



BRISBANE WATER
Project STTX- generator Connection Boxes

**GENERATOR CONNECTION
O & M Manual
SP 019 Centenary Hwy**



Issue : ***Book 1 of 1***

Date of Issue : ***JUNE 2004***

Author : ***Brisbane Water Projects***

COMMON LOGIC PTY LTD

ACN. 011 029 262

Electrical Contractors

Contract BW.30178-02/03 Switchboard Connection Facilities for Backup Generator Sets at Sewerage PS

Electrical Manual - WB19 Centenary Highway

ISSUE NO 1
AS BUILT
21/06/2004

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JH05

JH05Mj19Centenary



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 1

- Generator Connection Description
- ATS Connection Diagram

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- Parts List

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- Construction Markups

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- Site Testing
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- Site Testing NCS alarms
- Site Testing Generator
- Electrical Test Certificate

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- Parts information

PASTEL
MANILLA
DIVIDERS
5 TAB A4



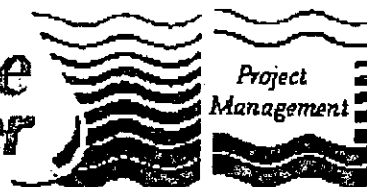
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Water**



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GENERATOR CONNECTION O & M Manual

Section 1

Generator Connection Description

COMMON LOGIC Pty Ltd Specialist Electrical Contractors		Electrical Manual	
Subject: Semi Permanent Generator Change Over Switchgear		Sheet: 2 Of: 10	Section 1
Page Revision No:	Date: 21/06/04	Manual Issue No: 1 Date: 21/06/04	
<div><div>1.0</div><div>GENERAL<p>The following document describes the operation of the switchgear and relays installed into the change over switchgear cubicle. The document does NOT describe the detailed operation of the generator PLC or the operation of the pump starters on the site. The generator is a plug in device and can be removed from site by BW at their discretion. All sites are identical with respect to the control mechanism with only the size of the circuit breakers and associated switchgear changing.</p></div></div>			
Authorised By: Grant Kerr			

JH05MC01

Subject: Semi Permanent Generator Change Over Switchgear

Sheet: 3
Of: 10Section
2

Page Revision No: Date: 21/06/04

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2.0 OPERATIONAL DESCRIPTION

There are four components to the system. These are the Generator, RTU, Pump MCC, and the Generator change over switchgear. The last component will be described within this document in detail. The remaining devices will be described in the BW manual.

2.1 GENERATOR

The generator and associated PLC control all automatic aspects of the change over switchgear, in affect making the basic transfer switch into an Automatic Transfer switch (ATS). The ATS will only operate if the generator PLC is fully operational.

The operation of the ATS is NOT fail safe and will NOT return to a predetermined condition on failure of the generator PLC or associated wiring.

Mains fail timing and return to mains timing is all controlled within the generator PLC.

2.2 RTU

The RTU monitors several generator alarm conditions and will report these conditions to the system as required.

The RTU can remotely start and stop the generator. The remote start will initiate a change over of the station to the generator. Stopping the generator will initiate a return to mains if available.

2.3 PUMP STARTER MCC

The pump starter MCC automatically starts and stops the pumps on demand determined by the wet well levels.

The starter has not been modified in any way to accommodate the generator ATS with the exception of the re-routing of the sub-mains cabling.

2.3.1. MCC MAIN SWITCH

The Main Switch in all cases refers to the Energex supply point of isolation.

The existing main switch in the pump starter MCC, when labelled as the "Main Switch", will isolate the incoming Energex Mains Supply.

For complete isolation of the switchboards where an automatic generator system is supplied the generator must also be isolated.

This must be carried out at the generator CB in the generator canopy as well as switching the control to the "OFF" position.

Where a separate main switchboard has been installed the MCC Main Switch will

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<p>become the MCC Main Isolator. This isolator will isolate all incoming power to the MCC regardless of the generator condition.</p> <p>2.3.2. MAINS AVAILABLE INDICATOR</p> <p>The mains available indicator mounted on the common control escutcheon is supplied by a 24VDC signal originating from the RTU control supply. The polarity of the signal on the unit is dependent on the type of RTU on the site. The signal will be "ON" when the mains are healthy.</p> <p>This relay does not monitor the level or the rotation of the generator supply and has no bearing on the running of the pumps.</p> <p>2.3.3. MAINS FAIL IN MCC</p> <p>The mains fail relay in the MCC is the only device that assures the system has the correct rotation and supply available for the pumps to operate. When re-connecting the generator to a site it is necessary to check the rotation is also correct.</p> <p>2.3.4. GENERATOR RUNNING.</p> <p>The generator running indicator is supplied by a 24VDC signal from the generator battery system. The indicator will be "ON" when the generator is running as determined by the generator PLC.</p> <p>2.4 ATS CUBICLE</p> <p>The ATS cubicle comprises 3 sections as described below. The control function of all sites is identical including all relays and components with the exception of the size of the transfer switch and associated connection hardware.</p> <p>2.4.1. GENERATOR INTERFACE</p> <p>The generator interface is via a Clipsal 27 Pin plug and socket. The multicore cable is connected core 1 to pin 1 and 2-2 etc. The Multicore cable is labelled wire No. 601 for core 1 to pin 1 and No.602 –Core2- Pin2 etc. This enables simple and quick reference to all wiring between the plug and the hardware within the ATS cubicle. All signals received from the generator are arranged to switch a relay powered from the generator 24VDC system. The exceptio to this is the "Generator Not On Site" signal, which wires directly to the RTU via the interface terminals.</p> <p>All control signals to the Generator are via clean contacts. Both sides of the contact are issued to the generator. These contacts switch relays in the generator panel and are powered via the generator 24VDC system.</p>			
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2.4.2. RTU INTERFACE

The RTU interface is via a hard wired loom or multicore cable and terminals. The Loom cable is specially numbered with the terminal numbers within the ATS cubicle. IE Core 23 is connected to terminal 23 and is labelled wire 623. If a Multicore cable is utilised then core 1 is connected to Terminal 23 the labelled wire No. 623 for core 2 to terminal 24 and No.624 etc.

This enables simple and quick reference to all wiring between the RTU and the hardware within the ATS cubicle.

The RTU connections are different for each site and may also have different polarities for each site according to the site hardware.

All signals received from the RTU are arranged to switch a relay powered from the RTU 24VDC system. IE Remote Start and Remote Stop only.

All signals to the RTU are via clean contacts. Both sides of the contact are issued to the RTU system. These contacts switch directly into the RTU Input cards. The voltage on these signal cables is 24VDC supplied from the RTU power supply.

2.4.3. ATS AND CONTROL

The transfer switch is a Terasaki Basic Transfer switch.

The control of this switch is only achieved from the generator PLC. The PLC controls the relays GTSM and GTSG within the ATS panel.

Energising GTSM if the Mains Volts are available will open the Generator CB and Close the Mains CB.

Energising GTSG if the Generator Volts are available will open the Mains CB and Close the Generator CB.

If volts are not available the motors in the BTS will not operate. (IE stay in the last condition.

If the BTS does not operate the PLC will remove the transfer signal and assume a fault condition. This condition required manual operator intervention.

Manual Operation:

If manual operation is desired then the following steps must be carried out.

Please note that it is not necessary to remove any covers when manually operating the CB's.

If the PLC is issuing an undesirable status then the operation of the CB motors must first be isolated. This is best achieved by switching the CB's QM2 and QG1 to the off position. This removes the motor charge and open close commands to the operators.

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<p>If the PLC is not affecting the transfer switch these CB's may be left in the ON state.</p> <p>Manual Open: To open a CB press the trip button on the motor operator "OR" toggle the spring wind mechanism until the CB opens and the open state shows in the window.</p> <p>Manual Close: To close a CB wind the motor spring wind mechanism until the CB closes and the Closed state shows in the window.</p> <p>Mains Fail detection: The mains fail relay detects the condition of the mains and issues a mains fail start signal to the PLC. The mains fail relay also operates the mains available indicator on the MCC common control panel. The mains fail signal also issues a condition to the RTU to indicate mains failed when the relay is de-energised.</p>			
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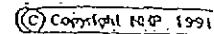


BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 1A

ATS Connection Diagram





BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 2

Parts list

Supplier Name	Part No	Item Description	Manual Incert
ABK	CL156AI310	APPLIANCE INLET	Clipsal Web Page
ABK	CL156CSC310	EXTENSION SOCKETS	Clipsal Web Page
ABK	CLIWIPM27	27 CONTROL PIN W/P INSUL PLUG HI-IMPACT	Clipsal Web Page
ABK	MEN368	MENNEKES 368 125A 5P PANEL INLET	Mennekes Web Page
NHP	93.2	JUMPER LINK 20WAY SUITS 38.5	NHP Catalogue F1
NHP	96.72	2P 12AMP RELAY BASE FOR 56.32 RLY	NHP Catalogue F1
NHP	96.74	4P 12AMP RELAY BASE FOR 56.34 RLY	NHP Catalogue F1
NHP	38.51 24VDC	24V DC RELAY 1CO 6A	NHP Catalogue F1
NHP	56.32 0074 24VDC	RELAY FPIN 2CO 12A 24VDC	NHP Catalogue F1
NHP	56.34 24VDC	RELAY FPIN 4CO 12A 24VDC	NHP Catalogue F1
NHP	99.013-024	LED & DIODE MODULE PLUG-IN	NHP Catalogue F1
NHP	CS4-22Z-240VAC	2N/O 2N/C 240VAC RELAY	NHP Catalogue CA4
NHP	2H1407DAA	FRONT TERMINAL COVER FOR XS125 (QTY 2)	NHP Web Page
NHP	2H2135DAA	C/B SHROUDS FOR XS250 (QTY 2)	NHP Web Page
NHP	BS2N233(NON AUTO)	TRANSFER SW BTSS250NJ25033 NON AUTO	NHP Web Page
NHP	CLSBB25033	250A BUSBAR LOAD SIDE 3P X23	
NHP	D5-3NL3A	LED LAMP BLOCK C/W COUPLER AMBER 24V AC/DC	NHP Flyer D5-3NF
NHP	D5-3NL3A	LED LAMP BLOCK C/W COUPLER AMBER 24V AC/DC	NHP Flyer D5-3NF
NHP	D5P-P5	YELLOW PILOT LIGHT STANDARD	NHP Web Page
NHP	DPA-01-D-M48	PHASE FAIL/SEQ	NHP Flyer CGM
NHP	DSRCB1030P	10A 2P DIN SAFE MCB WITH PIGTAIL	NHP Catalogue Page
NHP	DSRCB1030P	10A 2P DIN SAFE MCB WITH PIGTAIL	NHP Catalogue Page
NHP	DSRCBH1030A	DINT MCB/RCD 1P 10A 30MA 10KA	NHP Catalogue Page
NHP	DSRCBH1030A	MCB/RCD 1P 10A 30MA 10KA DIN-T	NHP Catalogue Page
NHP	DSRCBH3230A	MCB/RCD 1P 32A 10KA	NHP Catalogue Page
NHP	DTCB10332C	DINT 10KA 3P 32A CB	NHP Catalogue Page
NHP	DTCB6106C	DINT 6KA 1P 6A CB	NHP Catalogue Page
NHP	DTCB6306C	DINT 6KA 3P 6A CB	NHP Catalogue Page
Pheonix	441504	EARTH TERMINALS	Pheonix Web Page
Pheonix	800886	E/NS35N END CLAMP DIN RAIL	Pheonix Web Page
Pheonix	3004362	UK5N 4MM FEEDTHRU TERMINAL GREY	Pheonix Web Page
Weidmuller	102840	WFF70	Weidmuller Catalogue Page
Weidmuller	106456	WAH70 covers	Weidmuller Catalogue Page



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 3

Asbuilt Drawings



*Brisbane
Water*

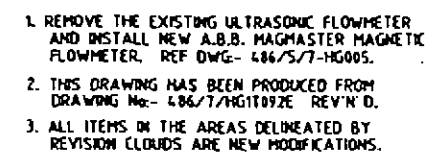


BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 3A

Construction Markups



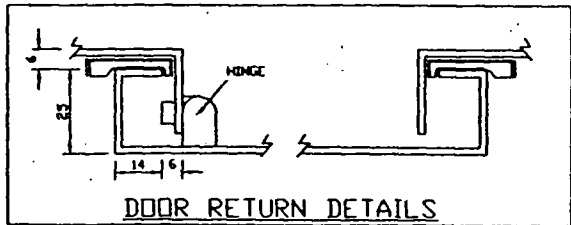
PLAN OF WELLS

SUPERCEDES DRAWING No:- 486/7/HGIT093E REV'N D

**Brisbane
Water**

PROJECT
CENTENARY HIGHWAY
SEWAGE PUMP STATION SP19

DRY & WET WELL PLAN
ELECTRICAL EQUIPMENT
GENERAL ARRANGEMENT



GHD
GUTHRIE
HARRISON
DUNN

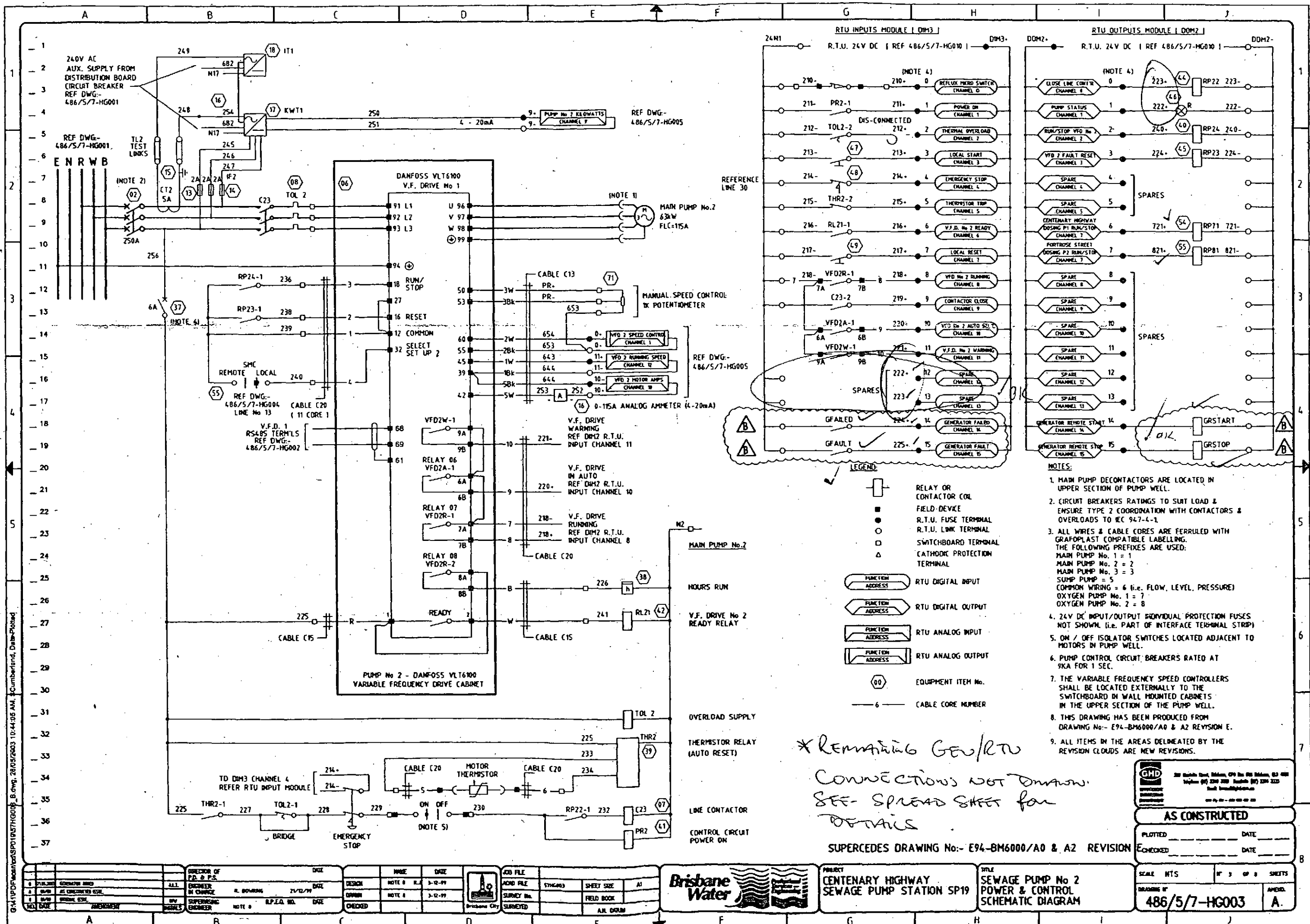
201 Dundas Street, Niagara, ON L8S 4B8 Niagara, ON L8S 4B8
Telephone (905) 238-3888 Facsimile (905) 238-3333
E-mail: info@ghd-niagara.com

Call us toll-free 1-800-363-4343

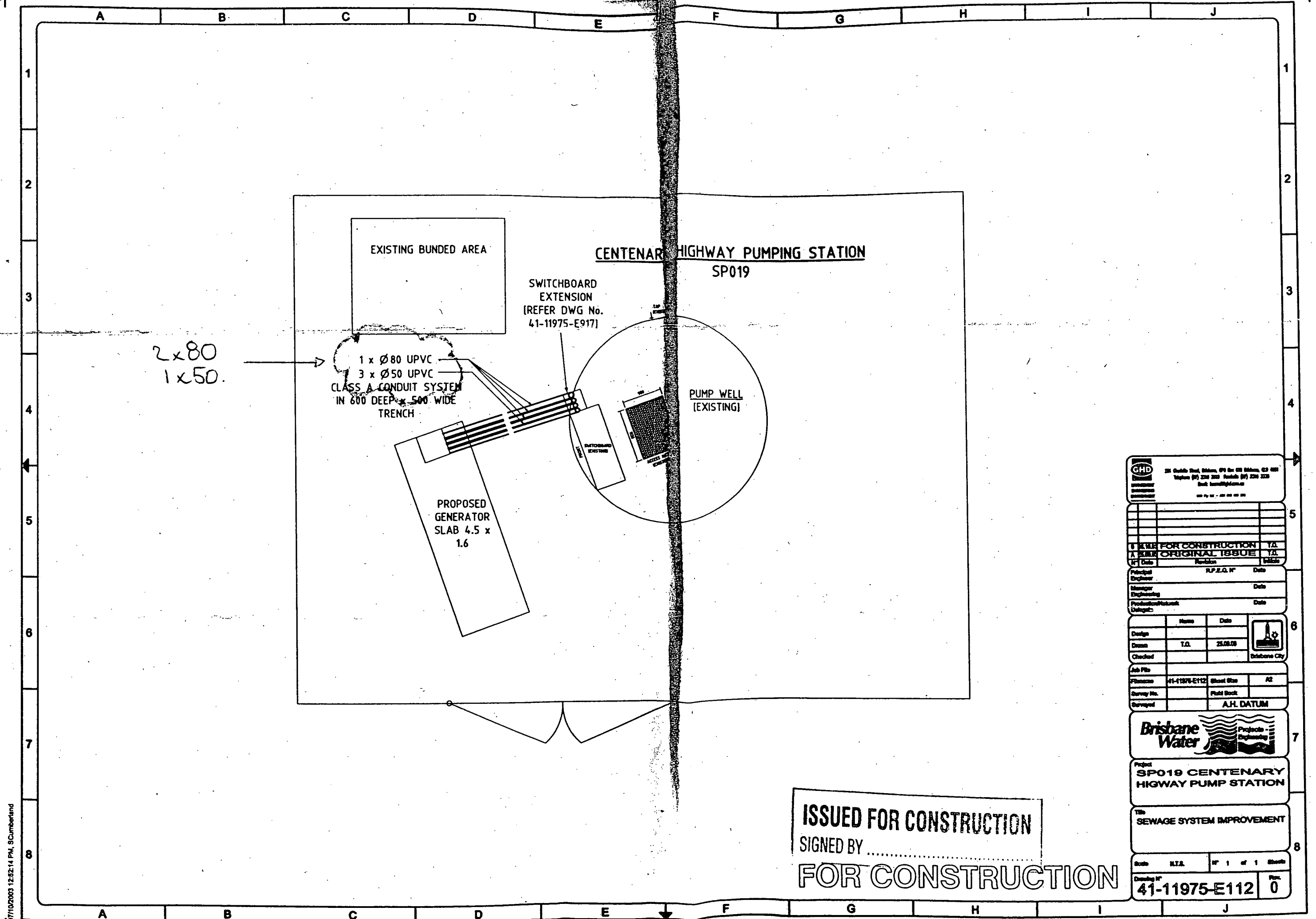
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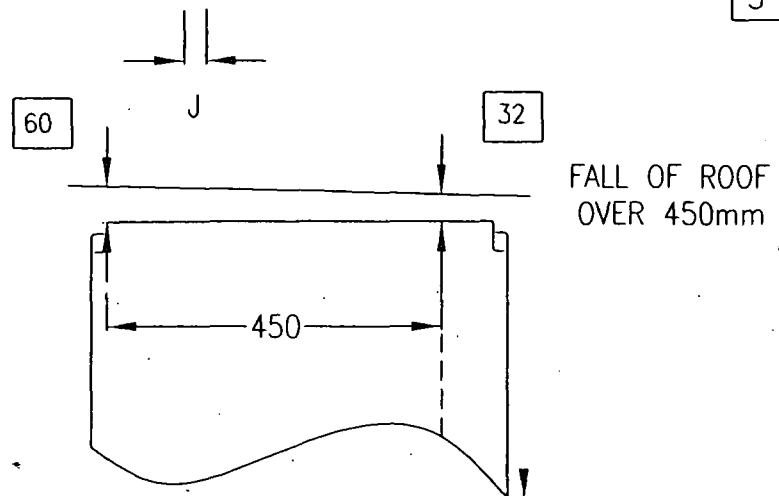
250 Adelaide Street, Brisbane, QLD 4000 Australia Telephone (07) 239 3333 Facsimile (07) 239 3333 Email: info@ghd.com.au Web: www.ghd.com.au		
1. ISSUE FOR CONSTRUCTION 2. ORIGINAL ISSUE		
Principal Engineer Manager Engineering Professional/Planner/Designer	R.P.E.O. No. Date Date Date	Date Date Date
Design Drawn Checked	Name T.O. Date	Date 25.08.09 Brisbane City
Job File Filename Survey No. Surveyed	41-11975-E112 Sheet Size Field Book A.H. DATUM	A2 0
Project SP019 CENTENARY HIGHWAY PUMP STATION		
Title SEWAGE SYSTEM IMPROVEMENT		
Scale Drawing No. 41-11975-E112	N.T.S. 1 of 1 Sheets 0	Rev.

ISSUED FOR CONSTRUCTION
 SIGNED BY
 FOR CONSTRUCTION

IF IN DOUBT, ASK.

ROOF SIDE VIEW

3 ROOF TYPE



EXISTING BOARD DEPTH

MINIMUM SPACE FOR ANTENNA

35

FRONT O/HANG

SIDE O/HANG

20

F

G

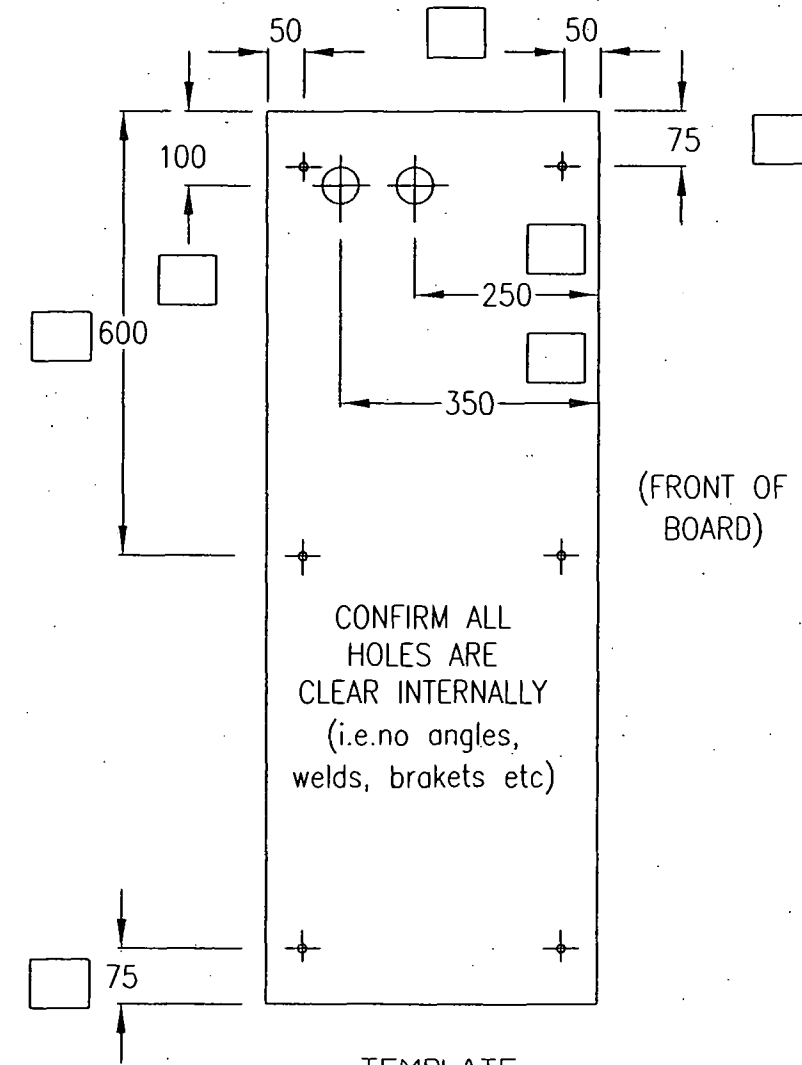
NEW EXTENSION

EXISTING SW/BD

FRONT

600

TOP VIEW



TEMPLATE SIDE ADJACENT TO EXIST. SW/BD

NOTE #1. Kianawah base to be made and placed in position after mounting.
NOTE #2. All plinths to be measured and installed after mounting of boards.

CENTENARY HWY
MACQUARIE ST
PROGRESS RD
KIANAWAH RD

PAINT COLOUR #4 POLISH
MATERIAL STAINLESS STEEL

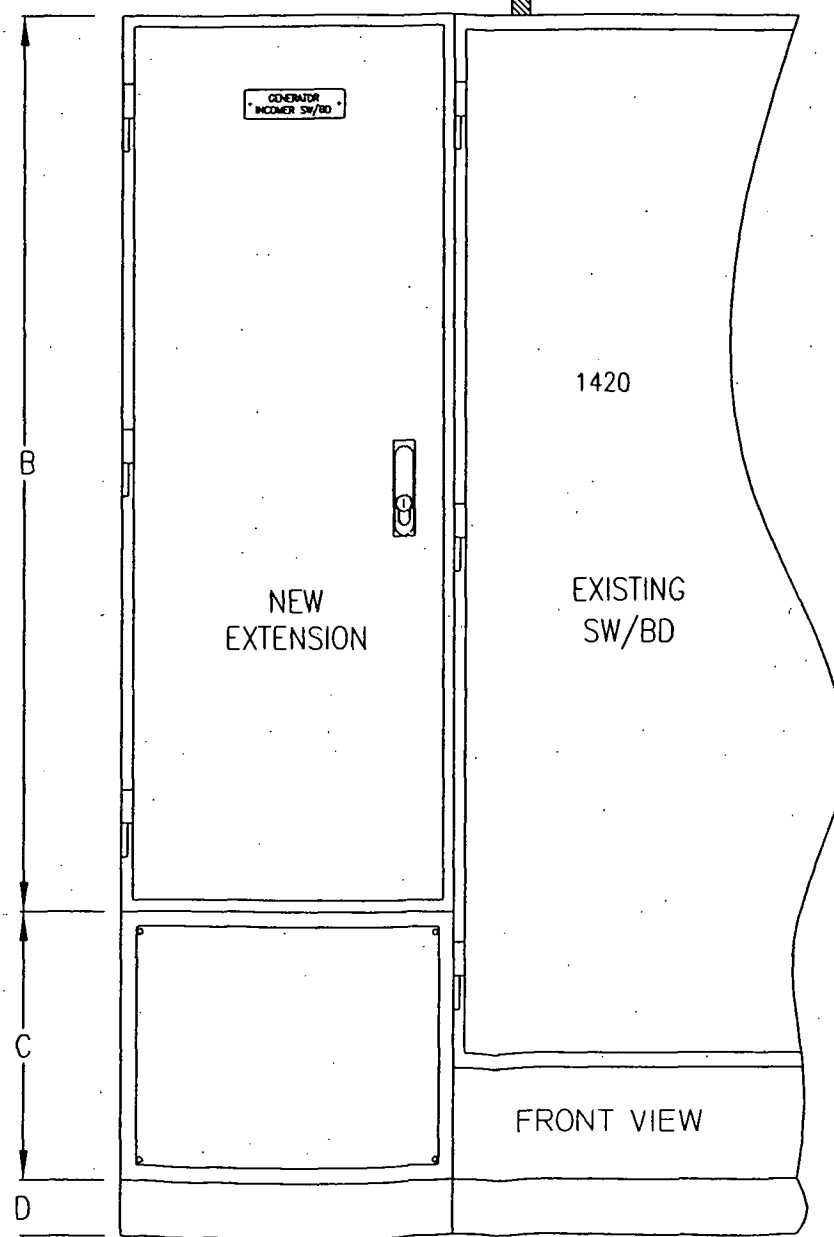
(TOTAL OF ALL EXTENSIONS)

220 + NIL

Note #1

(BASE) 160

Note #2.



10/12/03	B	AS BUILT			
2/10/03	A	ISSUED FOR APPROVAL			

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PO. BOX 2008
Mansfield QLD. 4122
Tele: 07 3849 7449

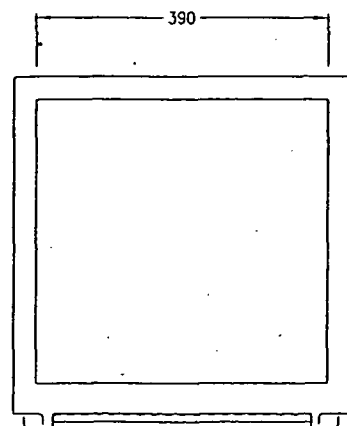
DATE 25/08/03
DRAWN YGF
SCALE NTS
APPROVED

BRISBANE WATER
SP LHS MTC AL SITES

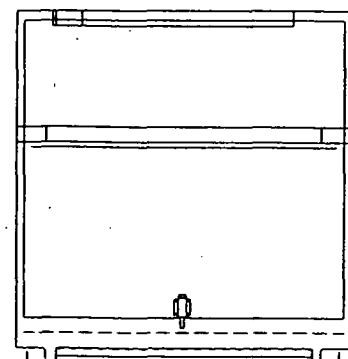
JH05DL04 A3 sheet 1/1 ISSUE B

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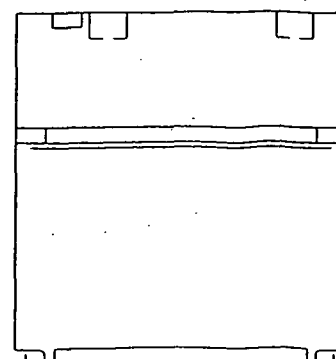
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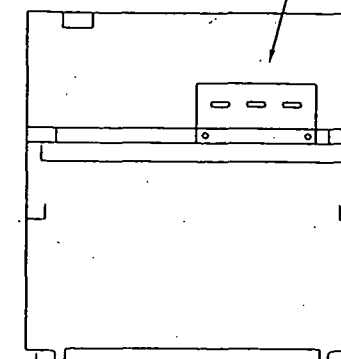
BOTTOM VIEW



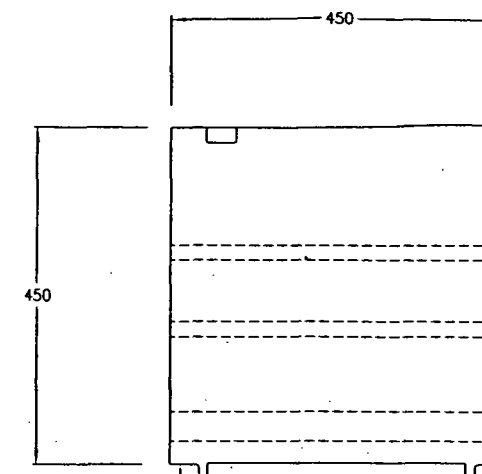
SECTION D-D



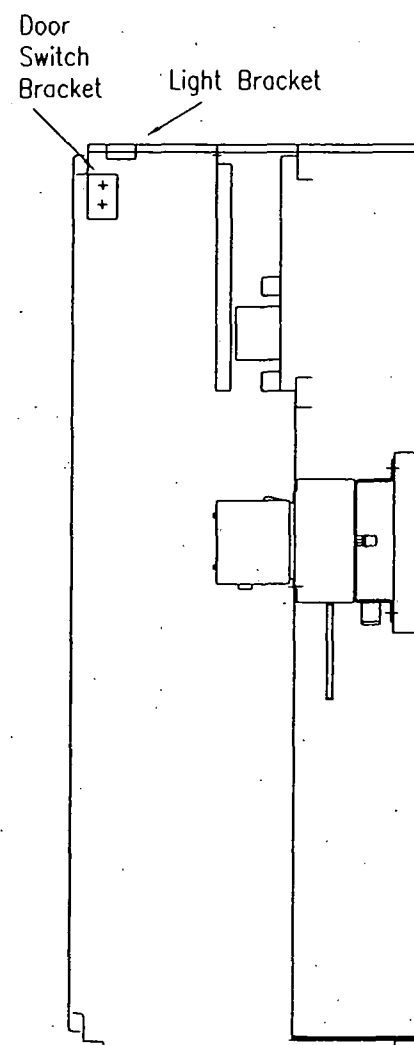
SECTION C-C



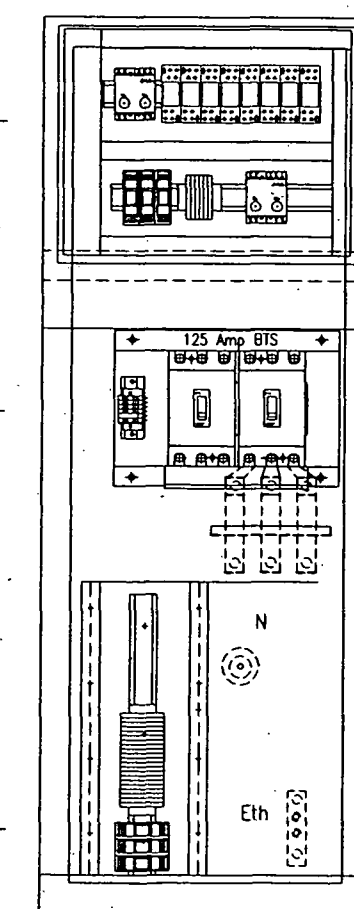
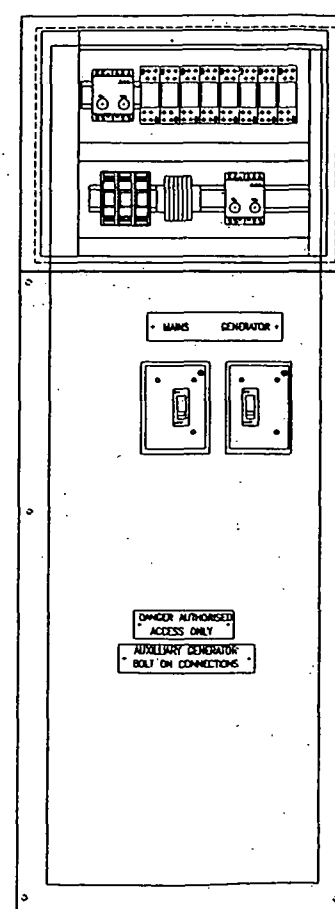
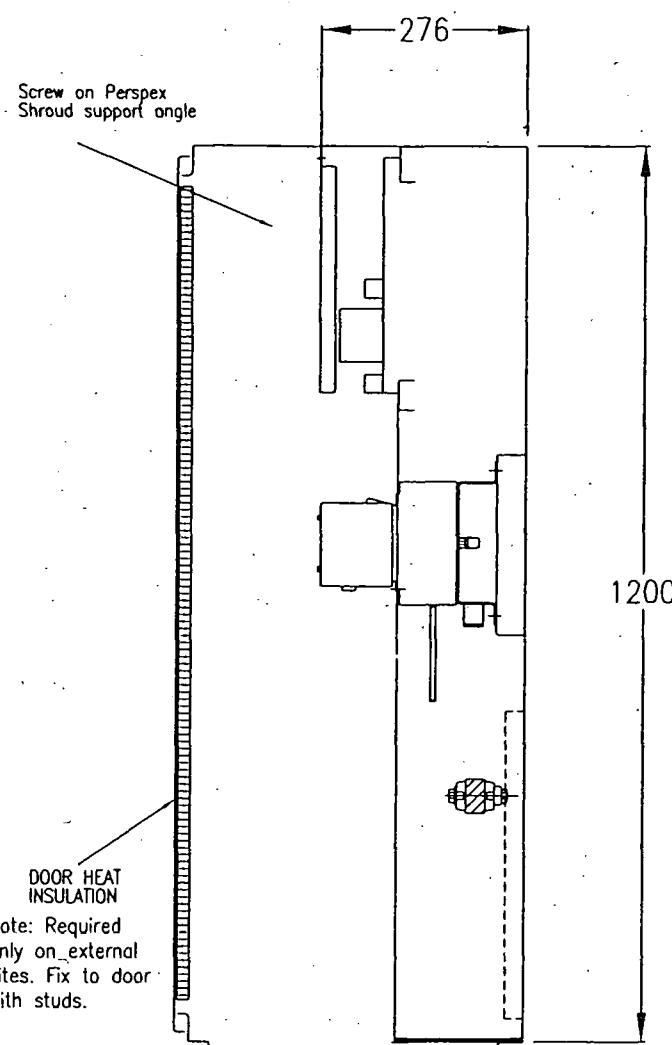
SECTION B-B



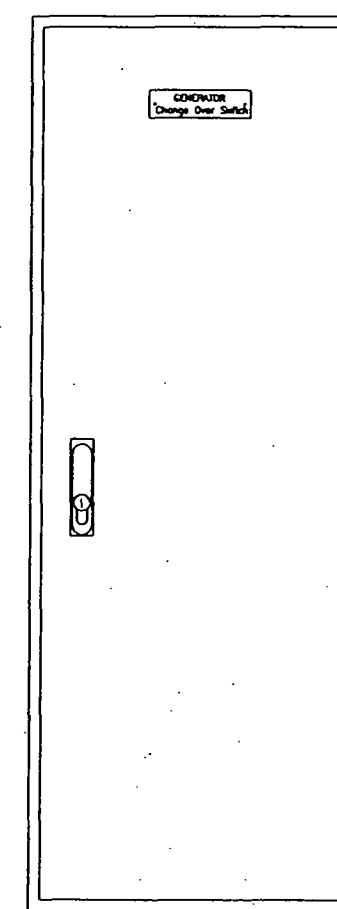
TOP VIEW



SECTION A-A



FRONT VIEW
(DOOR REMOVED)



FRONT VIEW

Door to hinge left or right depending on order.

1/2/04	B	AS BUILT	FWN		COMMON LOGIC PTY. LTD. P.O. BOX 2008 Mansfield QLD. 4122 Tele: 07 3849 7449	DATE	25/08/03	BRISBANE WATER 125 Amp Semi Permanent sites JH05DD01	A3 sheet 1/1 ISSUE B
2/10/03	A	ISSUED FOR APPROVAL	LWN			DRAWN	GCK		
			FTN			SCALE	NTS		
			LTN			APPROVED			
			STN						



**Brisbane
Water**



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 4

Site Testing

COMMON LOGIC Pty Ltd
Specialist Electrical Contractors

Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels

Sheet: 1
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6.1 COMPONENT OPERATION TEST 7

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Test Carried out by.....

Signed...

Date...

Test witnessed by.....

Signed...

Date...

Authorised By:

COMMON LOGIC Pty Ltd
Specialist Electrical Contractors

Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels

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1.0 SITE ACCEPTANCE TEST

1.1 Introduction

Complete EVERY box below; if items are not applicable indicate by a N/A in the check box, any comments can be completed at the end of the checklist.

Aim: This Commissioning list is to be completed by the person/s who are undertaking the commissioning and testing of the switchboard in question. The commissioning list is designed to check the fundamental wiring of the switchboard.

Scope: This Commissioning list is designed to test the operation of the MSB and Controls only. Building wiring is subject to test by building services qualified personnel.

Legend of Symbols

☐ Check Box, ⊗ Setting to be recorded, → and Action to take

1.2 Production Unit Information

Job Number	Name	Job Description	Signature	Date
		Centenary Highway		
Testing Officer				
Witness				

1.3 Safety precautions

Outlined below are some common safety procedures and First Aid Instruction.

SAFETY FIRST

- 1) Never test live boards alone. Always inform others of your actions and intentions.
- 2) Isolate mains or REMOVE TEST PLUG and locate close to testing area under your control.
- 3) Isolate the switchboard main switch and all circuitbreakers and fuses to completely remove all possibility of switching a live conductor when not deliberately required.
- 4) Tag all Distribution as DO NOT OPERATE removing only after tested and safe.
- 5) Insure NO LIVE WIRES are exposed at any time and a CLEAR TESTING AREA and escape route at all times.
- 6) PROTECTIVE CLOTHING and eyewear should be worn at all times when working within Live board or when appropriate.

Test Carried out by.....

Signed...

Date...

Test witnessed by.....

Signed...

Date...

Authorised By:

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Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels

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2.0 ELECTRICAL EARTHING SYSTEM

2.1 Electrical continuity and resistance of earthing system

☒ Maximum resistance of the Earthing system within the switchboard is 0.5 ohms (AS/NZS 3000:2000)

☒ Test resistance of the Earthing system 0.5 Ω ohms

2.2 Continuity Test Sheet

ITEM	DETAIL	COMPARTMENT DESIGNATION AND TEST RESULT		
		Extension	Main Eth Bar	Generator
	Test resistance of Earthing system to compartment Answer in Ohms			
1.	All Earth's wired and continuous	0.5 Ω	0.5 Ω	0.5 Ω
2	All metal work earthed where required	✓	✓	✓
3	Isolate Individual Earth Systems and check continuity.	✓	✓	Plug in

3.0 INSULATION RESISTANCE/ HIGH POT TEST

3.1 Insulation Resistance Test

Insulation resistance of whole or part of an installation must be a minimum of 1 Meg/ohm (AS/NZS 3000:2000)

- ☒ Insulation test conducted on all internal circuits
- All Selector Switches, Isolators and CB's are in the off position
 - All electronic equipment susceptible to high voltage damage to be isolated.

3.2 Low Voltage Switchboards Insulation Test

MEGGAR VOLTAGE 1000V VOLTS

INSTRUMENT DETAILS 015080

ACROSS	RESULT (M.OHM)	High Pot
Join Red, White & Blue Phases and Neutral, Test to Earth	> 400 M Ω	
Red Phase to White, Blue & N	> 400 M Ω	
White Phase to Red, Blue and N	> 400 M Ω	
Blue Phase to Red, White & N	> 400 M Ω	
N to Red, White & Blue	> 400 M Ω	

Test Carried out by.....

Signed...

Date...

Test witnessed by.....

Signed...

Date...

Authorised By:

COMMON LOGIC Pty Ltd
Specialist Electrical Contractors

Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels	Sheet: 4 Of: 7	Section
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4.0 GENERAL WIRING AND VISUAL INSPECTION

4.1 General Wiring and Visual Inspection

☐ Electrical Construction Coversheet Completed and correct.

4.2 Switchgear Visual Checklist

→ Carry out visual and mechanical checks to Switchgear

ITEM NO:	DETAIL	Switchboard compartments		
		Transfer switch compartment	Main switch area	Generator in general
1	Main Switch totally isolates SWBD	Both off	✓	See Gen
	Mains transfer switch device isolates mains from load. (IE switchboard)	Both off	—	
2	Generator transfer switch operates and isolates generator from the load. And mechanical interlock works	✓	—	—
3	Cables tight and correct phase rotation. Colour match.	✓	✓	✓
4	Main Switch Correct Rating/Label	✓	✓	✓
5	Neutral cable connected and continuous and tight.	✓	✓	Plug

ITEM	DETAIL	COMPARTMENT DESIGNATION AND TEST RESULT	
		Switchboard extension	Existing Switchboard. Where modified.
1	All CBs operate correctly	✓	✓
2	All incoming terminal numbers as per drawings	✓	✓
3	Check wire numbers to core numbers. Random selection.	✓	✓
4	All wires numbered as per drawings (random inspection)	✓	✓
5	Cables loomed and bushed correctly to all compartments.	✓	✓
6			
7			

4.3 Terminal Visual Checklist

→ Carry out visual and mechanical checks on Site terminals

Test Carried out by.....	Signed...	Date...
Test witnessed by.....	Signed...	Date...
Authorised By:		

COMMON LOGIC Pty Ltd
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ITEM	DETAIL	COMPARTMENT AND TEST RESULT	
		Switchboard extension	Existing Board
1	All Terminals tight (Randomly check)	/	/
2	Secure by End Clamps (Check All)	/	/
3	Labelled correctly	/	/
4			

4.4 Relay Visual Checklist

→ Carry out visual and mechanical checks on Relays

ITEM	DETAIL	COMPARTMENT AND TEST RESULT
1	Relays labelled correctly as per Dms	/
2	All relay coils correct voltage	/
3	Does relay require Diode fitted?	—
4	Common Bus Link on relays fitted	/
5	All numbering correct	/

Test Carried out by.....	Signed...	Date...
Test witnessed by.....	Signed...	Date...
Authorised By:		

COMMON LOGIC Pty Ltd
Specialist Electrical Contractors

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5.0 CONTINUITY & PRE-COMMISSIONING TEST

5.1 Continuity Test

- ☐ Wiring of circuits and connections are correct to constructed wiring schematics.
- ☐ Random Continuity Test using Buzzer.
- ☐ Visual Check of all wiring.

- Open all Circuit breakers and remove all fuse links
- Install Test plug in generator end.
- Install RTU terminal Plugs into terminals
- By pressing the relevant buttons and observing the relevant feedback LED all circuits will be checked.
- Test each circuit in turn with corresponding drawings

ITEM NO	Test description			
		Action	Observation	Result of test
1	Transfer to Mains	Press Button 1	Observe Relay GTSM	✓
2	Transfer to Gen	Press Button 2	Observe Relay GTSG	✓
3	Generator Failed	Press Button 3	Observe Relay GF	✓
4	Generator Fault	Press Button 4	Observe Relay GFR	✓
5	Gen Running	Press Button 4 6	Observe Relay GRUN	✓
			Check Door Indicator is on when relay is ON	
6	Generator Connected	Press Button 6 7	Observe Relay GCONN	✓
7	Doors Opened	Press Button 7 8	Observe Relay GOPEN	✓
8	CB Tripped	Press Button 8 9	Observe Relay GCBT	✓
9	Not in Auto	Press Button 9 10	Observe Relay GNAUTO	✓
10	Generator Not On Site	Press Button 10 11	Observe Indicator	✓
11	Spare			
15	Remote Start	Press Button 15	Observe Relay GSTART	✓
16	Remote Stop	Press Button 16	Observe Relay GSTOP	✓
1	Mains Failed	Close QM1	Indicator ON when PFR is ON	✓
			Check Door Indicator is ON when PFR is ON	
2	ATS to Mains	Manual Change to Mains	Indicator ON when TXS in Mains	✓
3	ATS To Gen	Manual change to Gen	Indicator ON when TSX in GEN	✓
4	Remote Start	Press PB 15	Indicator is on when PB is ON "start"	✓
5	Remote Stop	Press PB 16	Indicator is on When PB is ON "stop"	✓
6	Generator is missing	Press PB 10	Indicator is on when PB is ON	✓
	Fuel low	Press button 5		✓

Test Carried out by.... Rob McEwen

Signed...  Date.. 10-5-04

Test witnessed by.... Ron McEwen

Signed...  Date.. 10-5-04

Authorised By:

COMMON LOGIC Pty Ltd
Specialist Electrical Contractors

Site Acceptance Tests

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Page Revision No: 0 Date: 11/05/04

Manual Issue No: 0 Date: 11/05/04

6.0 COMPONENT OPERATIONAL TEST

6.1 Component Operation Test

- ☒ Correct Operation and Voltages
- ☒ All set points and parameters set to test values if required.

6.2 AC Control Systems

- Open all circuit breakers and remove all fuse links
- Test each circuit individually, replacing fuses and closing circuit breakers in turn.

AFTER VOLTAGE APPLIED

- Apply mains supply
- Carry out voltage and operational checks (ie switch operation etc)
- Bridge control points to check operation as per BW commissioning Sheet
- Apply generator voltage and check operation
- Return to normal and fail the mains
- Return the mains
- Carry out a manual transfer

ITEM NO:	DETAIL	New Extension
		Test Result
1	Mains Incoming Voltage Measured OK	✓
2	All CB's are turned off and isolate Crts	✓
3	Phase Fail operates correctly	✓

Test Carried out by.....

Signed...

Date...

Test witnessed by.....

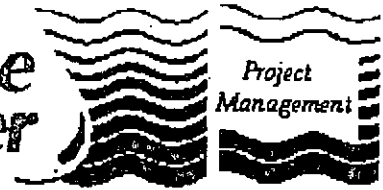
Signed...

Date...

Authorised By:



*Brisbane
Water*



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 4A

Site Testing Functional Description



PROJECTS – ENGINEERING

Sewerage System Performance Improvements Backup Diesel Generators for Pump Stations

FUNCTIONAL SITE TESTS FOR GENERATOR, AUTOMATIC TRANSFER SWITCH, AND RTU

Prepared by : Alan Mooney
Telephone - 07 3403 3356
Facsimile - 07 3403 0205

Document ID : Genset Functional Tests

Date of Issue : June 2003

Revision : Rev 1

Actions are shown in RED

1 MANUAL MODE FUNCTIONAL TESTS

1.1 Manual Mode Start

Turn the AUTO – TEST – MAN- OFF selector switch to the MANUAL position.

Press the MANUAL START push button to start the generator.

The generator set is allowed 3 attempts to start.

If it fails to start on the third attempt, the generator is locked out on FAIL TO START Alarm.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.

Once the generator is running there is a 30 second warm up time before it is ready to accept load.

RESULTS: PASS/FAIL _____ NOTES _____

1.2 Stopping the generator in the Manual Mode.

Press the MANUAL STOP push button.

If the generator is still GEN ATS operation. The MANUAL TRANSFER TO MAINS is initiated.

When the GEN ATS is Open, the generator will enter the cool down time of 1 second.

After the cool down time, the generator will shut down.

RESULTS: PASS/FAIL _____ NOTES _____

2 TEST MODE FUNCTIONAL TESTS

2.1 Test Mode Start – and test of Manual Mode interruption

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the TEST position.

The generator shall begin to crank.

Change the selector MAN while the generator is operating on TEST: to test that the system shall change to MANUAL TRANSFER TO GEN.

Press the MANUAL STOP push button.

RESULTS: PASS/FAIL _____ NOTES _____

2.2 Continue Test

Select TEST operation again by turning the AUTO – TEST – MAN- OFF selector switch to the TEST position.

The generator shall begin to crank.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.

Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close

RESULTS: PASS/FAIL _____ NOTES _____

2.3 Stopping Generator In The Test Mode - To Test Mains Failure /Genset Restart During Shutdown

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO or OFF position.

The GEN ATS shall Open and the MAINS ATS shall Close

When the GEN ATS is Open, the generator will enter the cool down time of 5 minutes.

During this time turn off the Mains to the site

When Mains Failure occurs during the cool down period the generator shall transfer back to the GENERATOR ATS without shutting down.

RESULTS: PASS/FAIL _____ NOTES _____

2.4 Stopping generator in the Test Mode.

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO or OFF position.

The GEN ATS shall Open and the MAINS ATS shall Close

After the cool down time of 5 minutes, the generator will shut down.

RESULTS: PASS/FAIL _____ NOTES _____

2.5 Test Mode Selected with genset unavailable (fault or GEN CB off).

Make GENSET unavailable

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the TEST position.

Observe results – Genset discussion of preferred results (unit should not start?)

RESULTS: PASS/FAIL _____ NOTES _____

3 AUTOMATIC MODE FUNCTIONAL TESTS

3.1 Automatic Start

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO position.

Turn off the Mains to the switchboard.

The Phase Failure Relay from the clients switch board shall give a Start Signal for the generators to run.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.

Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close.

RESULTS: PASS/FAIL _____ NOTES _____

3.2 Stopping the generator in the Auto Mode –and testing genset restart for mains failure during cool-down.

Turn on the Mains to the switchboard

The Phase Failure Relay from the clients switch board shall give a Stop Signal for the generator

There is a 2 minute proving time for the Phase Failure Relay.

After the 2 minute proving time the GEN ATS shall Open and the MAINS ATS shall Close

When the GEN ATS is Open, the generator will enter the cool down time of 5 minutes.

During this time turn off the Mains to the site

When Mains Failure occurs during the cool down period the generator shall transfer back to the GENERATOR ATS without shutting down.

RESULTS: PASS/FAIL _____ NOTES _____

3.3 Stopping the generator in the Auto Mode - continued.

Turn on the Mains to the switchboard

The Phase Failure Relay from the clients switch board shall give a Stop Signal for the generator

There is a 2 minute proving time for the Phase Failure Relay.

After the 2 minute proving time the GEN ATS shall Open and the MAINS ATS shall Close

When the GEN ATS is Open, the generator will enter the cool down time of 5 minutes.

After the cool down time, the generator will shut down.

RESULTS: PASS/FAIL _____ NOTES _____

3.4 Automatic ATS Transfer To Genset- Mains ATS Failure

Disable MAINS ATS CB

Restart the generator in Auto by turning off the Mains

The MAINS ATS will fail to Open: After a 5 second delay an Alarm shall be generated and the MAINS CONNECTED indicator shall flash to indicate the Alarm.

The system shall then return back to MAINS ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL _____ NOTES _____

3.5 Automatic ATS Transfer - Gen ATS Failure

Re-enable the MAINS ATS CB

Disable GEN ATS CB

Restart the generator in Auto by turning off the Mains

The GEN ATS will fail to Close: After a 5 second delay an Alarm shall be generated and the GENERATOR CONNECTED indicator shall flash to indicate the Alarm.

The system shall return back to MAINS ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL _____ NOTES _____

3.6 Automatic ATS Transfer To Mains - Gen ATS Failure

Disable GEN ATS CB

Restart the generator in Auto by turning off the Mains

The GEN ATS will fail to Open.

After a 5 second delay an Alarm shall be generated and the GENERATOR CONNECTED indicator shall flash to indicate the Alarm.

The system shall return back to GEN ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL _____ NOTES _____

3.7 Automatic ATS Transfer To Mains - Mains ATS Failure

Re-enable the GEN ATS CB

Disable MAINS ATS CB

Restart the generator in Auto by turning off the Mains

The MAINS ATS will fail to Close.

After a 5 second delay an Alarm shall be generated and the MAINS CONNECTED indicator shall flash to indicate the Alarm.

The system shall return back to GEN ATS operation.

RESULTS: PASS/FAIL _____ NOTES _____

3.8 Running in Auto and umbilical loses connection.

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO position.

Turn off the Mains to the switchboard.

The Phase Failure Relay from the clients switch board shall give a Start Signal for the generators to run.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.

Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close.

Remove umbilical plug

Observe results – Genset discussion of preferred results (ATS returns to MAINS?)

RESULTS: PASS/FAIL _____ NOTES _____

3.9 Running in Auto and genset trips or faults.

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO position.

Turn off the Mains to the switchboard.

The Phase Failure Relay from the clients switch board shall give a Start Signal for the generators to run.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.

Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close.

Cause Genset trip or fault

Observe results – Genset discussion of preferred results (ATS returns to MAINS?)

RESULTS: PASS/FAIL _____ NOTES _____

4 REMOTE START/STOP TESTS

4.1 Remote start command.

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO position.

Initiate a Remote Start Command from the BW Control Room

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.

Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close.

RESULTS: PASS/FAIL _____ NOTES _____

4.2 Remote stop command.

Initiate a Remote Start Command from the BW Control Room

The GEN ATS shall Open and the MAINS ATS shall Close

When the GEN ATS is Open, the generator will enter the cool down time of 5 minutes.

After the cool down time, the generator will shut down.

RESULTS: PASS/FAIL _____ NOTES _____

4.3 Remote Start with genset unavailable.

Make GENSET unavailable

Initiate a Remote Start Command from the BW Control Room

Observe results – Genset discussion of preferred results (unit should not transfer to MAINS?)

RESULTS: PASS/FAIL _____ NOTES _____

4.4 Remote Stop with when running with MAINS not available unavailable.

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO position.

Turn off the Mains to the switchboard.

The Phase Failure Relay from the clients switch board shall give a Start Signal for the generators to run.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.

Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close.

Initiate a Remote Start Command from the BW Control Room

Observe results – Genset discussion of preferred results (unit should not transfer to MAINS?)

RESULTS: PASS/FAIL _____ NOTES _____

5 SPECIFIC PROBLEM CHECKS (Variations to Functional Spec)

5.1 RTU IO and IDTS Alarms

The assumption is that all RTU IO and alarms have been proven by NCS.

5.2 From discussions on Indooroopilly Rd:

If the Genset ATS trips when genset is running - will ATS switch back to Mains?

If the Genset ATS trips when genset is running (medium alarm) - will ATS switch back to Mains?

If the Genset on-board CB trips when genset is running - will ATS switch back to Mains?

If the Mains ATS trips when genset is not running - will the genset start?

Eg Monitor the Mains ATS and allow the Gen ATS to take load when the Mains ATS is tripped. The problem is that genset start is initiated by PFR above the ATS.

If Mains trips and no genset start is initiated (?) and then Remote Start signal is sent will unit start and then transfer to GENSET

Does a Remote start "reset" the tripped ATS CB or provide a "work-around"?

5.3 From M&E:

The remote start (from control room) was sent with the Generator C/B in the off / tripped position.

The generator started and the ATS Switched to generator supply.

The generator continued to run with out supplying the site (C/B was off) and failed to transfer back to the available Energex supply with out a remote stop signal.

5.4 From Contract:

Performance guarantee of not less than 0.8pu at alternator terminals during startup - measure volts drop on start-up of load.

6 FAULTS - TO BE TESTED WHERE REQUIRED

6.1 HIGH HIGH Alarm Operation.

The Generator CB is Opened immediately.

The generator is shut down immediately.

The following alarms will initiate a HIGH HIGH Alarm condition :-

Emergency Stop Fault

MEN Fault

Low Oil Pressure Shutdown Fault, 10 Seconds Startup Delay

High Engine Temperature Shutdown Fault, 30 second Startup Delay

Low Radiator Level Fault, 5 Second Delay

Over Speed Fault

6.2 HIGH Alarm Operation

The Generator CB is Opened immediately.

Once the generator circuit breaker is opened, the generator will run through its normal cool down time and shut down.

The following alarms will initiate a HIGH Alarm condition:-

Generator Under Speed Fault, 5 Second Delay

Alternator Under Voltage Fault, 5 Second Delay

Alternator Over Voltage Fault, 5 Second Delay

Generator CB Tripped Fault

Alternator High Temperature Fault, 30 Second Startup Delay

6.3 MEDIUM Alarm Operation.

A Normal Shutdown shall be Initiated.

If the GEN ATS does not Open then the Generator CB is Opened.

The following alarms will initiate a MEDIUM Alarm condition :-

Fuel Empty Level Fault, 5 Second Delay

Fail To Start Fault, 3 Attempts

6.4 LOW Alarm Operation.

A Warning has occurred on the generator. The generator will not shut down for this level of alarm.

The following alarms will initiate a LOW Alarm condition :-

Low Oil Pressure Warning Alarm, 10 Seconds Startup Delay

High Engine Temperature Warning Alarm, 30 Second Startup Delay

Fuel Low Level Alarm, 5 Second Delay

Battery Charger AC Supply Failed Alarm, 60 Second Delay

Control Battery Low Volts Alarm, 30 Second Delay

Start Battery Low Volts Alarm, 60 Second Delay

AT A LATER DATE??**3. NON-PERMANENT SITE, MANUAL MODE**

- 3.1. To operate G1 in a Non-Permanent Site Location in MANUAL Mode.
- 3.2. Connect the generator cables to the site generator CB ensuring the site generator CB is OFF. See BCC procedures.
- 3.3. A plug with shorting links is required to be installed. It is required to be plugged into the 27 Pin Station Plug.
 - 3.3.1. Pins 11 and 12 are required to be connected. This is to indicate that the Mains ATS is Closed. If they are not connected a MAINS ATS Alarm shall be indicated.
- 3.4. Select from the AUTO – TEST – MAN- OFF selector switch to the MANUAL position.
- 3.5. Press the MANUAL START push button to start the generator.
- 3.6. The generator will begin to crank.
 - 3.6.1. If it fails to start within the 10 seconds, the starter motor is stopped and a delay of 10 seconds before it will attempt to restart.
 - 3.6.2. The generator set is allowed 3 attempts to start.
 - 3.6.3. If it fails to start on the third attempt, the generator is locked out on FAIL TO START Alarm.
 - 3.6.4. When the generator starts, the starter motor is stopped by a stop cranking input which measures the speed of the generator.
 - 3.6.5. Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.
 - 3.6.6. If the oil pressure is not up to pressure after the 10 second time delay, the generator shall shut down on LOW OIL PRESS Alarm.
 - 3.6.7. Once the generator is running there is a 5 second warm up time before it is ready to accept load.
- 3.7. To connect the generator to the site load.
 - 3.7.1. Manually switch over to the generator supply via the site CB's. See BCC procedures.
 - 3.7.2. Do not use the MANUAL TRANSFER TO GEN or the MAN TRANSFER TO MAINS push buttons.
- 3.8. To disconnect the generator from the site load.
 - 3.8.1. Manually switch over to the mains supply via the site CB's. See BCC procedures.
 - 3.8.2. Do not use the MANUAL TRANSFER TO GEN or the MAN TRANSFER TO MAINS push buttons.
- 3.9. To stop the generator in the MANUAL Mode.
 - 3.9.1. When the generator is running, it may be stopped by pressing the MANUAL STOP push button.
 - 3.9.2. The generator will enter the cool down time of 1 second.
 - 3.9.3. After the cool down time, the generator will shut down.
 - 3.9.4. Once the generator has shut down there is a 15 second delay before it may be restarted. This is to ensure the engine has mechanically stopped.



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 4B

Site Testing NCS Alarms



BRISBANE WATER

Network Control Systems

IDTS POINT COMMISSIONING SHEET AND GENERATOR SUPPLY OPERATIONAL CHECKS

Pump Station Generator Connection Project (STTX-I910)

DATE: 25/5/04

Site Name: SP019 Centenary Hwy

1. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction. The information is provided for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

2. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction. The information is provided for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

3. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction. The information is provided for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

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5. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction. The information is provided for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

6. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction. The information is provided for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

Brisbane Water – Network Control Systems Section

NOTE: Some (or all) of the Generator associated IDTS points may be Scan Inhibited in the IDTS system. Remove the Scan Inhibit from these points before proceeding with these tests

IDTS Point : Generator Offsite

Action	Observation	Result
Connect the Control interface lead to the station	Confirm that GENERATOR OFFSITE alarm return to normal is received by IDTS	✓ Yes
Disconnect the Control interface lead to the station	Confirm that GENERATOR OFFSITE alarm is received by IDTS	✓ Yes
Reconnect the Control interface lead to the station		✓ Yes

IDTS Point : Security Door_limit_switch

Action	Observation	Result
Open a canopy door on the Generator	Confirm that SECURITY DOOR_LIMIT_SWITCH alarm is received by IDTS	✓ Yes
Close the canopy door	Confirm that SECURITY DOOR_LIMIT_SWITCH alarm return to normal is received by IDTS	✓ Yes

IDTS Point : Generator Low_fuel

Action	Observation	Result
Make the Generator low fuel warning alarm active	Confirm that GENERATOR LOW_FUEL alarm is received by IDTS	✓ Yes
Deactivate the Generator low fuel warning alarm	Confirm that GENERATOR LOW_FUEL alarm return to normal is received by IDTS	✓ Yes

IDTS Point : Generator Warning

Action	Observation	Result
Make the Generator warning alarm active (except by low fuel)	Confirm that GENERATOR WARNING alarm is received by IDTS	✓ Yes
Deactivate the Generator warning alarm	Confirm that GENERATOR WARNING alarm return to normal is received by IDTS	✓ Yes

IDTS Point : Generator Common_fault

Action	Observation	Result
Make the Generator common fault alarm active	Confirm that GENERATOR COMMON_FAULT alarm is received by IDTS	✓ Yes
Deactivate the Generator common fault alarm	Confirm that GENERATOR COMMON_FAULT alarm return to normal is received by IDTS	✓ Yes

1. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

2. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

3. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

4. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

5. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

6. The following information is for the purpose of providing a general overview of the system and is not intended to be used as a basis for design or construction.

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IDTS Point : Generator Automatic

Action	Observation	Result
Turn the generator to local mode	Confirm that GENERATOR AUTOMATIC alarm is received by IDTS	✓ Yes
Return the generator to automatic mode	Confirm that GENERATOR AUTOMATIC alarm return to normal is received by IDTS	✓ Yes

IDTS Point : Generator CB_tripped

Action	Observation	Result
Trip the Generator circuit breaker	Confirm that GENERATOR CB TRIPPED alarm is received by IDTS	✓ Yes
Reset the Generator circuit breaker	Confirm that GENERATOR CB TRIPPED alarm return to normal is received by IDTS	✓ Yes

IDTS Point : Generator Running

Action	Observation	Result
Start the Generator (off line only)	Confirm that GENERATOR RUNNING alarm is received by IDTS	✓ Yes
Stop the Generator	Confirm that GENERATOR RUNNING alarm return to normal is received by IDTS	✓ Yes

**IDTS Control Points : Generator Remote_run_request
& Generator Remote_stop_request**

Action	Observation	Result
Confirm the Generator is available to run, but not running		✓ Yes
Set the IDTS control point GENERATOR REMOTE_RUN_REQUEST and send to the site	Confirm that the Generator starts and runs off-line	✓ Yes
	Confirm that GENERATOR RUNNING alarm is received by IDTS	✓ Yes
Set the IDTS control point GENERATOR REMOTE_STOP_REQUEST and send to the site	Confirm that the Generator stops	✓ Yes
	Confirm that GENERATOR RUNNING alarm return to normal is received by IDTS	✓ Yes

IDTS Point : Power_supply Energex_power

Action	Observation	Result
Turn the generator to local mode		✓ Yes
Fail the Energex power	Confirm that POWER_SUPPLY ENERGEX POWER alarm is received by IDTS	✓ Yes
Restore the Energex power	Confirm that POWER_SUPPLY ENERGEX POWER alarm return to normal is received by IDTS	✓ Yes

Brisbane Water – Network Control Systems Section

IDTS Point : Generator Connected, and**Generator supply operational checks**

NOTE: The purpose of these operational checks is;

- to confirm Generator is capable of starting all available pumps on site “simultaneously” (each pump start separated only by the RTU / PLC minimum pump start separation time), and running all pumps continuously for at least one minute.
- to confirm the pumps are interlocked under Generator supply (where required)
- to confirm the code changes have not interfered with the operation of the Surge Imminent probe.

Action	Observation	Result
Ensure the Generator is in Automatic mode		✓ Yes
Ensure the pumps are selected for local mode		✓ Yes
Ensure there is enough sewage in the well for the pumps to run continuously for one minute		✓ Yes
Fail the Energex power to the Generator	Confirm that the Generator starts and supplies power to the station	✓ Yes
	Confirm that GENERATOR CONNECTED alarm is received by IDTS	✓ Yes
Press all pumps local start buttons together	Confirm that all pumps (available under Generator supply) start	✓ Yes
<u>Sites:</u> Billan St, Musgrave Rd, Centenary Hwy / Koorringal Dr, Manet St, Sanananda St and Sinnamon Rd.	Confirm the RTU will run a maximum of one pump under generator supply.	✓ Yes
<u>Site:</u> Creek Rd / Oldfield Rd	Confirm the RTU will run a maximum of two pumps under generator supply.	N/A
Restore Energex power and record the time taken for the Generator controller to return the station power to Energex supply	Time for station power to return to Energex supply	120 Secs
	Confirm that GENERATOR CONNECTED alarm return to normal is received by IDTS	✓ Yes
Record time taken for the Generator to stop after station power to returns to Energex supply	Time for Generator to stop after station power to returns to Energex supply	300 Secs

Q-Pulse Id TMS919

Active 10/12/2014

Brisbane Water – Network Control Systems Section

***Pump Automatic operation, and
Surcharge Imminent operation under Generator supply***

Action	Observation	Result
Fail the Energex power to the Generator	Confirm that the Generator starts and supplies power to the station	√ Yes
Ensure the pumps are selected for remote mode	<u>Fixed speed pump sites:</u> Confirm that the duty pump lowers the well to the Duty A stop level and stops	√ Yes
	<u>Variable speed pump sites:</u> Confirm that the duty pump operates on variable speed control satisfactorily	√ Yes
Ensure the well level is below the Duty A start level using pump local control as required		√ Yes
Ensure the pumps are selected for remote mode and are stopped		√ Yes
Activate the surcharge imminent probe for at least 10 sec	Confirm that WET_WELL SURCHARGE_IMMINENT alarm is received by IDTS	√ Yes
	Confirm that all pumps (available under Generator supply) start	√ Yes
Ensure the well does not fall below the Duty A stop level by selecting local mode for the pumps as required		√ Yes
Return the surcharge imminent probe to normal	Confirm that WET_WELL SURCHARGE_IMMINENT alarm return to normal is received by IDTS	√ Yes
Restore Energex power indication to the Generator and allow the Generator controller to return the station power to Energex supply		√ Yes

Commissioning Notes:

1. partially tested and Site Left In Off Position (13-5-04)
2. Wiring issues for Common Logic resolved (20/5/04)
3. Pump 2 unavailable due to upgrade works on the station
4. Site retested on 25/5/04
5. Site left in Auto 25/5/04

IDTS Points and Generator Supply

Operational Checks commissioned by ...Peter Rennex Date 14/5/04



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 4C

Site Testing Generator

47 Proprietary Street, Tingalpa, Qld 4173
Telephone: (07) 3890 1744
PO Box 3306 Tingalpa B.C. Qld 4173

SEP 009/B

DATE: 23/07/03
JOB NO: 14291
ENG. SERIAL NO: 706091
ALT. SERIAL NO: X038070235/1

CUSTOMER TESTING OFFICER: _____ TESTING OFFICER: PAUL HLAVKA
JOHN ROTH



DIESEL GENERATOR SET LOAD TEST REPORT

SEP 0064/D

47 Proprietary Street
Tingalpa Q 4173
BRISBANE AUSTRALIA

CLIENT: BRISBANE WATER SPO19 DATE: 23/7/03
 SERIAL NO: 0307006 JOB NO/CONTRACT NO: 14291
 ENGINE TYPE: 4045H ENG. SERIAL NO: 706091
 ALTERNATOR TYPE: 274D ALT. SERIAL NO: X038070235/1
 GOVERNOR TYPE: G.A.C. STARTER MOTOR: STD
 OVERSPEED TYPE: Plc UNDERSPEED TYPE: Plc
 SHUTDOWN SOLENOID: G.A.C. HIGH WATER: HOBBS
 LOW OIL PRESSURE SHUTDOWN: HOBBS

A: 110 (+10%) KW: 79.0 (+10%)

TECHNICIAN: _____ INSPECTOR: PAUL HLAVKA

TIME	16:00	16:15	16:30	17:00	17:30	18:00	18:30			
OIL PRESSURE	<u>500</u> <u>350</u>	<u>350</u>	<u>320</u>	<u>300</u>	<u>300</u>	<u>300</u>	<u>350</u>			
OIL TEMPERATURE	-	-	-	-	-	-				
JACKET WATER TEMPERATURE	-	<u>70</u>	<u>80</u>	<u>85</u>	<u>85</u>	<u>85</u>	<u>80</u>			
IP'S	<u>0</u>	<u>43</u>	<u>85</u>	<u>125</u>	<u>125</u>	<u>43</u>	<u>0</u>			
VOLTS	<u>241</u> <u>241</u> <u>240</u> <u>4169</u>	<u>240</u> <u>241</u> <u>240</u>	<u>241</u> <u>241</u> <u>241</u>	<u>241</u> <u>241</u> <u>241</u>	<u>241</u> <u>241</u> <u>241</u>	<u>241</u> <u>241</u> <u>241</u>	<u>241</u> <u>241</u> <u>241</u>			
AMBIENT TEMPERATURE	<u>19</u>	<u>19</u>	<u>19</u>	<u>19</u>	<u>19</u>	<u>19</u>	<u>19</u>			
HZ	<u>50.1</u>	<u>50.1</u>	<u>50.1</u>	<u>50.1</u>	<u>50.1</u>	<u>50.1</u>	<u>50.1</u>			
KW	<u>0</u>	<u>31.5</u>	<u>60</u>	<u>90.3</u>	<u>90.3</u>	<u>31.3</u>	<u>0</u>			
LOAD%	<u>0</u>	<u>40%</u>	<u>75%</u>	<u>110%</u>	<u>110%</u>	<u>40%</u>	<u>0</u>			
REMARKS	<p>LOW OIL PRESSURE ON START UP. TESTED. REPLACED PRESSURE SENDER SWITCH.</p>									

Generator_Load_Test_Report.doc

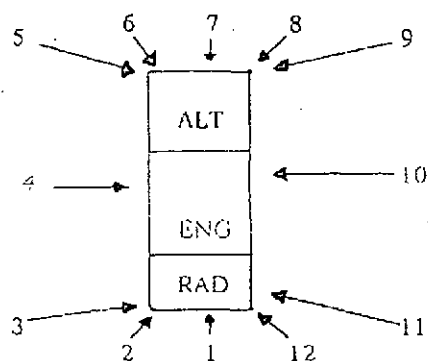


GENERATOR SET **SOUND PRESSURE LEVEL TEST REPORT**

SEP 0023/D

47 Proprietary Street
Tingalpa Q 4173
BRISBANE AUSTRALIA

CLIENT: BRISBANE WATER SPS19 DATE: _____
 SERIAL NO: 0307006 JOB NO: 14291
 ENGINE TYPE: 4045H ENG. SERIAL NO: 706091
 ALTERNATOR TYPE: 274D ALT. SERIAL NO: 403B070235/1
 SOUND LEVEL INSTRUMENT: RION NL-04

Remarks:Distance: 7 mHeight: 1.5 m

Position Layout

POSITION	SOUND LEVEL dB(A)	LOAD %				
		25	50	75	100	110
1				69		
2				68		
3				68		
4				67		
5				64		
6				64		
7				64		
8				64		
9				64		
10				67		
11				68		
12				68		
Average	66.25					

QUALITY ASSURANCE OFFICER: _____
 CUSTOMER TESTING OFFICER: _____
 TESTING OFFICER: D. COOPER
 WITNESS TESTING OFFICER: PAUL HLAVKA

47 Proprietary Street
Tingalpa Q 4173
BRISBANE AUSTRALIA



SEP 0013

FINAL INSPECTION CHECKLIST

This form is to be completely filled out before any generating set leaves the factory.

It is to be signed by the person doing the inspection and by their immediate supervisor. In the case of a non-standard job it must also be signed by the Special Projects Manager or the Engineering Manager.

A copy of this form is to be sent out with the plant concerned.

Please neatly tick in the boxes provided where applicable and note any comments in the space provided.

MODEL: SP019 SERIAL NO: 0307006 ENGINE NO: 706091
JOB NO: 14291 DATE: _____ CUSTOMER: B.W.

BASE

- (1) All welds continuous, neat and clean.
- (2) All bolts tightened.
- (3) Bearings completely secured.
- (4) No sharp corners.

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>

RADIATOR

- (1) Radiator correctly mounted.
- (2) All pipework included and secure.
- (3) Drain plug in place.
- (4) Water removed from radiator.
- (5) Clamps on hoses tight.

FILLED

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>

ENGINE

- (1) Fan is correctly mounted.
- (2) All guards in place and secure.
- (3) Wiring loom is correct to drawing, securely fixed and marked and is terminated in an appropriate terminal box.
- (4) Battery leads attached and secure and long enough for termination to battery.
- (5) Air cleaner is properly mounted.
- (6) Magnetic pickup is fitted and set to correct depth.
- (7) Exhaust pipe and silencer (where required) are fitted correctly.
- (8) Dip stick in place.
- (9) Oil removed from engine.
- (10) All fuel and oil unions completely tightened.
- (11) All ordered options are fitted and function correctly.
- (12) All parts secure, no damage.
- (13) All earths less than 0.1 ohms.
- (14) Cables and hoses secure for transport.

CORRECT LEVEL

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>

CONTROL SYSTEM (where applicable)

- (1) Control functions as ordered.
- (2) Control is mounted correctly.
- (3) All leads, terminals, fuses, printed circuit boards and switchgear are completely secure and marked correctly.
- (4) Dust seals are fitted around doors.
- (5) Doors hinged correctly.
- (6) All earths less than 0.1 ohms.
- (7) Red Danger labels in cubicle.

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>



47 Proprietary Street
Tingalpa Qld 4173
PH: (07) 3890 1744

SEP0084

TRANSIENT LOAD RESPONSE TEST SHEET

Transient response for load changes: Load PF 0.8

% Change Electrical kW	0-25	0-50	0-75	0-100	100-0	75-0	50-0	25-0
Change in Electrical kW	28	41	60			60	41	28
% Change HZ	5	2.5	4.5			3.5	2.4	7
% Change Volts	2	2	3			4	2	1
Recovery secs	2	2	3			2.5	2	2

CLIENT: BRISBANE WATER

EQ. S/N : 0307006

ENGINE: 4045H

ALTERNATOR: 274D

GOVERNOR: GAC



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 4D

Electrical Testing Certificate

Call Out Service

Signature on Completion

Date 26/7/04

Risk Assessment

Mobile Phone No

D-ELECTRICIAN Date 26/2/0

04507-576710

PLEASE SEE ATTACHED FORM FOR ADDITIONAL ☐ TOTAL LABOUR CHARGED:

PLEASE SEE ATTACHED FORM FOR ADDITIONAL ☐ TOTAL MATERIALS:

**PROJECT COMPLETED
NO FURTHER ACTION
REQUIRED**

YELLOW COPY - OFFICE

Signature:

FUNCTIONAL TEST

Page 101 of 185





BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 5

Parts Information

ACO CABLEMATE

Type 66H Polymer Concrete Pit

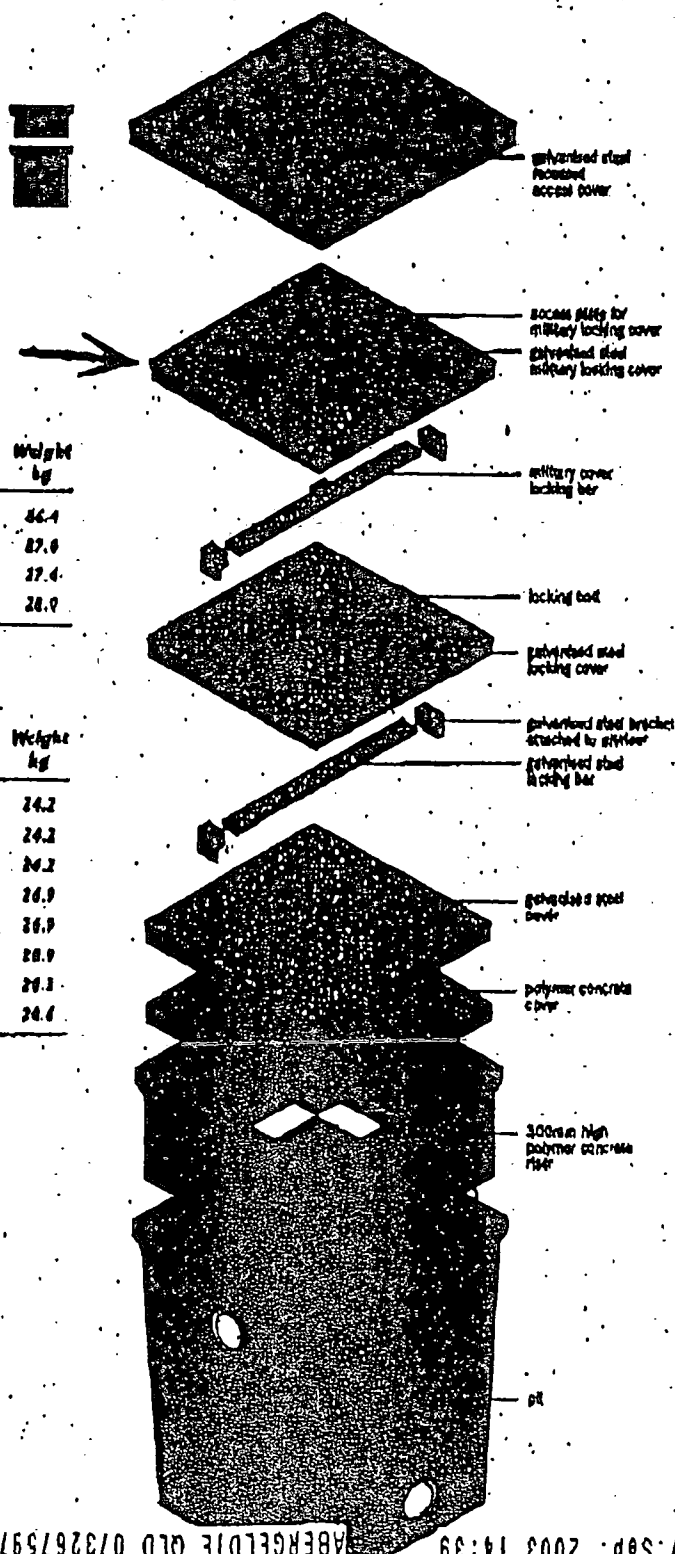
667mm x 667mm x 915mm depth

Pit Data

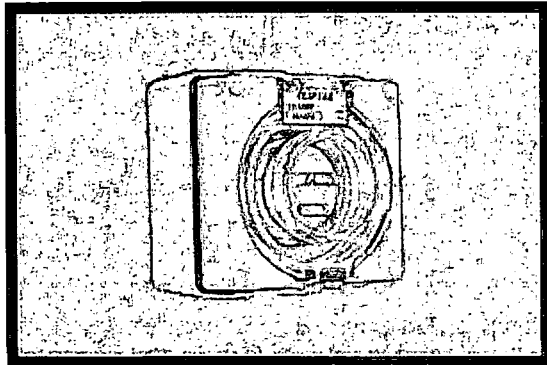
Description	Part No.	Weight kg
Type 66H Polymer Concrete Pit	75224	46.4
Type 66H Polymer Concrete Pit for Locking Cover	75233	27.0
Type 66 Polymer Concrete Extension Riser	75126	27.4
Type 66 Polymer Concrete Extension Riser for Locking Cover	75133	28.0

Cover Data

Description	Part No.	Weight kg
Type 66 Polymer Concrete Lid - Blank	75149	24.2
Type 66 Polymer Concrete Lid - Communications	75154	24.2
Type 66 Polymer Concrete Lid - Electricity	75169	24.2
Type 66 Galvanised Steel Cover	75177	26.9
Type 66 Locking Galvanised Steel Cover	75185	26.9
Type 66 Military Locking Galvanised Steel Cover	75193	28.9
Type 66 Light Duty Recessed Access Cover - Lock & Seal	75207	29.1
Type 66 Medium Duty Recessed Access Cover - Lock & Seal	75210	26.6



Catalogue No. 56AI310



Colour Options

- ☐ GY Grey
☐ RO Resistant Orange

More colour options may be available. Please check with your nearest Clipsal office.

Description:

Appliance Inlets, 250V 10A - 3 Flat pins

Item Type

02 Industrial Products

Business Area

40 Industrial Switchgear

Product Group

400 56 Series Industrial Switchgear

Item Group

40001 Appliance Inlets

Brochures Available:

56AI Series installation instructions

56 Series flyer

56 and 66 Series technical data

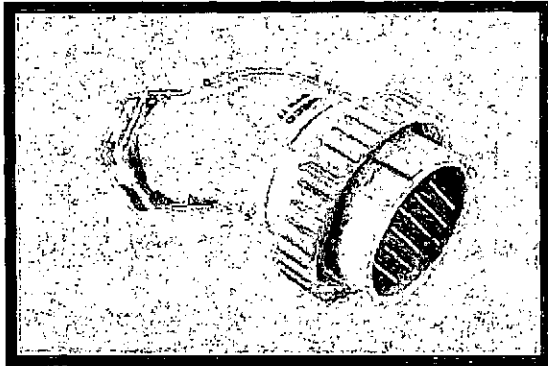
56 Series Features

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial

Catalogue No. WIPM27



Colour Options

☐ No colour options

☐ TR Transparent

More colour options may be available. Please check with your nearest Clipsal office.

Description:

Plugs And Extension Sockets - Wilco, Low Voltage, Multipin - 27 pin maximum

Item Type

02 Industrial Products

Business Area

40 Industrial Switchgear

Product Group

403 Wilco Hi-Impact Industrial Switchgear

Item Group

40303 Plugs & Extension Sockets

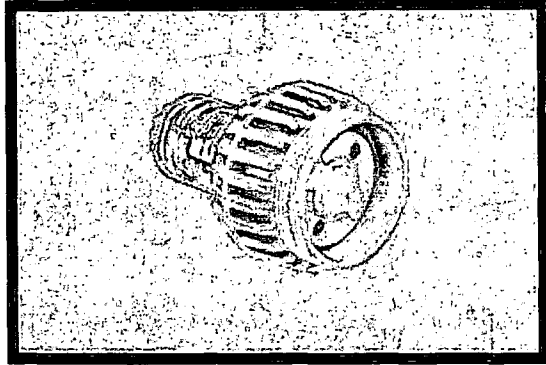
Brochures Available:

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial

Catalogue No. 56CSC310



Colour Options

EO	Electric Orange
RO	Resistant Orange

More colour options may be available. Please check with your nearest Clipsal office.

Description:

Plugs And Extension Sockets, 250V 10A - 3 Flat pins

Item Type

02 Industrial Products

Business Area

40 Industrial Switchgear

Product Group

400 56 Series Industrial Switchgear

Item Group

40004 Plugs & Extension Sockets

Brochures Available:

56CSC and 56PO series wiring instructions

56CSC310, 56CSC315 wiring instructions

56 Series flyer

56 and 66 Series technical data

56 Series Features

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial




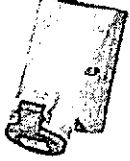
A Specifiers guide to Clipsal Industrial

Products
Product Locator
Technical Information

Wiring Devices: [Plugs](#) | [In-Line Connectors](#) | [Panel Mount Plugs](#) | [Panel Mount Receptacles](#) | [Internationally Rated Devices](#)

Internationally Rated Devices

Mennekes, a global manufacturer of industrial electrical products, has products to sat electrical connection needs anywhere in the world. Our products are approved by nur international agencies. Internationally rated products range from 16 Amp to 125 Amp, A.C. through 500V A.C. 3,4, and 5 wire. All units are configured to IEC 309-1 and IEC and are VDE Approved.

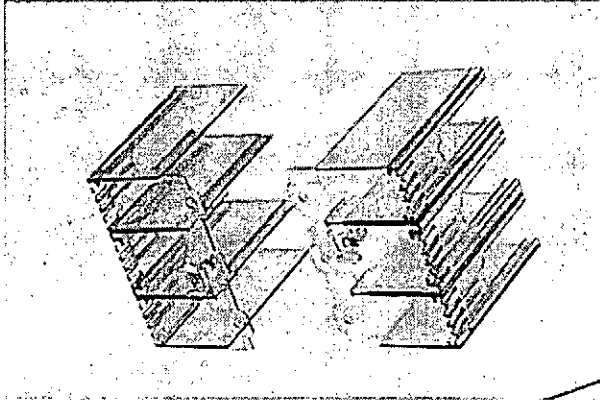
	PLUGS Plugs feature screwless two-piece construction for snap tog pull apart assembly. A pivoting cable strain relief provides e terminal access. Units have a self-sealing cable grommet wl requires no cutting to accommodate various HAR cable size Backed-out terminal screws reduce installation time.
	CONNECTORS Connectors' feature dead-front construction for safety and u brass solid sleeves for reliability. Units feature screwless tw construction for snap together / pull apart assembly and hav pivoting strain relief for easy terminal access. A self-sealing grommet requires no cutting to accommodate various HAR , sizes. Backed out terminal screws reduce installation time.
	INLETS Ideal for generator or motor plug interface applications, inlet compact and can be surface mounted with available backbo
	RECEPTACLES These compact units are available for either panel or surfac mount applications. Box mounted units feature top or botton entry. Both receptacle styles feature an oversized ground sl prohibit mismatching of plug devices with different voltages.

[Company](#) | [Products](#) | [Locations](#) | [Contact Us](#)

©2000 Mennekes Electronics, Inc.

NHP Item Info

NHP E-Cat online website
Friday, June 18, 2004 12:29:23 PM
User: Not logged in



Catalogue Number:

2H1407DAA

Description:

COVER TERMINAL 3P FC X1

List Price \$ (Not including GST):



Unit of Measure:

EA

Price Schedule:

T2

Circuit breakers-Moulded Case (MCCB)

Accessories-Terminal covers

Type

3 Pole FC terminal cover

Frame size

125A

Features

- Protective terminal cover 3 pole (set of 2) for front connected terminals on the Tembreak XS125 series & TL30F series MCCB's.
- Made from high impact clear plastic

Benefits

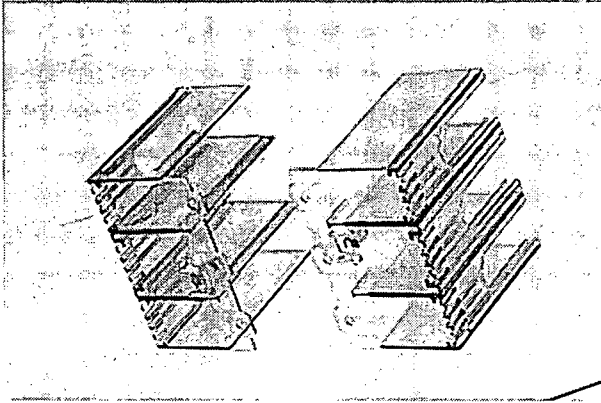
- The terminal cover is designed to protect breaker terminals and other live parts from exposure.
- Terminal covers are available for front or rear connection, and plug-in types.

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

NHP Item Info

NHP E-Cat online website
Friday, June 18, 2004 12:30:55 PM
User: Not logged in



Catalogue Number:

2H2135DAA

Description:

COVER TERMINAL 3P FC XS2

List Price \$ (Not including GST):

\$

Unit of Measure:

EA

Price Schedule:

T2

Circuit breakers-Moulded Case (MCCB)

Accessories-Terminal covers

Type

3 Pole RC terminal cover

Frame size

250A

Features

- Terminal cover (2 pcs) to suit 3 pole front connect Tembreak XS250 series circuit breakers.

Benefits

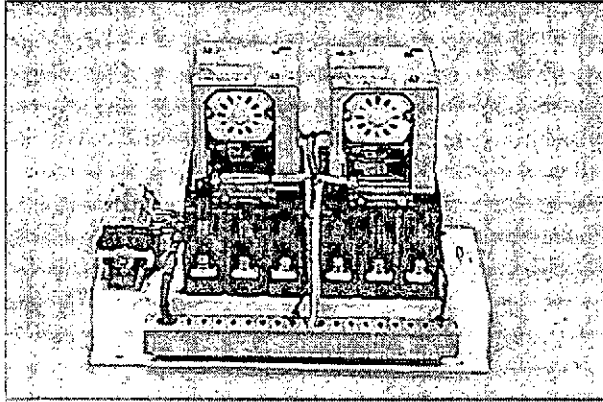
- The terminal cover is designed to protect breaker terminals and other live parts from exposure.

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

NHP Item Info

NHP E-Cat online website
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 User: Not logged in



Catalogue Number:

BS2N233

Description:

TRANSFER SW BTSS250NJ25033

List Price \$ (Not including GST):



Unit of Measure:

EA

Price Schedule:

Transfer switches

Basic (BTS)

Amp rating

250A 3P / 250A 3P

kA rating

35

Features

- Standard model features a proven design walking beam interlock.
- Fully wired to terminals for 3 wire control.
- Terminals and wires are numbered.
- Optional insulated common loadside busbars 250A - 1250A.
- Standard TemLogic panel standardized design.
- Up to 12 additional features can be added to a logic panel.
- Logic panels can be relay or PLC logic.
- As an option motor operators may be padlockable in sizes up to 250A. Standard for larger sizes.

Benefits

- Needs to maintenance or adjustment once installed.
- There are no coils to burn out or consume energy.
- Simple installation; easy connection.
- Fully numbered schematic diagrams are supplied.
- Increases safety during routine maintenance.
- Convenient for switchboard builders.
- Fast track delivery from stocked parts.

Ordering Information

- Assembled to order.
- 4 pole and other configurations available on request.

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

sprecher+schuh

*The ultimate
in pushbuttons*

NHP

*Full voltage,
superior brightness
and long life*

D5-3N

Integrated LED Lamp Blocks

- 5 Colour choices
- Available in voltages up to 240 V AC
- 11 year lamp life (100,000 hours)
- Maintenance free
- Vibration and shock resistant
- Snap lock fit to existing D5 coupling latch
- Superior illumination qualities
- IP 20 finger protection on live components
- Clear identification of function
- Suitable for use with existing D5 illuminated operators and pilot lights

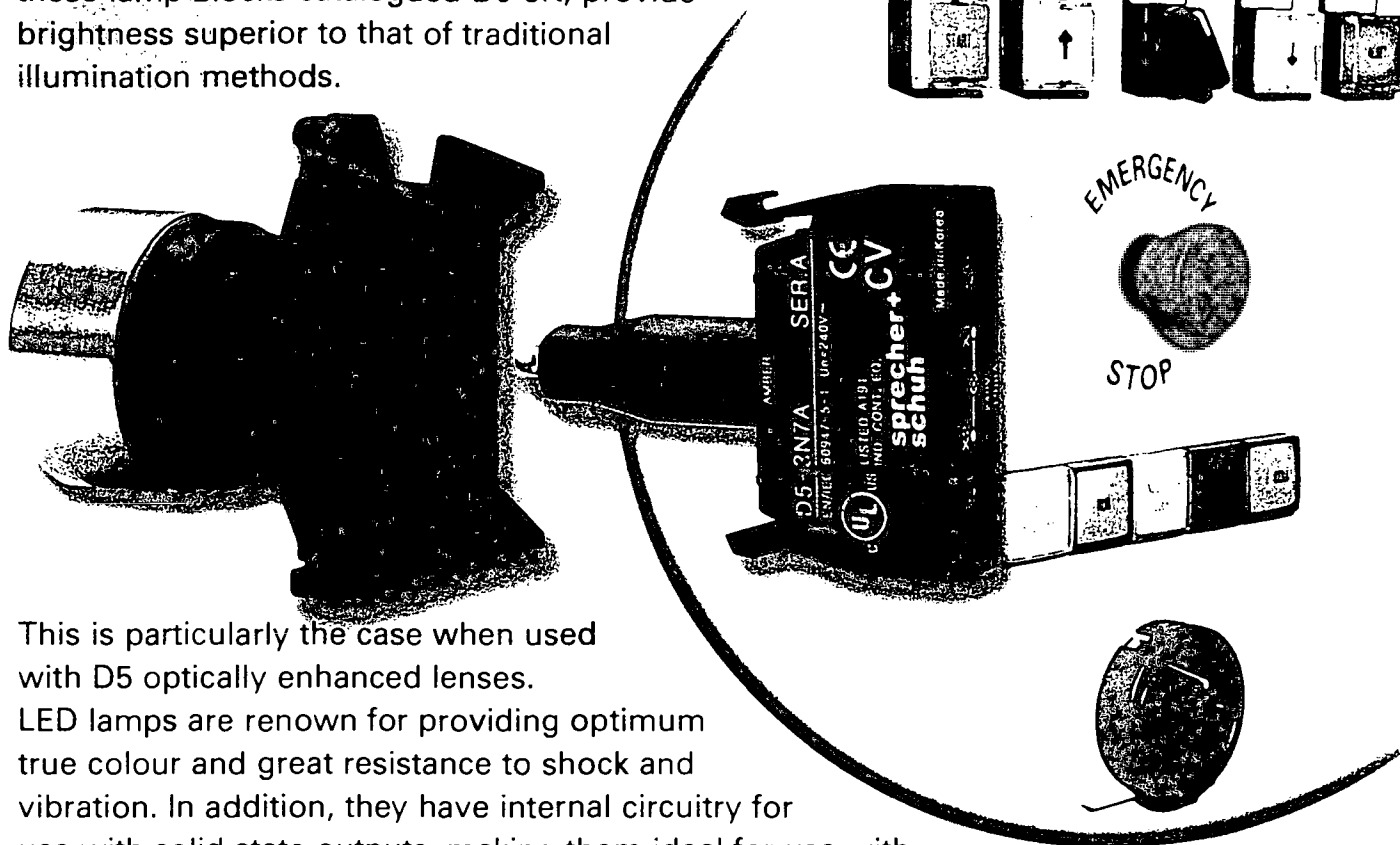
NHP ELECTRICAL ENGINEERING PRODUCTS PTY LTD

sprecher+schuh
The ultimate
in pushbuttons

NHP

NHP

Sprecher + Schuh has once again expanded and improved illumination options for the popular D5 22.5 mm control and signalling products by developing a new range of modular integrated LED lamp blocks. When used in conjunction with Sprecher + Schuh D5 illuminated operators and pilot lights these lamp blocks catalogued D5-3N, provide brightness superior to that of traditional illumination methods.



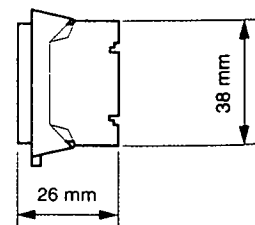
This is particularly the case when used with D5 optically enhanced lenses. LED lamps are renowned for providing optimum true colour and great resistance to shock and vibration. In addition, they have internal circuitry for use with solid state outputs, making them ideal for use with PLC inputs. The new D5-3N series integrated LED lamp blocks offer all of the above and a tested lamp life of approximately 100,000 hours.

Ordering Information

Available colours:

⊗ Red (R) ⊗ Green (G) ⊗ Amber (A) ⊗ Blue (B) ⊗ White (W)

Insert corresponding letter at the end of part number; eg: D5-3NL3R = RED



Lamp Block Width: 9.5 mm

Voltage	Nominal Current Consumption ¹⁾	Description	Catalogue Number
24 V AC/DC	54 mA	Lamp Block with Operator latch	D5-3NL3_
120 V AC	18 mA	Lamp Block with Operator latch	D5-3NL5_
240 V AC	24 mA	Lamp Block with Operator latch	D5-3NL7_
24 V AC/DC	54 mA	Lamp Block without Operator latch	D5-3N3_
120 V AC	18 mA	Lamp Block without Operator latch	D5-3N5_
240 V AC	24 mA	Lamp Block without Operator latch	D5-3N7_

Note: ¹⁾ Approximate permissible leakage current 3 mA

NHP

ELECTRICAL ENGINEERING PRODUCTS PTY LTD

www.nhp.com.au

A.B.N. 84 004 304 812

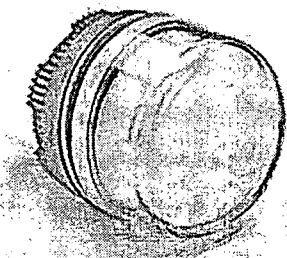
Melbourne Sydney Newcastle Brisbane Townsville Rockhampton Toowoomba Cairns Adelaide Perth Darwin Hobart
 PH: +61 3 9429 2399 +61 2 9748 9444 +61 2 4960 2220 +61 7 3891 6008 +61 7 4779 0700 +61 7 4927 2277 +61 7 4634 4799 +61 7 4035 6888 +61 8 8297 9055 +61 8 9277 1777 +61 8 8947 2666 +61 3 6228 9575
 FAX: +61 3 9429 4075 +61 2 9648 4353 +61 2 4960 2203 +61 7 3891 6139 +61 7 4775 1457 +61 7 4922 2947 +61 7 4633 1796 +61 7 4035 6999 +61 8 8371 0962 +61 8 9277 1700 +61 8 8947 2049 +61 3 6228 9757

FLYER D5-3N

D5-3NF 06/02 14M

NHP Item Info

NHP E-Cat online website
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User: Not logged in



Catalogue Number:

D5P-P5

Description:

PILOT LIGHT ELEMENT YELLOW

List Price \$ (Not including GST):

Ⓢ

Unit of Measure:

EA

Price Schedule:

A2

Pushbutton Products

Pilot Light and Buzzer

Mounting Size

22.5mm

Specification

Lamp Body Only

Shape

Round

Style / Frame

Standard

Colour

Yellow

Lamp Block

Operator Only

Features

- SiPart of the vast D5 range of matching 22.5 mm. control and signalling units providing IP 66 front protection
- Assembled round plastic pilot light front element
- Standard yellow lens cap with diffuser
- 4 other colours available
- Easy to mount
- Accepts coupling plate with clip-on standard lamp holder
- Wide range of legends available to complete the assembly
- Individually packaged component

Benefits

- The D5 range combines aesthetic appeal with robust flexibility to suit heavy-duty industrial control applications
- Readily visible
- Choice of pre-assembled clip-on rear elements
- When fixing pilot light it will hold in place without a notched panel hole,
- Saves time and allows fitting by one person only
- Simplified ordering and spares holding

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

Din-Safe MCBs (RCBO)

- └ Standard AS/NZ 61009.
- └ Approval N17482.
- └ Mines Department Approval – Pending.
- └ Short circuit, overcurrent and earth leakage protection.
- └ Handle sealable and padlockable.
- └ DIN Rail mounting.

Din-Safe MCB with pigtail

Poles	Amp rating	Voltage	Short circuit	Phase	Trip '1) Sens.	Cat. No
2	6	240	10 kA	1+N '1)	30 mA	<input type="checkbox"/> DSRCB0630P
2	10	240	10 kA	1+N '1)	30 mA	DSRCB1030P
2	16	240	10 kA	1+N '1)	10 mA	DSRCB1630P
2	20	240	10 kA	1+N '1)	30 mA	DSRCB2030P
2	25	240	10 kA	1+N '1)	30 mA	DSRCB2530P
2	32	240	10 kA	1+N '1)	30 mA	DSRCB3230P
2	40	240	10 kA	1+N '1)	30 mA	DSRCB4030P

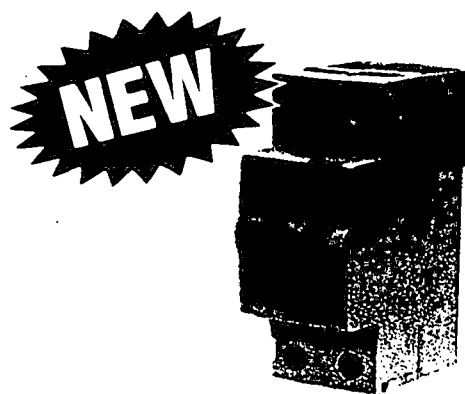
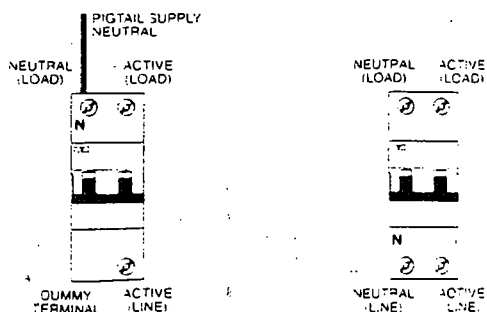
Din-Safe MCB standard terminal configuration

Poles	Amp rating	Voltage	Short circuit	Phase	Trip '1) Sens.	Cat. No '1)
2	6	240	10 kA	1+N '1)	10 mA	<input type="checkbox"/> DSRCB0610A
2	6	240	10 kA	1+N '1)	30 mA	<input type="checkbox"/> DSRCB0630
2	10	240	10 kA	1+N '1)	10 mA	<input type="checkbox"/> DSRCB1010A
2	10	240	10 kA	1+N '1)	30 mA	DSRCB1030
2	10	240	10 kA	1+N '1)	100 mA	<input type="checkbox"/> DSRCB10100
2	16	240	10 kA	1+N '1)	10 mA	<input type="checkbox"/> DSRCB1610A
2	16	240	10 kA	1+N '1)	30 mA	DSRCB1630
2	16	240	10 kA	1+N '1)	100 mA	<input type="checkbox"/> DSRCB16100
2	20	240	10 kA	1+N '1)	10 mA	<input type="checkbox"/> DSRCB2010A
2	20	240	10 kA	1+N '1)	30 mA	DSRCB2030
2	20	240	10 kA	1+N '1)	100 mA	<input type="checkbox"/> DSRCB20100
2	25	240	10 kA	1+N '1)	30 mA	DSRCB2530
2	32	240	10 kA	1+N '1)	30 mA	DSRCB3230
2	40	240	10 kA	1+N '1)	30 mA	DSRCB4030

Application

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

Din-Safe MCBs are suitable for use in residential, commercial and light industrial applications.

Terminal configuration

DIN-Safe MCB with neutral pigtail
suits standard 3 phase chassis



DIN-Safe MCB
standard terminal configuration

Characteristics

- └ Width: 2 modules.
- └ For type AC residual currents.
- └ Rated voltage: 240 V/50-60 Hz.
- └ Tripping characteristics of MCB part: IEC 898 - C curve.
- └ Short circuit capacity: 10 kA.
- └ Terminal capacity: 25 mm².
- └ High immunity to transient current.
- └ Profile as per Din-T MCB.
- └ Test button for periodic testing.

Accessories	Page
Auxiliary/Alarm	Page 1 - 31
Shunt trip	Page 1 - 29
Padlock bracket	Page 1 - 33
Link bars and terminals	Page 1 - 33, 39
Enclosures	Section 2

Technical data	
Tripping characteristics	Page 3 - 29
Dimensions	Page 3 - 45
Technical data	Section 3

- Notes:**
- '1) Unprotected neutral, not switched.
 - '2) Unprotected neutral, switched.
 - '3) Fits Din-T chassis (special configuration) refer page TBA.
 - '4) Mines department approval applies to 30 mA only.

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

☐ Available on indent only.

Din-Safe single pole width residual current circuit breaker (RCBO)

- Standards AS/NZ 1009.
- Approval N17482.
- Mines department approval - Pending.
- One module wide (18 mm).
- Short circuit, overcurrent and earth leakage protection.
- ┘ Short circuit protection 10 kA.
- ┘ Sensitivity 10 and 30 mA.
- ┘ Din rail mount.
- ┘ Suits CD chassis.

Amp rating	Modules (18mm)	Voltage AC	Short circuit	Trip Sensitivity ³⁾	Cat. No ¹⁾ ²⁾
6	1	240	10 kA	30 mA	DSRCBH0630A
10	1	240	10 kA	30 mA	DSRCBH1030A
16	1	240	10 kA	30 mA	DSRCBH1630A
20	1	240	10 kA	30 mA	DSRCBH2030A
25	1	240	10 kA	30 mA	DSRCBH2530A
32	1	240	10 kA	30 mA	DSRCBH3230A
40	1	240	10 kA	30 mA	DSRCBH4030A
6	1	240	10 kA	10 mA	DSRCBH0610A
10	1	240	10 kA	10 mA	DSRCBH1010A
16	1	240	10 kA	10 mA	DSRCBH1610A
20	1	240	10 kA	10 mA	DSRCBH2010A
25	1	240	10 kA	10 mA	DSRCBH2510A
32	1	240	10 kA	10 mA	DSRCBH3210A
40	1	240	10 kA	10 mA	DSRCBH4010A

Note: ¹⁾ Neutral not switched
²⁾ Will not accept side mounting accessories

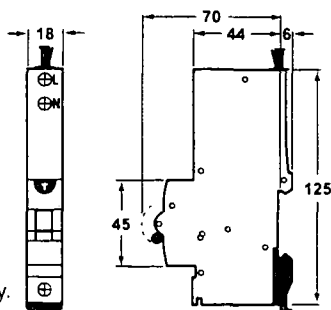
³⁾ Mines Dept. approval applies to 30 mA units only.

Operation

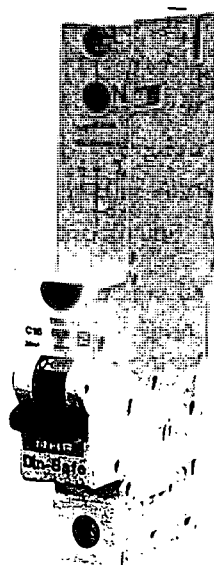
This unit combines the overload and short circuit protection of an MCB with earth leakage protection of an RCD. The unit occupies one, sub-circuit (one pole) of the distribution board and provides single phase protection against overload, short circuit and earth leakage current.

- The MCB element provides thermal and magnetic tripping protection which is rated to 10 kA prospective fault current.
- The RCD element of the device provides core-balance detection of the difference between the active and neutral currents and amplification to provide high sensitivity. The rated residual operating current ($I_{\Delta n}$) is 10 mA or 30 mA.
- The green/yellow earth reference cable in case of loss of supply neutral ensures the device will continue to provide earth leakage protection and will operate normally upon detection of an earth leakage current.

Dimensions (mm)



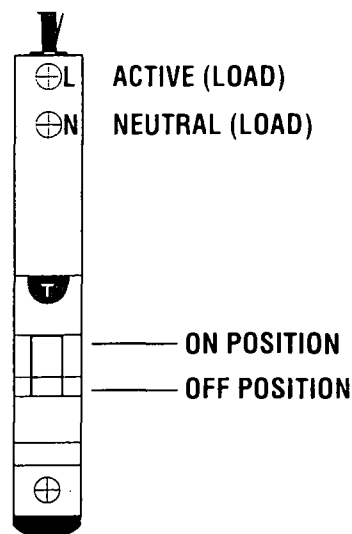
□ Available on indent only.



Application

The Din-Safe single pole width residual current circuit breaker will fit the standard Din-T chassis for use in NHP panelboards. The design makes it possible to provide an MCB complete with earth leakage protection in an 18 mm wide module which allows a greater number of devices to be fitted into a distribution board.

Connection diagram



Accessories

Padlock bracket	Page 1 - 33
Link bars and terminals	Page 1 - 33, 39
Enclosures	Section 2

Technical data

Tripping characteristics	Page 3 - 29
Technical data / wiring	Page 3 - 35

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

1

NHP**Miniature circuit breakers****Din-T 6 series 6 kA MCB**

- ☐ Standards AS3111, IEC 898.
- ☐ Approval No. N17481.
- ☐ Current range 2-63 Amps 1, 2 and 3 pole.
- ☐ Sealable and lockable handle.
- ☐ Available in curve type C and D.
- ☐ Mounts on CD chassis (250 A and 355 A).

NEW**DTCB6**
1 pole**1 pole 1 module**

In (A)	C – Curve 5-10In	D – Curve 10-20In
2	DTCB6102C	DTCB6102D
4	DTCB6104C	DTCB6104D
6	DTCB6106C	DTCB6106D
10	DTCB6110C	DTCB6110D
13	<input type="checkbox"/> DTCB6113C	<input type="checkbox"/> DTCB6113D
	DTCB6116C	DTCB6116D
20	DTCB6120C	DTCB6120D
25	DTCB6125C	DTCB6125D
32	DTCB6132C	DTCB6132D
40	DTCB6140C	DTCB6140D
50	DTCB6150C	DTCB6150D
63	DTCB6163C	DTCB6163D

2 pole 2 modules

2	DTCB6202C	DTCB6202D
4	DTCB6204C	DTCB6204D
6	DTCB6206C	DTCB6206D
10	DTCB6210C	DTCB6210D
13	<input type="checkbox"/> DTCB6213C	<input type="checkbox"/> DTCB6213D
16	DTCB6216C	DTCB6216D
20	DTCB6220C	DTCB6220D
	DTCB6225C	DTCB6225D
32	DTCB6232C	DTCB6232D
40	DTCB6240C	DTCB6240D
50	DTCB6250C	DTCB6250D
63	DTCB6263C	DTCB6263D

3 pole 3 modules

2	DTCB6302C	<input type="checkbox"/> DTCB6302D
4	DTCB6304C	<input type="checkbox"/> DTCB6304D
6	DTCB6306C	<input type="checkbox"/> DTCB6306D
10	DTCB6310C	DTCB6310D
13	<input type="checkbox"/> DTCB6313C	<input type="checkbox"/> DTCB6313D
16	DTCB6316C	DTCB6316D
20	DTCB6320C	DTCB6320D
25	DTCB6325C	DTCB6325D
32	DTCB6332C	DTCB6332D
40	DTCB6340C	DTCB6340D
50	DTCB6350C	DTCB6350D
63	DTCB6363C	DTCB6363D

Short circuit capacity 6 kA

In (A)	2 - 63
1P	240 V AC
2P	240 - 415 V AC
3P	240 - 415 V AC

DC use

	1P	2P ¹⁾
Short circuit	20 kA	25 kA
Max.voltage (DC)	60 V	125 V

Use at DC

When using Din-T6 in a DC application the magnetic tripping current is approximately 40 % higher than in AC 50/60 Hz.

Shock resistance (In X, Y, Z directions).

20 g with shock duration 10 ms (minimum 18 shocks).
40 g with shock duration 5 ms (minimum 18 shocks).

Vibration resistance (In X, Y, Z directions).

3 g in frequency range 10 to 55 Hz
(operating time at least 30 min).
According to IEC 60068-2-6.

Storage temperature

From -55 °C to +55 °C, according to IEC 88 part 2 - 1
(duration 96 hours).

Operating temperature

From -25 °C to +55 °C, according to
VDE 0664 parts 1 and 2.

Use at 400 Hz

At 400 Hz the magnetic trip current is approximately
50 % higher than in AC 50/60 Hz.

Accessories	Section
Add on RCD	1 - 21
Auxiliary/alarm	1 - 31
Shunt trip	1 - 29
UVT	1 - 30
Padlockable bracket	1 - 33
Link bars & terminals	1 - 33, 39
Enclosures	2
Busbar chassis	2 - 35

Technical data	Section
Technical data	3
Tripping characteristics	3 - 6, 8
Dimensions	3 - 22

Notes: ¹⁾ 2 pole MCB connected in series.

The line side is the "OFF" (bottom) side of the MCB.

☐ Available on indent only.

1

NHP

Miniature circuit breakers

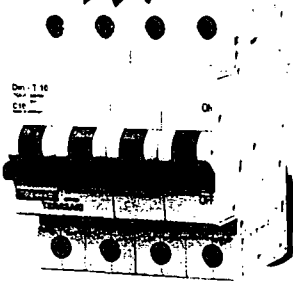
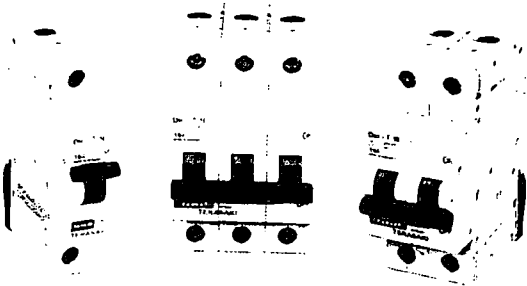
Din-T10 series 10 kA MCB (cont.)

3 pole 3 modules

In (A)	B – Curve 3-5 In	C – Curve 5-10 In	D – Curve 10-20 In
0.5	DTCB10305B	<input type="checkbox"/> DTCB10305C	<input type="checkbox"/> DTCB10305D
1	DTCB10301B	<input type="checkbox"/> DTCB10301C	<input type="checkbox"/> DTCB10301D
2	DTCB10302B	DTCB10302C	<input type="checkbox"/> DTCB10302D
4	DTCB10304B	DTCB10304C	<input type="checkbox"/> DTCB10304D
6	DTCB10306B	DTCB10306C	<input type="checkbox"/> DTCB10306D
10	DTCB10310B	DTCB10310C	DTCB10310D
13	<input type="checkbox"/> DTCB10313B	<input type="checkbox"/> DTCB10313C	<input type="checkbox"/> DTCB10313D
16	DTCB10316B	DTCB10316C	DTCB10316D
20	DTCB10320B	DTCB10320C	DTCB10320D
25	DTCB10325B	DTCB10325C	DTCB10325D
32	DTCB10332B	DTCB10332C	DTCB10332D
40	DTCB10340B	DTCB10340C	DTCB10340D
50	DTCB10350B	DTCB10350C	DTCB10350D
63	DTCB10363B	DTCB10363C	DTCB10363D

4 pole 4 modules ¹⁾

6	DTCB10406B	DTCB10406C	<input type="checkbox"/> DTCB10406D
10	DTCB10410B	DTCB10410C	<input type="checkbox"/> DTCB10410D
13	<input type="checkbox"/> DTCB10413B	<input type="checkbox"/> DTCB10413C	<input type="checkbox"/> DTCB10413D
16	DTCB10416B	DTCB10416C	<input type="checkbox"/> DTCB10416D
20	DTCB10420B	DTCB10420C	<input type="checkbox"/> DTCB10420D
25	DTCB10425B	DTCB10425C	<input type="checkbox"/> DTCB10425D
32	DTCB10432B	DTCB10432C	<input type="checkbox"/> DTCB10432D
40	DTCB10440B	DTCB10440C	DTCB10440D
50	DTCB10450B	DTCB10450C	DTCB10450D
63	DTCB10463B	DTCB10463C	DTCB10463D

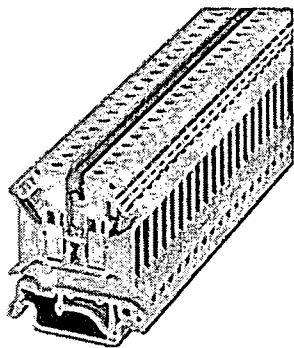


DTCB10
1 - 4 pole types

Notes: ¹⁾ All poles include over-current and short circuit protection.
☐ Available on indent only

Accessories	Section
Add on RCD	1 - 21
Auxiliary/alarm	1 - 31
Shunt trip	1 - 29
UVT	1 - 30
Padlock bracket	1 - 33
Link bars and terminals	1 - 33, 39
Enclosures	2
Busbar chassis	2 - 35
Technical data	Section
Technical data	3
Tripping characteristics	3 - 6, 8
Dimensions	3 - 22

UK 5 N



Universal terminal block with screw connection, cross section: 0.2 - 4 mm², AWG: 30 - 10, width: 6.2 mm, color: gray

- ▶ Accessories
- ▶ Technical data
- ▶ Certificates
- ▶ PDF File



add to cart

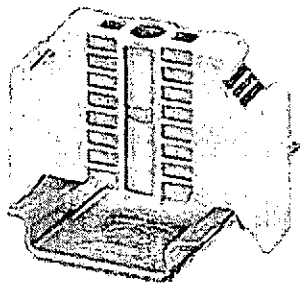


view cart

General data

Order number	3004362
Type	UK 5 N
Barcode number	4017918090760
Unit pack	50 Pcs.
Customs tariff	85369010000
Max. conductor cross section, flexible	4 mm²
Conductor cross section, rigid max.	6 mm²
Conductor cross section AWG/kcmil max	10
Nominal current I _N	41 A

E/NS 35 N



End bracket, width: 9.5 mm, color: gray

- ▶ Accessories
- ▶ Technical data
- ▶ Drawings
- ▶ PDF File



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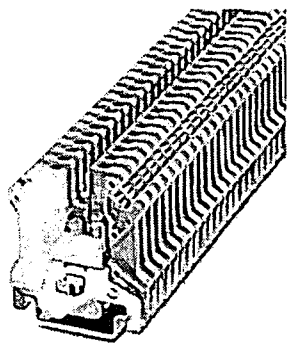


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General data

Order number	0800886
Type	E/NS 35 N
Barcode number	4017918129309
Unit pack	50 Pcs.
Customs tariff	85369010000
Color	gray

USLKG 5



Ground terminal block with screw connection, cross section: 0.2 - 4 mm², AWG: 26 - 10, width: 6.2 mm, color: green-yellow

- Accessories
- Technical data
- PDF File



add to cart

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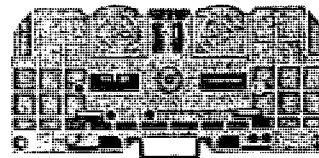
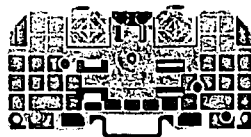
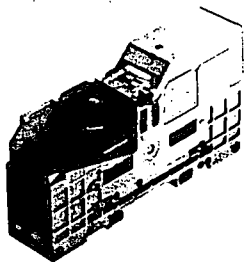
General data

Order number	0441504
Type	USLKG 5
Barcode number	4017918002190
Unit pack	50 Pcs.
Customs tariff	85369010000
Max. conductor cross section, flexible	4 mm²
Conductor cross section, rigid max.	4 mm²
Conductor cross section AWG/kcmil max	12

Tab connection terminals

WFF 35

WFF 70



Max. technical data

Dimensions

Width/length/height (mm)

Width/length/height (mm)

Bolt size

without WAH

with WAH

M

VDE rated data, 0611, Part 1/8.92 / IEC 947-7-1

Rated voltage/rated current/rated cross-section

Rated impulse voltage/pollution severity

Further technical data

Tightening torque range

Nm

Clampable conductor

Cable lug DIN 46235

mm²

Cable lug DIN 46234

mm²

2 x cable lug DIN 46235

mm²

1 cable lug DIN 46 234

mm²

rips

mm

Strips

mm

Strips

mm

Max. Connection Area in mm² Gauge for flat connections to 50043 Size

Continuous current rating of cross-connection 2-pole

Continuous current rating of cross-connection 3-pole

C 4

A

A

UL / CSA rated data

Voltage / current / conductor size

UL

Voltage / current / conductor size

CSA

Ordering data

Version

Wemid

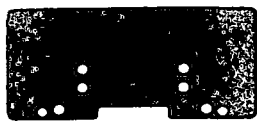
Blue Wemid

With covers

Wemid

Wemid

Partition (thickness 2 mm)



Cross-connection

WQL



Auxiliary / control conductor terminal



Cover



Beige PA 66

Blue PA 66

Light-green PA 66

Warning sign

Yellow, Self-adhesive
With lightning flash
Can be stuck to WAH only

Fixing screw

For direct assembly
Screwdriver

Cupel washers



For aluminium conductors

Marking tags



Print

Consecutive horizontal

Consecutive vertical

Blank

Printed

Mounting rails, end brackets, further marking material see section "Accessories"

168 A/50 mm²

27/107/54

27/136/60

6

1000 V/125 A/35 mm²

8 kV/3

3.0...6.0

6...25

2.5...50

6...25

2.5...35

3 x 13 x 0.5

6 x 13 x 0.5

2 x 15.5 x 0.6

2.08...50

135

135

600 V/115 A/14...2 AWG

600 V/130 A/14...2 AWG

Type

Cat. No.

Qty.

WTW WFF 35

106710

10

Type

Cat. No.

Qty.

WTW WFF 35

106710

10

WQL 2/35

106490

5

WQL 3/35

106540

5

WZAF 35

107050

10

WAH 35

106446

20

WAH 35 BL

106448

20

WAH 35 HG

106445

20

WAP*

106970

20

WD 1

156390

5

Qty. = 5 cards with 6 labels on each

M 6 x 16

106370

20

SD

902450

-

CPSB M 6

015620

50

DEK 5

047348

-

DEK 5

047356

-

WS 12/6.5

160992

-

WS 12/6.5

156895

-

250 A/95 mm²

32/132/63

32/179/71.5

8

1000 V/192 A/70 mm²

8 kV/3

6.0...12

16...70

2.5...120

15...70

2.5...70

2 x 15.5 x 0.8

4 x 20 x 1

4 x 15.5 x 0.8

6 x 15.5 x 0.8

2.06...120

207

207

600 V/175 A/14...2/0 AWG

600 V/170 A/14...2/0 AWG

Type

Cat. No.

Qty.

WTW WFF 70

102840

10

WTW WFF 70

102848

10

WTW WFF 70

102940

10

Type

Cat. No.

Qty.

WTW WFF 70

106720

10

WQL 2/70

106500

5

WQL 3/70

106550

5

WZAF 70

106620

10

WAH 70

106456

20

WAH 70 BL

106458

20

WAH 70 HG

106455

20

WAP*

106980

20

WD 1

156390

5

Qty. = 5 cards with 6 labels on each

M 6x16

106370

20

SD

902450

-

CPSB M 8

015630

50

DEK 5

047348

-

DEK 5

047356

-

WS 12/6.5

160992

-

WS 12/6.5

156895

-

* The WAP can be used only in conjunction with the WAH.

In the event that no conductor is connected, it guarantees shock protection in the connection area.



NHP

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“Reliability...you can count on”

- ▼ **DIN Rail & Plug in Housings**
FOR FLEXIBILITY & CHOICE
- ▼ **Single & Extended Functions**
FOR TAILORING YOUR
PROTECTION NEEDS
- ▼ **True RMS Monitoring**
FOR TRUE MONITORING
& CONTROL

**Now available
at NHP**



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Monitoring & Control Technology

NHP

Electromatic has been synonymous with monitoring and control in the Australian market for over 25 years. Since its merger in 1984 with Carlo Gavazzi, Electromatic has continued to specialise in control technology that is guaranteed to out perform. Carlo Gavazzi is a company with a lifetime commitment to automation and control and dedicated to providing its customers and their industries with increased efficiency, reduced down time and solutions you can rely on. It's what they do best.

Advantage SERIES:

Current, voltage, phase, frequency and power factor guarding is vital in order to maximise your system's performance.

The Carlo Gavazzi range of economical and advanced monitoring relays translates into the Advantage and Advantage Plus Series offering reliability you can count on.

1 & 3 Phase Monitoring

Phase Sequence & Phase Loss

Latch Function

AC/DC Over Voltage

AC/DC Over Current

Up to 500 V AC/DC monitoring

AdvantagePlus SERIES:

1 & 3 Phase True RMS Monitoring

AC/DC Over or Under Current

AC/DC Over or Under Voltage

Phase Sequence

Phase Loss

Time Delay Setting (0.1 - 30 sec)

AC/DC Over or Under Current - mV input

AC/DC Over & Under Voltage

Phase Asymmetry

Latch & Inhibit Function

Advantage SERIES

DIN Rail



DIA
Current



DUA
Voltage



DPA
3 Phase

Plug-In



PIA
Current

- 1 Phase
- AC/DC over current
- Latch function



PUA
Voltage

- 1 Phase
- AC/DC over voltage up to 500 V AC/DC
- Latch function



PPA
3 Phase

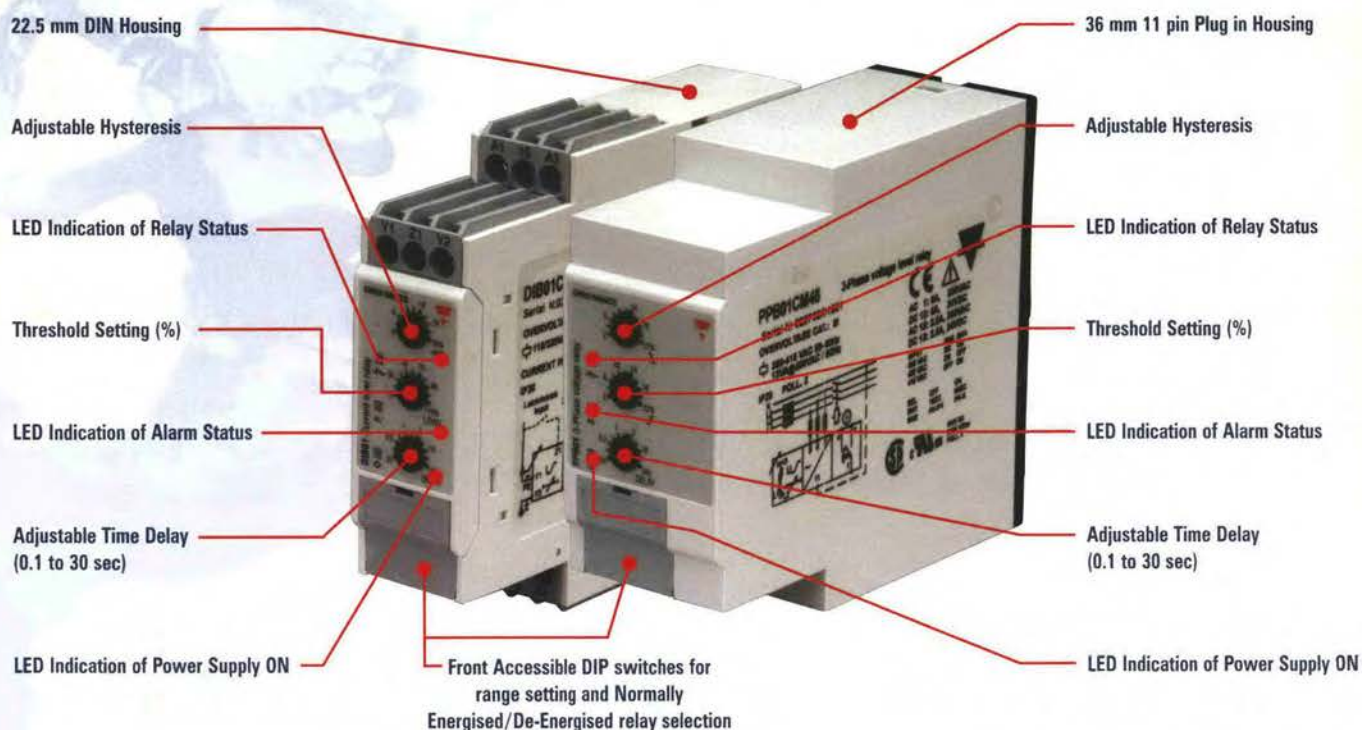
- 3 Phase
- Phase sequence and phase loss

Accurate

Responsive

Quality

Reliability... you can count on



AdvantagePlus SERIES



DIB
Current



DUB
Voltage



DPB
3 Phase



DFB Frequency
DWB Power Factor

- 1 Phase
- 50 - 60 Hz
- Latch & inhibit function
- Time delay 0.1 - 30 sec.
- 3 Phase
- Latch & inhibit function
- Time delay 1 - 30 sec.



PIB
Current

- 1 Phase True RMS
- AC/DC over/under current
- Latch & inhibit function
- Time delay 0.1 - 30 sec



PUB
Voltage

- 1 Phase True RMS • AC/DC over/under voltage
- Latch & inhibit function
- Time delay 0.1 - 30 sec



PPB
3 Phase

- 3 Phase
- AC over & under voltage, phase asymmetry sequence & phase loss
- Latch & inhibit function
- Time delay 0.1 - 30 sec

Advanced

Reliable

Flexible

"Get the Advantage"

**CARLO GAVAZZI***"A lifetime commitment to Control & Automation"*

A CARLO GAVAZZI BRAND

Functions**Areas****Applications****Monitoring Solutions****Phase sequence
Phase loss**

A total phase loss of one of the 3 phases is an extreme case of phase unbalance. Incorrect phase sequence may lead to serious equipment damage.



DPB01 and PPB01 detect incorrect phase sequence and total phase loss.

Phase asymmetry

Several 1-phase loads added to only one or two of the phases may generate unbalance. This makes motors run at a temperature higher than their nominal ratings, causing insulation breakdown and shortening motor life.



DPB02 and PPB02 offer knob adjustable asymmetry and time delay set points. Longer motor life means less maintenance and down time, saving you money and time.

**Mains
Over-/Undervoltage
monitoring**

High quality mains monitoring in a plant prevent problems including overheating, malfunction of sensitive devices and phase unbalance.



DPB01 and PPB01 can monitor all the phases in one unit. For more selective monitoring 3 units of DUB01 and PUB01 (or DUB02 and PUB02) can be linked to each single phase voltage.

Undercurrent

When running unloaded a pump can be damaged. If this is the case, the current is low and can easily be detected.



The easy to program functions of DIB01 and PIB01 can help to solve problems such as transient currents, safe relay connection, and machine stop in case of danger.

**Regenerated
voltage by
3-phase motors**

In case of cut wire or blown fuse the motor generates itself the missing phase. There are few phase sequence relays that will detect this situation.



DPA01 and PPA01 detect a regenerated voltage up to 70% of the nominal star voltage (~85 % of the delta voltage) preventing motor damage and expensive replacement costs.

Phase reversal

Incorrect phase sequence may cause a reverse in the directional current that can be extremely dangerous. In the case of mobile applications the phase sequence has to be constantly monitored.



Installing DPB02 or DPP02 on the mobile apparatus ensures damage due to wrong connection is prevented.

C-Tick Compliance

N155

NHP ELECTRICAL ENGINEERING PRODUCTS PTY LTD

www.nhp.com.au

A.B.N. 84 004 304 812

Version 6



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CA 4 Miniature Contactors

**Three ratings in one
frame size up to 6.1 kW**



Compact 45 mm width



Electronic motor protection



Accurate thermal protection



Clip on accessories

- **High switching capacity**
- **Clip-on accessories**
- **DIN rail or screw mounting**
- **Auxiliary contacts for low voltage**

NHP ELECTRICAL ENGINEERING PRODUCTS PTY LTD

A.B.N. 84 004 304 812



NHP was formed in 1968 for the purpose of manufacturing, importing and merchandising a wide range of specialised electrical switchgear, motor control and other technical electrical products for Australian industry; including mining and general industries, electrical contractors and government departments.

NHP is a wholly Australian owned company and exclusively represents a considerable number of overseas companies. These companies manufacture complementary equipment to the NHP programme, which includes products locally manufactured in Melbourne.



NHP Premises, Melbourne

The head office and Melbourne sales organisation is situated at Richmond, with branch offices in Sydney, Brisbane, Adelaide, Perth, Newcastle, Townsville, Rockhampton, Toowoomba, Cairns, Darwin and Hobart. The company also has a number of regional representatives to service country areas. NHP products are stocked and distributed through more than 500 centres, Australia wide.

The company also has an office in Auckland, New Zealand primarily involved in the supply of Terasaki circuit breakers and panelboards. The product range is steadily growing with product brands such as Eldon, Schmersal, Austrol and Elektra already added.

Due to this extensive national sales and service network, the company is able to continue a policy of supplying an extensive range of technical electrical equipment, supported by substantial stocks and competent service on a national basis.



National Distribution Warehouse (5200sq metres)

NHP has also built a substantial 5,200 square metre national distribution warehouse, the first stage of a potential three stage development, which ultimately will result in a 15,000 square metre warehouse. The facility is located in the middle of the freight corridor between Melbourne airport and the city's docks area to help ensure effective stock delivery and despatch.

NHP has been consistently committed to providing an outstanding level of customer service and the staff have been trained over many years to provide a customer friendly environment and be seen to be 'easy to deal with'.

It is the continuing policy of the company to improve both the range and quality of products and services available for the Australian market. Experienced engineering and management personnel continually visit world centres to ensure that the organisation keeps pace with technological advances, research and development and modern marketing techniques.



Sydney Premises



Sprecher + Schuh administrative building at Aarau



Part of the low voltage factory at Aarau

Sprecher + Schuh has been one of the leading manufacturers of high quality electrical equipment in Europe for many years. The company was founded by Carl Sprecher in 1900 in Aarau, Switzerland, but in 1993 the company was acquired by Rockwell International and now operates under the direction of Rockwell Automation.

The Sprecher + Schuh facility in Switzerland will continue to operate and develop products for world markets as a centre of excellence and will continue to produce low voltage control gear products, including the world famous Sprecher + Schuh contactor range.

In 1968 NHP was appointed the exclusive Australian agent for Sprecher + Schuh low voltage motor control gear products which were primarily manufactured at the head office of the company in Aarau, Switzerland.

Since 1966 when Sprecher + Schuh equipment was introduced into the Australian market it has received remarkable acceptance from Australian industry. This has been largely due to the technical superiority of the products produced to traditional Swiss exacting standards of precision engineering. These high standards are the result of strict manufacturing controls and testing, and by the

use of the latest high quality materials available. This high quality has resulted in remarkable reliability ensuring long life and excellent performance.

NHP has welcomed the acquisition of Sprecher + Schuh by Rockwell because international businesses in the electro-mechanical field requires very substantial volumes to minimise production costs. In manufacture there are ever increasing costs associated with advanced research and development technology, complicated tooling, and sophisticated automated production lines.

Rockwell is committed to providing substantial increases in funds available for R & D and the latest production techniques.

Rockwell/Sprecher + Schuh will be better able to achieve economies of scale and international growth as a result of the union.

The full range of Sprecher + Schuh equipment is freely available throughout Australia from the NHP organisation or NHP representatives and distributors.

The Ultimate in Motor Control

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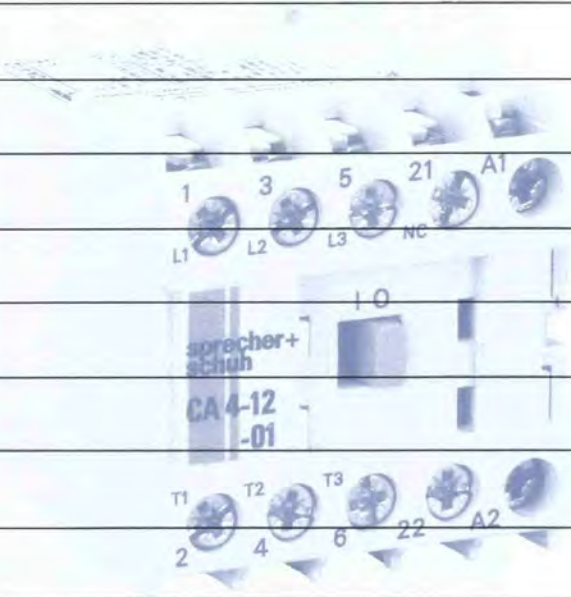


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MINI CONTACTOR AND RELAY SYSTEM

CA 4 Contactor

The **CA 4** series of miniature contactors provide an extremely compact and reliable method for controlling motors up to 6.1 kW (at 400/415 volts) and is particularly useful in applications where enclosure space is restricted.

CA 4 miniature contactors are available in three (3) power ratings: 2.6 kW, 4.5 kW and 6.1 kW. The physical dimensions are constant throughout the range featuring a width of only 45 mm. In addition, there is also a wide range of clip-on accessories available which do not impact on the contactor width. A four pole version is also available in 4.5 kW.



CS 4 Relay

The **CS 4** is a versatile control relay available in several different contact configurations:

4 N/O, 3 N/O 1 N/C, 2 N/O 2 N/C.

Clip-on auxiliary contacts allow the CS 4 to have up to eight poles and a complete range of AC and DC coil voltages are offered to meet the relevant control supply requirements.

CS 4 relays are suitable for DIN rail mounting and are the same physical size as the CA 4 contactors. This facilitates a common range of accessories to reduce stockholding.



CT 4 Thermal Overload

The **CT 4** thermal overload relay is a reliable and proven solution for providing economical motor protection. It fits directly to CA 4 contactors and can cater for current ranges from 0.1 to 9 amps.



CEP 7 Electronic Overload

The **CEP 7** is a self-powered electronic overload which utilises the supplied voltage, via integrated transformers, to feed the ASIC circuit board electronics for accurate current measurement. The electronics can detect excessive currents or phase loss more rapidly and with greater accuracy than traditional overload relays.

The CEP 7, up to 12 amps, can be directly mounted onto CA 4 contactors and is available with manual or automatic/manual reset. It also provides the choice of two trip classes - class 10 or class 20 version.



AC CONTACTORS CA 4

NHP

Compact Dimensions

The examples shown demonstrate the compactness and versatility of the CA 4 contactor.

The CA 4 contactor lends itself perfectly to compact switchboard design. Designs where space saving is a priority without sacrificing performance.

CA 4 is equally effective in simple or complex motor starter applications.



CA 4 contactor fitted to CT 4 thermal overload



Compact 45 mm wide



CA 4 contactor fitted to a KTA 7 breaker & KA 2 busbar system



CA 4 contactor fitted to CEP 7 electronic overload relay



CA 4 contactor fitted with auxiliary contact block



THREE RATINGS IN ONE FRAME SIZE

Features

- Compact dimensions
- Modular design
- Rugged construction
- High switching capacity
- Low power requirements
- AC or DC coil types
- Four pole 4.5 kW version available
- High electrical and mechanical life
- Clip on accessories
- DIN rail or screw mounting
- Rated at 60 °C
- Auxiliary contacts for low voltage
- Supplied with open terminals for rapid installation

Three Ratings

CA 4 contactors consist of three ratings in one frame size the CA 4-5, CA 4-9 and CA 4-12. All three miniature contactors share a common width of only 45 mm, and cover kW ranges of 2.6, 4.5 and 6.1 respectively.

The components of the CA 4 contactor system complement each other to form a flexible and dependable system.

It can utilise state of the art motor protection (CEP 7 electronic overload) and the economical CT 4 thermal overload.

It is one system that truly delivers maximum performance in a small, rugged and reliable package.

AC Coil

AC 3 kW	AC 2 amps	Aux. Contacts std. max.	Cat. No.
2.6	5.3	1 N/O 5	CA 4-5-10...V
2.6	5.3	1 N/C 5	CA 4-5-01...V
4.5	9	1 N/O 5	CA 4-9-10...V
4.5	9	1 N/C 5	CA 4-9-01...V
6.1	12	1 N/O 5	CA 4-12-10...V
6.1	12	1 N/C 5	CA 4-12-01...V

AC Coil 4-pole

AC 3 kW	AC 2 amps	Contacts	Cat. No.
4.5	9	4 N/O	CA 4-9M-40...V

DC Coil

AC 3 kW	AC 2 amps	Aux. Contacts std. max.	Cat. No.
2.6	5.3	1 N/O 5	CA 4-5C-10...V
2.6	5.3	1 N/C 5	CA 4-5C-01...V
4.5	9	1 N/O 5	CA 4-9C-10...V
4.5	9	1 N/C 5	CA 4-9C-01...V
6.1	12	1 N/O 5	CA 4-12C-10...V
6.1	12	1 N/C 5	CA 4-12C-01...V

Maximum performance minimum space



UNDER VOLTAGE RELIABILITY (AC/DC COIL)

NHP

CA 4 AC & DC coils

CA 4 coils are designed for total under-voltage reliability. Under voltages that do not cause the contactor to close can be withstood indefinitely without damage.

Even though their contacts and coils are not replaceable, Sprecher + Schuh has subjected this series of contactors to monitored endurance tests that highlight their ruggedness.

At full load, under three phase conditions, the contacts in the CA 4 have an electrical life of 700,000 operations. The AC magnet system has a mechanical life of 10,000,000 operations, and DC at 20,000,000 operation.



AC coil & magnet system



DC coil & magnet system

Low Heat Losses

The low power consumption required for control purposes also contributes to efficiency:

AC pick-up = 24 VA

AC hold = 4 VA

DC pick-up and hold = 2.5 W

The result is significantly reduced heat losses which in turn permits even more compact installations and a noticeable reduction in power consumption.



Efficiency with Wiring

The CA 4 miniature contactor system has been systematically designed for speedy wiring. All components have:

- Easily accessible connections
- Open terminals
- Universal slot screws
- Same size screw guides as on larger units. Both manual as well as power screwdrivers can be used; no tool bit changing is necessary.

No special tools are required to fasten the terminals.



Contact Configuration

The CA 4 contactor system can also handle low voltages. Excellent encapsulation and special contact design are major factors for the high degree of contact reliability:

- On the basic unit:
Contacts with indentation
- On the auxiliary contact block:
H-contact bridges with non-wear, self-aligning wiping contacts having a 4-way current path feature.

Main Contacts of CA 4 Contactor

The built-in auxiliary contact (bottom far left) is cross-stamped to provide a four-way current path. (The CS 4 relay has all four contacts of the base unit cross-stamped).

The image below shows the auxiliary contact block H-contacts

Clever contact design provides improved electrical connection and reliability.



ADVANCED MOTOR PROTECTION

CEP 7 Electronic Overload

CA 4 contactors are suitable for use with CEP 7 electronic overload relays. The CEP 7 attaches directly to the load side of the contactor to allow the CA 4 to be used in applications requiring improved motor protection.

The CEP 7 electronic overload offers two models to cater for manual and automatic/manual trip reset modes. Each is also available with class 10 or class 20 tripping characteristics.

The combination of miniature contactor and electronic overload relay provides a unique solution for superior motor protection whilst supporting most control philosophies.



Features

- Self powered
- Low power consumption (150 mW)
- Phase failure
- Separate N/O and N/C trip contacts
- Visible trip indicator
- Wide adjustment range
- Thermal memory

CA 4 with CEP 7

CT 4 Thermal Overload

CT 4 thermal overloads can be directly fitted to CA 4 contactors to form an economical arrangement for motor thermal protection and control.



The CT 4 is fitted with a built-in wire connection to provide a series connection between its trip contact and the 'A2' coil termination of a contactor. This connection can be removed if not required.

Trip flag indicator and test/reset button is also offered as standard on the CT 4 as well as a dual scale for current setting to allow for the straightforward commissioning of direct-on-line (DOL) or star-delta starters.

Features

- High tripping accuracy
- Manual reset
- Trip indicator
- Maximum volts 660 V
- Temperature compensation from -25 °C to 75 °C
- Snap on signal contact available



CA 4 with CT 4

TIME UNDER CONTROL

NHP

CRZE 4 Timing Element

The CRZE 4 is an innovative timing element for accurate on-delay timing functions adjustable up to 30 seconds. The timer is connected in series with the contactor coil resulting in contactor energisation after the set time on the timer has elapsed.

CRZE 4 offers excellent repeatability and can be fitted to the front or right-hand side of the contactor or can be separately mounted on DIN rail via the CR 4-P adapter.

Two time ranges are available and supports voltages from 110...250 V 50/60 Hz:

0.1...3 seconds

1...30 seconds



CRZY 4 Timing Element

The CRZY 4 is a timing element for star-delta starting. It disconnects the star contactor after the specified time of the timer has expired and then energises the delta contactor after an in-built transition time of about 100 milliseconds. This time delay is essential for star-delta starters.

The CRZY 4 can be mounted to the front of the CA 4 contactor, or can be fitted to the right-hand side or, can be DIN rail mounted separately via a CR 4-P adapter.



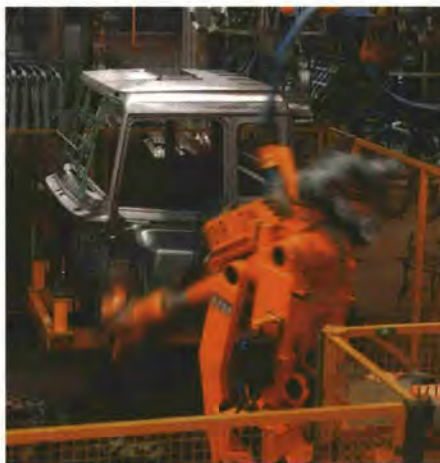
Dependable Interlocking

Two CA 4 contactors can be mechanically interlocked with a CM 4 interlocking mechanism. This is used in applications where only one of two contactors is required to operate at a time such as in the case with reversing starters.

The mechanical interlock can only be used with CA 4 contactors having AC coils. CM 4 is mounted to the back of the contactors so as not to interfere with the fitting of auxiliary contacts on the front like other miniature contactors.



Two CA 4's interlocked (2.6 kW)



CA 4 with a CRZY 4 timer fitted

CA 4

CS 4 MINIATURE RELAY SYSTEM

CS 4 Miniature Relay

Despite increasing complexity, control systems and installations must become increasingly compact. The CS 4 miniature relay system contains a variety of control possibilities.

Just like the CA 4 contactor, the CS 4 relay shares the same dimension width of 45 mm. This also makes the CS 4 miniature relay an attractive selection for the most discerning user. It will satisfy many industrial applications, from the most complex electronics to the basic lighting circuit.



The body of the device is sturdy as well. The front housing, containing the phase partitions and screwdriver guides, is manufactured in one piece. Front and rear housings are then joint fitted together.

Auxiliary Components

CS 4 auxiliary components allow you to convert the basic four pole relay into a:

- 6 or 8 pole relay
- 4, 6 or 8 pole relay with electronic time delay
- Multiple 4, 6 or 8 pole relays with mechanical interlock



CRC 4 Suppressor Module

CRC 4 is a suppression device for limiting voltage spikes especially in electronics circuits.



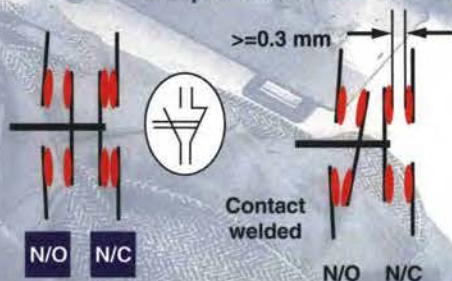
Rear housing

Contacts

Front housing

Coil assembly (DC)

Positive Guidance Design Requirements



CS 4 control relays are perfect for fail-safe control circuits. An interlock contact design, which maintains minimum 0.3 mm clearance, prevents the N/C contacts from reclosing if the N/O contact is welded when in operation. (This feature includes the base contact poles only and does not extend to the front mounted auxiliary contacts).

No Additional Space Required

The entire CS 4 system is logically engineered. Auxiliary contact blocks and timing elements are modular and snap-on without increasing the CS 4's original width of 45 mm. Also due to its sideways switching movement, the basic relay has the same low profile whether an AC or DC operating magnet is used. This permits the use of enclosures with shallow mounting depths. Once the CS 4 is installed, the auxiliary contact blocks can be snapped-on or removed without changing any existing wiring.



WIDE APPLICATION USE

NHP

CA 4 Mounted on an ACS Busbar System



CA 4 Miniature Starter System



- Star-delta
- Reversing starters
- DOL applications
- Lighting
- Building industry



CA 4 contactors can also be used in the following applications: swimming pools, sauna control systems, electric heating systems, refrigerators, house hold appliances and contact breakers.

Miniature Contactor System



Withstand capability of extreme industrial conditions make the CA 4 an ideal and smart choice for miniature contactor systems.



- CA 4 contactors are ideal in the office place, controlling lighting, heating, air-conditioning
- Hospitality industry where industrial dishwashing machines are used
- Large buildings where elevators and escalators are being used
- Recycling industry with large compactor crushing machines and the postal service where sorting of mail is used in a fast paced environment



WORLD CLASS QUALITY CA 4 MINIATURE CONTACTORS

Sprecher + Schuh has been developing and manufacturing electrical equipment for protection and control purposes for many years. NHP is proud to be associated in bringing a world quality product to the building and electrical industry.

The CA 4 compact contactor system fully complies with the IEC recommendations as well as equivalent national standards and regulations.

The system also complies with the stringent CSA and UL specifications. The requirements of countries having compulsory termination marking codes are also complied with.

CA 4, a world class series of miniature contactors which are recognised world wide.

NHP is a company delivering quality electrical switchgear to the building and automation industry.



**Backed by
decades of
experience**

NHP is proud to supply quality products such as Sprecher + Schuh to the Australian industry.

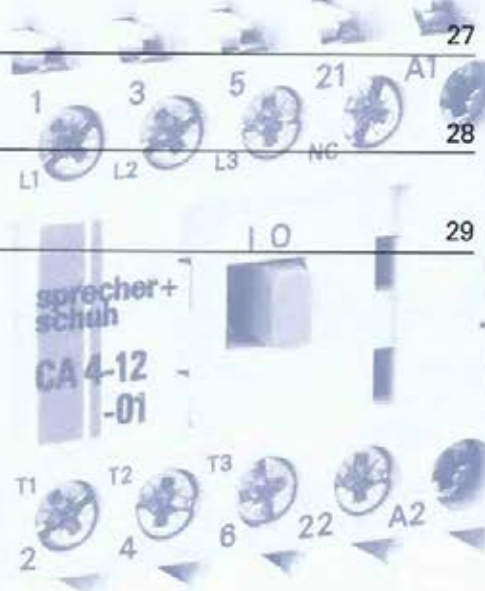


CA 4 NHP

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AC AND DC CONTACTORS

CA 4 Contactor

AC coil ¹⁾

AC 3 kW	AC 2/3 amps	Aux. Contacts std.	max.	Cat. No. ²⁾
2.6	5.3	1 N/O	5	CA 4-5-10...V
2.6	5.3	1 N/C	5	CA 4-5-01...V
4.5	9	1 N/O	5	CA 4-9-10...V
4.5	9	1 N/C	5	CA 4-9-01...V
6.1	12	1 N/O	5	CA 4-12-10...V
6.1	12	1 N/C	5	CA 4-12-01...V



CA 4 contactor

AC Coil 4-pole

AC 3 kW	AC 2/3 amps	No. of Contacts	Cat. No.
4.5	9	4 N/O	CA 4-9M-40...V

DC coil ¹⁾

AC 3 kW	AC 2 amps	Aux. Contacts std.	max.	Cat. No. ²⁾
2.6	5.3	1 N/O	5	CA 4-5C-10...V
2.6	5.3	1 N/C	5	CA 4-5C-01...V
4.5	9	1 N/O	5	CA 4-9C-10...V
4.5	9	1 N/C	5	CA 4-9C-01...V
6.1	12	1 N/O	5	CA 4-12C-10...V
6.1	12	1 N/C	5	CA 4-12C-01...V



CS 4 relay

Basic relay CS 4 4-pole ¹⁾

Contacts	AC	Cat. No. ²⁾
N/O N/C	or DC	
4 —	AC	CS 4-40E...VAC
	DC	CS 4C-40E...VDC
3 1	AC	CS 4-31Z...VAC
	DC	CS 4C-31Z...VDC
2 2	AC	CS 4-22Z...VAC
	DC	CS 4C-22Z...VDC

Contact diagram



Notes: ¹⁾ CA 4/CS 4 not available without coil. Coils and contacts not replaceable.

²⁾ Add coil voltage AC 24, 32, 110, 240, 415 V 50 Hz when ordering.
Add coil voltage DC 12, 24, 48, 110, 125, 220 V when ordering.

240/415 V rated coils are suitable for use on 230/400 V in accordance with AS 60038:2000

CA 4/CS 4 ACCESSORIES

NHP



Auxiliary contact block



RC link



Mechanical Interlock



KCD 4

CR4-P
DIN rail adaptor

CRZE 4 Timer

Auxiliary Contact Blocks CA 4-P

For contactors CA 4... -10 ¹⁾

Contact arrangement	Cat. No.
	CA 4-P-02
	CA 4-P-11
	CA 4-P-22

For contactors CA 4...-01 ¹⁾

Contact arrangement	Cat. No.
	CS 4-P-20
	CS 4-P-11
	CS 4-P-40

Accessories

Description	Cat. No.
Mechanical interlock (requires no additional space)	CM 4 ²⁾
Steel DIN rail 35 mm (2 metre lengths) - price per metre	SDR
Star-delta timing relay solid state (110 or 240 V AC)	CRZY 4
On time-delay, solid state	
0.1-3 sec (CA 4 connection)	CRZE 4-3S
1-30 secs (CA 4 connection)	CRZE 4-30S
Protective cover for CA 4 / CS 4	CA 4-PC
Adaptor for mounting time relay onto G or DIN rail	CR 4-P
RC link for coil suppression 24-48 V or 110-240 V 50 Hz	CRC 4
Diode link for coil suppression 12-110 V DC	CRD 4
Connection bridges (parallel contacts)	
2 pole max. 34 amps	CB 4-2
3 pole max. 50 amps	CB 4-3
4 pole max. 64 amps	CB 4-4
Connecting modules for complete starters 5...23 Amp	
For use with KT 7-25S & CA 4	KT 7-25S-PEM12

Connection links

Connection links for DOL starters KTA 3 + CA 4/CA 3 @ 60 °C

For CA 4 to KTA 3	max. 9 amps	KCD 4
Connection links for reversing and star delta starters @ 60 °C		
Reversing link set for CA 4-5/9	max. 9 amps	KCR 4
Star delta link set for CA 4	max. 9 amps	KCSD 4

Adaptor CR 4-P

For mounting timing element CRZ...4 on EN 50 022-35 (DIN) mounting rails and G rails.

Timing elements CRZE 4 and CRZY 4

For time delay circuits. Snap-fits onto an auxiliary contact location, on the right hand side of a contactor, or with the aid of the adaptor on DIN mounting rails.

RC link CRC 4

For damping circuits of coils and contacts. For fitting on all labelling spaces or arbitrarily in cable channels.

Auxiliary contact blocks CA 4-P

Terminal markings in compliance with EN 50 012.

Can be snap fitted onto the CA 4 in a 2 or 4 pole form.

Mechanical interlock CM 4

Requires no additional space. Fitting from rear and recessed in DIN rails (not suitable for DC magnet system).

Notes: ¹⁾ The contact selection is to comply with contact numbering sequence. The auxiliary contacts from page 3-6 can also be used if terminal numbering is not a pre-requisite.

²⁾ Not available for use with DC contactors and relays.

STATE OF THE ART MOTOR PROTECTION

- Superior phase failure protection
- Choice of tripping classes
- Choice of reset options
- Self powered design means convenience
- Increased accuracy and motor protection
- Wide current adjustment range

**Self
Powered
Design**

Manual reset

Standard Motor kW	Approx. kW range @ 400/415 V	Current range (A)	Cat. No.
—	—	0.1...0.32	CEP7-M32-0.32-10
—	—	0.32...1.00	CEP7-M32-1-10
1.1	0.3...1.25	1.00...2.9	CEP7-M32-2.9-10
1.5/2.2	0.6...2.2	1.6...5	CEP7-M32-5-10
2.2/4/5.5	1.6...6	3.7...12	CEP7-M32-12-10

Automatic and manual reset

Standard Motor kW	Approx. kW range @ 400/415 V	Current range (A)	Cat. No.
—	—	0.1...0.32	CEP7-A32-0.32-10
—	—	0.32...1.00	CEP7-A32-1-10
1.1	0.3...1.25	1.00...2.9	CEP7-A32-2.9-10
1.5/2.2	0.6...2.2	1.6...5	CEP7-A32-5-10
2.2/4/5.5	1.6...6	3.7...12	CEP7-A32-12-10

Remote reset magnet

Cat. No.
To suit CEP7-M32 and CEP7-A32
CMR7...V ')

Accessories

Cat. No.
Cover for preventing overload adjustment
CMS7-BC4
Cover for preventing current adjustment only
CMS7-BC5
Separate mounting bracket
CEP7-37-PA

Notes: ¹⁾ Standard AC voltages 24, 110 and 240 V AC 50 Hz.
Standard DC voltage 24 V DC. Others available on request.
Class 20 tripping available on request



ECONOMICAL THERMAL OVERLOAD CT 4

NHP

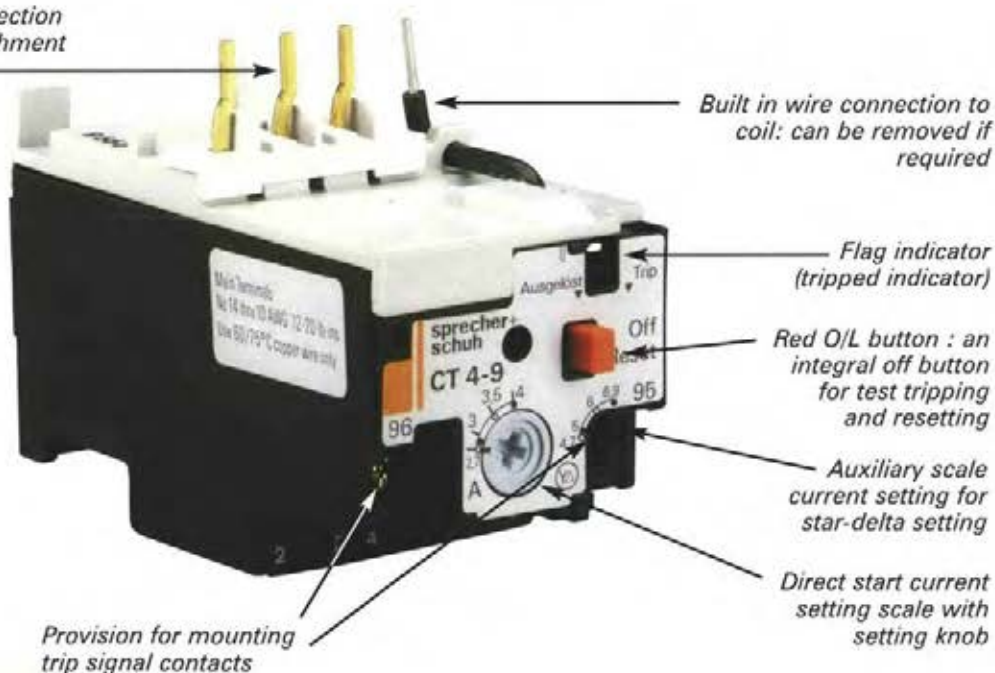
- Consistent and reliable protection
- Superior class 10 characteristics
- Protection from single phase conditions
- Ambient temperature compensation
- Maximum 660 V
- Snap-on signal contacts
- Manual reset
- Trip indicator complies with AS 1023



CT 4 Thermal Overload Relays for Mounting on CA 4 Contactors

Adjustment range in amps (DOL)	Type T HRC fuse	Approx. kW @ 400/415 V	Cat. No.
0.10-0.15	0.63 A	0.06	CT 4-9-0.15
0.15-0.23	1	0.09	CT 4-9-0.23
0.23-0.35	2	0.12	CT 4-9-0.35
0.35-0.55	2	0.18	CT 4-9-0.55
0.55-0.80	2	0.25	CT 4-9-0.8
0.80-1.20	4	0.5	CT 4-9-1.2
1.20-1.80	4	0.55	CT 4-9-1.8
1.80-2.70	6	0.75	CT 4-9-2.7
2.70-4.00	10	1.5	CT 4-9-4
4.00-6.00	16	2.2	CT 4-9-6
6.00-7.70	20	3	CT 4-9-7.7
7.50-9.00	20	4	CT 4-9-9
Auxiliary signal contact block (N/O) - clip on to thermal overload			CT 3K-P-10

Electrical connection
for direct attachment
to CA 4



TECHNICAL INFORMATION

CS 4 Control Relay

CS 4 Relays

CS 4 Relays

Electrical

Contact Ratings - IEC 947

AC 15 (solenoids, contactors)	240 V	[A]	6
at rated voltage	400 V	[A]	2.5
IEC 947, EN 60947	500 V	[A]	1.25
AC 1 (Non-inductive, or 40 °C 230...500 V		[A]	16
slightly inductive 60 °C 230...500 V		[A]	12
loads, resistance furnaces)			
IEC 947, EN 60947			

AC 2, AC 3, AC 4	230 V	[A]	5
(switching 3 Ø motors)	400 V	[A]	3.7
	500 V	[A]	2.8

Short Circuit Protection afforded by contactor

Coordination Type 2	Fuse gG	[A]	16
acc. IEC 947-4-1	Fuse aM	[A]	16

Min. switching capacity	17 V		
DIN 19240 for H-contacts (Double contacts and auxiliary contact blocks)		[mA]	5

Switching DC

Non-inductive or slightly inductive loads, resistance furnaces DC 1 at 60 °C

1 pole	24...48 V	[A]	6 / 4
	110 V	[A]	0.6
	220 V	[A]	0.2
	440 V	[A]	0.08
2 poles in series	24...48 V	[A]	6
	110 V	[A]	4
	220 V	[A]	0.08
	440 V	[A]	0.2
3 poles in series	24...48 V	[A]	6
	110 V	[A]	6
	220 V	[A]	3
	440 V	[A]	0.4

Mechanical

Mechanical Life	[Mil]	10
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Electrical Life

AC 15 (240 V, 3 A) AC Operations	[Mil]	~
AC 1 (230 V, 6 A)	[Mil]	0.7

Weight	[g]	153
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Terminal Cross-Section

Terminal Type

	1 Conductor	[mm ²]	0.75...2.5
	2 Conductor	[mm ²]	0.75...2.5
	1 Conductor	[mm ²]	0.75...2.5
	2 Conductor	[mm ²]	0.75...2.5

Max. Wire Size	[AWG]	18...14
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Tightening Torque	[Nm]	1...1.5
	[lb-in]	7...15

Control Circuit

Operating Voltage

AC 50/60 Hz	Pickup	[x U _s]	0.85...1.1
	Dropout	[x U _s]	0.35...0.65
DC	Pickup	[x U _s]	0.8...1.1
	Dropout	[x U _s]	0.1...0.25
with protection circuit	Dropout	[U _{max} U _{min}]	1...1.2

Coil Consumption

AC 50/60 Hz	Inrush	[VA/W]	22/20
	Seal	[VA/W]	4/14
DC	Inrush/Seal	[W]	2.5

Operating Times

AC 50/60 Hz	Pickup Time	[ms]	15...40
	Dropout Time	[ms]	15...25
DC	Pickup Time	[ms]	18...40
	Dropout Time	[ms]	6...12
with protection circuit	Dropout	[ms]	8...12

General

Rated Voltage Withstand U

IEC	500 V
High voltage - 1 minute (per IEC 947-4)	2500 V

Rated Impulse Strength U _{imp}	8 kV
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Rated Voltage U_e

AC	230, 240, 400, 415, 500 V
DC	24, 48, 110, 220, 440 V

Rated Frequency	50/60 Hz, DC
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Ambient Temperature

Storage	-55...+80 °C (-67...176 °F)
Operation at normal current	-55...+60 °C (-58...140 °F)
At > 70 °C	15 % current reduction against 60 ° value

Corrosion Resistance

humid-alternating climate, cyclic, per IEC 68-2-30 and DIN 50 016, 56 cycles

Altitude	2000 m M.S.L., per IEC 947-4
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Type of Protection	IP 20
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Finger Protection	safe from touch by fingers and back of hand per vde 0106, part 100
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TECHNICAL INFORMATION

NHP

CA 4 Miniature Contactors

Rated Insulation Voltage U_i			CA4			
to IEC 947-1	[V]	500 V		-05	-09	-12
UL/CSA	[V]	600 V				
Rated Impulse Voltage U_{imp}						
	[kV]	8				
Rated Voltage U_e						
-Main Contacts						
AC 50/60 Hz	[V]	230, 240, 400, 415, 500	(Star Delta)			
DC	[V]	24, 48, 110, 220, 440	50 Hz	230 V	[A]	11 21 21
				240 V	[A]	11 21 21
				400 V	[A]	9.2 16 21
				415 V	[A]	9.2 16 21
				500 V	[A]	6.9 12 12
				230 V	[kW]	3 5.5 5.5
				240 V	[kW]	3 5.5 5.5
				400 V	[kW]	4 7.5 10
				415 V	[kW]	4 7.5 11
				500 V	[kW]	4 7.5 7.5
Operating Frequency for AC Loads						
	[Hz]	50/60 Hz				
Switching Motor Loads			CA4			
Standard IEC Ratings				-05	-09	-12
AC 2, AC 3, AC 4	230 V [A]	6.5 12 12	AC 1 Load,			
DOL & Reversing	240 V [A]	6.5 12 12	3 Ø Switching	I_e	[A]	20 20 20
50 Hz/60 °C	400 V [A]	5.3 9 12	Ambient	230 V	[kW]	8 8 8
	415 V [A]	5.3 9 12	Temperature 40 °C	240 V	[kW]	8.3 8.3 8.3
	500 V [A]	4 7 7		400V	[kW]	14 14 14
	230 V [kW]	1.5 3 3		415 V	[kW]	14 14 14
	240 V [kW]	1.5 3 3		500 V	[kW]	17 17 17
	400 V [kW]	2.2 4.5 5.5	Ambient	I_e	[A]	16 16 16
	415 V [kW]	2.2 4.5 6.1	Temperature 60 °C	230 V	[kW]	6.4 6.4 6.4
	500 V [kW]	2.2 4 4		240 V	[kW]	6.7 6.7 6.7
				400 V	[kW]	11 11 11
				415 V	[kW]	12 12 12
				500 V	[kW]	14 14 14
Maximum Operating Rate			Lighting Loads			
At 9 A for AC 3; 20 A for AC 2/4	AC 2 [ops/hr]	300	Elec. Dischrg.	Open	[A]	18 18 18
Starting time $t_A = 0.25$ s	AC 3 [ops/hr]	600	Lamps-AC 5a,	Enclosed	[A]	14.5 14.5 14.5
AC 4 (200,000 Op. Cycles)	AC 4 [ops/hr]	300	Single compensated	10 kA	[μF]	750
50 Hz	230 V [A]	3.9	Max. capacitance at	20 kA	[μF]	400
	240 V [A]	3.9	prospective short circuit			
	400 V [A]	3.3	current available at the			
	415 V [A]	3.3	contactor			
	230 V [kW]	0.92	Incandescent			
	240 V [kW]	0.96	Lamps-AC 5b,			
	400 V [kW]	1.5	Electrical endurance	[A]	9.3 9.3 9.3	
	415 V [kW]	1.6	~100,000 operations			
Max. Operating Rate	[ops/hr]	250				

TECHNICAL INFORMATION

CA 4 Miniature Contactors

Electrical Data

Switching power transformers AC 6a			CA4		
Inrush		= 30	-05	-09	-12
Rated transformer current					
230 V	[A]		2.9	5.4	5.4
240 V	[A]		2.9	5.4	5.4
400 V	[A]		2.4	4.1	5.4
415 V	[A]		2.4	4.1	5.4
500 V	[A]		1.8	3.2	3.2
230 V	[kVA]		1.2	2.2	2.2
240 V	[kVA]		1.2	2.2	2.2
400 V	[kVA]		1.7	2.8	3.7
415 V	[kVA]		1.7	2.9	3.9
500 V	[kVA]		1.6	2.7	2.7

DC Ratings

DC1 Rating at 60 °C			-05	-09	-12
1 Pole	24 V DC	[A]	9	9	9
	48 V DC	[A]	4	6	6
	110 V DC	[A]	0.6	1	1
	220 V DC	[A]	0.2	0.3	0.3
	440 V DC	[A]	0.08	0.1	0.1
2 Pole in series	24 V DC	[A]	6	9	9
	48 V DC	[A]	6	8	8
	110 V DC	[A]	4	6	6
	220 V DC	[A]	0.8	1.2	1.2
	440 V DC	[A]	0.2	0.3	0.3
3 Pole in series	24 V DC	[A]	6	9	9
	48 V DC	[A]	6	9	9
	110 V DC	[A]	6	9	9
	220 V DC	[A]	3	4	4
	440 V DC	[A]	0.4	0.6	0.6

Short Time Current Withstand Ratings	-05	-09	-12
I_{cw} 60 °C			

10 s	[A]	60	96	96
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Off Time Between Operations	[Min]	3
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Resistance and Watt Loss I_e AC 3			-05	-09	-12
Resistance per power pole		[mΩ]	5.5	5.5	5.5
Watt Loss - 3 power pole		[W]	0.46	1.3	2.4
Coil and 3 power poles	AC	[W]	1.9	2.7	3.8
	DC	[W]	3.0	3.8	4.9

Coil Data

Voltage Range			
AC: 50 Hz, 60 Hz, 50/60 Hz	Pickup	[xU _s]	0.85...1.1
	Dropout	[xU _s]	0.35...0.65
DC	Pickup	[xU _s]	0.85...1.1
	Dropout	[xU _s]	0.1...0.25

Coil Consumption			
AC: 50 Hz, 60 Hz, 50/60 Hz	Pickup	[VA/W]	22/20
	Hold-in	VA/W	4/1.4
DC	Pickup	[W]	2.5
	Hold-in	[W]	2.5

Operating Times			
AC: 50 Hz, 60 Hz, 50/60 Hz	Pickup	[ms]	15...40
	Dropout	[ms]	15...25
with RC Suppressor	Dropout	[ms]	15...25
DC	Pickup	[ms]	18...40
	Dropout	[ms]	6...12
with Integ. Suppression	Dropout	[ms]	8...12
with Diode Suppression	Dropout	[ms]	35...50



CA 4 contactor

TECHNICAL INFORMATION




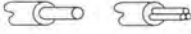
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CA 4 Miniature Contactors

Mechanical Data

Service Life			
Mechanical	AC	[Mil]	10
	DC	[Mil]	20
Electrical	AC 3 (400 V)	[Mil]	0.7

Shipping Weights			
AC-CA 4		[kg]	0.16
		[Lbs]	0.35
AC-CAU 4		[kg]	0.35
		[Lbs]	0.77
DC-CA 4		[kg]	0.16
		[Lbs]	0.35
DC-CAU 4		[kg]	0.35
		[Lbs]	0.77

Terminations-power			
Terminal Type 			
Combination Screw Head: Cross, Slotted, Posidrive			
	1 Wire	[mm²]	0.75...2.5
	2 Wires	[mm²]	0.75...2.5
	1 Wire	[mm²]	0.75...2.5
	2 Wires	[mm²]	0.75...2.5
	1 Wire	[mm²]	18...14
	2 Wires	[mm²]	18...14
Torque Requirement		[Nm]	1...1.5
		[Lb-in]	7...15

Terminations - Control			
Terminal Type 			
Combination Screw Head: Cross, Slotted, Posidrive			
Coils	1 or 2	[mm²]	0.75...2.5
Wires		[AWG]	18...14
Control Modules	1 or 2	[mm²]	0.75...2.5
Wires		[AWG]	18...14
Torque Requirement		[Nm]	1...1.5
		[Lb-in]	7...15

Degree of Protection - contactor IP 2LX per IEC 529 and DIN 40 050 (with wires installed)

Protection Against Accidental Contact
back-of-hand proof per VDE 0106; Part 100

Environmental and General Specifications






Ambient Temperature	
Storage	-55...+80 °C (-67...176 °F)
Operation	-25...+60 °C (-13...140 °F)
Conditioned 15 % current reduction after AC 1 at T 60 ° -55...+70 °C (-13...158 °F)	
Altitude at installed site	2000 meters above sea level per IEC 947-4
Resistance to corrosion/ Humidity	Damp-alternating climate: cyclic to IEC 68-2, 56 cycles. Dry heat: IEC 68-2, +100 °C (212 °F), relative humidity < 50 %, 7 days. Damp tropical: IEC 68-2, +40 °C (104 °F), relative humidity < 92 %, 56 days
Shock Resistance	IEC 68-2: Half sinusoidal shock 11 ms, 30 g (in all three directions)
Vibration Resistance	IEC 68-2: Static > 2 g, in normal position no malfunction < 5 g
Operating Position	Refer to Dimension Pages
Standards	IEC 947-1/4, EN 60947; UL 508; CSA 22.2, No. 14, SEV1025
Approvals	CE, UL, CSA, SEV, SUVA, Lloyd's Registry of Shipping, Bureau Veritas, Maritime Register of Shipping, Elektrizitats-Inspektorat Finland



TECHNICAL INFORMATION

CA 4 Miniature Contactors

Auxiliary Contacts

Current Switching			Built-in Auxiliary Contacts	Auxiliary Contact Blocks
AC 1 lth	at 40 °C	[A]	16	10
	at 60 °C	[A]	12	6
AC 15, switching electromagnetic loads at:		[V]	230, 240, 400, 415, 500	230, 240, 400, 415, 500
		[A]	6, 5, 2.5, 2, 1.25	2, 2, 1, 1, 0.6
DC 13, switching DC electromagnets at:		[V]	24, 48, 110, 220, 440	24, 48, 110, 220, 440
		[A]	5, 0.6, 0.45, 0.25, 0.04	2, 0.6, 0.45, 0.1, 0.04
Short-Circuit Protection - gG Fuse				
Type 2 Coordination		[A]	16	10
Load carrying capacity per UL/CSA				
Rated Voltage	AC	[V]	600 max.	600 max.
Continuous Rating	40 °C	[A]	10 general purpose	10 general purpose
Switching Capacity	AC		Heavy pilot duty (A600)	Heavy pilot duty (A600)
Rated Voltage	DC	[V]	600 max.	600 max.
Switching Capacity	AC		Standard pilot duty (Q600)	Standard pilot duty (Q600)
Terminals				
Terminal Type				
Maximum Wire Size per IEC 947-1				
 Flexible with Wire	1 Conductor	[mm ²]	0.75...2.5	0.75...2.5
 End Ferrule	2 Conductor	[mm ²]	0.75...2.5	0.75...2.5
 Solid/Stranded-Conductor	1 Conductor	[mm ²]	0.75...2.5	0.75...2.5
	2 Conductor	[mm ²]	0.75...2.5	0.75...2.5
Recommended Tightening Torque		[Nm]	1...1.5	1...1.5
Max. Wire Size per UL/CSA		[AWG]	18...14	18...14
Recommended Tightening Torque		[lb-in]	7...15	7...15









CRZE4/CRZY4 Electronic Timers

Permissible voltage		Repeat accuracy	
CRZE4 (AC or DC)	110 V (-23 %) - 250 V (+10 %)	± 5 %	
CRZY4 (AC only)	110 V (-23 %) - 120 V (+10 %)	Time interval for start commands	
	220 V (-20 %) - 250 V (+10 %)		
Voltage drop	5 V max	CRZE4	1.4 x set time
Load current for reliable operation	10 mA min	CRZY4	2 x set time
Load Current at 220 V		Ambient temperature	
20 °C	600 mA	Storage	-40 °C to + 80 °C
40 °C	440 mA	Operation	-20 °C to + 55 °C
55 °C	320 mA		
Leakage current at 220 V			
CRZE4	5 mA		
CRZY4	"Y" 17 mA, "D" 6 mA		
Reset time	200 ms		
Voltage failure duration having no influence for start commands			
CRZE4	15 ms		
CRZY4	20 ms		

TECHNICAL INFORMATION

NHP

CEP 7/CT 4 Overloads

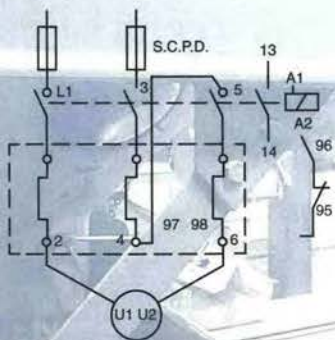
Electrical data					
Main Circuits		CEP7-A/M-32			CT4-9
Rated insulation voltage U_i					
UL	[V]	600			600
CSA	[V]	690			690
Rated impulse strength U_{imp}		[kV]	6		X
Rated operating voltage U_e		[V]	690		690
Terminal Cross-section					
Terminal type					
Terminal screws			M4		M4
Flexible with wire ferrule 	[mm²]	1 x (1...4)			2 x (1...4)
		2 x (1...4)			
Solid conductor 	[mm²]	1 x (1.5...6)			x
Stranded	[mm²]	2 x (1.5...6)			x
Max.wire size per UL/CSA		[AWG]	14...8		14...8
Recommended torque		[Nm]	1.8		1.8
		[lb-in]	16		16
Pozidrive screwdriver	[size]	2			2
Slotted screwdriver	[mm]	1 x 6			1 x 6
Hexagon socket size	[mm]	-			
Control circuits					
Rated insulation voltage U_i		[V]	600		x
Rated impulse strength U_{imp}		[kV]	6		x
Rated operating voltage U_e		[V]	600		x
Rated operating current U_e			N/O-N/C		x
AC-15	12...120 V	[A]	3	2	x
	220..240 V	[A]	1.5	1.5	x
	380..480 V	[A]	0.75	0.75	x
	500..600 V	[A]	0.6	0.6	x
DC-13					
At L/R < 15 ms 24 V		[A]	1.1	1.1	x
	110 V	[A]	0.4	0.4	x
	220 V	[A]	0.2	0.2	x
	440 V	[A]	0.08	0.08	x
Conventional thermal current		[A]	5		x
Terminal cross section					
Terminal type					
Terminal screws			M3.5		M3.5
Flexible with wire ferrule 	[mm²]	2 x (0.75...2.5)			2 x (0.75...2.5)
Solid conductor 	[mm²]	2 x (0.75...4)			2 x (0.75...4)
Max.wire size per UL/CSA		[AWG]	18...12		18...14
Recommended torque		[Nm]	1.4		1.2
		[lb-in]	12		11
Pozidrive screwdriver	size	2			2
Slotted screwdriver	mm	1 x 6			1 x 6

TECHNICAL INFORMATION

CEP 7/CT 4 Overloads

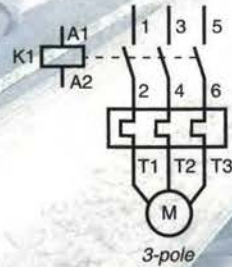
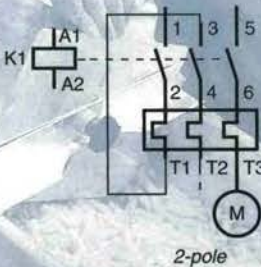
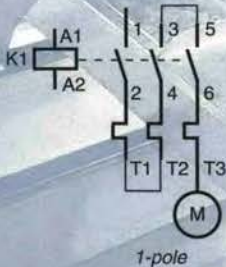
General data	CEP7-A/M-32	CT4-9
Weight [kg]	0.14	X
Standards	IEC 947, EN 60 947, DIN VDE 0660	
Approvals	CE, UL, CSA, PTB	
Corrosion resistance	95 % relative humidity without condensation, 30...60 °C	humid/warm, constant
Ambient temperature		humid/warm, cyclic
Open	-20...+60 °C	-25...+50 °C
Enclosed	-20...+40 °C	-25...+40 °C
Temperature compensation	Continuous	
Shock resistance		
10 ms sinusidal shock [G]	30	
Type of protection	IP2LX	
In connected state		
Finger protection	safe from touch by fingers and back of hand (VDE 0106, Part 100)	

Connection Diagram CEP 7
Single Phase Wiring



The CEP 7S must be wired as indicated to provide "self-powering" of the overload relay

Connection Diagram CT 4



UTILISATION CATEGORIES

NHP

Category ¹⁾	Typical applications
AC 1	Non-inductive or slightly inductive loads, resistance furnaces
AC 2	Slip ring motors: Starting, plugging
AC 3	Squirrel cage motors: Starting, switching off motors during run
AC 4	Squirrel cage motors: Starting, plugging ²⁾ , inching ³⁾
AC 5a	Switching of electric discharge lamp control
AC 5b	Switching of incandescent lamps
AC 6	Switching of power transformers
AC 6b	Switching of 3-phase capacitors. Inductance of leads between capacitors in parallel: min 6uH
AC 7a	Slightly inductive loads in house hold appliances and similar applications
AC 7b	Motor-loads for house hold applications
AC 8a (manual reset) of overload	Switching of Hermetically sealed compressor motors (air tight sealed)
AC 8b (automatic reset) of overload	
AC 12	Control of resistive loads and solid state loads with isolation by optocouplers
AC 13	Control of solid state loads with transformer isolation
AC 14	Control of small electromechanical loads
AC 15	Electromagnets for contactors, valves, solenoid actuators
AC 20	Connecting and disconnecting under no-load condition
AC 21	Switching of resistive loads, including moderate overloads
AC 22	Switching of mixed resistive and inductive loads, including moderate overloads
AC 23	Switching of motor loads or other highly inductive loads
DC 1	Non-inductive or slightly inductive loads, resistance furnaces
DC 3	Shunt motors: Starting , plugging ²⁾ , inching ³⁾
DC 4	Series-motors: Starting, switching off motors during running
DC 5	Series-motors, starting, plugging ²⁾ , inching ³⁾ , dynamic breaking of motors
DC 6	Switching of incandescent lamps
DC 12	Control of resistive loads and solid state loads with isolation of optocouplers
DC 13	Control of D.C. electromagnets
DC 14	Control of D.C. electromagnetic loads having economy resistors in circuit
DC 20	Connecting and disconnecting under no-load conditions
DC 21	Switching of resistive loads, including moderate overloads
DC 22	Switching of mixed resistive and inductive loads, including moderate overloads (eg. Shunt motors)
DC 23	Switching of highly inductive loads (eg. series motors)

Notes: ¹⁾ All category listings according to **IEC 947-4** and **AS 3497-4**

²⁾ **Plugging** is understood as stopping or reversing the motor rapidly by reversing the motor primary connections while the motor is running.

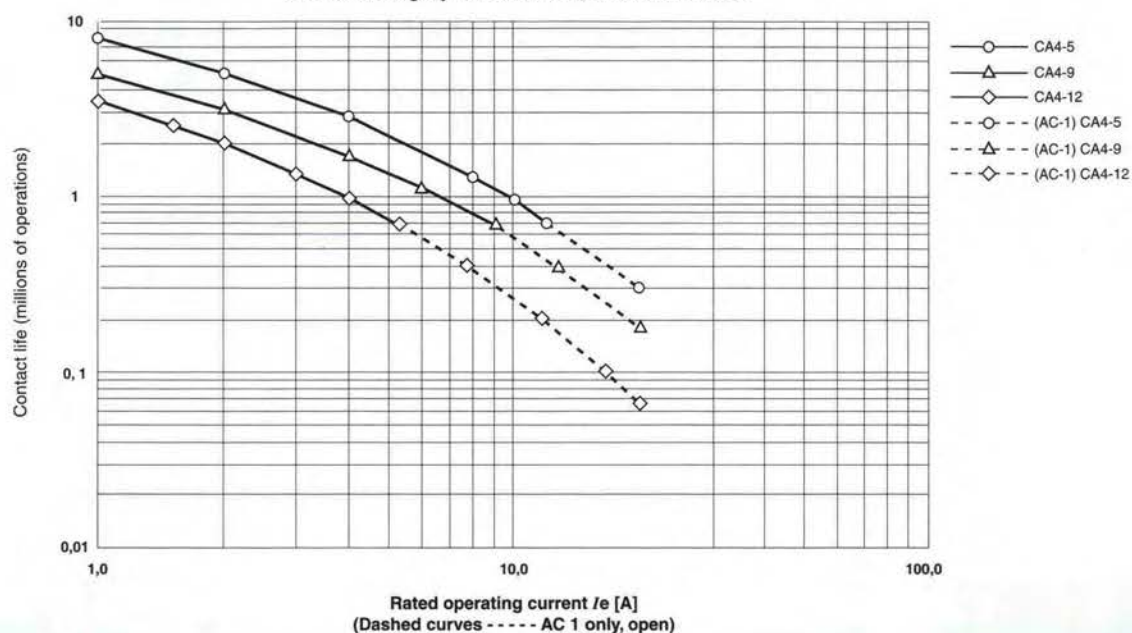
³⁾ **Inching** is understood as energising a motor once or repeatedly for short periods to obtain small movements of the mechanism.

ELECTRICAL LIFE GRAPHS

CA 4 Contactors

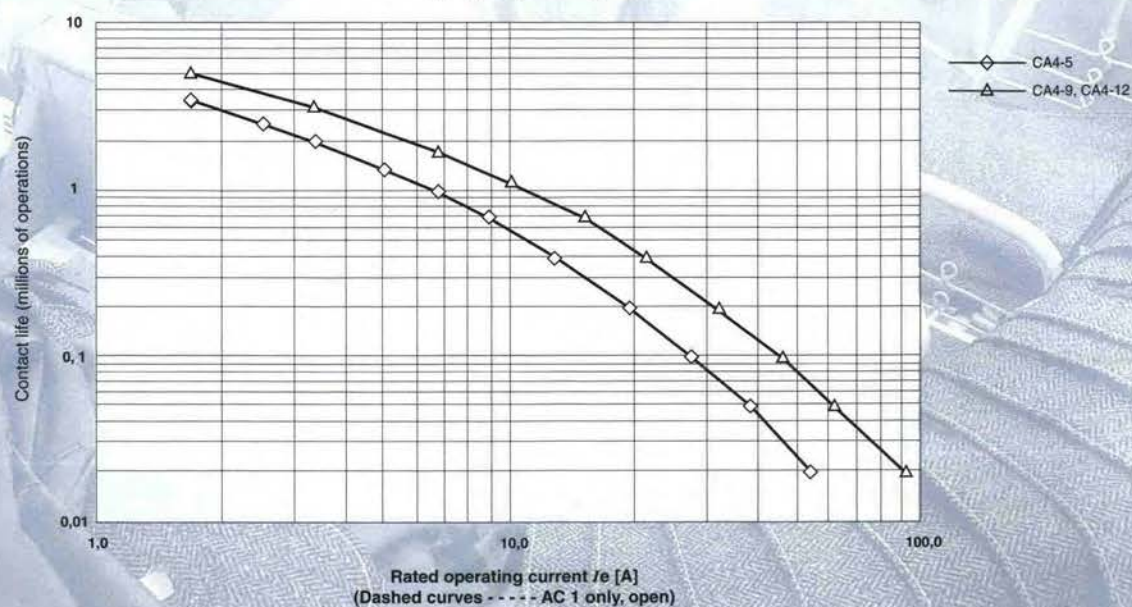
CA 4 Contactors

Electrical Life; $U_e = 400/415$ V
 AC 3 Switching of squirrel-cage motors while starting
 AC 1 Non-or slightly inductive loads, resistance furnaces



CA 4 Contactors

Electrical Life; $U_e = 400/415$ V
 AC 4 Stepping of squirrel-cage motors

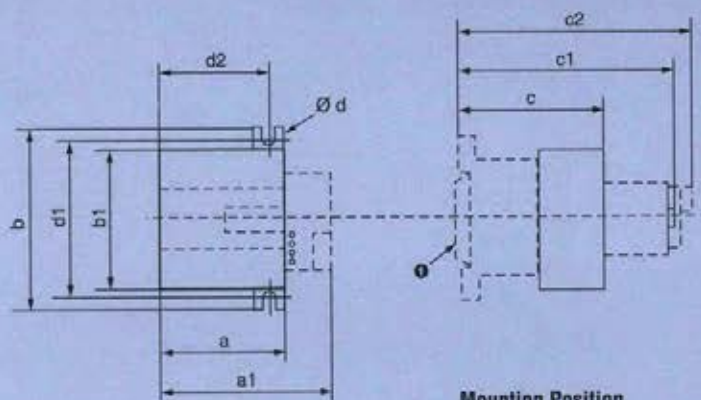


DIMENSIONS

NHP

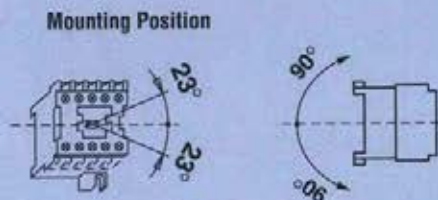
CA 4 Contactor CS 4 Control Relay

Series CA 4

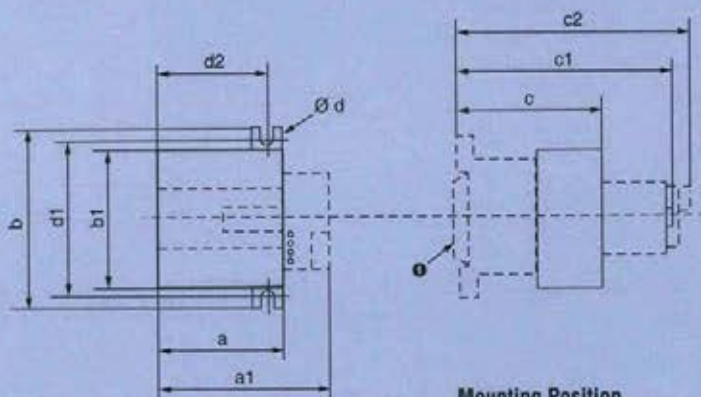


Type	a	a1	b	b1	c	C1	C2	Ød	d1	d2
CA 4-9	45	67	56	47	48	74	77	4.2	50	40

Dimensions are in (mm) and are not intended for manufacturing purposes

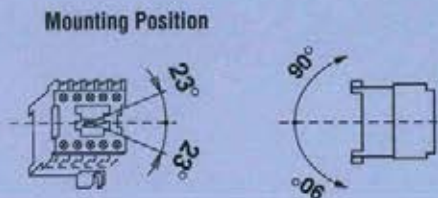


Series CS 4 industrial control relays



Type	a	a1	b	b1	c	c1	c2	Ød	d1	d2
CS 4 (AC & DC)	45	67	56	47	48	74	77	4.2	50	40

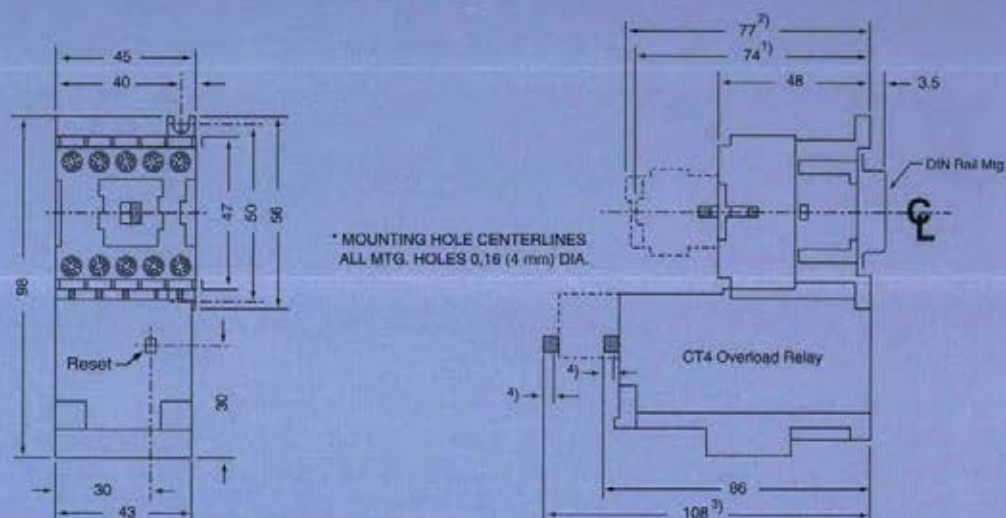
Dimensions are in (mm) and are not intended for manufacturing purposes



Note: DIN Rail mounting 35 mm to EN 50 022.

4A4

Series CT 4 (mounting to CA 4 contactors)



Notes: 1) With aux contact block CA4-P
2) With timing elements CRZE4, CRZY4
3) With aux contact CT3-P-10 on overload
4) Overload reset: 0.09 (2.3 mm) minimum travel

Dimensions are in (mm) and are not intended for manufacturing purposes

Technical drawings of a mechanical part, showing front and side views with dimensions.

Front View (Left):

- Overall height: 68.4
- Overall width: 43
- Distance from left edge to centerline: 30
- Distance from centerline to right edge: 30

Side View (Right):

- Overall width: 108
- Distance from front face to centerline: 86
- Distance from centerline to right edge: 2.3
- Distance from front face to right edge: 2.3

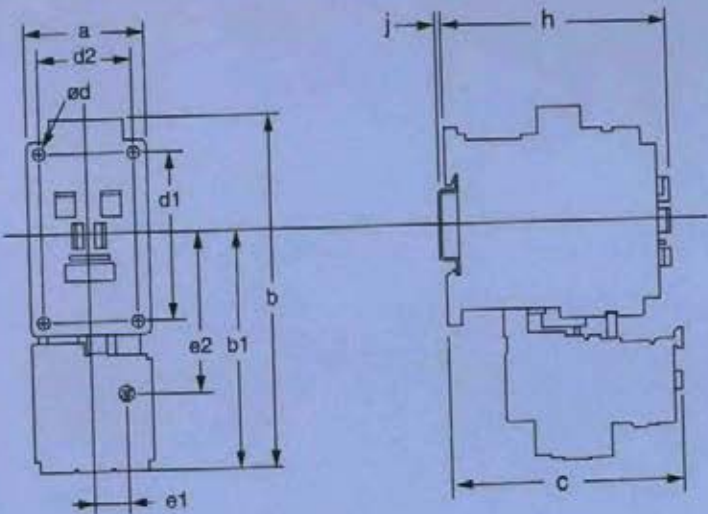
Notes: 1) Minimum reset travel = 2.3 mm
Dimensions in (mm)

DIMENSIONS



CEP 7 Electronic Overload Relay

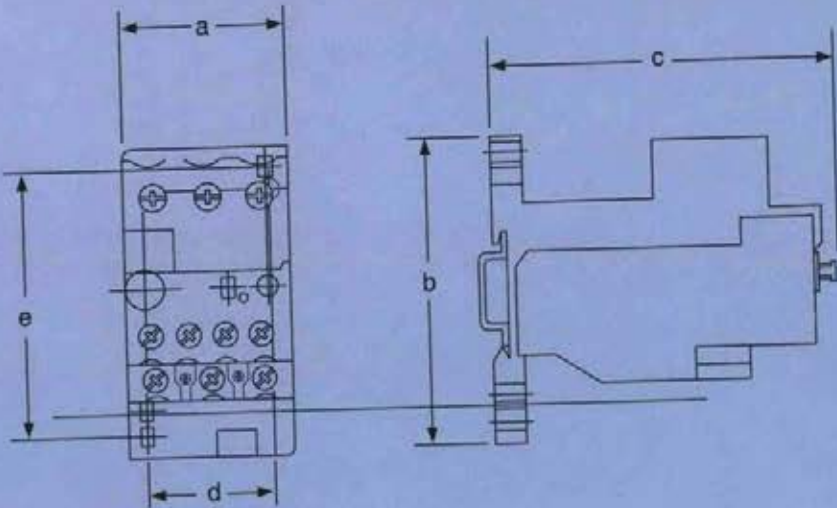
Series CEP 7 (mounting to CA 4 contactors)



Dimensions when fitted to contactor	a Width	b Height	b1	c Depth	e1	e2	d1	d2	h	j	ød
CA 4	45	107	79.4	66.6	16.5	50	50	-	48.2	2	Two ø 4.2

Dimensions are in (mm) and are not intended for manufacturing purposes

Series CEP 7 (separate mounting using adaptor CEP 7-....-P-A)

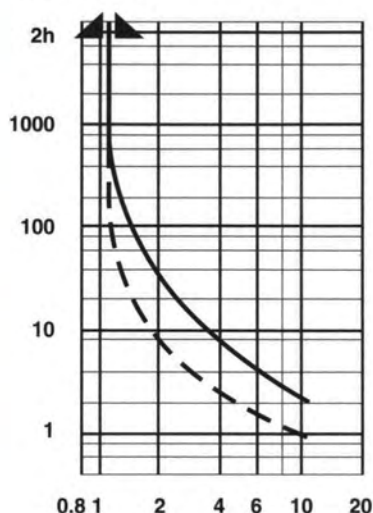


Cat. No.	a Width	b Height	c Depth	d	e
CEP7-37-P-A	45	90	75	30	75

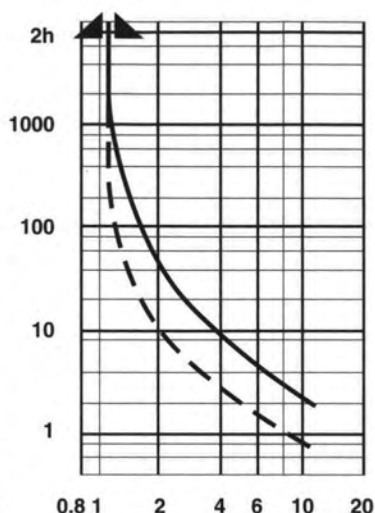
Dimensions are in (mm) and are not intended for manufacturing purposes

CEP 7/CT 4 OVERLOAD GRAPH

CT4-0.1 2.7



CT4-2.7 9.0



CT 4 Thermal Overload Relay (thermally delayed over-current relay).

Mean value of tolerance bands, heated in three phases.

Curves: — from cold state

Curves: - - - in operationally warm state (loaded with the set current).

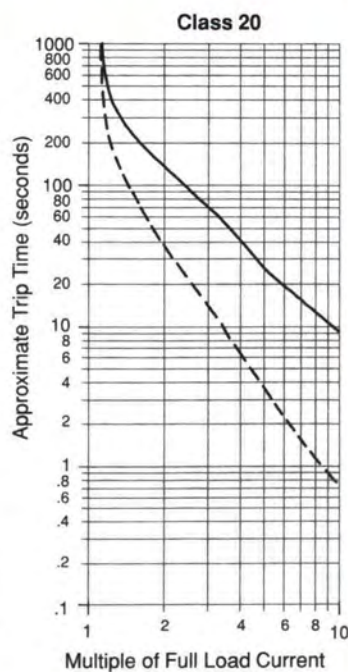
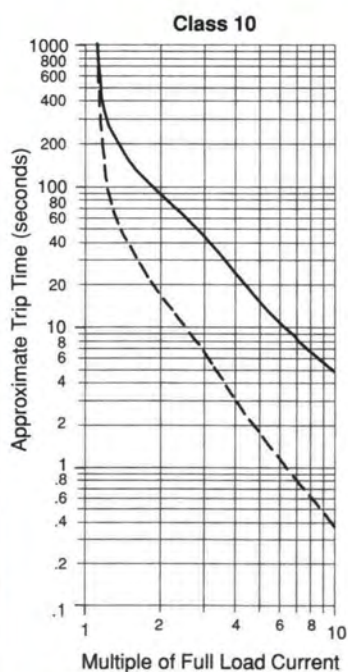
Tolerance: trip time $\pm 20\%$ ($\pm 10\%$ for current).

Function Limits and Temperature Compensation: from $-25\text{ }^{\circ}\text{C}$... $+70\text{ }^{\circ}\text{C}$.

Tripping Limits: specified in IEC 292-1 for $-5\text{ }^{\circ}\text{C}$... $+60\text{ }^{\circ}\text{C}$.

Two Phase Loading (phase failure):
Trip limits 1.05...1.25 of set current I_{ef} in accordance with IEC 292-1. For motors up to 10 kW, the two-phase trip at max. 1.25 I_{ef} guarantees heat build-up limitation to the value which occurs on three phase trip at 1.2 I_{ef} .

Trip Curves for 3Ø Applications (CEP 7-A/M...)



Approximate trip time for 3-phase balanced condition from cold start.

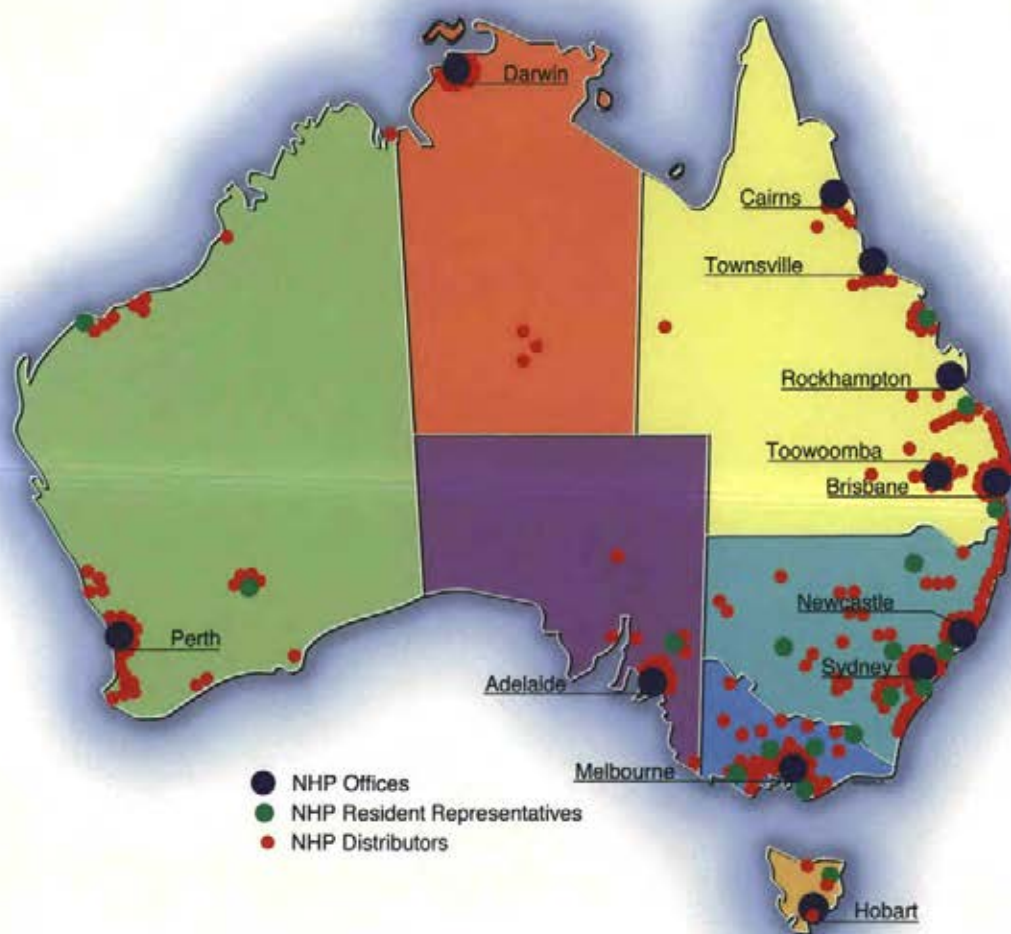
Approximate trip time for 3-phase balanced condition from hot start.

The CEP 7-A/M trip time under single-phase conditions (loss of 1-phase on a 3-phase system) varies according to the percentage of motor load. Estimate 2-3 seconds if phase loss occurs during running condition. If single phase condition is present when the motor is started, estimate 3-8 seconds for motor loads 80 %. Trip times may be extended for motor loads 65-80 % due to cold start CT saturation. Single-phase protection will not function for motor loads $< 65\%$.

The reset time of a CEP 7 set in the automatic mode is approximately 180 seconds.



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CA4 6/02 14M

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Catalogue

F1

January 2003

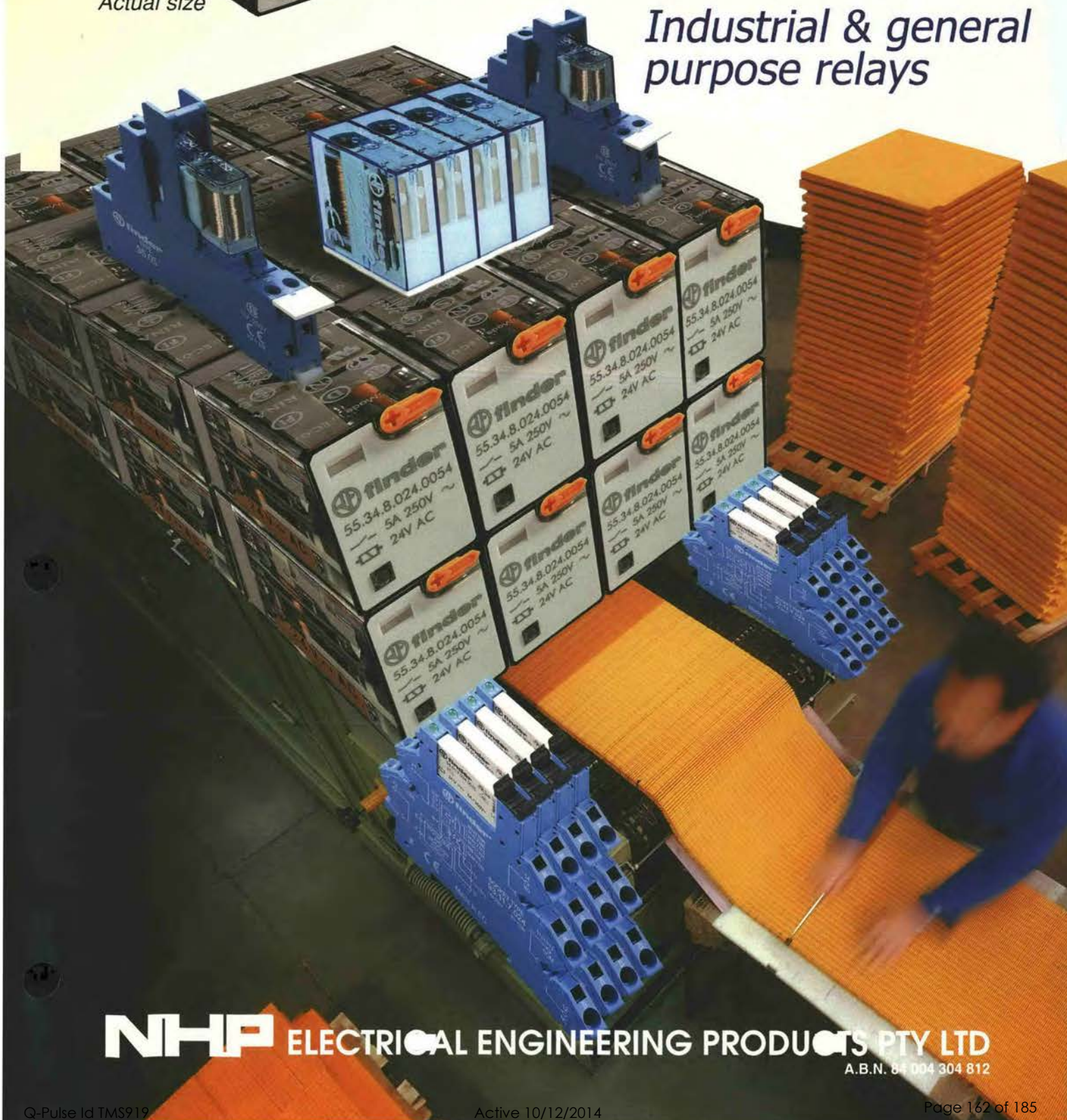
RELAYS & TIMERS
Time controls



Actual size

Relays that take control

*Industrial & general
purpose relays*



NHP ELECTRICAL ENGINEERING PRODUCTS PTY LTD

A.B.N. 81 004 304 812



NHP

The power in relays

Finder is a world leader and pioneer of relay technology. Its 10,000 different products represent one of the most extensive product lines available on the market. Since 1954, Finder has specialised in step relays, miniature and sub-miniature PCB relays, plug-in general purpose and power relays, relay interface modules, timing modules, bases and accessories. Factories located in Italy, France and Spain ensure European manufactured excellence with quality and reliable performance. Finder's commitment to quality is evident in the materials that are selected for the manufacture of its products. Finder exclusively uses thermosetting plastic in its relay and power relay bases. These strict standards adopted by Finder ensure the integrity of the final product over varying operating conditions.

Superior performance, cutting edge technology and reliability put Finder on the forefront of the global relay market.



Production facilities

Finder manufactures its products in four facilities: Its headquarters and main production plant are situated in Almese near Turin, north-west Italy. It has production plants in Sanfront near Cuneo, north-west Italy, in Saint Jean de Maurienne, south-east France and in Valencia, Spain. Some of these manufacturing facilities are located in the

north-west Alps, an area characterised by a strong international outlook and high export achievement. The most recent plant in Eichhoff Reles, Valencia, complements the existing organisation in terms of the plant's manufacturing process and emphasis on product quality.

Approvals

Finder has always followed a product value strategy aimed at constantly increasing quality. Product line reliability has been recognised through approvals by international standards organisations such as the BBJ, BEAB, CSA, DEMKO, FIMKO, GL, GOST, IMQ, IRAM, NEMKO, RINA, SEV, SEMKO, UL, UTE and VDE and through CE certification.

As important as these quality approvals are, Finder considers them no more important than its partnership with customers, who are able to value the quality of its products and after-sales service.



Applications

The extensive Finder product range is designed to meet the requirements of a variety of application areas, such as industrial automation, home appliances, vending machines, air conditioning and heating, building automation and control, domestic installations, and generally wherever power switching is needed.

Product users can rely on

- Ease of installation
- Suitability for a variety of systems



The Australian connection

The alliance of Finder and NHP in Australia has allowed valuable feedback on Australian conditions direct to the manufacturer and has provided Australian industry with world class relay technology.



NHP was formed in 1968 for the purpose of manufacturing, importing and merchandising a wide range of specialised electrical switchgear, motor control and other technical electrical products for Australian industry; including mining and general industries, electrical contractors and government departments.

NHP is a wholly Australian owned company and exclusively represents a considerable number of overseas companies. These companies manufacture complementary equipment to the NHP programme, which includes products locally manufactured in Melbourne.

The head office and Melbourne sales organisation is situated at Richmond, with branch offices in Sydney, Brisbane, Adelaide, Perth, Newcastle, Townsville, Rockhampton, Toowoomba, Cairns, Darwin and Hobart. The company also has a number of regional representatives to service country areas. NHP products are stocked and distributed through more than 500 centres, Australia wide.

The company has an office in Auckland and Christchurch, New Zealand primarily involved in the supply of circuit breakers and panelboards. The range is steadily growing in the enclosures, safety and control & switching products.

As an extensive national sales and service network, the company is able to continue a policy of supplying a vast range of technical electrical equipment, supported by substantial stocks and competent service on a national basis.



NHP has also built a large 5,200 square metre national distribution centre, the first stage of a potential three stage development, which ultimately will result in a 15,000 square metre warehouse and production facility. The facility is located in the middle of the freight corridor between Melbourne airport and the city's docks area to help ensure effective stock delivery and despatch.

NHP continues to be committed to providing an outstanding level of customer service and the staff have been trained over many years to provide a customer friendly environment and be seen to be 'easy to deal with'.

It is the ongoing policy of the company to improve both the range and quality of products and services available for the Australasian market. Experienced engineering, sales and management personnel continually visit world centres of excellence to ensure that the organisation keeps pace with technological advances, research and development and modern marketing techniques.

Finder Relays - A Product Overview



38 Series

Relay Interface Modules - 6A

- Ultra slim for high packing density, only 6.2 mm wide
 - Designed especially for PLC interfacing
 - Integral LED for coil indication and protection circuit
 - Easy relay replacement
- See page 8*



55 Series

Miniature general purpose relays - 7 A & 10 A

- Integral LED
 - 2 & 4 pole available
 - Built in diode for DC versions
- See page 9*



56 Series

Miniature Power Relays - 12 A

- 2 & 4 pole contacts available
 - Simple relay diagnostics using integral LED and lockable test button (2 pole version only)
 - AC & DC coil control
- See page 10*



60 Series

General purpose relays - 10 A

- 2 & 3 changeover contacts available
 - Integral LED and lockable test button for easy relay assessment
 - Plug-in mounting
- See page 11*



62 Series

Power relays - 16 A

- Suitable for high power switching
 - Plug-in or quick connect mounting options
 - 2 & 3 changeover contacts available
- See page 11 & 12*



65 Series

Power relays - 20 A & 30 A

- Quick connect terminals
 - High current switching capability, up to 30 Amps
 - 1 & 2 contact outputs
- See page 13*



40 & 44 Series

Miniature relays - 8 A, 10 A & 16 A

- Mounting flexibility - PCB or plug-in
 - Compact yet capable of high power switching (16 A version)
 - Reliable operation where ambient temperatures are excessive (up to 85 °C)
- See page 14 & 15*



30 Series

Sub-miniature D.I.L. - 1.25 A

- Suitable for harsh environments - IP 67 rating
 - Ideal for switching low signals
 - Designed for PCB mounting
- See page 16*



34 Series

Ultra slim PCB relays - 6 A

- Ultra slim, only 5 mm wide
 - Superior insulation between coil and contacts - 6 kV
 - Coil voltages up to 60 V DC
- See page 16*



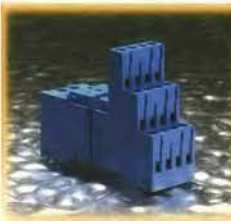
20 & 26 Series

Step relays - 10 A & 16 A

- 1 module wide, DIN rail mounted (20 series)
 - 1 & 2 contact outputs
 - Panel mount available (26 series)
- See page 17*

Relay Bases and Accessories

Finder completes its relay range with an offering of robust bases, jumper links, plug-in LED and diode modules. Each relay series has a specifically designed range of bases to optimise ease of installation and ensure application suitability.



94 Series

Suitable for 55 series

- Trouble shoot with ease - coil and contact terminals separated
 - Easy snap on DIN rail mounting
- See page 18*



96 Series

Suitable for 56 series

- Low projection profile
 - Screw terminals
 - Suitable for 99 series plug-in modules
- See page 18*



90 Series

Suitable for 60 series

- Increased safety with shrouded terminals
 - Easy snap on DIN rail mounting
 - Suitable for 99 series plug-in modules
- See page 19*



92 Series

Suitable for 62 series

- Trouble shoot with ease - coil and contact terminal segregation
 - Easy snap on DIN rail mounting
- See page 20*



95 Series

Suitable for 40 & 44 series

- Increased safety with shrouded terminals
 - Easy snap on DIN rail mounting
 - Suitable for 99 series plug-in modules
- See page 19*



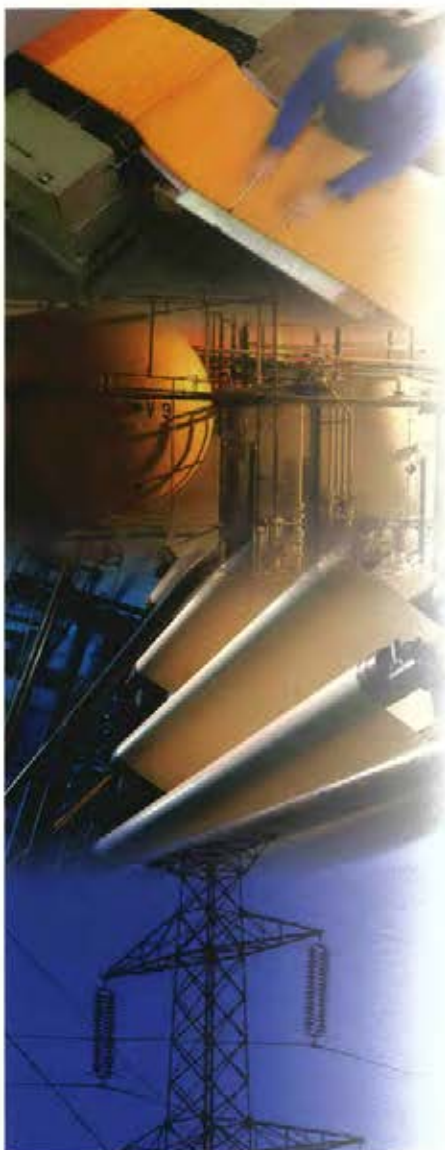
Jumperlinks are available for 38 series relay interface modules and 40 and 44 series plug-in relay where multi-pole units are mounted side by side. This eliminates the need for crowded wiring and reduces installation costs.

See pages 8 and 19

LED and Diode Module Systems

Finder place great importance on versatility of product application and modular capability.

The technology behind each relay and base allows the user to customise the relay package with the addition of plug-in LED and diode modules. This means that circuit changes will not necessarily require relay replacement. Finder's forward thinking and industry acumen guarantees a user friendly product.

**55 Series****56 Series****60 Series**

Finder's 55, 56 and 60 series relay ranges are used in a myriad of applications for all industries;

- marine
- food
- chemical
- pharmaceutical
- petrochemical
- pulp and paper and many others.

Their small presentation and high power switching capabilities make them versatile and user friendly. Finder has further developed the relays to enhance ease of installation, testing and use.

The lockable test button feature is integral to the 55 series miniature general purpose relay, 56 series miniature power relay (2 pole version only) and 60 series general purpose relay.

Lockable test button - maintenance made easy



The dual purpose Finder test button can be used in two ways:

Case 1 The plastic pip (located directly above the test button) remains intact. In this case when the test button is pushed, the contacts operate. When the test button is released the contacts return to their former state.

Case 2 The plastic pip is broken off (using an appropriate cutting tool). In this case, (in addition to the above function) when the test button is pushed and rotated, the contacts are latched in the operating state and remain so until the test button is rotated back to its former position.

It is important to note that in both cases the test button actuation should be swift and decisive.

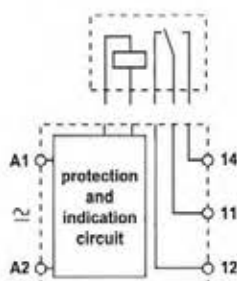
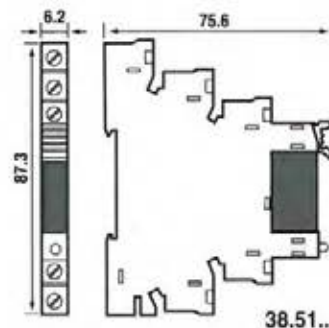
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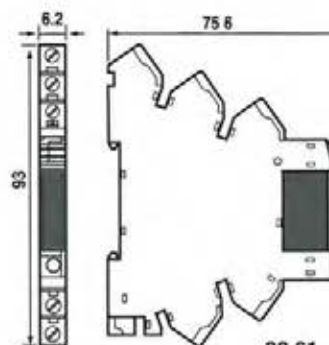
38 Series - The New Generation

6 A**Technical Data**

Nominal coil voltage	AC	24, 110, 240
	DC	12, 24, 110
Nominal coil sensitivity		0.3 W
Coil operating range	AC/DC	(1.4...1.6) U_N
Rated AC 1 load		1500 VA
Rated AC 15 load (230 V AC)		300 VA
Single phase motor rating		—
Breaking capacity in DC 1 30/110/220 V		6/0.2/0.15 A
Mechanical life	DC cycles	10.10 ⁶
Operating time	Energise	7ms
	De-energise	11 ms
Ambient temperature		-40 °C to 55 °C

**Connection Diagram****Dimensions (mm)**

38.51...



38.61...

Cat. No.	Contact config.	Amps (AC 1)
38.51...V AC/DC	1 C/O	6 A
38.51...V DC	1 C/O	6 A
38.61...V AC/DC	1 C/O	6 A
38.61...V DC	1 C/O	6 A

Accessories**NEW****20 way jumper link**

- Connection up to 20 modules with one link (121.5 mm)

Cat. No. 93.20

NEW**Identification labels**

- 64 labels in one pack
- Reduce troubleshooting maintenance and repair

Cat. No. 93.64

NEW**Plastic isolation plate**

- For the Isolation of varying voltages on one DIN rail (2 mm thick)

Cat. No. 93.01



Miniature General Purpose Relays - Plug-in

55 Series - 2 Pole

10 A



Lockable test
button, mechanical
flag & LED

Technical Data

Nominal coil voltage	AC	12, 24, 240 V
	DC	12, 24, 48, 110 V
Nominal coil sensitivity		1.5 VA / 1 W
Coil operating range	AC	(0.8...1.1) V_N
	DC	(0.8...1.1) V_N
Rated AC 1 load		2500 VA
Rated AC 15 load (230 V AC)		500 VA
Single phase motor rating (230 V AC)		0.37 kW
Breaking capacity in DC 1 30/110/220 V		10/0.25/0.12 A
Mechanical life	AC/DC cycles	20.10 ⁶ /50.10 ⁶
Operating time	Energise	10 ms
	De-energise	15 ms
Ambient temperature		-40 °C to +70 °C

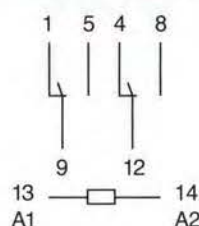
Cat. No.	Contact config.	Amps (AC 1)
55.320054...V AC	2 C/O	10 A
55.320074...V DC	2 C/O	10 A

Bases and accessories

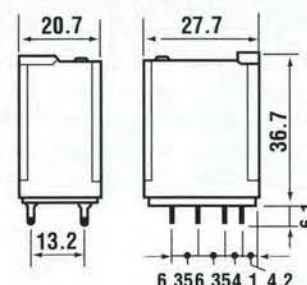
94.02 screw terminal base

Refer to page 18 for more details.

Connection Diagram



Dimensions (mm)



55 Series - 4 Pole

7 A



Lockable test
button, mechanical
flag & LED

Technical Data

Nominal coil voltage	AC	12, 24, 240 V
	DC	12, 24, 48, 110 V
Nominal coil sensitivity		1.5 VA/1 W
Coil operating range	AC	(0.8...1.1) U_N
	DC	(0.8...1.1) U_N
Rated AC 1 load		1750 VA
Rated AC 15 load (230 V AC)		350 VA
Single phase motor rating		0.125 kW
Breaking capacity in DC 1 30/110/220 V		7/0.25/0.12 A
Mechanical life	AC/DC cycles	20.10 ⁶ /50.10 ⁶
Operating time	Energise	10 ms
	De-energise	15 ms
Ambient temperature		-40 °C to +70 °C

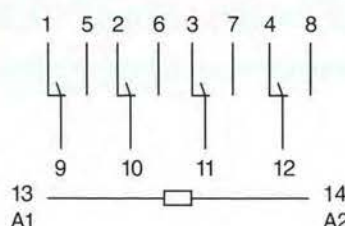
Cat. No.	Contact config.	Amps (AC 1)
55.34.0054...V AC	4 C/O	7 A
55.34.0074...V DC	4 C/O	7 A

Bases and accessories

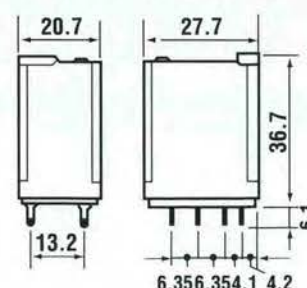
94.04 screw terminal base

Refer to page 18 for more details.

Connection Diagram



Dimensions (mm)



56 Series - 2 Pole

12 A

Lockable test
button, mechanical
flag & LED



Technical Data

Nominal coil voltage	AC	12, 24, 240 V
	DC	12, 24, 48, 110 V
Nominal coil sensitivity		1.5 VA / 1 W
Coil operating range	AC	(0.8...1.1) U_N
	DC	(0.85...1.1) U_N
Rated AC 1 load		3000 VA
Rated AC 15 load (230 V AC)		500 VA
Single phase motor rating (230 V AC)		0.55 kW
Breaking capacity in DC 1 30/110/220 V		12/0.25/0.12 A
Mechanical life	AC/DC cycles	20.10 ⁶ /50.10 ⁶
Operating time	Energise	10 ms
	De-energise	15 ms
Ambient temperature		-40 °C to +70 °C

Cat. No. Contact config. Amps (AC 1)

56.32.0054...V AC 2 C/O 12 A

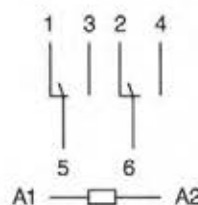
56.32.0074...V DC 2 C/O 12 A

Bases and accessories

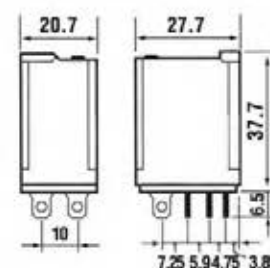
96.72 screw terminal base

Refer to page 19 for more details.

Connection Diagram



Dimensions (mm)



56 Series - 4 Pole

12 A

4 Contact
Outputs



Technical Data

Nominal coil voltage	AC	12, 24, 240 V
	DC	12, 24, 48, 110 V
Nominal coil sensitivity		2 VA / 1.3 W
Coil operating range	AC	(0.8...1.1) U_N
	DC	(0.85...1.1) U_N
Rated AC 1 load		3000 VA
Rated AC 15 load (230 V AC)		500 VA
Single phase motor rating		0.55 kW
Breaking capacity in DC 1 30/110/220 V		12/0.25/0.12 A
Mechanical life	AC/DC cycles	20.10 ⁶ /50.10 ⁶
Operating time	Energise	15 ms
	De-energise	15 ms
Ambient temperature		-40 °C to +70 °C

Cat. No. Contact config. Amps (AC 1)

56.34...V AC(V DC) 4 C/O 12 A

Bases and accessories

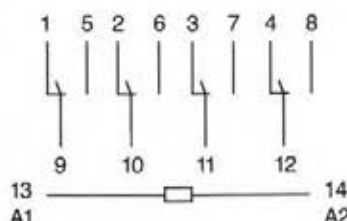
96.74 screw terminal base

99.010 LED module plug-in

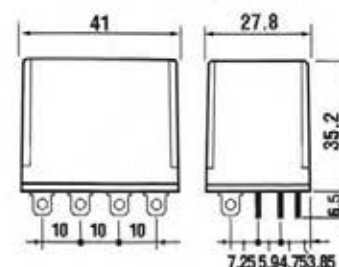
99.013 LED and diode module plug-in (DC only)

Refer to page 19 for more details.

Connection Diagram



Dimensions (mm)



60 Series - 2 & 3 Pole

10 A



Technical Data

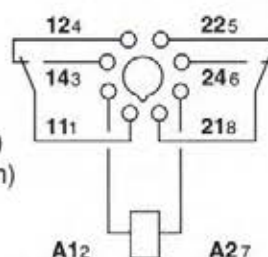
Nominal coil voltage	AC	12, 24, 240 V
	DC	12, 24, 48, 110 V
Nominal coil sensitivity		2.2 VA / 1.3 W
Coil operating range	AC	(0.8...1.1) U_N
	DC	(0.8...1.1) U_N
Rated AC 1 load		2500 VA
Rated AC 15 load (230 V AC)		500 VA
Single phase motor rating		0.37 kW
Breaking capacity in DC 1 30/110/220 V		10/0.4/0.15 A
Mechanical life	AC/DC cycles	20.10 ⁶ /50.10 ⁶
	Energise	15 ms
Operating time	De-energise	15 ms
Ambient temperature		-40 °C to +70 °C

Cat. No.	Contact config.	Amps (AC 1)
60.12...V AC(V DC)	2 C/O	10 A
60.13...V AC(V DC)	3 C/O	10 A

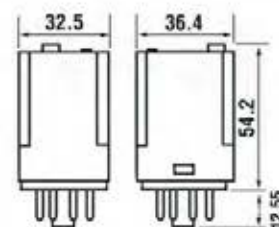
Bases and accessories

90.20 DIN rail mount base shrouded terminals for 60.12 (8 pin)
 90.21 DIN rail mount base shrouded terminals for 60.13 (11 pin)
 Refer to page 19 for more details.

Connection Diagram



Dimensions (mm)



62 Series - 2 & 3 Pole

16 A



Technical Data

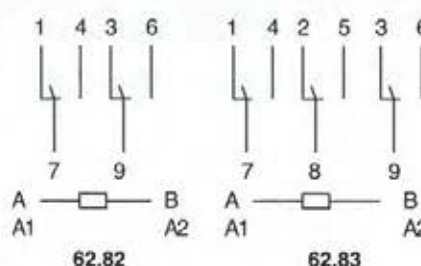
Nominal coil voltage	AC	24, 110, 240 V
	DC	12, 24, 48, 110 V
Nominal coil sensitivity		2.2 VA / 1.3 W
Coil operating range	AC	(0.8...1.1) U_N
	DC	(0.8...1.1) U_N
Rated AC 1 load		4000 VA
Rated AC 15 load (230 V AC)		750 VA
Single phase motor rating (230 V AC)		0.8 kW
Breaking capacity in DC 1 30/110/220 V		16/0.6/0.4 A
Mechanical life	AC/DC cycles	10.10 ⁶ /30.10 ⁶
	Energise	20 ms
Operating time	De-energise	20 ms
Ambient temperature		-40 °C to +70 °C

Cat. No.	Contact config.	Amps (AC 1)
62.32...V AC(V DC)	2 C/O	16 A
62.33...V AC(V DC)	3 C/O	16 A

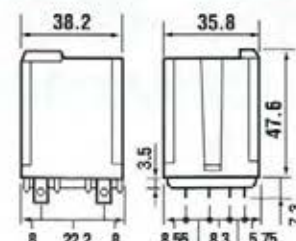
Bases and accessories

92.03 screw terminal base
 99.020 LED module plug-in
 99.029 LED and diode module plug-in
 Refer to page 19 for more details.

Connection Diagram



Dimensions (mm)



62 Series - 2 & 3 Pole

16 A



Flange Mount

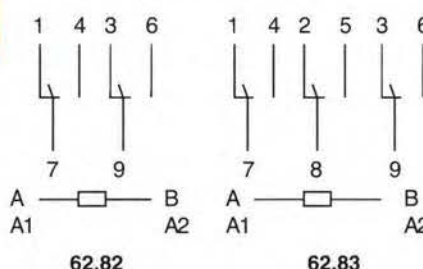
Technical Data

Nominal coil voltage	AC	12, 24, 110, 240 V
	DC	12, 24, 110 V
Nominal coil sensitivity		2.2 VA /1.3 W
Coil operating range	AC	(0.8...1.1) U _N
	DC	(0.8...1.1) U _N
Rated AC 1 load		4000 VA
Rated AC 15 load (230 V AC)		750 VA
Single phase motor rating (230 V AC)		0.8 kW
Breaking capacity in DC 1 30/110/220 V		16/0.6/0.4 A
Mechanical life	AC/DC cycles	10.10 ⁶ /30.10 ⁶
Operating time	Energise	20 ms
	De-energise	20 ms
Ambient temperature		-40 °C to +70 °C

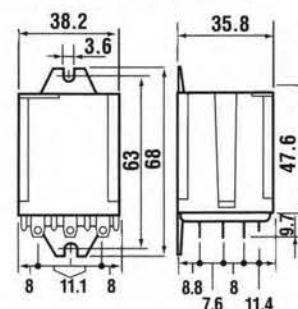
Cat. No.	Contact config.	Amps (AC 1)
62.82.0040...V AC(V DC)	2 C/O	16 A
62.83.0040...V AC(V DC)	3 C/O	16 A

Bases and accessories
Not required

Connection Diagram



Dimensions (mm)



62 Series - 2 & 3 Pole

16 A



DIN Rail Mount

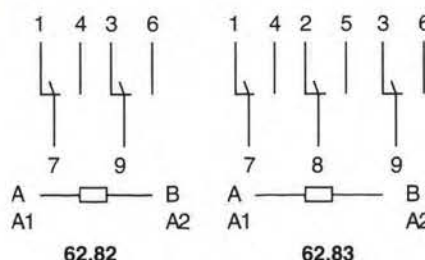
Technical Data

Nominal coil voltage	AC	24, 110, 240 V
	DC	24, 110 V
Nominal coil sensitivity		2.2 VA /1.3 W
Coil operating range	AC	(0.8...1.1) U _N
	DC	(0.8...1.1) U _N
Rated AC 1 load		4000 VA
Rated AC 15 load (230 V AC)		750 VA
Single phase motor rating		0.8 kW
Breaking capacity in DC 1 30/110/220 V		16/0.6/0.4 A
Mechanical life	AC/DC cycles	10.10 ⁶ /30.10 ⁶
Operating time	Energise	20 ms
	De-energise	20 ms
Ambient temperature		-40 °C to +70 °C

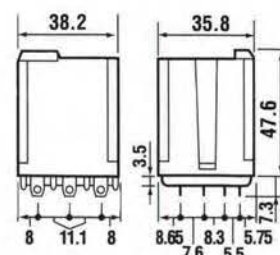
Cat. No.	Contact config.	Amps (AC 1)
62.82.0048...V AC(V DC)	2 C/O	16 A
62.83.0048...V AC(V DC)	3 C/O	16 A

Bases and accessories
Not required

Connection Diagram



Dimensions (mm)



65 Series - 2 Pole

20 A

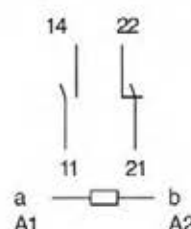
Technical Data

Nominal coil voltage	AC	12, 24, 110, 240 V
	DC	12, 24, 110 V
Nominal coil sensitivity		2.2 VA / 1.3 W
Coil operating range	AC	(0.8...1.1) U_N
	DC	(0.85...1.1) U_N
Rated AC 1 load		5000 VA
Rated AC 15 load (230 V AC)		1000 VA
Single phase motor rating (230 V AC)		1.1 kW
Breaking capacity in DC 1 30/110/220 V		20/0.8/0.5 A
Mechanical life	AC/DC cycles	10.10 ⁶ /30.10 ⁶
Operating time	Energise	20 ms
	De-energise	20 ms
Ambient temperature		-40 °C to +50 °C

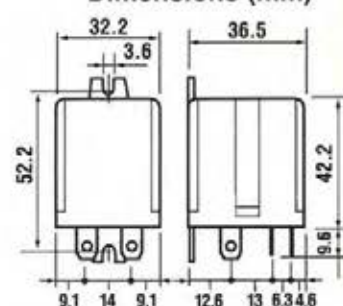
Cat. No.	Contact config.	Amps (AC 1)
65.31...V AC(V DC)	1 N/O + 1 N/C	20 A

Bases and accessories
Not required

Connection Diagram



Dimensions (mm)



65 Series - 1 Pole

30 A

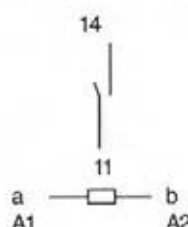
Technical Data

Nominal coil voltage	AC	110, 240 V
	DC	12, 24, 110 V
Nominal coil sensitivity		2.2 VA / 1.3 W
Coil operating range	AC	(0.8...1.1) U_N
	DC	(0.8...1.1) U_N
Rated AC 1 load		7500 VA
Rated AC 15 load (230 V AC)		1250 VA
Single phase motor rating		1.5 kW
Breaking capacity in DC 1 30/110/220 V		30/1.1/0.7 A
Mechanical life	AC/DC cycles	10.10 ⁶ /30.10 ⁶
Operating time	Energise	25 ms
	De-energise	—
Ambient temperature		-40 °C to +50 °C

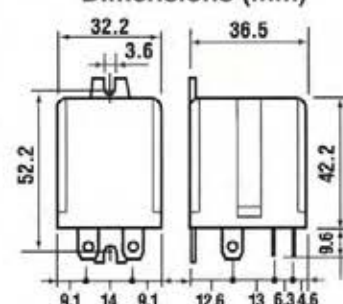
Cat. No.	Contact config.	Amps (AC 1)
65.31M...V AC(V DC)	1 N/O	30 A

Bases and accessories
Not required

Connection Diagram

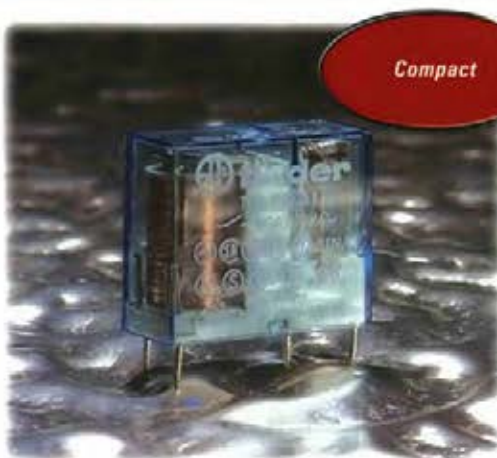


Dimensions (mm)



40 Series - 1 Pole

10 A



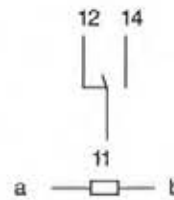
Compact

Technical Data

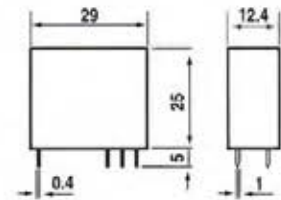
Nominal coil voltage	AC	24, 240 V
	DC	12, 24, 48, 110 V
Nominal coil sensitivity		1.2 VA / 0.65 W
Coil operating range	AC	(0.8...1.1) U_N
	DC	(0.73...1.5) U_N
Rated AC 1 load		2500 VA
Rated AC 15 load (230 V AC)		500 VA
Single phase motor rating		0.37 kW
Breaking capacity in DC 1 30/110/220 V		10/0.3/0.12 A
Mechanical life	AC/DC cycles	10.10 ⁶ /20.10 ⁶
Operating time	Energise	10 ms
	De-energise	10 ms
Ambient temperature		-40 °C to +85 °C

Cat. No.	Contact config.	Amps (AC 1)
40.51...V AC(V DC)	1 C/O	10 A

Connection Diagram



Dimensions (mm)



Bases and accessories

95.05 screw terminal base

95.18 jumperlink 8 way

99.01 LED module plug-in

99.013 LED and diode module plug-in

Refer to page 20 for more details.

40 Series - 2 Pole

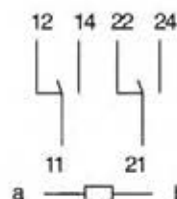
8 A

PCB Mount
or Plug-in

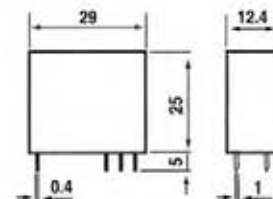
Technical Data

Nominal coil voltage	AC	24, 240 V
	DC	12, 24, 48, 110 V
Nominal coil sensitivity		1.2 VA / 0.65 W
Coil operating range	AC	(0.8...1.1) U_N
	DC	(0.73...1.5) U_N
Rated AC 1 load		2000 VA
Rated AC 15 load (230 V AC)		400 VA
Single phase motor rating		0.3 kW
Breaking capacity in DC 1 30/110/220 V		8/0.3/0.12 A
Mechanical life	AC/DC cycles	10.10 ⁶ /20.10 ⁶
Operating time	Energise	10 ms
	De-energise	10 ms
Ambient temperature		-40 °C to +85 °C

Connection Diagram



Dimensions (mm)



Cat. No.	Contact config.	Amps (AC 1)
40.52...V AC(V DC)	2 C/O	8 A

Bases and accessories

95.05 screw terminal base

95.18 jumperlink 8 way

99.01 LED module plug-in

99.013 LED and diode module plug-in

Refer to page 20 for more details.

Miniature Relays - PCB & Plug-in

40 Series - 1 Pole

16 A



*Suitable for
high power
switching*

Technical Data

Nominal coil voltage	AC	–
	DC	12, 24 V
Nominal coil sensitivity		0.65 W
Coil operating range	DC	(0.73...1.5) U _N
Rated AC 1 load		4000 VA
Rated AC 15 load (230 V AC)		750 VA
Single phase motor rating		0.55 kW
Breaking capacity in DC 1 30/110/220 V		16/0.3/0.12 A
Mechanical life	AC/DC cycles	20.10 ⁶
Operating time	Energise	10 ms
	De-energise	10 ms
Ambient temperature		-40 °C to +85 °C

Cat. No.	Contact config.	Amps (AC 1)
40.61...V DC	1 C/O	16 A

Bases and accessories

95.05 screw terminal base

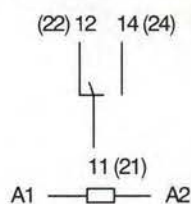
95.18 8 way jumperlink

99.01 LED module plug-in

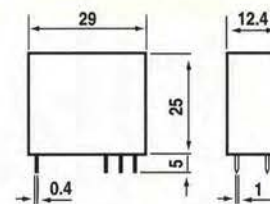
99.013 LED and diode module plug-in

Refer to page 20 for more details.

Connection Diagram



Dimensions (mm)



44 Series - 2 Pole

10 A



*Reliable
operation in high
temperature*

Technical Data

Nominal coil voltage	AC	–
	DC	12, 24 V
Nominal coil sensitivity		0.65 W
Coil operating range	DC	(0.73...1.5) U _N
Rated AC 1 load		2500 VA
Rated AC 15 load (230 V AC)		500 VA
Single phase motor rating		0.37 kW
Breaking capacity in DC 1 30/110/220 V		10/0.3/0.12 A
Mechanical life	DC cycles	20.10 ⁶
Operating time	Energise	10 ms
	De-energise	12 ms
Ambient temperature		-40 °C to +85 °C

Cat. No.	Contact config.	Amps (AC 1)
44.62...V DC	2 C/O	10 A

Bases and accessories

95.05 screw terminal base

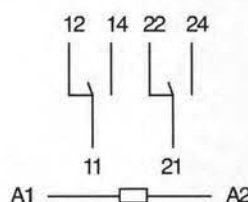
95.18 8 way jumperlink

99.01 LED module plug-in

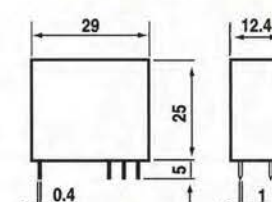
99.013 LED and diode module plug-in

Refer to page 20 for more details.

Connection Diagram



Dimensions (mm)



Sub-miniature Relays - PCB Mount

34 Series

6 A



Technical Data

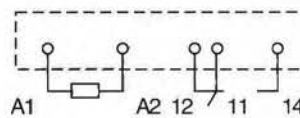
Nominal coil voltage	AC	—
	DC	12, 24, 48, 60 V
Nominal coil sensitivity		0.17 W
Coil operating range		(0.7...2) U_N
Rated AC 1 load		1500 VA
Rated AC 15 load (230 V AC)		750 VA
Single phase motor rating		—
Breaking capacity in DC 1 30/110/220 V	DC cycles	6/0.2/0.12 A
Mechanical life	Energise	10.10 ⁶
Operating time	De-energise	7 ms
		8 ms
Ambient temperature		-40 °C to +80 °C

Cat. No.	Contact config.	Amps (AC 1)
34.51...V DC	1 C/O	6 A

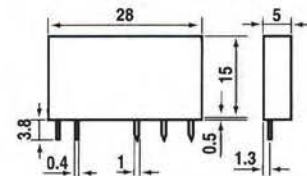
Bases and accessories

Refer to 38.51 PLC interface relay page for complete unit ordering.

Connection Diagram



Dimensions (mm)



30 Series

1.25 A



Technical Data

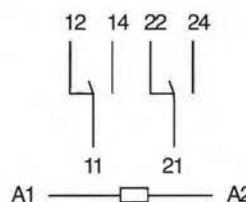
Nominal coil voltage	AC	—
	DC	12, 24 V
Nominal coil sensitivity		0.2 W
Coil operating range	DC	(0.7...1.9) V_N
Rated AC 1 load		125 VA
Rated AC 15 load (230 V AC)		25 VA
Single phase motor rating		—
Breaking capacity in DC 1 30/110/220 V	DC cycles	2/0.3/- A
Mechanical life	Energise	10.10 ⁶
Operating time	De-energise	15 ms
		10 ms
Ambient temperature		-40 °C to +70 °C

Cat. No.	Contact config.	Amps (AC 1)
30.22...V DC	2 C/O	1.25 A

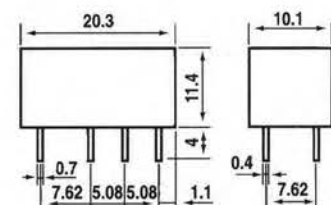
Bases and accessories

Not required

Connection Diagram



Dimensions (mm)



Step Relays - DIN Rail Mount

20 Series

16 A



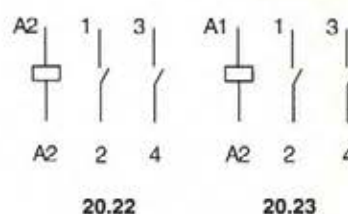
One module wide
(17.5 mm) Integral
ID Tag

Technical Data

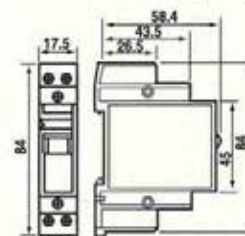
Nominal coil voltage	AC	24, 240 V
	DC	24 V
Nominal coil sensitivity		5.5 V / 5 W
Coil operating range	AC	(0.85...1.1) U_N
	DC	(0.9...1.1) U_N
Rated AC 1 load		4000 VA
Rated AC 15 load (230 V AC)		750 VA
Nominal lamp ratings		1.1 kW
	Incandescent (230 V AC)	2000 W
	Compensate fluorescent (230 V AC)	750 W
	Halogens (230 V AC)	2000 W
	Uncompensated fluorescents (230 V AC)	1000 W
Mechanical life cycles		300.10 ³
Maximum impulse duration		1 hr
Ambient temperature		-40 °C to +40 °C

Cat. No.	Contact config.	Amps (AC 1)
20.22...V AC(V DC)	2 N/O	16 A
20.23...V AC(V DC)	1 N/O + 1 N/C	16 A

Connection Diagram



Dimensions (mm)



26 Series

10 A



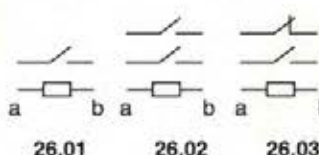
1 & 2 pole
models available

Technical Data

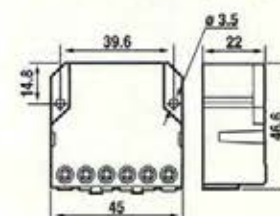
Nominal coil voltage	AC	24, 240 V
	DC	—
Nominal coil sensitivity		4.5 VA
Coil operating range	AC	(0.8...1.1) U_N
	DC	—
Rated AC 1 load		2500 VA
Rated AC 15 load (230 V AC)		500 VA
Nominal lamp ratings		
	Incandescent (230 V AC)	800 kW
	Compensate fluorescent (230 V AC)	360 W
	Halogens (230 V AC)	800 W
	Uncompensated fluorescents (230 V AC)	500 W
Mechanical life cycles		300.10 ³
Maximum impulse duration		1 hr
Ambient temperature		-40 °C to +50 °C

Cat. No.	Contact config.	Amps (AC 1)
26.01...V AC(V DC)	1 N/O	10 A
26.02...V AC(V DC)	2 N/O	10 A
26.03...V AC(V DC)	1 N/O + 1 N/C	10 A

Connection Diagram



Dimensions (mm)



55 Series



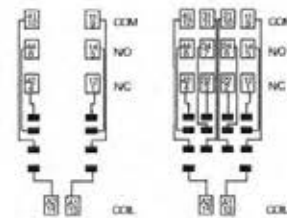
NEW coil & contact terminals separated

Cat. No.
94.02

DIN rail mounting base with open terminals
For use with - 55.32
(2 C/O, 8 pin) relay

Note: For the full range of bases, please consult NHP, Part A price list catalogue, section 9

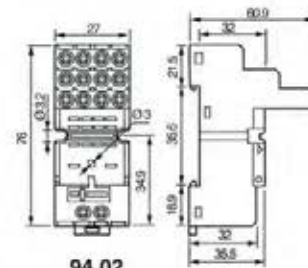
Base configuration



94.02

94.04

Dimensions (mm)

94.02
94.04

NEW coil & contact terminals separated

Cat. No.
94.04

DIN rail mounting base with open terminals
For use with - 55.34
(4 C/O, 11 pin) relay

Note: For the full range of bases, please consult NHP, Part A price list catalogue, section 9



Cat. No.
94.06

Jumper link 6 way 10 A, 250 V For use with -
94.02 & 94.04 relay bases

56 Series

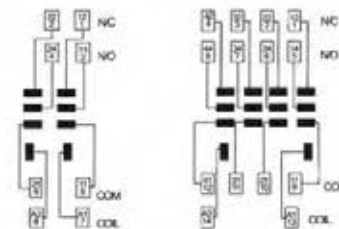


Cat. No.
96.72

DIN rail mounting base with open terminals
For use with - 56.32
(2 C/O, 8 pin) relay

Note: For the full range of bases, please consult NHP, Part A price list catalogue, section 9

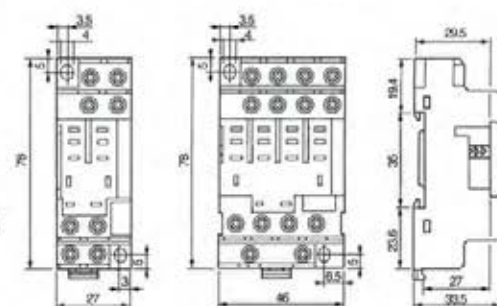
Base configuration



96.72

96.74

Dimensions (mm)



96.72

96.74



Cat. No.
96.74

DIN rail mounting base with open terminals
For use with - 56.34
(4 C/O, 11 pin) relay

Note: For the full range of bases, please consult NHP, Part A price list catalogue, section 9

60 Series



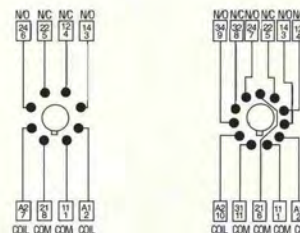
*Slim design
38 mm wide*

Cat. No.
90.20

DIN rail mounting base with
shrouded terminals
(for round pin)
For use with - 60.12
(2 C/O, 8 pin) relay
Dimensions below

Note: For the full range of
bases, please consult NHP, Part A
price list catalogue, section 9

Base configuration



90.20

90.21



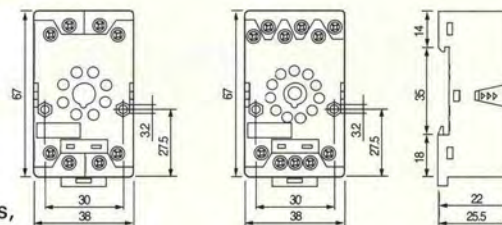
*Slim design
38 mm wide*

Cat. No.
90.21

DIN rail mounting base with
shrouded terminals
(for round pin)
For use with - 60.13
(3 C/O, 11 pin) relay
Dimensions below

Note: For the full range of bases,
please consult NHP, Part A
price list catalogue, section 9

Dimensions (mm)



90.20

90.21

40 & 44 Series



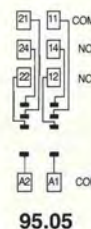
*Integral locking
and release lever*

Cat. No.
95.05

DIN rail mounting base with
shrouded terminals
For use with - 40.51, 40.52
40.61, 44.62

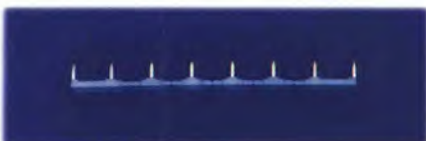
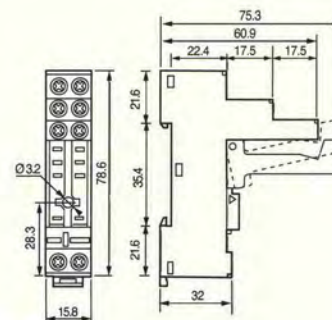
Note: For the full range of
bases, please consult NHP, Part A
price list catalogue, section 9

Base configuration



95.05

Dimensions (mm)



Cat. No.
95.18

Jumper link 8 way 10 A, 250 V
For use with 95.05 bases

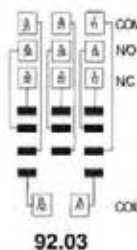
62 Series



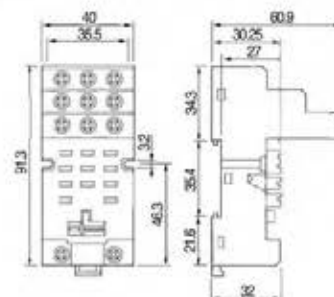
92.03

DIN rail mounting base with screw terminals
For use with -
62.32 (2 C/O, 8 pin) relay
62.33 (3 C/O, 11 pin) relay
Dimensions below
Note: For other bases available, consult NHP Part A price list catalogue section 9

Base configuration



Dimensions (mm)



99 Series Plug-in Modules

99 Series

LED and diode module system 99 Series

The 99 series miniature module system introduces a totally new and innovative concept in LED indication and diode suppression for plug-in relays.

The 99.02 series is a new range that is interchangeable with 92.03, 94.02 and 94.04, offering a tamperproof feature where the relay must be removed before the module can be accessed.

NEW



99.020 module LED only

024 6-24 V AC/DC
060 25-60 V AC/DC
240 61-240 V DC
61-110 V DC
Suits 40 & 44 Series (95.75 base)

NEW



99.029 module LED & diode

024 6-24 V DC
060 25-60 V DC
110 61-110 V DC
Suits 62, 55 & 56 Series (92.03, 94.02 & 94.04 bases)

The miniature modules provide an LED only type, diode only and LED and diode combined. The 99.01 series is interchangeable with 96.72, 96.74 and 95.75 bases.



99.010 module LED only

024 6-24 V AC/DC
060 25-60 V AC/DC
240 61-240 V DC
61-110 V DC

99.013000 diode only
DC Voltages only

99.013 module LED & diode

024 6-24 V AC/DC
060 25-60 V AC/DC
110 61-110 V DC

Note: Modules are not required for 55.32, 55.34 and 56.32 as these come complete with integral LED, mechanical flag, press to test button and diode (DC versions only).

Rated load @ AC 1 - the maximum AC resistive switching power (VA) that a contact is capable of carrying, making and breaking repeatedly. It is the product of rated current and rated voltage.

Rated load @ AC 15 - the maximum AC inductive switching power (VA) that a contact is capable of carrying, making and breaking repeatedly.

Single phase motor rating - the nominal value of motor power that a relay can switch according to AS 3947. If reversing motor direction, always allow an immediate break > 300 ms, otherwise an extensive inrush peak current may occur, causing contact welding.

Breaking capacity in DC 1 - the maximum value of DC resistive current that contacts can switch depending on the value of the local voltage.

Nominal voltage - the nominal value of coil voltage for which the relay has been designed and for which operation has been intended.

Nominal coil sensitivity - the DC power (W) or the apparent power value (VA) which is absorbed by the coil at 23 °C and at rated value. This is a short time value (not steady state).

Mechanical life - the test performed by energising the coils of several relays at 8 cycles per second without any load applied to the contacts. It establishes the ultimate durability of the relay where mechanical wear of the contacts is not an issue. The maximum electrical life may approach the mechanical life where contact loading is very small.

Operating time - the maximum operate time of contacts with the coil energised at rated voltage. This includes bounce time.

Rated lamps load - maximum incandescent and fluorescent lamp ratings for 230 V AC supply voltage. Fluorescent lamps compensate to $\cos \phi \geq 0.9$.

Coil Specifications

30 Series - Sub-miniature D.I.L. Relays 1.25 A

DC VERSION DATA (0.2 W sensitive)

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
5	3.5	9.5	125	40
6	4.2	11.4	180	33
9	6.3	17.1	405	22
12	8.4	22.8	720	16
24	16.8	45.6	2,880	8.3
48	33.6	91.2	11,520	4.1

34 Series - Ultra-Slim P.C.B. Relays 6 A

DC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
5	3.5	11.4	130	38.4
12	8.4	26.4	840	14.2
24	16.8	52.8	3,350	7.1
48	33.6	105	12,300	3.9
60	42	132	19,700	3

38 Series- Relay Interface Modules 6 A

AC/DC VERSION DATA

Nominal voltage	Operating range		Rated coil absorption	Rated coil absorption
U_N	U_{min}	U_{max}	I at U_N	I at U_N
V	V	V	mA	W
12	9.6	13.2	19	0.2
24	19.2	26.4	12	0.3
48	38.4	52.8	9	0.4
60	48	66	7	0.5
110...125	88	138	5(*)	0.6(*)
230...240	184	264	4(*)	0.9(*)

(*) Normal absorption and power absorption values relate at $U_N = 125$ and 240 V

40 Series - Miniature P.C.B. Relays 8 -10 - 16 A

AC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	4.8	6.6	21	168
12	9.6	13.2	80	90
24	19.2	26.4	320	45
48	38.4	52.8	1,350	21
60	48	66	2,100	16.8
110	88	121	6,900	9.4
120	96	132	9,000	8.4
230	184	253	28,000	4.5
240	192	264	31,500	4.1

DC VERSION DATA (0.65 W standard)

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
5	3.65	7.5	38	130
6	4.4	9	55	109
7	5.1	10.5	75	93
9	6.6	13.5	125	72
12	8.8	18	220	55
14	10.2	21	300	47
18	13.1	27	500	36
21	15.3	31.5	700	30
24	17.5	36	900	27
28	20.5	42	1,200	23
36	26.3	54	2,000	18
48	35	72	3,500	14
60	43.8	90	5,500	11
90	65.7	135	12,500	7.2
110	80.3	165	18,000	6.1

44 Series - Miniature P.C.B. Relays 6 -10 A

DC VERSION DATA (0.65 W standard)

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	4.4	9.5	55	109
9	6.6	13.5	125	72
12	8.8	18	220	55
14	10.2	21	300	47
24	17.5	36	900	27
28	20.5	42	1,200	23
48	35	72	3,500	14
60	43.8	90	5,500	11
110	80.3	165	18,000	6.1

55 Series - Miniature General Purpose Relays 5 -10 A

AC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N (50Hz)
V	V	V	Ω	mA
6	4.8	6.6	12	230
12	9.6	13.2	50	117
24	19.2	26.4	190	58.3
48	38.4	52.8	770	29.2
60	48	66	1,200	23.3
110	88	121	4,000	12.7
120	96	132	4,700	11.3
230	184	253	17,000	6.1
240	192	264	19,100	5.8

DC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	4.8	6.6	40	150
12	9.6	13.2	140	86
24	19.2	26.4	600	40
48	38.4	52.8	2,400	20
60	48	66	4,000	15
110	88	121	12,500	8.8

56 Series - Miniature Power Relays 12

AC VERSION DATA (2 CO - DPDT, 2 NO - DPST-NO)

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	4.8	6.6	12	230
12	9.6	13.2	50	117
24	19.2	26.4	190	58.3
48	38.4	52.8	770	29.2
60	48	66	1,200	23.3
110	88	121	3,940	12.7
120	96	132	4,700	10.8
230	184	253	17,000	6.1
240	192	264	19,100	5.8

DC VERSION DATA (2 CO - DPDT)

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	5.1	6.6	44	150
12	10.2	13.2	140	86
24	20.4	26.4	600	40
48	40.8	52.8	2,400	20
60	51	66	4,000	15
110	93.5	121	12,500	8.8

Coil Specifications

56 Series - Miniature Power Relays 12 A

AC VERSION DATA (4 CO - 4PDT)

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	4.8	6.6	6	290
12	9.6	13.2	23	150
24	19.2	26.4	80	75
48	38.4	52.8	380	36
60	48	66	600	26
110	88	121	1,900	16.5
120	96	132	2,600	13.4
230	184	253	8,000	7.2
240	192	264	10,500	6.9

DC VERSION DATA (4 CO - 4PDT)

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	5.1	6.6	33	180
12	10.2	13.2	123	92
24	20.4	26.4	500	46
48	40.8	52.8	1,800	25
60	51	66	3,000	20
110	93.5	121	10,500	10

60 Series- General Purpose Relays 10 A

AC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	4.8	6.6	4.6	367
12	9.6	13.2	19	183
24	19.2	26.4	80	91.7
48	38.4	52.8	320	45.8
60	48	66	500	36.7
110	88	121	1,800	20
120	96	132	1,940	18.6
230	184	253	7,250	9.6
240	192	264	8,500	9.2

DC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	4.8	6.6	28	214
12	9.6	13.2	110	109
24	19.2	26.4	445	53.9
48	38.4	52.8	1,770	27.1
60	48	66	2,760	21.7
110	88	121	9,420	11.7

62 Series - Power Relays 16 A

AC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	4.8	6.6	4.6	367
12	9.6	13.2	19	183
24	19.2	26.4	80	92
48	38.4	52.8	320	46
60	48	66	500	37
110	88	121	1,800	20
120	96	132	1,940	18.6
230	184	253	7,250	10.4
240	192	264	8,500	9.2

DC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	4.8	6.6	28	214
12	9.6	13.2	110	109
24	19.2	26.4	445	54
48	38.4	52.8	1,770	27
60	48	66	2,760	21.7
110	88	121	9,420	11.7

65 Series - Power Relays 20 - 30 A

AC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	4.8	6.6	4.6	367
12	9.6	13.2	19	183
24	19.2	26.4	80	91.7
48	38.4	52.8	320	45.8
60	48	66	500	36.7
110	88	121	1,800	20
120	96	132	1,940	18.6
230	184	253	7,250	10.4
240	192	264	8,500	9.2

DC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
6	5.1	6.6	28	214
12	10.2	13.2	110	109
24	8.8	21	300	53.9
48	40.8	52.8	1,700	27.1
60	51	66	2,760	21.7
110	93.5	121	9,420	11.7

20 Series - Modular Step Relays 16 A

AC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
8	6.8	6.6	3.5	700
12	10.2	13.2	7	450
24	20.4	26.4	27	210
48	40.8	52.8	105	110
110	93.5	121	600	45
120	102	132	700	42
230	195.5	253	2,500	23.5
240	204	264	2,700	22

DC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
12	10.8	13.2	27	440
24	21.6	26.4	105	230
48	43.2	52.8	440	110
110	99	121	2,330	47

26 Series - Step Relays 10 A

AC VERSION DATA

Nominal voltage	Operating range		Resistance	Rated coil absorption
U_N	U_{min}	U_{max}	R	I at U_N
V	V	V	Ω	mA
12	9.6	13.2	17	370
24	19.2	26.4	70	180
48	38.4	52.8	290	90
110	88	121	1,500	40
230	184	253	6,250	20



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