it is complete.

## 5.5 Checking Motor Rotation

#### **NOTICE**

**Risk of damage to pumps/compressors caused by motor running in wrong direction. Before running the frequency converter, check the motor rotation.**

The motor runs briefly at 5 Hz or the minimum frequency set in 4-12 *Motor Speed Low Limit [Hz]*.

- Press [Main Menu].
- Scroll to 1-28 *Motor Rotation Check* and press [OK].
- Scroll to [1] *Enable*.

The following text appears: *Note! Motor may run in wrong direction.*

- Press [OK].
- Follow the on-screen instructions.

#### **NOTICE**

**To change the direction of rotation, remove power to the frequency converter and wait for power to discharge. Reverse the connection of any 2 of the 3 motor wires on the motor or frequency converter side of the connection.**

## 5.6 Local-control Test

1. Press [Hand On] to provide a local start command to the frequency converter.
2. Accelerate the frequency converter by pressing [▲] to full speed. Moving the cursor left of the decimal point provides quicker input changes.
3. Note any acceleration problems.
4. Press [Off]. Note any deceleration problems.

In the event of acceleration or deceleration problems, see *chapter 7.5 Troubleshooting*. See *chapter 7.3 Warnings and Alarm Definitions - Frequency Converter* and *chapter 7.4 Warning and Alarm Definitions - Filter (Left LCP)* for resetting the frequency converter after a trip.

## 5.7 System Start-up

The procedure in this section requires user-wiring and application programming to be completed. The following procedure is recommended after application set-up is completed.

1. Press [Auto On].
2. Apply an external run command.
3. Adjust the speed reference throughout the speed range.
4. Remove the external run command.
5. Check sound and vibration level of the motor to ensure that the system is working as intended.

If warnings or alarms occur, see *chapter 7.3 Warnings and Alarm Definitions - Frequency Converter*.

## 6 Application Examples

### 6.1 Introduction

The examples in this section are intended as a quick reference for common applications.

- Parameter settings are the regional default values unless otherwise indicated (selected in *0-03 Regional Settings*).
- Parameters associated with the terminals and their settings are shown next to the drawings.
- Where switch settings for analog terminals A53 or A54 are required, these are also shown.

#### NOTICE

When the optional Safe Torque Off feature is used, a jumper wire may be required between terminal 12 (or 13) and terminal 37 for the frequency converter to operate when using factory default programming values.

### 6.2 Application Examples

#### 6.2.1 Speed

		Parameters	
FC		Function	Setting
+24 V	12	6-10 Terminal 53	0.07 V*
+24 V	13	Low Voltage	
D IN	18	6-11 Terminal 53	10 V*
D IN	19	High Voltage	
COM	20	6-14 Terminal 53	0 Hz
D IN	27	Low Ref./Feedb. Value	
D IN	29	6-15 Terminal 53	50 Hz
D IN	32	High Ref./Feedb. Value	
D IN	33	* = Default Value	
D IN	37	<b>Notes/comments:</b> D IN 37 is an option.	
A53			

Table 6.1 Analog Speed Reference (Voltage)

		Parameters	
FC		Function	Setting
+24 V	12	6-12 Terminal 53	4 mA*
+24 V	13	Low Current	
D IN	18	6-13 Terminal 53	20 mA*
D IN	19	High Current	
COM	20	6-14 Terminal 53	0 Hz
D IN	27	Low Ref./Feedb. Value	
D IN	29	6-15 Terminal 53	50 Hz
D IN	32	High Ref./Feedb. Value	
D IN	33	* = Default Value	
D IN	37	<b>Notes/comments:</b> D IN 37 is an option.	
A53			

Table 6.2 Analog Speed Reference (Current)

		Parameters	
FC		Function	Setting
+24 V	12	6-10 Terminal 53	0.07 V*
+24 V	13	Low Voltage	
D IN	18	6-11 Terminal 53	10 V*
D IN	19	High Voltage	
COM	20	6-14 Terminal 53	0 Hz
D IN	27	Low Ref./Feedb. Value	
D IN	29	6-15 Terminal 53	1500 Hz
D IN	32	High Ref./Feedb. Value	
D IN	33	* = Default Value	
D IN	37	<b>Notes/comments:</b> D IN 37 is an option.	
A53			

Table 6.3 Speed Reference (Using a Manual Potentiometer)

		Parameters	
FC		Function	Setting
+24 V	12	5-10 Terminal 18	[8] Start*
+24 V	13	Digital Input	
D IN	18	5-12 Terminal 27	[19] Freeze Reference
D IN	19	Digital Input	
COM	20	5-13 Terminal 29	[21] Speed Up
D IN	27	Digital Input	
D IN	29	5-14 Terminal 32	[22] Speed Down
D IN	32	Digital Input	
D IN	33		
D IN	37		
* = Default Value			
<b>Notes/comments:</b> D IN 37 is an option.			

Table 6.4 Speed Up/Down

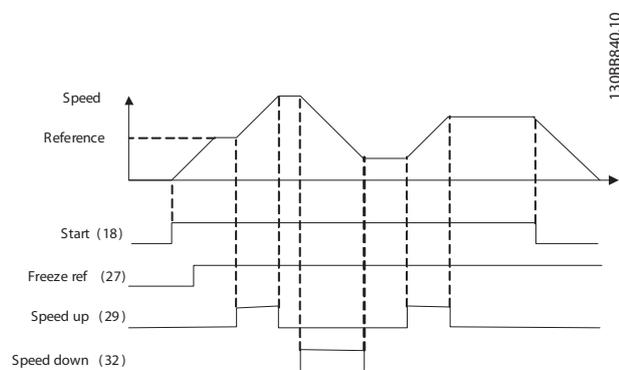


Illustration 6.1 Speed Up/Down

### 6.2.2 Start/Stop

		Parameters	
FC		Function	Setting
+24 V	12	5-10 Terminal 18	[8] Start*
+24 V	13	Digital Input	
D IN	18	5-12 Terminal 27	[0] No operation
D IN	19	Digital Input	
COM	20	5-19 Terminal 37	[1] Safe Stop Alarm
D IN	27	Safe Stop	
D IN	29		
D IN	32		
D IN	33		
D IN	37		
* = Default Value			
<b>Notes/comments:</b> If 5-12 Terminal 27 Digital Input is set to [0] No operation, a jumper wire to terminal 27 is not needed. D IN 37 is an option.			

Table 6.5 Start/Stop Command with Safe Stop Option

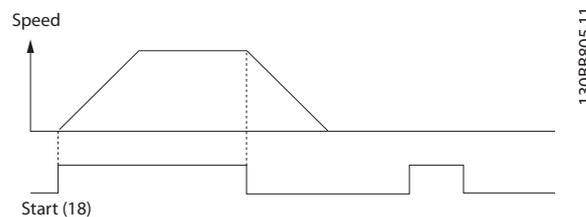


Illustration 6.2 Start/Stop Command with Safe Stop

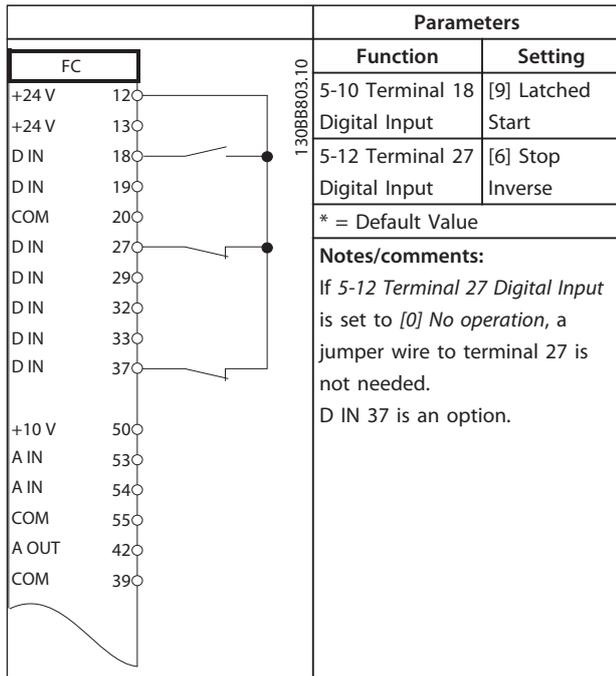


Table 6.6 Pulse Start/Stop

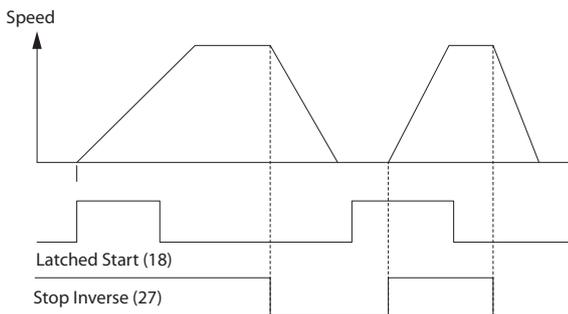


Illustration 6.3 Latched Start/Stop Inverse

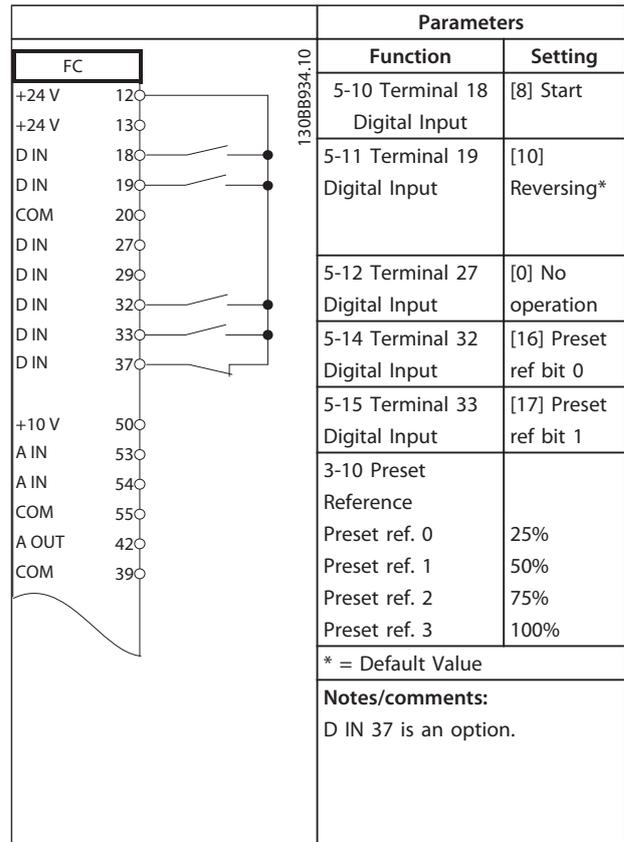


Table 6.7 Start/Stop with Reversing and 4 Preset Speeds

### 6.2.3 External Alarm Reset

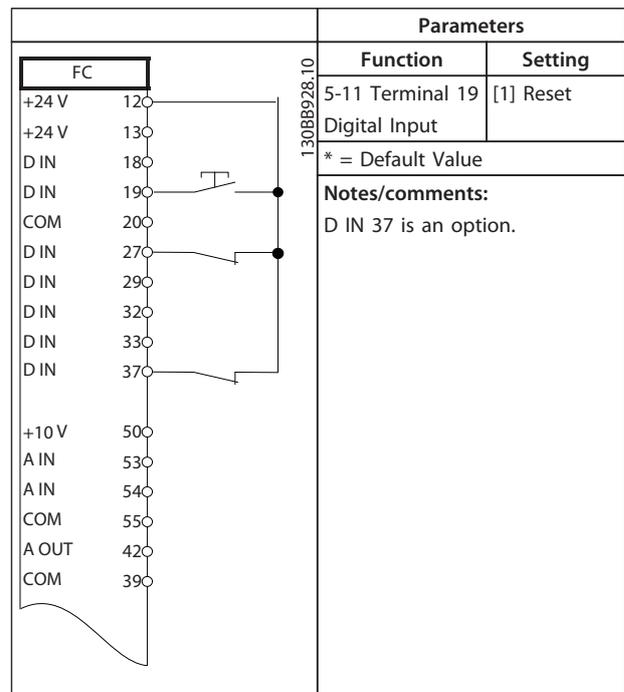


Table 6.8 External Alarm Reset

### 6.2.4 RS-485

		Parameters																																																				
		Function	Setting																																																			
<table border="1"> <thead> <tr> <th colspan="2">FC</th> </tr> </thead> <tbody> <tr> <td>+24 V</td> <td>12</td> </tr> <tr> <td>+24 V</td> <td>13</td> </tr> <tr> <td>D IN</td> <td>18</td> </tr> <tr> <td>D IN</td> <td>19</td> </tr> <tr> <td>COM</td> <td>20</td> </tr> <tr> <td>D IN</td> <td>27</td> </tr> <tr> <td>D IN</td> <td>29</td> </tr> <tr> <td>D IN</td> <td>32</td> </tr> <tr> <td>D IN</td> <td>33</td> </tr> <tr> <td>D IN</td> <td>37</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td>+10 V</td> <td>50</td> </tr> <tr> <td>A IN</td> <td>53</td> </tr> <tr> <td>A IN</td> <td>54</td> </tr> <tr> <td>COM</td> <td>55</td> </tr> <tr> <td>A OUT</td> <td>42</td> </tr> <tr> <td>COM</td> <td>39</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td>RE1</td> <td>01, 02, 03</td> </tr> <tr> <td>RE2</td> <td>04, 05, 06</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td></td> <td>61</td> </tr> <tr> <td></td> <td>68</td> </tr> <tr> <td></td> <td>69</td> </tr> </tbody> </table>		FC		+24 V	12	+24 V	13	D IN	18	D IN	19	COM	20	D IN	27	D IN	29	D IN	32	D IN	33	D IN	37			+10 V	50	A IN	53	A IN	54	COM	55	A OUT	42	COM	39			RE1	01, 02, 03	RE2	04, 05, 06				61		68		69	130BB685.10	8-30 Protocol	FC*
		FC																																																				
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	69																																																					
		8-31 Address	1*																																																			
		8-32 Baud Rate	9600*																																																			
		* = Default Value																																																				
		<b>Notes/comments:</b>																																																				
		Select protocol, address and baud rate in the above mentioned parameters.																																																				
		D IN 37 is an option.																																																				

Table 6.9 RS-485 Network Connection

### 6.2.5 Motor Thermistor

#### CAUTION

#### THERMISTOR INSULATION

Risk of equipment damage exists.

- Use only thermistors with reinforced or double insulation to meet PELV insulation requirements.

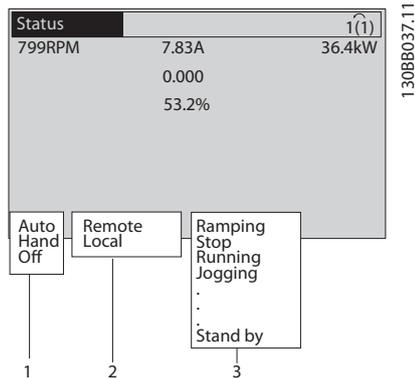
		Parameters																																														
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<table border="1"> <thead> <tr> <th colspan="2">VLT</th> </tr> </thead> <tbody> <tr> <td>+24 V</td> <td>12</td> </tr> <tr> <td>+24 V</td> <td>13</td> </tr> <tr> <td>D IN</td> <td>18</td> </tr> <tr> <td>D IN</td> <td>19</td> </tr> <tr> <td>COM</td> <td>20</td> </tr> <tr> <td>D IN</td> <td>27</td> </tr> <tr> <td>D IN</td> <td>29</td> </tr> <tr> <td>D IN</td> <td>32</td> </tr> <tr> <td>D IN</td> <td>33</td> </tr> <tr> <td>D IN</td> <td>37</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td>+10 V</td> <td>50</td> </tr> <tr> <td>A IN</td> <td>53</td> </tr> <tr> <td>A IN</td> <td>54</td> </tr> <tr> <td>COM</td> <td>55</td> </tr> <tr> <td>A OUT</td> <td>42</td> </tr> <tr> <td>COM</td> <td>39</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td></td> <td>61</td> </tr> <tr> <td></td> <td>68</td> </tr> <tr> <td></td> <td>69</td> </tr> </tbody> </table>		VLT		+24 V	12	+24 V	13	D IN	18	D IN	19	COM	20	D IN	27	D IN	29	D IN	32	D IN	33	D IN	37			+10 V	50	A IN	53	A IN	54	COM	55	A OUT	42	COM	39				61		68		69	130BB686.12	1-90 Motor Thermal Protection	[2] Thermistor trip
		VLT																																														
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	61																																															
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	69																																															
		1-93 Thermistor Source	[1] Analog input 53																																													
		* = Default Value																																														
		<b>Notes/comments:</b>																																														
		If only a warning is desired, 1-90 Motor Thermal Protection should be set to [1] Thermistor warning.																																														
		D IN 37 is an option.																																														

Table 6.10 Motor Thermistor

# 7 Diagnostics and Troubleshooting

## 7.1 Status Messages

When the frequency converter is in status mode, status messages are generated automatically and appear in the bottom line of the display (see *Illustration 7.1*).



1	Operation mode (see <i>Table 7.1</i> )
2	Reference site (see <i>Table 7.2</i> )
3	Operation status (see <i>Table 7.3</i> )

Illustration 7.1 Status Display

Table 7.1 to Table 7.3 describe the displayed status messages.

Off	The frequency converter does not react to any control signal until [Auto On] or [Hand On] is pressed.
Auto On	The frequency converter is controlled from the control terminals and/or the serial communication.
Hand On	Control the unit via the navigation keys on the LCP. Stop commands, reset, reversing, DC brake, and other signals applied to the control terminals can override local control.

Table 7.1 Operation Mode

Remote	The speed reference is given from external signals, serial communication, or internal preset references.
Local	The frequency converter uses [Hand On] control or reference values from the LCP.

Table 7.2 Reference Site

AC Brake	AC Brake was selected in <i>2-10 Brake Function</i> . The AC brake over-magnetises the motor to achieve a controlled slow down.
AMA finish OK	Automatic motor adaptation (AMA) was carried out successfully.
AMA ready	AMA is ready to start. Press [Hand On] to start.
AMA running	AMA process is in progress.
Braking	The brake chopper is in operation. The brake resistor absorbs generative energy.
Braking max.	The brake chopper is in operation. The power limit for the brake resistor has been reached.
Coast	<ul style="list-style-type: none"> <li>Coast inverse was selected as a function for a digital input (parameter group 5-1* <i>Digital Inputs</i>). The corresponding terminal is not connected.</li> <li>Coast activated by serial communication</li> </ul>
Ctrl. Ramp-down	Control Ramp-down was selected in <i>14-10 Mains Failure</i> . <ul style="list-style-type: none"> <li>The mains voltage is below the value set in <i>14-11 Mains Voltage at Mains Fault</i> at mains fault</li> <li>The frequency converter ramps down the motor using a controlled ramp down</li> </ul>
Current High	The frequency converter output current is above the limit set in <i>4-51 Warning Current High</i> .
Current Low	The frequency converter output current is below the limit set in <i>4-52 Warning Speed Low</i>
DC Hold	DC hold is selected in <i>1-80 Function at Stop</i> and a stop command is active. The motor is held by a DC current set in <i>2-00 DC Hold/Preheat Current</i> .
DC Stop	The motor is held with a DC current ( <i>2-01 DC Brake Current</i> ) for a specified time ( <i>2-02 DC Braking Time</i> ). <ul style="list-style-type: none"> <li>DC brake is activated in <i>2-03 DC Brake Cut In Speed [RPM]</i> and a stop command is active.</li> <li>DC brake (inverse) is selected as a function for a digital input (parameter group 5-1* <i>Digital Inputs</i>). The corresponding terminal is not active.</li> <li>The DC brake is activated via serial communication.</li> </ul>
Feedback high	The sum of all active feedbacks is above the feedback limit set in <i>4-57 Warning Feedback High</i> .
Feedback low	The sum of all active feedbacks is below the feedback limit set in <i>4-56 Warning Feedback Low</i> .

Freeze output	The remote reference is active, which holds the present speed. <ul style="list-style-type: none"> <li>Freeze output was selected as a function for a digital input (parameter group 5-1* <i>Digital Inputs</i>). The corresponding terminal is active. Speed control is only possible via the terminal functions Speed Up and Speed Down.</li> <li>Hold ramp is activated via serial communication.</li> </ul>
Freeze output request	A freeze output command has been given, but the motor remains stopped until a run permissive signal is received.
Freeze ref.	<i>Freeze Reference</i> was selected as a function for a digital input (parameter group 5-1* <i>Digital Inputs</i> ). The corresponding terminal is active. The frequency converter saves the actual reference. Changing the reference is now only possible via terminal functions speed up and speed down.
Jog request	A jog command has been given, but the motor remains stopped until a run permissive signal is received via a digital input.
Jogging	The motor is running as programmed in 3-19 <i>Jog Speed [RPM]</i> . <ul style="list-style-type: none"> <li><i>Jog</i> was selected as function for a digital input (parameter group 5-1* <i>Digital Inputs</i>). The corresponding terminal is active.</li> <li>The jog function is activated via the serial communication.</li> <li>The jog function was selected as a reaction for a monitoring function. The monitoring function is active.</li> </ul>
Motor check	In 1-80 <i>Function at Stop, Motor Check</i> was selected. A stop command is active. To ensure that a motor is connected to the frequency converter, a permanent test current is applied to the motor.
OVC control	<i>Overvoltage</i> control was activated in 2-17 <i>Overvoltage Control, [2] Enabled</i> . The connected motor supplies the frequency converter with generative energy. The overvoltage control adjusts the V/Hz ratio to run the motor in controlled mode and to prevent the frequency converter from tripping.
PowerUnit Off	(Only frequency converters with an external 24 V power supply installed). Mains supply to the frequency converter is removed, but the control card is supplied by the external 24 V.

Protection md	Protection mode is active. The unit has detected a critical status (an overcurrent or overvoltage). <ul style="list-style-type: none"> <li>To avoid tripping, the switching frequency is reduced to 4 kHz.</li> <li>If possible, protection mode ends after approximately 10 s.</li> <li>Protection mode can be restricted in 14-26 <i>Trip Delay at Inverter Fault</i>.</li> </ul>
QStop	The motor is decelerating using 3-81 <i>Quick Stop Ramp Time</i> . <ul style="list-style-type: none"> <li><i>Quick stop inverse</i> was selected as a function for a digital input (parameter group 5-1* <i>Digital Inputs</i>). The corresponding terminal is not active.</li> <li>The quick stop function was activated via serial communication.</li> </ul>
Ramping	The motor is accelerating/decelerating using the active ramp up/down. The reference, a limit value, or a standstill is not yet reached.
Ref. high	The sum of all active references is above the reference limit set in 4-55 <i>Warning Reference High</i> .
Ref. low	The sum of all active references is below the reference limit set in 4-54 <i>Warning Reference Low</i> .
Run on ref.	The frequency converter is running in the reference range. The feedback value matches the setpoint value.
Run request	A start command has been given, but the motor is stopped until a run permissive signal is received via digital input.
Running	The frequency converter drives the motor.
Sleep Mode	The energy saving function is enabled. The motor has stopped, but restarts automatically when required.
Speed high	Motor speed is above the value set in 4-53 <i>Warning Speed High</i> .
Speed low	Motor speed is below the value set in 4-52 <i>Warning Speed Low</i> .
Standby	In Auto On mode, the frequency converter starts the motor with a start signal from a digital input or serial communication.
Start delay	In 1-71 <i>Start Delay</i> , a delay starting time was set. A start command is activated and the motor starts after the start delay time expires.
Start fwd/rev	Start forward and start reverse were selected as functions for 2 different digital inputs (parameter group 5-1* <i>Digital Inputs</i> ). The motor starts in forward or reverse depending on which corresponding terminal is activated.
Stop	The frequency converter has received a stop command from the LCP, digital input, or serial communication.

Trip	An alarm occurred and the motor is stopped. Once the cause of the alarm is cleared, the frequency converter can be reset manually by pressing [Reset] or remotely by control terminals or serial communication.
Trip lock	An alarm occurred and the motor is stopped. Once the cause of the alarm is cleared, power must be cycled to the frequency converter. The frequency converter can then be reset manually by pressing [Reset] or remotely by control terminals or serial communication.

Table 7.3 Operation Status

**NOTICE**

In auto/remote mode, the frequency converter requires external commands to execute functions.

7

7.2 Warning and Alarm Types

The frequency converter monitors the condition of its input power, output, and motor factors as well as other system performance indicators. A warning or alarm does not necessarily indicate a problem internal to the frequency converter itself. In many cases, it indicates failure conditions from:

- input voltage
- motor load
- motor temperature
- external signals
- other areas monitored by internal logic

Investigate as indicated in the alarm or warning.

7.2.1 Warnings

A warning is issued when an alarm condition is impending or when an abnormal operating condition is present and may result in the frequency converter issuing an alarm. A warning clears by itself when the abnormal condition is removed.

7.2.2 Alarm Trip

An alarm is issued when the frequency converter is tripped, that is, the frequency converter suspends operation to prevent frequency converter or system damage. The motor coasts to a stop. The frequency converter logic continues to operate and monitors the frequency converter status. After the fault condition is remedied, reset the frequency converter. It is then ready to start operation again.

A trip can be reset in any of 4 ways:

- Press [Reset] on the LCP
- Digital reset input command
- Serial communication reset input command
- Auto reset

7.2.3 Alarm Trip-lock

An alarm that causes the frequency converter to trip-lock requires that input power is cycled. The motor coasts to a stop. The frequency converter logic continues to operate and monitors the frequency converter status. Remove input power to the frequency converter and correct the cause of the fault, then restore power. This action puts the frequency converter into a trip condition as described in chapter 7.2.2 Alarm Trip and may be reset in any of the 4 ways.

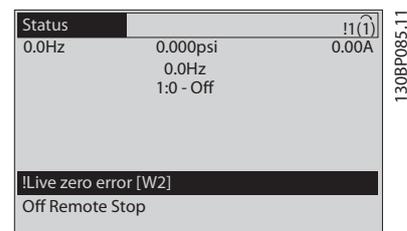


Illustration 7.2 Warning Display

An alarm or trip-lock alarm flashes in the display along with the alarm number.

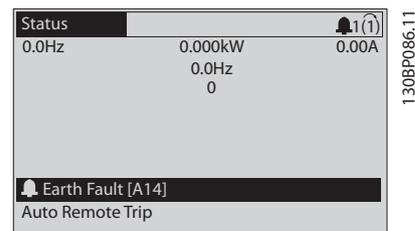
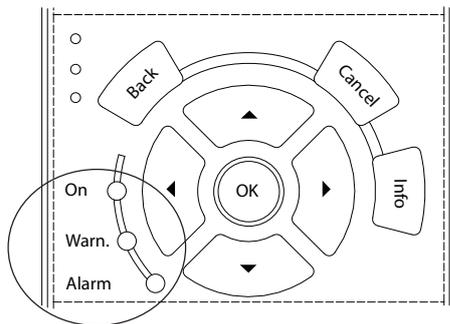


Illustration 7.3 Alarm Display

In addition to the text and alarm code in the display, there are 3 status indicator lights.



130BB467.11

Illustration 7.4 Status Indicator Lights

	Warning LED	Alarm LED
Warning	On	Off
Alarm	Off	On (Flashing)
Trip-Lock	On	On (Flashing)

Table 7.4 Status Indicator Lights Explanations

### 7.3 Warnings and Alarm Definitions - Frequency Converter

The warning/alarm information below defines each warning/alarm condition, provides the probable cause for the condition, and details a remedy or troubleshooting procedure.

**WARNING 1, 10 Volts low**

The control card voltage is below 10 V from terminal 50. Remove some of the load from terminal 50, as the 10 V supply is overloaded. Max. 15 mA or minimum 590 Ω.

A short circuit in a connected potentiometer or improper wiring of the potentiometer can cause this condition.

**Troubleshooting**

- Remove the wiring from terminal 50. If the warning clears, the problem is with the wiring. If the warning does not clear, replace the control card.

**WARNING/ALARM 2, Live zero error**

This warning or alarm only appears if programmed in 6-01 Live Zero Timeout Function. The signal on one of the analog inputs is less than 50% of the minimum value programmed for that input. Broken wiring or faulty device sending the signal can cause this condition.

**Troubleshooting**

- Check connections on all the analog input terminals. Control card terminals 53 and 54 for signals, terminal 55 common. MCB 101 terminals 11 and 12 for signals, terminal 10 common. MCB

109 terminals 1, 3, 5 for signals, terminals 2, 4, 6 common).

- Check that the frequency converter programming and switch settings match the analog signal type.
- Perform input terminal signal test.

**WARNING/ALARM 3, No motor**

No motor has been connected to the output of the frequency converter.

**WARNING/ALARM 4, Mains phase loss**

A phase is missing on the supply side, or the mains voltage imbalance is too high. This message also appears for a fault in the input rectifier on the frequency converter. Options are programmed at 14-12 Function at Mains Imbalance.

**Troubleshooting**

- Check the supply voltage and supply currents to the frequency converter.

**WARNING 5, DC link voltage high**

The intermediate circuit voltage (DC) is higher than the high-voltage warning limit. The limit is dependent on the frequency converter voltage rating. The unit is still active.

**WARNING 6, DC link voltage low**

The intermediate circuit voltage (DC) is lower than the low-voltage warning limit. The limit is dependent on the frequency converter voltage rating. The unit is still active.

**WARNING/ALARM 7, DC overvoltage**

If the intermediate circuit voltage exceeds the limit, the frequency converter trips after a time.

**Troubleshooting**

- Connect a brake resistor
- Extend the ramp time
- Change the ramp type
- Activate the functions in 2-10 Brake Function
- Increase 14-26 Trip Delay at Inverter Fault
- If the alarm/warning occurs during a power sag, use kinetic back-up (14-10 Mains Failure)

**WARNING/ALARM 8, DC under voltage**

If the DC-link voltage drops below the undervoltage limit, the frequency converter checks if a 24 V DC backup supply is connected. If no 24 V DC backup supply is connected, the frequency converter trips after a fixed time delay. The time delay varies with unit size.

**Troubleshooting**

- Check that the supply voltage matches the frequency converter voltage.
- Perform input voltage test.
- Perform soft charge circuit test.

**WARNING/ALARM 9, Inverter overload**

The frequency converter is about to cut out because of an overload (too high current for too long). The counter for electronic, thermal inverter protection issues a warning at 98% and trips at 100%, while giving an alarm. The frequency converter cannot be reset until the counter is below 90%.

The fault is that the frequency converter has run with more than 100% overload for too long.

**Troubleshooting**

- Compare the output current shown on the LCP with the frequency converter rated current.
- Compare the output current shown on the LCP with measured motor current.
- Display the thermal drive load on the LCP and monitor the value. When running above the frequency converter continuous current rating, the counter increases. When running below the frequency converter continuous current rating, the counter decreases.

**WARNING/ALARM 10, Motor overload temperature**

According to the electronic thermal protection (ETR), the motor is too hot. Select whether the frequency converter issues a warning or an alarm when the counter reaches 100% in *1-90 Motor Thermal Protection*. The fault occurs when the motor runs with more than 100% overload for too long.

**Troubleshooting**

- Check for motor overheating.
- Check if the motor is mechanically overloaded
- Check that the motor current set in *1-24 Motor Current* is correct.
- Ensure that Motor data in parameters 1-20 to 1-25 are set correctly.
- If an external fan is in use, check in *1-91 Motor External Fan* that it is selected.
- Running AMA in *1-29 Automatic Motor Adaptation (AMA)* tunes the frequency converter to the motor more accurately and reduces thermal loading.

**WARNING/ALARM 11, Motor thermistor over temp**

The thermistor might be disconnected. Select whether the frequency converter issues a warning or an alarm in *1-90 Motor Thermal Protection*.

**Troubleshooting**

- Check for motor overheating.
- Check if the motor is mechanically overloaded.
- Check that the thermistor is connected correctly between either terminal 53 or 54 (analog voltage input) and terminal 50 (+10 V supply). Also check that the terminal switch for 53 or 54 is set for

voltage. Check that *1-93 Thermistor Resource* selects terminal 53 or 54.

- When using digital inputs 18 or 19, check that the thermistor is connected correctly between either terminal 18 or 19 (digital input PNP only) and terminal 50.
- If a KTY sensor is used, check for correct connection between terminals 54 and 55
- If using a thermal switch or thermistor, check that the programming of *1-93 Thermistor Resource* matches sensor wiring.
- If using a KTY Sensor, check the programming of *1-95 KTY Sensor Type*, *1-96 KTY Thermistor Resource* and *1-97 KTY Threshold level* match sensor wiring.

**WARNING/ALARM 12, Torque limit**

The torque has exceeded the value in *4-16 Torque Limit Motor Mode* or the value in *4-17 Torque Limit Generator Mode*. *14-25 Trip Delay at Torque Limit* can change this warning from a warning-only condition to a warning followed by an alarm.

**Troubleshooting**

- If the motor torque limit is exceeded during ramp up, extend the ramp up time.
- If the generator torque limit is exceeded during ramp down, extend the ramp down time.
- If torque limit occurs while running, possibly increase the torque limit. Make sure that the system can operate safely at a higher torque.
- Check the application for excessive current draw on the motor.

**WARNING/ALARM 13, Over current**

The inverter peak current limit (approximately 200% of the rated current) is exceeded. The warning lasts about 1.5 s, then the frequency converter trips and issues an alarm. Shock loading or quick acceleration with high inertia loads can cause this fault. If the acceleration during ramp up is quick, the fault can also appear after kinetic back-up. If extended mechanical brake control is selected, trip can be reset externally.

**Troubleshooting**

- Remove power and check if the motor shaft can be turned.
- Check that the motor size matches the frequency converter.
- Check parameters 1-20 to 1-25 for correct motor data.

**ALARM 14, Earth (ground) fault**

There is current from the output phases to ground, either in the cable between the frequency converter and the motor or in the motor itself.

### Troubleshooting

- Remove power to the frequency converter and repair the ground fault.
- Check for ground faults in the motor by measuring the resistance to the ground of the motor cables and the motor with a megohmmeter.
- Perform current sensor test.

#### ALARM 15, Hardware mismatch

A fitted option is not operational with the present control board hardware or software.

Record the value of the following parameters and contact Danfoss:

- 15-40 FC Type
- 15-41 Power Section
- 15-42 Voltage
- 15-43 Software Version
- 15-45 Actual Typecode String
- 15-49 SW ID Control Card
- 15-50 SW ID Power Card
- 15-60 Option Mounted
- 15-61 Option SW Version (for each option slot)

#### ALARM 16, Short circuit

There is short-circuiting in the motor or motor wiring.

Remove power to the frequency converter and repair the short circuit.

#### WARNING/ALARM 17, Control word timeout

There is no communication to the frequency converter. The warning is only active when 8-04 Control Word Timeout Function is not set to [0] Off.

If 8-04 Control Word Timeout Function is set to [2] Stop and [26] Trip, a warning appears and the frequency converter ramps down until it trips and then displays an alarm.

#### Troubleshooting:

- Check connections on the serial communication cable.
- Increase 8-03 Control Word Timeout Time
- Check the operation of the communication equipment.
- Verify a proper installation based on EMC requirements.

#### WARNING/ALARM 22, Hoist mechanical brake

Report value shows what kind it is.

0 = The torque ref. was not reached before time out (2-27 Torque Ramp Time).

1 = Expected brake feedback not received before time out (2-23 Activate Brake Delay, 2-25 Brake Release Time).

#### WARNING 23, Internal fan fault

The fan warning function is an extra protective function that checks if the fan is running/mounted. The fan warning can be disabled in 14-53 Fan Monitor ([0] Disabled).

#### Troubleshooting

- Check fan resistance.
- Check soft charge fuses.

#### WARNING 24, External fan fault

The fan warning function is an extra protective function that checks if the fan is running/mounted. The fan warning can be disabled in 14-53 Fan Monitor ([0] Disabled).

#### Troubleshooting

- Check fan resistance.
- Check soft charge fuses.

#### WARNING 25, Brake resistor short circuit

The brake resistor is monitored during operation. If a short circuit occurs, the brake function is disabled and the warning appears. The frequency converter is still operational, but without the brake function.

#### Troubleshooting

- Remove power to the frequency converter and replace the brake resistor (see 2-15 Brake Check).

#### WARNING/ALARM 26, Brake resistor power limit

The power transmitted to the brake resistor is calculated as a mean value over the last 120 s of run time. The calculation is based on the intermediate circuit voltage and the brake resistance value set in 2-16 AC brake Max. Current. The warning is active when the dissipated braking is higher than 90% of the brake resistance power. If [2] Trip is selected in 2-13 Brake Power Monitoring, the frequency converter trips when the dissipated braking power reaches 100%.

### **WARNING**

If the brake transistor is short-circuited, there is a risk of substantial power being transmitted to the brake resistor.

#### WARNING/ALARM 27, Brake chopper fault

The brake transistor is monitored during operation and if a short circuit occurs, the brake function is disabled and a warning is issued. The frequency converter is still operational, but since the brake transistor has short-circuited, substantial power is transmitted to the brake resistor, even if it is inactive.

Remove power to the frequency converter and remove the brake resistor.

This alarm/warning could also occur if the brake resistor overheats. Terminals 104 and 106 are available as brake resistors Klixon inputs.

#### WARNING/ALARM 28, Brake check failed

The brake resistor is not connected or not working. Check 2-15 Brake Check.

**ALARM 29, Heat Sink temp**

The maximum temperature of the heat sink has been exceeded. The temperature fault resets when the temperature falls below a defined heat sink temperature. The trip and reset points are different based on the frequency converter power size.

**Troubleshooting**

Check for the following conditions.

- Ambient temperature too high.
- Motor cables too long.
- Incorrect airflow clearance above and below the frequency converter
- Blocked airflow around the frequency converter.
- Damaged heat sink fan.
- Dirty heat sink.

For the D, E, and F enclosures, this alarm is based on the temperature measured by the heat sink sensor mounted inside the IGBT modules. For the F enclosures, the thermal sensor in the rectifier module can also cause this alarm.

**Troubleshooting**

- Check fan resistance.
- Check soft charge fuses.
- IGBT thermal sensor.

**ALARM 30, Motor phase U missing**

Motor phase U between the frequency converter and the motor is missing.

Remove power from the frequency converter and check motor phase U.

**ALARM 31, Motor phase V missing**

Motor phase V between the frequency converter and the motor is missing.

Remove power from the frequency converter and check motor phase V.

**ALARM 32, Motor phase W missing**

Motor phase W between the frequency converter and the motor is missing.

Remove power from the frequency converter and check motor phase W.

**ALARM 33, Inrush fault**

Too many power-ups have occurred within a short time period. Let the unit cool to operating temperature.

**WARNING/ALARM 34, Fieldbus communication fault**

The fieldbus on the communication option card is not working.

**WARNING/ALARM 36, Mains failure**

This warning/alarm is only active if the supply voltage to the frequency converter is lost and *14-10 Mains Failure* is not set to [0] *No Function*. Check the fuses to the frequency converter and mains supply to the unit.

**ALARM 38, Internal fault**

When an internal fault occurs, a code number defined in *Table 7.5* is displayed.

**Troubleshooting**

- Cycle power
- Check that the option is properly installed
- Check for loose or missing wiring

It may be necessary to contact Danfoss service or the supplier. Note the code number for further troubleshooting directions.

No.	Text
0	Serial port cannot be initialised. Contact your Danfoss supplier or Danfoss Service Department.
256–258	Power EEPROM data is defective or too old
512	Control board EEPROM data is defective or too old.
513	Communication time-out reading EEPROM data
514	Communication time-out reading EEPROM data
515	Application-oriented control cannot recognise the EEPROM data.
516	Cannot write to the EEPROM because a write command is on progress.
517	Write command is under time-out
518	Failure in the EEPROM
519	Missing or invalid barcode data in EEPROM
783	Parameter value outside of min/max limits
1024–1279	A CAN telegram that has to be sent could not be sent.
1281	Digital signal processor flash time-out
1282	Power micro software version mismatch
1283	Power EEPROM data version mismatch
1284	Cannot read digital signal processor software version
1299	Option SW in slot A is too old
1300	Option SW in slot B is too old
1301	Option SW in slot C0 is too old
1302	Option SW in slot C1 is too old
1315	Option SW in slot A is not supported (not allowed)
1316	Option SW in slot B is not supported (not allowed)
1317	Option SW in slot C0 is not supported (not allowed)
1318	Option SW in slot C1 is not supported (not allowed)
1379	Option A did not respond when calculating platform version
1380	Option B did not respond when calculating platform version
1381	Option C0 did not respond when calculating platform version.
1382	Option C1 did not respond when calculating platform version.
1536	An exception in the application-oriented control is registered. Debug information written in LCP.

No.	Text
1792	DSP Watch Dog is active. Debugging of power part data, motor-oriented control data not transferred correctly.
2049	Power data restarted
2064–2072	H081x: Option in slot x has restarted
2080–2088	H082x: Option in slot x has issued a powerup-wait
2096–2104	H983x: Option in slot x has issued a legal powerup-wait
2304	Could not read any data from power EEPROM
2305	Missing SW version from power unit
2314	Missing power unit data from power unit
2315	Missing SW version from power unit
2316	Missing lo_statepage from power unit
2324	Power card configuration is determined to be incorrect at power-up
2325	A power card has stopped communicating while main power is applied
2326	Power card configuration is determined to be incorrect after the delay for power cards to register.
2327	Too many power card locations have been registered as present.
2330	Power size information between the power cards does not match.
2561	No communication from DSP to ATACD
2562	No communication from ATACD to DSP (state running)
2816	Stack overflow control board module
2817	Scheduler slow tasks
2818	Fast tasks
2819	Parameter thread
2820	LCP stack overflow
2821	Serial port overflow
2822	USB port overflow
2836	cfListMemPool too small
3072–5122	Parameter value is outside its limits
5123	Option in slot A: Hardware incompatible with control board hardware
5124	Option in slot B: Hardware incompatible with control board hardware.
5125	Option in slot C0: Hardware incompatible with control board hardware.
5126	Option in slot C1: Hardware incompatible with control board hardware.
5376–6231	Out of memory

Table 7.5 Internal Fault, Code Numbers

**ALARM 39, Heat Sink sensor**

No feedback from the heat sink temperature sensor.

The signal from the IGBT thermal sensor is not available on the power card. The problem could be on the power card, on the gate drive card, or the ribbon cable between the power card and gate drive card.

**WARNING 40, Overload of digital output terminal 27**

Check the load connected to terminal 27 or remove short-circuit connection. Check *5-00 Digital I/O Mode* and *5-01 Terminal 27 Mode*.

**WARNING 41, Overload of digital output terminal 29**

Check the load connected to terminal 29 or remove short-circuit connection. Check *5-00 Digital I/O Mode* and *5-02 Terminal 29 Mode*.

**WARNING 42, Overload of digital output on X30/6 or overload of digital output on X30/7**

For X30/6, check the load connected to X30/6 or remove the short-circuit connection. Check *5-32 Term X30/6 Digi Out (MCB 101)*.

For X30/7, check the load connected to X30/7 or remove the short-circuit connection. Check *5-33 Term X30/7 Digi Out (MCB 101)*.

**ALARM 45, Earth fault 2**

Ground fault.

**Troubleshooting**

- Check for proper grounding and loose connections.
- Check for proper wire size.
- Check motor cables for short-circuits or leakage currents.

**ALARM 46, Power card supply**

The supply on the power card is out of range.

There are 3 power supplies generated by the switch mode power supply (SMPS) on the power card: 24 V, 5 V,  $\pm 18$  V. When powered with 24 V DC with the MCB 107 option, only the 24 V and 5 V supplies are monitored. When powered with 3 phase mains voltage, all 3 supplies are monitored.

**WARNING 47, 24 V supply low**

The 24 V DC is measured on the control card. This alarm arises when the detected voltage of terminal 12 is lower than 18 V.

**Troubleshooting**

- Check for a defective control card.

**WARNING 48, 1.8 V supply low**

The 1.8 V DC supply used on the control card is outside of allowable limits. The power supply is measured on the control card. Check for a defective control card. If an option card is present, check for an overvoltage condition.

**WARNING 49, Speed limit**

When the speed is not within the specified range in *4-11 Motor Speed Low Limit [RPM]* and *4-13 Motor Speed High Limit [RPM]*, the frequency converter shows a warning. When the speed is below the specified limit in *1-86 Trip Speed Low [RPM]* (except when starting or stopping), the frequency converter trips.

**ALARM 50, AMA calibration failed**

Contact Danfoss supplier or Danfoss service department.

**ALARM 51, AMA check  $U_{nom}$  and  $I_{nom}$** 

The settings for motor voltage, motor current and motor power are wrong. Check the settings in parameters 1-20 to 1-25.

**ALARM 52, AMA low  $I_{nom}$** 

The motor current is too low. Check the settings.

**ALARM 53, AMA motor too big**

The motor is too big for the AMA to operate.

**ALARM 54, AMA motor too small**

The motor is too small for the AMA to operate.

**ALARM 55, AMA parameter out of range**

The parameter values of the motor are outside of the acceptable range. AMA cannot run.

**ALARM 56, AMA interrupted by user**

The user has interrupted the AMA.

**ALARM 57, AMA internal fault**

Try to restart AMA again a number of times, until the AMA is carried out.

**NOTICE**

Repeated runs may heat the motor to a level where the resistance  $R_s$  and  $R_r$  are increased. In most cases, however, this behaviour is not critical.

**ALARM 58, AMA Internal fault**

Contact the Danfoss supplier.

**WARNING 59, Current limit**

The current is higher than the value in *4-18 Current Limit*. Ensure that motor data in parameters 1-20 to 1-25 are set correctly. Possibly increase the current limit. Be sure that the system can operate safely at a higher limit.

**WARNING 60, External interlock**

External interlock has been activated. To resume normal operation, apply 24 V DC to the terminal programmed for external interlock and reset the frequency converter (via serial communication, digital I/O, or by pressing [Reset]).

**WARNING/ALARM 61, Tracking error**

An error between calculated motor speed and speed measurement from feedback device. The function warning/ alarm/disable is set in *4-30 Motor Feedback Loss Function*. Accepted error setting in *4-31 Motor Feedback Speed Error* and the allowed time the error occur setting in *4-32 Motor Feedback Loss Timeout*. During a commissioning procedure, the function could be effective.

**WARNING 62, Output frequency at maximum limit**

The output frequency is higher than the value set in *4-19 Max Output Frequency*.

**ALARM 63, Mechanical brake low**

The actual motor current has not exceeded the release brake current within the start delay time window.

**ALARM 64, Voltage Limit**

The load and speed combination demands a motor voltage higher than the actual DC-link voltage.

**WARNING/ALARM 65, Control card over temperature**

The cut-out temperature of the control card is 80 °C.

**Troubleshooting**

- Check that the ambient operating temperature is within limits
- Check for clogged filters
- Check fan operation
- Check the control card

**WARNING 66, Heat sink temperature low**

The frequency converter is too cold to operate. This warning is based on the temperature sensor in the IGBT module.

Increase the ambient temperature of the unit. Also, a trickle amount of current can be supplied to the frequency converter whenever the motor is stopped by setting *2-00 DC Hold/Preheat Current* at 5% and *1-80 Function at Stop*

**Troubleshooting**

The heat sink temperature measured as 0 °C could indicate that the temperature sensor is defective, causing the fan speed to increase to the maximum. If the sensor wire between the IGBT and the gate drive card is disconnected, this warning would result. Also, check the IGBT thermal sensor.

**ALARM 67, Option module configuration has changed**

One or more options have either been added or removed since the last power-down. Check that the configuration change is intentional and reset the unit.

**ALARM 68, Safe Stop activated**

Safe Torque Off has been activated. To resume normal operation, apply 24 V DC to terminal 37, then send a reset signal (via bus, digital I/O, or by pressing [Reset]).

**ALARM 69, Power card temperature**

The temperature sensor on the power card is either too hot or too cold.

**Troubleshooting**

- Check the operation of the door fans.
- Check that the filters for the door fans are not blocked.
- Check that the gland plate is properly installed on IP21/IP 54 (NEMA 1/12) frequency converters.

**ALARM 70, Illegal FC configuration**

The control card and power card are incompatible. To check compatibility, contact the Danfoss supplier with the type code of the unit from the nameplate and the part numbers of the cards.

**ALARM 71, PTC 1 Safe Torque Off**

Safe Torque Off has been activated from the VLT® PTC Thermistor Card MCB 112 (motor too warm). Normal operation can resume when the VLT® PTC Thermistor Card MCB 112 applies 24 V DC to T-37 (when the motor temperature is acceptable ) and when the digital input

from the VLT® PTC Thermistor Card MCB 112 is deactivated. When that happens, a reset signal must be sent (via Bus, Digital I/O, or by pressing [Reset]). Note that if automatic restart is enabled, the motor could start when the fault is cleared.

**ALARM 72, Dangerous failure**

Safe Torque Off with trip lock. Unexpected signal levels on safe stop and digital input from the VLT® PTC Thermistor Card MCB 112.

**WARNING 73, Safe Stop auto restart**

Safe stopped. With automatic restart enabled, the motor could start when the fault is cleared.

**WARNING 76, Power unit setup**

The required number of power units does not match the detected number of active power units.

**WARNING 77, Reduced power mode**

The frequency converter is operating in reduced power mode (less than the allowed number of inverter sections). This warning is generated on power cycle when the frequency converter is set to run with fewer inverters, and remains on.

**ALARM 79, Illegal power section configuration**

The scaling card has an incorrect part number or is not installed. The MK102 connector on the power card could not be installed.

**ALARM 80, Drive initialised to default value**

Parameter settings are initialised to default settings after a manual reset. To clear the alarm, reset the unit.

**ALARM 81, CSIV corrupt**

CSIV file has syntax errors.

**ALARM 82, CSIV parameter error**

CSIV failed to init a parameter.

**ALARM 85, Dang fail PB**

Profibus/Profisafe error.

**WARNING/ALARM 104, Mixing fan fault**

The fan is not operating. The fan monitor checks that the fan is spinning at power-up or whenever the mixing fan is turned on. The mixing-fan fault can be configured as a warning or an alarm trip by *14-53 Fan Monitor*.

**Troubleshooting**

- Cycle power to the frequency converter to determine if the warning/alarm returns.

**ALARM 243, Brake IGBT**

This alarm is only for F-frame frequency converters. It is equivalent to Alarm 27. The report value in the alarm log indicates which power module generated the alarm:

- 1 = left most inverter module.
- 2 = middle inverter module in F12 or F3 frame sizes.
- 2 = right inverter module in F10 or F11 frame sizes.

2 = second frequency converter from the left inverter module in F14 frame size.

3 = right inverter module in F12 or F13 frame sizes.

3 = third from the left inverter module in F14 frame size.

4 = far right inverter module in F14 frame size.

5 = rectifier module.

6 = right rectifier module in F14 frame size.

**ALARM 244, Heat Sink temperature**

This alarm is only for F-frame frequency converters. It is equivalent to Alarm 29. The report value in the alarm log indicates which power module generated the alarm.

1 = left most inverter module.

2 = middle inverter module in F12 or F3 frame sizes.

2 = right inverter module in F10 or F11 frame sizes.

2 = second frequency converter from the left inverter module in F14 frame size.

3 = right inverter module in F12 or F13 frame sizes.

3 = third from the left inverter module in F14 frame size.

4 = far right inverter module in F14 frame size.

5 = rectifier module.

6 = right rectifier module in F14 frame size.

**ALARM 245, Heat Sink sensor**

This alarm is only for F-frame frequency converters. It is equivalent to Alarm 39. The report value in the alarm log indicates which power module generated the alarm

1 = left most inverter module.

2 = middle inverter module in F12 or F13 frame sizes.

2 = right inverter module in F10 or F11 frame sizes.

2 = second frequency converter from the left inverter module in F14 frame size.

3 = right inverter module in F12 or F13 frame sizes.

3 = third from the left inverter module in F14 frame size.

4 = far right inverter module in F14 frame size.

5 = rectifier module.

6 = right rectifier module in F14 frame size.

**ALARM 246, Power card supply**

This alarm is only for F-frame frequency converter. It is equivalent to Alarm 46. The report value in the alarm log indicates which power module generated the alarm

- 1 = left most inverter module.
- 2 = middle inverter module in F12 or F13 frame sizes.
- 2 = right inverter module in F10 or F11 frame sizes.
- 2 = second frequency converter from the left inverter module in F14 frame size.
- 3 = right inverter module in F12 or F13 frame sizes.
- 3 = third from the left inverter module in F14 frame size.
- 4 = far right inverter module in F14 frame size.
- 5 = rectifier module.
- 6 = right rectifier module in F14 frame size.

3 = right inverter module in F12 or F13 frame sizes.

3 = third from the left inverter module in F14 frame size.

4 = far right inverter module in F14 frame size.

5 = rectifier module.

6 = right rectifier module in F14 frame size.

**WARNING 250, New spare part**

A component in the frequency converter has been replaced. Reset the frequency converter for normal operation.

**WARNING 251, New typecode**

The power card or other components have been replaced and the typecode changed. Reset to remove the warning and resume normal operation.

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**ALARM 247, Power card temperature**

This alarm is only for F-frame frequency converters. It is equivalent to Alarm 69. The report value in the alarm log indicates which power module generated the alarm

- 1 = left most inverter module.
- 2 = middle inverter module in F12 or F13 frame sizes.
- 2 = right inverter module in F10 or F11 frame sizes.
- 2 = second frequency converter from the left inverter module in F14 frame size.
- 3 = right inverter module in F12 or F13 frame sizes.
- 3 = third from the left inverter module in F14 frame size.
- 4 = far right inverter module in F14 frame size.
- 5 = rectifier module.
- 6 = right rectifier module in F14 frame size.

**ALARM 248, Illegal power section configuration**

This alarm is only for F-frame frequency converters. It is equivalent to Alarm 79. The report value in the alarm log indicates which power module generated the alarm:

- 1 = left most inverter module.
- 2 = middle inverter module in F12 or F13 frame sizes.
- 2 = right inverter module in F10 or F11 frame sizes.
- 2 = second frequency converter from the left inverter module in F14 frame size.

## 7.4 Warning and Alarm Definitions - Filter (Left LCP)

### **NOTICE**

This section covers warnings and alarms on the filter side LCP. For warning and alarms for the frequency converter, see *chapter 7.3 Warnings and Alarm Definitions - Frequency Converter*

A warning or an alarm is signalled by the relevant LED on the front of the filter and indicated by a code on the display.

A warning remains active until its cause is no longer present. Under certain circumstances operation of the unit may still be continued. Warning messages may be critical, but are not necessarily so.

In the event of an alarm, the unit has tripped. To restart operation, reset the rectified alarms.

#### **This may be done in 4 ways:**

1. By pressing [Reset].
2. Via a digital input with the Reset function.
3. Via serial communication/optional fieldbus.
4. By resetting automatically using the [Auto Reset] function.

### **NOTICE**

After a manual reset pressing [Reset], press [Auto On] or [Hand On] to restart the unit.

If an alarm cannot be reset, the reason may be that its cause has not been rectified, or the alarm is trip-locked (see also *Table 7.6*).

Alarms that are trip-locked offer additional protection, meaning that the mains supply must be switched off before the alarm can be reset. After being switched back on, the unit is no longer blocked and may be reset as described above once the cause has been rectified.

Alarms that are not trip-locked can also be reset using the automatic reset function in *14-20 Reset Mode* (Warning: automatic wake-up is possible)

If a warning and alarm is marked against a code in *Table 7.6*, either a warning occurs before an alarm, or it can be specified whether it is a warning or an alarm that is to be displayed for a given fault.

No.	Description	Warning	Alarm/Trip	Alarm/Trip Lock	Parameter Reference
1	10 Volts low	X			
2	Live zero error	(X)	(X)		6-01
4	Mains phase loss	X			
5	DC link voltage high	X			
6	DC link voltage low	X			
7	DC over voltage	X	X		
8	DC under voltage	X	X		
13	Over current	X	X	X	
14	Earth fault	X	X	X	
15	Hardware mismatch		X	X	
16	Short circuit		X	X	
17	Control word timeout	(X)	(X)		8-04
23	Internal fan fault	X			
24	External fan fault	X			14-53
29	Heatsink temp	X	X	X	
33	Inrush fault		X	X	
34	Fieldbus fault	X	X		

No.	Description	Warning	Alarm/Trip	Alarm/Trip Lock	Parameter Reference
35	Option fault	X	X		
38	Internal fault				
39	Heatsink sensor		X	X	
40	Overload of digital output terminal 27	(X)			5-00, 5-01
41	Overload of digital output terminal 29	(X)			5-00, 5-02
46	Pwr. card supply		X	X	
47	24 V supply low	X	X	X	
48	1.8 V supply low		X	X	
65	Control board over-temperature	X	X	X	
66	Heat sink temperature low	X			
67	Option configuration has changed		X		
68	Safe torque off activated		X <sup>1)</sup>		
69	Pwr. card temp		X	X	
70	Illegal FC configuration			X	
72	Dangerous Failure			X <sup>1)</sup>	
73	Safe torque off auto restart				
76	Power unit setup	X			
79	Illegal PS config		X	X	
80	Unit initialised to default value		X		
244	Heatsink temp	X	X	X	
245	Heatsink sensor		X	X	
246	Pwr.card supply		X	X	
247	Pwr.card temp		X	X	
248	Illegal PS config		X	X	
250	New spare part			X	
251	New type code		X	X	
300	Mains cont. fault	X			
301	SC cont. fault	X			
302	Cap. over current	X	X		
303	Cap. earth fault	X	X		
304	DC over current	X	X		
305	Mains freq. limit		X		
308	Resistor temp	X		X	
309	Mains earth fault	X	X		
311	Switch. freq. limit		X		
312	CT range		X		
314	Auto CT interrupt		X		
315	Auto CT error		X		
316	CT location error	X			
317	CT polarity error	X			
318	CT ratio error	X			

Table 7.6 Alarm/Warning Code List

A trip is the action when an alarm has appeared. The trip coasts the motor and can be reset by pressing [Reset] or make a reset by a digital input (parameter group 5-1\* *Digital Inputs [1] Reset*). The origin event that caused an alarm cannot damage the frequency converter or cause dangerous conditions. A trip lock is an action when an alarm occurs, which may cause damage to frequency converter or connected parts. A Trip Lock situation can only be reset by a power cycling.

Warning	yellow
Alarm	flashing red
Trip locked	yellow and red

Table 7.7 LED Indicator Lights

Alarm Word and Extended Status Word					
Bit	Hex	Dec	Alarm Word	Warning Word	Extended Status Word
0	00000001	1	Mains cont. fault	Reserved	Reserved
1	00000002	2	Heatsink temp	Heatsink temp	Auto CT running
2	00000004	4	Ground fault	Ground fault	Reserved
3	00000008	8	Ctrl.card temp	Ctrl.card temp	Reserved
4	00000010	16	Ctrl. word TO	Ctrl. word TO	Reserved
5	00000020	32	Over current	Over current	Reserved
6	00000040	64	SC cont. fault	Reserved	Reserved
7	00000080	128	Cap. over current	Cap. over current	Reserved
8	00000100	256	Cap. earth fault	Cap. earth fault	Reserved
9	00000200	512	Inverter overld.	Inverter overld.	Reserved
10	00000400	1024	DC under volt	DC under volt	Reserved
11	00000800	2048	DC over volt	DC over volt	Reserved
12	00001000	4096	Short circuit	DC voltage low	Reserved
13	00002000	8192	Inrush fault	DC voltage high	Reserved
14	00004000	16384	Mains ph. loss	Mains ph. loss	Reserved
15	00008000	32768	Auto CT error	Reserved	Reserved
16	00010000	65536	Reserved	Reserved	Reserved
17	00020000	131072	Internal fault	10V low	Password Time Lock
18	00040000	262144	DC over current	DC over current	Password Protection
19	00080000	524288	Resistor temp	Resistor temp	Reserved
20	00100000	1048576	Mains earth fault	Mains earth fault	Reserved
21	00200000	2097152	Switch. freq. limit	Reserved	Reserved
22	00400000	4194304	Fieldbus fault	Fieldbus fault	Reserved
23	00800000	8388608	24 V supply low	24V supply low	Reserved
24	01000000	16777216	CT range	Reserved	Reserved
25	02000000	33554432	1.8V supply low	Reserved	Reserved
26	04000000	67108864	Reserved	Low temp	Reserved
27	08000000	134217728	Auto CT interrupt	Reserved	Reserved
28	10000000	268435456	Option change	Reserved	Reserved
29	20000000	536870912	Unit initialized	Unit initialized	Reserved
30	40000000	1073741824	Safe torque off	Safe torque off	Reserved
31	80000000	2147483648	Mains freq. limit	Extended status word	Reserved

Table 7.8 Description of Alarm Word, Warning Word and Extended Status Word

The alarm words, warning words and extended status words can be read out via serial bus or optional fieldbus for diagnosis. See also *16-90 Alarm Word*, *16-92 Warning Word* and *16-94 Ext. Status Word*. Reserved means that the bit is not guaranteed to be any particular value. Reserved bits should not be used for any purpose.

### 7.4.1 Fault Messages for Active Filter

#### WARNING 1, 10 volts low

The control card voltage is below 10 V from terminal 50. Remove some of the load from terminal 50, as the 10 V supply is overloaded. Max. 15 mA or minimum 590 Ω. Fault messages - active filter

#### WARNING/ALARM 2, Live zero error

The signal on terminal 53 or 54 is less than 50% of the value set in parameters 6-10, 6-12, 6-20 or 6-22.

#### WARNING 4, Mains phase loss

A phase is missing on the supply side, or the mains voltage imbalance is too high.

#### WARNING 5, DC link voltage high

The intermediate circuit voltage (DC) is higher than the high-voltage warning limit. The unit is still active.

#### WARNING 6, DC link voltage low

The intermediate circuit voltage (DC) is below the undervoltage limit of the control system. The unit is still active.

#### WARNING/ALARM 7, DC overvoltage

If the intermediate circuit voltage exceeds the limit, the unit trips.

#### WARNING/ALARM 8, DC under voltage

If the intermediate circuit voltage (DC) drops below the under voltage limit, the filter checks if a 24 V back-up supply is connected. If not, the unit trips. Check that the mains voltage matches the nameplate specification.

#### WARNING/ALARM 13, Over Current

the unit current limit has been exceeded.

#### ALARM 14, Earth (ground) fault

The sum current of the IGBT CTs does not equal zero. Check if the resistance of any phase to ground has a low value. Check both before and after mains contactor. Ensure IGBT current transducers, connection cables, and connectors are ok.

#### ALARM 15, Incomp. Hardware

A mounted option is incompatible with the present control card SW/HW.

#### ALARM 16, Short circuit

There is a short-circuit in the output. Turn off the unit and correct the error.

#### WARNING/ALARM 17, Control word timeout

There is no communication to the unit. The warning is only active when *8-04 Control Word Timeout Function* is not set to off. Possible correction: Increase *8-03 Control Word Timeout Time*. Change *8-04 Control Word Timeout Function*

#### WARNING 23, Internal fan fault

Internal fans have failed due to defect hardware or fans not mounted.

#### WARNING 24, External fan fault

External fans have failed due to defect hardware or fans not mounted.

#### ALARM 29, Heat sink temp

The maximum temperature of the heat sink has been exceeded. The temperature fault is not reset until the temperature falls below a defined heat sink temperature.

#### ALARM 33, Inrush fault

Check whether a 24 V external DC supply has been connected.

#### WARNING/ALARM 34, Fieldbus communication fault

The fieldbus on the communication option card is not working.

#### WARNING/ALARM 35, Option Fault:

Contact Danfoss or supplier.

#### ALARM 38, Internal fault

Contact Danfoss or supplier.

#### ALARM 39, Heat sink sensor

No feedback from the heat sink temperature sensor.

#### WARNING 40, Overload of Digital Output Terminal 27

Check the load connected to terminal 27 or remove short-circuit connection.

#### WARNING 41, Overload of Digital Output Terminal 29

Check the load connected to terminal 29 or remove short-circuit connection.

#### WARNING 43, Ext. Supply (option)

The external 24 V DC supply voltage on the option is not valid.

#### ALARM 46, Power card supply

The supply on the power card is out of range.

#### WARNING 47, 24 V supply low

Contact Danfoss or supplier.

#### WARNING 48, 1.8 V supply low

Contact Danfoss or supplier.

#### WARNING/ALARM/TRIP 65, Control card over temperature

Control card over temperature: The cut-out temperature of the control card is 80 °C.

#### WARNING 66, Heat sink temperature low

This warning is based on the temperature sensor in the IGBT module.

#### Troubleshooting

The heat sink temperature measured as 0 °C could indicate that the temperature sensor is defective, causing the fan speed to increase to the maximum. If the sensor wire between the IGBT and the gate drive card is disconnected, this warning would results. Also, check the IGBT thermal sensor.

#### ALARM 67, Option module configuration has changed

One or more options have either been added or removed since the last power-down.

**ALARM 68, Safe Torque Off activated**

Safe Torque Off has been activated. To resume normal operation, apply 24 V DC to terminal 37, then send a reset signal (via bus, digital I/O, or by pressing [Reset]. See 5-19 Terminal 37 Safe Stop.

**ALARM 69, Power card temperature**

The temperature sensor on the power card is either too hot or too cold.

**ALARM 70, Illegal FC Configuration**

Actual combination of control board and power board is illegal.

**WARNING 73, Safe Torque Off auto restart**

Safe stopped. Note that with automatic restart enabled, the motor can start when the fault is cleared.

**ALARM 79, Illegal power section configuration**

The scaling card is the incorrect part number or not installed. Also MK102 connector on the power card could not be installed.

**ALARM 80, Unit initialised to default value**

Parameter settings are initialised to default settings after a manual reset.

**ALARM 244, Heat sink temperature**

Report value indicates source of alarm (from left):  
1-4 inverter  
5-8 rectifier

**ALARM 245, Heat sink sensor**

No feedback from the heat sink sensor. Report value indicates source of alarm (from left):  
1-4 inverter  
5-8 rectifier

**ALARM 246, Power card supply**

The supply on the power card is out of range. Report value indicates source of alarm (from left):  
1-4 inverter  
5-8 rectifier

**ALARM 247, Power card temperature**

Power card over temperature. Report value indicates source of alarm (from left):  
1-4 inverter  
5-8 rectifier

**ALARM 248, Illegal power section configuration**

Power size configuration fault on the power card. Report value indicates source of alarm (from left):  
1-4 inverter  
5-8 rectifier

**ALARM 250, New spare part**

The power or switch mode power supply has been exchanged. The filter type code must be restored in the EEPROM. Select the correct type code in 14-23 *Typecode Setting* according to the label on the unit. Remember to select 'Save to EEPROM' to complete.

**ALARM 251, New type code**

The filter has a new type code.

**ALARM 300, Mains Cont. Fault**

The feedback from the mains contactor did not match the expected value within the allowed time frame. Contact Danfoss or supplier.

**ALARM 301, SC Cont. Fault**

The feedback from the soft charge contactor did not match the expected value within the allowed time frame. Contact Danfoss or supplier.

**ALARM 302, Cap. Over Current**

Excessive current was detected through the AC capacitors. Contact Danfoss or supplier.

**ALARM 303, Cap. Earth Fault**

An earth fault was detected through the AC capacitor currents. Contact Danfoss or supplier.

**ALARM 304, DC Over Current**

Excessive current through the DC-link capacitor bank was detected. Contact Danfoss or supplier.

**ALARM 305, Mains Freq. Limit**

The mains frequency was outside the limits. Verify that the mains frequency is within product specification.

**ALARM 306, Compensation Limit**

The needed compensation current exceeds unit capability. Unit is running at full compensation.

**ALARM 308, Resistor temp**

Excessive resistor heat sink temperature detected.

**ALARM 309, Mains Earth Fault**

An earth fault was detected in the mains currents. Check the mains for shorts and leakage current.

**ALARM 310, RTDC Buffer Full**

Contact Danfoss or supplier.

**ALARM 311, Switch. Freq. Limit**

The average switching frequency of the unit exceeded the limit. Verify that 300-10 *Active Filter Nominal Voltage* and 300-22 *CT Nominal Voltage* are set correctly. If so, contact Danfoss or supplier.

**ALARM 312, CT Range**

Current transformer measurement limitation was detected. Verify that the CTs used are an appropriate ratio.

**ALARM 314, Auto CT Interrupt**

Auto CT detection has been interrupted.

**ALARM 315, Auto CT Error**

An error was detected while performing auto CT detection. Contact Danfoss or supplier.

**WARNING 316, CT Location Error**

The auto CT function could not determine the correct locations of the CTs.

**WARNING 317, CT Polarity Error**

The auto CT function could not determine the correct polarity of the CTs.

**WARNING 318, CT Ratio Error**

The auto CT function could not determine the correct primary rating of the CTs.

## 7.5 Troubleshooting

Symptom	Possible cause	Test	Solution
Display dark/No function	Missing input power	See <i>Table 5.1</i>	Check the input power source
	Missing or open fuses or circuit breaker tripped	See <i>Open fuses and Tripped circuit breaker</i> in this table for possible causes	Follow the recommendations provided
	No power to the LCP	Check the LCP cable for proper connection or damage	Replace the faulty LCP or connection cable
	Shortcut on control voltage (terminal 12 or 50) or at control terminals	Check the 24 V control voltage supply for terminals 12/13 to 20-39 or 10 V supply for terminals 50 to 55	Wire the terminals properly
	Wrong LCP (LCP from VLT® 2800 or 5000/6000/8000/ FCD or FCM)		Use only LCP 101 (P/N 130B1124) or LCP 102 (P/N 130B1107)
	Wrong contrast setting		Press [Status] + [▲]/[▼] to adjust the contrast
	Display (LCP) is defective	Test using a different LCP	Replace the faulty LCP or connection cable
	Internal voltage supply fault or SMPS is defective		Contact supplier
Intermittent display	Overloaded power supply (SMPS) due to improper control wiring or a fault within the frequency converter	To rule out a problem in the control wiring, disconnect all control wiring by removing the terminal blocks.	If the display stays lit, then the problem is in the control wiring. Check the wiring for shorts or incorrect connections. If the display continues to cut out, follow the procedure for display dark.
Motor not running	Service switch open or missing motor connection	Check if the motor is connected and the connection is not interrupted (by a service switch or other device).	Connect the motor and check the service switch
	No mains power with 24 V DC option card	If the display is functioning but no output, check that mains power is applied to the frequency converter.	Apply mains power to run the unit
	LCP Stop	Check if [Off] has been pressed	Press [Auto On] or [Hand On] (depending on operation mode) to run the motor
	Missing start signal (Standby)	Check <i>5-10 Terminal 18 Digital Input</i> for correct setting for terminal 18 (use default setting)	Apply a valid start signal to start the motor
	Motor coast signal active (Coasting)	Check <i>5-12 Coast inv.</i> for correct setting for terminal 27 (use default setting).	Apply 24 V on terminal 27 or program this terminal to <i>no operation</i>
	Wrong reference signal source	Check reference signal: Local, remote or bus reference? Preset reference active? Terminal connection correct? Scaling of terminals correct? Reference signal available?	Program correct settings. Check <i>3-13 Reference Site</i> . Set preset reference active in parameter group <i>3-1* References</i> . Check for correct wiring. Check scaling of terminals. Check reference signal.
Motor running in wrong direction	Motor rotation limit	Check that <i>4-10 Motor Speed Direction</i> is programmed correctly.	Program correct settings
	Active reversing signal	Check if a reversing command is programmed for the terminal in parameter group <i>5-1* Digital inputs</i> .	Deactivate reversing signal
	Wrong motor phase connection		See <i>chapter 4.6.1 Motor Cable</i> in this manual

Symptom	Possible cause	Test	Solution
Motor is not reaching maximum speed	Frequency limits set wrong	Check output limits in 4-13 <i>Motor Speed High Limit [RPM]</i> , 4-14 <i>Motor Speed High Limit [Hz]</i> and 4-19 <i>Max Output Frequency</i> .	Program correct limits
	Reference input signal not scaled correctly	Check reference input signal scaling in 6-0* <i>Analog I/O Mode</i> and parameter group 3-1* <i>References</i> . Reference limits in parameter group 3-0* <i>Reference Limit</i> .	Program correct settings
Motor speed unstable	Possible incorrect parameter settings	Check the settings of all motor parameters, including all motor compensation settings. For closed loop operation, check PID settings.	Check settings in parameter group 1-6* <i>Load Depen. Setting</i> . For closed loop operation, check settings in parameter group 20-0* <i>Feedback</i> .
Motor runs rough	Possible overmagnetisation	Check for incorrect motor settings in all motor parameters	Check motor settings in parameter groups 1-2* <i>Motor Data</i> , 1-3* <i>Adv Motor Data</i> , and 1-5* <i>Load Indep. Setting</i> .
Motor will not brake	Possible incorrect settings in the brake parameters. Possible too short ramp down times	Check brake parameters. Check ramp time settings	Check parameter group 2-0* <i>DC Brake</i> and 3-0* <i>Reference Limits</i> .
Open power fuses or circuit breaker trip	Phase-to-phase short	Motor or panel has a short phase to phase. Check motor and panel phase for shorts	Eliminate any shorts detected
	Motor overload	Motor is overloaded for the application	Perform startup test and verify motor current is within specifications. If motor current is exceeding nameplate full load current, motor may run only with reduced load. Review the specifications for the application.
	Loose connections	Perform pre-startup check for loose connections	Tighten loose connections
Mains current imbalance greater than 3%	Problem with mains power (See <i>Alarm 4 Mains phase loss</i> description)	Rotate input power leads into the frequency converter one position: A to B, B to C, C to A.	If imbalanced leg follows the wire, it is a power problem. Check mains power supply.
	Problem with the frequency converter	Rotate input power leads into the frequency converter one position: A to B, B to C, C to A.	If imbalance leg stays on same input terminal, it is a problem with the unit. Contact the supplier.
Motor current imbalance greater than 3%	Problem with motor or motor wiring	Rotate output motor leads one position: U to V, V to W, W to U.	If imbalanced leg follows the wire, the problem is in the motor or motor wiring. Check motor and motor wiring.
	Problem with the frequency converters	Rotate output motor leads one position: U to V, V to W, W to U.	If imbalance leg stays on same output terminal, it is a problem with the unit. Contact the supplier.
Acoustic noise or vibration (e.g. a fan blade is making noise or vibrations at certain frequencies)	Resonances, e.g. in the motor/fan system	Bypass critical frequencies by using parameters in parameter group 4-6* <i>Speed Bypass</i>	Check if noise and/or vibration have been reduced to an acceptable limit
		Turn off over-modulation in 14-03 <i>Overmodulation</i>	
		Change switching pattern and frequency in parameter group 14-0* <i>Inverter Switching</i>	
		Increase Resonance Dampening in 1-64 <i>Resonance Dampening</i>	

Table 7.9 Troubleshooting

## 8 Specifications

### 8.1 Power-Dependent Specifications

#### 8.1.1 Mains Supply 3x380-480 V AC

	P160	P200	P250
<b>Normal Overload =110% current for 60 s</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>
Typical shaft output at 400 V [kW]	160	200	250
Typical shaft output at 460 V [hp]	250	300	350
Typical shaft output at 480 V [kW]	200	250	315
Enclosure IP21/54	D13		
<b>Output current</b>			
Continuous (at 400 V) [A]	315	395	480
Intermittent (60 s overload) (at 400 V) [A]	347	435	528
Continuous (at 460/480 V) [A]	302	361	443
Intermittent (60 s overload) (at 460/480 V) [A]	332	397	487
Continuous kVA (at 400 V) [kVA]	218	274	333
Continuous kVA (at 460 V) [kVA]	241	288	353
Continuous kVA (at 480 V) [kVA]	262	313	384
<b>Max. Input current</b>			
Continuous (at 400 V) [A]	304	381	463
Continuous (at 460/480 V) [A]	291	348	427
Max. pre-fuses <sup>1)</sup> [A]	400	500	630
<b>Max. cable size</b>			
Motor (mm <sup>2</sup> /AWG <sup>2)</sup> )	2x185 (2x300 mcm)		
Mains (mm <sup>2</sup> /AWG <sup>2)</sup> )			
Loadsharing (mm <sup>2</sup> /AWG <sup>2)</sup> )			
Brake (mm <sup>2</sup> /AWG <sup>2)</sup> )			
Total LHD loss 400 V AC [kW]	8868	10527	11751
Total back channel loss 400 V AC [kW]	7318	8903	10033
Total filter loss 400 V AC [kW]	4954	5714	6234
Total LHD loss 460 V AC [kW]	9059	10192	11706
Total back channel loss 460 V AC [kW]	7123	8209	9635
Total filter loss 460 V AC [kW]	5279	5819	6681
Weight, enclosure IP21, IP54 [kg]	380		406
Efficiency <sup>4)</sup>	0.96		
Output frequency [Hz]	0-800		
Heatsink overtemp. trip [°C]	105		
Power card ambient trip [°C]	85		

\*High overload = 160% torque during 60 s; Normal overload = 110% torque during 60 s

Table 8.1 Mains Supply 3x380-480 V AC

## Specifications

## Operating Instructions

	P315	P355	P400	P450
<b>Normal Overload = 110% current for 60 s</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>
Typical shaft output at 400 V [kW]	315	355	400	450
Typical shaft output at 460 V [hp]	450	500	600	600
Typical shaft output at 480 V [kW]	355	400	500	530
Enclosure IP21/54	E9			
<b>Output current</b>				
Continuous (at 400 V) [A]	600	658	745	800
Intermittent (60 s overload) (at 400 V) [A]	660	724	820	880
Continuous (at 460/480 V) [A]	540	590	678	730
Intermittent (60 s overload) (at 460/480 V) [A]	594	649	746	803
Continuous kVA (at 400 V) [kVA]	416	456	516	554
Continuous kVA (at 460 V) [kVA]	430	470	540	582
Continuous kVA (at 480 V) [kVA]	468	511	587	632
<b>Max. input current</b>				
Continuous (at 400 V) [A]	590	647	733	787
Continuous (at 460/480 V) [A]	531	580	667	718
Max. pre-fuses <sup>1)</sup> [A]	700	900		
<b>Max. cable size</b>				
Motor (mm <sup>2</sup> /AWG <sup>2)</sup> )	4x240 (4x500 mcm)			
Mains (mm <sup>2</sup> /AWG <sup>2)</sup> )				
Loadsharing (mm <sup>2</sup> /AWG <sup>2)</sup> )				
Brake (mm <sup>2</sup> /AWG <sup>2)</sup> )	2x185 (2x350 mcm)			
Total LHD loss 400 V AC [kW]	14051	15320	17180	18447
Total back channel loss 400 V AC [kW]	11301	11648	13396	14570
Total filter loss 400 V AC [kW]	7346	7788	8503	8974
Total LHD loss 460 V AC [kW]	12936	14083	15852	16962
Total back channel loss 460 V AC [kW]	10277	10522	12184	13214
Total filter loss 460 V AC [kW]	7066	7359	8033	8435
Weight, enclosure IP21, IP54 [kg]	596	623	646	
Efficiency <sup>4)</sup>	0.96			
Output frequency [Hz]	0-600			
Heatsink overtemp. trip [°C]	105			
Power card ambient trip [°C]	85			
*High overload = 160% torque during 60 s; Normal overload = 110% torque during 60 s				

Table 8.2 Mains Supply 3x380-480 V AC

## Specifications

## Operating Instructions

	P500	P560	P630	P710
<b>Normal Overload = 110% current for 60 s</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>
Typical shaft output at 400 V [kW]	500	560	630	710
Typical shaft output at 460 V [hp]	650	750	900	1000
Typical shaft output at 480 V [kW]	560	630	710	800
Enclosure IP21/54	F18			
<b>Output current</b>				
Continuous (at 400 V) [A]	880	990	1120	1260
Intermittent (60 s overload) (at 400 V) [A]	968	1089	1232	1386
Continuous (at 460/480 V) [A]	780	890	1050	1160
Intermittent (60 s overload) (at 460/480 V) [A]	858	979	1155	1276
Continuous kVA (at 400 V) [kVA]	610	686	776	873
Continuous kVA (at 460 V) [kVA]	621	709	837	924
Continuous kVA (at 480 V) [kVA]	675	771	909	1005
<b>Max. Input current</b>				
Continuous (at 400 V) [A]	857	964	1090	1227
Continuous (at 460/480 V) [A]	759	867	1022	1129
Max. pre-fuses <sup>1)</sup> [A]	1600		2000	
<b>Max. cable size</b>				
Motor (mm <sup>2</sup> /AWG <sup>2)</sup> )	8 x 150 (8 x 300 mcm)			
Mains (mm <sup>2</sup> /AWG <sup>2)</sup> )	8 x 240 (8 x 500 mcm)			
Brake (mm <sup>2</sup> /AWG <sup>2)</sup> )	4 x 185 (4 x 350 mcm)			
Total LHD loss 400 V AC [kW]	21909	24592	26640	30519
Total back channel loss 400 V AC [kW]	17767	19984	21728	24936
Total filter loss 400 V AC [kW]	11747	12771	14128	15845
Total LHD loss 460 V AC [kW]	19896	22353	25030	27989
Total back channel loss 460 V AC [kW]	16131	18175	20428	22897
Total filter loss 460 V AC [kW]	11020	11929	13435	14776
Weight, enclosure IP21, IP54 [kg]	2009			
Efficiency <sup>4)</sup>	0.96			
Output frequency [Hz]	0-600			
Heatsink overtemp. trip [°C]	105			
Power card ambient trip [°C]	85			
*Normal overload = 110% torque during 60 s				

Table 8.3 Mains Supply 3x380-480 V AC

1) For type of fuse, see *chapter 8.5.1 Fuses*.

2) American wire gauge.

3) Measured using 5 m screened motor cables at rated load and rated frequency.

4) The typical power loss is at nominal load conditions and expected to be within  $\pm 15\%$  (tolerance relates to variety in voltage and cable conditions). Values are based on a typical motor efficiency (IE2/IE3 border line). Motors with lower efficiency also add to the power loss in the frequency converter and opposite. If the switching frequency is increased to the default setting, the power losses may rise significantly. LCP and typical control card power consumptions are included. Further options and customer load may add up to 30 W to the losses. (Though typical only 4 W extra for a fully loaded control card, or options for slot A or slot B, each).

Although measurements are made with state-of-the-art equipment, some measurement inaccuracy must be allowed for ( $\pm 5\%$ ).

### 8.1.2 Derating for Temperature

The frequency converter automatically derates the switching frequency, switching type, or output current under certain load or ambient conditions as described below. The derating curves in *Illustration 8.1* apply to both SFAVM and 60 AVM switching modes.

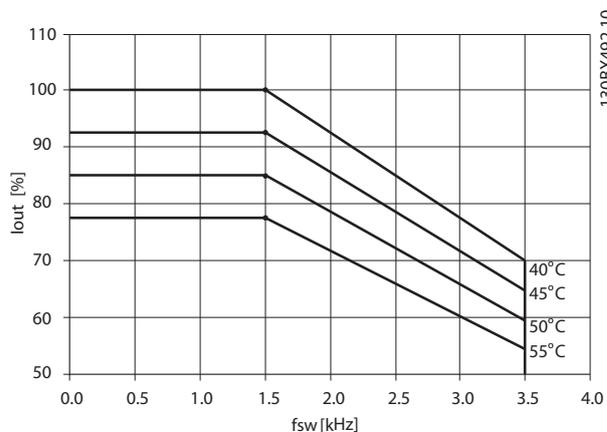


Illustration 8.1 Derating Frame Sizes D, E, and F 380-500 V (T5) Normal Overload 110%

### 8.2 Mechanical Dimensions

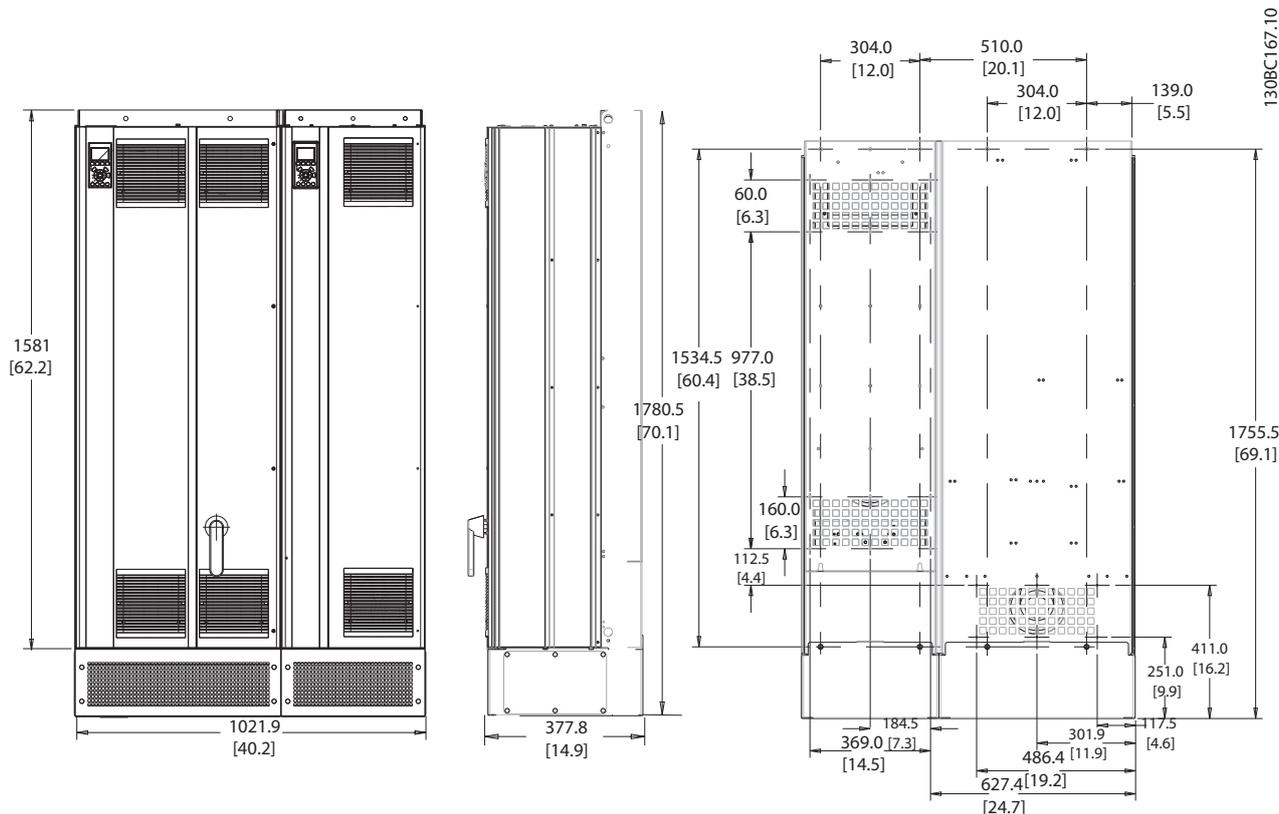


Illustration 8.2 Frame Size D13

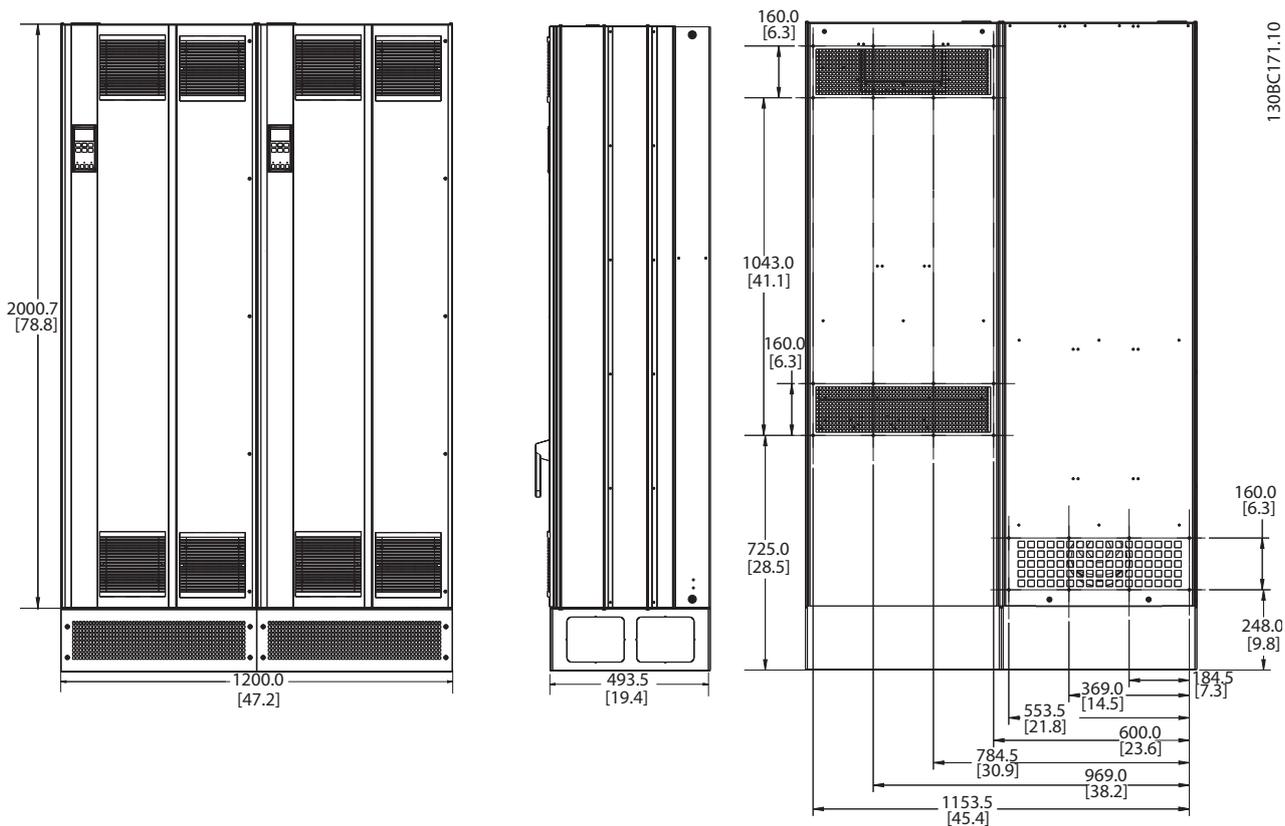


Illustration 8.3 Frame Size E9

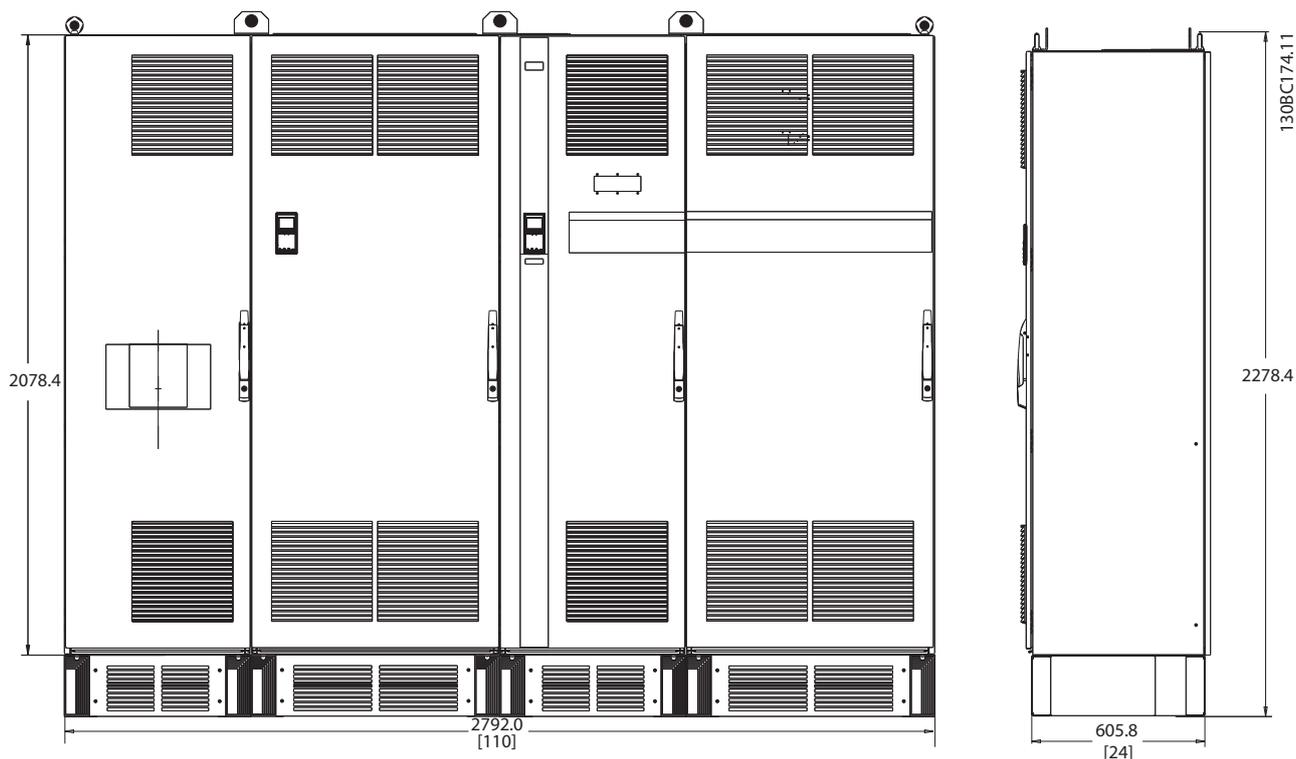


Illustration 8.4 Frame Size F18, Front and Side View

### 8.3 General Technical Data - Frequency Converter

**Mains supply (L1, L2, L3)**

Supply voltage ..... 380–480 V +5%

*Mains voltage low/mains drop-out:*

*During low mains voltage or mains drop-out, the frequency converter continues until the intermediate circuit voltage drops below the minimum stop level, corresponding to 15% below the lowest rated supply voltage. Power up and full torque cannot be expected at mains voltage lower than 10% below the lowest rated supply voltage.*

Supply frequency ..... 50/60 Hz ±5%

Max. imbalance temporary between mains phases ..... 3.0% of rated supply voltage

True power factor (λ) ..... > 0.98 nominal at rated load

Displacement power factor (cosφ) near unity ..... (> 0.98)

THiD ..... < 5%

Switching on input supply L1, L2, L3 (power-ups) ..... maximum once/2 min.

Environment according to EN60664-1 ..... overvoltage category III/pollution degree 2

*The unit is suitable for use on a circuit capable of delivering not more than 100.000 RMS symmetrical Amperes, 480/690 V maximum.*

**Motor output (U, V, W)**

Output voltage ..... 0-100% of supply voltage

Output frequency ..... 0-590 Hz<sup>1)</sup>

Switching on output ..... Unlimited

Ramp times ..... 0.01-3600 s

1) Voltage and power dependent

## Specifications

## Operating Instructions

## Torque characteristics

Starting torque (constant torque)	maximum 160% for 1 m <sup>1)</sup>
Starting torque	maximum 180% up to 0.5 s <sup>1)</sup>
Overload torque (constant torque)	maximum 160% for 1 m <sup>1)</sup>

1) Percentage relates to nominal torque of the unit.

## Cable lengths and cross-sections

Max. motor cable length, screened/armoured	150 m
Max. motor cable length, unscreened/unarmoured	300 m
Max. cross-section to motor, mains, load sharing, and brake <sup>1)</sup>	
Maximum cross-section to control terminals, rigid wire	1.5 mm <sup>2</sup> /16 AWG (2 x 0.75 mm <sup>2</sup> )
Maximum cross-section to control terminals, flexible cable	1 mm <sup>2</sup> /18 AWG
Maximum cross-section to control terminals, cable with enclosed core	0.5 mm <sup>2</sup> /20 AWG
Minimum cross-section to control terminals	0.25 mm <sup>2</sup>

1) See chapter 8.1.1 Mains Supply 3x380-480 V AC for more information

## Digital inputs

Programmable digital inputs	4 (6)
Terminal number	18, 19, 27 <sup>1)</sup> , 29 <sup>1)</sup> , 32, 33,
Logic	PNP or NPN
Voltage level	0-24 V DC
Voltage level, logic '0' PNP	< 5 V DC
Voltage level, logic '1' PNP	> 10 V DC
Voltage level, logic '0' NPN	> 19 V DC
Voltage level, logic '1' NPN	< 14 V DC
Maximum voltage on input	28 V DC
Input resistance, R <sub>i</sub>	approx. 4 kΩ

All digital inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

1) Terminals 27 and 29 can also be programmed as output.

## Analog inputs

Number of analog inputs	2
Terminal number	53, 54
Modes	Voltage or current
Mode select	Switch S201 and switch S202
Voltage mode	Switch S201/switch S202 = OFF (U)
Voltage level	0 to + 10 V (scaleable)
Input resistance, R <sub>i</sub>	approx. 10 kΩ
Max. voltage	± 20 V
Current mode	Switch S201/switch S202 = ON (I)
Current level	0/4 to 20 mA (scaleable)
Input resistance, R <sub>i</sub>	approx. 200 Ω
Max. current	30 mA
Resolution for analog inputs	10 bit (+ sign)
Accuracy of analog inputs	Max. error 0.5% of full scale
Bandwidth	200 Hz

The analog inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

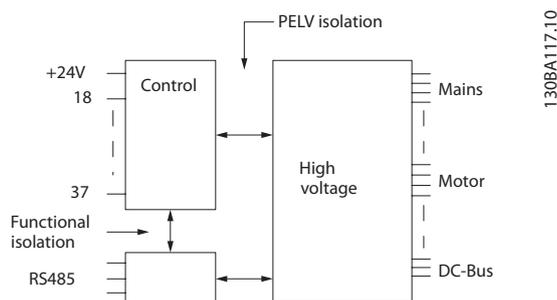


Illustration 8.5 PELV Isolation of Analog Inputs

Pulse inputs

Programmable pulse inputs	2
Terminal number pulse	29, 33
Max. frequency at terminal, 29, 33	110 kHz (Push-pull driven)
Max. frequency at terminal, 29, 33	5 kHz (open collector)
Min. frequency at terminal 29, 33	4 Hz
Voltage level	see chapter 8.3.1 Digital inputs
Maximum voltage on input	28 V DC
Input resistance, $R_i$	approx. 4 k $\Omega$
Pulse input accuracy (0.1–1 kHz)	Max. error: 0.1% of full scale

Analog output

Number of programmable analog outputs	1
Terminal number	42
Current range at analog output	0/4-20 mA
Max. resistor load to common at analog output	500 $\Omega$
Accuracy on analog output	Max. error: 0.8% of full scale
Resolution on analog output	8 bit

The analog output is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, RS-485 serial communication

Terminal number	68 (P,TX+, RX+), 69 (N,TX-, RX-)
Terminal number 61	Common for terminals 68 and 69

The RS-485 serial communication circuit is functionally seated from other central circuits and galvanically isolated from the supply voltage (PELV).

Digital output

Programmable digital/pulse outputs	2
Terminal number	27, 29 <sup>1)</sup>
Voltage level at digital/frequency output	0-24 V
Max. output current (sink or source)	40 mA
Max. load at frequency output	1 k $\Omega$
Max. capacitive load at frequency output	10 nF
Minimum output frequency at frequency output	0 Hz
Maximum output frequency at frequency output	32 kHz
Accuracy of frequency output	Max. error: 0.1% of full scale
Resolution of frequency outputs	12 bit

1) Terminal 27 and 29 can also be programmed as input.

The digital output is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

## Specifications

## Operating Instructions

## Control card, 24 V DC output

Terminal number	13
Output voltage	24 V (+1, -3 v)
Max. load	200 mA

The 24 V DC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analog and digital inputs and outputs.

## Relay outputs

Programmable relay outputs	2
<b>Relay 01 Terminal number</b>	1-3 (break), 1-2 (make)
Max. terminal load (AC-1) <sup>1)</sup> on 1-3 (NC), 1-2 (NO) (resistive load)	240 V AC, 2 A
Max. terminal load (AC-15) <sup>1)</sup> (inductive load @ $\cos\phi$ 0.4)	240 V AC, 0.2 A
Max. terminal load (DC-1) <sup>1)</sup> on 1-2 (NO), 1-3 (NC) (resistive load)	60 V DC, 1 A
Max. terminal load (DC-13) <sup>1)</sup> (inductive load)	24 V DC, 0.1 A
<b>Relay 02 Terminal number</b>	4-6 (break), 4-5 (make)
Max. terminal load (AC-1) <sup>1)</sup> on 4-5 (NO) (resistive load) <sup>2)3)</sup>	400 V AC, 2 A
Max. terminal load (AC-15) <sup>1)</sup> on 4-5 (NO) (inductive load @ $\cos\phi$ 0.4)	240 V AC, 0.2 A
Max. terminal load (DC-1) <sup>1)</sup> on 4-5 (NO) (resistive load)	80 V DC, 2 A
Max. terminal load (DC-13) <sup>1)</sup> on 4-5 (NO) (inductive load)	24 V DC, 0.1 A
Max. terminal load (AC-1) <sup>1)</sup> on 4-6 (NC) (resistive load)	240 V AC, 2 A
Max. terminal load (AC-15) <sup>1)</sup> on 4-6 (NC) (inductive load @ $\cos\phi$ 0.4)	240 V AC, 0.2 A
Max. terminal load (DC-1) <sup>1)</sup> on 4-6 (NC) (resistive load)	50 V DC, 2 A
Max. terminal load (DC-13) <sup>1)</sup> on 4-6 (NC) (inductive load)	24 V DC, 0.1 A
Min. terminal load on 1-3 (NC), 1-2 (NO), 4-6 (NC), 4-5 (NO)	24 V DC 10 mA, 24 V AC 20 mA
Environment according to EN 60664-1	overvoltage category III/pollution degree 2

1) IEC 60947 parts 4 and 5

The relay contacts are galvanically isolated from the rest of the circuit by reinforced isolation (PELV).

2) Overvoltage Category II

3) UL applications 300 V AC 2 A

## Control characteristics

Resolution of output frequency at 0-1000 Hz	$\pm 0.003$ Hz
System response time (terminals 18, 19, 27, 29, 32, 33)	$\leq 2$ ms
Speed control range (open loop)	1:100 of synchronous speed
Speed accuracy (open loop)	30-4000 RPM: Maximum error of $\pm 8$ RPM

All control characteristics are based on a 4-pole asynchronous motor

## Specifications

## Operating Instructions

## Surroundings

Enclosure, frame size D and E	IP21, IP54
Enclosure, frame size F	IP21, IP54
Vibration test	0.7 g
Relative humidity	5-95% (IEC 721-3-3; Class 3K3 (non-condensing) during operation
Aggressive environment (IEC 60068-2-43) H <sub>2</sub> S test	class kD
Test method according to IEC 60068-2-43 H <sub>2</sub> S (10 days)	
Ambient temperature (at 60 AVM switching mode)	
- with derating	max. 55 °C
- with full output power, typical IE2 motors (see <i>chapter 8.1.2 Derating for Temperature</i> )	max. 50 °C
- at full continuous FC output current	max. 45 °C
Minimum ambient temperature during full-scale operation	0 °C
Minimum ambient temperature at reduced performance	- 10 °C
Temperature during storage/transport	-25 - +65/70 °C
Maximum altitude above sea level without derating	1,000 m
Maximum altitude above sea level with derating	3,000 m

*For more information on derating, consult the design guide*

EMC standards, emission	EN 61800-3, EN 61000-6-3/4, EN 55011, IEC 61800-3 EN 61800-3, EN 61000-6-1/2,
EMC standards, immunity	EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6

## Control card performance

Scan interval	5 ms
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## Control card, USB serial communication

USB standard	1.1 (full speed)
USB plug	USB type B device plug

**NOTICE**

Connection to PC is carried out via a standard host/device USB cable.

The USB connection is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

The USB connection is not galvanically isolated from protective earth. Use only isolated laptop/PC as connection to the USB connector on the frequency converter or an isolated USB cable/converter.

## Protection and features:

- Electronic thermal motor protection against overload.
- Temperature monitoring of the heat sink ensures that the frequency converter trips if the temperature reaches a predefined level. An overload temperature cannot be reset until the temperature of the heat sink is below the allowed values.
- The frequency converter is protected against short-circuits on motor terminals U, V, W.
- If a mains phase is missing, the frequency converter trips or issues a warning (depending on the load).
- Monitoring of the intermediate circuit voltage ensures that the frequency converter trips if the intermediate circuit voltage is too low or too high.
- The frequency converter is protected against earth faults on motor terminals U, V, W.

### 8.4 General Technical Data - Filter

Frame size	D13	E9	F18
Voltage [V]	380–480	380–480	380–480
Current, RMS [A]	120	210	330
Response time [ms]	<0.5		
Settling time - reactive current control [ms]	<40		
Settling time - harmonic current control (filtering) [ms]	<20		
Overshoot - reactive current control [%]	<20		
Overshoot - harmonic current control [%]	<10		

Table 8.4 Power Ranges (LHD with AF)

#### 8.4.1 Power Rating

Grid conditions

Supply voltage 380–480 V

*Mains voltage low/mains drop-out:*

*During low mains voltage or a mains drop-out, the filter continues until the intermediate circuit voltage drops below the minimum stop level, which corresponds to 15% below the filter lowest rated supply voltage. Full compensation cannot be expected at mains voltage lower than 10% below the filter lowest rated supply voltage. If mains voltage exceed the filter highest rated voltage, the filter continues to work but harmonic mitigation performance is reduced. The filter does not cut out until main voltages exceed 580 V.*

Supply frequency 50/60 Hz ±5%  
3.0% of rated supply voltage

Max. imbalance temporary between mains phases where mitigation performance is kept high. Filter mitigates at higher mains imbalance but harmonic mitigation performance is reduced

Max THDv pre-distortion 10% with kept mitigation performance  
Reduced performance for higher pre-distortion levels

Harmonic mitigation performance

Best performance <4%

THiD Depending on filter vs. distortion ratio.

Individual harmonic mitigation ability: Current maximum RMS [% of rated RMS current]

2nd	10%
4th	10%
5th	70%
7th	50%
8th	10%
10th	5%
11th	32%
13th	28%
14th	4%
16th	4%
17th	20%
19th	18%
20th	3%
22nd	3%
23rd	16%
25th	14%
Total current of harmonics	90%

*The filter is performance tested to the 40th order*

Reactive current compensation

Cos phi Controllable 1.0 to 0.5 lagging

Reactive current, % of filter current rating 100%

## Specifications

## Operating Instructions

## Cable lengths and cross-sections

Max grid cable length (direct internal connection to drive)	Unlimited (determined by voltage drop)
Maximum cross-section to control terminals, rigid wire	1.5 mm <sup>2</sup> /16 AWG (2 x 0.75 mm <sup>2</sup> )
Maximum cross-section to control terminals, flexible cable	1 mm <sup>2</sup> /18 AWG
Maximum cross-section to control terminals, cable with enclosed core	0.5 mm <sup>2</sup> /20 AWG
Minimum cross-section to control terminals	0.25 mm <sup>2</sup>

## CT terminals specification

CT number	3 (one for each phase)
The AAF burden equals	2 mΩ
Secondary current rating	1 A or 5 A (hardware set-up)
Accuracy	Class 0.5 or better

## Digital inputs

Programmable digital inputs	2 (4)
Terminal number	18, 19, 27 <sup>1)</sup> , 29 <sup>1)</sup>
Logic	PNP or NPN
Voltage level	0–24 V DC
Voltage level, logic '0' PNP	< 5 V DC
Voltage level, logic '1' PNP	> 10 V DC
Voltage level, logic '0' NPN	> 19 V DC
Voltage level, logic '1' NPN	< 14 V DC
Maximum voltage on input	28 V DC
Input resistance, R <sub>i</sub>	approx. 4 kΩ

All digital inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

1) Terminals 27 and 29 can also be programmed as output.

## Control card, RS-485 serial communication

Terminal number	68 (P, TX+, RX+), 69 (N, TX-, RX-)
Terminal number 61	Common for terminals 68 and 69

The RS-485 serial communication circuit is functionally separated from other central circuits and galvanically isolated from the supply voltage (PELV).

## Digital output

Programmable digital/pulse outputs	2
Terminal number	27, 29 <sup>1)</sup>
Voltage level at digital/frequency output	0–24 V
Max. output current (sink or source)	40 mA

1) Terminal 27 and 29 can also be programmed as input.

## Control card, 24 V DC output

Terminal number	13
Max. load	200 mA

The 24 V DC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analog and digital inputs and outputs.

## Specifications

## Operating Instructions

## Surroundings

Enclosure	IP21, IP54
Vibration test	1.0 g
Relative humidity	5% - 95% (IEC 721-3-3; class 3K3 (non-condensing) during operation
Aggressive environment (IEC 60068-2-43) H <sub>2</sub> S test	class kD
Test method according to IEC 60068-2-43 H <sub>2</sub> S (10 days)	
Ambient temperature	
- with derating	max. NA °C
- with full output current (short temperature overload)	max. 45 °C
- at full continuous output current (24 hours)	max. 40 °C
Minimum ambient temperature during full-scale operation	0 °C
Minimum ambient temperature at reduced performance	-10 °C
Temperature during storage/transport	-25 to +70 °C
Maximum altitude above sea level without derating	1000 m
Maximum altitude above sea level with derating	3000 m
EMC standards, Emission	EN 61800-3, EN 61000-6-3/4, EN 55011, IEC 61800-3 EN 61800-3, EN 61000-6-1/2,
EMC standards, Immunity	EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6

## Control card performance

Scan interval	5 ms
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## Control card, USB serial communication

USB standard	1.1 (full speed)
USB plug	USB type B "device" plug

## Generic specifications

Maximum parallel filters	4 on same CT set
Filter efficiency	97%
Typical average switching frequency	3.0–4.5 kHz
Response time (reactive and harmonic)	< 0.5 ms
Settling time - reactive current control	< 20 ms
Settling time - harmonic current control	< 20 ms
Overshoot – reactive current control	<10%
Overshoot – Harmonic current control	<10%

Connection to PC is carried out via a standard host/device USB cable. The USB connection is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals. The USB connection is not galvanically isolated from protective earth. Use only isolated laptop/PC as connection to the USB connector on the unit or an isolated USB cable/converter.

## Protection and features

- Temperature monitoring of the heat sink ensures that the active filter trips if the temperature reaches a predefined level. An overload temperature cannot be reset until the temperature of the heat sink is below the acceptable values.
- If a mains phase is missing, the active filter trips.
- The active filter has a short circuit protection current rate of 100 kA if properly fused
- Monitoring of the intermediate circuit voltage ensures that the filter trips if the intermediate circuit voltage is too low or too high.
- The active filter monitors the mains current as well as internal currents to reassure that current levels do not reach critical levels. If current exceeds a critical level, the filter trips.

### 8.4.2 Derating for Altitude

The cooling capability of air is decreased at lower air pressure.

Below 1,000 m altitude no derating is necessary but above 1,000 m the ambient temperature ( $T_{AMB}$ ) or max. output current ( $I_{out}$ ) should be derated in accordance with *Illustration 8.6*.

An alternative is to lower the ambient temperature at high altitudes and thereby ensure 100% output current at high altitudes. As an example of how to read the graph, the situation at 2,000 m is elaborated. At a temperature of 45 °C ( $T_{AMB, MAX} - 3.3 K$ ), 91% of the rated output current is available. At a temperature of 41.7 °C, 100% of the rated output current is available.

#### Altitude Derating

Derating of output current versus altitude at  $T_{AMB, MAX}$  for frame sizes D, E and F.

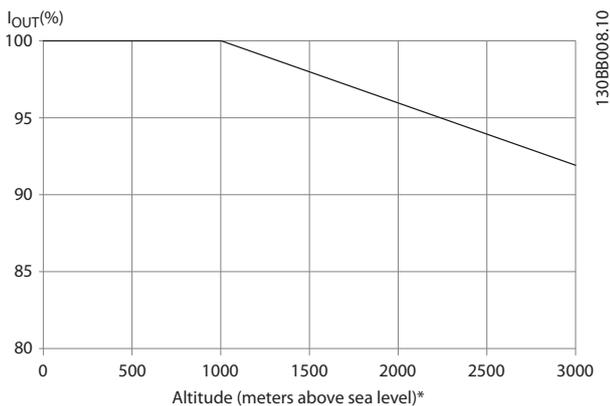


Illustration 8.6 Altitude Derating

### 8.5 Fuses

It is recommended to use fuses and/or circuit breakers on the supply side as protection in case of component break-down inside the frequency converter (first fault).

#### NOTICE

This is mandatory to ensure compliance with IEC 60364 for CE or NEC 2009 for UL.

#### WARNING

Protect personnel and property against the consequence of component break-down internally in the frequency converter.

#### Branch circuit protection

To protect the installation against electrical and fire hazard, all branch circuits in an installation, switch gear, machines etc., must be protected against short-circuit and overcurrent according to national/international regulations.

#### NOTICE

The recommendations given do not cover branch circuit protection for UL.

#### Short-circuit protection

Danfoss recommends using the fuses/circuit breakers mentioned below to protect service personnel and property in case of component break-down in the frequency converter.

#### Overcurrent protection

The frequency converter provides overload protection to limit threats to human life, property damage and to avoid fire hazard due to overheating of the cables in the installation. The frequency converter is equipped with an internal overcurrent protection (*4-18 Current Limit*) that can be used for upstream overload protection (UL-applications excluded). Moreover, fuses or circuit breakers can be used to provide the overcurrent protection in the installation. Overcurrent protection must always be carried out according to national regulations.

The following tables list the recommended rated current. Recommended fuses are of the type gG for small to medium power sizes. For larger powers, aR fuses are recommended. Circuit breakers must be used, provided they meet the national/international regulations and they limit the energy into the frequency converter to an equal or lower level than the compliant circuit breakers. If fuses/circuit breakers according to recommendations are selected, possible damage on the frequency converter is mainly limited to damage inside the unit.

#### Non UL compliance

If UL/cUL is not to be complied with, use the following fuses, which ensure compliance with EN50178:

P160-P250	380-480 V	type gG
P315-P450	380-480 V	type gR

Table 8.5 Fuse Types by Power Range

## 8.5.1 Fuse Specifications

### UL compliance

#### 380-480 V, frame sizes D, E and F

The fuses below are suitable for use on a circuit capable of delivering 100,000  $A_{rms}$  (symmetrical), 240 V, or 480 V, or 500 V, or 600 V depending on the frequency converter voltage rating. With the proper fusing the frequency converter Short Circuit Current Rating (SCCR) is 100,000  $A_{rms}$ .

Size/ Type	Bussmann E1958 JFHR2 <sup>2)</sup>	Bussmann E4273 T/JDDZ <sup>2)</sup>	SIBA E180276 JFHR2	Littelfuse E91611 JFHR2 <sup>2)</sup>	Ferraz- Shawmut E60314 JFHR2 <sup>2)</sup>	Bussmann E4274 H/JDDZ <sup>2)</sup>	Bussmann E125085 JFHR2 <sup>1)</sup>	Internal Option Bussmann
P160	FWH- 400	JJS- 400	2061032.40	L50S-400	A50-P400	NOS- 400	170M4012	170M4016
P200	FWH- 500	JJS- 500	2061032.50	L50S-500	A50-P500	NOS- 500	170M4014	170M4016
P250	FWH- 600	JJS- 600	2062032.63	L50S-600	A50-P600	NOS- 600	170M4016	170M4016

Table 8.6 Frame size D, Line Fuses, 380-480 V

Size/Type	Bussmann PN <sup>1)</sup>	Rating	Ferraz	Siba
P315	170M4017	700 A, 700 V	6.9URD31D08A0700	20 610 32.700
P355	170M6013	900 A, 700 V	6.9URD33D08A0900	20 630 32.900
P400	170M6013	900 A, 700 V	6.9URD33D08A0900	20 630 32.900
P450	170M6013	900 A, 700 V	6.9URD33D08A0900	20 630 32.900

Table 8.7 Frame size E, Line Fuses, 380-480 V

Size/Type	Bussmann PN <sup>1)</sup>	Rating	Siba	Internal Bussmann Option
P500	170M7081	1600 A, 700 V	20 695 32.1600	170M7082
P560	170M7081	1600 A, 700 V	20 695 32.1600	170M7082
P630	170M7082	2000 A, 700 V	20 695 32.2000	170M7082
P710	170M7082	2000 A, 700 V	20 695 32.2000	170M7082

Table 8.8 Frame size F, Line Fuses, 380-480 V

Size/Type	Bussmann PN <sup>1)</sup>	Rating	Siba
P500	170M8611	1100 A, 1000 V	20 781 32.1000
P560	170M8611	1100 A, 1000 V	20 781 32.1000
P630	170M6467	1400 A, 700 V	20 681 32.1400
P710	170M6467	1400 A, 700 V	20 681 32.1400

Table 8.9 Frame Size F, Inverter module DC Link Fuses, 380-480 V

1) 170M fuses from Bussmann shown use the -/80 visual indicator, -TN/80 Type T, -/110 or TN/110 Type T indicator fuses of the same size and amperage may be substituted for external use

2) Any minimum 500 V UL listed fuse with associated current rating may be used to meet UL requirements.

### Supplementary fuses

Frame size	Bussmann PN <sup>1)</sup>	Rating
D, E and F	KTK-4	4 A, 600 V

Table 8.10 SMPS Fuse

## Specifications

## Operating Instructions

Size/Type	Bussmann PN <sup>1)</sup>	Littelfuse	Rating
P160-P315, 380-480 V	KTK-4		4 A, 600 V
P355-P710, 380-480 V		KLK-15	15A, 600 V

Table 8.11 Fan Fuses

Size/Type		Bussmann PN <sup>1)</sup>	Rating	Alternative Fuses
P500-P710, 380-480 V	2.5-4.0 A	LPJ-6 SP or SPI	6 A, 600 V	Any listed Class J Dual Element, Time Delay, 6A
P500-P710, 380-480 V	4.0-6.3 A	LPJ-10 SP or SPI	10 A, 600 V	Any listed Class J Dual Element, Time Delay, 10 A
P500-P710, 380-480 V	6.3-10 A	LPJ-15 SP or SPI	15 A, 600 V	Any listed Class J Dual Element, Time Delay, 15 A
P500-P710, 380-480 V	10-16 A	LPJ-25 SP or SPI	25 A, 600 V	Any listed Class J Dual Element, Time Delay, 25 A

Table 8.12 Manual Motor Controller Fuses

Frame size	Bussmann PN <sup>1)</sup>	Rating	Alternative Fuses
F	LPJ-30 SP or SPI	30 A, 600 V	Any listed Class J Dual Element, Time Delay, 30 A

Table 8.13 30 A Fuse Protected Terminal Fuse

Frame size	Bussmann PN <sup>1)</sup>	Rating	Alternative Fuses
D	LP-CC-8/10	0.8A, 600V	Any listed Class CC, 0.8A
E	LP-CC-1 1/2	1.5A, 600V	Any listed Class CC, 1.5A
F	LPJ-6 SP or SPI	6 A, 600 V	Any listed Class J Dual Element, Time Delay, 6 A

Table 8.14 Control Transformer Fuse

Frame size	Bussmann PN <sup>1)</sup>	Rating
F	GMC-800MA	800 mA, 250 V

Table 8.15 NAMUR Fuse

Frame size	Bussmann PN <sup>1)</sup>	Rating	Alternative Fuses
F	LP-CC-6	6 A, 600 V	Any listed Class CC, 6 A

Table 8.16 Safety Relay Coil Fuse with PILZ Relay

1) 170M fuses from Bussmann shown use the -/80 visual indicator, -TN/80 Type T, -/110 or TN/110 Type T indicator fuses of the same size and amperage may be substituted for external use

## 9 Appendix

### 9.1 Abbreviations and Conventions

AC	Alternating Current
AEO	Automatic Energy Optimization
AMA	Automatic Motor Adaptation
AWG	American Wire Gauge
°C	Degrees Celsius
DC	Direct Current
EMC	Electromagnetic Compatibility
ETR	Electronic Thermal Relay
$f_{M,N}$	Nominal Motor Frequency
FC	Frequency Converter
$I_{LIM}$	Current Limit
$I_{INV}$	Rated Inverter Output Current
$I_{M,N}$	Nominal Motor Current
$I_{VLT,MAX}$	The Maximum Output Current
$I_{VLT,N}$	The Rated Output Current Supplied by the Frequency Converter
IP	Ingress Protection
LCP	Local Control Panel
N.A.	Not applicable
$P_{M,N}$	Nominal Motor Power
PCB	Printed Circuit Board
PE	Protective earth
PELV	Protective Extra Low Voltage
Regen	Regenerative Terminals
RPM	Revolutions Per Minute
$T_{LIM}$	Torque Limit
$U_{M,N}$	Nominal Motor Voltage

Table 9.1 Abbreviations

#### Conventions

Numbered lists indicate procedures.

Bullet lists indicate other information and description of illustrations.

Italicised text indicates

- cross reference
- link
- footnote
- parameter name, parameter group name, parameter option

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# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	Thermostat
<b>Location:</b>	Motor Starter Section
<b>Model Numbers:</b>	FZK011
<b>Manufacturer:</b>	Stego
<b>Supplier:</b>	NHP Pty Ltd 16 Riverview Place Murarrie (07) 3909 4999

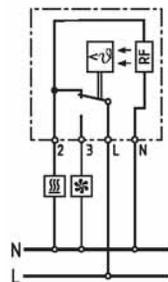
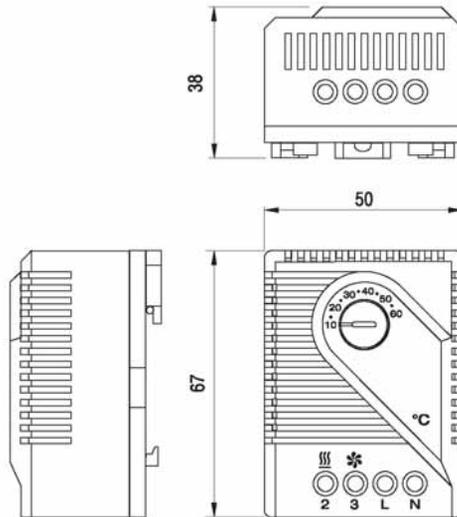


## MECHANICAL THERMOSTAT SERIES FZK 011

The mechanical thermostat is used for controlling heating and cooling equipment, filter fans or signal devices. The thermostat registers the surrounding air and can switch both inductive and resistive loads via snap-action contact.

- Adjustable temperature
- Small hysteresis
- Changeover contact

Dimensions (mm)



Load 1:  
Enclosure heater

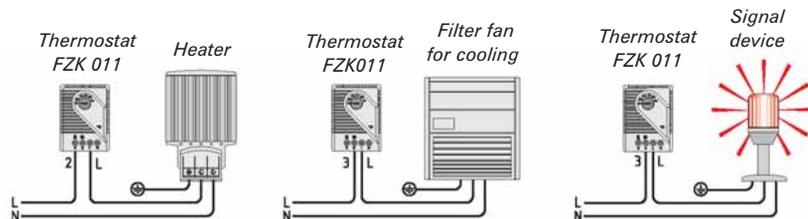
Load 2:  
Filter fan, Cooling  
equipment, Signal  
device

### Technical Data:

<b>Operating voltage:</b>	230 V AC
<b>Switch temperature difference:</b>	4K ( $\pm 1.5K$ tolerance) <sup>1)</sup>
<b>Sensor element:</b>	Thermostatic bimetal
<b>Contact type:</b>	Changeover snap-action contact
<b>Contact resistance:</b>	< 10 mOhm
<b>Service life:</b>	> 100,000 cycles
<b>Max. Switching capacity, NC:</b>	250 V AC, 10 A DC 30 W
<b>Max. Switching capacity, NO:</b>	250 V AC, 5 A DC 30 W
<b>EMC:</b>	Acc. to EN 55014-1-2, EN 61000-3-2, EN 61000-3-3
<b>Connection:</b>	4-pole terminal for 2.5 mm <sup>2</sup> , clamping torque 0.8 Nm
<b>Mounting:</b>	Clip for 35 mm DIN rail, EN50022
<b>Casing:</b>	Plastic according to UL-94 V-0, light grey
<b>Dimensions:</b>	67 x 50 x 38 mm
<b>Weight:</b>	Approx. 0.10 kg
<b>Operating/Storage temperature:</b>	-20 to +80 °C /-45 to +80 °C
<b>Protection type:</b>	IP 20



**Note:** <sup>1)</sup> Connecting terminal "N" (RF heating resistor) causes the thermal feedback to work and so reduces the switch temperature difference to approx. 0.5K.



Example of connection

**Setting range**

+5 to +60 °C

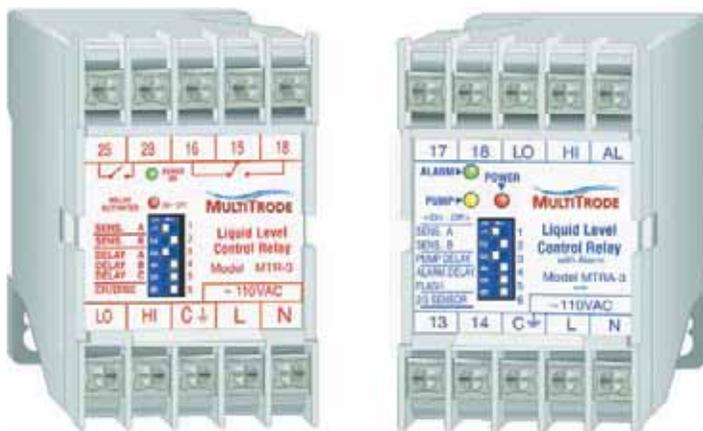
**Cat. No.**

**FZK01100**

# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	MTR Relays
<b>Location:</b>	RTU Section
<b>Model Numbers:</b>	MTR
<b>Manufacturer:</b>	Xylem
<b>Supplier:</b>	Brisbane Technology Park Unit 1, 18 Brandl Street P.O. Box 4633 Eight Mile Plains Queensland 4113 Australia

# MTR Level Relay



The MTR level relay has proven itself to be simple and extremely reliable in pump stations everywhere. The MTR controls one pump or one alarm. The MTRA controls one pump and one alarm.

## Safe

The extra low sensing voltage ensures maintenance staff and operators are protected at all times.

## Four sensitivities

Allows the relay to operate effectively in a wide range of conductive liquids.

## Activation delays

Each output can have a different time delay to overcome wave action and turbulence.

## LED indication

High intensity LED indicators ensure clear signals. Power On (green). Alarm On (red). Pump On (yellow).

## Dipswitch programmable

All settings are easily selectable from the front panel.

## Proven reliability

The proven design and performance of the relay ensures long-term reliability of the MultiTrode system.

## I.S application

Perfect for I.S application when used with an MTISB.

## Unique two-sensor operation (MTRA only)

Pump and alarm can be controlled using two or three sensors. Two-sensor operation is ideal for budget applications or where space is limited.

## DIN rail or screw mounting

## Low installed cost

# Specifications

## Mode of operation:

MTR Mode	Charge/Discharge (Fill or Empty)
MTRA Mode	Discharge ONLY

## Probe Inputs:

Sensor inputs	MTR : 2 / MTRA : 3
Sensor voltage	10/12VAC Nominal
Sensor current	0.8mA max. (per sensor)
Sensitivity	1k, 4k, 20k, 80k

## Relay Outputs:

MTR relay output	2 contact sets : 1 N/O & 1 C/O
MTR Output delay	0, 2.5, 5, 10, 20, 40, 80, 160 sec
MTRA relay output	2 relays : both N/O
MTRA Output delay	Pump: 0.5, 10; Alarm: 0.5, 15 sec
Relay contact rating	250 VAC 5A Resistive, 2A Inductive
Relay contact life	10 <sup>5</sup> Operations
Terminal size	2 x 13 AWG / 2.5mm <sup>2</sup>

## Display

LEDs:	Power On	Pump	Alarm
MTR	Green	Red	Red
MTRA	Green	Yellow	Red

## Physical Product:

Dimensions	2.7/8H x 1.3/4W x 4.1/2D (Inches) 72Hx45Wx114D (mm)
Mounting	DIN Rail or 2 x #6 Screws / 2 x M4 Screws
Enclosure	Makrolon (self-extinguishing)



## Power Supply:

Supply Voltage AC	24, 110, 240, 415VAC* - 50/60Hz
Power Consumption	3.5 Watts max *(MTR only)
Supply Voltage DC	12 or 24VDC,
Power Consumption	3 Watts max

## Environmental Range:

Centigrade	- 10 <sup>0</sup> to +60°C
Fahrenheit	+14 <sup>0</sup> to +140°F



## Available Models & Ordering Information

415VAC	MTR-1	n/a
240VAC	MTR-2	MTRA-2
110VAC	MTR-3	MTRA-3
24VAC	MTR-4	MTRA-4
24VDC	MTR-5	MTRA-5
12VDC	MTR-6	MTRA-6

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# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	SAFE FSP Relays
<b>Location:</b>	RTU Section
<b>Model Numbers:</b>	SAFE FSP
<b>Manufacturer:</b>	Xylem
<b>Supplier:</b>	Brisbane Technology Park Unit 1, 18 Brandl Street P.O. Box 4633 Eight Mile Plains Queensland 4113 Australia



# SAFESMART Backup Controller SAFE-FSP

## Installation & Operation Manual





# SAFE-FSP Relay Manual

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This Manual is the support documentation for the installation,  
commissioning and operation of the  
SafeSmart FSP Backup Controller

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Document Revision 1

Last updated 2 June 2009

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# SAFE-FSP Relay Manual

## 1 Warnings & Cautions

### 1.1 Information to User

Read this manual prior to installing or operating the SafeSmart-FSP Backup Controller. It contains all the information necessary to configure it for maximum performance for your application. After reading, place the manual in a safe place for future reference.

### 1.2 Documentation Standards



**DANGER:**

This symbol is used where non-compliance could result in injury or death.



**WARNING:**

This symbol is used where non-compliance could result in incorrect operation, damage to or failure of the equipment.



**NOTE:**

This symbol is used to highlight an issue or special case within the body of the manual.

### 1.3 Installation Notes



**WARNING:**

The SafeSmart-FSP installation and wiring must be performed by qualified personnel.



**DANGER:**

The SafeSmart-FSP has no user serviceable parts. To reduce the risk of electric shock leave all servicing to qualified Multitrode technical staff.

## 2 Introduction

The SAFE-FSP Backup Controller is a solid-state electronic level control module housed in a hi-impact plastic case with a DIN rail attachment on the back. It is used to control a pump (via a contactor or soft starter) in response to a liquid level sensor such as a MultiTrode probe.

The FSP Controller can be used as the primary source of control for a single pump or as a backup control device (for a single pump) when the primary control equipment fails. When using an FSP Controller as a backup controller, it only controls the pump in response to high or low level signals from dedicated level sensors.

A thermal sensor can be connected to the FSP Controller for pump protection. During operation, the LED indicators on the front panel display the current status including – Power, Pump On/Off, Level alarm, Thermal fault and Probe fault.

The FSP Backup Controller is designed to be easy to install and configure. All connections are clearly labelled on the side of the device and options are configured using a set of Dip switches on the front of the Controller.

### 3 Specifications

Dimensions	
Width	22.5mm (7/8")
Height	101mm (4")
Length (depth)	120mm (4 3/4")
Environmental	
Ambient Temperature	-10 to 60 °C (14 to 140 °F)
Humidity	5% to 90% non-condensing
AC Power Supply	
Voltage Range	85 – 265V AC
Frequency	50/60Hz
Power	3.5W
DC Power Supply	
Voltage Range	12 – 30V DC
Current	0.15A max
Relay Outputs	
Type	Form A
Current (Resistive)	5A
Current (Inductive)	2A
Voltage Rating DC	30V DC
Voltage Rating AC	250V AC
Thresholds*	
Thermal Fault Present	> 4k ohms
Thermal Fault Cleared	< 2k ohms
Thermal BU Input	0.15V DC

Table 1 - SAFE-FSP Specifications

\* Where applicable, values include a 56 ohm series resistor on the thermal input.

## SAFE-FSP Relay Manual

---

### 4 Installation

The FSP Backup Controller is designed to be mounted onto a standard DIN rail. The power supply, input and output connections are located on the top of the Controller housing.

The features of the Controller are listed below and are discussed in the following sections.

- Power Supply Options
  - Four Configurations
- Operation Modes & Probe Inputs
  - Empty (Discharge) Mode
  - Fill (Charge) Mode
- Level Alarm Fault
  - Level Alarm (AL Probe)
- Pump Faults
  - Thermal Pump Fault
- Probe Faults
  - Failsafe Probe Fault
  - Assumed Probe Fault
- Digital Output and Pump Sensor Connection Options
  - Local or Remote Monitoring of Pump Status & Faults
  - MultiSmart Connections - Conductive Thermal Sensor
  - MultiSmart Connections - FLS Thermal Sensor
- Manual (Hand) Operation
- Alarm Activation and Deactivation Delays
- Probe Sensitivity
- LED Status Summary
- DIP Switch Settings

## 5 Power Supply Options

The FSP Controller can be supplied power in the following ways:

- 85 – 240V AC Supply Only
- 12 – 30V DC Supply Only
- 85 – 240V AC with 12 – 14V DC as Backup
- 15\* – 30V DC with 85 – 240V AC as Backup

\* When the DC supply is 15V or greater, the DC supply is the primary source.

A Power LED (steady green) indicates when the Controller is powered. If the LED flashes, supply voltage is too low.



**NOTE:**

If the power supply is below 24 VDC, the voltage alarm threshold is automatically set to 11.5 V. If the supply is 24 VDC or above, the voltage alarm threshold is automatically set to 23 V.

A switch or circuit-breaker and an over-current protection device must be included in the installation. The protection device must be in close proximity to the equipment, within easy reach of the operator, and be marked as the protection device for the equipment.

The input wiring and the switch/circuit-breaker/over-current device must be rated to at least the nominal input voltage being used. The recommended current ratings are below.

Unit Supply Range	Recommended Switch/Circuit-Breaker/Overcurrent Protection Device Rating	Minimum Supply Wiring Rating
85 - 180VAC	0.1A	0.1A
180 - 265VAC	0.05A	0.05A
12 – 20VDC	0.3A	0.3A
20 – 30VDC	0.15A	0.15A

Table 2 – Current Ratings



**NOTE:**

The MultiTrobe probe uses an earth/ground return path for the signal. Ensure that the GROUND (DC-) terminal on the FSP Controller is also grounded.

# SAFE-FSP Relay Manual

## 6 Operation Modes & Probe Inputs

The SafeSmart-FSP Backup Controller can be configured to operate in either Empty (Discharge) or Fill (Charge) mode.

- Empty (Discharge) Mode - Dip Switch 1 = OFF
- Fill (Charge) Mode - Dip Switch 1 = ON

The Controller has three (3) probe inputs, High, Low and Alarm. The Alarm probe input can be configured as a low or high level alarm.

- High Level Alarm - Dip Switch 2 = OFF
- Low Level Alarm - Dip Switch 2 = ON

### 6.1 Empty (Discharge) Mode

This mode is used to pump liquid out of a well once it reaches a preset level. (Figure 1) In this mode the Controller operates as follows:

- The pump activates when the liquid reaches the sensor in the high level probe.
- The pump continues to operate until the liquid level drops below the low level probe and the pump deactivation period expires.
- When a thermal fault occurs, the Pump Control output is deactivated regardless of the liquid level. The pump stops, the Pump Fault output (DO1) is deactivated and the Thermal LED flashes.

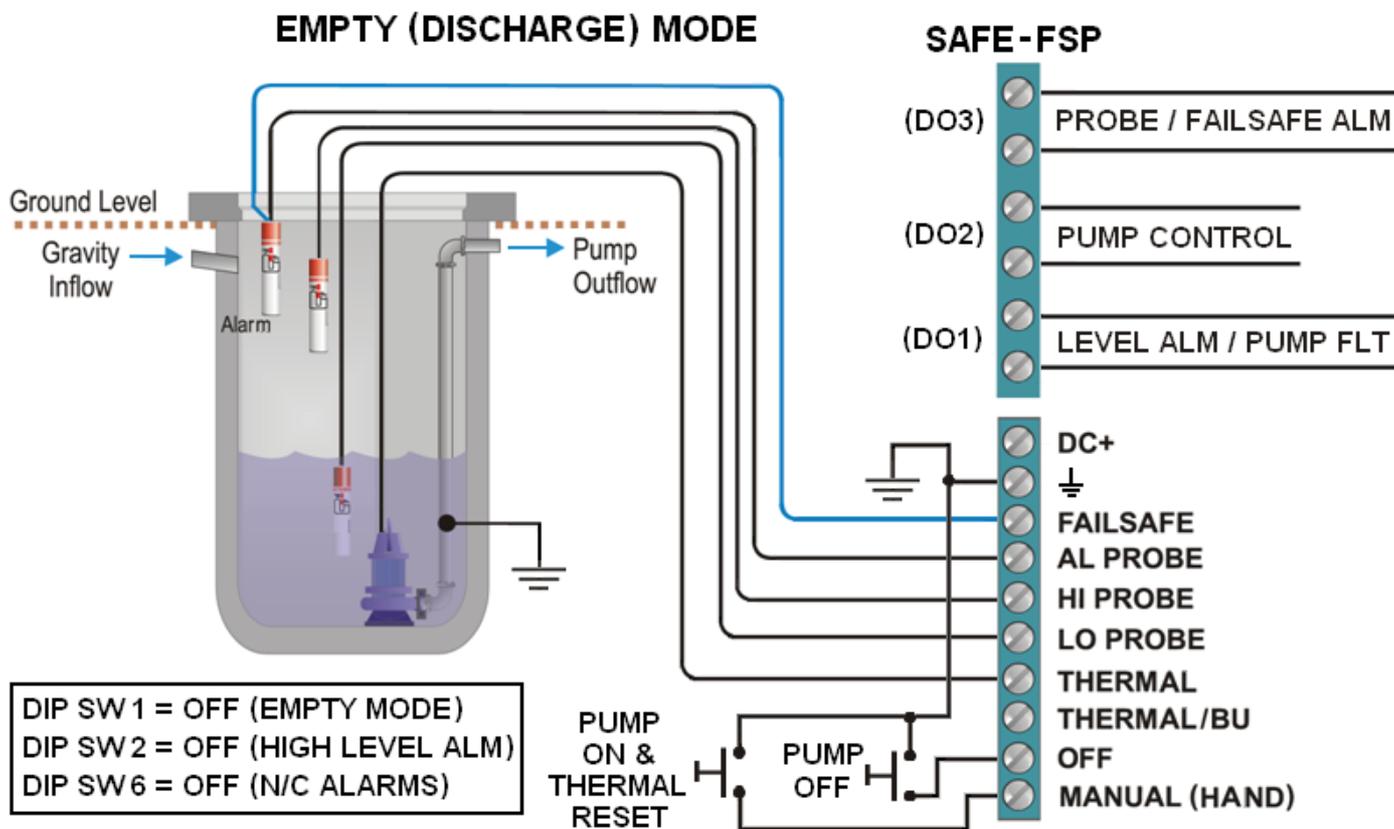


Figure 1 – Empty (Discharge) Mode

## 6.2 Fill (Charge) Mode

This mode is used to fill up a well with liquid when the level falls to a preset level. (Figure 2) In this mode the Controller operates as follows:

- The pump activates when the liquid falls just below the sensor in the low level probe.
- The pump continues to operate until the liquid level reaches the sensor in the high level probe and the pump deactivation period expires.
- When a thermal fault occurs the Pump Control output deactivates regardless of the liquid level. The pump stops, the Pump Fault output is deactivated and the Thermal LED flashes.

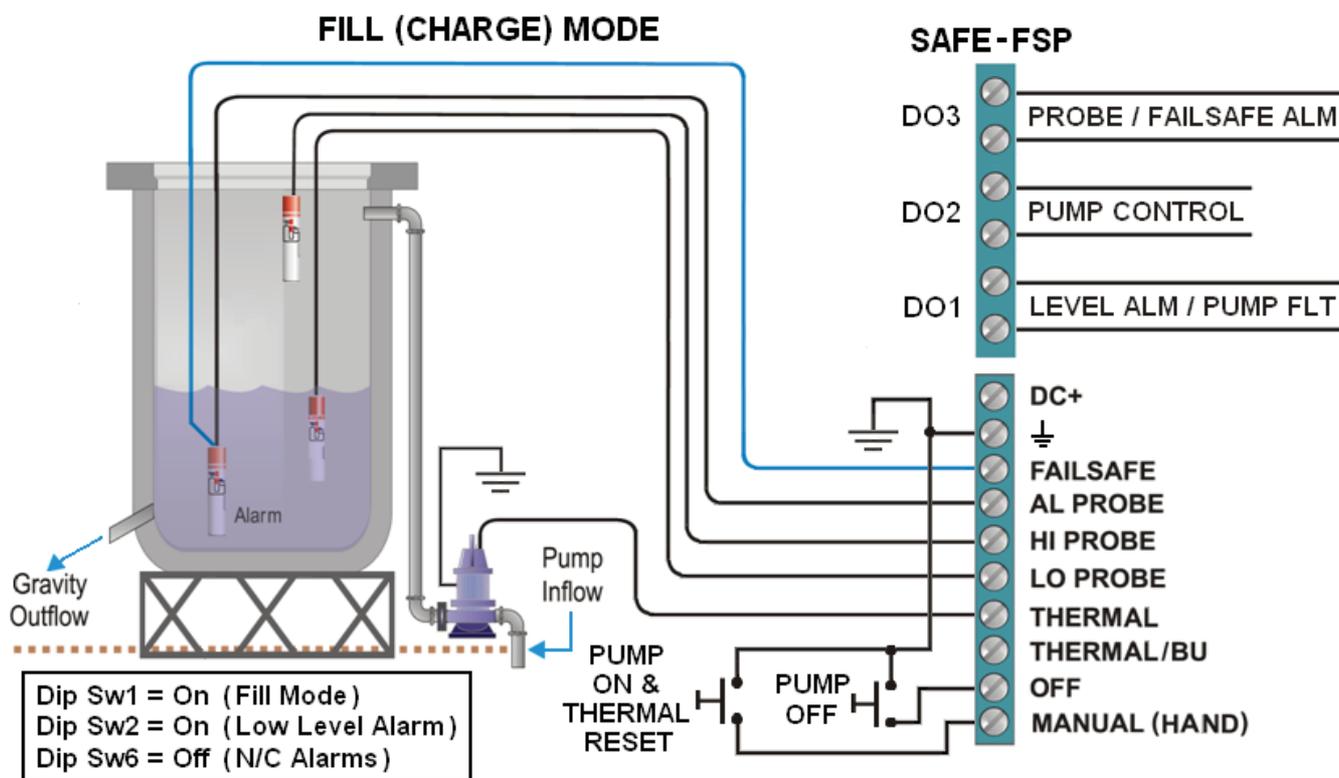


Figure 2 - Fill (Charge) Mode

## 7 Level Alarms (AL Probe)

A conductive level sensor is connected to the AL Probe input to detect when the liquid level has risen above or fallen below an acceptable level.

In Empty (Discharge) mode this is typically a high level alarm and is activated when the AL Probe input detects liquid and the activation delay has expired.

In Fill (Charge) mode this is typically a low level alarm and is activated when the AL Probe input is no longer detecting level (i.e. the level has dropped below the sensor) and the activation delay has expired.

When a level alarm is detected the Level Alarm output (DO1) changes state and the Level Alarm LED flashes at 1Hz. The Level Alarm/Pump Fault output can be used to operate an alarm device such as a beacon.

The Level Alarm/Pump Fault output (DO1) can be configured as normally open or normally closed.

- Normally Closed Output - Dip Switch 6 = OFF
- Normally Open Output - Dip Switch 6 = ON



**NOTE:**

Dip Sw6 also has the same effect on the Probe/Failsafe Alarm output (DO3).

## SAFE-FSP Relay Manual

### 8 Thermal Pump Fault

The FSP Controller can detect thermal and FLS thermal faults. The FSP Controller can not detect a Seal fault. Types of sensors that maybe connected are FLS (Flygt Leakage Sensor), FLS10 or a thermal only sensor such as non-linear PTC thermistor or bi-metallic switch.

A thermal sensor is connected as illustrated in Figure 3. No Dip Switch setting change is required.

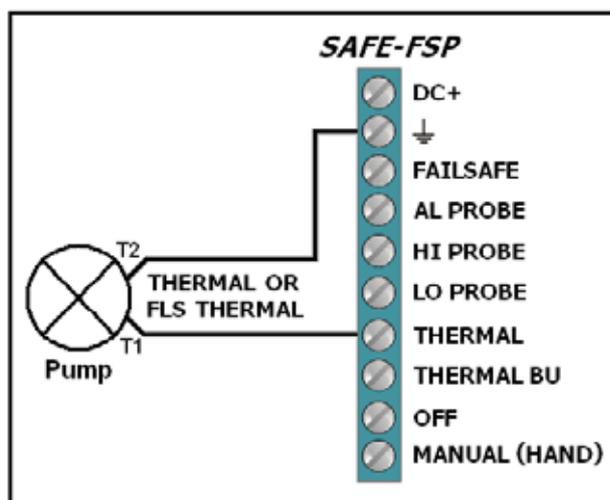


Figure 3 - Thermal Sensor Connection (Flygt and Non-Flygt Pumps)

When a thermal fault is detected, the pump stops, (DO2 is deactivated), the Level Alarm / Pump Fault output (DO1) changes state and the Thermal Fault LED begins to flash.

A thermal fault is automatically reset when the pump returns to normal operating temperature (i.e. the fault is no longer present). The flashing Thermal LED becomes steady and the pump is free to run.

A manual acknowledgement is required to clear the Thermal LED. A manual acknowledgement is performed by momentarily connecting Ground/Earth to the Manual (Hand) terminal. See Figure 4 below. (Note, the pushbutton switch is not supplied).

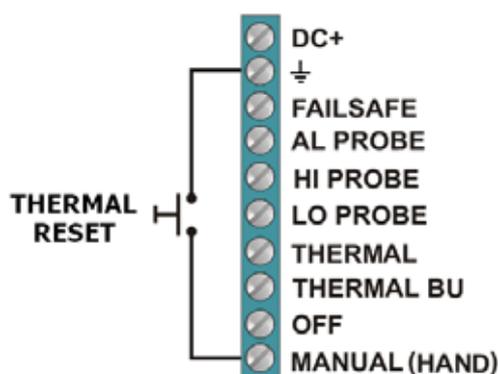


Figure 4 - Manual Thermal Fault Reset & Manual (Hand) Operation

The Level Alarm/Pump Fault output (DO1) can be configured as normally open or normally closed.

- Normally Closed Output - Dip Switch 6 = OFF
- Normally Open Output - Dip Switch 6 = ON



**NOTE:**

Dip Sw6 also has the same effect on the Probe/Failsafe Alarm output (DO3).

## 9 Probe Faults

The FSP Controller detects two types of probe faults, a Failsafe Probe fault and an Assumed Probe fault. When either fault is detected the Probe/Failsafe Alarm output (DO3) changes state. This output can be configured as normally open or normally closed.

- Normally Closed Output - Dip Switch 6 = OFF
- Normally Open Output - Dip Switch 6 = ON



**NOTE:**

Dip Sw6 also has the same effect on the Level Alarm/Pump Fault output (DO1).

### 9.1 Failsafe Probe Fault

MultiTrode probes are available with a failsafe connection to the top-most sensor to enable detection of a sensor fault. If a broken cable is detected to the top-most sensor, the Probe/FailSafe fault output (DO3) changes state, the Probe Fault LED flashes and the **pump stops**.

A Failsafe probe is typically used in discharge (empty) applications only. By its very nature the probes used in a charge or fill application are covered, so for example if the low level alarm probe goes open circuit, a low level alarm would be present immediately.



**NOTE:**

If a non-failsafe probe is used, then a jumper must be connected between the Alarm Probe and the Failsafe Probe inputs to suppress erroneous probe faults.



**NOTE:**

When using single sensor probes, the Failsafe Probe input should be connected to the highest probe in the system.

### 9.2 Assumed Probe Fault

For an Empty (Discharge) application, if a High Level probe is activated and the Low Level probe is deactivated, then the Controller assumes the Low Level probe is faulty. This condition is called an “Assumed Probe Fault” and the Probe Fault LED illuminates.

The Controller changes its pumping behaviour to a timed method until the fault condition is no longer present. So the pump continues to run for 60s after the High Level probe has deactivated and during this time the Pump LED flashes.

For a Fill (Charge) application, if a High Level probe is activated and the Low Level probe is deactivated, then the Controller assumes the Low Level probe is faulty. This condition is called an “Assumed Probe Fault” and the Probe Fault LED illuminates.

The Controller changes its pumping behaviour to a timed method until the fault condition is no longer present. So the Controller waits for 60 seconds after the High Level probe has deactivated then starts the pump, and during this time the Pump LED flashes.

When an Assumed Probe fault occurs, the Probe/FailSafe fault output (DO3) changes state.

## SAFE-FSP Relay Manual

### 10 Digital Output and Pump Sensor Connection Options

#### 10.1 Local or Remote Monitoring of Pump Status & Faults

The FSP Controller's digital outputs can be wired into the inputs of a wide range of devices (e.g. a PLC, RTU or Dialler etc.) and the state of the pump monitored. The valid states and what they signify are tabled below.

FSP Outputs*			Level Alarm or Thermal Fault	Pump Status	As\Probe Fit or Failsafe Fault
DO1	DO2	DO3	DO1	DO2	DO3
0	0	0	-	Off	-
0	0	1	-	Off	Y
1	0	0	Y	Off	-
1	0	1	Y	Off	Y
0	1	0	-	On	-
0	1	1	-	On	Y
1	1	0	Y	On	-
1	1	1	Y	On	Y

Table 3 – FSP Controller Output States

\* Dip Sw 6 = On (Normally Open)

#### 10.2 MultiSmart and FSP Controller Thermal Sensor Options

The FSP Controller can be used in conjunction with a MultiSmart Pump Station Manager.

The MultiSmart is indirectly connected to the thermal sensor via a relay within the FSP Controller. The Controller monitors this line and if it detects that the MultiSmart is no longer connected, the internal relay switches over and the FSP Controller drives the sensor.

The Controller monitors the voltage on the Thermal BU input to the MultiSmart. If the MultiSmart fails, the Controller takes over and controls the pump (but does not inhibit the MultiSmart pump control) and monitors for a thermal fault – thus providing backup control and thermal overload protection to the pump.

##### 10.2.1 MultiSmart Connections - Conductive Thermal Sensor

The conductive thermal sensor is connected to the Thermal input. The Thermal BU (backup) is connected to a digital input on the MultiSmart (configured as a Motor OverTemp fault). See Figure 5 below.

The MultiSmart and FSP controller are both capable of responding to a thermal fault. When a thermal fault is detected, the pump stops, if running. A Motor OverTemp fault is displayed on the MultiSmart and a thermal fault is displayed on the Controller. The pump can not be restarted until the thermal fault clears. The FSP Controller automatically resets the fault when the fault condition is no longer present, this allows the pump to run again but only via the Controller. The fault must be reset at the MultiSmart before the MultiSmart is able to run the pump again.

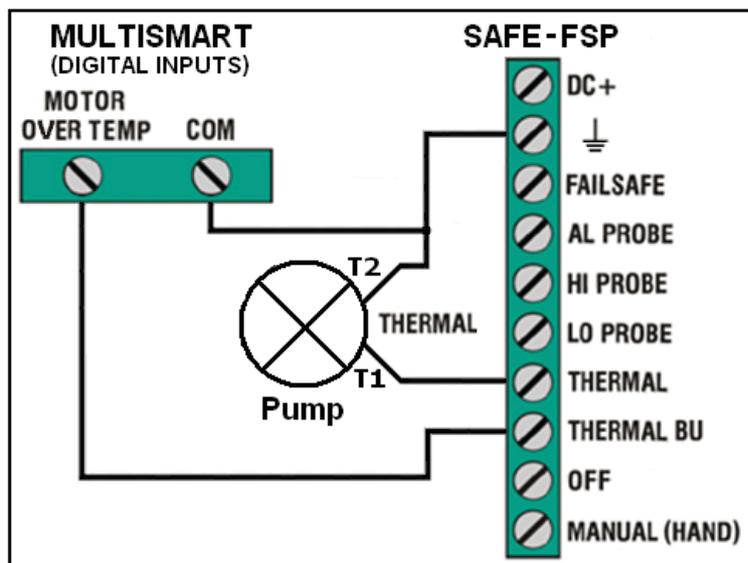


Figure 5 – Thermal Sensor Connections to a MultiSmart

**10.2.2 MultiSmart Connections - FLS Thermal Sensor**

The FLS sensor is connected to the Thermal input. The Thermal BU is connected to a digital input on the MultiSmart (configured as an FLS fault). (See Figure 6 below). The FSP Controller is not able to detect a seal fault however the MultiSmart can.

When an FLS thermal fault is detected, the pump stops, if running - shut down by the MultiSmart and/or the FSP Controller. An FLS Flygt Thermal fault is displayed on the MultiSmart and on the Controller. The pump can not be restarted until the thermal fault clears. The FSP Controller automatically resets the fault when the fault condition is no longer present, this allows the pump to run again but only via the Controller. The fault must be reset at the MultiSmart before the MultiSmart is able to run the pump again.

When an FLS Seal fault occurs the FSP Controller is unable to detect it however the MultiSmart can and will display an FLS Flygt Seal fault. By default, the MultiSmart allows the pump to continue to run when a seal fault occurs.

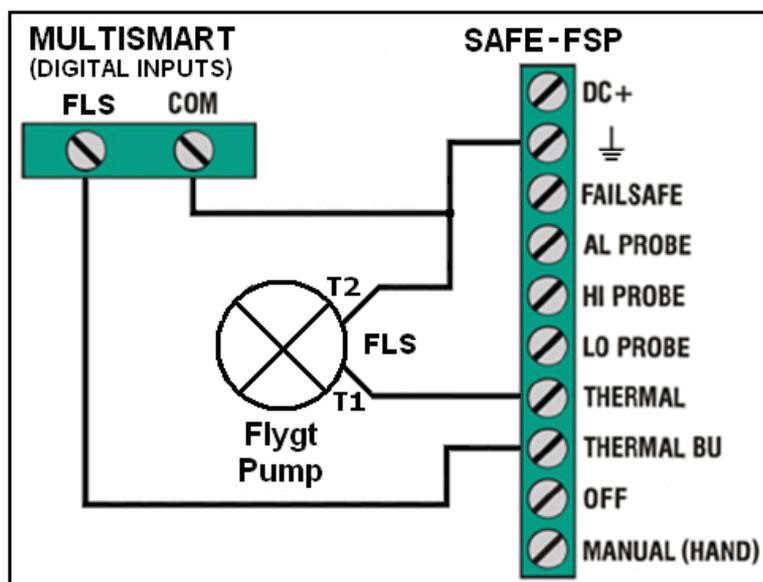


Figure 6 - FLS Connections to a MultiSmart (Flygt Pump)

## SAFE-FSP Relay Manual

### 11 Manual (Hand) Operation

A momentary action pushbutton (not supplied) may be connected to the Manual (Hand) input and used to operate the pump directly. (See Figure 7). Once pressed the pump begins to operate immediately irrespective of the liquid level. A second momentary action pushbutton switch is required to switch the pump off. It is connected across the Off input and Ground/Earth.



#### WARNING:

If operating the pump manually via the Manual (Hand) switch, the pump does **NOT** automatically turn off when the level falls below the low sensor. So ensure that the pump is switched off via the Pump **Off** switch before the level becomes critically low to avoid potential **damage** to the **pump**.

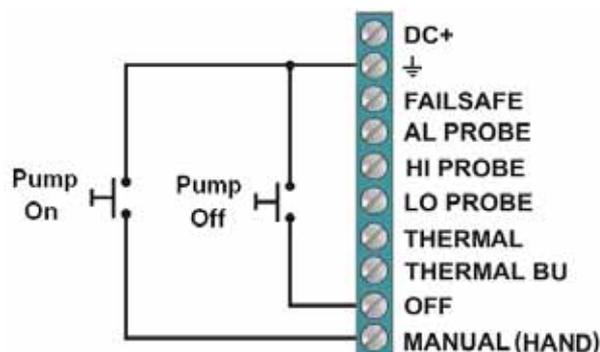


Figure 7 – Manual Pump Operation – On & Off Switches

### 12 Pump Activation and Deactivation Delays

Activation delays are used to prevent spurious pump starts. The delay allows the level device to positively detect the liquid before operating the pump.

There are two delay periods for Pump Activation delay:

- 0.5 sec - Dip Switch 3 = OFF
- 30 sec - Dip Switch 3 = ON

There are two delay periods for Pump Deactivation delay:

- 0.5 sec - Dip Switch 4 = OFF
- 30 sec - Dip Switch 4 = ON

### 13 Alarm Activation and Deactivation Delays

Activation and Deactivation delays are used to prevent spurious level alarms. The delay allows the level device to positively detect the liquid before triggering the alarm.

There are two delay periods:

- 0.5 sec - Dip Switch 5 = OFF
- 10 sec - Dip Switch 5 = ON

This delay applies to both the alarm activation and deactivation delay.

### 14 Probe Sensitivity

The Controller is used in conjunction with a conductive level sensing device, such as the MultiTrode probe. Conductive probes rely on conductivity through the liquid to earth in order to detect level. Highly conductive liquids, such as saltwater, generally require the Controller be set to a lower sensitivity than for low conductivity liquids, such as distilled water.

For most applications, the default probe setting of 20k ohms is satisfactory but the Controller allows the operator to adjust its sensitivity as needed for specific conditions. The sensitivity is set using Dip Switches 7 and 8.

Dip Sw 7	Dip Sw 8	Sensitivity	Typical Application
OFF	OFF	1k ohm	Concentrates Acids, Minerals, Alkalis
ON	OFF	4k ohm	Acids, Alkalis, Diluted Brine, Sea Water
OFF	ON	20k ohm	Sullage, Sewage Effluent, Town Water
ON	ON	80k ohm	Industrial Effluent, Purified Water*

Table 4 - Probe Sensitivity

\* Not recommended for use with purified de-ionised water or pristine rain water.

## 15 LED Status Summary

Five LEDs on the front of the Controller indicate the power, level alarm, pump status, thermal and probe fault status of the Controller.

LED	Status	Indication
Power	Power on	Steady
	Low voltage	Flashing
Level	Level alarm	Flashing
Pump	Pump on	Steady
	Activation delay period	Flashing
Thermal	Manual ack required	Steady
	Thermal fault active	Flashing
	Standalone locked mode*	Flashing - Double
Probe	Assumed probe fault	Steady
	Failsafe probe fault **	Flashing

Table 5 - LED Summary Status

\* In Standalone Locked mode the FSP Controller ignores the THERMAL BU input. Standalone Locked mode occurs if the voltage on the THERMAL BU input is unstable (i.e. voltage is < 0.15V and > 6V in less than 0.5s for 30 seconds). To exit Standalone Locked mode, press the Manual (Hand) button.

\*\* Failsafe probe fault has higher priority than Assumed probe fault.

## 16 DIP Switch Settings

The Controller is configured using the DIP switches located on the front of the enclosure.

DIP #	Setting	Mode Description	Section
1	OFF	Empty (Discharge) Mode	6
	ON	Fill (Charge) Mode	6
2	OFF	High Level Alarm	6
	ON	Low Level Alarm	6
3	OFF	0.5 sec Pump Activation Delay	12
	ON	30 sec Pump Activation Delay	12
4	OFF	0.5 sec Pump Deactivation Delay	12
	ON	30 sec Pump Deactivation Delay	12
5	OFF	0.5 sec Alarm Activation &	13
	ON	10 sec Alarm Activation &	13
6	OFF	N/C (Normally Closed) (DO3 & DO1)	7,8,9
	ON	N/O (Normally Open) (DO3 & DO1)	7,8,9
7	8	Probe Sensitivity	14
OFF	OFF	1k ohm	
ON	OFF	4k ohm	
OFF	ON	20k ohm	
ON	ON	80k ohm	

Table 6 - Dip Switch Settings

# SAFE-FSP Relay Manual

## 17 Example Applications

### 17.1 Backup Operation

Following is an example an empty (discharge) application using the FSP Controller as backup to a pump controller (the primary control device). In this configuration the FSP Controller does not control the pump until the High Level probe is covered which should only occur if the pump controller fails.

If the level continues to rise and it reaches the Alarm probe, a high level alarm is tripped. This indicates that the pump for whatever reason is unable to cope and the level has risen to an excessively high level (and overflow is possibly imminent).

The Alarm and High Level probes are positioned higher than the highest activation point used by the pump controller.

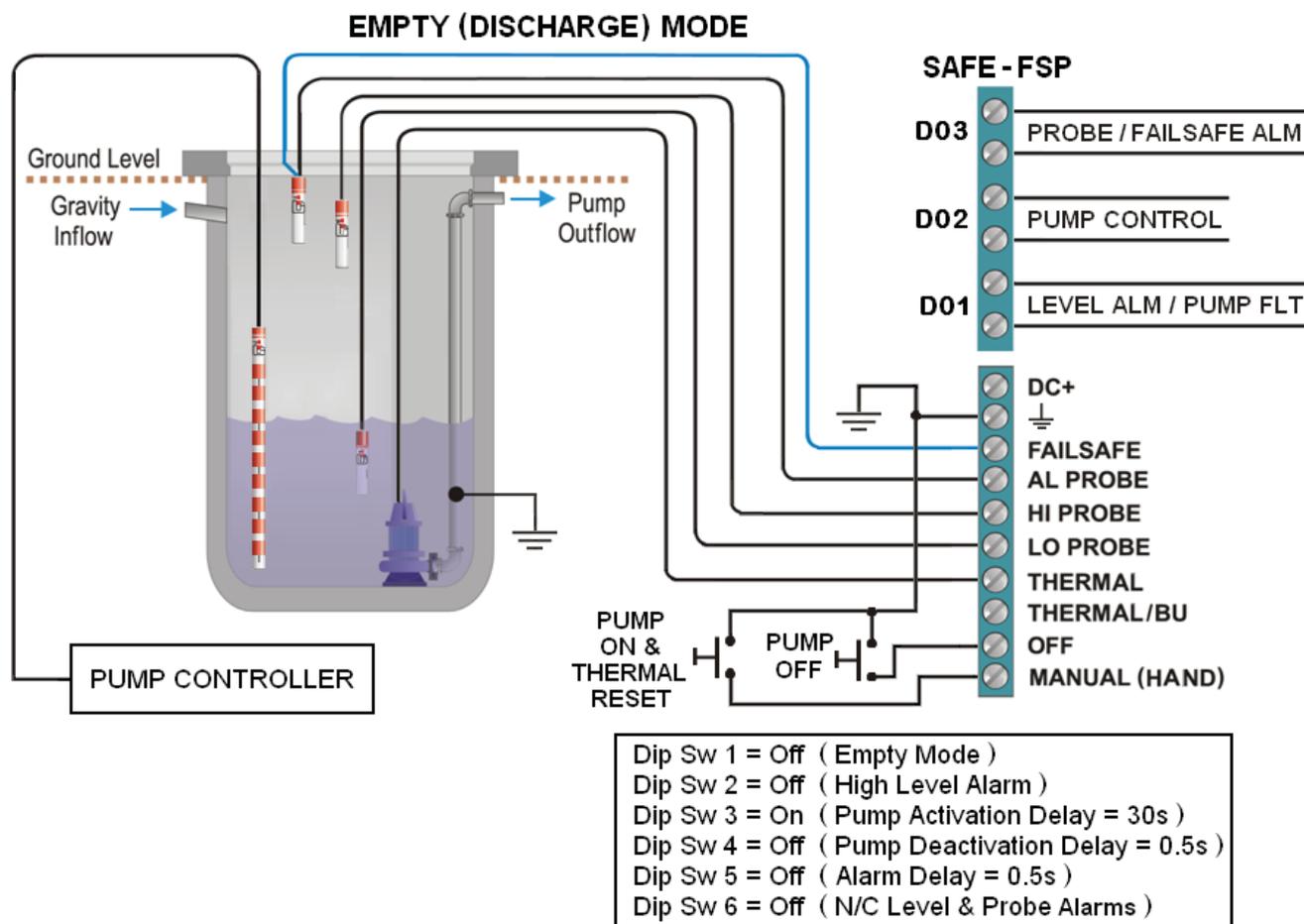


Figure 8 - Example of a Backup Application

If the pump controller is located at a site with no telemetry, a low level alarm could be configured (rather than a high level alarm). If the alarm trips, it indicates (by means of say a beacon) that the primary pump controller has most likely failed. However in this case no further alarm can be generated by the FSP Controller to indicate an excessively high level has been reached.



**NOTE:**

The actual probe position is at the discretion of the end user, the only requirement for a discharge (empty) application is that the high probe must be positioned higher than the (highest\*) activation setpoint. (\* In some pump controllers, more then one activation setpoint may be defined).

## 17.2 Dual Thermal Fault Monitoring (with MultiSmart)

The following wiring diagram (Figure 9), illustrates an application where the FSP Controller and a MultiSmart pump controller operate in parallel.

The thermal sensor is connected to the FSP Controller and the Thermal Bu input is connected to the MultiSmart. This allows both devices to act on a thermal fault.

If a seal sensor is present it is connected to the MultiSmart.

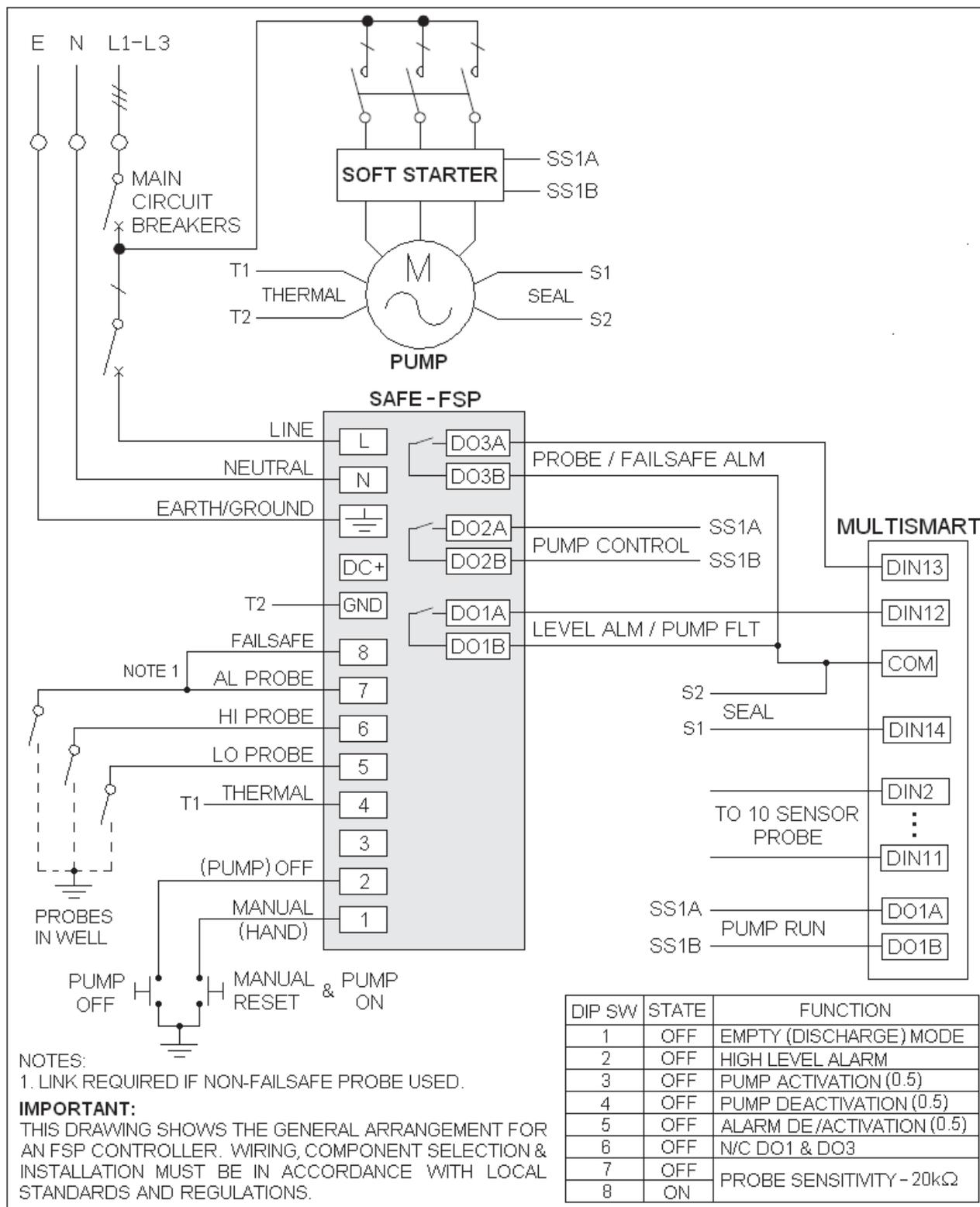


Figure 9 – Dual Thermal Fault Monitoring

# SAFE-FSP Relay Manual

## 17.3 Simplex Pump Controller

In this example the FSP Controller is configured as the primary pump controller for a single pump. The FSP Controller takes no action until the High Level probe is covered. When it is covered, the Pump Control output (DO2) closes turning on the pump.

When the Alarm Level probe is covered, a high level alarm is generated and the Level Alarm/Pump Fault output (DO1) changes state.

The FSP Controller monitors the thermal sensor. If a seal sensor is present it is not connected to the FSP Controller.

The FSP Controller and associated probes can control a maximum of one pump. The wiring is illustrated in Figure 10 below.

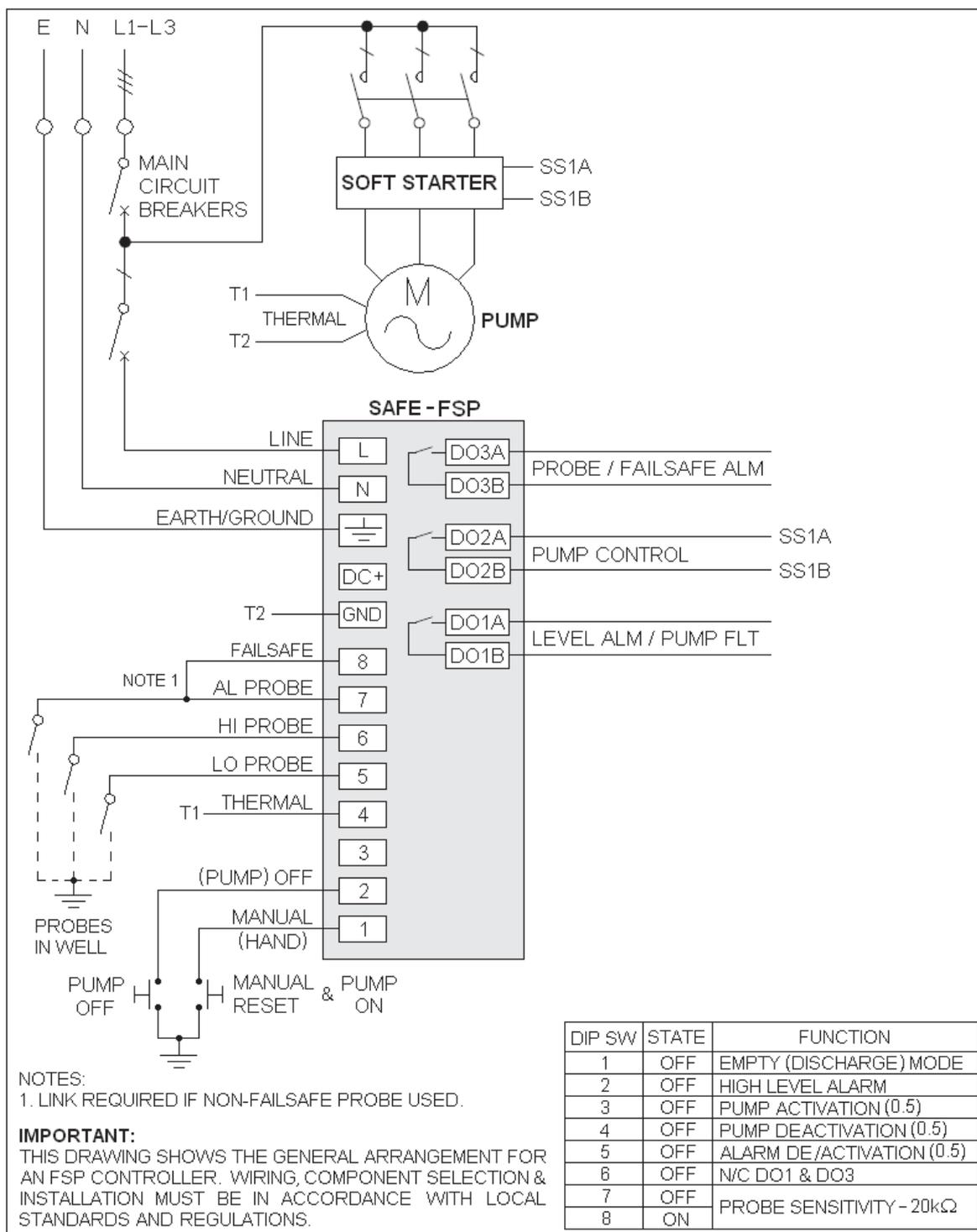


Figure 10 - Simplex Pump Controller

**18 Backup Controller SAFE-FSP Label**

**SafeSmart Backup Controller MTRA-FSP**

AC INPUT 85-265 VAC 50/60 Hz 3.5W  
DC INPUT 12-30 VDC 0.15 A MAX

Serial No.

**multitrode**  
www.multitrode.com

SW#	SETTING	MODE DESCRIPTION
SW1	OFF	EMPTY (DISCHARGE) MODE
	ON	FILL (CHARGE) MODE
SW2	OFF	HIGH LEVEL ALARM
	ON	LOW LEVEL ALARM
SW3	OFF	0.5 sec PUMP ACTIVATION DELAY
	ON	30 sec PUMP DEACTIVATION DELAY
SW4	OFF	0.5 sec PUMP DEACTIVATION DELAY
	ON	30 sec PUMP DEACTIVATION DELAY
SW5	OFF	0.5 sec ALARM ACT. & DEACT. DELAY
	ON	10 sec ALARM ACT. & DEACT. DELAY
SW6	OFF	N/C ALARM (LEVEL & PROBE)
	ON	N/O ALARM (LEVEL & PROBE)
SW7	OFF	PROBE SENSITIVITY
	ON	
	OFF	
	ON	
SW8	OFF	1K Ω
	ON	4K Ω
	OFF	20K Ω
	ON	80K Ω

LINE ~ NEUTRAL

AC INPUT

PROBE/ FAILSAFE ALARM (D03)

PUMP CONTROL (D02)

LEVEL ALARM/ PUMP FAULT (D01)

DC INPUT

DC +

FAILSAFE

AL PROBE

HI PROBE

LO PROBE

THERMAL

THERMAL BU

OFF

MANUAL (HAND)

8 7 6 5 4 3 2 1

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:  
(1) This device may not cause harmful interference, and  
(2) this device must accept any interference received, including interference that may cause undesired operation.

**CE** **UL** **LISTED** **us** **N1653**  
PROCESS CONTROL EQUIPMENT 42E9

**POWER** **LEVEL ALARM** **PUMP** **THERMAL FAULT** **PROBE FAULT**

**DIP SWITCHES**

ON → 1 2 3 4 5 6 7 8

Figure 11 – SafeSmart SAFE-FSP Label.

## SAFE-FSP Relay Manual

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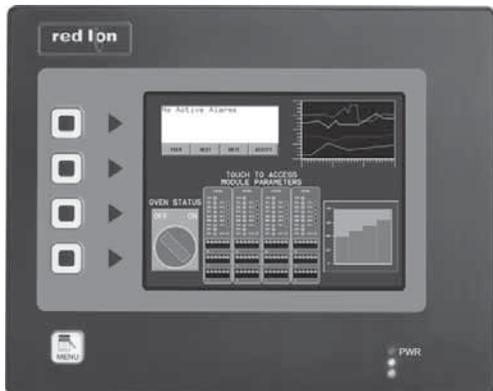
# TECHNICAL DATA SHEET

<b>Equipment Type:</b>	HMI
<b>Location:</b>	RTU Section
<b>Model Numbers:</b>	G306A
<b>Manufacturer:</b>	Red Lion
<b>Supplier:</b>	Control Logic 25 Lavarack Ave, Eagle Farm QLD 4009 (07) 3623 1212



Tel +1 (717) 767-6511  
 Fax +1 (717) 764-0839  
 www.redlion.net

## MODEL G306A - GRAPHIC COLOR LCD OPERATOR INTERFACE TERMINAL WITH TFT QVGA DISPLAY AND TOUCHSCREEN



- CONFIGURED USING CRIMSON® SOFTWARE (BUILD 424 OR NEWER)
- UP TO 5 RS-232/422/485 COMMUNICATIONS PORTS (2 RS-232 AND 1 RS-422/485 ON BOARD, 1 RS-232 AND 1 RS422/485 ON OPTIONAL COMMUNICATIONS CARD)
- 10 BASE T/100 BASE-TX ETHERNET PORT TO NETWORK UNITS AND HOST WEB PAGES
- USB PORT TO DOWNLOAD THE UNIT'S CONFIGURATION FROM A PC OR FOR DATA TRANSFERS TO A PC
- UNIT'S CONFIGURATION IS STORED IN NON-VOLATILE MEMORY (8 MBYTE FLASH)
- COMPACTFLASH® SOCKET TO INCREASE MEMORY CAPACITY
- 5.7-INCH TFT ACTIVE MATRIX 256 COLOR QVGA 320 X 240 PIXEL LCD W/LED BACKLIGHT
- 5-BUTTON KEYPAD FOR ON-SCREEN MENUS
- THREE FRONT PANEL LED INDICATORS
- POWER UNIT FROM 24 VDC ±20% SUPPLY
- RESISTIVE ANALOG TOUCHSCREEN



PROCESS CONTROL EQUIPMENT

FOR USE IN HAZARDOUS LOCATIONS:  
 Class I, Division 2, Groups A, B, C, and D

### GENERAL DESCRIPTION

The G306A Operator Interface Terminal combines unique capabilities normally expected from high-end units with a very affordable price. It is built around a high performance core with integrated functionality. This core allows the G306A to perform many of the normal features of the Paradigm range of Operator Interfaces while improving and adding new features.

The G306A is able to communicate with many different types of hardware using high-speed RS232/422/485 communications ports and Ethernet 10 Base T/100 Base-TX communications. In addition, the G306A features USB for fast downloads of configuration files and access to trending and data logging. A CompactFlash socket is provided so that Flash cards can be used to collect your trending and data logging information as well as to store larger configuration files.

In addition to accessing and controlling of external resources, the G306A allows a user to easily view and enter information. Users can enter data through the touchscreen and/or front panel 5-button keypad.

### SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the controller to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the controller.



The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.



**WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2**



**CAUTION: Risk Of Danger.**  
Read complete instructions prior to installation and operation of the unit.



**CAUTION: Risk of electric shock.**

### CONTENTS OF PACKAGE

- G306A Operator Interface.
- Panel gasket.
- Template for panel cutout.
- Hardware packet for mounting unit into panel.
- Terminal block for connecting power.

### ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
<b>G306A</b>	Operator Interface for indoor applications, textured finish with embossed keys	G306A000
G3CF	CompactFlash Card <sup>5</sup>	G3CFxxxx
G3RS	RS232/485 Optional Communication Card	G3RS0000
G3CN	CANopen Optional Communication Card	G3CN0000
G3DN	DeviceNet option card for G3 operator interfaces with isolated high speed communications ports	G3DN0000
G3PBDP	Profibus DP Optional Communication Card	G3PBDP00
SFCRM2	Crimson 2.0 <sup>2</sup>	SFCRM200
CBL	RS-232 Programming Cable	CBLPROG0
	USB Cable	CBLUSB00
	Communications Cables <sup>1</sup>	CBLxxxxx
DR	DIN Rail Mountable Adapter Products <sup>3</sup>	DRxxxxxx
	Replacement Battery <sup>4</sup>	BNL20000
G3FILM	Protective Films	G3FILM06

<sup>1</sup> Contact your Red Lion distributor or visit our website for complete selection.

<sup>2</sup> Use this part number to purchase the Crimson® software on CD with a printed manual, USB cable, and RS-232 cable. Otherwise, download for free from www.redlion.net.

<sup>3</sup> Red Lion offers RJ modular jack adapters. Refer to the DR literature for complete details.

<sup>4</sup> Battery type is lithium coin type CR2025.

<sup>5</sup> Industrial grade two million write cycles.

CompactFlash is a registered trademark of CompactFlash Association.

# SPECIFICATIONS

## 1. POWER REQUIREMENTS:

Must use a Class 2 circuit according to National Electrical Code (NEC), NFPA-70 or Canadian Electrical Code (CEC), Part I, C22.1 or a Limited Power Supply (LPS) according to IEC 60950-1 or Limited-energy circuit according to IEC 61010-1.

Power connection via removable three position terminal block.

Supply Voltage: +24 VDC ±20%  
 Typical Power<sup>1</sup>: 8 W  
 Maximum Power<sup>2</sup>: 10 W

**Notes:**

1. Typical power with +24 VDC, RS232/485 communications, Ethernet communications, CompactFlash card installed, and display at full brightness.
2. Maximum power indicates the most power that can be drawn from the G306A. Refer to "Power Supply Requirements" under "Installing and Powering the G306A."
3. The G306A's circuit common is not connected to the enclosure of the unit. See "Connecting to Earth Ground" in the section "Installing and Powering the G306A."
4. Read "Power Supply Requirements" in the section "Installing and Powering the G306A" for additional power supply information.

## 2. BATTERY:

Lithium coin cell. Typical lifetime of 10 years.

## 3. LCD DISPLAY:

SIZE	5.7-inch
TYPE	TFT
COLORS	256
PIXELS	320 X 240
BRIGHTNESS	380 cd/m <sup>2</sup>
BACKLIGHT*	50,000 HR TYP.

\*Lifetime at room temperature. Refer to "Display" in "Software/Unit Operation"

## 4. 5-KEY KEYPAD:

for on-screen menus.

## 5. TOUCHSCREEN:

Resistive analog

## 6. MEMORY:

**On Board User Memory:** 8 Mbyte of non-volatile Flash memory.

**Memory Card:** CompactFlash Type II slot for Type I and Type II CompactFlash cards.

## 7. COMMUNICATIONS:

**USB Port:** Adheres to USB specification 1.1. Device only using Type B connection.



**WARNING - DO NOT CONNECT OR DISCONNECT CABLES WHILE POWER IS APPLIED UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS. USB PORT IS FOR SYSTEM SET-UP AND DIAGNOSTICS AND IS NOT INTENDED FOR PERMANENT CONNECTION.**

**Serial Ports:** Format and Baud Rates for each port are individually software programmable up to 115,200 baud.

PGM Port: RS232 port via RJ12.

COMMS Ports: RS422/485 port via RJ45, and RS232 port via RJ12.

DH485 TXEN: Transmit enable; open collector, V<sub>OH</sub> = 15 VDC,

V<sub>OL</sub> = 0.5 V @ 25 mA max.

*Note: For additional information on the communications or signal common and connections to earth ground please see the "Connecting to Earth Ground" in the section "Installing and Powering the G306A."*

**Ethernet Port:** 10 BASE-T / 100 BASE-TX

RJ45 jack is wired as a NIC (Network Interface Card).

Isolation from Ethernet network to G3 operator interface: 1500 Vrms

## 8. ENVIRONMENTAL CONDITIONS:

**Operating Temperature Range:** 0 to 50°C

**Storage Temperature Range:** -20 to 70°C

**Operating and Storage Humidity:** 80% maximum relative humidity (non-condensing) from 0 to 50°C.

**Vibration according to IEC 68-2-6:** Operational 5 to 8 Hz, 0.8" (p-p), 8 to 500 Hz, in X, Y, Z direction, duration: 1 hour, 3 g.

**Shock according to IEC 68-2-27:** Operational 40 g, 9 msec in 3 directions.

**Altitude:** Up to 2000 meters.

## 9. CERTIFICATIONS AND COMPLIANCES:

### SAFETY

UL Listed, File #E245515, UL61010-1, ANSI/ISA 12.12.01-2007, CAN/CSA 22.2 No. 61010.1, CSA 22.2 No. 213-M1987 and File #E179259, UL61010-1, CAN/CSA 22.2 No.61010-1

LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards

Type 4X Indoor Enclosure rating (Face only), UL50

IECEE CB Scheme Test Report #E179259-A1-CB-3

Issued by Underwriters Laboratories Inc.

IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.

IP66 Enclosure rating (Face only), IEC 529

### ELECTROMAGNETIC COMPATIBILITY

Emissions and Immunity to EN 61326: 2006: Electrical Equipment for Measurement, Control and Laboratory use.

### Immunity to Industrial Locations:

Electrostatic discharge	EN61000-4-2	Criterion A 4kV contact discharge 8kV air discharge
Electromagnetic RF fields	EN61000-4-3	Criterion A 10V/m (80 MHz to 1 GHz) 3 V/m (1.4 GHz to 2 GHz) 1 V/m (2 GHz to 2.7 GHz)
Fast transients (burst)	EN61000-4-4	Criterion A 2kV power 1kV I/O signal
Surge	EN61000-4-5	Criterion A 1kV L to L 2kV L to G power 1 kV signal
RF conducted interference	EN61000-4-6	Criterion A 3Vrms
Power frequency magnetic fields	EN61000-4-8	Criterion A 30A/m

### Emissions:

Emissions EN55011 Class A

### Note:

1. Criterion A: Normal operation within specified limits.

## 10. CONNECTIONS:

Compression cage-clamp terminal block.

Wire Gauge: 12-30 AWG copper wire

Torque: 5-7 inch-pounds (56-79 N-cm)

## 11. CONSTRUCTION:

Steel rear metal enclosure with NEMA 4X/IP66 aluminum front plate for indoor use only when correctly fitted with the gasket provided. Installation Category II, Pollution Degree 2.

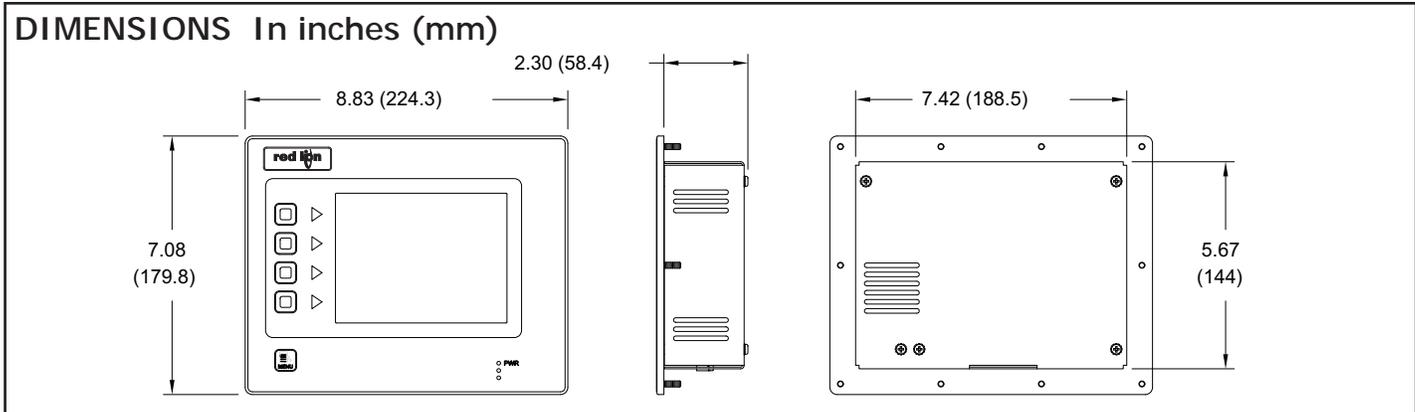
## 12. MOUNTING REQUIREMENTS:

Maximum panel thickness is 0.25" (6.3 mm). For NEMA 4X/IP66 sealing, a steel panel with a minimum thickness of 0.125" (3.17 mm) is recommended.

**Maximum Mounting Stud Torque:** 17 inch-pounds (1.92 N-m)

## 13. WEIGHT:

3.0 lbs (1.36 Kg)

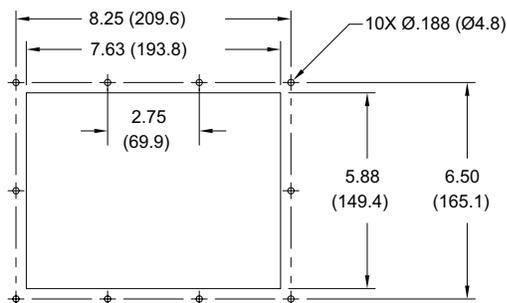


# INSTALLING AND POWERING THE G306A

## MOUNTING INSTRUCTIONS

This operator interface is designed for through-panel mounting. A panel cut-out diagram and a template are provided. Care should be taken to remove any loose material from the mounting cut-out to prevent that material from falling into the operator interface during installation. A gasket is provided to enable sealing to NEMA 4X/IP66 specification. Install the ten kee nuts provided and tighten evenly for uniform gasket compression.

*Note: Tightening the kee nuts beyond a maximum of 17 inch-pounds (1.92 N-m) may cause damage to the front panel.*



All tolerances ±0.010" (±0.25 mm).



ALL NONINCENDIVE CIRCUITS MUST BE WIRED USING DIVISION 2 WIRING METHODS AS SPECIFIED IN ARTICLE 501-4 (b), 502-4 (b), AND 503-3 (b) OF THE NATIONAL ELECTRICAL CODE, NFPA 70 FOR INSTALLATION WITHIN THE UNITED STATES, OR AS SPECIFIED IN SECTION 19-152 OF CANADIAN ELECTRICAL CODE FOR INSTALLATION IN CANADA.

## CONNECTING TO EARTH GROUND



The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

Each G306A has a chassis ground terminal on the back of the unit. Your unit should be connected to earth ground (protective earth).

The chassis ground is not connected to signal common of the unit. Maintaining isolation between earth ground and signal common is not required to operate your unit. But, other equipment connected to this unit may require isolation between signal common and earth ground. *To maintain isolation between signal common and earth ground care must be taken when connections are made to the unit.* For example, a power supply with isolation between its signal common and earth ground must be used. Also, plugging in a USB cable may connect signal common and earth ground.<sup>1</sup>

<sup>1</sup> USB's shield may be connected to earth ground at the host. USB's shield in turn may also be connected to signal common.

## POWER SUPPLY REQUIREMENTS

The G306A requires a 24 VDC power supply. Your unit may draw considerably less than the maximum rated power depending upon the options being used. As additional features are used your unit will draw increasing amounts of power. Items that could cause increases in current are additional communications, optional communications card, CompactFlash card, and other features programmed through Crimson.

In any case, it is very important that the power supply is mounted correctly if the unit is to operate reliably. Please take care to observe the following points:

- The power supply must be mounted close to the unit, with usually not more than 6 feet (1.8 m) of cable between the supply and the operator interface. Ideally, the shortest length possible should be used.
- The wire used to connect the operator interface's power supply should be at least 22-gage wire. If a longer cable run is used, a heavier gage wire should be used. The routing of the cable should be kept away from large contactors, inverters, and other devices which may generate significant electrical noise.
- A power supply with an NEC Class 2 or Limited Power Source (LPS) and SELV rating is to be used. This type of power supply provides isolation to accessible circuits from hazardous voltage levels generated by a mains power supply due to single faults. SELV is an acronym for "safety extra-low voltage." Safety extra-low voltage circuits shall exhibit voltages safe to touch both under normal operating conditions and after a single fault, such as a breakdown of a layer of basic insulation or after the failure of a single component has occurred.

# INSTALLING AN OPTION CARD



WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN DISCONNECTED AND THE AREA IS KNOWN TO BE NON-HAZARDOUS.

Each option card comes with a cable for communications and three screws for attaching the option card to the G306's rear cover. To install the option card, remove all power and I/O communications cables from the unit. Use the three screws provided to mount the option card to the rear cover of the G306 as shown in Figure 1.

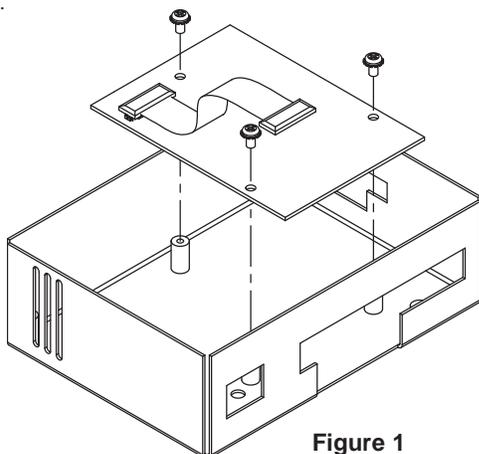


Figure 1

Connect the cable from the option card to CN11 on the main board of the G306 as shown in Figure 2. Be sure both ends of the cable are firmly seated into their appropriate connector housing. Carefully replace the rear cover by reversing the instructions for removing the rear cover.

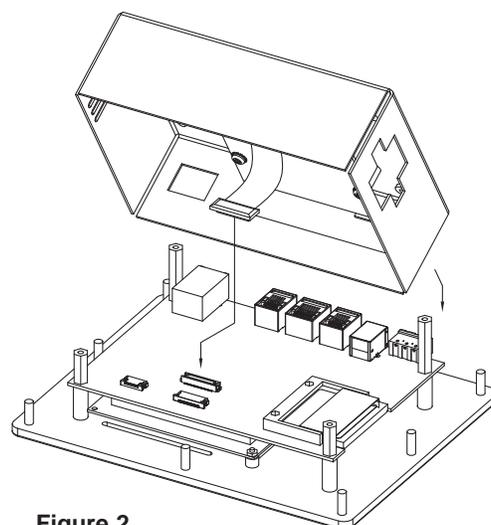


Figure 2

# COMMUNICATING WITH THE G306A

## CONFIGURING A G306A

The G306A is configured using Crimson® software. Crimson is available as a free download from Red Lion's website, or it can be purchased on CD. Updates to Crimson for new features and drivers are posted on the website as they become available. By configuring the G306A using the latest version of Crimson, you are assured that your unit has the most up to date feature set. Crimson® software can configure the G306A through the RS232 PGM port, USB port, or CompactFlash.

The USB port is connected using a standard USB cable with a Type B connector. The driver needed to use the USB port will be installed with Crimson.

The RS232 PGM port uses a programming cable made by Red Lion to connect to the DB9 COM port of your computer. If you choose to make your own cable, use the "G306A Port Pin Out Diagram" for wiring information.

The CompactFlash can be used to program a G3 by placing a configuration file and firmware on the CompactFlash card. The card is then inserted into the target G3 and powered. Refer to the Crimson literature for more information on the proper names and locations of the files.

## USB, DATA TRANSFERS FROM THE COMPACTFLASH CARD



**WARNING - DO NOT CONNECT OR DISCONNECT CABLES WHILE POWER IS APPLIED UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS. USB PORT IS FOR SYSTEM SET-UP AND DIAGNOSTICS AND IS NOT INTENDED FOR PERMANENT CONNECTION.**

In order to transfer data from the CompactFlash card via the USB port, a driver must be installed on your computer. This driver is installed with Crimson and is located in the folder C:\Program Files\Red Lion Controls\Crimson 2.0\Device\ after Crimson is installed. This may have already been accomplished if your G306A was configured using the USB port.

Once the driver is installed, connect the G306A to your PC with a USB cable, and follow "Mounting the CompactFlash" instructions in the Crimson 2 user manual.

## CABLES AND DRIVERS

Red Lion has a wide range of cables and drivers for use with many different communication types. A list of these drivers and cables along with pin outs is available from Red Lion's website. New cables and drivers are added on a regular basis. If making your own cable, refer to the "G306A Port Pin Outs" for wiring information.

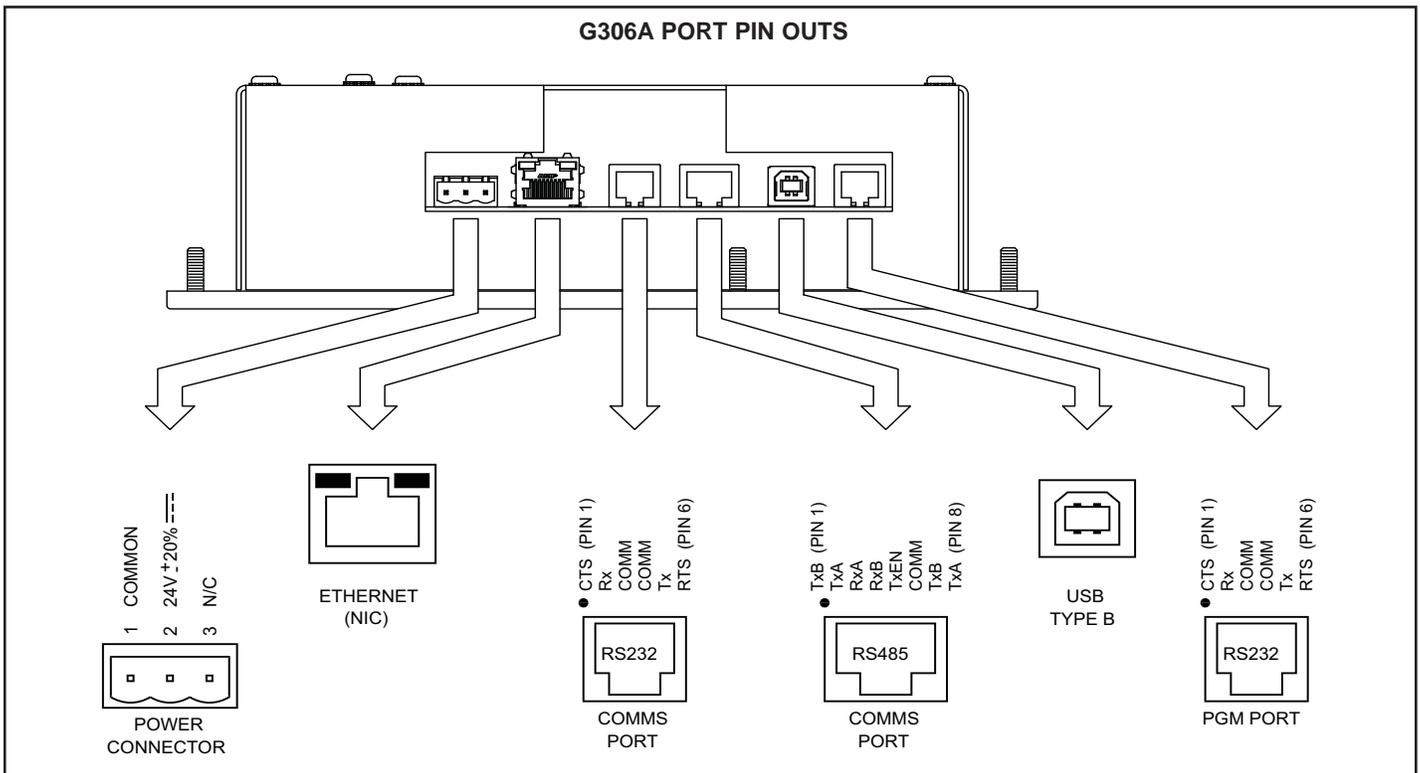
## ETHERNET COMMUNICATIONS

Ethernet communications can be established at either 10 BASE-T or 100 BASE-TX. The G306A unit's RJ45 jack is wired as a NIC (Network Interface Card). For example, when wiring to a hub or switch use a straight-through cable, but when connecting to another NIC use a crossover cable.

The Ethernet connector contains two LEDs. A yellow LED in the upper right, and a bi-color green/amber LED in the upper left. The LEDs represent the following statuses:

LED COLOR	DESCRIPTION
YELLOW solid	Link established.
YELLOW flashing	Data being transferred.
GREEN	10 BASE-T Communications
AMBER	100 BASE-TX Communications

On the rear of each unit is a unique 12-digit MAC address and a block for marking the unit with an IP address. Refer to the Crimson manual and Red Lion's website for additional information on Ethernet communications.



## RS232 PORTS

The G306A has two RS232 ports. There is the PGM port and the COMMS port. Although only one of these ports can be used for programming, both ports can be used for communications with a PLC.

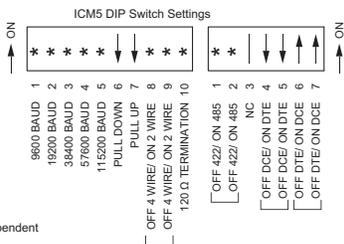
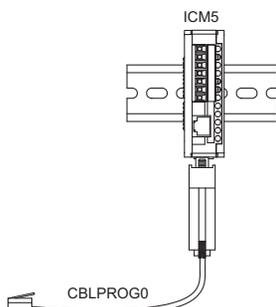
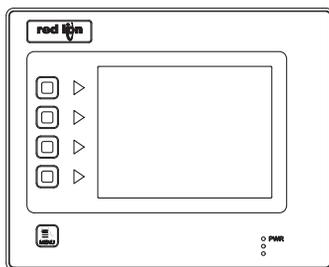
The RS232 ports can be used for either master or slave protocols with any G306A configuration.

Examples of RS232 communications could involve another Red Lion product or a PC. By using a cable with RJ12 ends on it, and a twist in the cable, RS232 communications with another G3 product or the Modular Controller can be established. Red Lion part numbers for cables with a twist in them are CBLPROG0<sup>1</sup>, CBLRLC01<sup>2</sup>, or CBLRLC02<sup>3</sup>.

### G3 RS232 to a PC

Connections			
G3: RJ12	Name	PC: DB9	Name
4	COMM	1	DCD
5	Tx	2	Rx
2	Rx	3	Tx
	N/C	4	DTR
3	COM	5	GND
	N/C	6	DSR
1	CTS	7	RTS
6	RTS	8	CTS
	N/C	9	RI

CONNECTING A G306A OPERATOR INTERFACE TO AN ICM5



<sup>1</sup> CBLPROG0 can also be used to communicate with either a PC or an ICM5.  
<sup>2</sup> DB9 adapter not included, 1 foot long.  
<sup>3</sup> DB9 adapter not included, 10 feet long.

## Examples of RS485 2-Wire Connections

### G3 to Red Lion RJ11 (CBLRLC00) DLC, IAMS, ITMS, PAXCDC4C

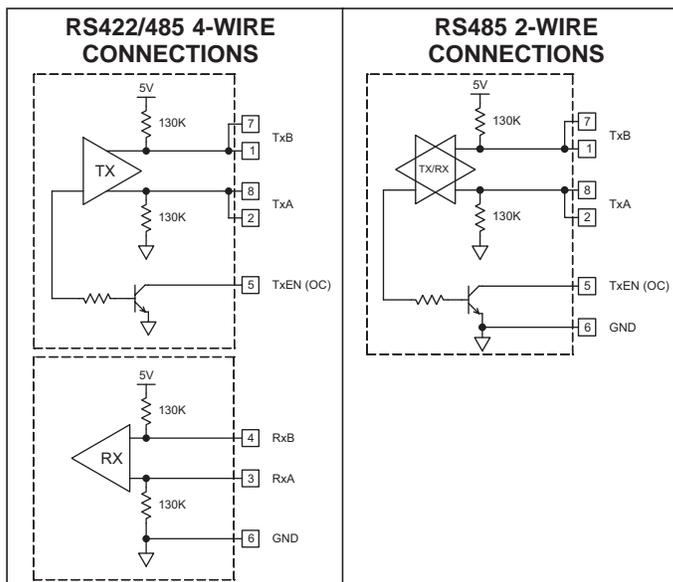
Connections			
G3: RJ45	Name	RLC: RJ11	Name
5	TxEN	2	TxEN
6	COM	3	COM
1	TxB	5	B-
2	TxA	4	A+

### G3 to Modular Controller (CBLRLC05)

Connections			
G3	Name	Modular Controller	Name
1,4	TxB	1,4	TxB
4,1	RxB	4,1	RxB
2,3	TxA	2,3	TxA
3,2	RxA	3,2	RxA
5	TxEN	5	TxEN
6	COM	6	COM
7	TxB	7	TxB
8	TxA	8	TxA

## RS422/485 COMMS PORT

The G306A has one RS422/485 port. This port can be configured to act as either RS422 or RS485.



**Note:** All Red Lion devices connect A to A and B to B, except for Paradigm devices. Refer to [www.redlion.net](http://www.redlion.net) for additional information.

## DH485 COMMUNICATIONS

The G306A's RS422/485 COMMS port can also be used for Allen Bradley DH485 communications.

**WARNING: DO NOT** use a standard DH485 cable to connect this port to Allen Bradley equipment. A cable and wiring diagram are available from Red Lion.

### G3 to AB SLC 500 (CBLAB003)

Connections			
RJ45: RLC	Name	RJ45: A-B	Name
1	TxB	1	A
2	TxA	2	B
3, 8	RxA	-	24V
4, 7	RxB	-	COMM
5	TxEN	5	TxEN
6	COMM	4	SHIELD
4, 7	TxB	-	COMM
3, 8	TxA	-	24V

# SOFTWARE/UNIT OPERATION

## CRIMSON® SOFTWARE

Crimson® software is available as a free download from Red Lion's website or it can be purchased on a CD, see "Ordering Information" for part number. The latest version of the software is always available from the website, and updating your copy is free.

## DISPLAY

This operator interface uses a liquid crystal display (LCD) for displaying text and graphics. The display utilizes an LED backlight for lighting the display. The backlight can be dimmed for low light conditions.

The LED backlight has a limited lifetime. Backlight lifetime is based upon the amount of time the display is turned on at full intensity. Turning the backlight off when the display is not in use can extend the lifetime of your backlight. This can be accomplished through the Crimson® software when configuring your unit.

## FRONT PANEL LEDs

There are three front panel LEDs. Shown below is the default status of the LEDs.

LED	INDICATION
<b>RED (TOP, LABELED "PWR")</b>	
FLASHING	Unit is in the boot loader, no valid configuration is loaded. <sup>1</sup>
STEADY	Unit is powered and running an application.
<b>YELLOW (MIDDLE)</b>	
OFF	No CompactFlash card is present.
STEADY	Valid CompactFlash card present.
FLASHING RAPIDLY	CompactFlash card being checked.
FLICKERING	Unit is writing to the CompactFlash, either because it is storing data, or because the PC connected via the USB port has locked the drive. <sup>2</sup>
FLASHING SLOWLY	Incorrectly formatted CompactFlash card present.
<b>GREEN (BOTTOM)</b>	
FLASHING	A tag is in an alarm state.
STEADY	Valid configuration is loaded and there are no alarms present.

<sup>1</sup> The operator interface is shipped without a configuration. After downloading a configuration, if the light remains in the flashing state continuously, try cycling power. If the LED still continues to flash, try downloading a configuration again.

<sup>2</sup> Do not turn off power to the unit while this light is flickering. The unit writes data in two minute intervals. Later Microsoft operating systems will not lock the drive unless they need to write data; Windows 98 may lock the drive any time it is mounted, thereby interfering with logging. Refer to "Mounting the CompactFlash" in the Crimson 2 User Manual.

## TOUCHSCREEN

This operator interface utilizes a resistive analog touchscreen for user input. The unit will only produce an audible tone (beep) when a touch on an active touchscreen cell is sensed. The touchscreen is fully functional as soon as the operator interface is initialized, and can be operated with gloved hands.

## KEYPAD

The G306A keypad consists of five keys that can be used for on-screen menus.

## TROUBLESHOOTING YOUR G306A

If for any reason you have trouble operating, connecting, or simply have questions concerning your new G306A, contact Red Lion's technical support. For contact information, refer to the back page of this bulletin for phone and fax numbers.

EMAIL: [techsupport@redlion.net](mailto:techsupport@redlion.net)

Web Site: <http://www.redlion.net>

## BATTERY & TIME KEEPING



**WARNING - EXPLOSION HAZARD - THE AREA MUST BE KNOWN TO BE NON-HAZARDOUS BEFORE SERVICING/ REPLACING THE UNIT AND BEFORE INSTALLING OR REMOVING I/O WIRING AND BATTERY.**



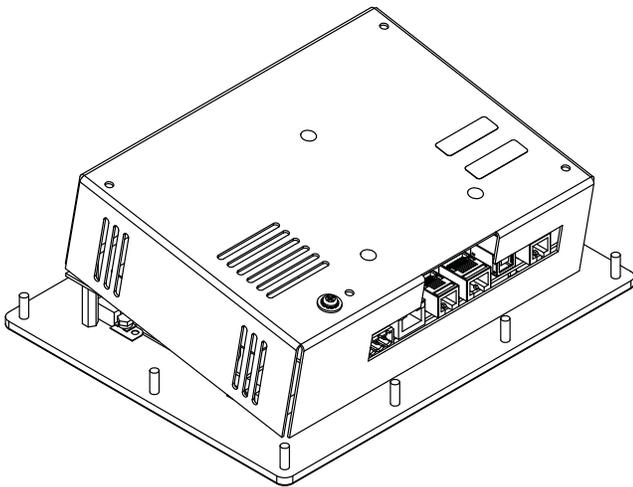
**WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN DISCONNECTED AND THE AREA IS KNOWN TO BE NON-HAZARDOUS.**

A battery is used to keep time when the unit is without power. Typical accuracy of the G306A time keeping is less than one minute per month drift. The battery of a G306A unit does not affect the unit's memory, all configurations and data is stored in non-volatile memory.



**CAUTION:** The circuit board contains static sensitive components. Before handling the operator interface without the rear cover attached, discharge static charges from your body by touching a grounded bare metal object. Ideally, handle the operator interface at a static controlled clean workstation. Also, do not touch the surface areas of the circuit board. Dirt, oil, or other contaminants may adversely affect circuit operation.

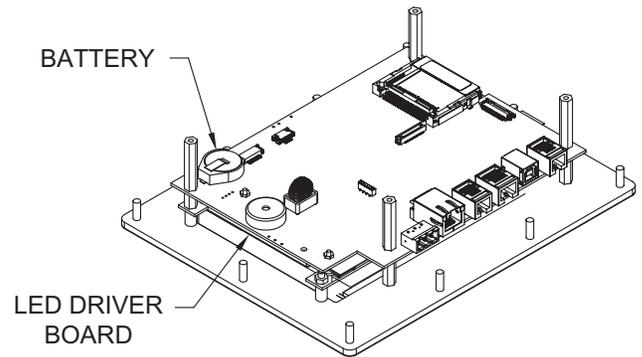
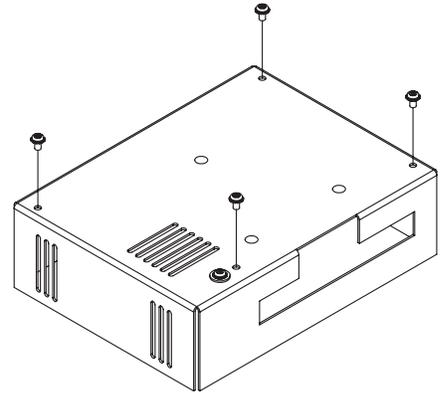
To change the battery of a G306A, remove power, cabling, and then the rear cover of the unit. To remove the cover, remove the four screws designated by the arrows on the rear of the unit. Then, by lifting the top side, hinge the cover, thus providing clearance for the connectors on the bottom side of the PCB as shown in the illustration below. Install in the reverse manner.



Remove the old battery\* from the holder and replace with the new battery. Replace the rear cover, cables, and re-apply power. Using Crimson or the unit's keypad, enter the correct time and date.

*\* Please note that the old battery must be disposed of in a manner that complies with your local waste regulations. Also, the battery must not be disposed of in fire, or in a manner whereby it may be damaged and its contents come into contact with human skin.*

*The battery used by the G306A is a lithium type CR2025.*



# OPTIONAL FEATURES AND ACCESSORIES

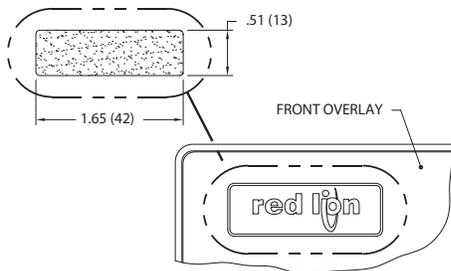
## OPTIONAL COMMUNICATION CARD

Red Lion offers optional communication cards for fieldbus communications. These communication cards will allow your G306A to communicate with many of the popular fieldbus protocols.

Red Lion is also offering a communications card for additional RS232 and RS422/485 communications. Visit Red Lion's website for information and availability of these cards.

## CUSTOM LOGO

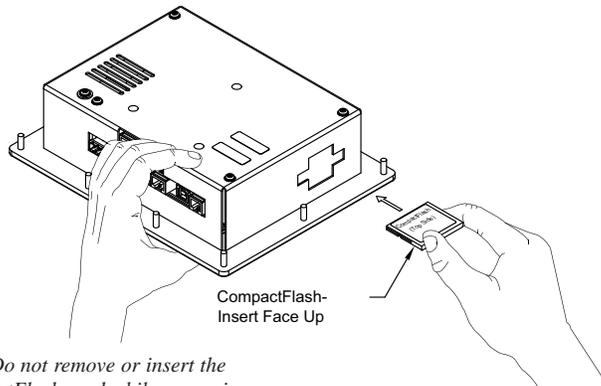
Each G3 operator interface has an embossed area containing the Red Lion logo. Red Lion can provide custom logos to apply to this area. Contact your distributor for additional information and pricing.



## COMPACTFLASH SOCKET

CompactFlash socket is a Type II socket that can accept either Type I or II cards. Use cards with a minimum of 4 Mbytes and formatted to a maximum of 2 Gbytes (See Note box below) with the G306A's CompactFlash socket. Cards are available at most computer and office supply retailers.

CompactFlash can be used for configuration transfers, larger configurations, data logging, and trending.



*Note: Do not remove or insert the CompactFlash card while power is applied. Refer to "Front Panel LEDs."*

Information stored on a CompactFlash card by a G306A can be read by a card reader attached to a PC. This information is stored in IBM (Windows®) PC compatible FAT16 file format.

**NOTE**

For reliable operation of this and other Red Lion products, one of the following brands of CompactFlash card must be used...

SimpleTech	SMART® Modular
SanDisk®	Silicon Systems

*Not all of the above manufacturers offer CompactFlash cards recognized to UL standards, which may be required for your application. Although RLC products limit use of CompactFlash card memory to 2 GB, cards with a larger capacity can be used. They MUST be formatted to 2 GB and use the FAT 16 file system. It is recommended to format the CF card using the format utility from within Crimson.*

**LIMITED WARRANTY**

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

No warranties expressed or implied are created with respect to The Company's products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.

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Fax +86 21 6113 3683

# 3. Drawings

# Drawings – As Built

Andy Walmsley:   
 Licence number: A30723  
 Date: 5 March 2015



QUEENSLAND  
**UrbanUtilities**

POINT TO POINT  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Parley  
 Licence no: 122714  
 Signed: 

# SP044 LYTTON ROAD SEWAGE PUMPING STATION SITE COVER SHEET

ELECTRICAL DRAWINGS INDEX					
DWG N°	TITLE	SHEET	REVISIONS		
486/5/7-0463-000	SITE COVER SHEET	00	0	A	
486/5/7-0463-001	POWER DISTRIBUTION SCHEMATIC DIAGRAM	01	0	A	
486/5/7-0463-002	PUMP 01 SCHEMATIC DIAGRAM	02	0	A	
486/5/7-0463-003	RESERVED (PUMP 02 SCHEMATIC DIAGRAM)	03			
486/5/7-0463-004	RESERVED (PUMP 03 SCHEMATIC DIAGRAM)	04			
486/5/7-0463-005	DRY WELL & EM. STORAGE DEWATERING PUMPS SCHEMATIC DIAGRAM	05	0	A	
486/5/7-0463-006	MTS CONTROL WIRING DIAGRAM	06	0	A	
486/5/7-0463-007	COMMON CONTROLS SCHEMATIC DIAGRAM	07	0	A	
486/5/7-0463-008	COMMON RTU I/O SCHEMATIC DIAGRAM	08	0	A	
486/5/7-0463-009	RTU POWER DISTRIBUTION SCHEMATIC & NETWORK DIAGRAM	09	0	A	
486/5/7-0463-010	RTU DIGITAL INPUTS TERMINATION DIAGRAM - SHEET 1 OF 3	10	0	A	
486/5/7-0463-011	RTU DIGITAL INPUTS TERMINATION DIAGRAM - SHEET 2 OF 3	11	0	A	
486/5/7-0463-012	RESERVED RTU DIGITAL INPUTS TERMINATION DIAGRAM - SHEET 3 OF 3	12			
486/5/7-0463-013	RTU DIGITAL OUTPUTS TERMINATION DIAGRAM - SHEET 1 OF 2	13	0	A	
486/5/7-0463-014	RESERVED RTU DIGITAL OUTPUTS TERMINATION DIAGRAM - SHEET 2 OF 2	14			
486/5/7-0463-015	RTU ANALOG INPUTS TERMINATION DIAGRAM	15	0	A	
486/5/7-0463-016	RTU ANALOG OUTPUTS TERMINATION DIAGRAM	16	0	A	
486/5/7-0463-017	COMMON CONTROLS TERMINATION DIAGRAM	17	0	A	
486/5/7-0463-018	EQUIPMENT LIST	18	0	A	
486/5/7-0463-019	CABLE SCHEDULE	19	0	A	
486/5/7-0463-020	SWITCHBOARD LABEL SCHEDULE	20	0	A	
486/5/7-0463-021	SWITCHBOARD CONSTRUCTION DETAILS - SHEET 1 of 3	21	0	A	
486/5/7-0463-022	SWITCHBOARD CONSTRUCTION DETAILS - SHEET 2 of 3	22	0	A	
486/5/7-0463-023	SWITCHBOARD CONSTRUCTION DETAILS - SHEET 3 of 3	23	0	A	
486/5/7-0463-024	FIELD INSTRUMENTATION - INSTALLATION DETAILS	24	0	A	
486/5/7-0463-025	RESERVED (CATHODIC PROTECTION UNIT)	25			
486/5/7-0463-026	RESERVED (GENERATOR CONTROL)	26			
486/5/7-0463-027	DRY WELL DISCONNECTION BOX GENERAL ARRANGEMENT	27	0	A	
486/5/7-0463-028	WETWELL INSTRUMENTATION MARSHALLING BOX-GENERAL ARRANGEMENT	28	0	A	
486/5/7-0463-029	SWBD GENERAL ARRANGEMENT ELEVATIONS	29	0	A	
486/5/7-0463-030	SWBD GENERAL ARRANGEMENT SECTIONS	30	0	A	
486/5/7-0463-031	RESERVED (GENERATOR EXTERNAL CONNECTION BOX)	31			
486/5/7-0463-032	DRYWELL INSTRUMENTATION MARSHALLING BOX-GENERAL ARRANGEMENT	32	0	A	
486/5/7-0463-040	SWITCHBOARD SLAB - LOCALITY AND SITE PLANS - SHEET 1 of 4	40	0	A	
486/5/7-0463-041	SWITCHBOARD SLAB AND CONDUIT DETAILS - SHEET 2 of 4	41	0	A	
486/5/7-0463-042	GALLERY CONDUIT LAYOUT AND DETAILS - SHEET 3 of 4	42	0	A	
486/5/7-0463-043	SWITCHBOARD & ELECTRICAL CONDUIT & EQUIP LAYOUT - SHEET 4 of 4	43	0	A	

STANDARD VARIABLES		
DESCRIPTION	VALUES	
CT METERING ISOLATOR	250A	SLB 2503P
NORMAL SUPPLY MAIN SWITCH	0.95(237.5A)	S440GE/250
GENERATOR SUPPLY MAIN SWITCH	0.8(200A)	S440GE/250
PUMP1 CIRCUIT BREAKER	1(160A)	S160GJ/160
PUMP2 CIRCUIT BREAKER	1(160A)	S160GJ/160
DRY WELL SUMP PUMP CIRCUIT BREAKER	20A	S125NJ/20
EM STORAGE DEWATERING PUMP CCT BREAKER	NOT APPLICABLE	
PUMP VSD STARTER SIZE	FC202P90K	177A
PUMP RATING	80kW	139A
PUMP LINE CONTACTOR	NOT APPLICABLE	
DRY WELL SUMP PUMP RATING	2.2kW	4.8A
DRY WELL SUMP PUMP CONTACTOR & TOL	CA7-16	ET7-24-6
PUMP SOCKET OUTLET - INCLINE SLEEVE	NOT APPLICABLE	
PUMP INLET PLUG - HANDLE	NOT APPLICABLE	
WET WELL LEVEL TRANSMITTER	WLS2XXAM0100IX	5m
EMERGENCY STORAGE WELL LEVEL TRANSMITTER	NOT APPLICABLE	
EM STORAGE DEWATERING PUMP RATING	NOT APPLICABLE	
EM STORAGE DEWATERING PUMP CONTR & TOL	NOT APPLICABLE	
FLOWMETER RANGE	.771/2.2	
WET WELL ULTRASONIC LEVEL SENSOR	NOT APPLICABLE	
DELIVERY PRESSURE TRANSMITTER	BRS2XXCA1FHPHAS	L=40 50m
RADIO	DR900-07A02-00	
EMERGENCY PUMPING TIME	1.b.a.sec	
No of SINGLE POINT PROBES	6	
INCOMING MAINS SUPPLY CABLE	70mm <sup>2</sup>	
MAIN EARTHING CABLE	25mm <sup>2</sup>	
INCOMING GENERATOR SUPPLY CABLE	NOT APPLICABLE	
VSD STARTER 3 PHASE SUPPLY	35mm <sup>2</sup>	

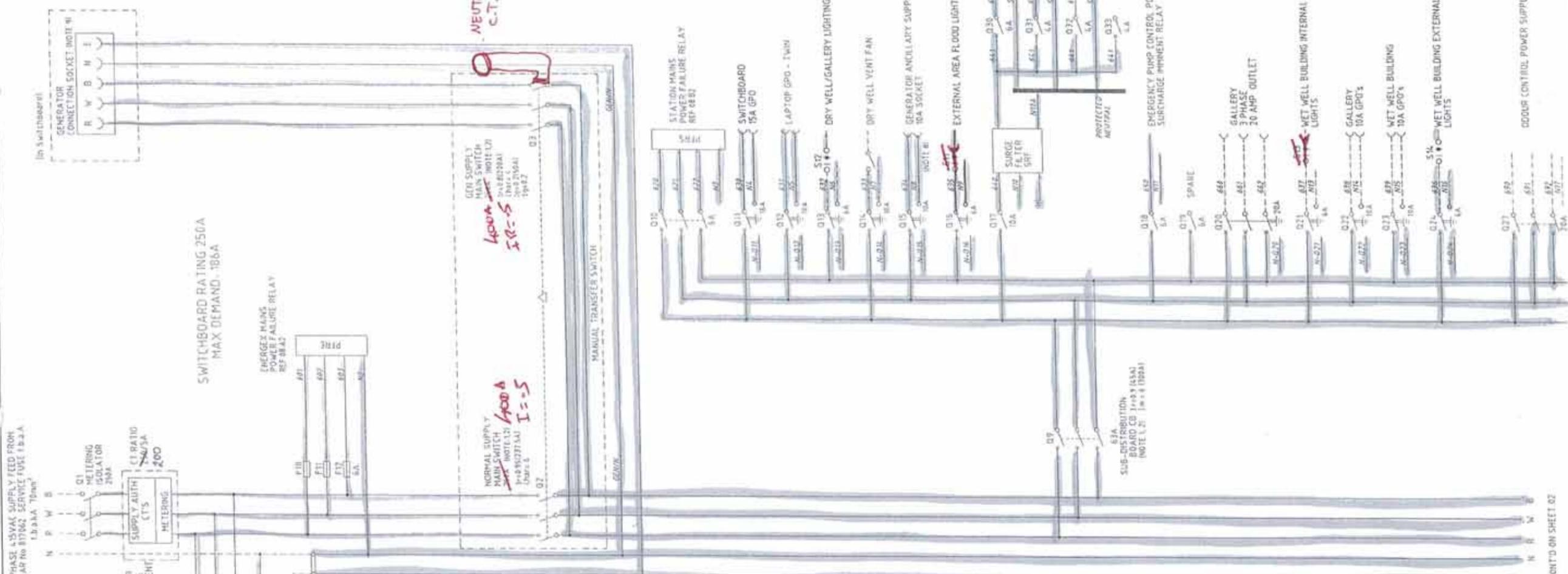
STANDARD DESIGN OPTIONS		
OPTION	DESCRIPTION	FITTED
A	INDIVIDUAL PUMP MOISTURE IN OIL (MIO) SENSOR AND FAULT RELAY	YES <input checked="" type="checkbox"/>
B	INDIVIDUAL PUMP MOTOR AUX PROTECTION SENSORS AND FAULT RELAYS	YES <input checked="" type="checkbox"/>
C	INDIVIDUAL PUMP REFLUX VALVE PROXIMITY SWITCH	YES <input checked="" type="checkbox"/>
D		YES NO
E	STATION DRY WELL SUMP PUMP AND LEVEL INDICATION SENSORS AND RELAYS	YES <input checked="" type="checkbox"/>
F	PERMANENT GENERATOR INSTALLED	<input checked="" type="checkbox"/> NO
G	STATION EMERGENCY STORAGE LEVEL SENSOR, DEWATERING PUMP	<input checked="" type="checkbox"/> NO
H	STATION DELIVERY FLOWMETER - 240VAC ABB	YES <input checked="" type="checkbox"/>
I	BACKUP COMMUNICATION - GSM	YES <input checked="" type="checkbox"/>
J	PUMP CONNECTION (Via Dry Well J-Box)	YES <input checked="" type="checkbox"/>
K	CATHODIC PROTECTION	<input checked="" type="checkbox"/> NO
L	MOTOR THERMISTORS (Via Dry Well J-Box)	YES <input checked="" type="checkbox"/>
M	ODOUR CONTROL	YES <input checked="" type="checkbox"/>
N	CURRENT TRANSFORMER (CT) METERING	YES <input checked="" type="checkbox"/>
O	PUMPS ELECTRICAL INTERLOCK	<input checked="" type="checkbox"/> NO
P	WET WELL WASHER	<input checked="" type="checkbox"/> NO
Q	AUX PIT SUMP PUMP AND LEVEL PROBE	<input checked="" type="checkbox"/> NO
R	TELEMETRY RADIO	YES <input checked="" type="checkbox"/>
S	WET WELL SECONDARY LEVEL SENSOR	<input checked="" type="checkbox"/> NO
T	WET WELL PRIMARY LEVEL SENSOR (Via Field Instrument Box)	YES <input checked="" type="checkbox"/>
U	DELIVERY PRESSURE TRANSMITTER (Via Field Disconnect Box)	YES <input checked="" type="checkbox"/>
V	CHEMICAL DOSING	<input checked="" type="checkbox"/> NO
W	PUMP START METHOD - VARIABLE SPEED DRIVE	YES <input checked="" type="checkbox"/>
X	3rd PUMP INSTALLED	<input checked="" type="checkbox"/> NO
Y	POWER METER	<input checked="" type="checkbox"/> NO

Sheet 00  
 FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	P.HAGUE	DATE	3-2-14	 Cardno (Q&B) Pty Ltd 400 961 810	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE SITE COVER SHEET	SHEET No. 0 Queensland Urban Utilities DRAWING No. 486/5/7-0463-000	AMEND. A
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	57-0463set_A	DATE	3-3-14					
AMENDMENT	DRN. APS.	B.C.S. FILE No.		DATE						

**NOTES**

1. INCISING MAIN GEMSET, PUMP & DB CIRCUIT BREAKERS SHALL BE LINE SIDE SHROUDED
2. M.E.N. LINK TO BE PROVIDED AS PER AS-1000.7097 SECTION 7
3. SURGE PROTECTION DEVICE TO BE AS CLOSE TO THE INCOMER AS POSSIBLE
4. ALL WIRING SHALL BE A MINIMUM 90mm<sup>2</sup> AT A MAXIMUM LENGTH OF 600mm TO BE USED OVER THE SHORTEST AND MOST DIRECT PATH WITH NO LOOPS CONNECTED TO NEUTRAL
5. ALL CIRCUIT BREAKERS TO BE PADLOCKABLE. LOCKING IS TO BE INDEPENDENT OF ESCUTCHEON
6. CIRCUIT BREAKER RATINGS TO SUIT FAULT LEVEL & LOAD TO ENSURE TYPE 2 CO-ORDINATION WITH CONTACTORS AND OVERLOADS TO AS3957-1-1
7. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST 52000 COMPATIBLE LABELING
8. ALL LIGHT AND POWER CIRCUITS SHALL BE FITTED WITH RCD PROTECTION, SET AT 300mA
9. ALL 10 & 30 AMP POWER OUTLETS MOUNTED ON ESCUTCHEONS TO BE WIRED IN DOUBLE INSULATED CABLES
10. MAXIMUM DEMAND CALCULATION AND ALL CIRCUIT BREAKER SETTINGS WITHIN THIS DRAWING SET HAVE BEEN DERIVED FROM THE SITE POWER SYSTEM ANALYSIS FILE. (Refer "SP044\_LYTTON ROAD Power System Analysis and Protection Coordination.pdf")
11. CABLING TO GENERATOR CONNECTION SOCKET AND AUXILIARY SUPPLY SOCKET TO BE DOUBLE INSULATED. CABLING TO BE FULLY SEALED TO OTHER COMPARTMENTS



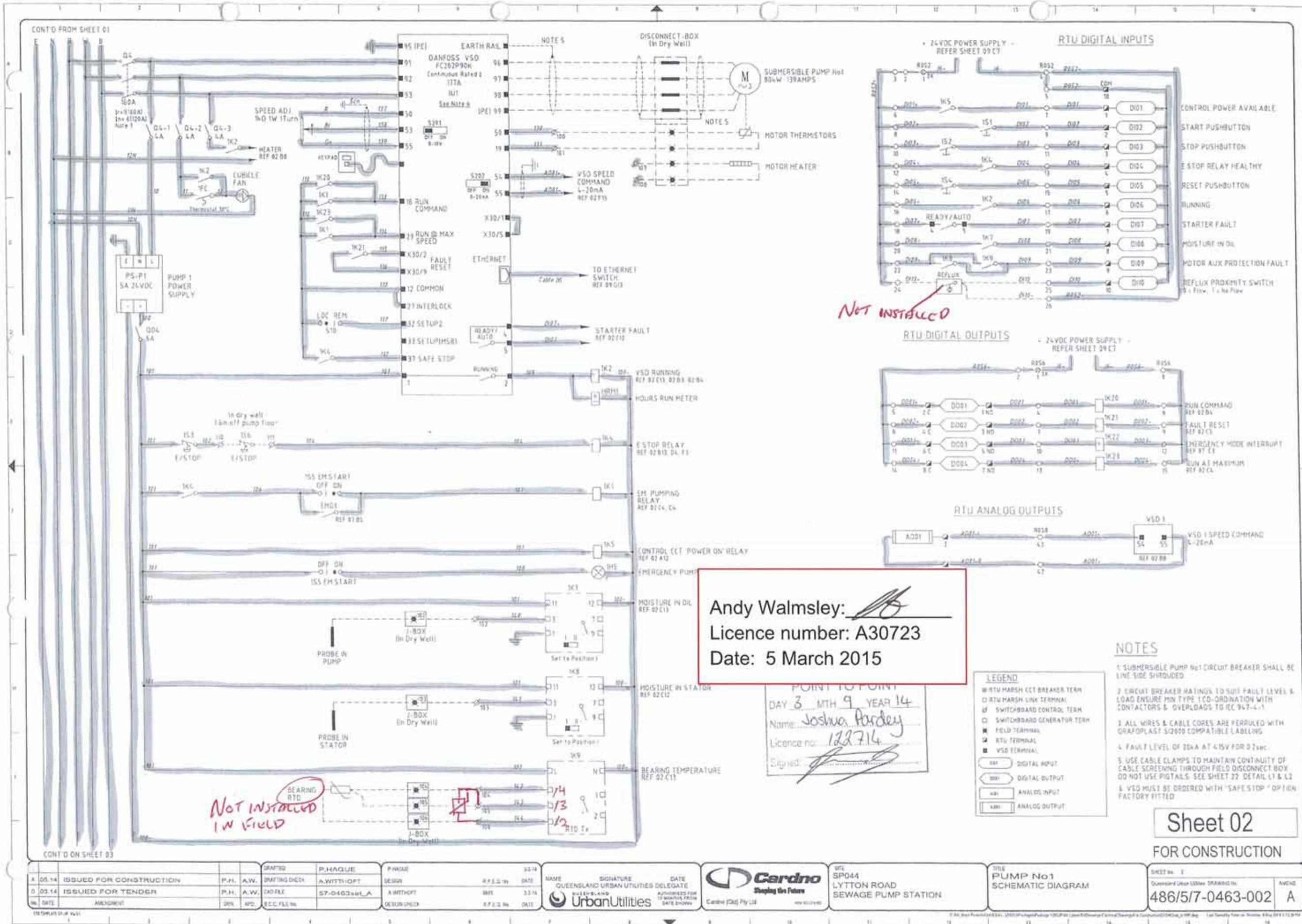
**POINT TO POINT**  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Parkley  
 Licence no. 122714  
 Signed: \_\_\_\_\_

Andy Walmsley: \_\_\_\_\_  
 Licence number: A30723  
 Date: 5 March 2015

Sheet 01

FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H.	A.W.	ISSUING CHECK	A.WITHOFT	DESIGN	R.F.E.D. No.	DATE	01-14	NAME	SIGNATURE	DATE	01-14	QUT	SP044	TITLE	POWER DISTRIBUTION SCHEMATIC DIAGRAM	SHEET No.	1	QUANTITIES	486/5/7-0463-001	AMEND.	A
ISSUED FOR TENDER	P.H.	A.W.	CAD FILE	57-0463-001_A	A.WITHOFT	REV	23-14	01-14	QUEENSLAND	Urban Utilities	AUTHORISED FOR	12 MONTHS FROM	DATE SHOWN	Cardno	Shopping the Future	Cardno (QNT) Pty Ltd	DATE	01-14	PROJECT	SP044	LYTTON ROAD SEWAGE PUMP STATION	



Andy Walmsley: *[Signature]*  
 Licence number: A30723  
 Date: 5 March 2015

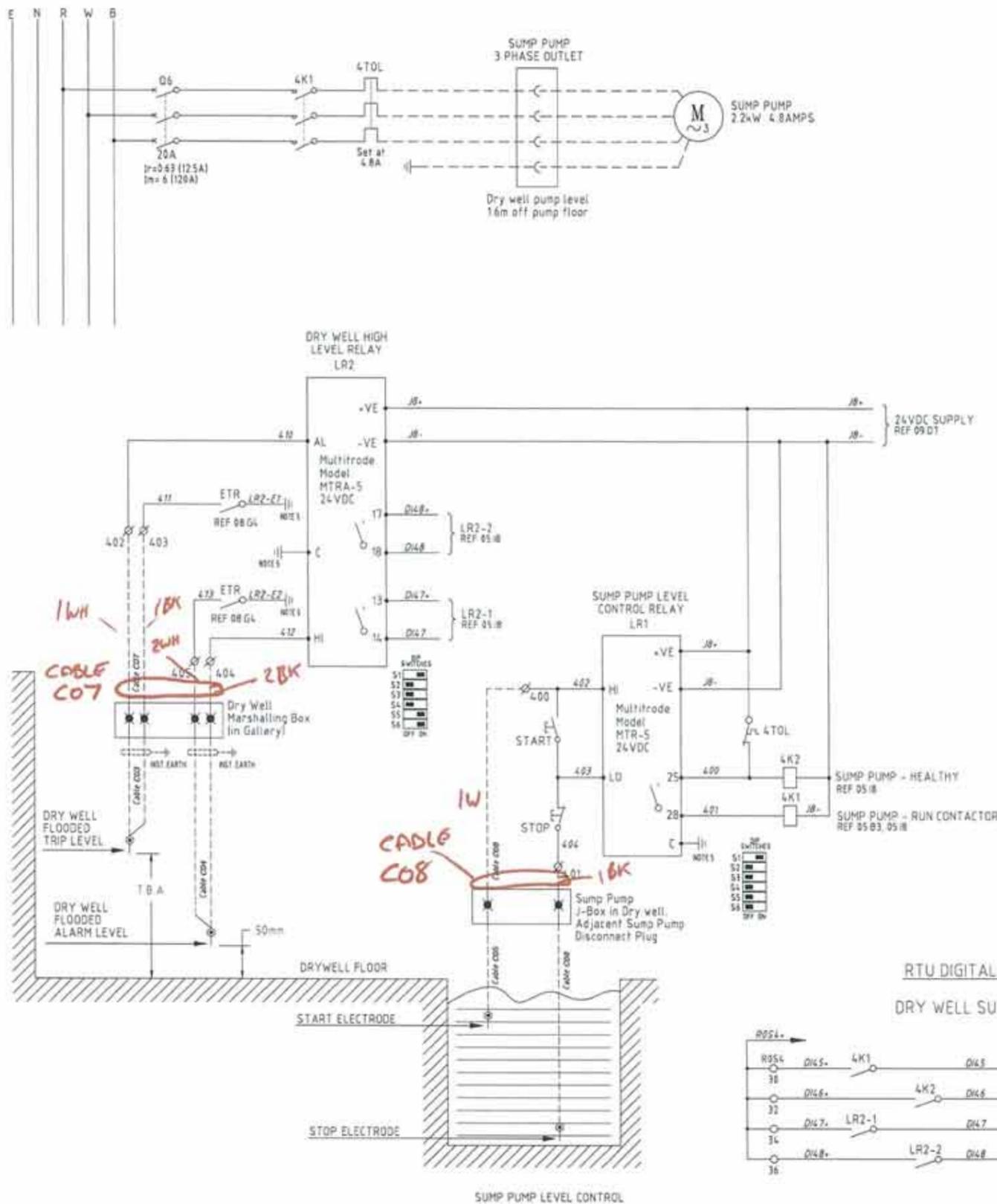
POINT TO POINT  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Pardey  
 Licence no: 122714  
 Signed: *[Signature]*

NOT INSTALLED  
 IN FIELD

Sheet 02  
 FOR CONSTRUCTION

REV	DATE	AMENDMENT	DRN	APP	REC FILE NO	DESIGN CHECK	P. HAGUE	DESIGN	DATE	NAME	SIGNATURE	DATE	TITLE	SHEET No.	QUANTITY	AWNS
A	05.14	ISSUED FOR CONSTRUCTION				SMITHING CHECK	P. HAGUE	DESIGN	30.11	NAME	SIGNATURE	DATE	TITLE	1		
B	03.14	ISSUED FOR TENDER				CAD FILE	P. HAGUE	DESIGN	30.11	NAME	SIGNATURE	DATE	TITLE			

CONT'D FROM SHEET 03



RESERVED  
EMERGENCY  
STORAGE  
DEWATERING  
PUMP

Andy Walmsley:   
Licence number: A30723  
Date: 5 March 2015

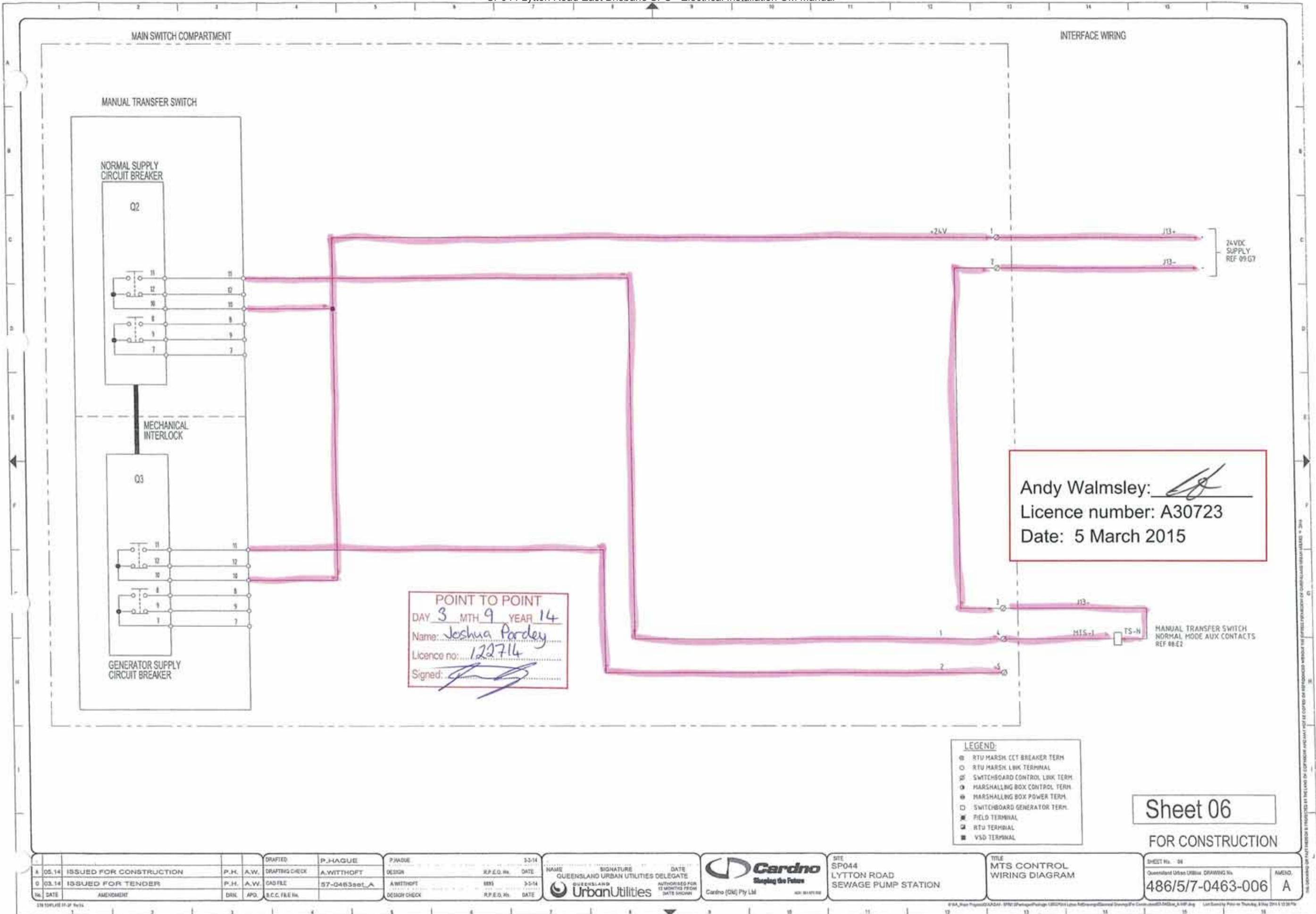
**LEGEND**

- ⊙ RTU MARSH. CCT BREAKER TERM
- RTU MARSH. LINK TERMINAL
- ⊕ SWITCHBOARD CONTROL TERM.
- SWITCHBOARD GENERATOR TERM.
- FIELD TERMINAL
- ⊠ RTU TERMINAL
- VSD TERMINAL
- DI1 DIGITAL INPUT
- DO1 DIGITAL OUTPUT
- AI1 ANALOG INPUT
- AO1 ANALOG OUTPUT

- NOTES**
- SUMP PUMP & STORAGE TANK DEWATERING PUMP CIRCUIT BREAKERS SHALL BE LINE SIDE SHROUDED
  - CIRCUIT BREAKER RATINGS TO SUIT FAULT LEVEL & LOAD ENSURE MIN TYPE 1 CO-ORDINATION WITH CONTACTORS & OVERLOADS TO IEC 947-4-1.
  - FAULT LEVEL OF 20kA AT 415V FOR 0.2sec
  - ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING
  - RUN SEPARATE DEDICATED EARTH CONDUCTORS TO EARTH BAR.

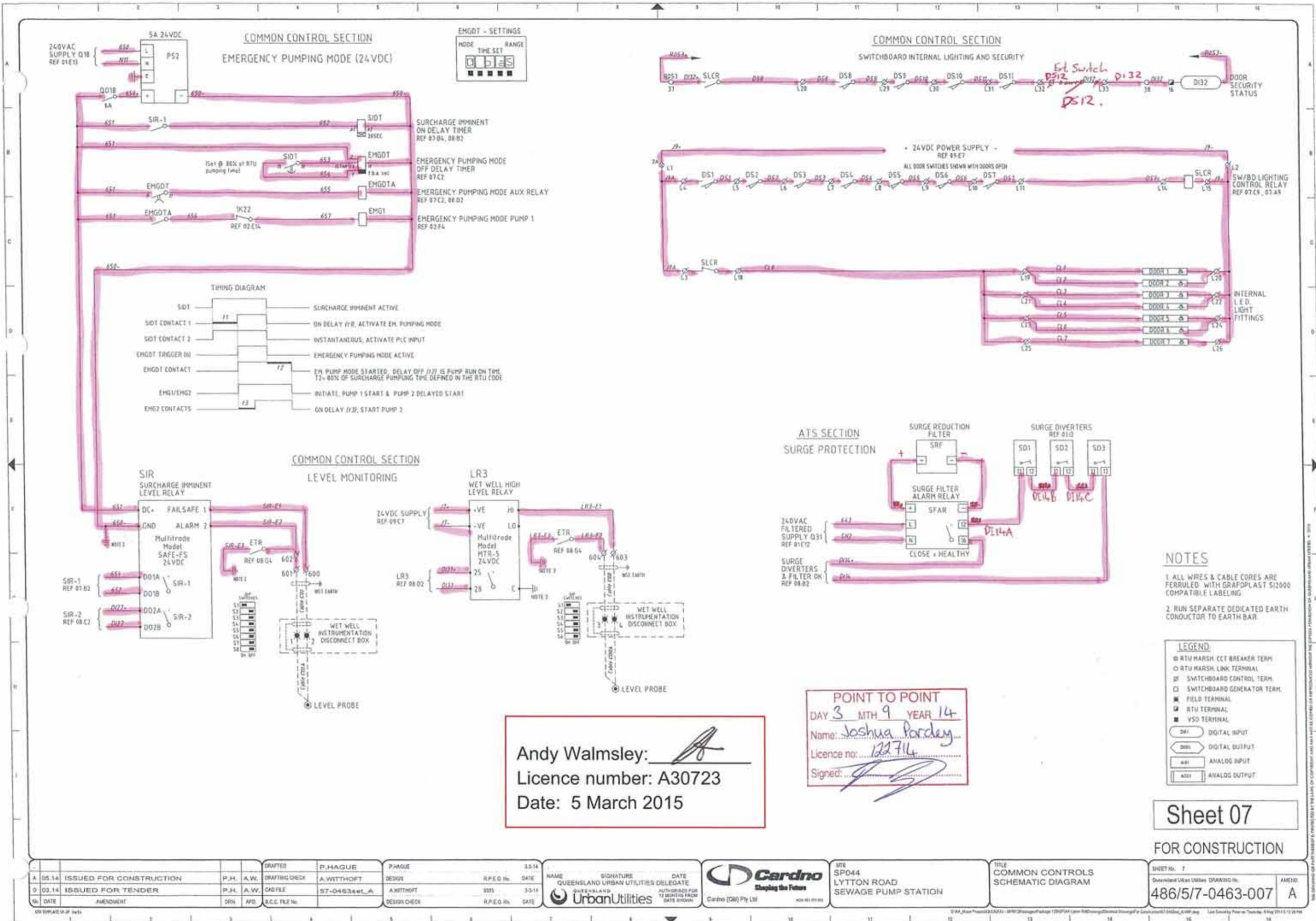
**Sheet 05**  
FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.G. No.	DATE	3-3-14	 Cardno (CQ) Pty Ltd	SITE: SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE: SUMP PUMPS SCHEMATIC DIAGRAM DRY WELL SUMP PUMP EM. STORAGE DEWATERING PUMP	SHEET No. 5 Queensland Urban Utilities DRAWING No. <b>486/5/7-0463-005</b>	AMEND: <b>A</b>
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	57-0463aot.A	A WITTHOFT	6895	3-3-14	NAME: QUEENSLAND URBAN UTILITIES DELEGATE SIGNATURE: DATE: AUTHORIZED FOR 12 MONTHS FROM DATE SHOWN					
AMENDMENT	DRN	APD	B.C.C. FILE No.	DESIGN CHECK	R.P.E.G. No.	DATE		 Urban Utilities	DATE: 05/03/2015 TIME: 10:00 AM	DRAWING No. 486/5/7-0463-005	SHEET No. 5	AMEND: A



Sheet 06  
FOR CONSTRUCTION

NO.	DATE	AMENDMENT	DRN.	APD.	S.C.C. FILE No.	DRAFTED	P.HAGUE	P.HAGUE	3-3-14	NAME	SIGNATURE	DATE	DESIGN	R.P.E.O. No.	DATE	NAME	SIGNATURE	DATE	SITE	TITLE	SHEET No.	AMEND.
1	05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	3-3-14	NAME	SIGNATURE	DATE	DESIGN	R.P.E.O. No.	DATE	NAME	SIGNATURE	DATE	SP044	MTS CONTROL WIRING DIAGRAM	06		
2	03.14	ISSUED FOR TENDER	P.H.	A.W.	CAD FILE	57-0463asL_A	DESIGN	3-5-14	NAME	SIGNATURE	DATE	DESIGN	R.P.E.O. No.	DATE	NAME	SIGNATURE	DATE	LYTTON ROAD SEWAGE PUMP STATION	MTS CONTROL WIRING DIAGRAM	06		
3																				486/5/7-0463-006	A	



Andy Walmsley:   
 Licence number: A30723  
 Date: 5 March 2015

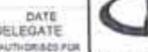
POINT TO POINT  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Pardey  
 Licence no: 122714  
 Signed: 

- NOTES**
- ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S1200 COMPATIBLE LABELLING
  - RUN SEPARATE DEDICATED EARTH CONDUCTOR TO EARTH BAR

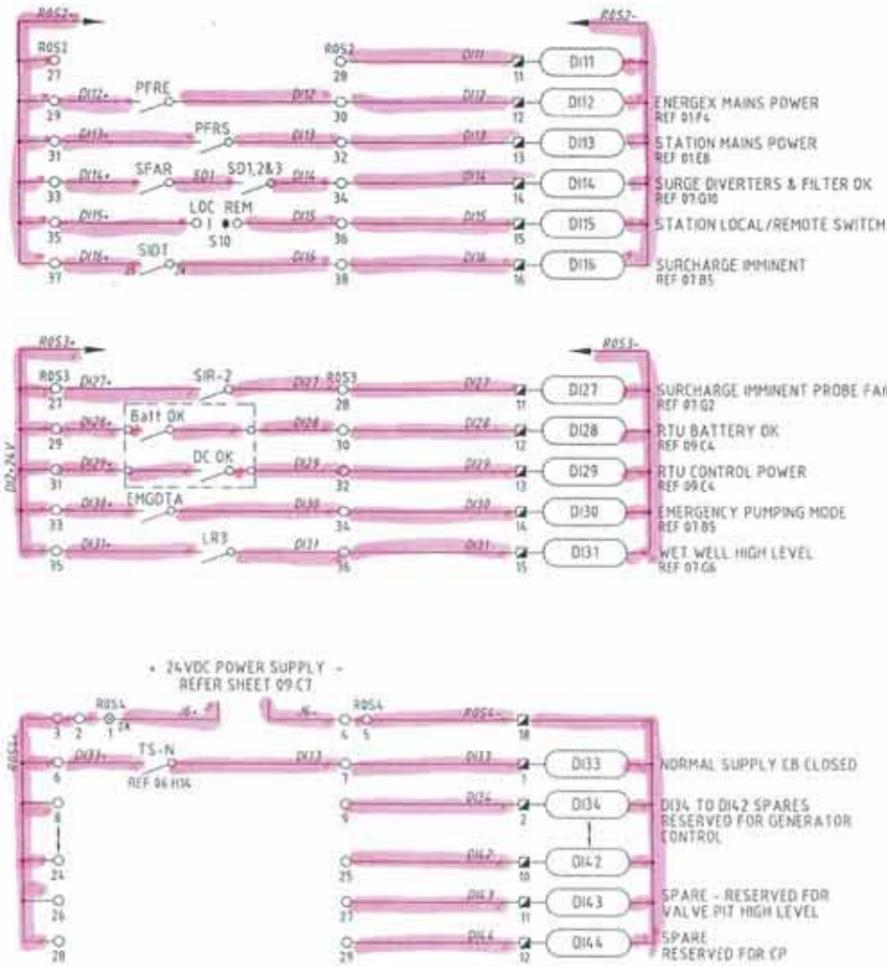
- LEGEND**
- RTU MARSH CCT BREAKER TERM
  - RTU MARSH LINK TERMINAL
  - SWITCHBOARD CONTROL TERM.
  - SWITCHBOARD GENERATOR TERM.
  - FIELD TERMINAL
  - RTU TERMINAL
  - VSD TERMINAL
  - DIGI DIGITAL INPUT
  - DIGO DIGITAL OUTPUT
  - ANIN ANALOG INPUT
  - ANOU ANALOG OUTPUT

Sheet 07

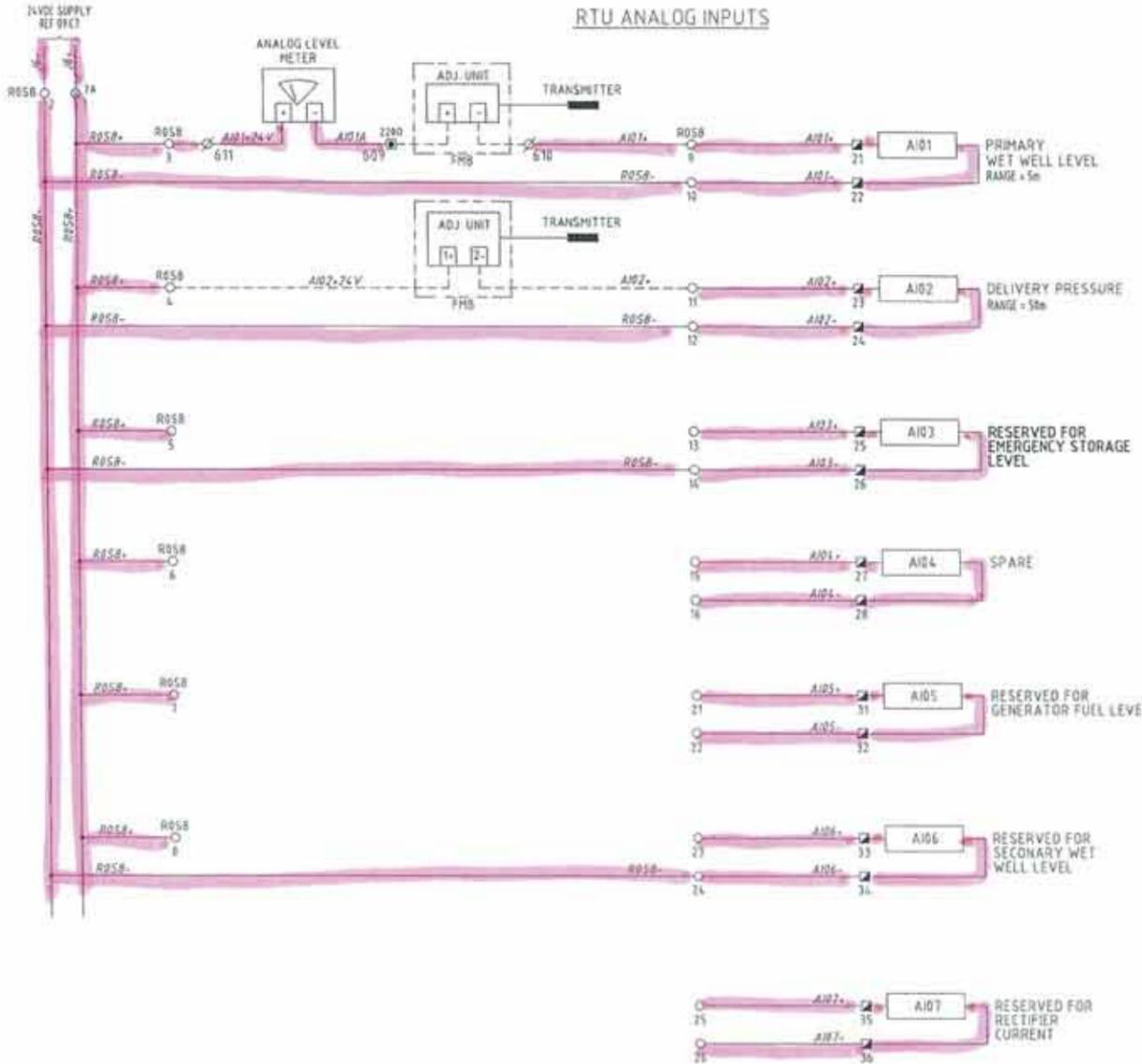
FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	P.HAGUE	P.HAGUE	R.P.E.D. No.	3-3-14	NAME	SIGNATURE	DATE	SP044	TITLE	SHEET No. 7
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	A.WITTHOFT	DESIGN	3-3-14	3-3-14	QUEENSLAND URBAN UTILITIES DELEGATE		122714	SP044	COMMON CONTROLS SCHEMATIC DIAGRAM	486/5/7-0463-007
AMENDMENT	DRN	APP	R.C.C. FILE No.	DESIGN CHECK	R.P.E.G. No.	DATE	UrbanUtilities	Cardno	122714	SP044	LYTTON ROAD SEWAGE PUMP STATION	AMEND. A

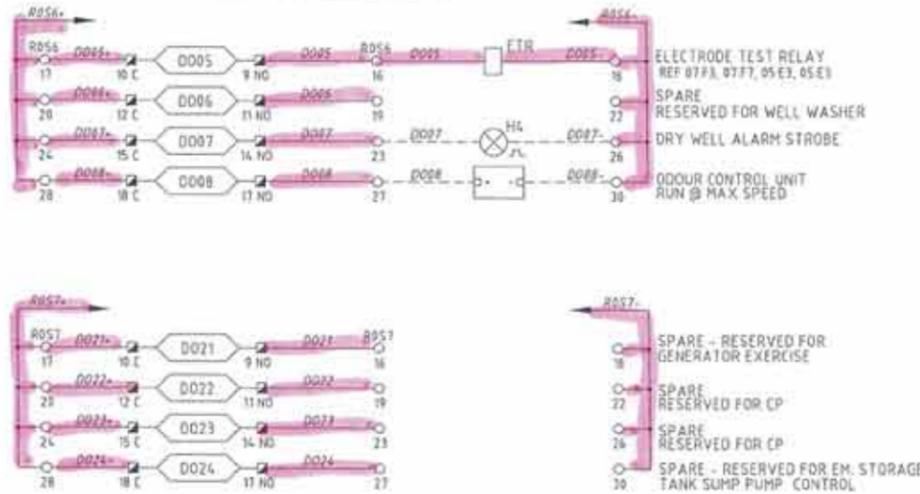
RTU DIGITAL INPUTS



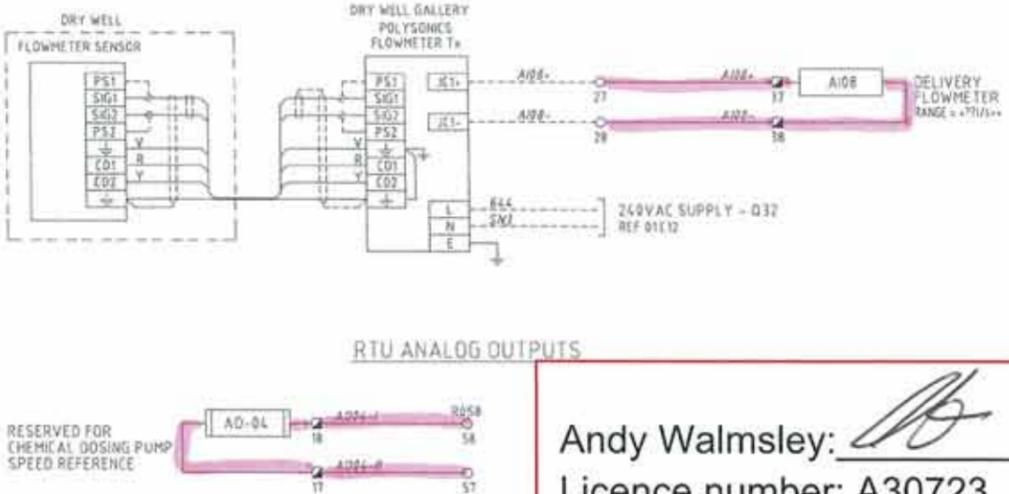
RTU ANALOG INPUTS



RTU DIGITAL OUTPUTS



RTU ANALOG OUTPUTS



POINT TO POINT  
 DAY 3 MTH 4 YEAR 12  
 Name: Joshua Parley  
 Licence no: 122714  
 Signed: [Signature]

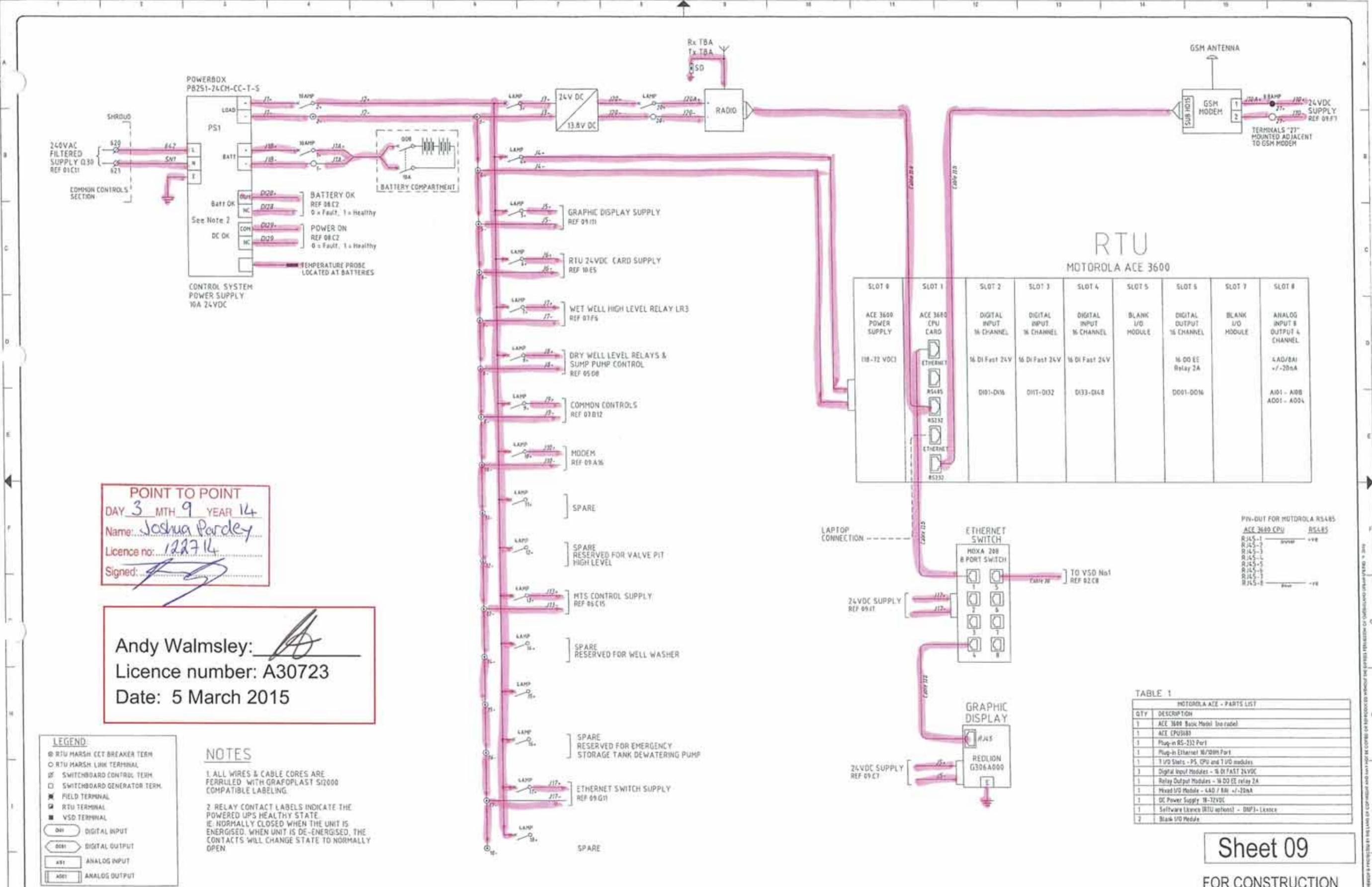
NOTES  
 1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST SIZ200 COMPATIBLE LABELING.

- LEGEND
- RTU MARSH ECT BREAKER TERM
  - RTU MARSH LINK TERMINAL
  - SWITCHBOARD CONTROL TERM
  - SWITCHBOARD GENERATOR TERM
  - ⊗ FIELD TERMINAL
  - ⊕ RTU TERMINAL
  - ⊖ COMPONENT TERMINAL
  - VSD TERMINAL
  - DI11 DIGITAL INPUT
  - DO11 DIGITAL OUTPUT
  - AI01 ANALOG INPUT
  - AO11 ANALOG OUTPUT

Andy Walmsley: [Signature]  
 Licence number: A30723  
 Date: 5 March 2015

Sheet 08  
 FOR CONSTRUCTION

4	05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.	DRAFTING CHECK	P.HAGUE	P.HAGUE	DESIGN	R.P.E.Q.No.	DATE	3-0-14	NAME	SIGNATURE	DATE	3-0-14	Cardno	SP044	COMMON RTU I/O SCHEMATIC DIAGRAM	SHEET No. 8	486/517-0463-008	A
0	03.14	ISSUED FOR TENDER	P.H.	A.W.	CAD FILE	57-0463seL_A	A.WITHOFT	DESIGN	8885	3-0-14	UrbanUtilities	QUEENSLAND URBAN UTILITIES DELEGATE	DATE	3-0-14	Cardno	SP044	COMMON RTU I/O SCHEMATIC DIAGRAM	AMEND.			



**POINT TO POINT**  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Pardey  
 Licence no: 122714  
 Signed: [Signature]

Andy Walmsley: [Signature]  
 Licence number: A30723  
 Date: 5 March 2015

**LEGEND**

- RTU MARSH CCT BREAKER TERM
- RTU MARSH LINK TERMINAL
- SWITCHBOARD CONTROL TERM
- SWITCHBOARD GENERATOR TERM
- FIELD TERMINAL
- RTU TERMINAL
- VSD TERMINAL

DIGI DIGITAL INPUT  
 DOIG DIGITAL OUTPUT  
 ANI ANALOG INPUT  
 AOI ANALOG OUTPUT

**NOTES**

1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST 512000 COMPATIBLE LABELING.

2. RELAY CONTACT LABELS INDICATE THE POWERED UPS HEALTHY STATE IE. NORMALLY CLOSED WHEN THE UNIT IS ENERGISED. WHEN UNIT IS DE-ENERGISED, THE CONTACTS WILL CHANGE STATE TO NORMALLY OPEN.

**RTU MOTOROLA ACE 3600**

SLOT #	SLOT 1	SLOT 2	SLOT 3	SLOT 4	SLOT 5	SLOT 6	SLOT 7	SLOT 8
ACE 3600 POWER SUPPLY (118-12 VDC)	ACE 3600 CPU CARD (ETHERNET, RS485, RS232, ETHERNET)	DIGITAL INPUT 16 CHANNEL (16 Di Fast 24V)	DIGITAL INPUT 16 CHANNEL (16 Di Fast 24V)	DIGITAL INPUT 16 CHANNEL (16 Di Fast 24V)	BLANK I/O MODULE	DIGITAL OUTPUT 16 CHANNEL (16 DO EE Relay 2A)	BLANK I/O MODULE	ANALOG INPUT 8 OUTPUT 4 CHANNEL (4 AD/8AI +/-20mA)

**PIN-OUT FOR MOTOROLA RS485**

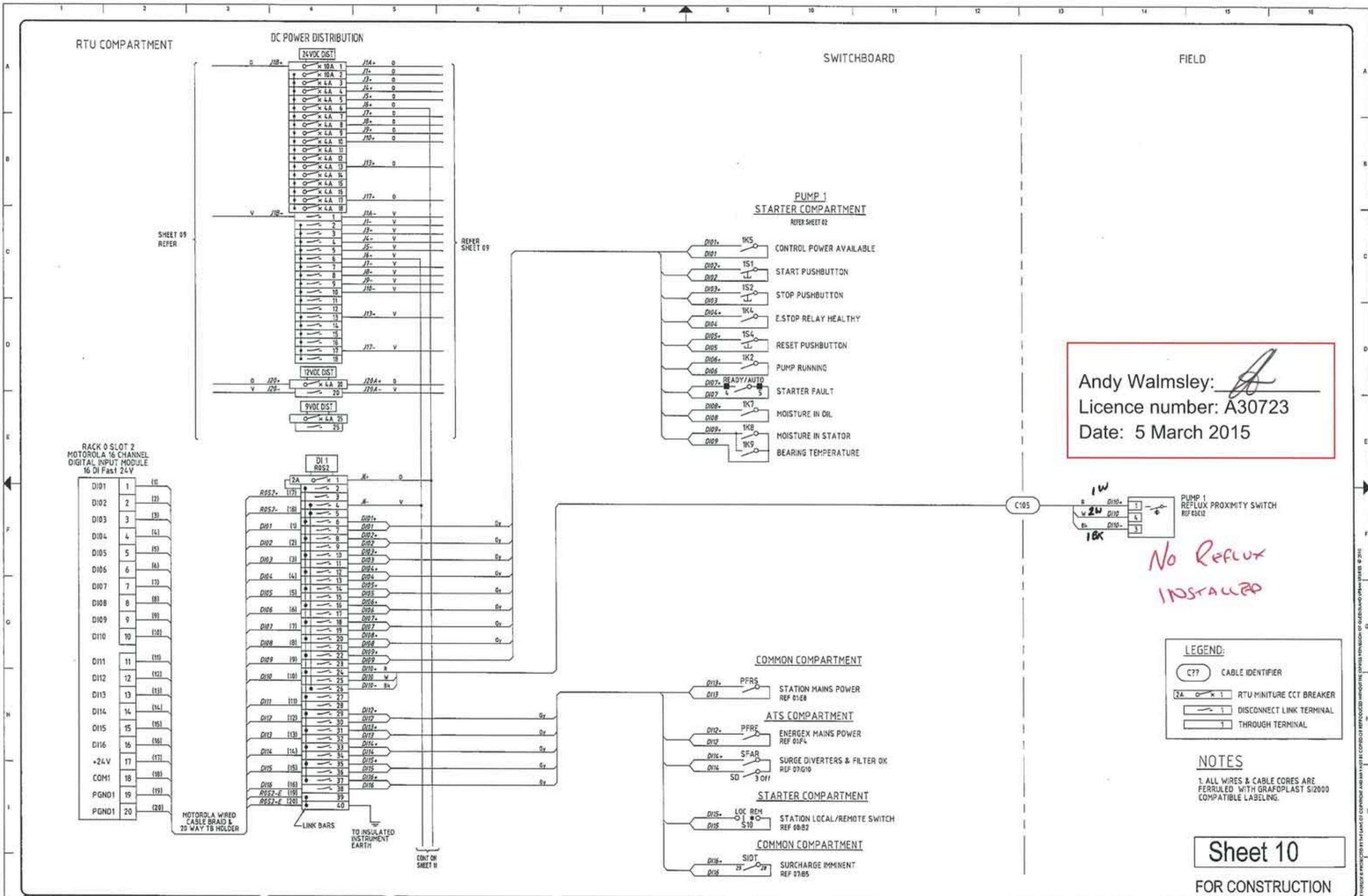
ACE 3600 CPU	RS485
RJ45-1	Driver +VE
RJ45-2	
RJ45-3	
RJ45-4	
RJ45-5	
RJ45-6	
RJ45-7	
RJ45-8	Driver -VE

**TABLE 1 MOTOROLA ACE - PARTS LIST**

QTY	DESCRIPTION
1	ACE 3600 Basic Model (no rack)
1	ACE CPU3600
1	Plug-in RS-232 Port
1	Plug-in Ethernet 10/100M Port
1	1 I/O Slots - PS, CPU and I/O modules
3	Digital Input Modules - 16 Di Fast 24VDC
1	Relay Output Modules - 16 DO EE relay 2A
1	Mixed I/O Module - 4AD / 8AI +/-20mA
1	DC Power Supply 18-12VDC
1	Software Licence (RTU options) - DM3+ Licence
2	Blank I/O Module

**Sheet 09**  
 FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	DRAFTED	P.HAGUE	P.HAGUE	3-3-14	NAME	SIGNATURE	DATE	3/3/14	SP044	RTU POWER DISTRIBUTION SCHEMATIC AND NETWORK DIAGRAM	SHEET No. 9
ISSUED FOR TENDER	DRAFTING CHECK	A.WITTHOFT	DESIGN	3-3-14	QUEENSLAND URBAN UTILITIES DELEGATE	[Signature]	3-3-14	3-3-14	LYTTON ROAD SEWAGE PUMP STATION	DRAWING No.	486/5/7-0463-009
	DESIGN CHECK	A.WITTHOFT	DESIGN CHECK		AUTHORIZED FOR 12 MONTHS FROM DATE SHOWN	[Signature]				AMEND	A



Andy Walmsley:   
 Licence number: A30723  
 Date: 5 March 2015

*No Reflux  
 INSTALL*

**LEGEND:**

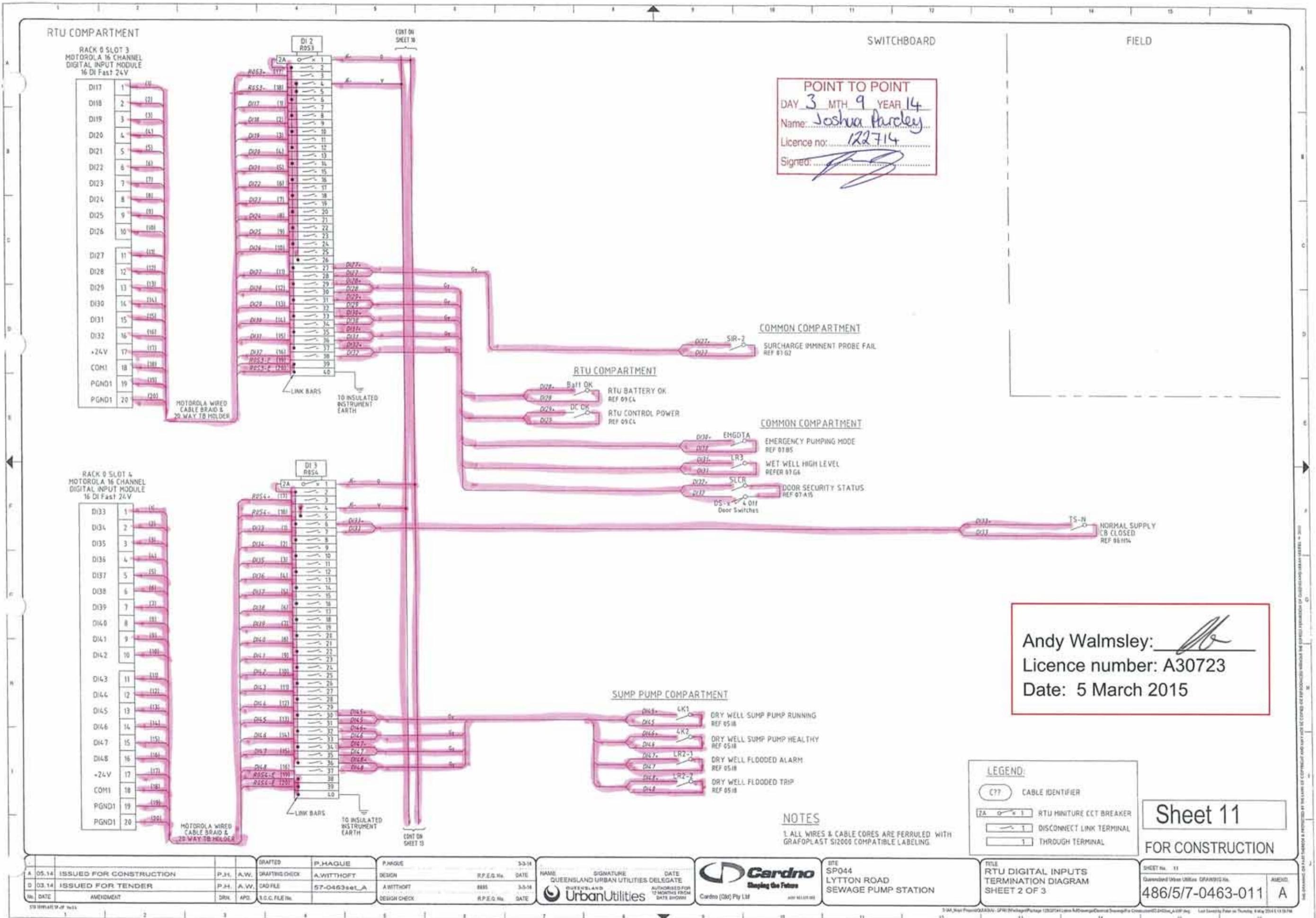
- C?? CABLE IDENTIFIER
- 2A x 1 RTU MINITURE CCT BREAKER
- 1 DISCONNECT LINK TERMINAL
- 1 THROUGH TERMINAL

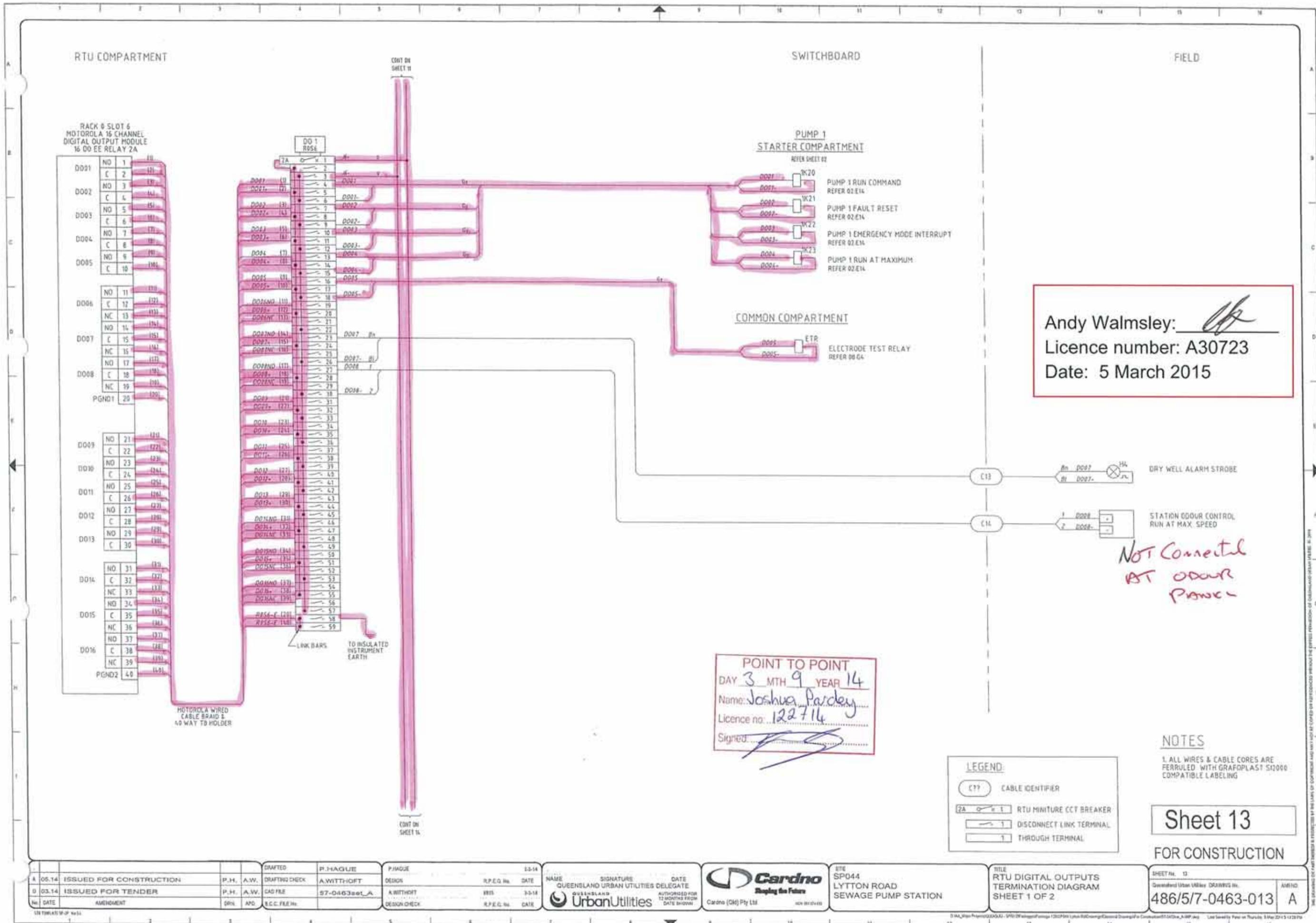
**NOTES**

1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S/2000 COMPATIBLE LABELING.

**Sheet 10**  
**FOR CONSTRUCTION**

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTED	P.HAGUE	P.HAGUE	3-3-14	 Cardno (Qld) Pty Ltd	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE RTU DIGITAL INPUTS TERMINATION DIAGRAM SHEET 1 OF 3	SHEET No. 10 Queensland Urban Utilities DRAWING No. 486/5/7-0463-010	AMEND. A
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	67-0463aeA	A.WITTHOFT	3-3-14					
AMENDMENT	DRN. APO.	B.C.C. FILE No.		DESIGN CHECK	R.P.E.Q. No. DATE	UrbanUtilities AUTHORIZED FOR 12 MONTHS FROM DATE SHOWN	© WA_Mgr_Power/01/03/11/SP044/Package/Package 1205/044 Lytton Road Sewage Pump Station/Construction/0463aeA_H07.dwg Last Saved: Four on Thursday 5 May 2014 1:10:22 PM			





Andy Walmsley: *[Signature]*  
 Licence number: A30723  
 Date: 5 March 2015

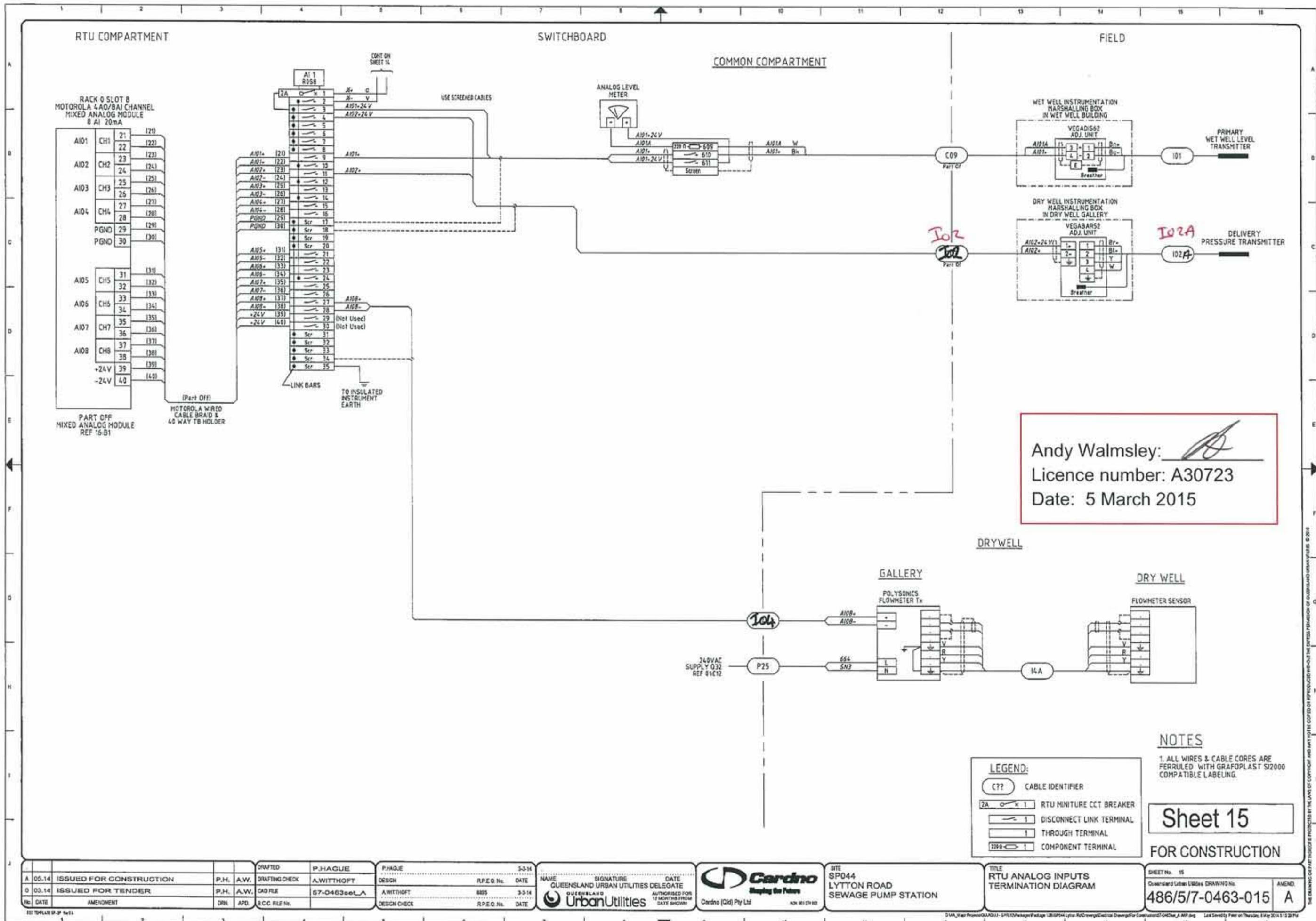
POINT TO POINT  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Pardey  
 Licence no: 122714  
 Signed: *[Signature]*

NOT Connected  
 AT ODOUR  
 POWER

NOTES  
 1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING

Sheet 13  
 FOR CONSTRUCTION

05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.G. No.	DATE	03-14	 Cardno (Qld) Pty Ltd	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE RTU DIGITAL OUTPUTS TERMINATION DIAGRAM SHEET 1 OF 2	SHEET No. 13 Queensland Urban Utilities (QUB)	AMEND: 486/5/7-0463-013 A
03.14	ISSUED FOR TENDER	P.H.	A.W.	CAD FILE	57-0463aet_A	A.WITTHOFT	885	3-3-14	 Urban Utilities					
No.	DATE	AMENDMENT	DRN	APD	S.C.C. FILE No.	DESIGN CHECK	R.P.E.G. No.	DATE						



**LEGEND:**

- C?? CABLE IDENTIFIER
- 2A x 1 RTU MINUTRE CCT BREAKER
- 1 DISCONNECT LINK TERMINAL
- 1 THROUGH TERMINAL
- 2200 1 COMPONENT TERMINAL

**NOTES**

1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING.

Sheet 15

FOR CONSTRUCTION

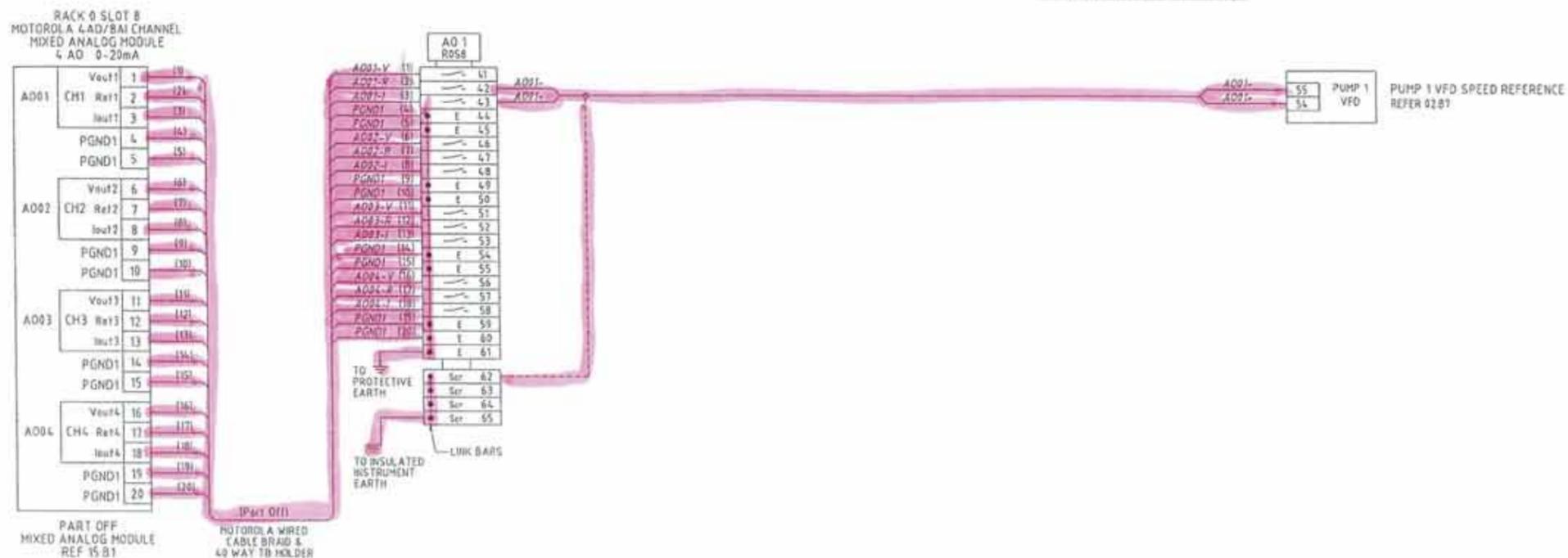
A 05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.	DRAFTING CHECK	A.WITTHOFT	P.HAGUE	3-3-14	<p>Cardno (Cik) Pty Ltd</p>	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE RTU ANALOG INPUTS TERMINATION DIAGRAM	SHEET No. 15 Queensland Urban Utilities DRAWING No. 486/5/7-0463-015	AMEND. A
0 03.14	ISSUED FOR TENDER	P.H.	A.W.	CAD FILE	67-0463seLA	DESIGN	R.P.E.Q. No.					
		DRN.	APD.	B.C.C. FILE No.		DESIGN CHECK	R.P.E.Q. No.					

RTU COMPARTMENT

SWITCHBOARD

FIELD

STARTER COMPARTMENT



Andy Walmsley:

Licence number: A30723

Date: 5 March 2015

POINT TO POINT  
DAY 3 MTH 9 YEAR 14  
Name: Joshua Pardey  
Licence no: 122714  
Signed:

**LEGEND:**

- C?? CABLE IDENTIFIER
- 2A x 1 RTU MINATURE CCT BREAKER
- DISCONNECT LINK TERMINAL
- THROUGH TERMINAL

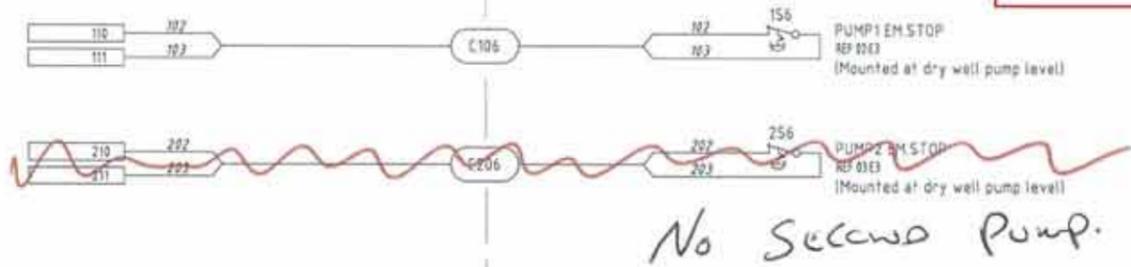
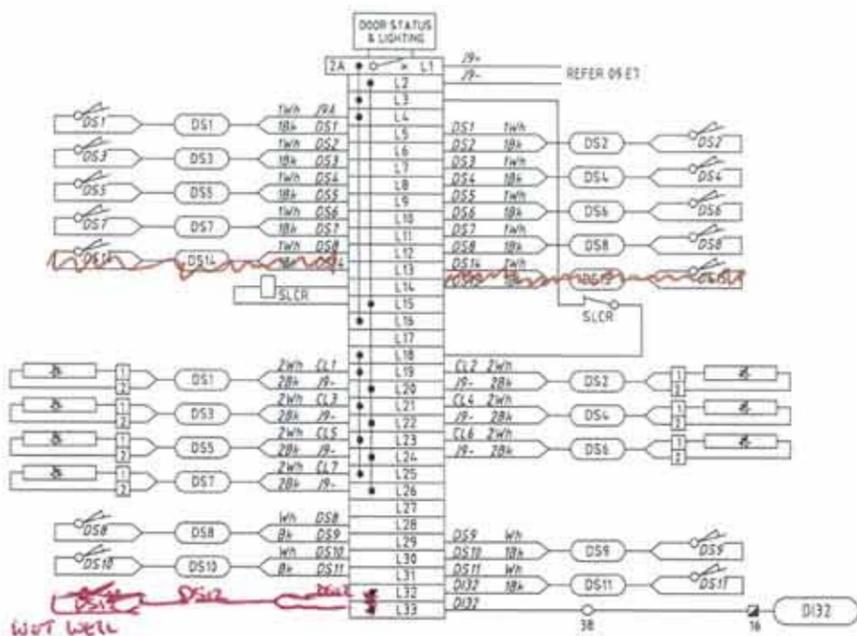
**NOTES**

1 ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST 512000 COMPATIBLE LABELING.

Sheet 16  
FOR CONSTRUCTION

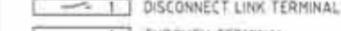
ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.G. No.	DATE	1-3-14	NAME	SIGNATURE	DATE	1-3-14	 Cardno (CN) Pty Ltd 401 84 41 000	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE RTU ANALOG OUTPUTS TERMINATION DIAGRAM	SHEET No. 16 Queensland Urban Utilities DRAWING No. 486/5/7-0463-016	AMCH: A
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	57-0463-016_A	A.WITTHOFT	MS	5-3-14	 QUEENSLAND UrbanUtilities	AUTHORIZED FOR 12 MONTHS FROM DATE SHOWN								

SWITCHBOARD INTERNAL LIGHTING AND SECURITY



Andy Walmsley:   
 Licence number: A30723  
 Date: 5 March 2015

**LEGEND:**

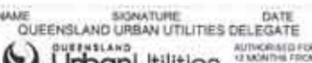
-  C?? CABLE IDENTIFIER
-  RTU MINITURE CCT BREAKER
-  DISCONNECT LINK TERMINAL
-  THROUGH TERMINAL

**NOTES**

1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING.

**Sheet 17**  
 FOR CONSTRUCTION

05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.	DRAFTING CHECK	P.HAGUE	P.HAGUE	3-3-14
03.14	ISSUED FOR TENDER	P.H.	A.W.	DAD FILE	A.WITTHOFT	DESIGN	3-3-14
		DRN	APD	S.C.C. FILE No	57-0463set_A	DESIGN CHECK	3-3-14

NAME: QUEENSLAND URBAN UTILITIES DELEGATE  
 SIGNATURE:   
 DATE: 3-3-14  
 AUTHORIZED FOR 12 MONTHS FROM DATE SHOWN

**Cardno**  
 Shaping the Future  
 Cardno (Qld) Pty Ltd

SITE: SP044  
 LYTTON ROAD  
 SEWAGE PUMP STATION

TITLE: COMMON CONTROLS  
 TERMINATION DIAGRAM

SHEET No. 17  
 Queensland Urban Utilities DRAWING No. 486/5/7-0463-017  
 AMEND: A

ITEM	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	OPT	REMARKS	ITEM	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	OPT	REMARKS	ITEM	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	OPT	REMARKS		
1	1	01 METERING ISOLATOR	SOCOMEQ	SLB 25AP	N		65	1	VSD RUNNING RELAY - K2	IDEC	RH4B-ULD-DC24V	-	+ SH4B-05	129						G		
2	1	MANUAL TRANSFER SWITCH	TERASAKI	MT550PE25033	F	Q2 In=0.95(237.5A) Char=6	66							131						S		
3		- TO SUIT MAIN SWITCHES Q2 & Q3 S400E/250	TERASAKI	Q3 - c/w 0NO FAULT PROT UNIT	F	Q3 In=0.8(200A) Char=4	67	1	PUMP EM STOP RELAY - K6	IDEC	RH4B-ULD-DC24V	-	+ SH4B-05	132	1	FLOWMETER TRANSMITTER	ABB	MAGMASTER	H		RANGE = +71%+-	
4	1	04 PUMP1 CIRCUIT BREAKER + TMS Handle	TERASAKI	S160G1/60	-	Set In=1(160A) In=6(120A)	68	1	PUMP CONTROL CCT POWER ON RELAY - K5	IDEC	RH4B-ULD-DC24V	-	+ SH4B-05	133	1	PRIMARY WET WELL LEVEL PROBE	VEGA - VEGAWELLS2	WLS2XXAA4MD100X	-		SET RANGE TO = 5m	
5							69							134	1	PRIMARY WET WELL LEVEL ADJUSTMENT UNIT	VEGA - VEGADIS42	DIS4200M5X	-			
6	1	06 DRYWELL SUMP PUMP CIRCUIT BREAKER + TMS Handle	TERASAKI	S125N1/20	E	Set In=0.83(12.5A) In=6(120A)	70	1	PUMP MOISTURE IN OIL RELAY - K7	PEPPER & FUCHS	KFA6-ER-16	A		135						G		
7	2	F10-12 - ENERGEX PHASE FAILURE - FAULT LIMITING FUSES	NHP	6AMP	-	FUSES & HOLDERS	71	1	PUMP MOISTURE IN STATOR RELAY - K8	PEPPER & FUCHS	KFA6-ER-16	B		136						-		
8							72	1	PUMP BEARING TEMPERATURE RELAY - K3	AS PER PUMP MANUFACTURE RECOMMENDATION		B		137	1	DELIVERY PRESSURE TRANSMITTER	VEGA VEGABARS2	BR52XXCAWHPMAS L=40	U		RANGE = 50m	
9	1	09 SUB-DISTRIBUTION BOARD CIRCUIT BREAKER	TERASAKI	S125N1/63	-	Set In=0.8(4.5A) In=6(120A)	73	1	PUMP RUN COMMAND RELAY - K20	IDEC	RH4B-ULD-DC24V	-	+ SH4B-05	138	1	TRICLOVE FITTING FOR VEGABARS2	VEGA	ADAPTOR L	U			
10	1	010 STATION MANS PHASE FAILURE CIRCUIT BREAKER	TERASAKI	DTC86300C	-		74	1	PUMP FAULT RESET RELAY - K21	IDEC	RH4B-ULD-DC24V	-	+ SH4B-05	139	1	CONTROL SYSTEM POWER SUPPLY 24VDC	POWERBOX	PB251A-24CM-CC-T-S	-			
11	1	011 SWITCHBOARD 15A GPO CIRCUIT BREAKER	TERASAKI	DSRCBH-6-30A	-		75	1	PUMP EMERGENCY MODE INTERRUPT RELAY - K22	IDEC	RH4B-ULD-DC24V	-	+ SH4B-05	140	1	RADIO 24V/19 BVDC CONVERTER	POWERBOX	PBH-2412J-CC	R			
12	1	012 RTU LAPTOP GPO CIRCUIT BREAKER	TERASAKI	DSRCBH-10-30A	-		76	1	PUMP 'RUN AT MAXIMUM' RELAY - K23	IDEC	RH4B-ULD-DC24V	-	+ SH4B-05	141								
13	1	013 DRY WELL/GALLERY LIGHTING CIRCUIT BREAKER	TERASAKI	DSRCBH-6-30A	E		77	1	PUMP START PUSHBUTTON - S1	SPRECHER & SCHUH	DTP-F3-PX10	-		142	2	BATTERIES - INCLUDING SPILL TRAYS	YUASA	UXH50-12	-			
14	1	014 DRY WELL VENT FAN CIRCUIT BREAKER	TERASAKI	DSRCBH-10-30A	E		78	1	PUMP STOP PUSHBUTTON - S2	SPRECHER & SCHUH	DTP-F4-PX10	-		143	1	RADIO	TRO	DR900-07A02-00	R			
15	1	015 GENERATOR AUXILIARY SUPPLY CIRCUIT BREAKER	TERASAKI	DSRCBH-10-30A	-		79	1	PUMP EM/STOP PUSHBUTTON - S3	SPRECHER & SCHUH	DTP-MT34-PX01S	-	c/w DT-15YE112 + PX01S	144	1	RADIO ANTENNA	TRO	YAD1ANT13AL	R		15 ELEMENT 130B ALUM	
16	1	016 EXTERNAL AREA FLOOD LIGHTING CIRCUIT BREAKER	TERASAKI	DSRCBH-6-30A	-		80	1	PUMP RESET PUSHBUTTON - S4	SPRECHER & SCHUH	DTP-F6-PX10	-		145	1	RADIO COAX SURGE PROTECTION UNIT	POLYPHASE CORPORATION	IS-50X-CC	R		Mounted on Din Rail	
17	1	017 SURGE FILTER CIRCUIT BREAKER	TERASAKI	DTC86110C	-		81	1	PUMP HOUR RUN METER - HRM	NHP	RQ480100BVDC	-	24VDC	146	1	TELEMETRY UNIT - REFER SHIT 9 FOR PARTS LIST	MOTOROLA	ACE - 3600	-		REFER TABLE 1 - SHIT 9	
18	1	018 EM PUMP CNTRL & SURCHARGE IMMINENT CB	TERASAKI	DTC86104C	-		82							147	1	GSM MODEM	WAVECOM	FASTRACK Supreme	I		c/w 1M Cable	
19	1	019 SPARE CIRCUIT BREAKER	TERASAKI	DTC86104C	-		83							148	1	GSM CELLULAR TRANSIT ANTENNA	RF INDUSTRIES	TLA2000	I			
20	1	020 GALLERY 3 PHASE OUTLET CIRCUIT BREAKER	TERASAKI	DTC86320C	-	PLUS DSRCBH-32-30N	84							149	1	ETHERNET 8 PORT SWITCH	MOXA	EDS-208	-			
21	1	021 BUILDING INTERNAL LIGHTING CIRCUIT BREAKER	TERASAKI	DSRCBH-6-30A	-		85							150	1	GRAPHIC DISPLAY	REDUON	G06A000	-			
22	1	022 GALLERY 10A GPO'S CIRCUIT BREAKER	TERASAKI	DSRCBH-10-30A	-		86	1	DRY WELL SUMP PUMP RUN CONTACTOR - K1	SPRECHER & SCHUH	CAT-16	E	24VDC COIL	151								
23	1	023 BUILDING 10A GPO'S CIRCUIT BREAKER	TERASAKI	DSRCBH-10-30A	-		87	1	DRY WELL SUMP PUMP THERMAL OVERLOAD RELAY	SPRECHER & SCHUH	CT7-24-6	E		152								
24	1	024 BUILDING EXTERNAL LIGHTING CIRCUIT BREAKER	TERASAKI	DSRCBH-6-30A	-		88	1	DRY WELL SUMP PUMP HEALTHY RELAY - K2	IDEC	RH4B-ULD-DC24V	E	+ SH4B-05	153	1	INTERNAL COAX CABLE (Radio to Lightning Arrester)	TRO	TRO - SHAM/VM/TL23	R		Cable No X01	
25	1	026 GANTRY CRANE SUPPLY CIRCUIT BREAKER	TERASAKI	DTC86320C	E		89	1	DRY WELL SUMP PUMP START PUSHBUTTON	SPRECHER & SCHUH	DTP-F3-PX10	E		154	1	EXTERNAL COAX CABLE (Lightning Arrester to Aerial)	RF INDUSTRIES	ANDREW - CNT400	R		Cable No X02	
26	1	027 ODOUR CONTROL SUPPLY CIRCUIT BREAKER	TERASAKI	DTC86320C	N		90	1	DRY WELL SUMP PUMP STOP PUSHBUTTON	SPRECHER & SCHUH	DTP-F4-PX01	E		155	2	COAX PLUG (For CNT400 cable)	PULSE	N-203HS	R		Straight cable plug crimp	
27							91	1	LRI - DRY WELL SUMP PUMP LEVEL RELAY	MULTIRODE	MTR-5	E	24VDC	156	1	U CLAMPS	RF INDUSTRIES	UNV	R			
28							92	1	LRS - DRY WELL LEVEL RELAY	MULTIRODE	MTR-5	E	24VDC	157	1	MINIATURE THERMAL CIRCUIT BREAKER	PHOENIX CONTACT	TCP-YA - UNM5/C	-		'y' = AMP Rating	
29							93	1	LRS - WET WELL HIGH LEVEL RELAY	MULTIRODE	MTR-5	-	24VDC	158	1	THROUGH TERMINALS (Grey & Blue as Required)	PHOENIX CONTACT	PT 25	-		PT 25-BU (for -ve)	
30							94							159	1	DISCONNECT TERMINALS (Grey & Blue as Required)	PHOENIX CONTACT	PT 25-MT	-		PT 25-MT-BU (for -ve)	
31	2	PUMP 24VAC CONTROL CIRCUIT BREAKER	TERASAKI	DTC86104C	-	Q1-1, Q4-2, Q4-3	95							160	1	GROUP MARKER (ARRIER / PLUG-IN BRIDGE)	PHOENIX CONTACT	UBE / FBS	-			
32	2	24VDC CONTROL CIRCUIT BREAKER	TERASAKI	DTC86104C	-	Q04, Q01B	96	1	SIR - SURCHARGE IMMINENT LEVEL RELAY	MULTIRODE	SAFE-PS	-	24VDC	161	1	COMPONENT CONNECTOR c/w 220 Ohm RESISTOR	PHOENIX CONTACT	P-CO	-		+ Disconnect Terminal Block	
33	1	BATTERY SHORT CCT PROTECTION CIRCUIT BREAKER	TERASAKI	DTC86210C	-	Q08	97	1	EMERGENCY PUMPING MODE RELAY (PUMP) - EMG1	IDEC	RH4B-ULD-DC24V	-	+ SH4B-05	162	1	TEST PLUG	PHOENIX CONTACT	PS-5	-			
34	2	240VAC-24VDC CONTROL POWER SUPPLY - PS-P1, P2	WEIDMULLER	8951040000	-	12W 5A/24VDC	98	1	SURCHARGE IMMINENT DELAY TIMER - S101	SPRECHER & SCHUH	RZ1-PS 4U V23	-	ON DELAY / INSTANTANEOUS	163	1	COVER PROFILE (SHROUDED) + CARRIER PLATE	PHOENIX CONTACT	AP-2 + AP2-TU	-		AS REQUIRED	
35							99	1	EMERGENCY PUMPING MODE TIMER - EMG0T	OMRON	H3CA-A (1-PZCF-11)	-	1-Y2A-L80 1 OFF DELAY	164	1							
36	1	DISTRIBUTION BOARD CHASSIS	TERASAKI	CD-2-30/18-3U	-		100							165								
37	2	F1-3 - SURGE DIVERTER CIRCUIT FUSES	NHP	63AMP HRC	-	FUSES & HOLDERS	101	2	EMERGENCY PUMPING MODE SWITCH & LIGHT - SS/HS	SPRECHER & SCHUH	DTP-SM25-D7-NBY	-	+ DT-X10 IZL ENGRAVE 'OFF ON'	166								
38	1	SURGE DIVERTER	CRITEC	TDS1100-25R-27T	-		102	1	EMERGENCY PUMPING MODE AUX RELAY - EMG0TA	IDEC	RH4B-ULD-DC24V	-	+ SH4B-05	167	2	ENERGEX PADLOCK - 45mm brass pin humber	H.A. REED LOCKSMITHS	KEY No 325 & S/S Shackle	-		c/w 2 KEYS	
39	1	SURGE FILTER ALARM RELAY - SFAR	CRITEC	DAR-275V	-		103	1	MTS AUX RELAYS - TS-N	IDEC	RH4B-ULD-DC24V	F	+ SH4B-05	168								
40	1	SURGE REDUCTION FILTER - SRF	CRITEC	TDF-10A-240V	-		104							169								
41-42	2	ENERGEX/STATION PHASE FAILURE RELAY - PFRE / PFRS	CARLO GAVAZZI	DP861CH48W4	-		105							170	2							
43							106							171								
44							107							172								
45-46	2	MAIN NEUTRAL LINK + MAIN EARTH LINK	CLIPSAL	BP4H12 + BP4H12	-	+ BP16SF (Neutral)	108							173	Lot	S/STEEL FITTINGS AS DETAILED FOR PRESSURE TX.	FITTINGS	STAINLESS STEEL	U		Sheet 24	
47-48	2	DIST. BD NEUTRAL LINK + DIST. BD EARTH LINK	CLIPSAL	BP16S030	-	+ BP16SF (Neutral)	109							174	#	EARTH ROD CONNECTION BOXES	NESCO	ERB1	-		Quantity as Required	
49	1	SURGE DIVERTER NEUTRAL LINK	CLIPSAL	LSA	-	INSULATED	110							175	#	LINE TAPS - BONDING TO EARTHING ROD	CLIPSAL	BP26	-		Quantity as Required	
50	1	INSTRUMENT EARTH LINK	CLIPSAL	L13/25A	-	INSULATED	111							176	#	EARTHING RODS	COPPER ROD	16mm Dia 3000mm Lth	-		Quantity as Required	
51	1	FILTERED SUPPLY NEUTRAL LINK	CLIPSAL	LT	-	INSULATED	112							177	1	16A 3pin OUTLET - FOR DRY WELL SUMP PUMP	MENNEKES	Socket-116, Plug - 282	E		IP67	
52	1	3 PHASE SWITCHED OUTLET 20A	CLIPSAL	56CA20	-	ON GALLERY LEVEL	113							178	2	PUMP FIELD EM/STOP STATION - S6	SPRECHER & SCHUH	D11YH1 - I2) DTPX01S	E		c/w DT-15YE112	
53	1	1 PHASE OUTLET 15A	CLIPSAL	15/15-900 (SHROUD)	-	ON INTERNAL BUILDING WALL	114							179	1	DRY WELL VENT FAN ISOLATOR	CLIPSAL	56SW10	E			
54	1	LAPTOP GPO - TWIN 10A	CLIPSAL	25+449A+449AP	-		115	1	SW/BD LIGHTING CONTROL RELAY - SLCR	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05	180	1	GENTRY CRANE ISOLATOR	CLIPSAL	56SW332	E			
55	1	1 PHASE OUTLET - GENERATOR ANCLLARY POWER	CLIPSAL	56S0310 IP56	SF	Generator Plug Connection Zone	116	1	BUILDING INTERNAL LIGHTING SWITCH - S13	CLIPSAL	56SSW2/10	-	Located at building entry	181	2	IP56 JUNCTION BOX - FOR DRY WELL LEVEL PROBES	POLYCARBONATE	To Suit - c/w Terminals	E		Mounted in drywell	
56	1	SEQUENTIAL CONNECTING BOX - GENERATOR POWER	POWERLOCK-NRG	PBX-SL-PO-AU-100	SF	c/w Sealed Lid	117	1	DRY WELL/GALLERY LIGHTING SWITCH - S12	CLIPSAL	56SSW10	-	Located at gallery entry	182	4	DRY WELL FLURO FITTINGS	PERLITE - PWP236H	TWIN 36W W/PROOF	E		High Impact Resistant	
57	1	CUBICLE FAN THERMOSTAT	NHP	PZK0100	-	10 - +64°C	118	1	STATION LOCAL/REMOTE SWITCH - S10	KRAUS & NAMER	CAD11-A722-600-F72-F758	-	ENGRAVE 'LOCAL REMOTE'	183	2	10A GPO's - GALLERY LEVEL	CLIPSAL	56C30	E		Gallery Level	
58	1	VSD CUBICLE VENTILATION FAN + FILTER GRILL	COSMOTEC	GKV_2501020	-	360M3/hr	119	1	ELECTRODES TEST RELAY - ETR	IDEC	RH4B-ULD-DC24V	-	+ SH4B-05	184	1	ALARM STROBE LIGHT	MOFLASH	X195-02WH	E		24VDC	
59	1	PUMP VARIABLE SPEED DRIVES	DANFOSS	Model NafC202P90KT4E3AHTTxxxxxxxANBKxxxxDx	c/w Safe Stop		120							185	6	SINGLE POINT PROBES	MULTIRODE	4 eff - 020130FSP-Shield	-		2 eff - 0.2/1-'X' (1 core)	
60	1	REMOTE KEYPAD MOUNTING KIT	DANFOSS	1308107	-	c/w 5mtr CONNECTION CABLE	121	1	WET WELL LEVEL INDICATOR	CROMPTON INSTRUMENTS	244-01WS-HG-IP-SR - 4-25mA	-	0-100% ADJ RED POINTER	186	1	PUMP REFLEX VALVE PROXIMITY SWITCH	PEPPER & FUCHS	N120-UH-E2	C		+ support stand & J-boxes	
61	1	SPEED POTENTIOMETERS 1/20 TW 1 Turn	NHP	DTP-P0T3	-	c/w 1/20 TW 1 Turn POT.	122	1	SW/BD DOOR MICRO SWITCHES	OMRON	Z-1SGW2 55 B	-	11 OFF N/O	187	1	BUILDING EXTERNAL FLOOD LIGHT	PERLITE	HPP0MAX1 - 100W	-		LED Flood Light	
62							123	1	SW/BD INTERNAL LED LIGHTS	LUMFA	LF1B-C35-2THW4	-	See Construction Details Shit 21	188	1	GALLERY INTERNAL FLOOD FITTINGS	PERLITE - PWP236H	TWIN 36W W/PROOF	-		High Impact Resistant</	

CABLE No.	STATUS	SIZE	CORES	TYPE	LENGTH (m)	FROM	TO	CABLE FUNCTION	NOTES
P01	NEW	10mm <sup>2</sup>	4C	PVC/CLUPVC - Naked		EMERGENCY SUPPLY PILLAR No BT1062	Switchboard Metering Isolator	Increasing Mains Supply	Refer Note 2 for Cable Protection
E01	NEW	25mm <sup>2</sup>	3C	Building Wire		Switchboard	Earths Trainers	Main Earth	Loop to Earth Earth Stake as Required
P05	NEW	50mm <sup>2</sup>	3C+1	Screened/Sheathed VSD		Switchboard - Pump No1 VSD	Pump No1 Disconnect Box in Dry Well	Pump 1 Motor Feed	
P06	EXISTING	50mm <sup>2</sup>	3C+1-2zap	Flexible (Submersible)		Pump No1 (Disconnect) Box in Dry Well	Pump No1	Pump 1 Motor Feed Isolators	
P11	NEW	25mm <sup>2</sup>	3C+1	PVC/CLUPVC		Switchboard	Dry Well Sump Pump Job Outlet	Dry Well Sump Pump Motor	
P14	NEW	25mm <sup>2</sup>	3C+1	PVC/CLUPVC		Dry Well Sump Pump Job Outlet	Dry Well Sump Pump	Dry Well Sump Pump Motor	
P12	NEW	15mm <sup>2</sup>	2C+E	PVC/CLUPVC		Switchboard	Dry Well/Gallery Lighting	Dry Well/Gallery Lighting	Light Switch Located at Dry Well Entry
P13	NEW	25mm <sup>2</sup>	2C+E	PVC/CLUPVC		Switchboard	Dry Well Vent Fan Isolator	Vent Fan	Mount Isolator 16 mtrs off pump floor
P14	NEW	25mm <sup>2</sup>	2C+E	PVC/CLUPVC		Dry Well Vent Fan Isolator	Dry Well Vent Fan	Vent Fan	Mount Isolator 16 mtrs off pump floor
P15	NEW	15mm <sup>2</sup>	4C+1	PVC/CLUPVC		Switchboard	Door Control Unit	Door Control Unit Power Supply	
P16	NEW	25mm <sup>2</sup>	3C+E	PVC/CLUPVC		Switchboard	Delivery Flowmeter TX	Delivery Flowmeter Power Supply	In Dry Well Gallery
P17	NEW	25mm <sup>2</sup>	2C+E	PVC/CLUPVC		Switchboard	1A GPO - Gallery	Gallery 1 Phase 1A GPO	
P18	NEW	4mm <sup>2</sup>	3C+E	PVC/CLUPVC		Switchboard	2A 3 Phase Outlet - Gallery	Gallery 2 Phase 2A Outlet	
P19	NEW	15mm <sup>2</sup>	2C+E	PVC/CLUPVC		Switchboard	External Flood Light	External Flood Lighting	
P20	NEW	15mm <sup>2</sup>	2C+E	PVC/CLUPVC		Switchboard	1A 1 Phase GPO - Wet Well Building	Wet Well Building 1 Phase 1A GPO's	
P21	NEW	25mm <sup>2</sup>	2C+E	PVC/CLUPVC		Switchboard	Wet Well Building Internal Lights	Wet Well Building Internal Lighting	
P22	NEW	15mm <sup>2</sup>	2C+E	PVC/CLUPVC		Switchboard	External Lights	External Building Lighting	
P23	NEW	15mm <sup>2</sup>	2C+E	PVC/CLUPVC		Switchboard	Pump 1 Aux Terminals in Dry Well TDB	Pump 1 Motor Thermostats - Aux Protection	
P101	EXISTING	15mm <sup>2</sup>	3C	Insulated (Submersible)		Pump 1 Aux Terminals in Dry Well TDB	Pump No1	Pump 1 Motor Thermostats - Aux Protection	
P102	NEW	15mm <sup>2</sup>	3C	RID cable		Pump 1 Aux Terminals in Dry Well TDB	Pump 1	Pump 1 Bearing Temperature RTD	
P103	NEW	15mm <sup>2</sup>	11triple	Insulated		Switchboard	Pump 1 Reflux Valve	Pump 1 Reflux Valve Assembly Switch	
P104	NEW	15mm <sup>2</sup>	3C	PVC/CLUPVC		Switchboard	Pump 1 Field Emergency Stop Button	Pump 1 Field Emergency Stop	
<p>Andy Walmsley: </p> <p>Licence Number: A30723</p> <p>Date: 5 March 2015</p>									
E01	NEW	15mm <sup>2</sup>	2C	Vendor-02198SP-Shield		Wet Well Instrumentation Marshalling Box	Surcharge Inminent Probe	Surcharge Inminent Signal (SR)	
E02	NEW	15mm <sup>2</sup>	2C	Vendor-02198SP-Shield		Wet Well Instrumentation Marshalling Box	Wet Well High Level Probe	Wet Well Level Signal (LR)	
E03	NEW	15mm <sup>2</sup>	2C	Vendor-02198SP-Shield		Dry Well Instrumentation Marshalling Box	Dry Well Flooded Trip Level Probe	Dry Well Trip Level Signal (RT)	
E04	NEW	15mm <sup>2</sup>	2C	Vendor-02198SP-Shield		Dry Well Instrumentation Marshalling Box	Dry Well Flooded Alarm Level Probe	Dry Well Alarm Level Signal (RAT)	
E05	NEW	15mm <sup>2</sup>	2C	Vendor		Dry Well Sump Pump Stop/Start Probes J-Box	Dry Well Sump Pump Level Start Probe	Dry Well Sump Pump Level Central (RST)	
E06	NEW	15mm <sup>2</sup>	2C	Vendor		Dry Well Sump Pump Stop/Start Probes J-Box	Dry Well Sump Pump Level Stop Probe	Dry Well Sump Pump Level Central (RST)	
E07	NEW	15mm <sup>2</sup>	2C	Insulated		Switchboard	Dry Well Instrumentation Marshalling Box	Dry Well Station Level Probes	
E08	NEW	15mm <sup>2</sup>	2C	Insulated		Switchboard	Dry Well Sump Pump Stop/Start Probes J-Box	Dry Well Sump Pump Stop/Start Probes	
E09	NEW	15mm <sup>2</sup>	2C	Insulated		Switchboard	Wet Well Instrumentation Disconnection Box	Wet Well Instrumentation	
E10	NEW	15mm <sup>2</sup>	2C	PVC/CLUPVC		Switchboard	Dry Well Alarm Strobe	Alarm Strobe	
E11	NEW	15mm <sup>2</sup>	2C	Insulated		Switchboard	Status Door Control Unit	Door Control - Run @ Max Speed	
E12	NEW	15mm <sup>2</sup>	2C	Vendor		Wet Well Instrumentation Marshalling Box	Wet Well Level Sensor	Primary Wet Well Level	Jet Excess Length - See Note 3
E13	NEW	15mm <sup>2</sup>	2C	Vendor		Dry Well Instrumentation Marshalling Box	Delivery Pressure Transmitter	Delivery Pressure	Unshielded/Insulated
E14	NEW	15mm <sup>2</sup>	1Pr	Insulated		Switchboard	Delivery Flowmeter TX	Delivery Flowmeter 4-20mA Signal	
E15	NEW	15mm <sup>2</sup>	1Pr	Vendor		Delivery Flowmeter TX	Delivery Flowmeter Sensor	Delivery Flowmeter	Flowmeter Power Supply & Signals
E16	NEW			Ethernet		Switchboard - Ethernet Switch	Switchboard - VSD Not	Ethernet Cables	
E17	NEW			Ethernet		Switchboard - Ethernet Switch	Graphic Display/Modem/Router/RTU	Communications	
E18	NEW			Vendor		Switchboard - Radio	Aerial Gas Surge Protector	Radio Communications	
E19	NEW			DF100		Aerial Gas Surge Protector	Aerial	Radio Communications	

ISSUED FOR CONSTRUCTION	ISSUED FOR TENDER	AMENDMENT	GRAFTED: P.HAGUE	P.HAGUE	DESIGN	DATE	3-3-14	NAME: QUEENSLAND URBAN UTILITIES DELEGATE	SIGNATURE: 	DATE: 3-3-14		SITE: SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE: CABLE SCHEDULE	SHEET No: 19	486/5/7-0463-019	A
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Sheet 19  
FOR CONSTRUCTION

- NOTE:
- THE CONTRACTOR IS RESPONSIBLE IN DETERMINING THE ACTUAL CABLE LENGTHS REQUIRED ON SITE.
  - PROTECT THE MAINS CABLE USING PVC SHEATHED FLEXIBLE METAL CONDUIT SUCH AS 'ADAPT AFLEX' FROM 150mm Min WITHIN THE PVC MAINS CONDUIT CAST IN THE SLAB UP TO THE GLAND PLATE. TERMINATE USING PROPRIETARY GLAND. SEAL AROUND CABLE AT EXIT POINT OF CONDUIT TO PREVENT INGRESS OF VERMIN. PROVIDE ADEQUATE EXCESS FOR RE-TERMINATION.
  - ALLOW SUFFICIENT LENGTH ON CABLE TO ALLOW FOR REMOVAL OF PROBE AND CONDUIT EXCESS LENGTH TO BE STORED IN ELECTRODE BOX.
  - EARTH ELECTRODES: EARTH ELECTRODES SHALL BE LENGTHS OF 190mm x 3000mm COPPER CLAD EXTENSIBLE EARTHING RODS. DRIVEN TO A DEPTH SUCH THAT THE REQUIRED RESISTANCE IS OBTAINED.
  - EQUIPOTENTIAL BONDING: ALL CABLE LADDER RUNS, METAL PANELS, FRAMEWORK, SUPPORTS AND FLOORING SHALL BE ELECTRICALLY CONTINUOUS THROUGHOUT AND BE BONDED TO THE MAIN EARTH BAR.
  - SEPARATION: CABLE INSTALLATION TO MAINTAIN REQUIRED SEPARATION BETWEEN POWER AND INSTRUMENT/SIGNAL CABLES. SEE SHEET 73.

ITEM #	DPT	DESCRIPTION - INTERNAL LABEL	LABEL 1	LABEL 2 (IF NECESSARY)	TEXT HEIGHT	MATERIAL / COLOUR
81	H	METERING ISOLATOR	CT METERING ISOLATOR ONLY 250A		15mm	ABS PLASTIC W/B
82		ENERDEX SUPPLY	NORMAL SUPPLY MAIN SWITCH 250A		15mm	ABS PLASTIC W/B
83		GENERATOR SUPPLY	GENERATOR SUPPLY MAIN SWITCH 250A		15mm	ABS PLASTIC W/B
84/85		PUMP CIRCUIT BREAKER	PUMP No1 180A	PUMP No2 180A	15mm	ABS PLASTIC W/B
86	E	DRY WELL SUMP PUMP CIRCUIT BREAKER	DRY WELL SUMP PUMP 25A		15mm	ABS PLASTIC W/B
87		ENERDEX PHASE FAILURE FAULT LIMIT FUSES	F10-F12 1A	FED FROM LINE SIDE OF MAIN SWITCH	4mm	ABS PLASTIC W/B - R/W
88						
89		SUB-DISTRIBUTION BOARD CB	SUB-DISTRIBUTION BOARD 63A		15mm	ABS PLASTIC W/B
90		PHASE FAILURE CIRCUIT BREAKER	STATION PHASE FAILURE RELAY Q11		4mm	ABS PLASTIC W/B
91		1 PHASE OUTLET CIRCUIT BREAKER	1# SWND 15A GPO Q11		4mm	ABS PLASTIC W/B
92		RTU LAPTOP CIRCUIT BREAKER	RTU LAPTOP GPO Q12		4mm	ABS PLASTIC W/B
93	E	DRY WELL/GALLERY LIGHTING CCT BREAKER	DRY WELL LIGHTING Q13		4mm	ABS PLASTIC W/B
94	E	DRY WELL VENT FAN CIRCUIT BREAKER	DRY WELL VENT FAN Q14		4mm	ABS PLASTIC W/B
95		GENERATOR ANCLARY SUPPLY CB	GENERATOR ANCLARY SUPPLY Q15		4mm	ABS PLASTIC W/B
96		EXT. AREA LIGHTING CIRCUIT BREAKER	FLOOD LIGHTING Q16		4mm	ABS PLASTIC W/B
97		SURGE FILTER CIRCUIT BREAKER	SURGE FILTER Q17	Mounted On DB (outside)	4mm	ABS PLASTIC W/B
98		EM PUMP CONTROL & SB CIRCUIT BREAKER	EM PUMPING C&T & SB Q18		4mm	ABS PLASTIC W/B
99		SPARE CIRCUIT BREAKER	SPARE Q19		4mm	ABS PLASTIC W/B
100		3 PHASE OUTLET CIRCUIT BREAKER	GALLERY 3# OUTLET Q20		4mm	ABS PLASTIC W/B
101	E	BUILDING INTERNAL LIGHTING CCT BREAKER	BUILDING INT LIGHTING Q21		4mm	ABS PLASTIC W/B
102	E	GALLERY 1# GPO'S CIRCUIT BREAKER	GALLERY GPO'S Q22		4mm	ABS PLASTIC W/B
103	E	BUILDING 1# GPO'S CIRCUIT BREAKER	BUILDING GPO'S Q23		4mm	ABS PLASTIC W/B
104	E	BUILDING EXTERNAL LIGHTING CCT BREAKER	BUILDING EXT LIGHTING Q24		4mm	ABS PLASTIC W/B
105	E	GANTRY CRANE SUPPLY CIRCUIT BREAKER	GANTRY CRANE Q25		4mm	ABS PLASTIC W/B
106	H	ODOUR CONTROL SUPPLY CIRCUIT BREAKER	ODOUR CONTROL Q27		4mm	ABS PLASTIC W/B
107						
108						
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144						
145-146		MAIN NEUTRAL & EARTH LINKS	MAIN NEUTRAL	MAIN EARTH	4mm	ABS PLASTIC W/B
147-148		SUB-BOARD NEUTRAL & EARTH LINKS	NEUTRAL	EARTH	4mm	ABS PLASTIC W/B
149		SURGE DIVERTER NEUTRAL LINK	SURGE DIVERTER NEUTRAL		4mm	ABS PLASTIC W/B
150		INSTRUMENT EARTH LINK	INSTRUMENT EARTH		4mm	ABS PLASTIC W/B
151		FILTERED SUPPLY NEUTRAL LINK	FILTERED SUPPLY NEUTRAL		4mm	ABS PLASTIC W/B
152		LAPTOP SPD ONLY	LAPTOP SPD ONLY		4mm	ABS PLASTIC W/B
153	SF	GENERATOR 240VAC CONNECTION SOCKET	GENERATOR ANCLARY SUPPLY CONNECTION	(Mounted in Generator Plug Connection (compartment))	4mm	ABS PLASTIC W/B
154	SF	GENERATOR POWER CONNECTION SOCKET	GENERATOR CONNECTION	(Mounted in Generator Plug Connection (compartment))	4mm	ABS PLASTIC W/B
155		PUMP VARIABLE SPEED DRIVE	PUMP No1 VSD		6mm	ABS PLASTIC W/B
156		PUMP VSD KEYPAD	PUMP No1		6mm	ABS PLASTIC W/B
157		PUMP MANUAL SPEED CONTROL	PUMP 1 SPEED		6mm	ABS PLASTIC W/B
158		EMERGENCY PUMPING RELAY	EM1		4mm	ABS PLASTIC W/B
159		VSD RUNNING RELAY	RS2		4mm	ABS PLASTIC W/B
160						
161						
162						
163						
164						
165						
166						
167						
168						
169						
170						
171	A	PUMP MOISTURE IN OIL	WT		4mm	ABS PLASTIC W/B
172	B	PUMP MOISTURE IN STATOR	WS		4mm	ABS PLASTIC W/B
173	B	PUMP BEARING TEMPERATURE	WT		4mm	ABS PLASTIC W/B

ITEM #	DPT	DESCRIPTION - INTERNAL LABEL	LABEL 1	LABEL 2 (IF NECESSARY)	TEXT HEIGHT	MATERIAL / COLOUR
73		PUMP RUN COMMAND RELAY	NR0		4mm	ABS PLASTIC W/B
74		PUMP FAULT RESET RELAY	NR1		4mm	ABS PLASTIC W/B
75		PUMP EMERGENCY MODE INTERRUPT RELAY	NR2		4mm	ABS PLASTIC W/B
76		PUMP RUN AT MAXIMUM RELAY	NR3		4mm	ABS PLASTIC W/B
77		PUMP START PUSHBUTTON	START		4mm	ABS PLASTIC W/B
78		PUMP STOP PUSHBUTTON	STOP		4mm	ABS PLASTIC W/B
79		PUMP EM STOP PUSHBUTTON	low label supplied with P/B (after)		4mm	Y/B
80		PUMP RESET PUSHBUTTON	FAULT RESET		4mm	ABS PLASTIC W/B
81		PUMP HOURS RUN METER	HOURS RUN		4mm	ABS PLASTIC W/B
82						
83						
84						
85						
86	E	DRY WELL SUMP PUMP RUN CONTACTOR	LR1		4mm	ABS PLASTIC W/B
87	E	DRY WELL SUMP PUMP TOL	LR2		4mm	ABS PLASTIC W/B
88	E	DRY WELL SUMP PUMP HEALTHY RELAY	LR3		4mm	ABS PLASTIC W/B
89	E	DRY WELL SUMP PUMP START PUSHBUTTON	START		4mm	ABS PLASTIC W/B
90	E	DRY WELL SUMP PUMP STOP PUSHBUTTON	STOP		4mm	ABS PLASTIC W/B
91	E	DRY WELL SUMP PUMP STOP/START LEVEL RELAY	DRY WELL SUMP PUMP (C&T) - L&T		4mm	ABS PLASTIC W/B
92	E	DRY WELL LEVEL RELAY	DRY WELL HIGH LEVEL - L&T		4mm	ABS PLASTIC W/B
93		WET WELL HIGH LEVEL RELAY	WET WELL HIGH LEVEL - L&T		4mm	ABS PLASTIC W/B
94						
95						
96		SURCHARGE IMMINENT LEVEL RELAY	WET WELL SURCHARGE IMMINENT - SB		4mm	ABS PLASTIC W/B
97		EMERGENCY PUMPING MODE PUMP 1 RELAY	EM01		4mm	ABS PLASTIC W/B
98		SURCHARGE IMMINENT ON DELAY TIMER	SOT		4mm	ABS PLASTIC W/B
99		EMERGENCY PUMPING MODE OFF DELAY TIMER	EMODT		4mm	ABS PLASTIC W/B
100						
101		EMERGENCY PUMPING MODE START SWITCH	EMERGENCY PUMPING MODE		4mm	ABS PLASTIC W/B
102		EMERG. PUMPING MODE OFF DELAY AUX RELAY	EMODTA		4mm	ABS PLASTIC W/B
103	F	MTS - AUX RELAY	TS-H		4mm	ABS PLASTIC W/B
104						
105		SWITCHBOARD LIGHTING CONTROL RELAY	SLCR		4mm	ABS PLASTIC W/B
106						
107						
108		STATION LOCAL/REMOTE SELECTOR SWITCH	STATION CONTROL MODE	(Label + Red with White Lettering)	4mm	ABS PLASTIC R/W
109		ELECTRODS TEST RELAY	ETR		4mm	ABS PLASTIC W/B
110						
111						
112						
113						
114						
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116						
117						
118						
119						
120						
121		WET WELL LEVEL INDICATOR	WET WELL LEVEL		4mm	ABS PLASTIC W/B
122						
123						
124						
125						
126						
127						
128						
129						
130						
131						
132	H	DELIVERY FLOWMETER TRANSMITTER	DELIVERY FLOWMETER		4mm	ABS PLASTIC W/B
133	T	WET WELL PRIMARY LEVEL ADJ UNIT	PRIMARY WET WELL LEVEL (located in PSB)		4mm	ABS PLASTIC W/B
134						
135						
136						
137	U	DELIVERY PRESSURE ADJ. UNIT	DELIVERY PRESSURE (located in PSB)		4mm	ABS PLASTIC W/B
138						
139		CONTROL SYS 240VAC/24VDC POWER SUPPLY	CONTROL SYSTEM 24VDC POWER SUPPLY		4mm	ABS PLASTIC W/B
140	R	RADIO 24V/12VDC CONVERTER	24/12 VDC CONVERTER - RADIO		4mm	ABS PLASTIC W/B
141						
142						
143	R	RADIO	RADIO		4mm	ABS PLASTIC W/B
144						
145	R	RADIO COAX SURGE PROTECTION	RADIO SURGE PROTECTION		4mm	ABS PLASTIC W/B
146						
147	T	MODEM	MODEM		4mm	ABS PLASTIC W/B

Andy Walmsley:   
 Licence Number: A30723  
 Date: 5 March 2015

ITEM #	DPT	DESCRIPTION - INTERNAL LABEL	LABEL 1	LABEL 2 (IF NECESSARY)	TEXT HEIGHT	MATERIAL / COLOUR
		TERMINAL HEADER	24VDC POWER DISTRIBUTION	DIGITAL INPUTS DI 1	4mm	ABS PLASTIC W/B
		TERMINAL HEADER	DIGITAL INPUTS DI 2	DIGITAL INPUTS DI 3	4mm	ABS PLASTIC W/B
		TERMINAL HEADER	DIGITAL OUTPUTS DO 1	DIGITAL OUTPUTS DO 2	4mm	ABS PLASTIC W/B
		TERMINAL HEADER	ANALOG INPUTS AI 1	ANALOG OUTPUTS AO 1	4mm	ABS PLASTIC W/B
		HEADER LABELS (Above DB Circuit Breakers)	NON FILTERED SUPPLY	FILTERED SUPPLY	6mm	ABS PLASTIC W/B
		HEADER LABEL (Inner Section)	MEN BEHIND		6mm	ABS PLASTIC W/B
		HEADER LABEL (Over Terminals 600-610)	LEVEL TX AND LEVEL PROBES		4mm	ABS PLASTIC W/B
		HEADER LABEL (Over Shrouded Terminals)	WARNING 24VAC		4mm	ABS PLASTIC R/W
199		STATION CLASS LABEL (On Escutcheon)	"C" CLASS STATION	(Refer Escutcheon Layout Detail)	15mm	ABS PLASTIC Y/B
200						
201	E	HEADER LABEL (Over pushbutton)	DRY WELL SUMP PUMP		6mm	ABS PLASTIC W/B
202	F	GENERATOR CONNECTION SOCKET	MAX LOAD - 350A		4mm	ABS PLASTIC R/W
203						
204						
205						
206		METER PANEL WARNING SIGN	(DUPLICATE LABELS 'X' & 'Y')	(MOUNT INSIDE METER BOX ADJACENT METERS)	6mm	ABS PLASTIC W/B
207						
208		MAIN SWITCH WARNING LABEL (Mount Label over Normal & Generator main switches)	WARNING THIS BOARD MAY BE SUPPLIED FROM 2 SOURCES ISOLATE BOTH NORMAL SUPPLY CB AND GENERATOR SUPPLY CB BEFORE WORKING ON THIS SWITCHBOARD.		6mm	ABS PLASTIC R/W
209						

EXTERNAL DOOR LABEL LIST

LABEL	TEXT	TEXT HEIGHT	PAINT FILL LETTERING	QTY
A	SP044	25mm	Black	1
B	RTU	10mm	Black	1
C	PUMP 1 CONTROL	10mm	Black	1
D	THIS SITE IS MONITORED BY THE CONTROL ROOM. PLEASE INFORM THE OPERATOR BEFORE ISOLATING PUMPS OR STATION	8mm	Black	2
E	PLEASE CHECK THAT THE STATION IS IN REMOTE MODE BEFORE LEAVING SITE	8mm	Black	1
F	COMMON CONTROL	10mm	Black	1
G	SUPPLY AUTHORITY METERING ISOLATOR	10mm	Black	1
H	METERING CT's	10mm	Black	1
I	MAIN SWITCHES	10mm	Black	1
J	DISTRIBUTION BOARD	10mm	Black	1
K				
L				
M				
N	GENERATOR PLUG CONNECTIONS	10mm	Black	1
O	BATTERIES	10mm	Black	1
P	SUPPLY AUTHORITY METERING - (ON METER BOX)	10mm	Black	1
Q	DANGER L&V	10mm	Red	1
R	DANGER - POSSIBLE 2 SOURCES OF SUPPLY (ABS PLASTIC - RED)	10mm		

**CONSTRUCTION - EXTERNAL SWITCHBOARD**

Cubicle construction 3mm Marine grade Aluminium (5251).  
 Plinth construction 80x40 channel 6061 T6 Grade Aluminium.  
 Folded, "Pulse MIG" & "TIG" welded with all visible seams and joints fully welded, free from splatter and ground smooth where needed.  
 External doors and covers fitted with Emka 1011-207 self grip seal.  
 Stainless Steel "D" Handles fitted where indicated on the drawings.  
 M6 Earth studs fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces. Fit dedicated earth stud adjacent main earth bar for switchboard earth.  
 Door stiffeners, door stays, cable straps, and document holders etc fitted where shown on the drawings.  
 Door stay arms to be S/Steel and of sufficient strength to prevent being deformed when subjected to reasonable loads. Minimum 3mm S/Steel.  
 Lift-off covers and mounting panels fixed with M8 studs & stainless steel dome nuts.  
 Gland plates manufactured from 5mm aluminium, unless otherwise shown.  
 Inspection/Access plates manufactured from 3mm aluminium.  
 Gland/Inspection/Access plate openings fitted with M6x10 flat head closed end rivet nuts. (Detail F)  
 Cable glands to be fitted with compression side installed within cubicle. (Detail G)  
 Gland/Inspection/Access plates to be fitted with seals attached to cubicle.  
 Gland/Inspection/Access plate fixings at 100mm.  
 Gland/Inspection/Access plates to maintain a 50mm clearance from section dividers.  
 Gland/Inspection/Access plates are NOT to be split.  
 All gland plates to be earthed.  
 Inspection/Access plates are NOT to be earthed.  
 Provide Shrouding to all live parts to IP20 where required.  
 Hinges (external) Selectrix HIB650ss-316 Stainless steel.  
 S/Steel star washers fitted under all hinge screws.  
 Hinged escutcheons fixed with Emka 1/4 turn 1000-U142.  
 All equipment to be removable via front access.  
 Install switchboard with non-hydroscopic material between plinth and concrete slab. (Detail E)  
 All escutcheons to open a minimum of 90°.  
 All sheet metal edging to be de-burred.  
 All switchboard LED lights to be mounted on the horizontal plane.

**Locks Doors 1 - 8 & 11 - 12, 14 & 15**  
 SELECTRIX - Swing Handle 11075SSU3-45  
 SELECTRIX - 3 point lock rod set - 1000-1587  
 Lockwood Barrel Lock  
 Key Codes RC496A, RC496AB, RC496ABC refer to each door for clarification.

**Locks Door 13**  
 SELECTRIX - Swing Handle 11075SSU3-45  
 SELECTRIX - 3 point lock rod set - 1000-1587-SS (all S/Steel)  
 Lockwood Barrel Lock, Key Code RC496AB

**Locks Door 8 - CT Panel**  
 SELECTRIX - Swing Handle 11075SS04N Padlockable - 316  
 SELECTRIX - 3 point lock rod set - 1000-1587  
 ENERGEX padlock, S/Steel Shackles, 45mm brass pin tumbler.  
 Energex Key No325. c/w 1 key.

**Meter Box**  
 SELECTRIX - Swing Handle 11075SS04N Padlockable - 316  
 SELECTRIX - 3 point lock rod set - 1000-1587  
 ENERGEX padlock, S/Steel Shackles, 45mm brass pin tumbler.  
 Energex Key No325. c/w 1 key.

**OPERATING PARAMETERS**

Standard	AS 3439.1
Current & Frequency	AC 50Hz
Rated Operational Voltage Ue	415 VAC
Rated Insulation Voltage Ui	660 V
Rated Auxiliary Voltage	240 VAC / 24 VDC
Rated Current (Main Bus)	250A AMPS
Short Circuit Current Isc	20 kA
Duration of Isc	2 sec
Degree of Protection	IP 56 to AS 1939
Measure of Protection by barriers and enclosures.	
Service Conditions	Outdoors
Mass	Not exceeding 2000kg
Forms of Segregation	Form 3, DB Section Form 1

**WIRING**

All wiring to be PVC V90 HT 0.6/1kV Grade with tinned conductor.  
 Control and instrumentation wiring has flexible copper conductors, and is colour coded as detailed below, each individual wire shall be numbered each end, and terminated by the use of appropriate pre-insulated crimp lugs or pins.  
 Separate lugs or pins shall be used for each conductor. A proprietary double pin lug may be used to terminate two conductors.  
 Use proprietary bridging links when required to common up terminals.  
 Not more than two wires shall be connected to any terminal.  
 Not more than one wire shall be connected on one side of any tunnel type terminal. Where multiple connections are required on tunnel terminals, proprietary terminal link bars shall be used.  
 Power wiring to be minimum 2.5sqmm stranded copper conductors, phase colour coded as detailed below.  
 Control wiring to be minimum 1.0sqmm flexible copper conductors, colour coded as detailed below.  
 Low level control signals to be minimum 0.5sqmm flexible copper conductors, colour coded as detailed below.  
 Wiring between RTU terminals & RTU marshalling terminals to be multicore cable with 0.5sqmm flexible copper conductors.  
 4-20mA analog signals (internal & external) wired in shielded pair minimum size 0.5sqmm, and earthed at one end only. (Switchboard end for external signals)  
 All 240VAC wiring in the RTU section and cable zones shall be double insulated and all terminals shall be shrouded and labelled- "Danger 240VAC" or "Danger 415VAC"  
 1Ø & 3Ø Outlets on escutcheon to be wired in double insulated cable.  
 Provide shrouding with warning label over all 240VAC door/escutcheon mounted equipment.  
 Earth cables minimum 2.5sqmm flexible.  
 All equipment shrouding within switchboard to be minimum IP20.  
 Doors, gland plates and hinged escutcheons bonded with flexible copper B/Wire.  
 Disconnection zone door to be bonded with flexible copper B/Wire. Heat shrink at lugs.  
 Switchboard to have dedicated earthing cable bonding directly to main earth bar.  
 Ensure minimum clearance of 100mm is maintained between cable ducting & gland plates.  
 Wire numbering will be equal to Grafoplast 5i2000 system.  
 Terminal strips to be mounted 30mm off equipment panel to aid termination.  
 Wire numbers are readable left to right bottom to top as shown.



**COLOUR CODE**

Phase wiring (A,B & C)	Red, White, Blue	2.5sqmm (min)
Potential Metering (240/415 VAC)	Red, White, Blue, Black	1.5sqmm
Current Metering (Secondary)	Red, White, Blue, Grey	2.5sqmm
240 VAC Control Active	Red	1.0sqmm
240 VAC Neutral	Black	1.0sqmm
Extra Low VDC Positive supplies	Orange	1.0sqmm
Extra Low VDC Negative supplies	Violet	1.0sqmm
General Extra Low VDC Wiring	Grey	1.0sqmm
RTU & PLC Wiring	Grey	0.5sqmm
Electrode Wiring	Salmon	1.0sqmm
Intrinsically safe wiring	Light Blue	1.5sqmm
Earth	Green/Yellow	2.5sqmm (min)
Door & Escutcheon Earth Bonds	Green/Yellow	6 sqmm Flexible
Instrument Shield Earth	Green/Yellow	1.5sqmm (min)

**PAINTING**

Aluminium Surface Preparation.  
 Finish smooth all exposed welds, clean, descale, and degrease all surfaces.  
 Surfaces pretreatment in accordance with AS 1580 & AS 3715 using Novox LF acid etch cleaner, Novacoat 12 conversion coating, & clean water rinses.  
 Apply DULUX ALPHATECH 3000 powder coat to manufacturer's recommendations.  
 CUBICLE & EXTERNAL COMPONENTS -> DULUX Mist Green (3664B) matt finish.  
 INTERIOR ITEMS (mounting panels, escutcheons, etc) -> DULUX Bright White (32166)  
 Minimum Dry Film Thickness all surfaces 50 microns.

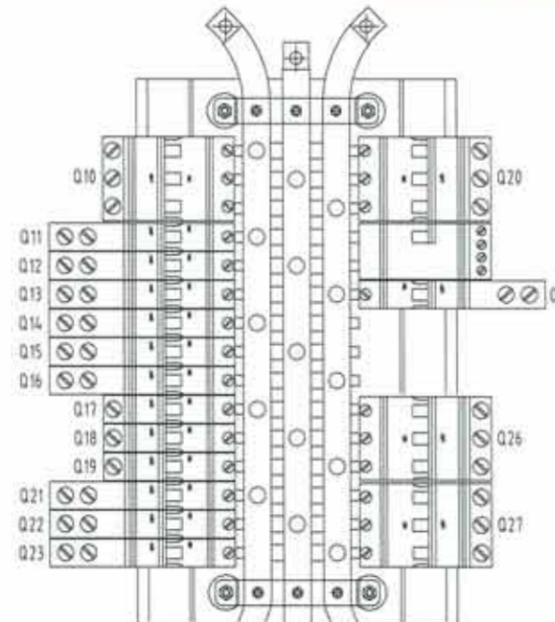
**LABELS**

Internal labels W/B engraved ABS PLASTIC to label schedule.  
 Warning labels R/W engraved ABS PLASTIC to label schedule.  
 E/Stop labels Y/B engraved ABS PLASTIC to label schedule.  
 First letter = Background colour, Second letter = Lettering colour.

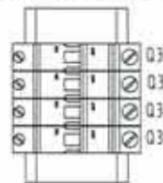
Main switch label	MAIN SWITCH 400A	10mm 4mm	Material ABS PLASTIC Colour B/W
Pump CB labels	PUMP No1 250A	6mm 4mm	Material ABS PLASTIC Colour W/B
Compartment labels	RTU	10mm	Material Stainless Steel
E/Stop labels	EMERGENCY STOP	4mm	Material ABS PLASTIC Colour Y/B
Warning labels	DANGER 415V ISOLATE ELSE WHERE	7mm 5mm	Material ABS PLASTIC Colour R/W

Internal labels secured by M3 chrome plated metal threads.  
 CB's to be identified with individual labels as per label schedule.  
 Labels obstructed by switchboard wiring are relocated to adjacent dust lid and secured by M3 nylon threads. Lid to be secured by a single cable tie at one corner.  
 External switchboard labels to be 1mm thick 316 grade stainless steel secured by M3 316 stainless steel metal threads.  
 All internal and external labels are to have bevelled edges.

Andy Walmsley:   
 Licence Number: A30723  
 Date: 5 March 2015



FILTERED SUPPLY ARRANGEMENT



NON-FILTERED SUPPLY ARRANGEMENT

DETAIL M1

SUB-DISTRIBUTION BOARD ARRANGEMENT



DETAIL M2

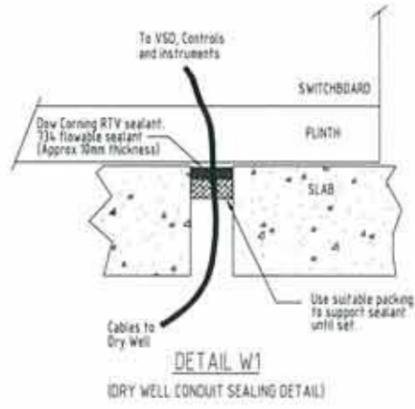
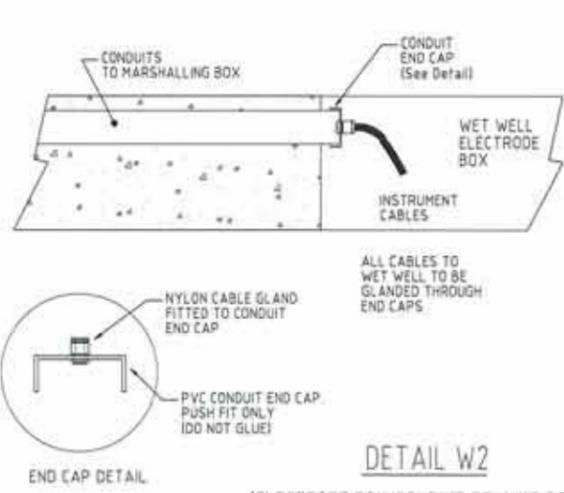
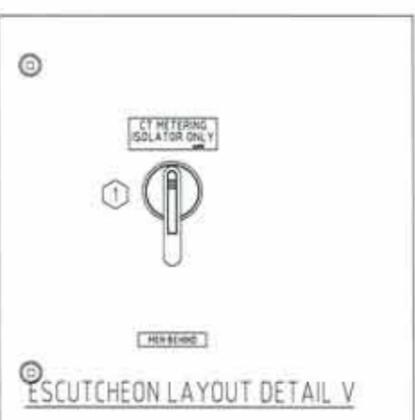
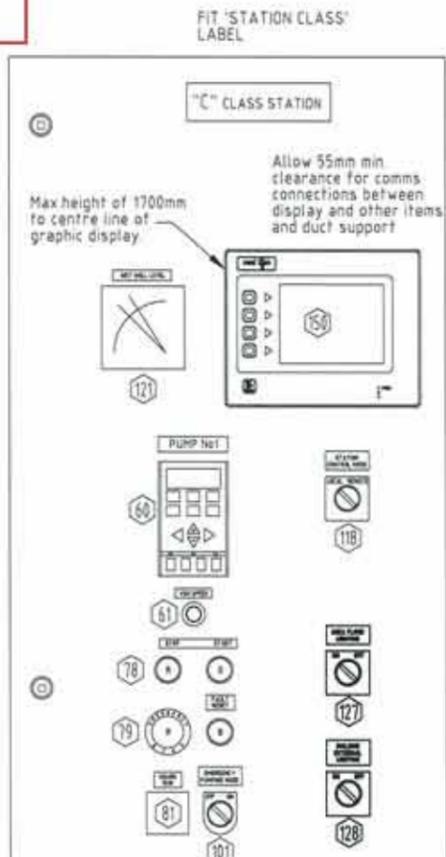
DC DISTRIBUTION ARRANGEMENT

Sheet 21

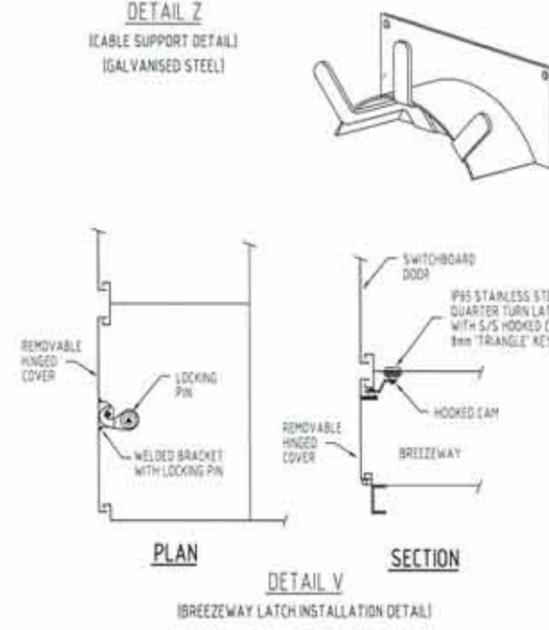
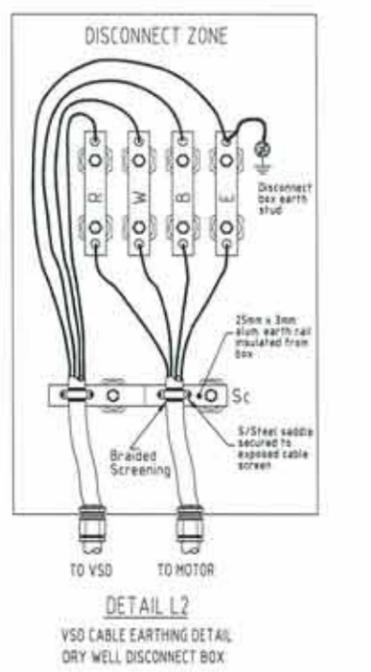
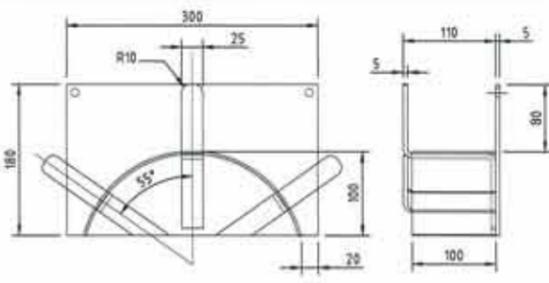
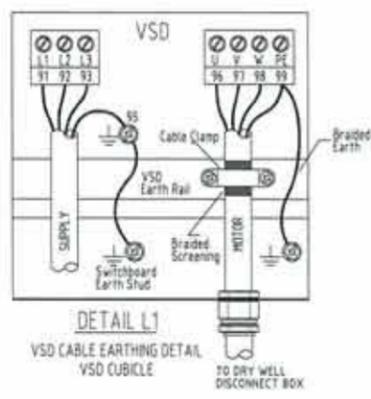
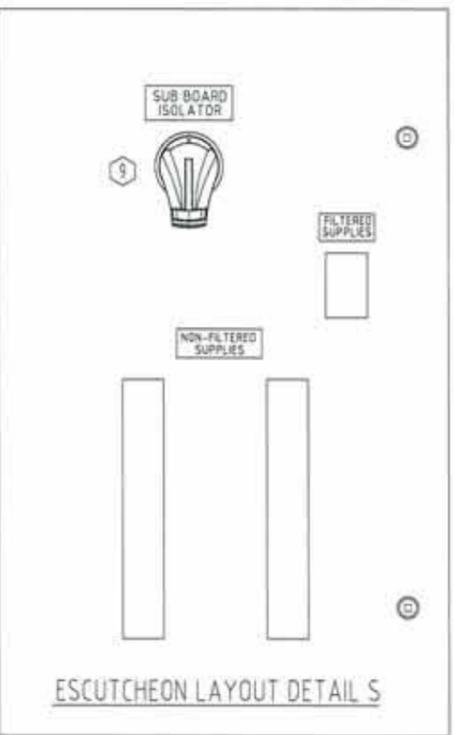
FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.G. No.	DATE	3-3-14	NAME	SIGNATURE	DATE	3-3-14	AUTHORIZED FOR 12 MONTHS FROM DATE SHOWN	UrbanUtilities	Cardno (Old) Pty Ltd	SITE	SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE	SWITCHBOARD CONSTRUCTION DETAILS SHEET 1 OF 3	SHEET No.	21	QUANTIFIED URBAN UTILITIES DRAWING No.	486/5/7-0463-021	AMEND.	A
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Andy Walmsley:  
Licence Number: A30723  
Date: 5 March 2015



Andy Walmsley:  
Licence Number: A30723  
Date: 5 March 2015



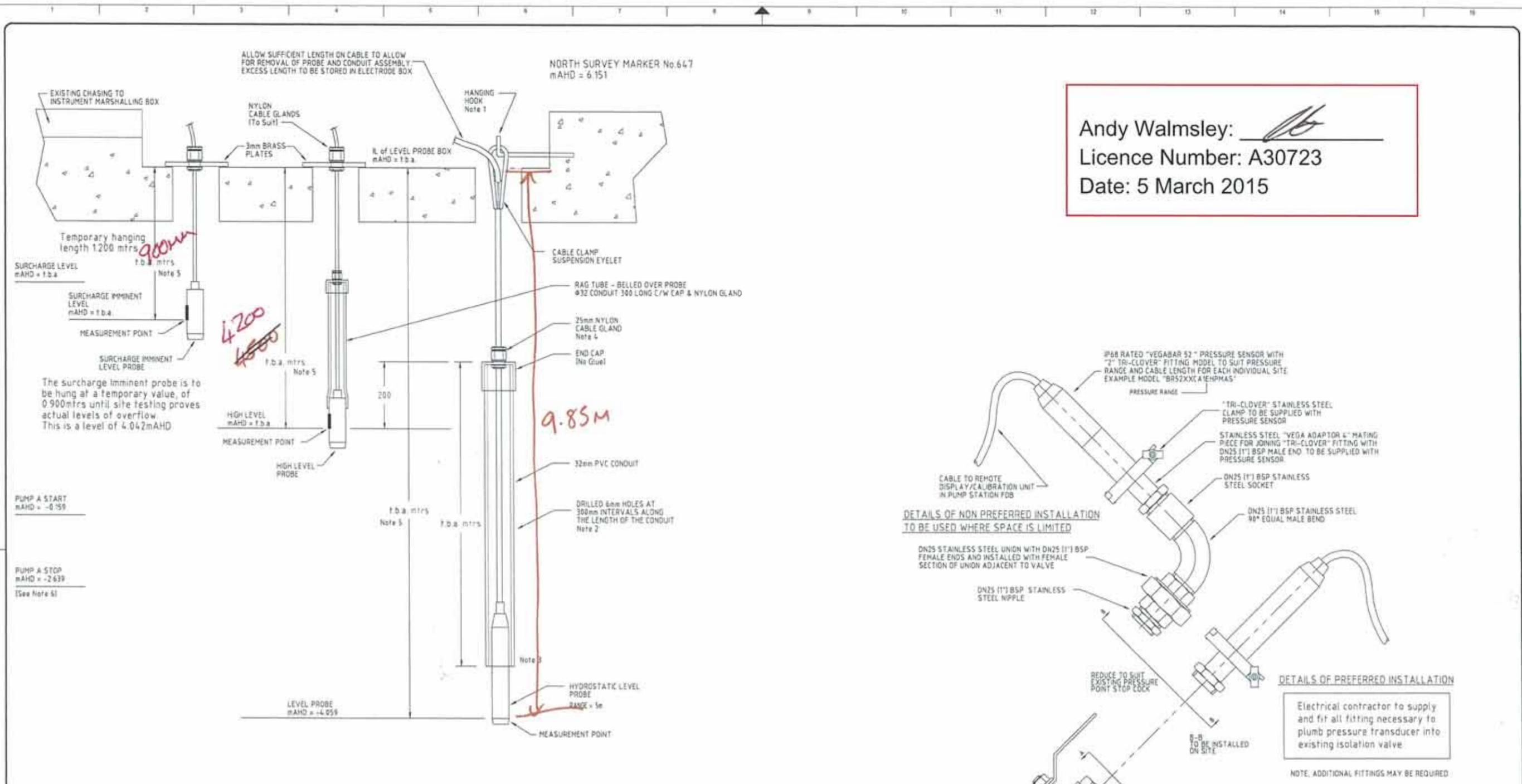
**NOTE:**  
THIS ESCUTCHEON LAYOUT DRAWING IS A GUIDE ONLY THAT SHOWS THE PREFERRED OVERALL GENERAL EQUIPMENT LAYOUT. IT IS NOT TO SCALE AND MUST NOT BE USED AS WORKSHOP DESIGN. THE SWITCHBOARD MANUFACTURER MUST PROVIDE THEIR OWN SWITCHBOARD WORKSHOP DESIGN FOR QUU APPROVAL BEFORE PROCEEDING WITH ANY SHEET METAL WORK.

Sheet 22  
FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	P.HAGUE	3-3-14	DATE	NAME	SIGNATURE	DATE	SP044	LITTON ROAD	SEWAGE PUMP STATION	TITLE	SWITCHBOARD CONSTRUCTION DETAILS SHEET 2 OF 3	SHEET No. 22	486/5/7-0463-022	AMEND.	A
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	57-0463set_A	DESIGN CHECK	A.WITTHOFT	3-3-14	DATE	QUEENSLAND URBAN UTILITIES DELEGATE	UrbanUtilities	3-3-14	SP044	LITTON ROAD	SEWAGE PUMP STATION	TITLE	SWITCHBOARD CONSTRUCTION DETAILS SHEET 2 OF 3	SHEET No. 22	486/5/7-0463-022	AMEND.	A



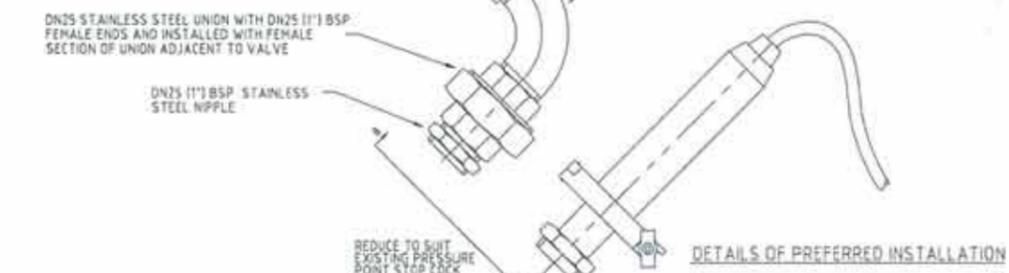
Andy Walmsley:   
 Licence Number: A30723  
 Date: 5 March 2015



Temporary hanging length 1200 mtrs  
 SURCHARGE LEVEL m AHD = 1.2.4  
 SURCHARGE IMMINENT LEVEL m AHD = 1.2.4  
 MEASUREMENT POINT  
 SURCHARGE IMMINENT LEVEL PROBE  
 The surcharge imminent probe is to be hung at a temporary value, of 0.900mtrs until site testing proves actual levels of overflow. This is a level of 4.042m AHD

PUMP A START m AHD = -0.159  
 PUMP A STOP m AHD = -2.639  
 (See Note 5)

**DETAILS OF NON PREFERRED INSTALLATION TO BE USED WHERE SPACE IS LIMITED**



**DETAILS OF PREFERRED INSTALLATION**

Electrical contractor to supply and fit all fittings necessary to plumb pressure transducer into existing isolation valve.  
 NOTE: ADDITIONAL FITTINGS MAY BE REQUIRED

**PRESSURE TRANSMITTER INSTALLATION NOTES**

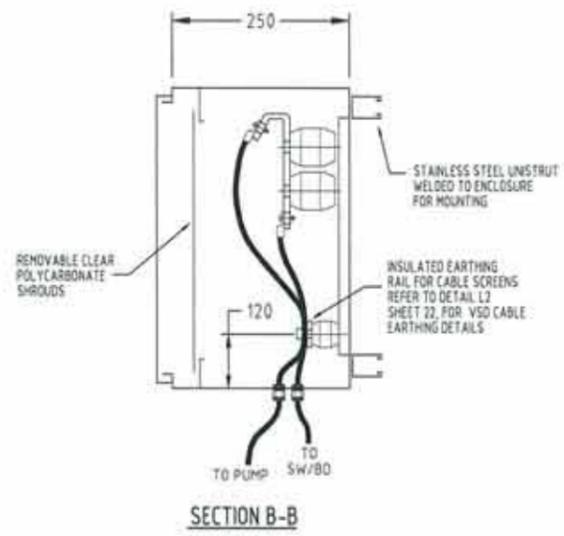
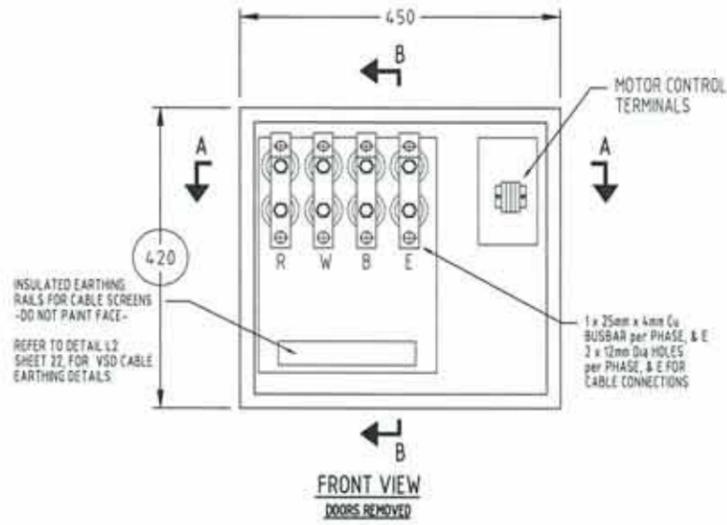
1. Material: All stainless steel fittings to be grade 316
2. Galling: All stainless steel threads to be lubricated with approved anti galling grease and thread tape where applicable.
3. Install as per 'preferred' detail unless space limitations prevents this method.

**PRIMARY LEVEL PROBE INSTALLATION NOTES**

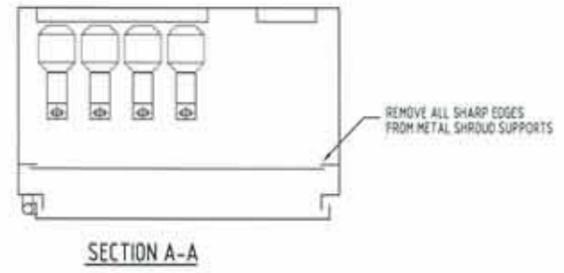
1. Install stainless steel hanging hook for the suspension of the hydrostatic probe.
2. Drill 4 x 6mm holes, 150mm from each end and every 300mm of the cut length, prior to installation.
3. Install so that the conduit covers approximately 1/2 the probe. Do not glue the conduit to the end cap.
4. Install a 25mm nylon cable gland. Apply no compression to cable.
5. Measurements are to be taken from bottom of the Level Probe box to 'measurement points' on probes.
6. Pump stop level may need to be adjusted to allow for pump ramp down time. This may be required to prevent possible air locking of the pumps.

QTY	MATERIALS LIST
1	LENGTH OF HEAVY DUTY ORANGE PVC CONDUIT 40mm
2	CONDUIT END CAP
3	25mm NYLON CABLE GLAND
4	CABLE CLAMP SUSPENSION EYELET

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	A.WITTHOFT	P.HAGUE	DESIGN	3-3-14	 Cardno (Qld) Pty Ltd 400 30 114 000	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE FIELD INSTRUMENTATION INSTALLATION DETAILS	SHEET No: 24 Queensland Urban Utilities DRAWING No: 486/5/7-0463-024	AMEND A
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	57-0463aot_A	A WITTHOFT	DESIGN CHECK	3-3-14					
AMENDMENT	DRN. APD.	B.C.C. FILE No.									



**TWO DISCONNECTION BOXES REQUIRED - PUMP1 & PUMP2**  
LOCATED IN DRY WELL



**CONSTRUCTION**

Cubicle construction 2mm Stainless Steel.  
 Folded, "Pulse MIG" & "TIG" welded with all visible seams and joints fully welded, free from splatter and ground smooth where needed.  
 External doors and covers fitted with Enka 1011-207 self grip seal.  
 M6 Earth studs fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces.  
 Door stiffeners to be of sufficient strength to prevent being deformed when subjected to reasonable loads.  
 Provide Shrouding as shown on drawing to all busbars to IP20  
 Hinges (external) Selectrix HB650ss-316, Stainless Steel  
 Star washers fitted under all hinge screws.

**OPERATING PARAMETERS**

Standard AS 3439.1  
 Current & Frequency AC 50Hz  
 Rated Operational Voltage Ue 415 VAC  
 Rated Insulation Voltage Ui 660 V  
 Rated Auxiliary Voltage 240 VAC / 24 VDC  
 Rated Current (Busbars) 200 AMPS  
 Short Circuit Current Isc 20 kA  
 Duration of Isc 2 sec  
 Degree of Protection IP 56 to AS 1939  
 Service Conditions Outdoors

**Locks Door 1**

DORE ELECTRICS - Swing Handle SHKSS Universal Locking - 92268  
 Lockwood Barrel Lock  
 Key Code RC496A

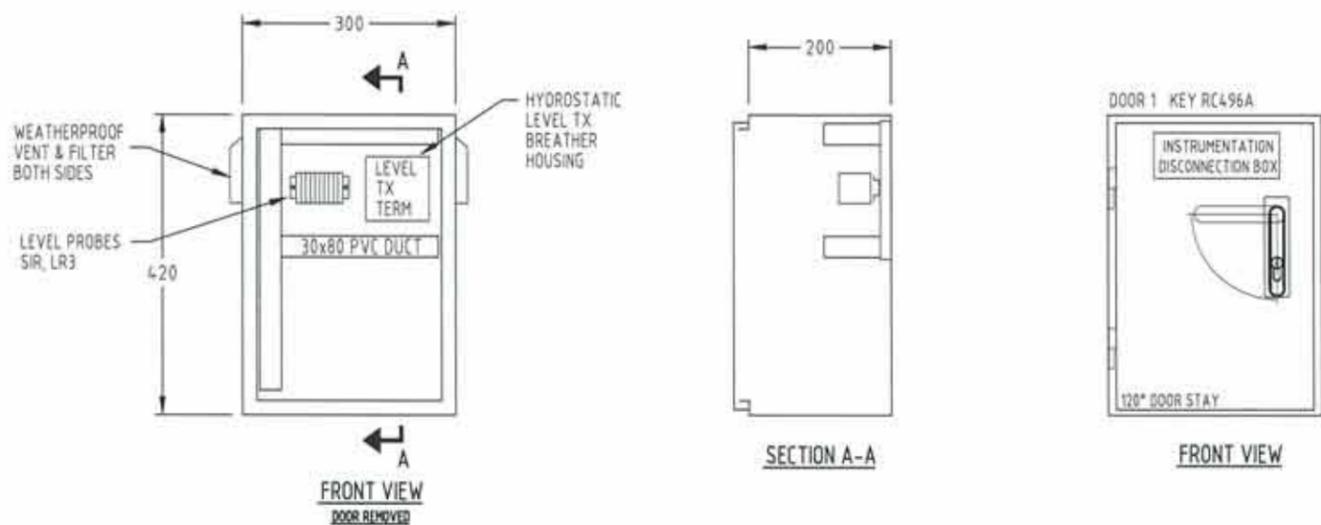
**JUNCTION BOX LABEL LIST**

TEXT	TEXT HEIGHT	MATERIAL / COLOUR	SIZE	QTY
PUMP No? DISCONNECT BOX (EXTERNAL)	20mm	S/STEEL - Black Text	300x35	1
WARNING 415V BEHIND DOOR (EXTERNAL)	10mm	S/STEEL - Red Text	160x40	1
EXTERNAL LABELS 1mm THICK, 316 GRADE STAINLESS STEEL, PRESSURE TRANSMITTER FIXED WITH M3 316 STAINLESS STEEL METAL THREADS.				

Andy Walmsley:   
 Licence Number: A30723  
 Date: 5 March 2015

**Sheet 27**  
FOR CONSTRUCTION

<table border="1"> <tr> <th>No.</th> <th>DATE</th> <th>AMENDMENT</th> <th>DRN.</th> <th>APP.</th> <th>B.C.C. FILE No.</th> </tr> <tr> <td>A</td> <td>05.14</td> <td>ISSUED FOR CONSTRUCTION</td> <td>P.H.</td> <td>A.W.</td> <td></td> </tr> <tr> <td>O</td> <td>03.14</td> <td>ISSUED FOR TENDER</td> <td>P.H.</td> <td>A.W.</td> <td></td> </tr> </table>	No.	DATE	AMENDMENT	DRN.	APP.	B.C.C. FILE No.	A	05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.		O	03.14	ISSUED FOR TENDER	P.H.	A.W.		<table border="1"> <tr> <th>DRAFTED</th> <th>P.HAGUE</th> <th>P.HAGUE</th> <th>3-3-14</th> </tr> <tr> <td>DRAFTING CHECK</td> <td>A.WITTHOFT</td> <td>DESIGN</td> <td>R.P.E.Q. No. DATE</td> </tr> <tr> <td>CAD FILE</td> <td>57-0463set_A</td> <td>A.WITTHOFT</td> <td>8895 3-3-14</td> </tr> <tr> <td></td> <td></td> <td>DESIGN CHECK</td> <td>R.P.E.Q. No. DATE</td> </tr> </table>	DRAFTED	P.HAGUE	P.HAGUE	3-3-14	DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.Q. No. DATE	CAD FILE	57-0463set_A	A.WITTHOFT	8895 3-3-14			DESIGN CHECK	R.P.E.Q. No. DATE	<table border="1"> <tr> <th>NAME</th> <th>SIGNATURE</th> <th>DATE</th> </tr> <tr> <td>QUEENSLAND URBAN UTILITIES DELEGATE</td> <td></td> <td></td> </tr> <tr> <td>UrbanUtilities</td> <td></td> <td>AUTHORISED FOR 12 MONTHS FROM DATE SHOWN</td> </tr> </table>	NAME	SIGNATURE	DATE	QUEENSLAND URBAN UTILITIES DELEGATE			UrbanUtilities		AUTHORISED FOR 12 MONTHS FROM DATE SHOWN	<table border="1"> <tr> <th>SITE</th> <th>TITLE</th> <th>SHEET No.</th> <th>AMEND.</th> </tr> <tr> <td>SP044 LYTTON ROAD SEWAGE PUMP STATION</td> <td>FIELD DISCONNECTION BOX GENERAL ARRANGEMENT DRY WELL DISCONNECTION BOX FIELD DISCONNECTION BOX</td> <td>27</td> <td>A</td> </tr> </table>	SITE	TITLE	SHEET No.	AMEND.	SP044 LYTTON ROAD SEWAGE PUMP STATION	FIELD DISCONNECTION BOX GENERAL ARRANGEMENT DRY WELL DISCONNECTION BOX FIELD DISCONNECTION BOX	27	A
No.	DATE	AMENDMENT	DRN.	APP.	B.C.C. FILE No.																																																	
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**WET WELL INSTRUMENTATION MARSHALLING BOX**  
 LOCATED ON INTERNAL WET WELL BUILDING WALL ADJACENT WET WELL

**CONSTRUCTION**

Cubicle construction 2mm 316 Stainless Steel.  
 Folded, "Pulse MIG" & "TIG welded" with all visible seams and joints fully welded, free from splatter and ground smooth where needed.  
 External doors and covers fitted with Emka 1011-207 self grip seal.  
 M6 Earth studs fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces.  
 Door stiffeners to be of sufficient strength to prevent being deformed when subjected to reasonable loads.  
 Hinges (external) Selectrix HIB650ss-316.  
 Stainless Steel Star washers fitted under all hinge screws.  
 Provide hat section for mechanical protection for cable entry. Hat section is to be readily removable to allow for probe replacement.

**Locks Door 1**

SELECTRIX - Swing Handle 11075SSU3-45  
 Lockwood Barrel Lock  
 Key Codes RC496A

**Labels**

Provide labels as shown. External labels 1mm thick, 316 grade stainless steel, fixed with m3 316 stainless steel metal threads.

**Finish**

Stainless Steel 2b Finish

**OPERATING PARAMETERS**

Standard AS 3439.1  
 Current & Frequency AC 50Hz  
 Rated Operational Voltage 24 VDC  
 Degree of Protection IP 55 to AS 1539  
 Service Conditions Outdoors

**LABEL LIST**

TEXT	TEXT HEIGHT	MATERIAL / COLOUR	QTY
INSTRUMENTATION MARSHALLING BOX (EXTERNAL)	20mm	S/STEEL - Black Text	1

EXTERNAL LABELS 1mm THICK 316 GRADE STAINLESS STEEL.  
 FIXED WITH M3 316 STAINLESS STEEL METAL THREADS.

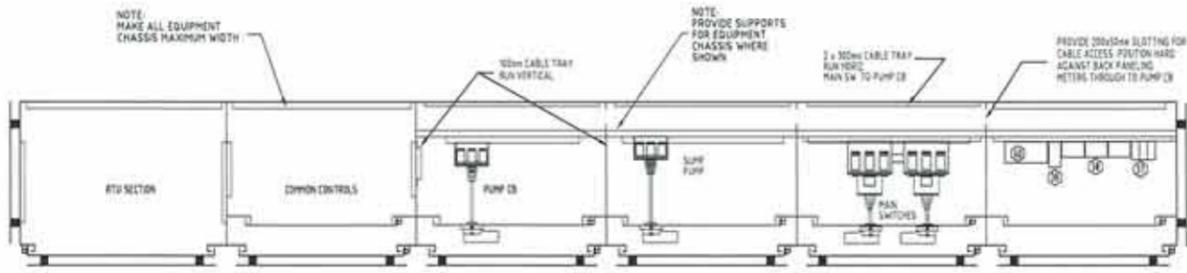
Andy Walmsley:   
 Licence Number: A30723  
 Date: 5 March 2015

**Sheet 28**

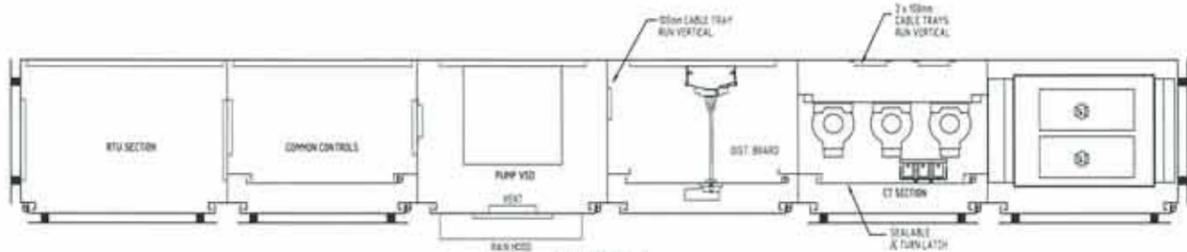
FOR CONSTRUCTION

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NO.	DATE	AMENDMENT	DRN.	APP.	B.C.C. FILE No.																																									
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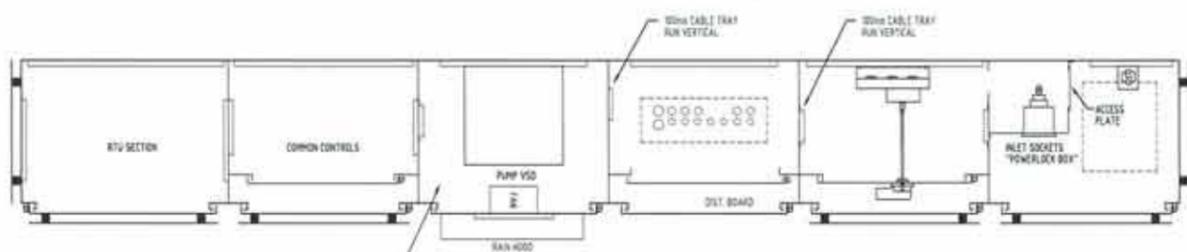




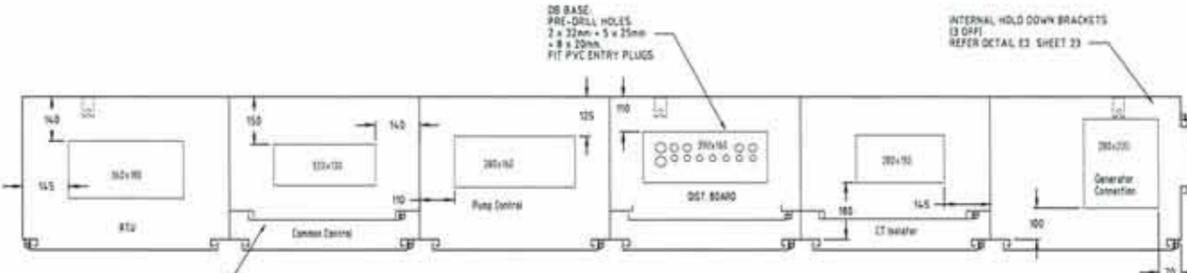
SECTION A-A



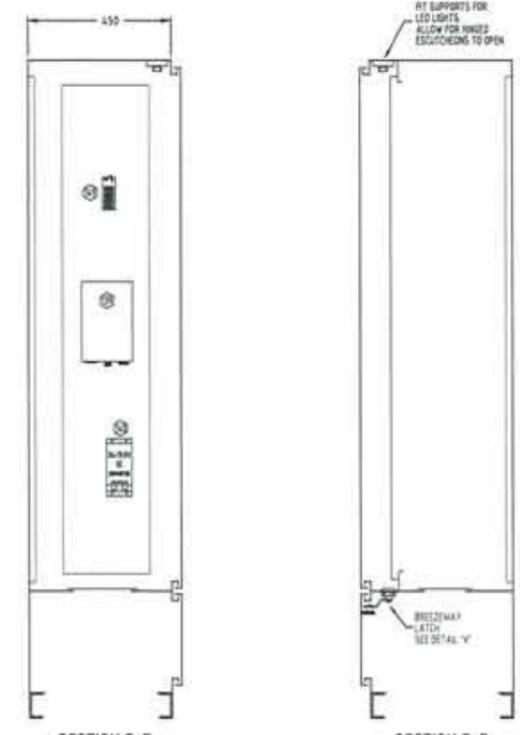
SECTION B-B



SECTION C-C



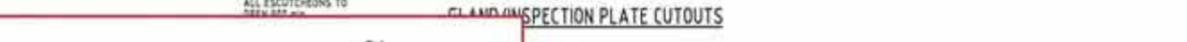
SECTION D-D



SECTION E-E



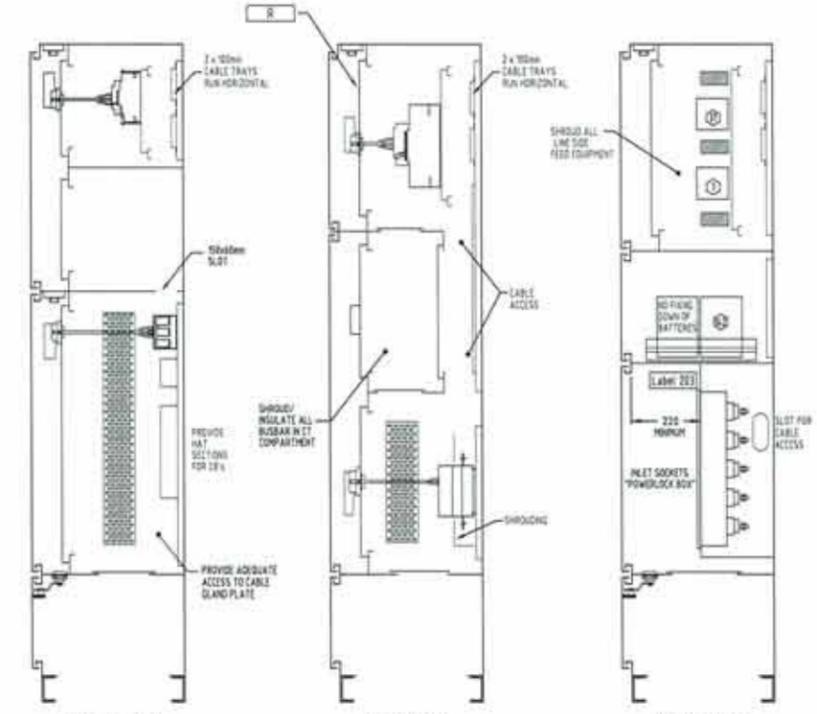
SECTION F-F



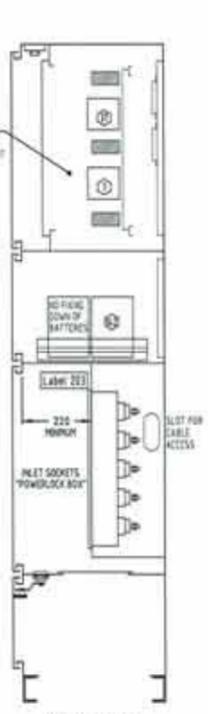
SECTION G-G



SECTION H-H



SECTION I-I



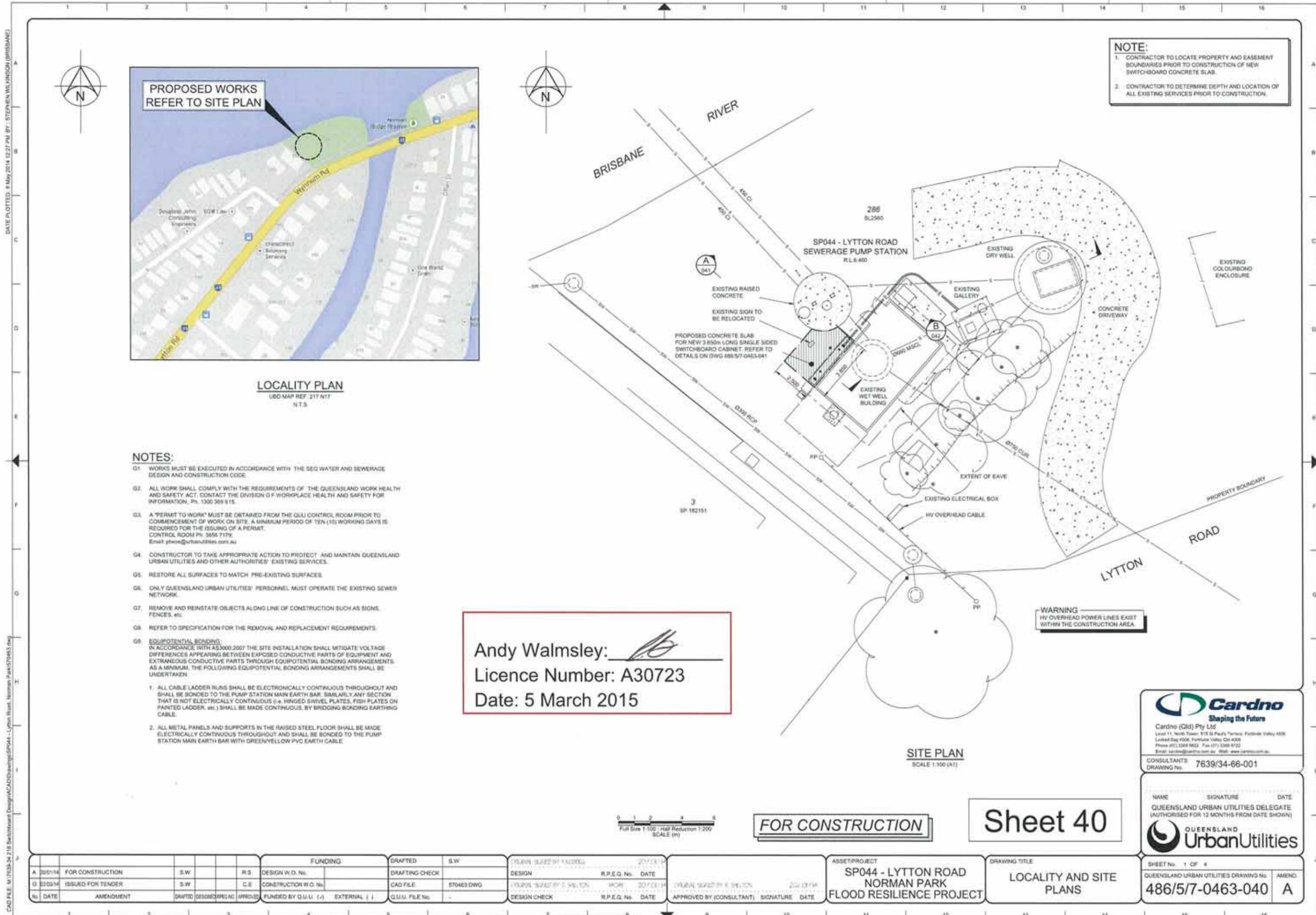
SECTION J-J

Andy Walmsley: *[Signature]*  
 Licence Number: A30723  
 Date: 5 March 2015

NOTE:  
 THIS GA DRAWING IS A GUIDE ONLY THAT SHOWS  
 OVERALL DIMENSIONS AND EQUIPMENT LAYOUT.  
 IT IS NOT TO SCALE AND MUST NOT BE USED AS  
 WORKSHOP DESIGN.  
 THE SWITCHBOARD MANUFACTURER MUST PROVIDE  
 THEIR OWN SWITCHBOARD WORKSHOP DESIGN BEFORE  
 PROCEEDING WITH ANY SHEET METAL WORK.

Sheet 30  
 FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.Q. No.	DATE	3-3-14	 Cardno (Dtd) Pty Ltd	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE SWITCHBOARD GENERAL ARRANGEMENT SECTIONS	SHEET No: 30 Queensland Urban Utilities DRAWING No: 486/5/7-0463-030	AMEND. A
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	57-0463set_A	A.WITTHOFT	8895	3-3-14	NAME QUEENSLAND UrbanUtilities					



**NOTE:**  
 1. CONTRACTOR TO LOCATE PROPERTY AND EASEMENT BOUNDARIES PRIOR TO CONSTRUCTION OF NEW SWITCHBOARD CONCRETE SLAB.  
 2. CONTRACTOR TO DETERMINE DEPTH AND LOCATION OF ALL EXISTING SERVICES PRIOR TO CONSTRUCTION.



**LOCALITY PLAN**  
 UBD MAP REF. 217 N17  
 N.T.S.

- NOTES:**
- G1. WORKS MUST BE EXECUTED IN ACCORDANCE WITH THE SEQ WATER AND SEWERAGE DESIGN AND CONSTRUCTION CODE.
  - G2. ALL WORK SHALL COMPLY WITH THE REQUIREMENTS OF THE QUEENSLAND WORK HEALTH AND SAFETY ACT. CONTACT THE DIVISION OF WORKPLACE HEALTH AND SAFETY FOR INFORMATION. Ph. 1300 369 915.
  - G3. A "PERMIT TO WORK" MUST BE OBTAINED FROM THE QUU CONTROL ROOM PRIOR TO COMMENCEMENT OF WORK ON SITE. A MINIMUM PERIOD OF TEN (10) WORKING DAYS IS REQUIRED FOR THE ISSUING OF A PERMIT. CONTROL ROOM Ph. 3856 7179. Email: ptwoe@urbanutilities.com.au
  - G4. CONSTRUCTOR TO TAKE APPROPRIATE ACTION TO PROTECT AND MAINTAIN QUEENSLAND URBAN UTILITIES AND OTHER AUTHORITIES' EXISTING SERVICES.
  - G5. RESTORE ALL SURFACES TO MATCH PRE-EXISTING SURFACES.
  - G6. ONLY QUEENSLAND URBAN UTILITIES' PERSONNEL MUST OPERATE THE EXISTING SEWER NETWORK.
  - G7. REMOVE AND REINSTATE OBJECTS ALONG LINE OF CONSTRUCTION SUCH AS SIGNS, FENCES, etc.
  - G8. REFER TO SPECIFICATION FOR THE REMOVAL AND REPLACEMENT REQUIREMENTS.
  - G9. **EQUIPOTENTIAL BONDING:** IN ACCORDANCE WITH AS3000:2007 THE SITE INSTALLATION SHALL MITIGATE VOLTAGE DIFFERENCES APPEARING BETWEEN EXPOSED CONDUCTIVE PARTS OF EQUIPMENT AND EXTRANEIOUS CONDUCTIVE PARTS THROUGH EQUIPOTENTIAL BONDING ARRANGEMENTS AS A MINIMUM. THE FOLLOWING EQUIPOTENTIAL BONDING ARRANGEMENTS SHALL BE UNDERTAKEN.
    - 1. ALL CABLE LADDER RUNS SHALL BE ELECTRONICALLY CONTINUOUS THROUGHOUT AND SHALL BE BONDED TO THE PUMP STATION MAIN EARTH BAR. SIMILARLY ANY SECTION THAT IS NOT ELECTRICALLY CONTINUOUS (e.g. HINGED SAWYEL PLATES, FISH PLATES ON PAINTED LADDER, etc.) SHALL BE MADE CONTINUOUS BY BRIDGING BONDING EARTHING CABLE.
    - 2. ALL METAL PANELS AND SUPPORTS IN THE RAISED STEEL FLOOR SHALL BE MADE ELECTRICALLY CONTINUOUS THROUGHOUT AND SHALL BE BONDED TO THE PUMP STATION MAIN EARTH BAR WITH GREEN/YELLOW PVC EARTH CABLE.

Andy Walmsley:   
 Licence Number: A30723  
 Date: 5 March 2015

**WARNING**  
 HV OVERHEAD POWER LINES EXIST WITHIN THE CONSTRUCTION AREA

**SITE PLAN**  
 SCALE 1:100 (A1)

Full Size 1:100 - Half Reduction 1:200  
 SCALE (m)

**FOR CONSTRUCTION**

**Sheet 40**

**Cardno**  
 Shaping the Future  
 Cardno (Old) Pty Ltd  
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 Locked Bag #906, Fortitude Valley QLD 4008  
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 Email: cardno@cardno.com.au Web: www.cardno.com.au

CONSULTANTS DRAWING No. 7639/34-66-001

NAME SIGNATURE DATE  
 QUEENSLAND URBAN UTILITIES DELEGATE  
 (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

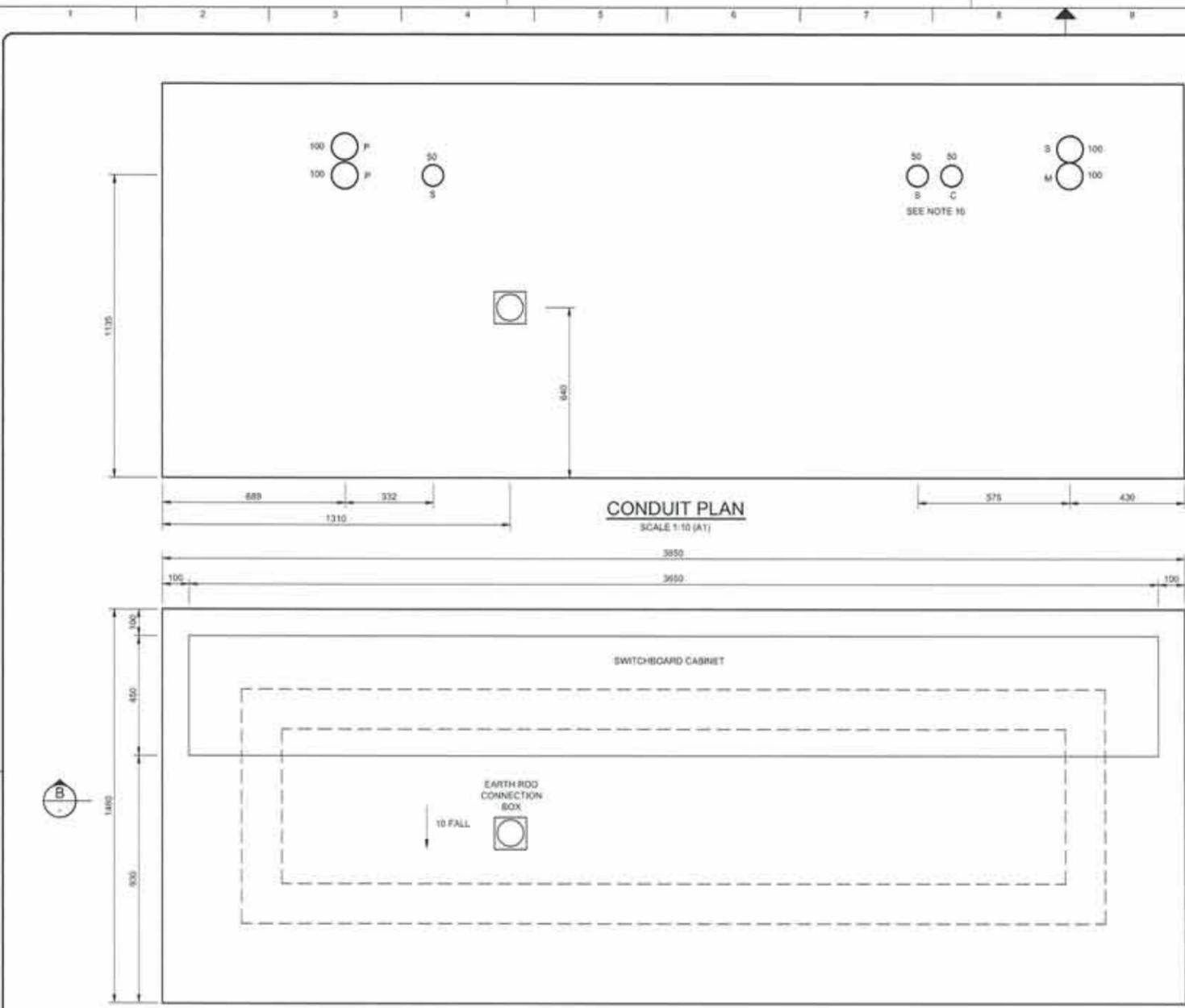


SHEET No. 1 OF 4  
 QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/7-0463-040  
 AMEND. A

FUNDING		DRAFTED		S.W.		DESIGN		ASSET/PROJECT		DRAWING TITLE	
A	2015/14	FOR CONSTRUCTION	S.W.	R.S.	DESIGN W.D. No.	DRAFTING CHECK	S.W.	2015/03/14	SP044 - LYTTON ROAD NORMAN PARK FLOOD RESILIENCE PROJECT	LOCALITY AND SITE PLANS	
D	2015/14	ISSUED FOR TENDER	S.W.	C.E.	CONSTRUCTION W.D. No.	CAD FILE	ST0463.DWG	2015/03/14			
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	APPROVED	FUNDED BY Q.U.U. ( )	EXTERNAL ( )	Q.U.U. FILE No.	DESIGN CHECK	R.P.E.Q. No.	DATE

DATE PLOTTED: 8 May 2014 12:26 PM BY: STEPHEN WALMSLEY (BRISBANE)

CAD FILE: M:\1035-N-218-Substation Design\ACAD\Drawings\SP044 - Lytton Road - Norman Park\SP044.dwg



**CONCRETE NOTES:**

- CONTRACTOR TO LOCATE EASEMENT AND PROPERTY BOUNDARIES PRIOR TO CONSTRUCTION OF NEW SWITCHBOARD CONCRETE SLAB. THE NEW CONCRETE BASE SLAB SHALL BE POURED TO PROVIDE A STABLE, LEVEL PLATFORM FOR THE NEW SWITCHBOARD.
- ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH CURRENT AUSTRALIAN STANDARDS, CODES AND RELEVANT BUILDING AUTHORITY BY-LAWS.
- ALL CONCRETE SHALL COMPLY WITH THE AUSTRALIAN STANDARDS CONCRETE STRUCTURES CODE AS 3600-2001 AND THE QUEENSLAND URBAN UTILITIES REFERENCE SPECIFICATION FOR CONCRETE WORK PSE-S33502.
- ALL CONCRETE SHALL BE H32 (MPa).
- THE MAXIMUM SIZE OF AGGREGATE IN THE CONCRETE SHALL BE 20mm.
- REINFORCEMENT STEEL TO BE 500 (MPa) MINIMUM.
- VAPOUR PROOF MEMBRANE (VPM) 0.2m THK. MINIMUM.
- EXPOSED EXTERNAL EDGING SHALL BE FINISHED WITH AN ARRIS.
- PENETRATIONS FOR CONDUIT STUBS SHALL BE ALLOWED FOR IN ACCORDANCE WITH THE CONDUIT LAYOUT PLAN.
- THE CONTRACTOR SHALL IDENTIFY ALL EXISTING SERVICES WITHIN THE IMMEDIATE AREA THAT MAY BE AFFECTED BY THE INSTALLATION OF THE NEW SLAB AND CONDUITS. ALL EXISTING SERVICES SHALL BE PROTECTED AND MAINTAINED.
- SURROUNDS OF SLAB TO BE CONTOURED DOWN TO EXISTING SURFACE LEVEL WITH COMPACTED FILL.
- HOLES TO BE CORED THROUGH PUMP-WELL WALL. JOINT TO BE SEALED WITH APPROVED HYDROPHILIC SEAL AROUND CONDUITS.
- THE CONTRACTOR SHALL MAKE GOOD EXISTING SWITCHBOARD SLAB AREA BY REMOVING THE OLD SWITCHBOARD AND BY SEALING AND CAPPING ALL REDUNDANT CONDUITS AT SLAB AND WET WELL.

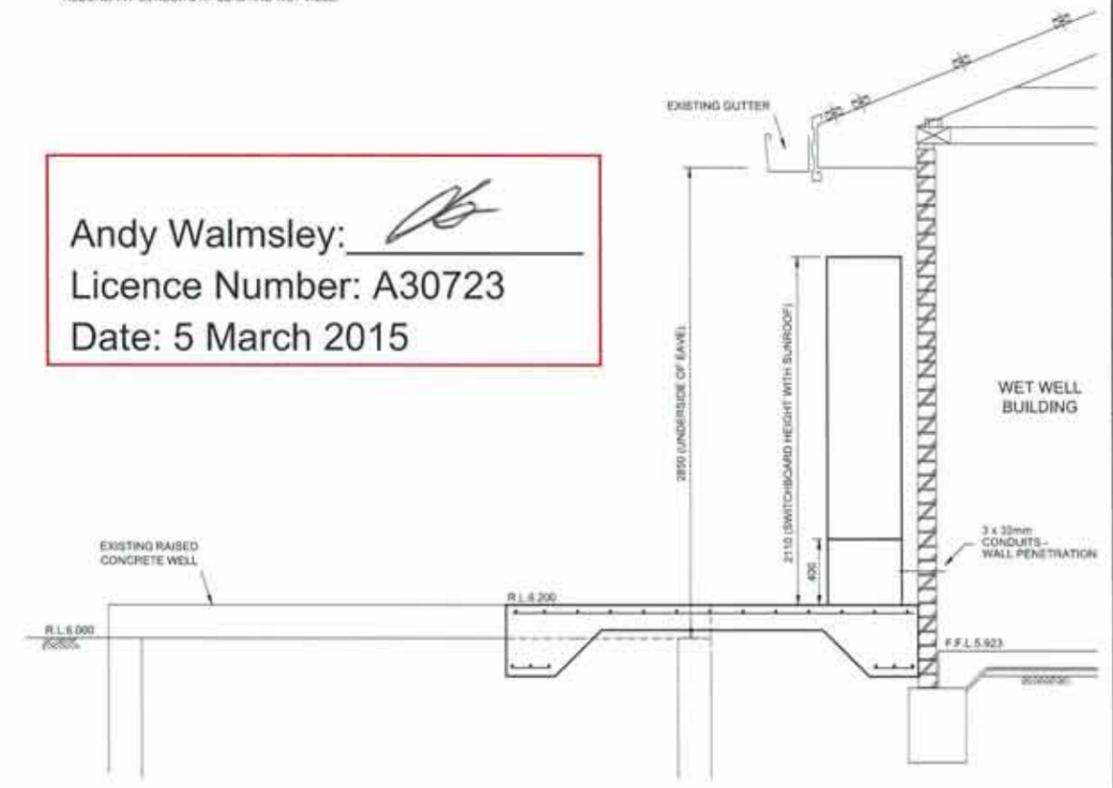
**CONDUIT NOTES:**

- PVC HEAVY DUTY ELECTRICAL CONDUITS (ORANGE) CAST INTO NEW CONCRETE SWITCHBOARD SLAB. ALL CONDUITS FITTED WITH LONG RADIUS BENDS, MINIMUM DEPTH 500mm. ALL CONDUIT STUBS FITTED WITH END CAPS TO PREVENT INGRESS OF MOISTURE AND SOIL. 'SPARE/FUTURE' CONDUITS TO EXTEND 300mm BEYOND SLAB EDGE AND FITTED WITH END CAPS.
- NESCO 'ERBT' EARTH ROD CONNECTION BOX TO BE CAST IN AND FLUSH WITH SLAB. ALLOW A MINIMUM OF 150mm CLEARANCE FROM CONNECTION BOX LID TO THE BASE OF SWITCHBOARD. 100mm CONDUIT CAST VERTICALLY IN SLAB TO EXTEND FROM INSIDE CONNECTION BOX, DOWN TO GROUND LEVEL. THIS CONDUIT ALLOWS FOR THE INSTALLATION OF AN EARTHING ROD. 25mm CONDUIT FOR EARTH IS TO BE MARRIED INTO THIS CONNECTION BOX PRIOR TO POURING ANY CONCRETE WORKS. REFER TO SECTION A.
- 50mm COMMUNICATIONS CONDUIT (WHITE) MUST BE USED.

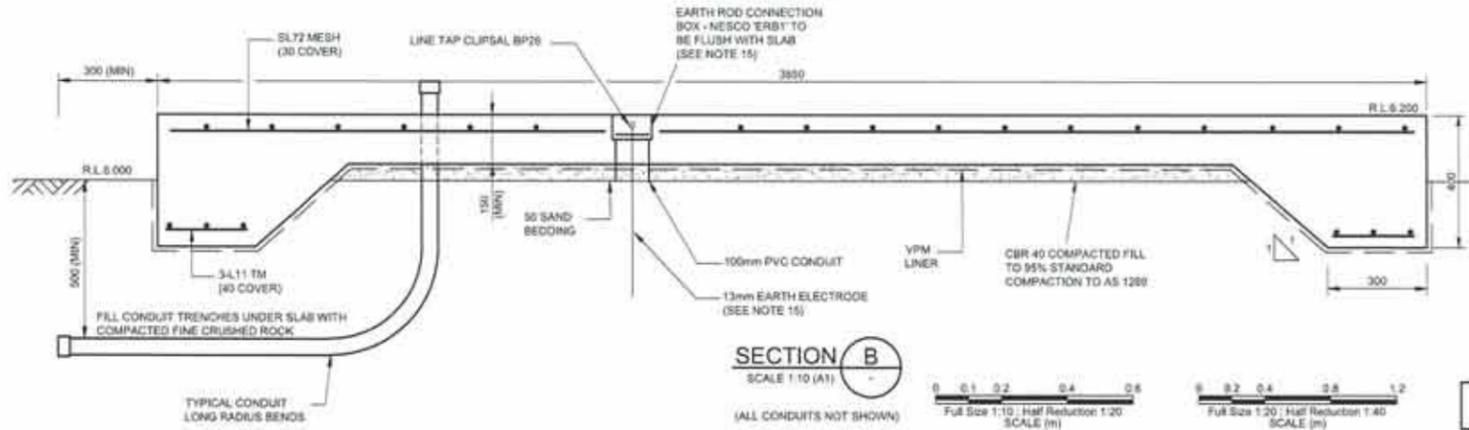
**CONDUIT LEGEND:**

- P • PUMP MOTOR CABLES
- E • ELECTRODES
- M • MAINS POWER SUPPLY
- G • GENERATOR POWER SUPPLY
- D • DISCHARGE PRESSURE TRANSDUCER
- ER • EARTH ROD
- C • COMMUNICATIONS
- S • SPARE

Andy Walmsley:   
 Licence Number: A30723  
 Date: 5 March 2015



**SECTION A**  
SCALE 1:20 (A1) 040



**SECTION B**  
SCALE 1:10 (A1)

0 0.1 0.2 0.4 0.6  
Full Size 1:10 / Half Reduction 1:20  
SCALE (m)

0 0.2 0.4 0.6 1.0  
Full Size 1:20 / Half Reduction 1:40  
SCALE (m)

**FOR CONSTRUCTION**

**Sheet 41**

**Cardno**  
Shaping the Future  
Cardno (Qld) Pty Ltd  
Level 11, North Tower, 218 St Paul's Terrace, Fortitude Valley QLD 4006  
Locked Bag 4006, Fortitude Valley QLD 4008  
Phone (07) 3288 9622 Fax (07) 3288 8722  
Email: cardno@cardno.com.au Web: www.cardno.com.au

CONSULTANTS DRAWING No. 7639/34-66-002

NAME SIGNATURE DATE  
 QUEENSLAND URBAN UTILITIES DELEGATE  
 (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

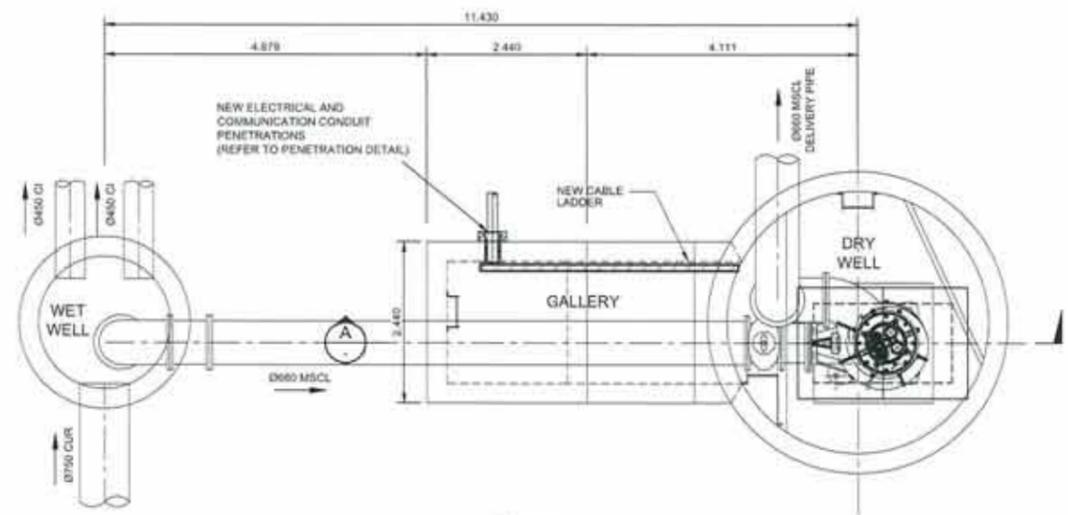
**UrbanUtilities**

SHEET No. 2 OF 4  
 QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/7-0463-041  
 AMEND. A

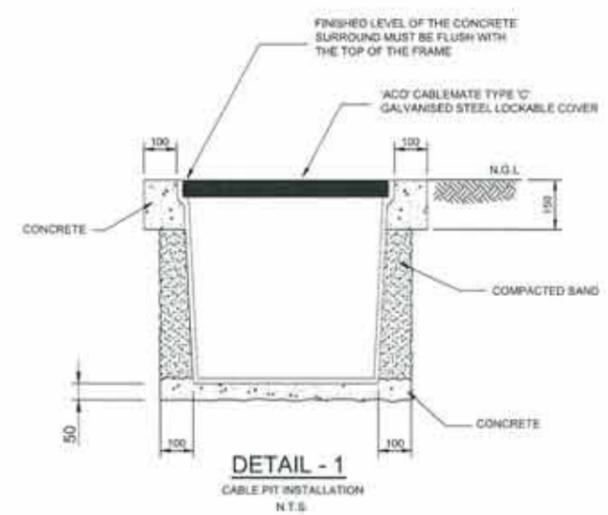
FUNDING		DRAFTED		S.W.		DESIGN		DATE	
A	20/01/14	FOR CONSTRUCTION	S.W.	R.S.	DESIGN W.O. No.	DRAFTING CHECK	S.W.	20/01/14	20/01/14
C	22/02/14	ISSUED FOR TENDER	S.W.	C.E.	CONSTRUCTION W.O. No.	CAD FILE	ST0463.DWG	20/01/14	20/01/14
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	SPEC. No.	APPROVED	FUNDED BY (Q.U.U. / -)	EXTERNAL ( )	Q.U.U. FILE No.

ASSET/PROJECT		DRAWING TITLE	
SP044 - LYTTON ROAD NORMAN PARK FLOOD RESILIENCE PROJECT		SWITCHBOARD SLAB AND CONDUIT DETAILS	

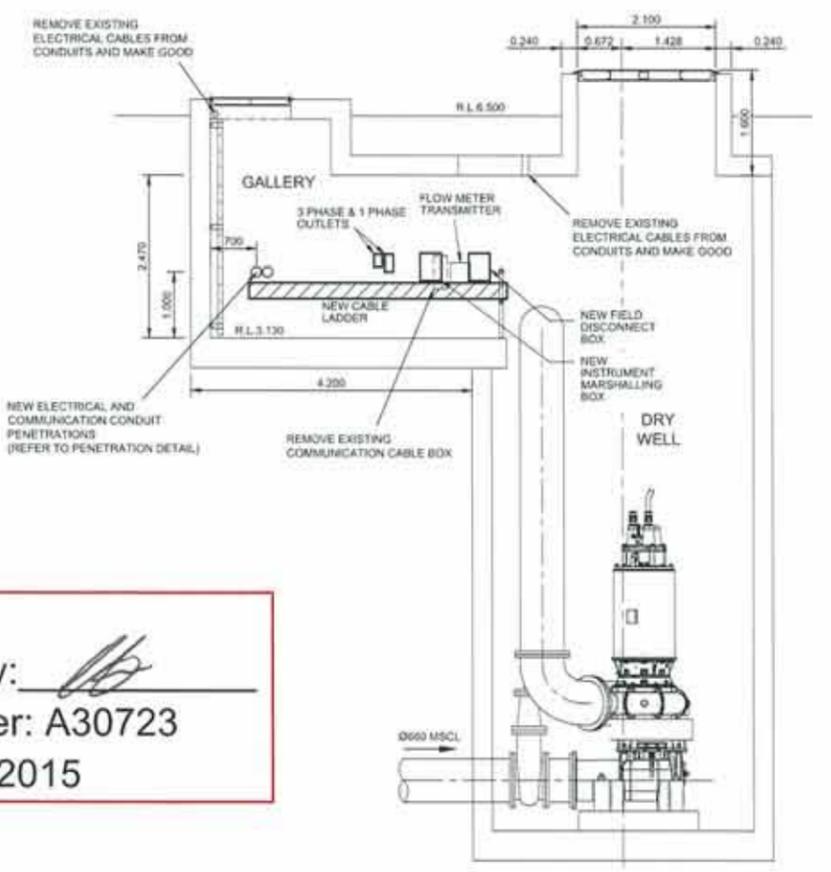
DATE PLOTTED: 8 May 2014 12:25 PM BY: STEPHEN WALMSLEY (BRISBANE)



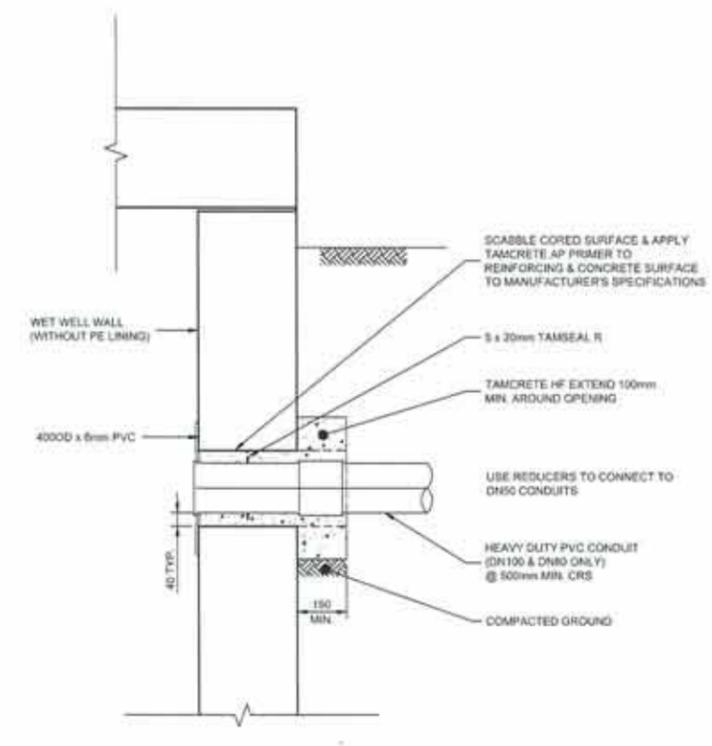
**PLAN**  
SCALE 1:50 (A1)



**DETAIL - 1**  
CABLE PIT INSTALLATION  
N.T.S.



**SECTION B**  
SCALE 1:50 (A1)



**PIPE WALL PENETRATION DETAIL**  
SCALE 1:10 (A1)

Andy Walmsley:   
Licence Number: A30723  
Date: 5 March 2015



**FOR CONSTRUCTION**

**Sheet 42**

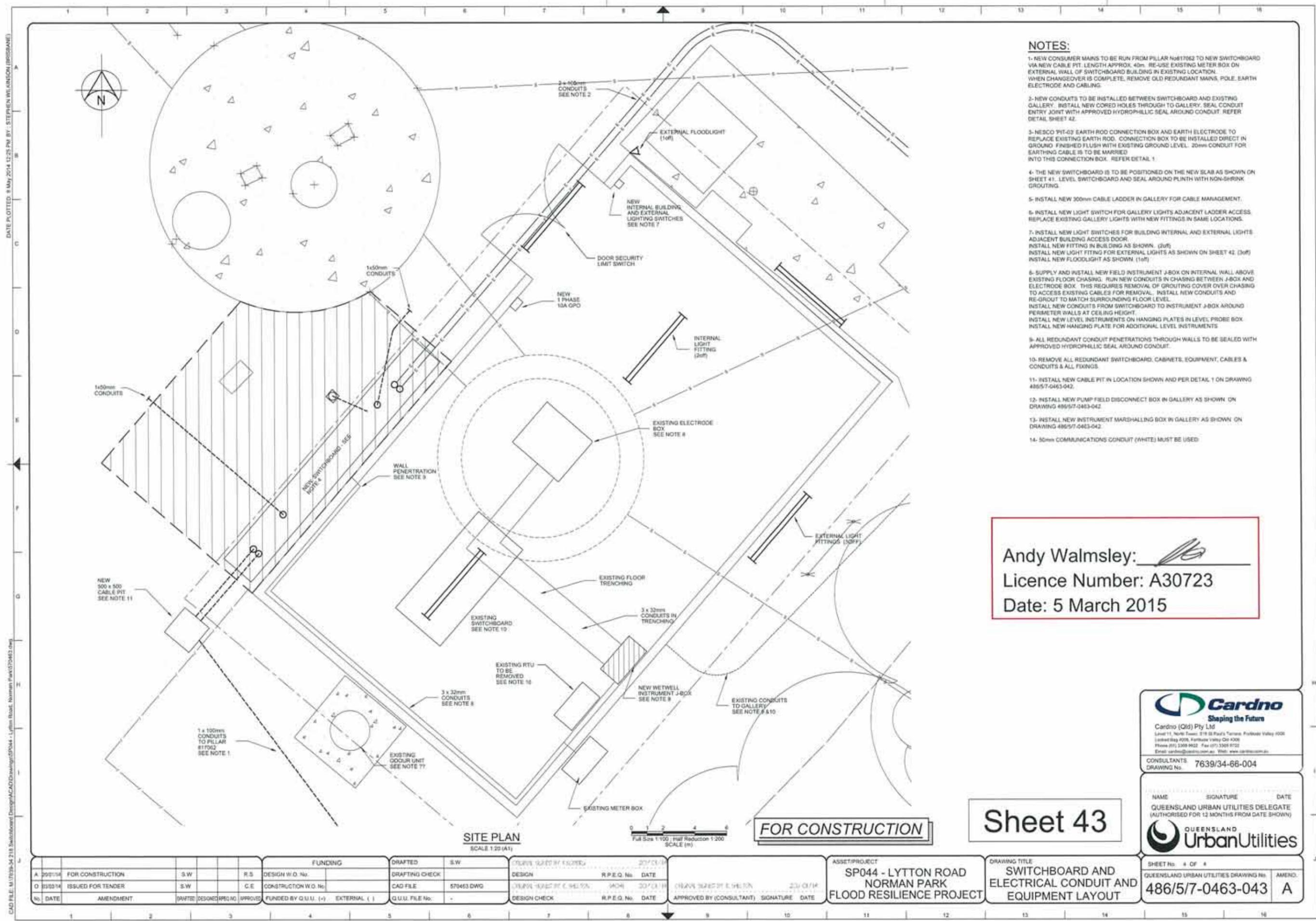
**Cardno**  
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Cardno (Old) Pty Ltd  
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Locked Bag 4000, Parkside Valley QLD 4008  
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CONSULTANTS DRAWING No. 7639/34-66-003

NAME SIGNATURE DATE  
QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

**UrbanUtilities**

A 20/01/14 FOR CONSTRUCTION S.W. R.S.		DESIGN W.O. No. 3		DRAFTED S.W. 13/02/14		DESIGN S.W. 13/02/14		ASSET/PROJECT		DRAWING TITLE		SHEET No. 3 OF 4	
O 03/03/14 ISSUED FOR TENDER S.W. I.C.E.		CONSTRUCTION W.O. No.		DRAFTING CHECK		DESIGN		SP044 - LYTTON ROAD NORMAN PARK FLOOD RESILIENCE PROJECT		GALLERY CONDUIT LAYOUT AND DETAILS		QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/7-0463-042	
No. DATE AMENDMENT		FUNDED BY Q.U.U. (-) EXTERNAL ( )		CAD FILE 579463.DWG		DESIGN CHECK		APPROVED BY (CONSULTANT) SIGNATURE DATE		AMEND		A	



- NOTES:**
- 1- NEW CONSUMER MAINS TO BE RUN FROM PILLAR No817062 TO NEW SWITCHBOARD VIA NEW CABLE PIT. LENGTH APPROX. 40m. RE-USE EXISTING METER BOX ON EXTERNAL WALL OF SWITCHBOARD BUILDING IN EXISTING LOCATION. WHEN CHANGEOVER IS COMPLETE, REMOVE OLD REDUNDANT MAINS, POLE, EARTH ELECTRODE AND CABLING.
  - 2- NEW CONDUITS TO BE INSTALLED BETWEEN SWITCHBOARD AND EXISTING GALLERY. INSTALL NEW CORED HOLES THROUGH TO GALLERY. SEAL CONDUIT ENTRY JOINT WITH APPROVED HYDROPHILIC SEAL AROUND CONDUIT. REFER DETAIL SHEET 42.
  - 3- HESCO PIT-02 EARTH ROD CONNECTION BOX AND EARTH ELECTRODE TO REPLACE EXISTING EARTH ROD. CONNECTION BOX TO BE INSTALLED DIRECT IN GROUND. FINISHED FLUSH WITH EXISTING GROUND LEVEL. 20mm CONDUIT FOR EARTHING CABLE IS TO BE MARRIED INTO THIS CONNECTION BOX. REFER DETAIL 1.
  - 4- THE NEW SWITCHBOARD IS TO BE POSITIONED ON THE NEW SLAB AS SHOWN ON SHEET 41. LEVEL SWITCHBOARD AND SEAL AROUND PLINTH WITH NON-SHRINK GROUTING.
  - 5- INSTALL NEW 300mm CABLE LADDER IN GALLERY FOR CABLE MANAGEMENT.
  - 6- INSTALL NEW LIGHT SWITCH FOR GALLERY LIGHTS ADJACENT LADDER ACCESS. REPLACE EXISTING GALLERY LIGHTS WITH NEW FITTINGS IN SAME LOCATIONS.
  - 7- INSTALL NEW LIGHT SWITCHES FOR BUILDING INTERNAL AND EXTERNAL LIGHTS ADJACENT BUILDING ACCESS DOOR. INSTALL NEW FITTING IN BUILDING AS SHOWN. (2x) INSTALL NEW LIGHT FITTING FOR EXTERNAL LIGHTS AS SHOWN ON SHEET 42. (3x) INSTALL NEW FLOODLIGHT AS SHOWN. (1x)
  - 8- SUPPLY AND INSTALL NEW FIELD INSTRUMENT J-BOX ON INTERNAL WALL ABOVE EXISTING FLOOR CHASING. RUN NEW CONDUITS IN CHASING BETWEEN J-BOX AND ELECTRODE BOX. THIS REQUIRES REMOVAL OF GROUTING COVER OVER CHASING TO ACCESS EXISTING CABLES FOR REMOVAL. INSTALL NEW CONDUITS AND RE-GROUT TO MATCH SURROUNDING FLOOR LEVEL. INSTALL NEW CONDUITS FROM SWITCHBOARD TO INSTRUMENT J-BOX AROUND PERIMETER WALLS AT CEILING HEIGHT. INSTALL NEW LEVEL INSTRUMENTS ON HANGING PLATES IN LEVEL. PROBE BOX. INSTALL NEW HANGING PLATE FOR ADDITIONAL LEVEL INSTRUMENTS.
  - 9- ALL REDUNDANT CONDUIT PENETRATIONS THROUGH WALLS TO BE SEALED WITH APPROVED HYDROPHILIC SEAL AROUND CONDUIT.
  - 10- REMOVE ALL REDUNDANT SWITCHBOARD, CABINETS, EQUIPMENT, CABLES & CONDUITS & ALL FIXINGS.
  - 11- INSTALL NEW CABLE PIT IN LOCATION SHOWN AND PER DETAIL 1 ON DRAWING 486/5/7-0463-042.
  - 12- INSTALL NEW PUMP FIELD DISCONNECT BOX IN GALLERY AS SHOWN ON DRAWING 486/5/7-0463-042.
  - 13- INSTALL NEW INSTRUMENT MARSHALLING BOX IN GALLERY AS SHOWN ON DRAWING 486/5/7-0463-042.
  - 14- 50mm COMMUNICATIONS CONDUIT (WHITE) MUST BE USED.

Andy Walmsley:   
 Licence Number: A30723  
 Date: 5 March 2015

**Cardno**  
 Shaping the Future  
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 Locked Bag 4008, Fortitude Valley QLD 4008  
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CONSULTANTS DRAWING No: 7639/34-68-004

NAME: \_\_\_\_\_ SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_  
 QUEENSLAND URBAN UTILITIES DELEGATE  
 (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

**UrbanUtilities**  
 SHEET No: 4 OF 4  
 QUEENSLAND URBAN UTILITIES DRAWING No: 486/5/7-0463-043 AMEND: A

**Sheet 43**

**FOR CONSTRUCTION**

**SITE PLAN**  
 SCALE 1:20 (A1)

0 1 2 4 6  
 Full Size 1:100 Half Reduction 1:200  
 SCALE (m)

NO.	DATE	AMENDMENT	DRAWN	DESIGNED	REQ'D	APPROVED	FUNDED BY Q.U.U. (+)	EXTERNAL (+)	DESIGN W/O No.	CONSTRUCTION W/O No.	Q.U.U. FILE No.	DESIGNED BY	DATE	DESIGN CHECK	R.P.E.Q. No.	DATE	APPROVED BY (CONSULTANT)	SIGNATURE	DATE	ASSET/PROJECT	DRAWING TITLE	SHEET No.	OF	AMEND.
A	20/01/14	FOR CONSTRUCTION	S.W.			R.S.						CHRIS WILSON	20/01/14							SP044 - LYTTON ROAD NORMAN PARK FLOOD RESILIENCE PROJECT	SWITCHBOARD AND ELECTRICAL CONDUIT AND EQUIPMENT LAYOUT	4	4	A
D	03/03/14	ISSUED FOR TENDER	S.W.			C.E.					570463 DWG	CHRIS WILSON	20/01/14											

# Drawings – Point to Point



QUEENSLAND  
**UrbanUtilities**

POINT TO POINT  
DAY 3 MTH 9 YEAR 14  
Name: Joshua Pardey  
Licence no: 122714  
Signed: [Signature]

# SP044 LYTTON ROAD SEWAGE PUMPING STATION SITE COVER SHEET

ELECTRICAL DRAWINGS INDEX				
DWG N°	TITLE	SHEET	REVISIONS	
486/5/7-0463-000	SITE COVER SHEET	00	0	A
486/5/7-0463-001	POWER DISTRIBUTION SCHEMATIC DIAGRAM	01	0	A
486/5/7-0463-002	PUMP 01 SCHEMATIC DIAGRAM	02	0	A
486/5/7-0463-003	RESERVED (PUMP 02 SCHEMATIC DIAGRAM)	03		
486/5/7-0463-004	RESERVED (PUMP 03 SCHEMATIC DIAGRAM)	04		
486/5/7-0463-005	DRY WELL & EM. STORAGE DEWATERING PUMPS SCHEMATIC DIAGRAM	05	0	A
486/5/7-0463-006	MTS CONTROL WIRING DIAGRAM	06	0	A
486/5/7-0463-007	COMMON CONTROLS SCHEMATIC DIAGRAM	07	0	A
486/5/7-0463-008	COMMON RTU I/O SCHEMATIC DIAGRAM	08	0	A
486/5/7-0463-009	RTU POWER DISTRIBUTION SCHEMATIC & NETWORK DIAGRAM	09	0	A
486/5/7-0463-010	RTU DIGITAL INPUTS TERMINATION DIAGRAM - SHEET 1 OF 3	10	0	A
486/5/7-0463-011	RTU DIGITAL INPUTS TERMINATION DIAGRAM - SHEET 2 OF 3	11	0	A
486/5/7-0463-012	RESERVED RTU DIGITAL INPUTS TERMINATION DIAGRAM - SHEET 3 OF 3	12		
486/5/7-0463-013	RTU DIGITAL OUTPUTS TERMINATION DIAGRAM - SHEET 1 OF 2	13	0	A
486/5/7-0463-014	RESERVED RTU DIGITAL OUTPUTS TERMINATION DIAGRAM - SHEET 2 OF 2	14		
486/5/7-0463-015	RTU ANALOG INPUTS TERMINATION DIAGRAM	15	0	A
486/5/7-0463-016	RTU ANALOG OUTPUTS TERMINATION DIAGRAM	16	0	A
486/5/7-0463-017	COMMON CONTROLS TERMINATION DIAGRAM	17	0	A
486/5/7-0463-018	EQUIPMENT LIST	18	0	A
486/5/7-0463-019	CABLE SCHEDULE	19	0	A
486/5/7-0463-020	SWITCHBOARD LABEL SCHEDULE	20	0	A
486/5/7-0463-021	SWITCHBOARD CONSTRUCTION DETAILS - SHEET 1 of 3	21	0	A
486/5/7-0463-022	SWITCHBOARD CONSTRUCTION DETAILS - SHEET 2 of 3	22	0	A
486/5/7-0463-023	SWITCHBOARD CONSTRUCTION DETAILS - SHEET 3 of 3	23	0	A
486/5/7-0463-024	FIELD INSTRUMENTATION - INSTALLATION DETAILS	24	0	A
486/5/7-0463-025	RESERVED (CATHODIC PROTECTION UNIT)	25		
486/5/7-0463-026	RESERVED (GENERATOR CONTROL)	26		
486/5/7-0463-027	DRY WELL DISCONNECTION BOX GENERAL ARRANGEMENT	27	0	A
486/5/7-0463-028	WETWELL INSTRUMENTATION MARSHALLING BOX-GENERAL ARRANGEMENT	28	0	A
486/5/7-0463-029	SWBD GENERAL ARRANGEMENT ELEVATIONS	29	0	A
486/5/7-0463-030	SWBD GENERAL ARRANGEMENT SECTIONS	30	0	A
486/5/7-0463-031	RESERVED (GENERATOR EXTERNAL CONNECTION BOX)	31		
486/5/7-0463-032	DRYWELL INSTRUMENTATION MARSHALLING BOX-GENERAL ARRANGEMENT	32	0	A
486/5/7-0463-040	SWITCHBOARD SLAB - LOCALITY AND SITE PLANS - SHEET 1 of 4	40	0	A
486/5/7-0463-041	SWITCHBOARD SLAB AND CONDUIT DETAILS - SHEET 2 of 4	41	0	A
486/5/7-0463-042	GALLERY CONDUIT LAYOUT AND DSTAILS - SHEET 3 of 4	42	0	A
486/5/7-0463-043	SWITCHBOARD & ELECTRICAL CONDUIT & EQUIP LAYOUT - SHEET 4 of 4	43	0	A

STANDARD VARIABLES	
DESCRIPTION	VALUES
CT METERING ISOLATOR	250A SLB 2503P
NORMAL SUPPLY MAIN SWITCH	0.95(237.5A) S400GE/250
GENERATOR SUPPLY MAIN SWITCH	0.8(200A) S400GE/250
PUMP1 CIRCUIT BREAKER	1(160A) S160GJ/160
PUMP2 CIRCUIT BREAKER	1(160A) S160GJ/160
DRY WELL SUMP PUMP CIRCUIT BREAKER	20A S125NJ/20
EM STORAGE DEWATERING PUMP CCT BREAKER	NOT APPLICABLE
PUMP VSD STARTER SIZE	FC202P90K 177A
PUMP RATING	80kW 139A
PUMP LINE CONTACTOR	NOT APPLICABLE
DRY WELL SUMP PUMP RATING	2.2kW 4.8A
DRY WELL SUMP PUMP CONTACTOR & TOL	CA7-16 CT7-24-6
PUMP SOCKET OUTLET - INCLINE SLEEVE	NOT APPLICABLE
PUMP INLET PLUG + HANDLE	NOT APPLICABLE
WET WELL LEVEL TRANSMITTER	WLS2XXA4AMD10DIX 5m
EMERGENCY STORAGE WELL LEVEL TRANSMITTER	NOT APPLICABLE
EM STORAGE DEWATERING PUMP RATING	NOT APPLICABLE
EM STORAGE DEWATERING PUMP CONTR & TOL	NOT APPLICABLE
FLOWMETER RANGE	<??/??>
WET WELL ULTRASONIC LEVEL SENSOR	NOT APPLICABLE
DELIVERY PRESSURE TRANSMITTER	BR52XXCA1FHPMAS L=40 50m
RADIO	DR900-07A02-00
EMERGENCY PUMPING TIME	1.5a.sec
No of SINGLE POINT PROBES	6
INCOMING MAINS SUPPLY CABLE	70mm <sup>2</sup>
MAIN EARTHING CABLE	25mm <sup>2</sup>
INCOMING GENERATOR SUPPLY CABLE	NOT APPLICABLE
VSD STARTER 3 PHASE SUPPLY	35mm <sup>2</sup>

STANDARD DESIGN OPTIONS		
OPTION	DESCRIPTION	FITTED
A	INDIVIDUAL PUMP MOISTURE IN OIL (MIO) SENSOR AND FAULT RELAY	YES <input checked="" type="checkbox"/>
B	INDIVIDUAL PUMP MOTOR AUX PROTECTION SENSORS AND FAULT RELAYS	YES <input checked="" type="checkbox"/>
C	INDIVIDUAL PUMP REFLUX VALVE PROXIMITY SWITCH	YES <input checked="" type="checkbox"/>
D		YES NO
E	STATION DRY WELL SUMP PUMP AND LEVEL INDICATION SENSORS AND RELAYS	YES <input checked="" type="checkbox"/>
F	PERMANENT GENERATOR INSTALLED	<input checked="" type="checkbox"/> NO
G	STATION EMERGENCY STORAGE LEVEL SENSOR, DEWATERING PUMP	<input checked="" type="checkbox"/> NO
H	STATION DELIVERY FLOWMETER - 240VAC ABB	YES <input checked="" type="checkbox"/>
I	BACKUP COMMUNICATION - GSM	YES <input checked="" type="checkbox"/>
J	PUMP CONNECTION (Via Dry Well J-Box)	YES <input checked="" type="checkbox"/>
K	CATHODIC PROTECTION	<input checked="" type="checkbox"/> NO
L	MOTOR THERMISTORS (Via Dry Well J-Box)	YES <input checked="" type="checkbox"/>
M	ODOUR CONTROL	YES <input checked="" type="checkbox"/>
N	CURRENT TRANSFORMER (CT) METERING	YES <input checked="" type="checkbox"/>
O	PUMPS ELECTRICAL INTERLOCK	<input checked="" type="checkbox"/> NO
P	WET WELL WASHER	<input checked="" type="checkbox"/> NO
Q	AUX PIT SUMP PUMP AND LEVEL PROBE	<input checked="" type="checkbox"/> NO
R	TELEMETRY RADIO	YES <input checked="" type="checkbox"/>
S	WET WELL SECONDARY LEVEL SENSOR	<input checked="" type="checkbox"/> NO
T	WET WELL PRIMARY LEVEL SENSOR (Via Field Instrument Box)	YES <input checked="" type="checkbox"/>
U	DELIVERY PRESSURE TRANSMITTER (Via Field Disconnect Box)	YES <input checked="" type="checkbox"/>
V	CHEMICAL DOSING	<input checked="" type="checkbox"/> NO
W	PUMP START METHOD - VARIABLE SPEED DRIVE	YES <input checked="" type="checkbox"/>
X	3rd PUMP INSTALLED	<input checked="" type="checkbox"/> NO
Y	POWER METER	<input checked="" type="checkbox"/> NO

Sheet 00  
FOR CONSTRUCTION

No.	DATE	AMENDMENT	DRN.	APD.	S.C.C. FILE No.	DRAFTED	P.HAGUE	P.HAGUE	3-3-14
A	05-14	ISSUED FOR CONSTRUCTION	P.H.	A.W.		DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.Q. No. DATE
C	03-14	ISSUED FOR TENDER	P.H.	A.W.	CAD FILE		57-0463set_A	A.WITTHOFT	1885 3-3-14

NAME: QUEENSLAND URBAN UTILITIES DELEGATE  
SIGNATURE: [Signature]  
DATE: 1885  
AUTHORISED FOR 12 MONTHS FROM DATE SIGNED  
**UrbanUtilities**

**Cardno**  
Shaping the Future  
Cardno (QM) Pty Ltd  
NO. 001 001 001

SITE: SP044  
LYTTON ROAD  
SEWAGE PUMP STATION

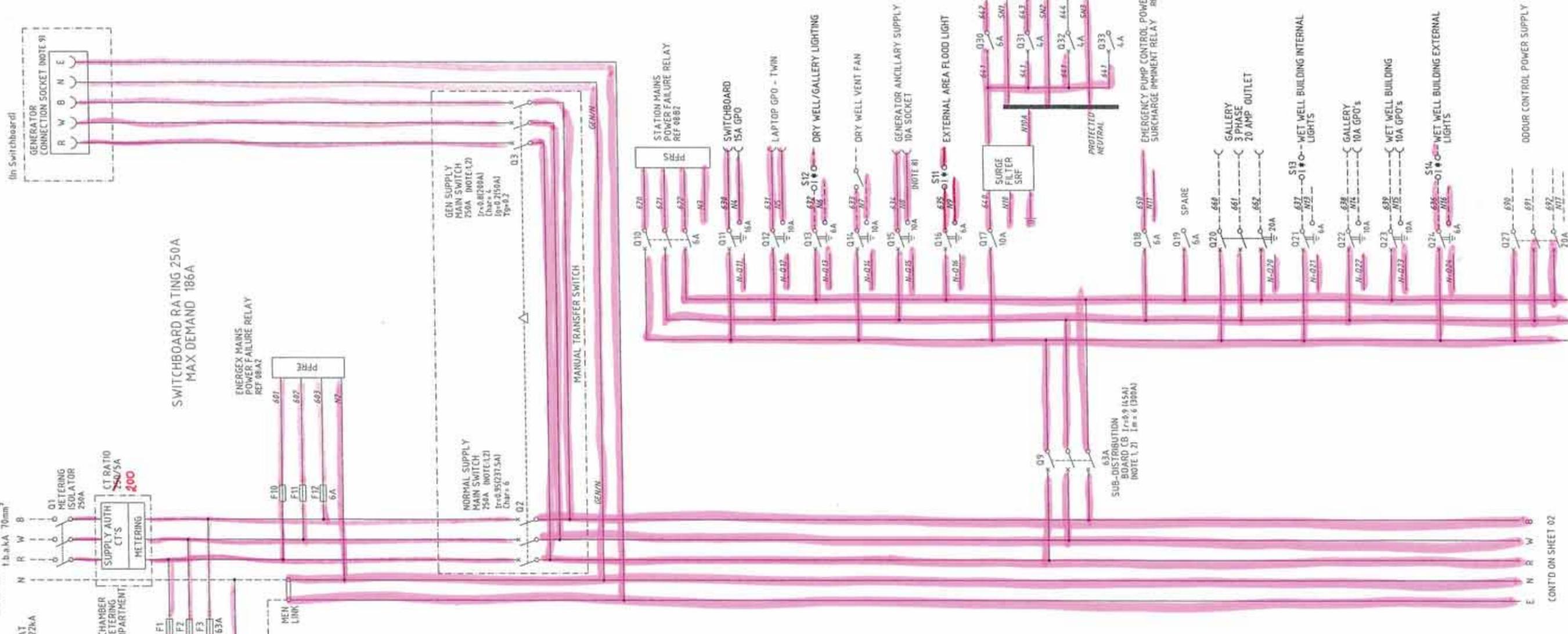
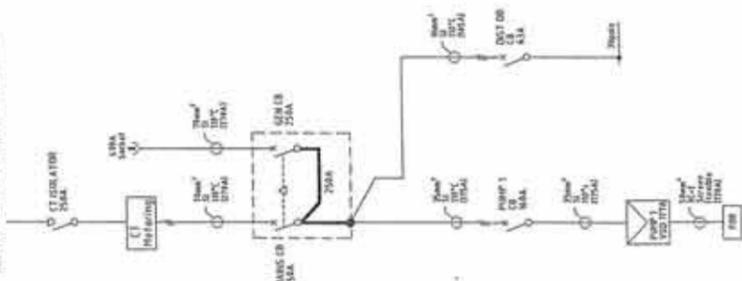
TITLE: SITE COVER SHEET

SHEET No. 0  
Queensland Urban Utilities DRAWING No.  
486/5/7-0463-000  
AMEND. A

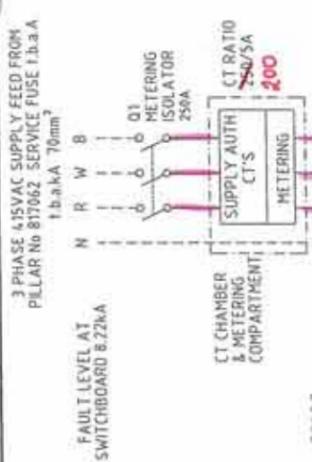
**NOTES**

1. INCOMING MAIN, GENSET, PUMP & DB CIRCUIT BREAKERS SHALL BE LINE 500 SHROUDED.
2. M.E.N. LINK TO BE PROVIDED AS PER AS3000.2007 SECTION 7.
3. SURGE PROTECTION DEVICE TO BE AS CLOSE TO THE INCOMER AS POSSIBLE. CONDUCTORS SHALL BE A MINIMUM 6mm<sup>2</sup> AT A MAXIMUM LENGTH OF 600mm TO BE USED OVER THE SHORTEST AND MOST DIRECT PATH WITH NO LOOPS CONNECTED TO NEUTRAL.
4. ALL CIRCUIT BREAKERS TO BE PADLOCKABLE. LOCKING IS TO BE INDEPENDENT OF ESCUTCHEON.
5. CIRCUIT BREAKER RATINGS TO SUIT FAULT LEVEL & LOAD TO ENSURE TYPE 2 CO-ORDINATION WITH CONTACTORS AND OVERLOADS TO AS3947-1-1.
6. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST SIZ2000 COMPATIBLE LABELING.
7. ALL LIGHT AND POWER CIRCUITS SHALL BE FITTED WITH RCD PROTECTION, SET AT 30mA. ALL 1Φ & 3Φ POWER OUTLETS MOUNTED ON ESCUTCHEONS TO BE WIRED IN DOUBLE INSULATED CABLES.
8. MAXIMUM DEMAND CALCULATION AND ALL CIRCUIT BREAKER SETTINGS WITHIN THIS DRAWINGS SET HAVE BEEN DERIVED FROM THE SITE POWER SYSTEM ANALYSIS FILE (Refer "SP044\_LYTTON ROAD Power System Analysis and Protection Coordination.pdf")
9. CABLING TO GENERATOR CONNECTION SOCKET AND AUXILIARY SUPPLY SOCKET TO BE DOUBLE INSULATED. CABLING TO BE FULLY SEALED TO OTHER COMPARTMENTS.

**POWER CABLING ARRANGEMENT**



**POINT TO POINT**  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Pardey  
 Licence no: 122714  
 Signed: [Signature]



SWITCHBOARD RATING 250A  
 MAX DEMAND 186A

ENERGEX MAINS  
 POWER FAILURE RELAY  
 REF 08A2

NORMAL SUPPLY  
 MAIN SWITCH  
 250A (NOTE 12)  
 Itr=0.8(200A)  
 Ipr=2.1(50A)  
 Tpr=0.2

MANUAL TRANSFER SWITCH

SUB-DISTRIBUTION  
 BOARD CB Itr=0.9 (1.5A)  
 Ipr=6.1 (300A)

Sheet 01  
 FOR CONSTRUCTION

A	05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.	DRAFTING CHECK	P.HAGUE	3-3-14
0	03.14	ISSUED FOR TENDER	P.H.	A.W.	CAD FILE	A.WITTHOFT	3-3-14
No.	DATE	AMENDMENT	DRN.	APD.	S.C.C. FILE No.	DESIGN CHECK	R.P.E.Q. No. DATE

DRAFTED	P.HAGUE	3-3-14
DESIGN	A.WITTHOFT	3-3-14
DESIGN CHECK	A.WITTHOFT	3-3-14

NAME	QUEENSLAND URBAN UTILITIES DELEGATE
SIGNATURE	[Signature]
DATE	3-3-14
AUTHORISED FOR	12 MONTHS FROM DATE SIGNING

**UrbanUtilities**  
 Queensland Urban Utilities Delegate

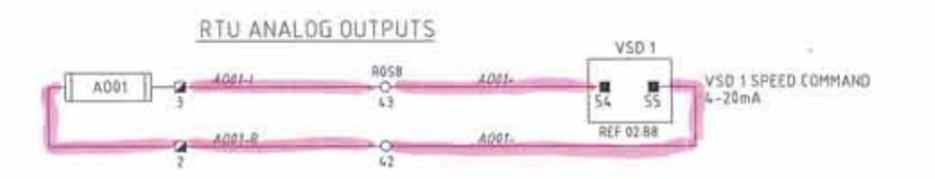
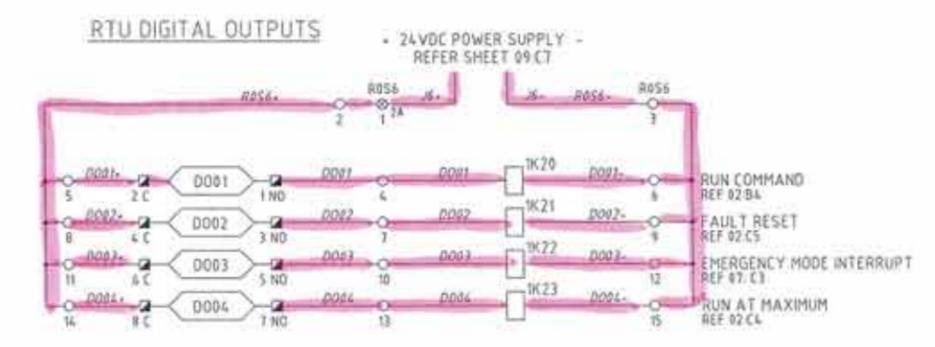
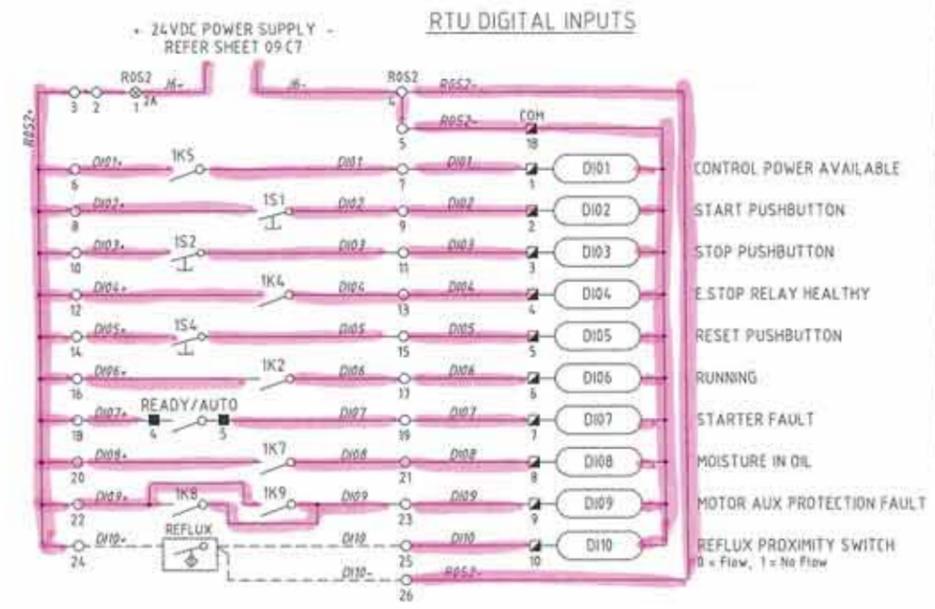
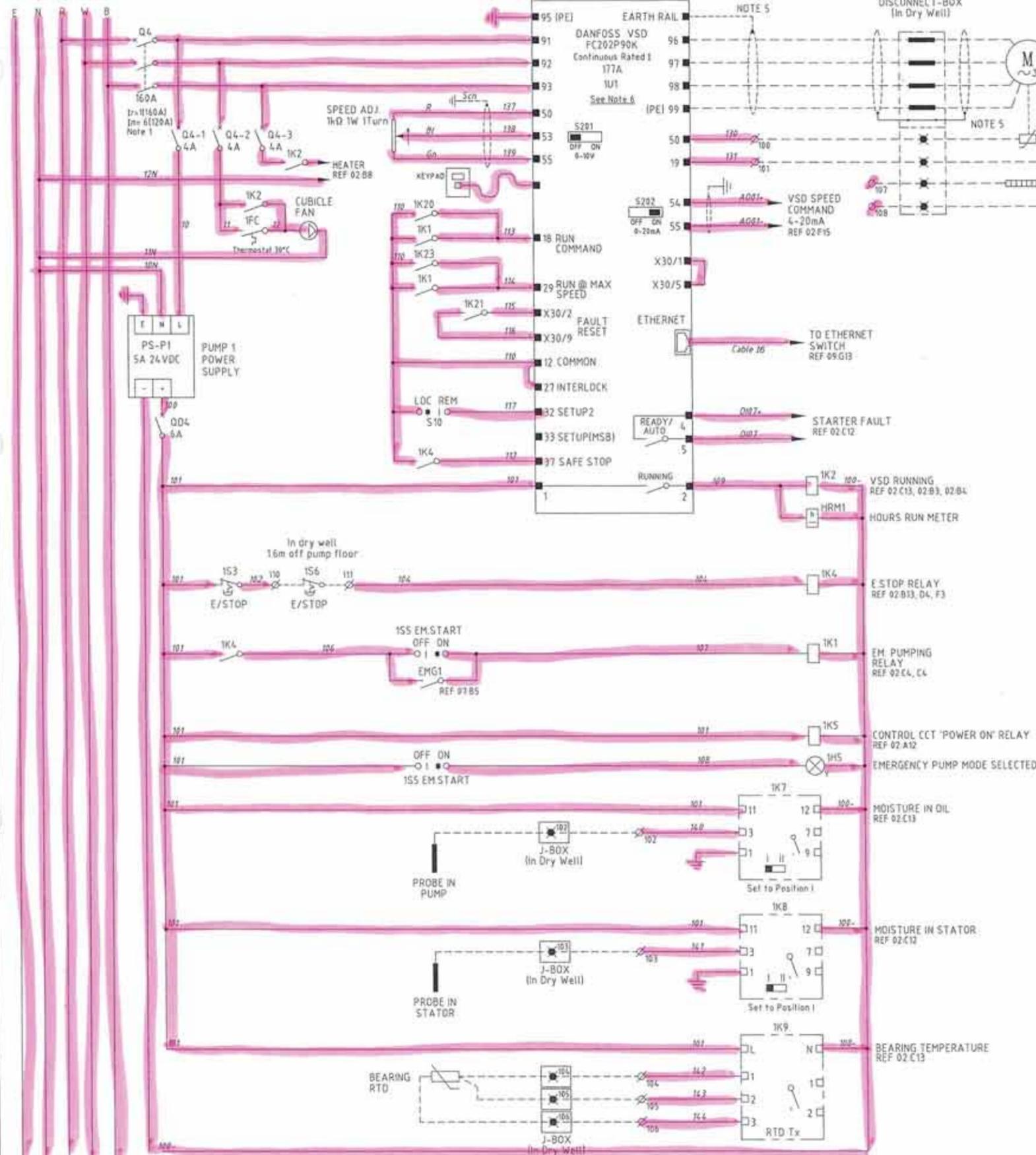
**Cardno**  
 Shaping the Future  
 Cardno (Cld) Pty Ltd

SITE  
 SP044  
 LYTTON ROAD  
 SEWAGE PUMP STATION

TITLE  
 POWER DISTRIBUTION  
 SCHEMATIC DIAGRAM

SHEET No. 1  
 Queensland Urban Utilities DRAWING No.  
 486/5/7-0463-001  
 AMEND. A

CONT'D FROM SHEET 01



- NOTES**
- SUBMERSIBLE PUMP No1 CIRCUIT BREAKER SHALL BE LINE SIDE SHROUDED.
  - CIRCUIT BREAKER RATINGS TO SUIT FAULT LEVEL & LOAD ENSURE MIN TYPE 1 CO-ORDINATION WITH CONTACTORS & OVERLOADS TO IEC 947-4-1.
  - ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST SI2000 COMPATIBLE LABELING.
  - FAULT LEVEL OF 20kA AT 415V FOR 0.2sec.
  - USE CABLE CLAMPS TO MAINTAIN CONTINUITY OF CABLE SCREENING THROUGH FIELD DISCONNECT BOX. DO NOT USE PIGTAILS. SEE SHEET 22 DETAIL L1 & L2.
  - VSD MUST BE ORDERED WITH "SAFE STOP" OPTION FACTORY FITTED.

**POINT TO POINT**  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Ardley  
 Licence no: 122714  
 Signed: [Signature]

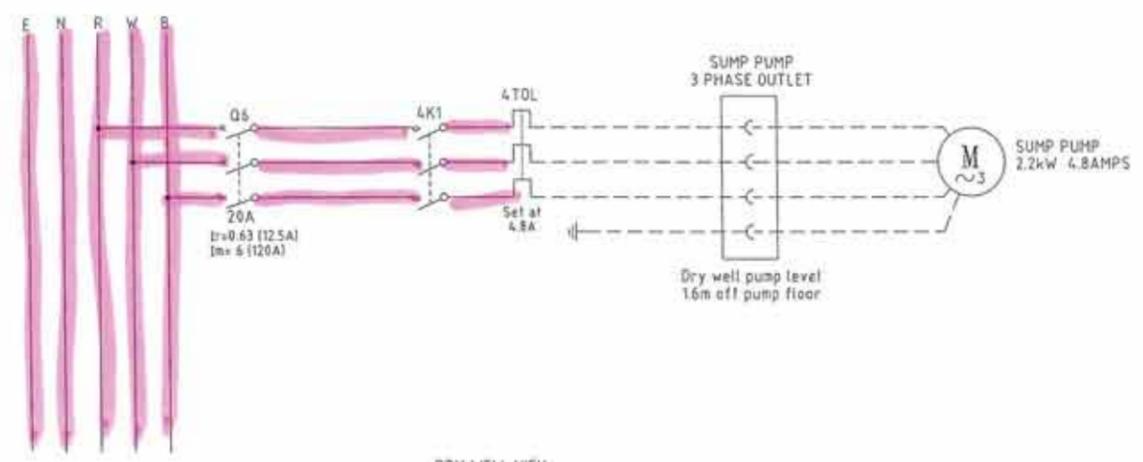
**LEGEND**

⊗	RTU MARSH CCT BREAKER TERM
○	RTU MARSH LINK TERMINAL
⊕	SWITCHBOARD CONTROL TERM
⊖	SWITCHBOARD GENERATOR TERM
⊗	FIELD TERMINAL
⊕	RTU TERMINAL
⊖	VSD TERMINAL
DI01	DIGITAL INPUT
DO01	DIGITAL OUTPUT
AI01	ANALOG INPUT
AO01	ANALOG OUTPUT

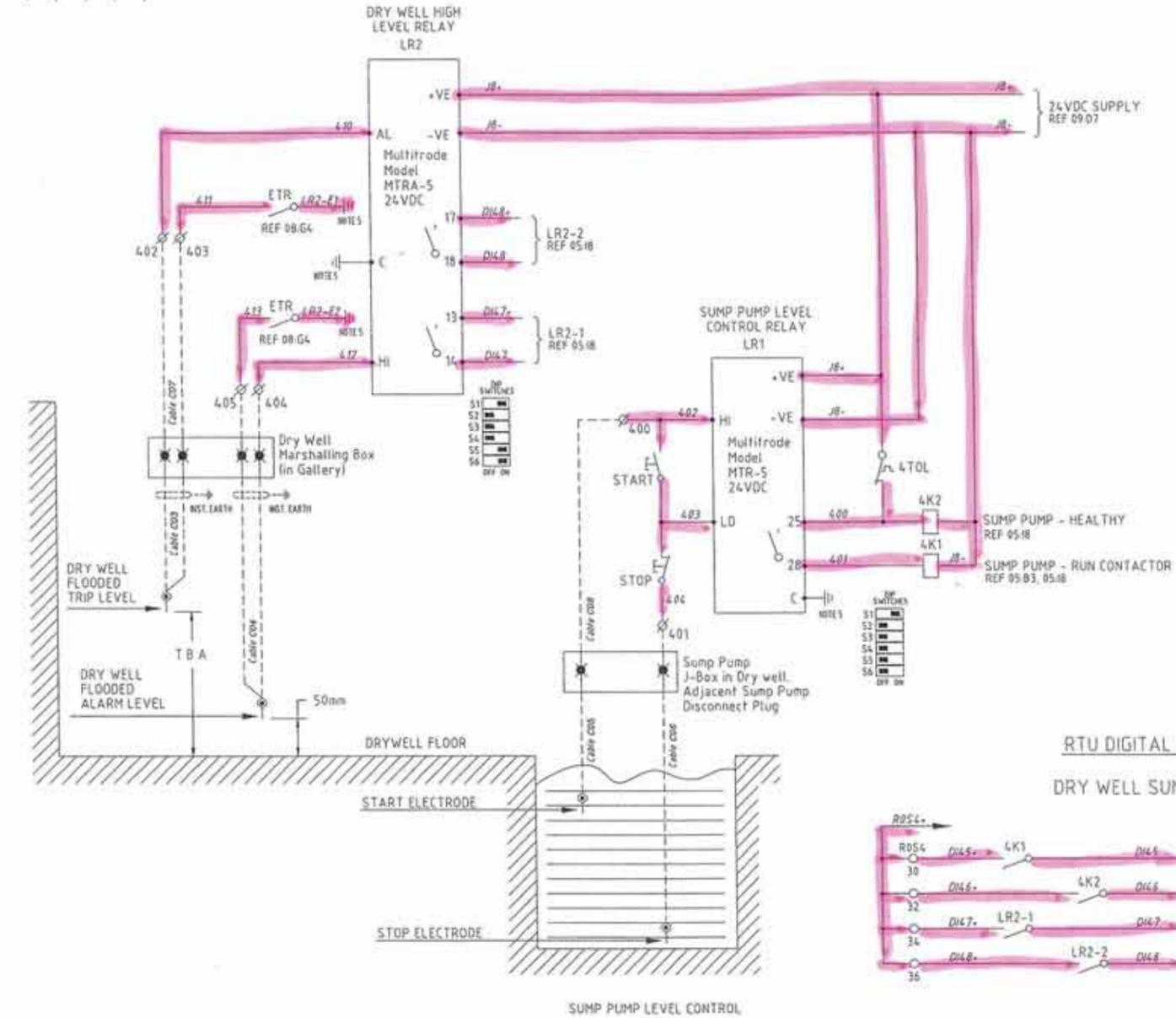
**Sheet 02**  
 FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION		P.H.	A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.G. No.	DATE	3-3-14
ISSUED FOR TENDER		P.H.	A.W.	CAD FILE	S7-0463seLA	A WITTHOFT	8885	3-3-14	
No.	DATE	AMENDMENT		DRN	APD	B.C.C. FILE No.	DESIGN CHECK	R.P.E.G. No.	DATE

CONT'D FROM SHEET 03

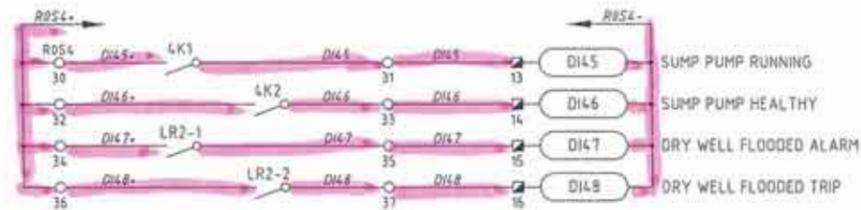


RESERVED  
EMERGENCY  
STORAGE  
DEWATERING  
PUMP



POINT TO POINT  
DAY 3 MTH 9 YEAR 14  
Name: Joshua Purdey  
Licence no: 122714  
Signed: [Signature]

RTU DIGITAL INPUTS  
DRY WELL SUMP PUMP



NOTES

- SUMP PUMP & STORAGE TANK DEWATERING PUMP CIRCUIT BREAKERS SHALL BE LINE SIDE SHROUDED.
- CIRCUIT BREAKER RATINGS TO SUIT FAULT LEVEL & LOAD ENSURE MIN TYPE 1 CO-ORDINATION WITH CONTACTORS & OVERLOADS TO IEC 947-4-1.
- FAULT LEVEL OF 20kA AT 415V FOR 0.2sec
- ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFDPLAST S12000 COMPATIBLE LABELING.
- RUN SEPARATE DEDICATED EARTH CONDUCTORS TO EARTH BAR.

LEGEND:

- ⊙ RTU MARSH. CCT BREAKER TERM
- RTU MARSH. LINK TERMINAL
- ⊠ SWITCHBOARD CONTROL TERM
- ⊞ SWITCHBOARD GENERATOR TERM
- ⊟ FIELD TERMINAL
- ⊡ RTU TERMINAL
- ⊞ VSD TERMINAL
- DI1 DIGITAL INPUT
- DO1 DIGITAL OUTPUT
- AI1 ANALOG INPUT
- AO1 ANALOG OUTPUT

Sheet 05

FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	P.HAGUE	3-3-14	NAME: SIGNATURE DATE QUEENSLAND URBAN UTILITIES DELEGATE QUEENSLAND AUTHORIZED FOR 12 MONTHS FROM DATE SHOWN	Cardno (Qlt) Pty Ltd	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE SUMP PUMPS SCHEMATIC DIAGRAM DRY WELL SUMP PUMP EM. STORAGE DEWATERING PUMP	SHEET No. 5 Queensland Urban Utilities DRAWING No. 486/5/7-0463-005	AMEND. A
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	57-0463set_A	A.WITTHOFT	DESIGN CHECK	3-5-14						

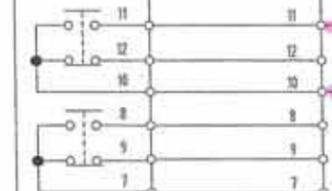
MAIN SWITCH COMPARTMENT

INTERFACE WIRING

MANUAL TRANSFER SWITCH

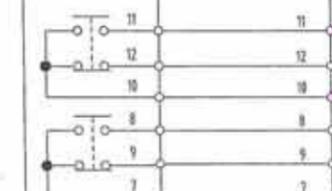
NORMAL SUPPLY  
CIRCUIT BREAKER

Q2



MECHANICAL  
INTERLOCK

Q3



GENERATOR SUPPLY  
CIRCUIT BREAKER

+24V

24VDC  
SUPPLY  
REF 09.G7

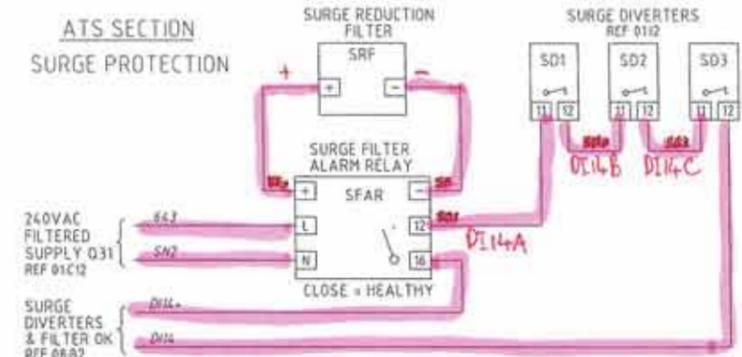
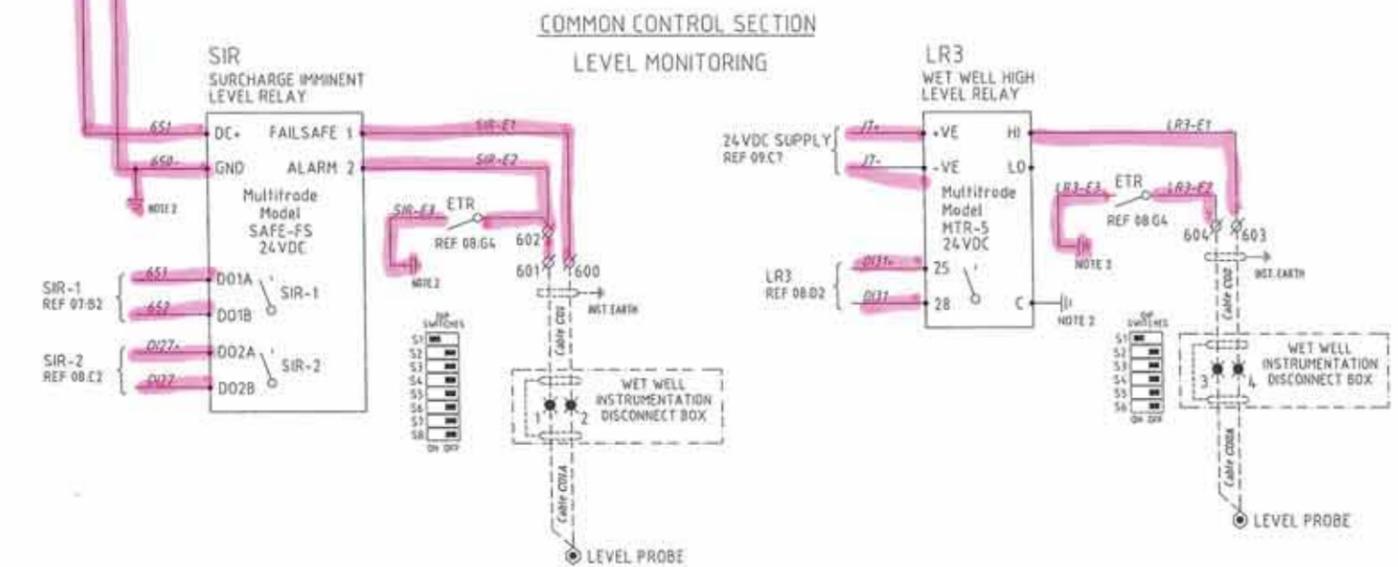
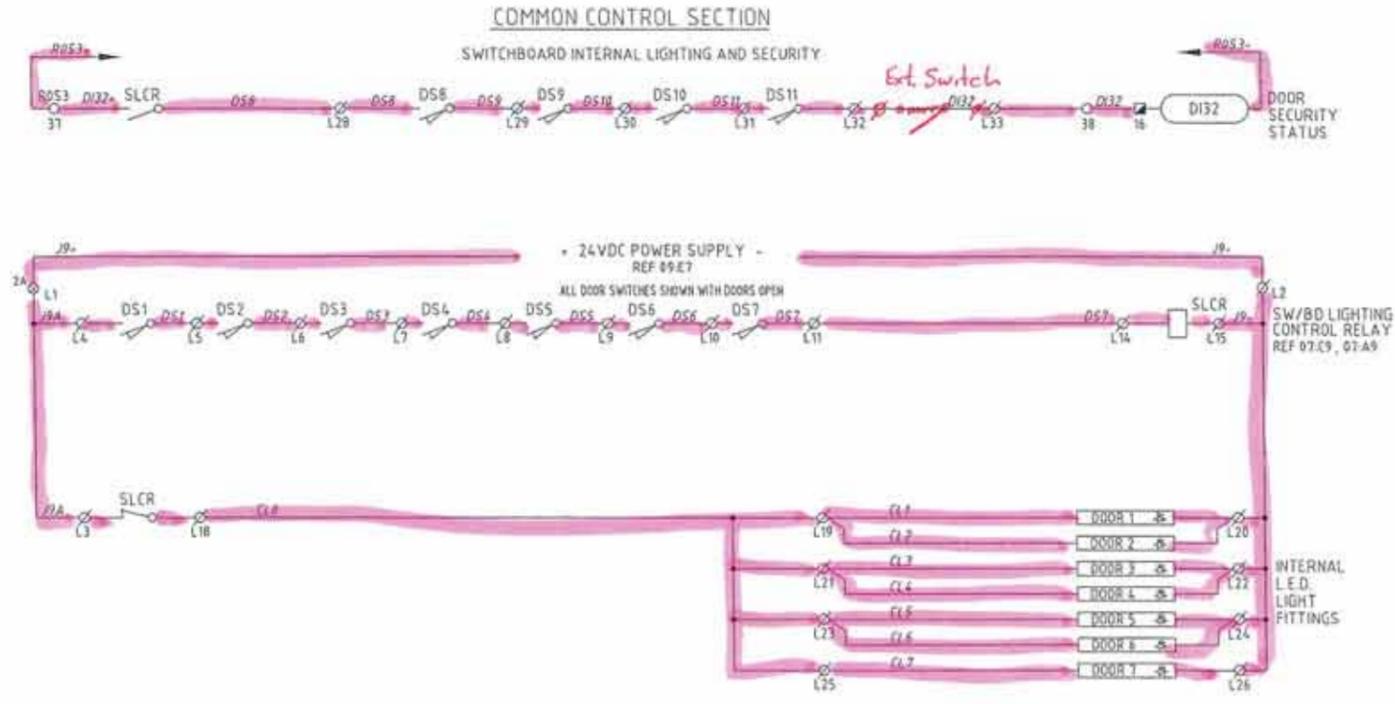
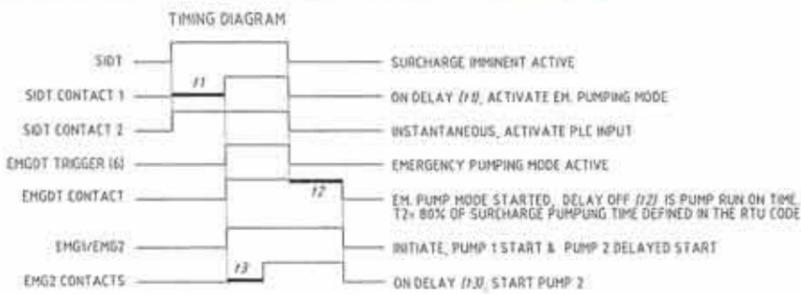
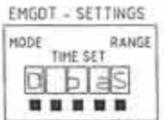
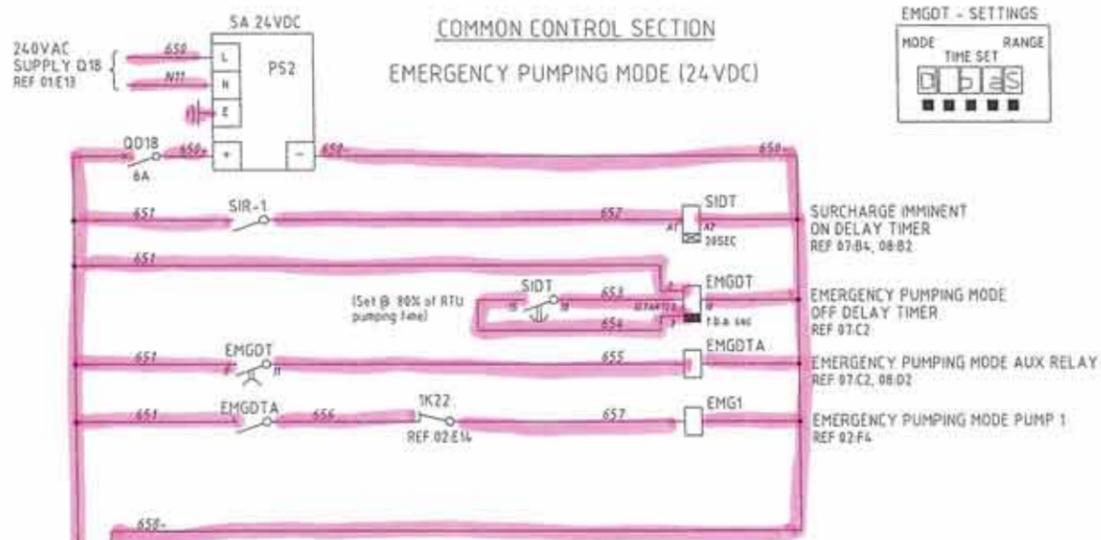
POINT TO POINT  
DAY 3 MTH 9 YEAR 14  
Name: Joshua Pardey  
Licence no: 122714  
Signed: *[Signature]*

MANUAL TRANSFER SWITCH  
NORMAL MODE AUX CONTACTS  
REF 08.E2

- LEGEND:**
- ⊙ RTU MARSH. CCT BREAKER TERM
  - RTU MARSH. LINK TERMINAL
  - ⊞ SWITCHBOARD CONTROL LINK TERM.
  - ⊙ MARSHALLING BOX CONTROL TERM.
  - ⊙ MARSHALLING BOX POWER TERM.
  - ⊞ SWITCHBOARD GENERATOR TERM.
  - ⊞ FIELD TERMINAL
  - ⊞ RTU TERMINAL
  - ⊞ VSD TERMINAL

Sheet 06  
FOR CONSTRUCTION

NO.	DATE	AMENDMENT	DRN.	APD.	B.C.C. FILE No.	DESIGN CHECK	R.P.E.Q. No.	DATE	NAME	SIGNATURE	DATE	SITE	TITLE	SHEET No.	AMEND.
A	05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.		P.HAGUE		3-3-14				SP044 LYTTON ROAD SEWAGE PUMP STATION	MTS CONTROL WIRING DIAGRAM	06	
D	03.14	ISSUED FOR TENDER	P.H.	A.W.		A.WITTHOFT		885							



- NOTES**
1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING.
  2. RUN SEPARATE DEDICATED EARTH CONDUCTOR TO EARTH BAR.

**LEGEND**

⊙	RTU MARSH. CCT BREAKER TERM
○	RTU MARSH. LINK TERMINAL
⊕	SWITCHBOARD CONTROL TERM.
⊖	SWITCHBOARD GENERATOR TERM.
■	FIELD TERMINAL
⊠	RTU TERMINAL
■	VSD TERMINAL
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
AI	ANALOG INPUT
AO	ANALOG OUTPUT

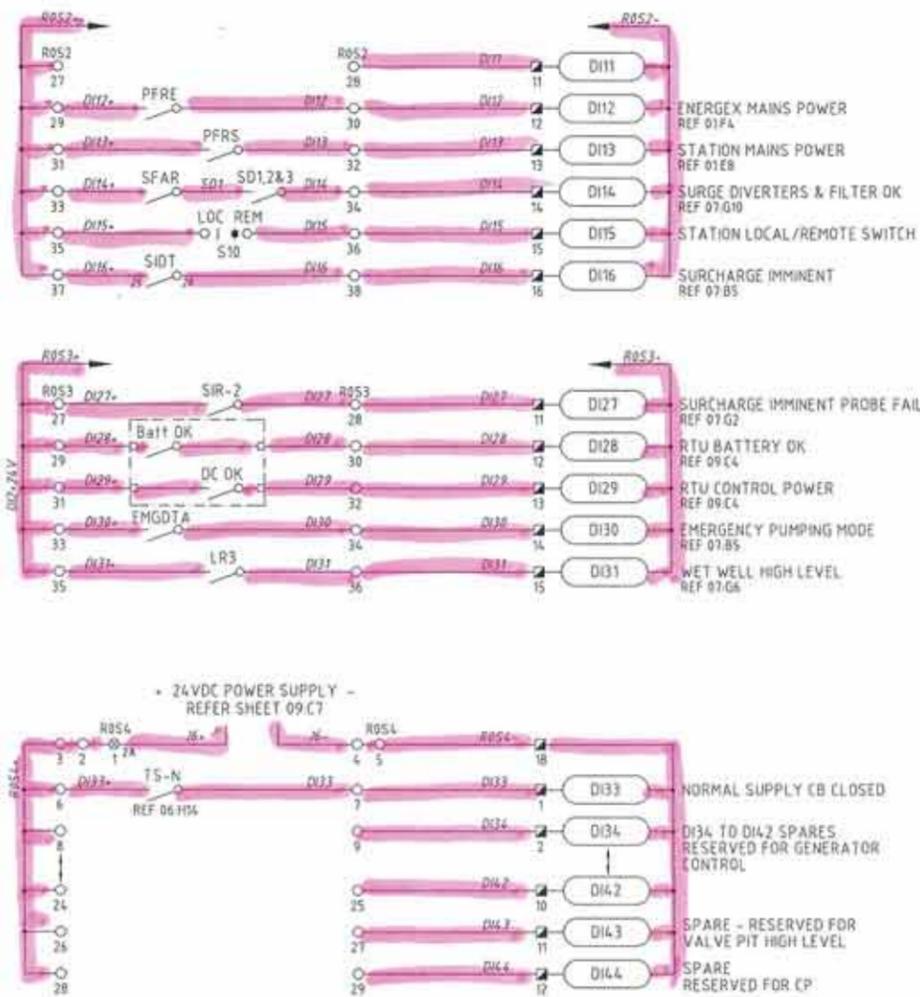
**POINT TO POINT**  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Pardey  
 Licence no: 122714  
 Signed: [Signature]

Sheet 07

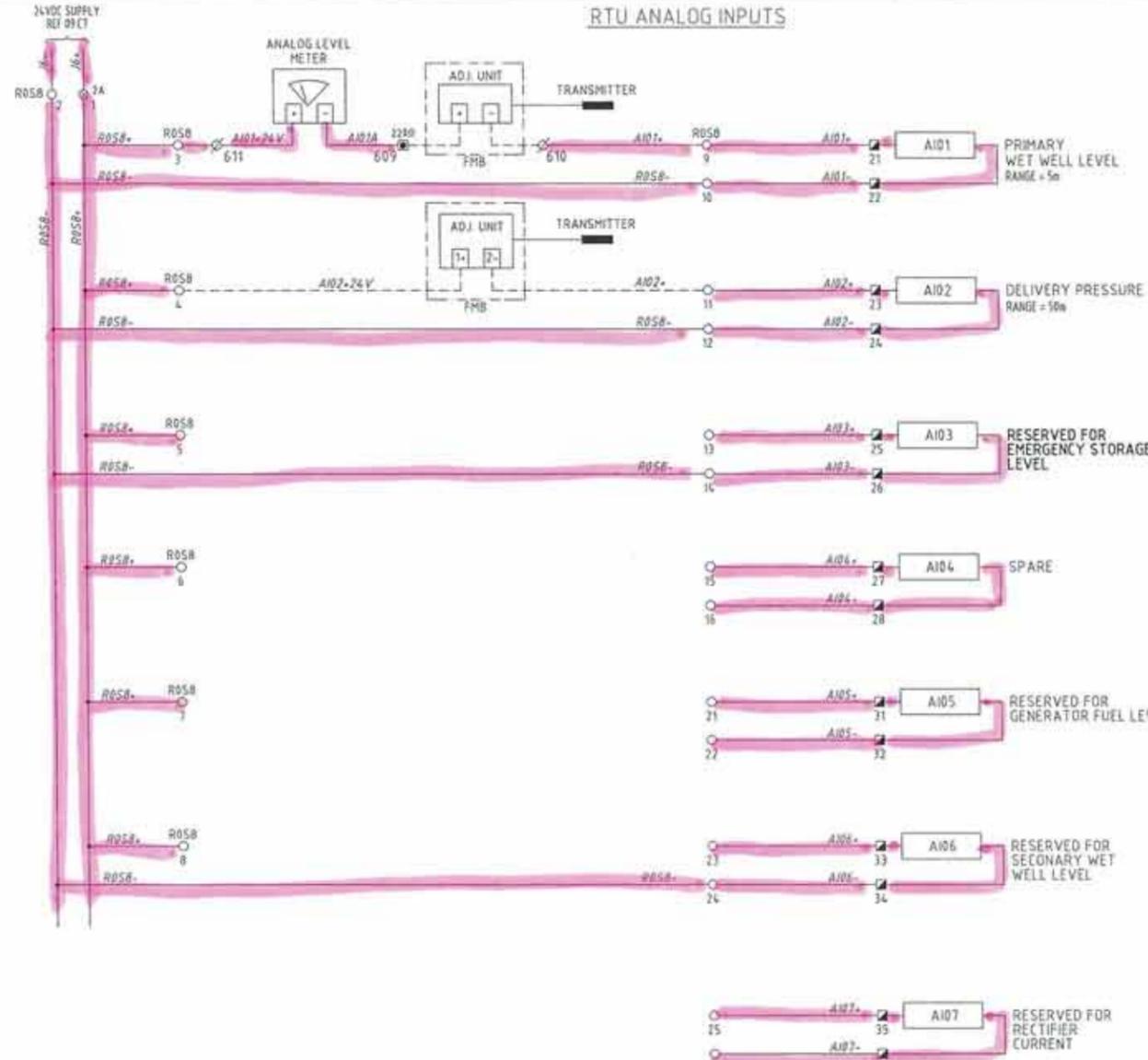
FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	P.JAGRE	3-3-14	NAME	SIGNATURE	DATE	SITE	TITLE	SHEET No. 7
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	57-0463set_A	DESIGN CHECK	A.WITTHOFT	3-3-14	QUEENSLAND	QUEENSLAND	13 MONTHS FROM DATE SHOWN	SP044 LYTTON ROAD SEWAGE PUMP STATION	COMMON CONTROLS SCHEMATIC DIAGRAM	486/5/7-0463-007
AMENDMENT	DRAWN	APD.	B.C.C. FILE No.	DESIGN CHECK	P.JAGRE	3-3-14	UrbanUtilities	Cardno (Qld) Pty Ltd	NO: 601-07130			A

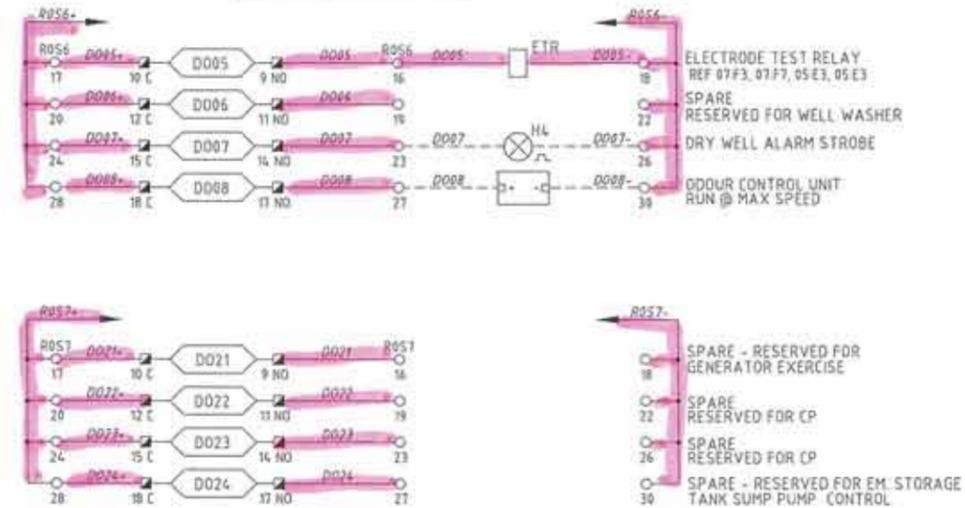
RTU DIGITAL INPUTS



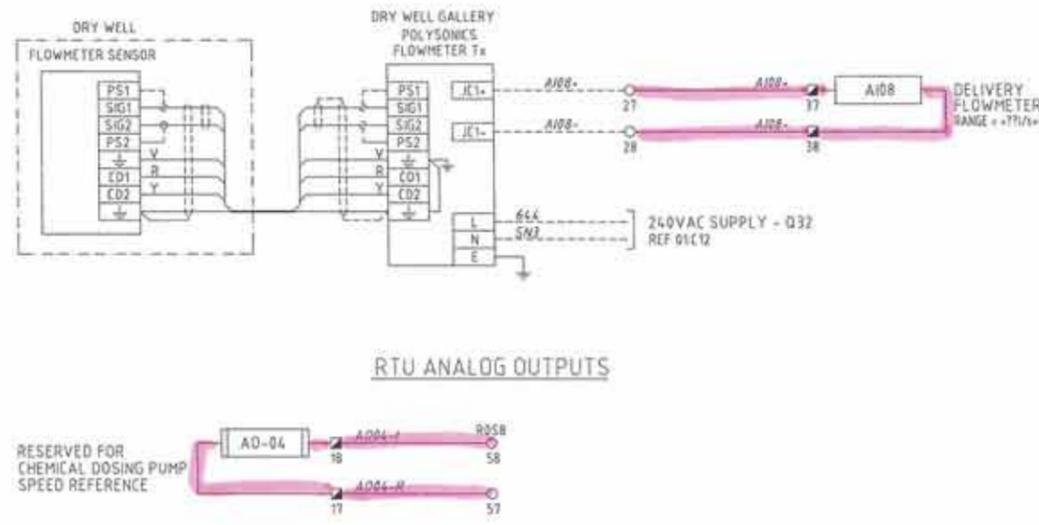
RTU ANALOG INPUTS



RTU DIGITAL OUTPUTS



RTU ANALOG OUTPUTS



POINT TO POINT  
 DAY 3 MTH 4 YEAR 12  
 Name: Joshua Parley  
 Licence no: 12774  
 Signed: [Signature]

NOTES

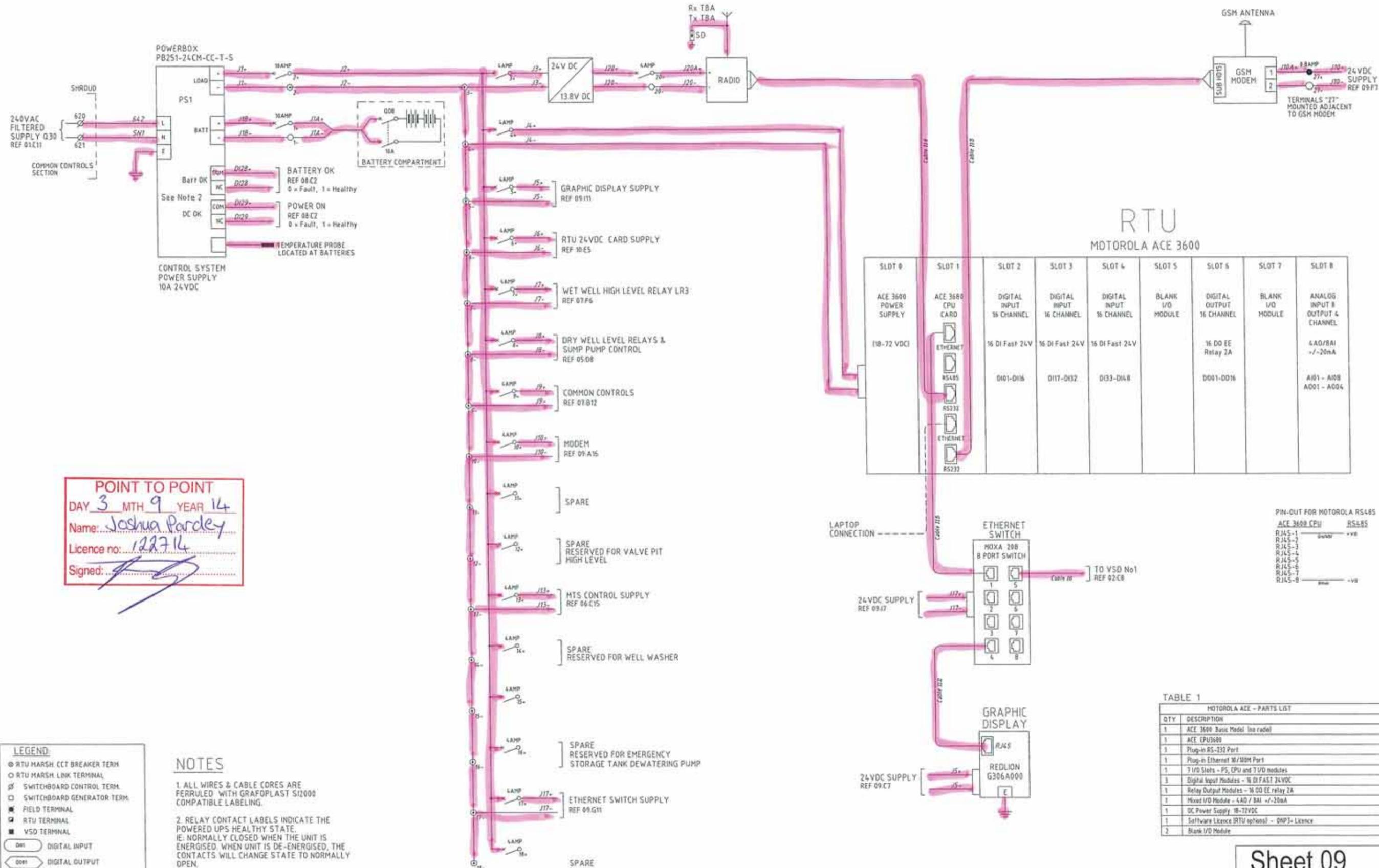
1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFPLAST S12000 COMPATIBLE LABELING.

**LEGEND:**

- RTU MARSH CCT BREAKER TERM
- RTU MARSH LINK TERMINAL
- SWITCHBOARD CONTROL TERM.
- SWITCHBOARD GENERATOR TERM.
- FIELD TERMINAL
- RTU TERMINAL
- COMPONENT TERMINAL
- VSD TERMINAL
- DIGITAL INPUT
- DIGITAL OUTPUT
- ANALOG INPUT
- ANALOG OUTPUT

Sheet 08  
 FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H.	A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.Q. No.	DATE	3-3-14
ISSUED FOR TENDER	P.H.	A.W.	CAD FILE	57-0463-08_A	A.WITTHOFT	888	3-3-14	
AMENDMENT	DRN.	APD.	B.C.C. FILE No.		DESIGN CHECK	R.P.E.Q. No.	DATE	



**POINT TO POINT**  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Pardey  
 Licence no: 122714  
 Signed: [Signature]

**LEGEND**

- ⊙ RTU MARSH CCT BREAKER TERM
- RTU MARSH LINK TERMINAL
- ⊞ SWITCHBOARD CONTROL TERM
- ⊞ SWITCHBOARD GENERATOR TERM
- FIELD TERMINAL
- ⊞ RTU TERMINAL
- VSD TERMINAL
- DI1 DIGITAL INPUT
- DO1 DIGITAL OUTPUT
- AI1 ANALOG INPUT
- AO1 ANALOG OUTPUT

**NOTES**

1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING.

2. RELAY CONTACT LABELS INDICATE THE POWERED UPS HEALTHY STATE. IE. NORMALLY CLOSED WHEN THE UNIT IS ENERGISED, WHEN UNIT IS DE-ENERGISED, THE CONTACTS WILL CHANGE STATE TO NORMALLY OPEN.

**RTU MOTOROLA ACE 3600**

SLOT 0	SLOT 1	SLOT 2	SLOT 3	SLOT 4	SLOT 5	SLOT 6	SLOT 7	SLOT 8
ACE 3600 POWER SUPPLY (18-72 VDC)	ACE 3600 CPU CARD	DIGITAL INPUT 16 CHANNEL 16 DI Fast 24V	DIGITAL INPUT 16 CHANNEL 16 DI Fast 24V	DIGITAL INPUT 16 CHANNEL 16 DI Fast 24V	BLANK I/O MODULE	DIGITAL OUTPUT 16 CHANNEL 16 DO EE Relay 2A	BLANK I/O MODULE	ANALOG INPUT 4 CHANNEL 4 AO/BAI +/-20mA
	ETHERNET RS485	DI01-DI16	DI17-DI32	DO3-DI48		DO01-DO16		AI01 - AI08 A001 - A004
	ETHERNET RS232							

**PIN-OUT FOR MOTOROLA RS485**

ACE 3600 CPU	RS485
RJ45-1	DATA+ (+VB)
RJ45-2	DATA- (-VB)
RJ45-3	
RJ45-4	
RJ45-5	
RJ45-6	
RJ45-7	
RJ45-8	

**TABLE 1 MOTOROLA ACE - PARTS LIST**

QTY	DESCRIPTION
1	ACE 3600 Basic Model (no radio)
1	ACE CPU3600
1	Plug-in RS-232 Port
1	Plug-in Ethernet 16/160M Port
1	7 I/O Slots - PS, CPU and 3 I/O modules
3	Digital Input Modules - 16 DI FAST 24VDC
1	Relay Output Modules - 16 DO EE relay 2A
1	Mixed I/O Module - 4 AO / BAI +/-20mA
1	DC Power Supply 18-72VDC
1	Software Licence IRTU optional - ONP3 Licence
2	Blank I/O Module

**Sheet 09**

**FOR CONSTRUCTION**

ISSUED FOR CONSTRUCTION	DRAFTED	P.HAGUE	P.HAGUE	3-3-14	 Cardno (QIM) Pty Ltd	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE RTU POWER DISTRIBUTION SCHEMATIC AND NETWORK DIAGRAM	SHEET No. 9 Queensland Urban Utilities DRAWING No. 486/5/7-0463-009	AMEND. A
ISSUED FOR TENDER	DRAFTING CHECK	A.WITTHOFT	A.WITTHOFT	3-3-14					
DATE	APPROVED	DRN.	APD.	B.C.C. FILE No.	DESIGN CHECK	DATE SHOWN	DATE	DATE	DATE

RTU COMPARTMENT

DC POWER DISTRIBUTION

SWITCHBOARD

FIELD

SHEET 09 REFER

REFER SHEET 09

PUMP 1 STARTER COMPARTMENT REFER SHEET 02

POINT TO POINT  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Pardey  
 Licence no: 122714  
 Signed: *[Signature]*

RACK 0 SLOT 2  
 MOTOROLA 16 CHANNEL  
 DIGITAL INPUT MODULE  
 16 DI Fast 24V

DI01	1	(11)
DI02	2	(12)
DI03	3	(13)
DI04	4	(14)
DI05	5	(15)
DI06	6	(16)
DI07	7	(17)
DI08	8	(18)
DI09	9	(19)
DI10	10	(20)
DI11	11	(21)
DI12	12	(22)
DI13	13	(23)
DI14	14	(24)
DI15	15	(25)
DI16	16	(26)
DI17	17	(27)
COM1	18	(28)
PGND1	19	(29)
PGND1	20	(30)

MOTOROLA WIRED  
 CABLE BRAID &  
 20 WAY TR HOLDER

LINK BARS

TO INSULATED  
 INSTRUMENT  
 EARTH

CONT ON  
 SHEET 11



C105



COMMON COMPARTMENT

ATS COMPARTMENT

STARTER COMPARTMENT

COMMON COMPARTMENT



**LEGEND:**

- C?? CABLE IDENTIFIER
- 2A x 1 RTU MINITURE CCT BREAKER
- 1 DISCONNECT LINK TERMINAL
- 1 THROUGH TERMINAL

**NOTES**

1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING.

Sheet 10  
 FOR CONSTRUCTION

NO.	DATE	AMENDMENT	DRN.	APD.	B.C.C. FILE No.	DRAFTED	P.HAGUE	P.HAGUE	P.HAGUE	DATE	3-3-14	NAME	SIGNATURE	DATE	3-3-14		SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE RTU DIGITAL INPUTS TERMINATION DIAGRAM SHEET 1 OF 3	SHEET No. 10 Queensland Urban Utilities DRAWING No. 486/5/7-0463-010	AMEND. A	
A	05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.		DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.Q. No.	DATE		QUEENSLAND									Cardno
O	03.14	ISSUED FOR TENDER	P.H.	A.W.		CO FILE	57-0463set_A	A.WITTHOFT	REV	DATE	3-3-14	Urban Utilities				Cardno (CM) Pty Ltd					

RTU COMPARTMENT

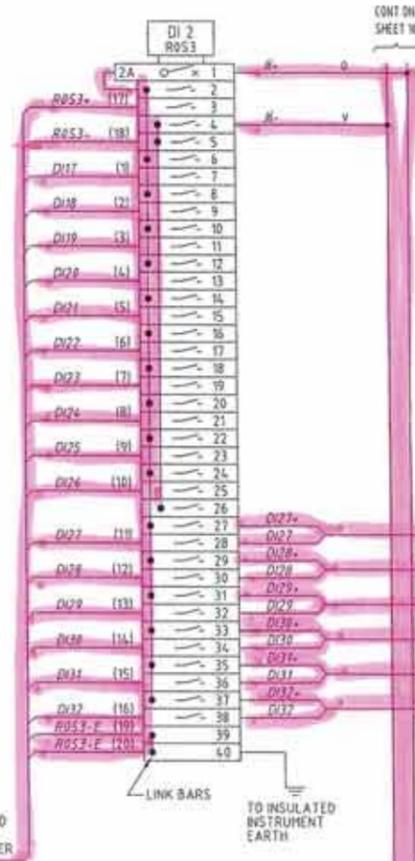
SWITCHBOARD

FIELD

**POINT TO POINT**  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Purley  
 Licence no: 122714  
 Signed: *[Signature]*

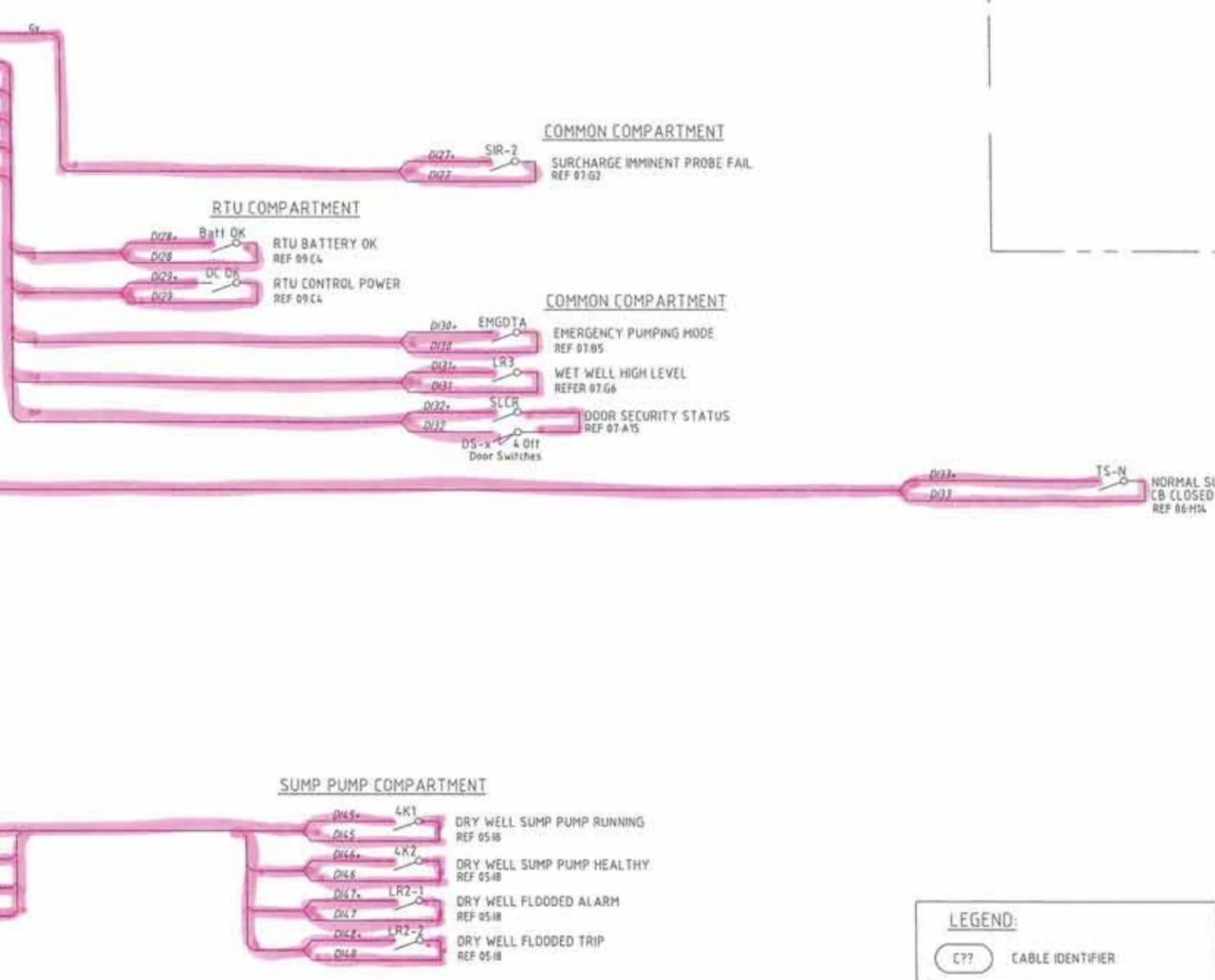
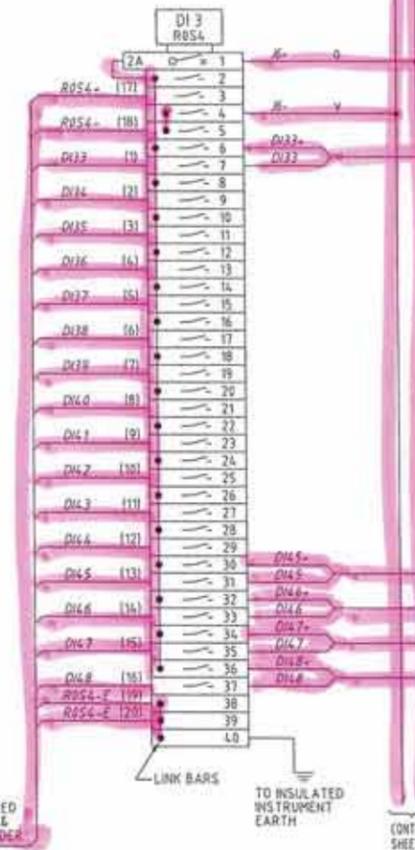
RACK 0 SLOT 3  
MOTOROLA 16 CHANNEL  
DIGITAL INPUT MODULE  
16 Di Fast 24V

DI17	1	(11)
DI18	2	(12)
DI19	3	(13)
DI20	4	(14)
DI21	5	(15)
DI22	6	(16)
DI23	7	(17)
DI24	8	(18)
DI25	9	(19)
DI26	10	(110)
DI27	11	(118)
DI28	12	(127)
DI29	13	(133)
DI30	14	(141)
DI31	15	(151)
DI32	16	(161)
+24V	17	(177)
COM1	18	(181)
PGND1	19	(191)
PGND1	20	(201)



RACK 0 SLOT 4  
MOTOROLA 16 CHANNEL  
DIGITAL INPUT MODULE  
16 Di Fast 24V

DI33	1	(11)
DI34	2	(12)
DI35	3	(13)
DI36	4	(14)
DI37	5	(15)
DI38	6	(16)
DI39	7	(17)
DI40	8	(18)
DI41	9	(19)
DI42	10	(110)
DI43	11	(111)
DI44	12	(121)
DI45	13	(131)
DI46	14	(141)
DI47	15	(151)
DI48	16	(161)
+24V	17	(177)
COM1	18	(181)
PGND1	19	(191)
PGND1	20	(201)



**COMMON COMPARTMENT**  
 SURCHARGE IMMINENT PROBE FAIL  
 REF 07.02

**COMMON COMPARTMENT**  
 EMGD TA  
 EMERGENCY PUMPING MODE  
 REF 07.05  
 LR3  
 WET WELL HIGH LEVEL  
 REFER 07.06  
 SCCR  
 DOOR SECURITY STATUS  
 REF 07.05  
 DS-X 4 Off Door Switches

**SUMP PUMP COMPARTMENT**  
 DI45 4K1 DRY WELL SUMP PUMP RUNNING  
 REF 05.08  
 DI46 4K2 DRY WELL SUMP PUMP HEALTHY  
 REF 05.08  
 DI47 LR2-1 DRY WELL FLOODED ALARM  
 REF 05.08  
 DI48 LR2-2 DRY WELL FLOODED TRIP  
 REF 05.08

**LEGEND:**  
 C?? CABLE IDENTIFIER  
 2A x 1 RTU MINTURE CCT BREAKER  
 1 DISCONNECT LINK TERMINAL  
 1 THROUGH TERMINAL

**NOTES**  
 1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING.

**Sheet 11**  
 FOR CONSTRUCTION

05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.	DRAFTING CHECK	P.HAGUE	3-3-14
03.14	ISSUED FOR TENDER	P.H.	A.W.	CAD FILE	A.WITTHOFT	888
		DRN	APD	B.C.C. FILE No.	57-0463set_A	

NAME: QUEENSLAND URBAN UTILITIES DELEGATE  
 SIGNATURE: *[Signature]*  
 DATE: 3-3-14  
 AUTHORIZED FOR 12 MONTHS FROM DATE SHOWN

**UrbanUtilities**  
 Cardno (Q&I) Pty Ltd

SITE: SP044  
 LYTTON ROAD  
 SEWAGE PUMP STATION

TITLE: RTU DIGITAL INPUTS  
 TERMINATION DIAGRAM  
 SHEET 2 OF 3

SHEET No. 11  
 Queensland Urban Utilities DRAWING No. 486/5/7-0463-011  
 AMEND. A

RTU COMPARTMENT

SWITCHBOARD

FIELD

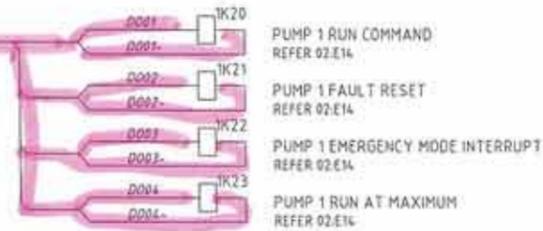
RACK 0 SLOT 6  
MOTOROLA 16 CHANNEL  
DIGITAL OUTPUT MODULE  
16 DO EE RELAY 2A

DO01	NO 1	(17)
	C 2	(18)
DO02	NO 3	(19)
	C 4	(20)
DO03	NO 5	(21)
	C 6	(22)
DO04	NO 7	(23)
	C 8	(24)
DO05	NO 9	(25)
	C 10	(26)
DO06	NO 11	(27)
	C 12	(28)
	NC 13	(29)
DO07	NO 14	(30)
	C 15	(31)
	NC 16	(32)
DO08	NO 17	(33)
	C 18	(34)
	NC 19	(35)
PGND1	20	(36)
DO09	NO 21	(37)
	C 22	(38)
DO10	NO 23	(39)
	C 24	(40)
DO11	NO 25	(41)
	C 26	(42)
DO12	NO 27	(43)
	C 28	(44)
DO13	NO 29	(45)
	C 30	(46)
DO14	NO 31	(47)
	C 32	(48)
	NC 33	(49)
DO15	NO 34	(50)
	C 35	(51)
	NC 36	(52)
	NO 37	(53)
	C 38	(54)
	NC 39	(55)
PGND2	40	(56)

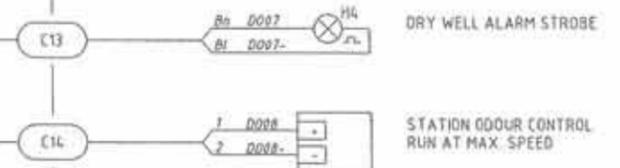
MOTOROLA WIRED  
CABLE BRAID &  
40 WAY TB HOLDER



PUMP 1  
STARTER COMPARTMENT  
REFER SHEET 02



COMMON COMPARTMENT



POINT TO POINT  
DAY 3 MTH 9 YEAR 14  
Name: Joshua Pardey  
Licence no: 122714  
Signed: *[Signature]*

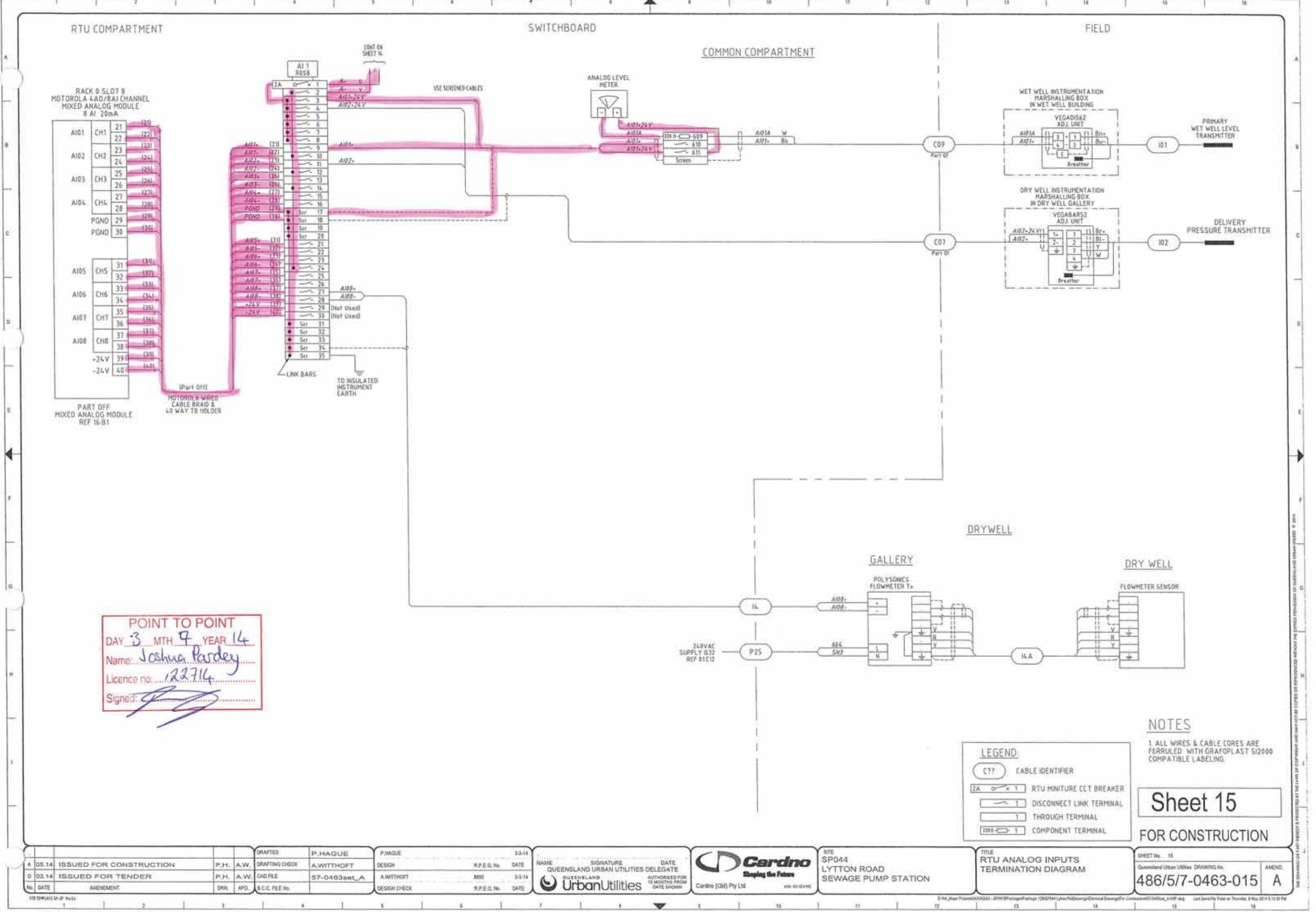
LEGEND:

(C17)	CABLE IDENTIFIER
2A	RTU MINITURE CCT BREAKER
1	DISCONNECT LINK TERMINAL
3	THROUGH TERMINAL

NOTES  
1. ALL WIRES & CABLE CORES ARE  
FERRULED WITH GRAFOPLAST S12000  
COMPATIBLE LABELING

Sheet 13  
FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION	P.H. A.W.	DRAFTING CHECK	P.HAGUE	3-3-14	NAME	SIGNATURE	DATE	 Cardno (Qld) Pty Ltd	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE RTU DIGITAL OUTPUTS TERMINATION DIAGRAM SHEET 1 OF 2	SHEET No. 13 Queensland Urban Utilities DRAWING No. 486/5/7-0463-013 AMEND A
ISSUED FOR TENDER	P.H. A.W.	CAD FILE	A.WITTHOFT	3-3-14	QUEENSLAND URBAN UTILITIES	DELEGATE	AUTHORISED FOR 12 MONTHS FROM DATE SHOWN				



**POINT TO POINT**  
 DAY 3 MTH 7 YEAR 14  
 Name: Joshua Pardey  
 Licence no. 122714  
 Signed: [Signature]

**LEGEND:**

- (C??) CABLE IDENTIFIER
- 2A [Symbol] RTU MINITURE CCT BREAKER
- [Symbol] DISCONNECT LINK TERMINAL
- [Symbol] THROUGH TERMINAL
- [Symbol] COMPONENT TERMINAL

**NOTES**  
 1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING.

**Sheet 15**  
**FOR CONSTRUCTION**

05.14	ISSUED FOR CONSTRUCTION	P.J.H.	A.W.	DRAFTING CHECK	A.WITTHOFT	DESIGN	R.P.E.Q. No.	DATE	3-3-14
03.14	ISSUED FOR TENDER	P.J.H.	A.W.	CAD FILE	57-0463set_A	A.WITTHOFT	885	3-3-14	
No.	DATE	AMENDMENT	DRK.	APD.	B.C.C. FILE No.	DESIGN CHECK	R.P.E.Q. No.	DATE	

NAME: QUEENSLAND URBAN UTILITIES DELEGATE  
 SIGNATURE: [Signature]  
 DATE: 3-3-14  
 AUTHORIZED FOR 12 MONTHS FROM DATE SHOWN



SITE: SP044 LYTTON ROAD SEWAGE PUMP STATION

TITLE: RTU ANALOG INPUTS TERMINATION DIAGRAM

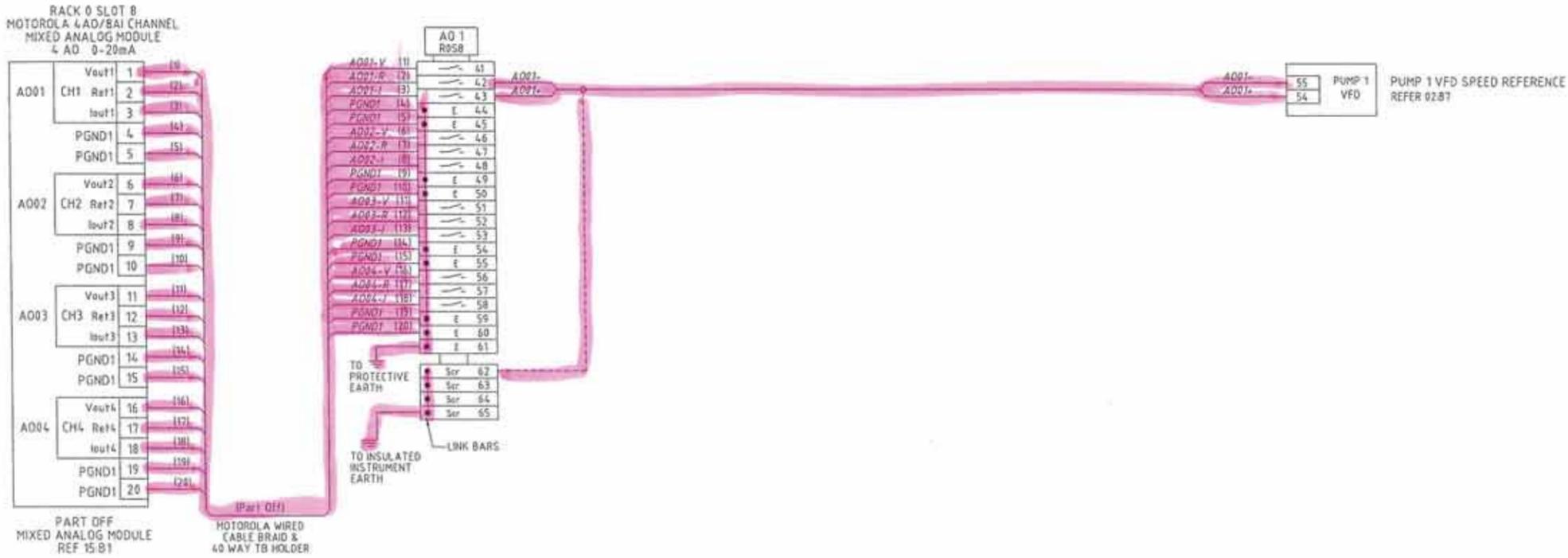
SHEET No. 15  
 Queensland Urban Utilities DRAWING No. 486/5/7-0463-015  
 AMEND. A

RTU COMPARTMENT

SWITCHBOARD

FIELD

STARTER COMPARTMENT



**POINT TO POINT**  
DAY 3 MTH 9 YEAR 14  
Name: Joshua Pardey  
Licence no: 122714  
Signed: [Signature]

**NOTES**  
1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING.

**LEGEND:**

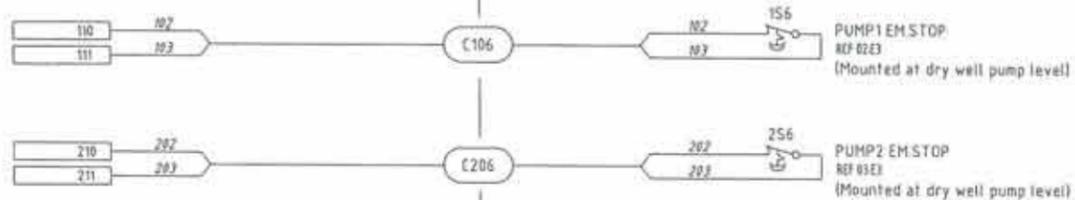
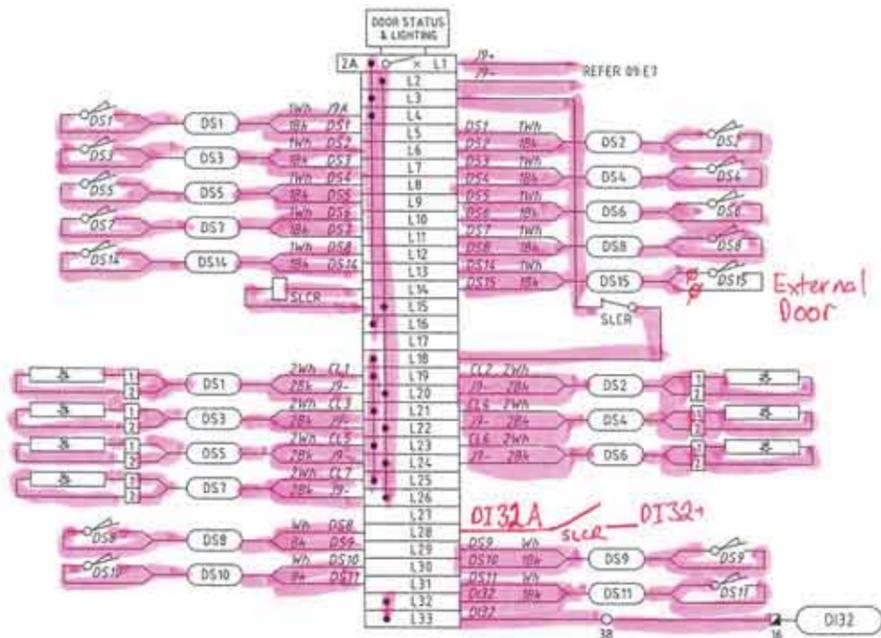
- (C??) CABLE IDENTIFIER
- 2A [Symbol] RTU MINITURE CCT BREAKER
- [Symbol] DISCONNECT LINK TERMINAL
- [Symbol] THROUGH TERMINAL

**Sheet 16**  
FOR CONSTRUCTION

05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.	DRAFTED	P.HAGUE	P.HAGUE	3-3-14	NAME	SIGNATURE	DATE	 Cardno (CM) Pty Ltd	SITE SP044 LYTTON ROAD SEWAGE PUMP STATION	TITLE RTU ANALOG OUTPUTS TERMINATION DIAGRAM	SHEET No. 16 Queensland Urban Utilities DRAWING No. 486/5/7-0463-016	AMEND. A
05.14	ISSUED FOR TENDER	P.H.	A.W.	CAD FILE	A.WITTHOFT	A.WITTHOFT	3-3-14	QUEENSLAND URBAN UTILITIES DELEGATE	DATE	AUTHORISED FOR 12 MONTHS FROM DATE SHOWN					
No.	DATE	AMENDMENT	ORL.	APD.	S.C.C. FILE No.	DESIGN CHECK	R.P.E.Q. No.	DATE							

**POINT TO POINT**  
 DAY 3 MTH 9 YEAR 14  
 Name: Joshua Pardey  
 Licence no: 122716  
 Signed: [Signature]

SWITCHBOARD INTERNAL LIGHTING AND SECURITY



**LEGEND:**

- C?? CABLE IDENTIFIER
- 2A [Symbol] RTU MINTURE CCT BREAKER
- [Symbol] DISCONNECT LINK TERMINAL
- [Symbol] THROUGH TERMINAL

**NOTES**  
 1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELING.

**Sheet 17**

FOR CONSTRUCTION

05.14	ISSUED FOR CONSTRUCTION	P.H.	A.W.	DRAFTED	P.HAGUE	3-3-14
03.14	ISSUED FOR TENDER	P.H.	A.W.	DRAFTING CHECK	A.WITTHOFT	3-3-14
		DRN	APD	B.C.C. FILE No.	57-0463set_A	

NAME	SIGNATURE	DATE
QUEENSLAND URBAN UTILITIES DELEGATE	[Signature]	3-3-14
UrbanUtilities		



SITE  
 SP044  
 LYTTON ROAD  
 SEWAGE PUMP STATION

TITLE  
 COMMON CONTROLS  
 TERMINATION DIAGRAM

SHEET No. 17	AMEND.
Queensland Urban Utilities DRAWING No.	
486/5/7-0463-017	A

# 4. Inspection and Test Results







### Inspection and Test Check List

Project: <u>Lytton Rd Pump Station SPO44</u>		
Contractor / Order No.		SJ Electric Job No. <u>43402227</u>
ITC No. <u>003</u>	Date:	Corresponding ITP No. <u>001</u>

**General Data**

Built By: <u>Josh, Tom, Ryan</u>	Test Equipment: <u>Multimeter/Megger</u>
Location Tested: <u>SJ Workshop</u>	Type: <u>Fluke / Kyoritsu</u>
Drg Rev No.	Serial No. <u>15120299 / 5132742</u>

Check List (Tick ( ) acceptable items only, note deviations under "REMARKS") (If not applicable mark as N/A)

Switch Board and Control Panels Construction Check List					
"This check list is to be used in conjunction with the correct construct schematic / wiring diagrams"					
Item	Activity Description	Hold Points	Checked	By (Initial)	
<b>Busbar</b>					
			( )		
1	Correct size busbar to rated current load to meet AS 2067		(✓)	JP	
2	Appearance is good i.e. Straight & level		(✓)		
3	Correct phase identification		(✓)		
4	Correct hole sizes for joins and terminations		(✓)		
5	All clearances have been meet		(✓)		
6	Correct busbar support material has been used and edges sealed with varnish.		(✓)		
7	Busbar supports are at the correct distances apart		(✓)		
8	Correct tensioning at all joins & terminations and witnessed marked.		(✓)		
9	Correct hole format in joining cubicle		(✓)		
10	Sufficient clearances for terminating cable		(✓)		
11	All joins are dressed flat		(✓)		
12	Busbar is insulated at supports when required,		(✓)		
<b>Cabling</b>					
13	Correct size for demand of circuit		(✓)	↓	
14	Correct phase colouring		(✓)		
15	Correct termination & insulated		(✓)		
16	Correct numbering		(✓)		
17	Correctly formed and neat		(✓)		
18	Correctly supported		(✓)		
19	All cable entry holes are insulated		(✓)		
20	Check cable tray is mounted correctly & all sharp surfaces are removed		(✓)		
21	All cable ties are neatly trimmed		(✓)		
22	All cable clear from busbar's		(✓)		
23	Check all analog inputs and outputs are shielded		(✓)		
26	All shielded cables have been earthed		(✓)		
Remarks/Remedial Action Required Hold Points:          Remedial Actions Completed <input type="checkbox"/>					
		Signature: .....	Date:		



Inspection and Test Check List

Switch Board and Control Panels Construction Check List (SJQF 502)				
Item	Activity Description	Hold Points	Checked	By (Initial)
<b>Switchgear</b>				
1	Check all main switches & circuit breakers are the correct <ul style="list-style-type: none"> <li>• current rating</li> <li>• ka rating.</li> <li>• trip settings</li> <li>• correct to cabling</li> <li>• to labels.</li> <li>• shunt trips</li> <li>• inter locks</li> </ul>		S S S S S S S	JP
2	Check the fixings		S	
3	Check the number of poles		S	
4	Check correct operation		S	
5	Correct mechanism		S	
<b>Control Switches</b>				
6	Check correct number of positions		S	
7	Check correct size		S	
8	Check correct to labels		S	
9	Check mountings		S	
<b>Contactors</b>				
10	Check for correct model no		S	
11	Check for correct current rating to control		S	
12	Correct auxiliary contacts		S	
13	Correct phasing		S	
14	Correct coil size		S	
15	Check that it is accessible		S	
16	Check it has correct overloads		S	
17	Correct labelling		S	
<b>Relays and Timers</b>				
18	Check correct rated voltage		S	
19	Correct contacts		S	
20	Correct variances		S	
21	Dip switches in required position		S	
22	Timers set to correct settings		S	
23	Correct operation		S	
24	Correct auxiliaries		S	
<b>Transformers and Power Supplies</b>				
25	Check for correct voltage ratings		S	
26	Check for correct current ratings		S	
27	Check cabling is correct (no crossed voltage)		S	
28	Check the secondary has been earthed when applicable		S	
29	Check correct labelling		S	
30	Check mountings		S	
31	Check for clearance around for heat extraction		S	
Remarks/Remedial Action Required:				
Remedial Actions Completed <input type="checkbox"/>		Signature: .....	Date:	



Inspection and Test Check List

Switch Board and Control Panels Construction Check List (SJQF 502)					
Item	Activity Description	Hold Points	Checked	By (Initial)	
<b>Fuses</b>					
1	Check that the cartridge is correct size		(S)	JP	
2	Correct mountings		(S)		
3	Correct labelling		(S)		
4	Check that line side conductors are SDI		(S)		
<b>Current Transformers</b>					
5	Correct ratio & size		(S)	↓	
6	Correct direction of feed		(S)		
7	Correct earthing		(S)		
8	Correct cabling		(S)		
<b>Voltage / Current Monitoring Equipment</b>					
9	Correct voltage / current range on meter to the installation		(S)		
10	Correct Ct Ratio		(S)		
11	Voltmeter terminations are insulated		(S)		
12	Check that all meters are preset to zero		(S)		
13	Correct indication labels applied		(S)		
<b>Indication Equipment</b>					
14	Correct colour		(S)		
15	Correct voltage size with matching lamp attached		(S)		
16	Correct operation eg. Push to test		(S)		
17	Correct labelling		(S)		
<b>Terminal Blocks</b>					
18	Correct size to cable		(S)		
19	Correct colour coding		(S)		
20	Correct numbering		(S)		
21	Correctly mounted with lock ends		(S)		
22	Correct labels		(S)		
<b>Neutral Links</b>					
23	Check that they are accessible		(S)		
24	Correct labelling		(S)		
25	Correct numbers stamped to match circuit identification		(S)		
26	Correct cabling to circuit identification		(S)		
27	Check that all neutral links & bar are insulated from the switchboard frame		(S)		
<b>Earthing</b>					
28	Check that all main earth bar is correct size		(S)		
29	Check that the main earth is continuous		(S)		
30	Correctly labelled		(S)		
31	Continuous for CT wiring		(S)		
32	Check that all doors with equipment mount are electrically earth		(S)		
33	Check all frames are earthed		(S)		
Remarks/Remedial Action Required:					
Remedial Actions Completed <input type="checkbox"/> Signature: _____ Date: _____					



Inspection and Test Check List

Switch Board and Control Panels Construction Check List (SJQF 502)				
Item	Activity Description	Hold Points	Checked	By (Initial)
<b>Earthing Resistance &amp; Continuity Test</b> (Note all readings should be <math>< 0.5 \Omega</math>)				
1	Make sure the MEN connection is removed		(✓)	JP ↓
2	Attach lead to main earth connection point than test with other lead between		(✓)	
3	The frame of each section		(✓)	
4	The doors		(✓)	
5	All mounting bolts to all equipment		(✓)	
6	All brackets		(✓)	
7	All earth links		(✓)	
8	All bolts & threads for the mounting of escutcheon		(✓)	
9	All gland plates		(✓)	
10	All cable trays		(✓)	
11	All earth connection		(✓)	
12	Earth secondary of transformers and power supplies where applicable		(✓)	
13	Earth surge diverters		(✓)	
14	Current transformers		(✓)	
<b>Insulation Test</b>				
		Hold Points	Test Result	By (Initial)
1	Make sure all control fuses and earths are removed from all electronic equipment before this test is carried out		(✓)	JP ↓
2	Set insulation tester (meggar) to 500 volts before proceeding. Note reading to be > 1M $\Omega$		(✓)	
3	Test between:			
	• Red - White		+200M $\Omega$	
	• Red - Blue		+200M $\Omega$	
	• Red - Earth		+200M $\Omega$	
	• Red - Neutral		+200M $\Omega$	
	• White - Blue		+200M $\Omega$	
	• White - Earth		+200M $\Omega$	
	• White - Neutral		+200M $\Omega$	
	• Blue - Earth		+200M $\Omega$	
• Blue - Neutral		+200M $\Omega$		
4	If all readings are clear the insulation tester is to be set at 1000 volts then proceed with the following Note reading to be > 1M $\Omega$		(✓)	
5	Test between:			
	• Red - White		+200M $\Omega$	
	• Red - Blue		+200M $\Omega$	
	• Red - Earth		+200M $\Omega$	
	• Red - Neutral		+200M $\Omega$	
	• White - Blue		+200M $\Omega$	
	• White - Earth		+200M $\Omega$	
	• White - Neutral		+200M $\Omega$	
	• Blue - Earth		+200M $\Omega$	
• Blue - Neutral		+200M $\Omega$		
Remarks/Remedial Action Required:				
Remedial Actions Completed <input type="checkbox"/> Signature: ..... Date: .....				



Inspection and Test Check List

Switch Board and Control Panels Construction Check List (SJQF 502)				
Item	Activity Description	Hold Points	Checked	By (Initial)
<b>2.5 KV Test This test is used to prove all busbar construction</b>				
1	Make sure all control fuses and earths are removed from all electronic equipment before this test is carried out		( )	
2	All the following tests must be set at a 1 minute time period		( )	
		Hold Points	Test Result	By (Initial)
3	Test between: <ul style="list-style-type: none"> <li>• Red - White</li> <li>• Red - Blue</li> <li>• Red - Earth</li> <li>• Red - Neutral</li> <li>• White - Blue</li> <li>• White - Earth</li> <li>• White - Neutral</li> <li>• Blue -Earth</li> <li>• Blue - Neutral</li> </ul>			
<b>Supply Authority section</b>				
1	Check supply authority main isolator lockable in the on position		(✓)	JP ↓
2	Check all doors before the Ct's. Or meters are lockable		(✓)	
3	Check where the neutral link is located for the site connection if metres are remotely mounted		(-)	
4	Check where the earth link is located for the site connection if metres are remotely mounted		(-)	
5	Check double insulated cable for POT fuses are less than 500 mm		(✓)	
6	Check double insulated cable are taken on line side of Ct.s		(✓)	
7	Check meter wiring is in building wire and correct size		(✓)	
8	Check if Ct meter wiring is in steel conduit when closer than 100mm to other conductors		(-)	
9	Check there is no equipment connected before on the line side of meters or Ct.s (i.e., surge diverters)		(✓)	
10	Check list may vary if switch board is going interstate. Alter where applicable		(✓)	
11	Provide black wrap when needed		(-)	
Remarks/Remedial Action Required:				
Remedial Actions Completed <input type="checkbox"/> Signature: ..... Date: .....				



Inspection and Test Check List

Switch Board and Control Panels Construction Check List (SJQF 502)				
Item	Activity Description	Hold Points	Checked	By (Initial)
<b>Functional Test</b>				
Prior to connection of supply all inspection and test check lists must be completed		Hold Points	Checked	By (Initial)
1	Point to point test on all cables as per schematic and single line drgs. (Leave spot for drawing, No's and Rev No's		(✓)	JP
2	Check all Cts are not open circuit		-	
Connect supply (personal protection equipment must be used)		Hold Points	Test Result	By (Initial)
3	Check polarity of connection		(✓)	JP ↓
	• Red - White		(✓)	
	• Red - Blue		(✓)	
	• Red - Earth		(✓)	
	• Red - Neutral		(✓)	
	• White - Blue		(✓)	
	• White - Earth		(✓)	
	• White - Neutral		(✓)	
			(✓)	
		Hold Points	Checked	By (Initial)
4	Correct voltage / current range on meter to the installation		(✓)	JP
5	Check functional operation of switchboard following specific construction issue drawings (leave spot for drawing No's and Rev No's		(✓)	↓
6	Check operation of all RCD's		(✓)	
<b>Final delivery check list</b>			(✓)	
1	Check all punch list items are complete		(✓)	
2	Check if Compliance label is mounted and correct		(✓)	
3	Check if heat shrinks is supplied when necessary		(✓)	
4	Check all load bolts are supplied		(✓)	
5	Check if m.e.n is mounted after testing		(✓)	
6	All drawings have been as built red lined and supplied and signed for to drafting office		(✓)	
	Received by drafting Office (Sign) .....		(✓)	
7	Photos have been taken of every section and given to manager		(✓)	
8	Test reports have been photo copied and placed in the client folder and SJ Electric folder		(✓)	
9	Manuals placed in client folder		(✓)	
10	As built drawings placed in client folder. (Latest revision (✓) Copy of red lined marked Drawing (✓)		(✓)	
Remarks/Remedial Action Required:				
Remedial Actions Completed <input type="checkbox"/> Signature: ..... Date:				
Tested By: Joshua Pardey				
Signature:		Witnessed By: Ricky McTaggart		
Electrical Licence No. 122714		Signature:		Date: 12/8/14
All the above signatories certify that the Electrical switchboard work listed has been checked and tested in accordance with the prescribed procedure and that such work complies in every respect with the requirements of the Electricity Act 2002, AS3000 2007 and AS3008.1 1998				



Site ID SP044	Site Name - Lytton Road, East Brisbane	Date 12/12/14	
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### A. Electrical Installation Test Records

AS/NZS 3000:2007 requires that prior to placing an electrical installation or any part thereof in service following its construction, alteration, addition or repair, it shall be inspected and tested to verify that the installation is safe to energize and that it will operate correctly in accordance with the requirements of AS3000:2007.

This section is aimed to ensure that the switchboard manufacturer has carried out and documented all applicable AS3000:2007 tests considered as mandatory, prior to execution of the Factory Acceptance Test.

AS/NZS 3017 Electrical Installations – Verification Guidelines provides inspection, test methods and test acceptance parameters to verify AS3000:2007 safety requirements, however these methods are provided for guidance and other alternative methods are acceptable, AS3017:2007 may be applied through legislative requirements made in each State and Territory of Australia and in New Zealand.

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
A.1						AS3000:2007 Section 8.3.5 AS3017:2007 Section 3.1
A.2						For acceptance criteria and test methods refer to: AS3000:2007 Section 8.3.6 AS3017:2007 Section 3.2
A.3						For acceptance criteria and test methods refer to:



**Major Projects & Commercial Services  
Checklist  
Pre Factory Inspection Tests**

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
						AS3000:2007 Section 8.3.7 AS3017:2007 Sections 3.3 and 3.5
A.4	Records for the verification of Correct Circuit connection tests records shall include: a) Interconnection between conductors of different circuits b) Socket-Outlet Sub-Circuits c) Lighting Points d) Equipment Sub-circuits	✓ ✓ ✓ ✓				For acceptance criteria and test methods refer to: AS3000:2007 Section 8.3.8 AS3017:2007 Section 3.4
A.5	Records for the verification of operation of RCD's shall include: a) Circuits protected by an RCD	✓				For acceptance criteria and test methods refer to: AS3000:2007 Section 8.3.10 AS3017:2007 Section 3.7

**Company Name** SJ Electric Group Qld

**Company Electrical Licence No:**73286

**Contractor's Tester Name -** Dave King

**Signature** *D. King* .....

**Date** 12/12/14

**QUU Electrical Inspector Name** John Clayton

**Signature**.....

**Date**



**B. Testing Area, Documentation and Test Set Up Arrangements**

This section is aimed to ensure that all documentation and test set up arrangements have been provided to allow execution and readiness to carry out the FAT.

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
B.1	Verify that a suitable test area has been provided, the test area shall be: <ul style="list-style-type: none"> <li>• Clearly identified and barricaded</li> <li>• Test bench with enough space for testing equipment and documentation</li> <li>• Well ventilated</li> </ul>	✓				
B.2	All testing equipment to simulate field inputs and outputs including field instruments and motors shall be pre-connected	✓				
B.3	Progressive "As Built" drawings marked up available.	✓				
B.4	"Point to Point" test drawing and Function Test schematic mark-ups provided	✓				<b>A set for each</b>

**Company Name** SJ Electric Group Qld

**Company Electrical Licence No:** 73286

**Contractor's Tester Name** Dave King

**Signature**.....*D. King*.....

**Date** 12/12/14

**QUU Electrical Inspector Name** John Clayton

**Signature**.....

**Date**

### C. Visual Inspections - Sheet Metal / Mechanical Construction Works

The following visual inspections shall take place previous to energising the switchboard circuits. All power supplies shall be disconnected, including the main power supply, generator power supplies and battery power supplies.

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
C.1	Switchboard dimensions correct as per contract drawings	✓				
C.2	Panel layout as per drawings	✓				
C.3	All equipment is to be removable from switchboard via front access.	✓				
C.4	Power distribution chassis not to be installed too close to the left of the door aperture	✓				
C.5	Check operation and orientation of doors and door handles	✓				
C.6	Switchboard mounting feet as per drawing	✓				
C.7	Material finish as per specification	✓				
C.8	IP Rating as per specifications. Fitting of sun shields shall maintain IP56 rating.	✓				
C.9	All bolts fitted / tight	✓				
C.10	All sheet metal edging to be de-burred, special attention given to handle/lock access heat shield cuts.	✓				

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
C.11	Door, hinges and locks are properly fitted to allow closing without forcing the door or being loose.	✓				
C.12	Lock barrels are mounted neatly. Door penetration and holes shall be suited to the particular lock barrel type.	✓				
C.13	Lock barrel types are provided as required and operate correctly	✓				
C.14	Energex Padlock Supplied	✓				
C.15	All doors sealing shall be properly fitted and firmly secured to the switchboard. Glue shall be provided if necessary.	✓				
C.16	Verify that proximity switch metal plates are fixed to doors as indicated in the drawings.			✓		No PROXIMITY SW.
C.17	Ensure to pre-drill holes in plates that are difficult to access after the construction or installation of the switchboard on site. Particular attention shall be given to internal barrier plates and access plate on distribution board.	✓				
C.18	Cut outs from one cubicle to another please shall be large enough to accommodate all cables.	✓				

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
C.19	Sealing between plinth and switchboard.	✓				
C.20	Sealing of disconnect zone.			✓		
C.21	Verify that portable generator cable access plate allows the generator plug pass into the switchboard and reach the generator connection outlet.	✓				
C.22	Inspection plates are properly labelled and not used as gland plates. Inspection plates are only provided to ease access to field wiring.	✓				
C.23	Verify that all gland entries are sealed – No split gland plates	✓				
C.24	All spare holes to be plugged with conduit plugs.	✓				
C.25	Enclosure free of debris	✓				
C.26	Lap top support tray provided including 1/4 turn wing knob on laptop support shelf. Knobs types that cannot be operated by hand are not acceptable.	✓				
C.27	Drawings & log book holder provided	✓				
C.28	Aerial support is adjustable	✓				<b>Fit the male to female elbow and barrel union to the switchboard</b>
C.29	A minimum clearance of 55mm shall be					



**Major Projects & Commercial Services  
Checklist  
Pre Factory Inspection Tests**

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
	provided around the Redlion HMI to other components mounted in common controls door.	✓				
C.30	Check that selector switches are correctly engraved	✓				
C.31	Check that Indicators are fitted with correct coloured bezels	✓				
C.32	Verify that all external labels are fitted to the switchboard.	✓				
C.33	Labelling is correct and complete - wording, size, fixing, material, level.	✓				
C.34	All internal and external labels are to have bevelled edges, sharp edges are not allowed.	✓				
C.35	Verify that 240VAC warning sign is fitted to the switchboard.			X		

**Company Name** SJ Electric Group Qld

**Company Electrical Licence No:** 73286

**Contractor's Tester Name** Dave King

**Signature** *[Signature]*.....

**Date** 12/12/14

**QUU Electrical Inspector Name** John Clayton

**Signature**.....

**Date**



**Major Projects & Commercial Services  
Checklist  
Pre Factory Inspection Tests**

**Visual Inspections- Neutral and Earthing**

A visual inspection shall be made when work on an electrical installation has been completed in order to verify that the work complies with the requirements of AS/NZS 3000.

The visual inspection shall be carried out before, or in association with testing, and as far as possible it should be made before the electrical installation is placed in service.

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
D.1	N/L & E/L have adequate bolts for main Neutral & Earth	✓				
D.2	Earth bar / earth connections fitted & OK	✓				
D.3	All neutral connections are accessible	✓				
D.4	MEN connections provided	✓				
D.5	Neutral & earth connections are not in CT section	✓				
D.6	Surge diverter earthed to adjacent stud.			✓		SURGE DIVERTER CONNECTED TO NEUTRAL
D.7	Confirm a Direct connection from main earth bar to switchboard chassis	✓				

**Company Name** SJ Electric Group Qld

**Company Electrical Licence No:** 73286

**Contractor's Tester Name** Dave King

**Signature** *D. King*

**Date** 12/12/14

**QUU Electrical Inspector Name** John Clayton

**Signature** .....

**Date**

#### D. Visual Inspections - Electrical Components Mounting, Wiring and Labelling

As a minimum a visual inspection shall be made when work on an electrical installation has been completed in order to verify that the work complies with the requirements of AS/NZS 3000. This visual inspection section includes AS/NZS 3000 checks as well as several checks to verify that the electrical installation meets the specific design and quality requirements and scope of work.

The visual inspection shall be carried out before, or in association with testing, and as far as possible it should be made before the electrical installation is placed in service.

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
E.1	Busbars appropriately shielded	✓				
E.2	Verify that main switches/circuit breakers and fuses are supplied to the specification (equipment schedule)	✓				
E.3	Main switches lockable/ defeatable as per spec.	✓				
E.4	Check operation of Main Supply and Generator supply mechanical and/or key interlocks as applicable.	✓				
E.5	Verify that metering fuses & CT's are fed off from main switch line side	✓				
E.6	Verify that cable lugs are provided into CRITEC 20 kA surge filter circuit breaker (in most cases Q17)	✓				

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
E.7	Equipment fed from line side shall be appropriately labelled.	✓				
E.8	Include 2nd label for Surge Diverter and Surge Diverter fuses "FED FROM LINE SIDE OF MAIN SWITCH" as applicable (Items 37/38 on switchboard label schedule).	✓				
E.9	All Circuit Breakers shall be set as indicated in the electrical schematic drawings.	✓				<b>Require circuit breaker setting document</b>
E.10	All circuit breakers shall be wired line side at the top / load side at the bottom	✓				
E.11	Verify that cables current carrying capacity is as indicated in the electrical schematic drawings.	✓				
E.12	Colour coding of wiring as per specification.	✓				
E.13	Wiring in PVC ducting shall be kept tidy.	✓				
E.14	Check cable access dimensions	✓				
E.15	Check cable access & routes for field cabling.	✓				
E.16	Check phasing of circuits are as per drawing.	✓				
E.17	Electrical components fitted are as specified in the equipment schedule	✓				
E.18	Verify that quantity and location of GPOs	✓				

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
	are provided as required in the drawings.					
E.19	Confirm all Idec relays are LED type and wired the correct polarity	✓				
E.20	Verify that digital timer is mounted on its own specific base (IDEC base) as specified in the equipment list (Item 99 -EMGDT)	✓				Using a different type of timer (omron)
E.21	Check that generator plug has protective cover fitted	✓				
E.22	Verify that power disconnection outlets and plugs are supplied with the switchboard as required			✓		
E.23	Verify that terminals & busbar connections are tight	✓				
E.24	Verify that terminals are identified as per drawings and spares are provided	✓				
E.25	All terminals shall be correct part number, shrouded to IP20 and labelled.	✓				
E.26	All cable cores ferruled & numbered.	✓				
E.27	24VDC power supply shall be mounted to prevent obstruction to the field instrument terminals.	✓				
E.28	Multicore cables shall be used for RTU harnesses to provide neat wiring installation.	✓				



**Major Projects & Commercial Services  
Checklist  
Pre Factory Inspection Tests**

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
E.29	Verify that adequate access to RTU and communication plug is provided	✓				
E.30	Modbus communication cables (RS 485) shall be 120ohm impedance twisted pair's.	✓				Road Worx is a good cable to use USING CAT 5E CABLE ON ETHERNET SW.
E.31	Aerial surge arrestor shall be mounted with a small section of DIN rail	✓				the earthed shall be run as directly as possible 6mm
E.32						
E.33						
E.34						
E.35						

Company Name SJ Electric Group Qld

Company Electrical Licence No: 73286

Contractor's Tester Name Dave King

Signature.....*D.K.*.....

Date *12/12/14*

QUU Electrical Inspector Name John Clayton

Signature.....

Date

### E. Live Power and Operational Tests

The following tests shall be made with all switchboard electrical circuits energized in order to check that the switchboard meets all operational requirements.

Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
F.1	Verify that all circuit breakers isolate their stated circuits	✓				
F.2	Verify that all electrical components energize when power circuits are energized	✓				
F.3	Switchboard lights operate	✓				
F.4	Confirm that E-Stops actually stop its corresponding drive.	✓				
F.5	Thermal overloads or soft starter protection appropriately set	✓				<b>Adjust for site specific on site</b>
F.6	Set up all of the soft starter parameters			✓		No soft starter
F.7	Verify that all Soft starter operation and all display parameters are displaying correctly.			✓		No soft starter
F.8	A copy of Soft Starter and/or VSD parameter configuration to match site equipment	✓				<b>Include in the O&amp;M</b>
F.9	Record output of 24VDC power supply when connected to 240 VAC main.	✓				27VDC



Item No.	Activity Description	Contractor Results			Signed QUU	Comments
		Pass	Fail	N/A		
F.10	Record output of 24VDC power supply when disconnected to 240 VAC main.	✓				25VDC
F.11	RTU provided with corresponding firmware/software					Software Version: _____.
F.12	Redlion HMI provided with corresponding software configuration					Software Version: _____.
F.13	I/O tested to RTU terminals					
F.14	Manual functions tested as per the below list					Before the function test the RTU & Redlion has been loaded with the correct code OK <input checked="" type="checkbox"/>

**“CONTRACTOR FUNCTION TEST ACTIVITIES”**

**MOTOR STARTER**

Task	Outcome
Check that the motor starter is programmed and able to start the each pump	Pump 1 - OK <input type="checkbox"/> Pump 2 - OK <input type="checkbox"/> N/A

**MODBUS**

Task	Outcome
Confirm that the modbus link from the RTU to the <del>Soft Starters</del> <sup>VSD</sup> and the Display Panel is operating correctly	OK <input checked="" type="checkbox"/>

**BATTERY**

Task	Outcome
Check that the battery is connected and charging (i.e. 26V across the terminals).	OK <input checked="" type="checkbox"/>
Check that the RTU is running off battery when the mains supply is isolated	OK <input checked="" type="checkbox"/>

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**Major Projects & Commercial Services**  
**Checklist**  
**Pre Factory Inspection Tests**

**POINT TO POINT**

Task	Outcome
Using the schematic page I/O list check each individual physical I-O Wired to the RTU from beginning to end. ie press the actual button and watch the I-O change in the Redlion debug page Output lights and relays activate Inject 4-20mA into the Analog Inputs monitor the result on the Redlion debug page The schematic page I/O should be highlighted and signed by the tester and attached to this FAT Test Document. Also confirm that the display panel is showing the correct information during each point to point check	OK <input checked="" type="checkbox"/> OK <input checked="" type="checkbox"/>
<b>Run Both pumps (Check for Interlocking)</b> Turn the station to local and start pump 1. Then simultainiuosly start pump 2. Stop both pumps and then start pump 2. and then start pump 1. Confirm test results match expected. Repeat this exersize via the emergency peump mode switches and in remote, inhect a wet well level signal above the duty "B" start point. (For Interlocked sites – also complete the next section)	N/A 2 pumps run <input type="checkbox"/> Site is Interlocked <input type="checkbox"/>



**HARD WIRED EMERGENCY PUMPING MODE FUNCTIONALITY CHECK**

Task	Outcome
Turn off the RTU and perform the following steps to confirm that the emergency pumping mode is functioning correctly.	
Simulate a surcharge imminent and ensure that the SIDT Timer starts to time	OK <input checked="" type="checkbox"/>
Ensure that the SIDT Timer expires after <del>10</del> <sup>20</sup> sec and activates the EMGDT Timer	OK <input checked="" type="checkbox"/>
Ensure the EMGDT Timer (Delay off) is set to the correct functionality and that it immediately activates EMG1 relay and pump No.1 starts	OK <input checked="" type="checkbox"/>
Ensure that the EMG2 timer is set at 110 sec (equal to the ramp up time in the pump starter) and that it starts pump No. 2 (10 seconds after pump 1 starts)	OK <input type="checkbox"/> N/A
Ensure both pumps are able to be stopped via the interrupt function, remove the interrupt relay for pump No.1 and confirm that the EMGDT timer de-energises and pump No.1 stops. Replace this relay and then remove pump No.2 interrupt relay confirm pump No.2 stops.	OK <input type="checkbox"/> N/A
De-activate the surcharge imminent timer and ensure that both pumps continue to run until the EMGDT timer expires and that both pumps ramp down when the timer expires	OK <input checked="" type="checkbox"/>



**GENERATOR FUNCTIONALITY (OPTION F)**

Task	Outcome
Ensure all Inteposing Relays are wired as per the drawings test all relays and monitor the Redlion debug page to confirm all inputs are correct.	OK <input checked="" type="checkbox"/>

**CATHODIC PROTECTION (OPTION K)**

Task	Outcome
Ensure all CP Circuit has been wired as per the drawings	OK <input type="checkbox"/> N/A

**SUMP PUMP AND DRY WELL CIRCUIT (OPTION E)**

Task	Outcome
Activate the stop electrode input to simulate a level above the stop level – The sump pump should still be off at this stage	OK <input checked="" type="checkbox"/>
Activate the start electrode input to simulate a level above the start level – The sump pump should now start	OK <input checked="" type="checkbox"/>
De-activate the start electrode – the pump should keep running	OK <input checked="" type="checkbox"/>
De-activate the stop electrode – the pump should stop	OK <input checked="" type="checkbox"/>
<b>Activate the Alarm level electrode</b>	
<b>Confirm operation of relay and input to RTU</b>	OK <input checked="" type="checkbox"/>
<b>Activate the Trip level electrode wait 10 seconds</b> This will stop all sewer pumps from running in local, remote (via Software) or under the control of the Emergency Pumping Circuit Circuit (Via the sewer pump interupt relays). Confirm this by trying to start the sewer pumps in all 3 modes.	Pump 1 - OK <input type="checkbox"/> Pump 2 - OK <input type="checkbox"/>
Confirm that the each sewer pump can still be run under the control of that pumps Emergency Start Switch	Pump 1 - OK <input type="checkbox"/> Pump 2 - OK <input type="checkbox"/>

**PUMP INTERLOCKING (OPTION O)**

Task	Outcome
<b>For a fully interlocked site</b>	
Ensure that the 2 pumps can not run either from a RTU command, Emergency Pumping Circuit or the Emeregecy Pumping Mode Switch	OK <input type="checkbox"/> N/A



**Major Projects & Commercial Services  
Checklist  
Pre Factory Inspection Tests**

<b>For a generator only interlocked site</b>	
Ensure that 2 pumps can run simultaneously when the station is powered by Energex. (From the RTU, Emergency Pumping Circuit and the Emergency Pumping Mode Switch )	OK <input type="checkbox"/>
Ensure that the 2 pumps can <b>not</b> run either from a RTU command, Emergency Pumping Circuit or the Emergency Pumping Mode Switch while the stations is powered from the Generator	OK <input type="checkbox"/>
<b>Pump Faulted Scenario</b>	
Ensure that if pump 1 is faulted, pump 2 can still start both via the RTU and the Emergency Pumping Circuit.	OK <input type="checkbox"/>
Ensure that if pump 2 is faulted, pump 1 can still start both via the RTU and the Emergency Pumping Circuit.	OK <input type="checkbox"/>

N/A

**Company Name** SJ Electric Group Qld

**Company Electrical Licence No:** 129881

**Contractor's Tester Name** Dave King

**Signature** *D. King* .....

**Date** 12/12/14

**QUU Electrical Inspector Name** John Clayton

**Signature** .....

**Date**

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**G. Non-Conformances and Unauthorised Modifications**

G.1	
G.2	
G.3	
G.4	
G.5	
G.6	

**Company Name** SJ Electric Group Qld

**Company Electrical Licence No:** 129881

**Contractor's Tester Name** Dave King

**Signature** ..... *D. King* .....

**Date** *12/12/14*

**QUU Electrical Inspector Name** John Clayton

**Signature** .....

**Date**



This section is to be completed only at the conclusion of the FAT:

Final FAT Results	YES	NO	Comments
Pre-FAT Completed			
Minor NCRs Generated			
Major NCRs Generated			
Pre-FAT Accepted			

**Notes:**

1. FAT results to be recorded above by Contractor.
2. FAT results to be approved by Queensland Urban Utilities Electrical Inspector.
3. Pre-FAT results to be approved by Queensland Urban Utilities Electrical Inspector at Pre-FAT (if present) or at the start of the FAT.
4. NCRs are to be generated by the Queensland Urban Utilities Electrical Inspector for all NCRs not resolved by the end of the test.

**Company Name** SJ Electric Group Qld

**Company Electrical Licence No:** 129881

**Contractor's Tester Name** Dave King

**Signature**.....

**Date**

**QUU Electrical Inspector Name** John Clayton

**Signature**.....

**Date**



SJ Electric Group (Qld) Pty Ltd  
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www.trivantage.com.au

## SP044 LYTTON ROAD, EAST BRISBANE SEWAGE PUMP STATION

### COMMISSIONING PLAN

**In Attendance**

Name	Role During Commissioning	Company
Amy Wamsley	Electrician	SJE
Alex Gray	APP. Electrician	SJE
JOHN CLAYTON	Commissioning NC	QUU
Carsten Vang	Control system	Waytec

Electrical Contactor's Supervisor

Name: A. Wamsley Date: 6-2-15

Signature: [Signature]

QUU Commissioning Manager

Name: John Clayton Date: 6/2/15

Signature: [Signature]

# 1 INTRODUCTION

**!! IMPORTANT !!**

**This commissioning Procedure is not to replace the electrical contractors own internal quality control and statutory documentation.**

As this is a wet weather only 1 pump station there will be no generator or temporary switchboard to run the pump.

The sequence of works shall be:

1. Station Preliminary Works
2. Install new motor for pump.
3. Install new switchboard
4. Install Probes
5. Install new consumer mains/earthing
6. Energise new switchboard
7. Connect pump to new switchboard and test.
8. Confirm communications work
9. Post Changeover

## 1.1 MAINTENANCE CHECK OF EXISTING INSTALLATION

Before the works on site can commence, QUU staff to ensure that both pumps are fully operational shall perform a thorough maintenance inspection of the site.

## 1.2 PRE COMMISSIONING CHECKLIST

The following checklist is to be completed and signed by the electrical contractor.

### 1.2.1 Switchboard Factory Acceptance Test

Contractor Task	Completed
FAT has been completed as per QUU FAT Document and all defects that were identified have been rectified.	OK <input checked="" type="checkbox"/>

Electrical Contractor initial: 

QUU Commissioning Manager initial: 

**1.2.2 Pump Station preliminary operational checks**

QUU Task	Checked
<p>These are checks will ensure the pump station is fully operational and that no delays will be incurred due to any pump station problem out side of the contract. These tasks are desirable to have completed before the SAT but are not essential. The job can proceed if they are not done.</p> <p>Commissioning Manager to request networks maintenance to inspect and rectify if necessary</p> <p style="text-align: center;"><i>WET WEATHER STATION</i></p>	OK <input checked="" type="checkbox"/>
The wet well does not need pumping out.	OK <input checked="" type="checkbox"/>
Ensure that the station is fully functional (the pump can run)	OK <input checked="" type="checkbox"/>

**2 STATION PRELIMINARY WORKS**

Contractor Task	Completed
Supply and install conduits as per plan, install new concrete slab Arrange for core holes in to the wet well and valve pit	OK <input checked="" type="checkbox"/>
Supply and install all equipment as per plan including lights, GPOs, Field disconnect boxes and instrument boxes	OK <input checked="" type="checkbox"/>
Arrange for the mechanical subcontractor to install the new motor	OK <input checked="" type="checkbox"/>

**2.1 INSTALL NEW SWITCHBOARD**

Contractor Task	Completed
<p>After the switchboard FAT and all defects rectified deliver the switchboard to site and bolt down to slab.</p> <p>Install consumer mains cabling from the pole to the switchboard</p>	OK <input checked="" type="checkbox"/>
Install new antenna cabling and antenna.	OK <input checked="" type="checkbox"/>

Electrical Contractor initial: *[Signature]*

QUU Commissioning Manager initial: *[Signature]*

## 2.2 UPGRADE WET WELL LEVEL SENSORS

Contractor Task	Completed
Install new Surge Imminent Probe Install new High Level Probe Install new Hydrostatic level Probe	OK <input checked="" type="checkbox"/>

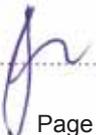
## 2.3 UPGRADE DELIVERY PRESSURE TRANSMITTER

Contractor Task	Completed
Install new pressure transmitter, cabling and associated fittings into existing tapping point in header pipe adjacent new access platform. The contractor shall supply and fit all fittings necessary to plumb the pressure transducer into the existing isolation valve. Fit label to pressure transmitter.	OK <input checked="" type="checkbox"/>

## 2.4 TEMPORARILY WORKS

Contractor Task	Completed
To enable the pump station to operate if there is wet weather the pump and all other equipment has been connected including instruments and the power fed from the existing switchboard. The PLC is not operational at this stage but the switchboard can operate manually.	OK <input checked="" type="checkbox"/>

Electrical Contractor initial: 

QUU Commissioning Manager initial: 

### 3 SWITCHBOARD CHANGEOVER PROCEDURE

#### OVERVIEW

The following sequence of change over works is the order in which they must be followed. After each phase has been completed, the commissioning manager will record the results and instruct the commissioning team to commence work on the next phase.

#### 3.1 CHANGEOVER SWITCHBOARD

*PTW 220  
March*

##### 3.1.1 Register with Control Room

Contractor and Commissioning Manager Task	Outcome
Call the QUU Control Room Operator (CRO) and inform him that you are on site. Record the CRO's Name and Officer Code and record the time of the call. Advise CRO that you are performing a switchboard changeover and that you will initially be taking one pump off line. <b>Give the operator your contact name and number and advise the operator that communications will be lost to the pump station until the job is finished</b>	Name: <u>Ben</u> CRO: _____ Time: <u>06-00</u>

##### 3.1.2 Existing Switchboard Parameters

Contractor Task	Outcome
Record the Energex meter serial numbers.	# <u>122900</u> # <u>122901</u> # <u>122902</u>
Record 3 phase motor currents Pump #1	<i>N/A NEW MOTOR</i> U. ___ V. ___ W. ___
<b>THIS IS A HOLD POINT.</b>  Do not proceed until the All PUMPS are confirmed to be fully operational	Signature: <u>[Signature]</u> TIME: <u>06-00</u>

Electrical Contractor initial: [Signature]

QUU Commissioning Manager initial: [Signature]

**3.1.3 Commission Pump station**

Contractor Task	Outcome
WORK WITH QUU TO COMMISSION PUMP STATION	OK <input checked="" type="checkbox"/>
ESTABLISH COMMUNICATIONS	OK <input checked="" type="checkbox"/>
TEST THE PUMP CONFIRM THAT THE PROBES WORK AND THAT THE PUMP WILL EMPTY THE WET WELL <b>WHEN TESTING ROTATION ONLY RUN THE PUMP AT 5 HZ</b>	OK <input checked="" type="checkbox"/>
CONFIRM THAT THE SUMP PUMPS, LIGHTS, GPOS WORK	OK <input checked="" type="checkbox"/>
TEST ALL POWER CABLING AND NOTE IN TEST BOOK	OK <input checked="" type="checkbox"/>
REMOVE OLD EQUIPMENT THAT IS NOT REQUIRED	OK <input checked="" type="checkbox"/>
CONTINUE TO ASSIST QUU WITH COMMISSIONING	OK <input checked="" type="checkbox"/>

Electrical Contractor initial:.....

QUU Commissioning Manager initial:.....

**TEST SHEET**

CUSTOMER NAME: QUX SWITCHBOARD ID: SP044 DATE: 5-2-15  
 CUSTOMERS ADDRESS: LYTTON RD JOB No: 434225

C/B NO.	CABLE SIZE	C/B SIZE	N NO.	CIRCUIT DESCRIPTION	VISUAL INSPECTION	CORRECT CIRCUIT CONNECTION	EARTH CONT.	A-E MΩ	N-E MΩ	A-E VOLTS	A-N VOLTS	φ-φ VOLTS	RCD TEST		Fault loop Impedance measurement
													mA	ms	
Q01	70			MAINS CABLES & PUMP	✓	✓	0.01	200	200	240	240	415			.15
	50			SUMP PUMP	✓	✓	0.15	200	N/A	236	236	✓			.69
Q011	2.5	16		15A GPO IN SWITCHBOARD	✓	✓	.05	200	200	240	240	✓		29	
Q012		10		10A LAPTOP GPO	✓	✓	.05	200	200	240	240	✓		29	
Q013	2.5	6		DRYWELL LIGHTING	✓	✓	.03	200	200	240	240	✓		29	
Q014	2.5	10		DRYWELL VENT FAN	✓	✓	.01	200	200	240	240	✓		62	
Q015		10		GENERATOR GPO	✓	✓	.05	200	200	240	240	✓		29	
Q016	2.5	6		EXTERNAL FLOOD LIT	✓	✓	.1	200	200	240	240	✓		29	
Q017	2.5	4		FLOW METER	✓	✓	.02	200	200	240	240	✓			.67
Q020	4	20		3PH GPO w/ DRYWELL	✓	✓	.1	200	200	240	240	415		20	
Q021	2.5	6		WET WELL BLDG LIGHTS	✓	✓	.1	50	50	240	240	✓		28	
Q022	2.5	10		GALLERY GPO	✓	✓	.02	200	200	240	240	✓		29	
Q023	2.5	10		WELL BLDG GPO'S	✓	✓	.01	200	200	240	240	✓		29	
Q024	2.5	10		EXT. LIGHTS	✓	✓	.1	50	50	240	240	✓		29	
Q027	10			DOOR CONTROL	✓	✓	.2	50	50	240	240	415			.72

TEST EQUIPMENT: Megger, R.C.D., Loop NAME: ANDY WATKINS  
 SERIAL NO: 517138, 0043151, 7011093 LIC NO: A30788  
 TEST DUE DATE: 4-3-15 SIGNATURE: 





### 3.2 SUGGESTIONS FOR IMPROVEMENT

Suggestion	Recommended By

# 5. Compliance Certificate



SJ Electric Group (Qld) Pty Ltd  
A Division of the Trivantage Group

19 Elliot Street, Albion QLD 4010

P 07 3256 1522 F 07 3256 1533 E mail.qld@sjelectric.com.au

ABN 45 124 414 768 REC 73286 QBSA No. 1265641

www.trivantage.com.au

**CERTIFICATE OF:**  
(Please mark relevant check-box)

**TESTING AND COMPLIANCE** (Electrical Installations)  
*Issued in accordance with s227 of the Electrical Safety Regulation 2013*

**TESTING AND SAFETY** (Electrical Equipment)  
*Issued in accordance with s26 of the Electrical Safety Regulation 2013*

**\*Work performed for:**

Customer: **Queensland Urban Utilities**  
*(Company Name)*

Address: **Level 2, 15 Green Square Close**  
*(Street)*

**Fortitude Valley**  
*(Suburb/town)*

**Qld**  
*(State)*

**4006**  
*(Postcode)*

**\*Electrical installation / equipment tested** *(please include site address for electrical installation work if different from above):*

Work carried out at SP044, Lytton Road, East Brisbane  
Installation tested as per Drawings 486/5/7-0463-000 to 486/5/7-0473-043

\*Date of test **5 / 2 / 2015** \*Electrical contractor licence number: **73286**

Name on contractor licence: **SJ Electric Group (Qld) Pty Ltd**

Electrical contractor phone number: **07 3256 1522**

For **electrical installations**, this certifies that the electrical installation, to the extent it is affected by the electrical work, has been tested to ensure that it is electrically safe and is in accordance with the requirements of the wiring rules and any other standard applying under the Electrical Safety Regulation 2013 to the electrical installation.

For **electrical equipment**, this certifies that the electrical equipment, to the extent it is affected by the electrical work, is electrically safe.

Name: **Andy Walmsley**  
*(Person who performed, or person who is responsible for the electrical work)*

Signature:

Date: **5 / 2 / 2015**

**\*Indicates a mandatory field**

# 6. Photos

# Photos - Before



IMG\_3283



IMG\_3284



IMG\_3285



IMG\_3286



IMG\_3287



IMG\_3288



IMG\_3289



IMG\_3290



IMG\_3291



IMG\_3292



IMG\_3293



IMG\_3294



IMG\_3295  
Q-Pulse Id: TMS1408



IMG\_3296  
Active: 30/09/2015



IMG\_3297  
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IMG\_3298



IMG\_3299



IMG\_3780



IMG\_3781



IMG\_3782



IMG\_3783



IMG\_3784



IMG\_3785



IMG\_3786



IMG\_3787



IMG\_3788



IMG\_3789



IMG\_3790



IMG\_3791

# Photos - After



IMG\_5163



IMG\_5164



IMG\_5165



IMG\_5166



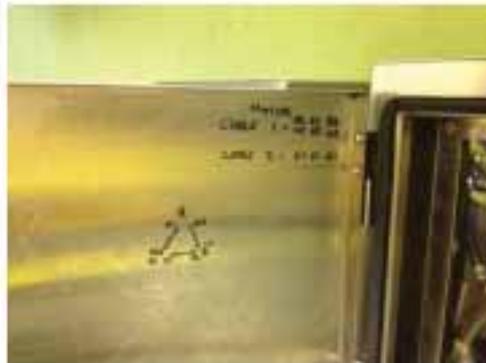
IMG\_5167



IMG\_5168



IMG\_5169



IMG\_5170



IMG\_5171



IMG\_5172



IMG\_5173



IMG\_5174



IMG\_5175