Operation and Maintenance Data Manual

Brisbane City

Brisbane Water Project Management

BRISBANE WATER

Project STTX- generator Connection Boxes

GENERATOR CONNECTION O & M Manual SP 081 Witton Rd

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

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

Author : ***Brisbane Water Projects***

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GENERATOR CONNECTION O & M Manual

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

Section 5

- Parts information

PASTEL
MANILLA
DIVIDERS
5 TAB A4

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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: 1 Of: 10	Section 1
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Authorised By: Grant Kerr

1.0 GENERAL

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.

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

become the MCC Main Isolator. This isolator will isolate all incoming power to the MCC regardless of the generator condition.

2.3.2. MAINS AVAILABLE INDICATOR

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.

This relay does not monitor the level or the rotation of the generator supply and has no bearing on the running of the pumps.

2.3.3. MAINS FAIL IN MCC

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.

2.3.4. GENERATOR RUNNING.

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.

2.4 ATS CUBICLE

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.

2.4.1. GENERATOR INTERFACE

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.

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.

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.

If the PLC is not affecting the transfer switch these CB's may be left in the ON state.

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.

Manual Close:
To close a CB wind the motor spring wind mechanism until the CB closes and the Closed state shows in the window.

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.

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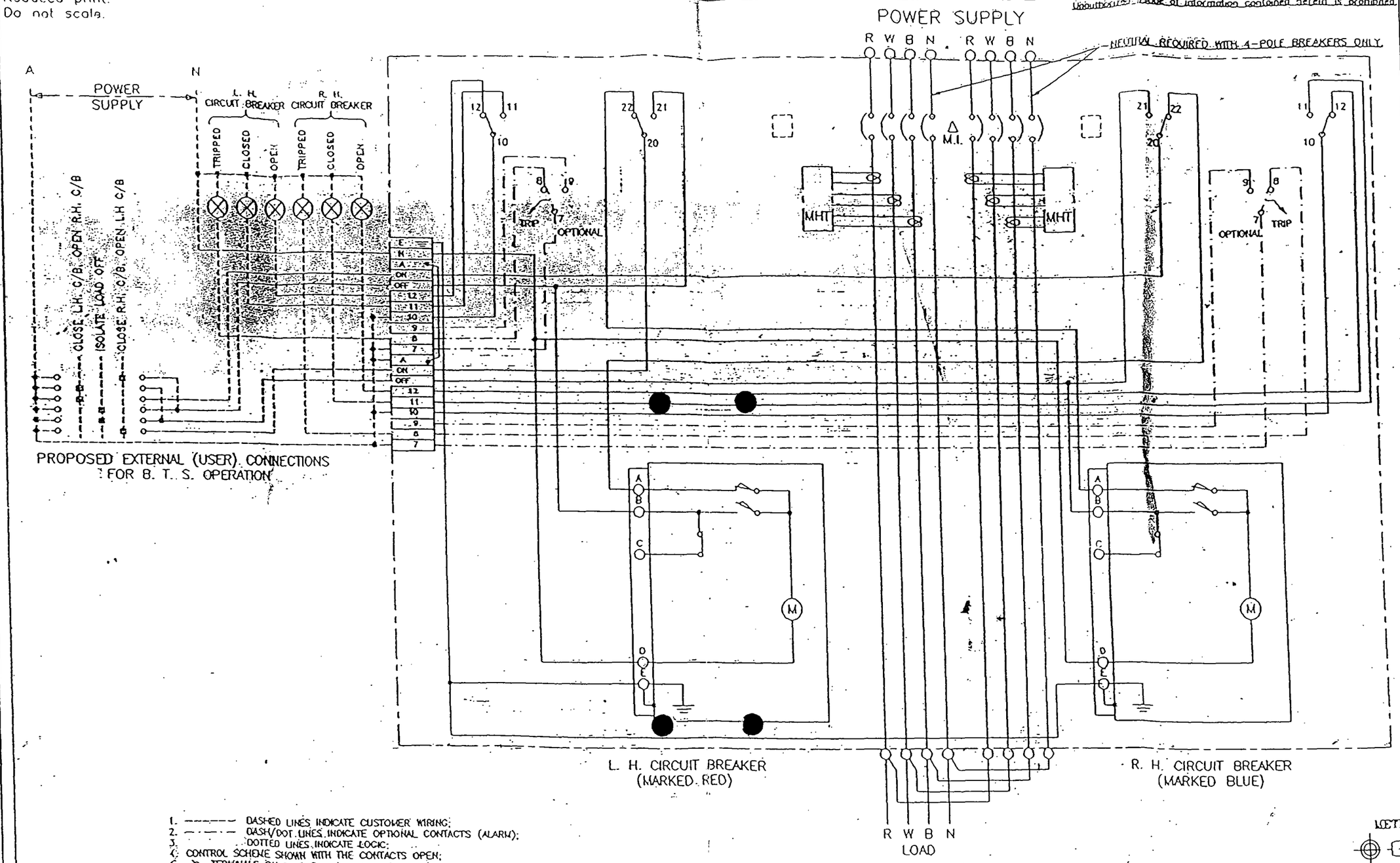
Section 1A

ATS Connection Diagram

Reduced print.
Do not scale.



1. ------- DASHED LINES INDICATE CUSTOMER WIRING;
2. — · — · — DASH/DOT LINES INDICATE OPTIONAL CONTACTS (ALARM);
3. ..... DOTTED LINES INDICATE LOGIC;
4. CONTROL SCHEME SHOWN WITH THE CONTACTS OPEN;
5. 'B' TERMINALS ON B. T. S.;
6. EXTERNAL CONTROL SIGNALS MUST BE MECHANICALLY OR ELECTRICALLY INTERLOCKED;
7. SELECTOR SWITCH CAN BE REPLACED WITH N/O CONTACTS FROM RELAYS OR CONTACTORS;
8. TERMINALS FOR RHS MCCB & MOTOR ARE "BLUE" COLOUR.
9. TERMINALS FOR LHS MCCB & MOTOR ARE "GREY" COLOUR
10. NEUTRAL & EARTH TERMINALS ARE FOR BOTH RHS & LHS.
11. MHT ONLY FOR ELECTRONIC BREAKER.

NO.	REVISION	DATE	DRAWN	CHECKED
C	DRAWING UPDATED - EXTERNAL CONNECTION BTS OPERATION	28/4/94	P.C.T	
B	NOTE 11 ADDED	6/8/93	P.C.T	
A	DRAWING REVISED DUE TO UPDATED	20.6.91	Q.V.M	

REFERENCE	DRAWING NO.	ISSUE
NHP	233	10.9.1988

TERASAKI — Ensuring Service, Maintaining Quality

NHP — ELECTRICAL ENGINEERING PRODUCTS PTY. LTD. — INCORPORATED IN VICTORIA

TITLE: TemBreak CIRCUIT BREAKERS B. T. S. SCHEMATIC XAB (SMALL) MOTOR OPERATORS

SCALE	SIZE	PASSED	DATE
NONE	A2		10.4.91
DRAWN		GROUP	DRAWING No.
TRACED		04	010
CHECKED		SHEET	2/2

CAD REF: 0401021

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Section 2

Parts list

Supplier Name	Part No	Item Description	Manual Incert
ABK	CLI56AI310	APPLIANCE INLET	Clipsal Web Page
ABK	CLI56CSC310	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

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Section 3

Asbuilt Drawings

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Section 3A

Construction Markups

ENERGEX.

CONSTRUCTION
Cubicle construction 2mm Zincanneal.
Plinth construction 75 TFC channel hot dipped galvanised finish.
Folded and "MIG" welded with all visible seams and joints fully welded, free from splatter and ground smooth where needed.
External doors and covers fitted with Emka 1011-207 self grip seal.
"D" Handles fitted where indicated on the drawings.
M6 Earth studs fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces.
Door stiffeners, door stays, cable straps, and document holders etc fitted where shown on the drawings.
Lift-off covers and mounting panels fixed with M8 studs & chrome acorn nuts.

Gland plates manufactured from 6mm Bakelite.
Gland plate openings reinforced with 25x6mm flat steel bar.
Gland plate seats attached to cubicle not gland plate.
Gland plate fixings are NOT more than 150 mm apart (refer Detail F)

Hinges Selectrix HI-0650.
Star washers fitted under all hinge screws.

Locks Doors 1, 2, 3, 4a, 4b
Lowe & Fletcher
Cam
Key Code :- Unlockable

Lock Door 5 & 6
Lowe & Fletcher
Cam
Key Code 92268
Hinged escutcheons fixed with Emka 1/4 turn 1000-U962

OPERATING PARAMETERS

Standard	AS 3439.1
Current & Frequency	AC 50Hz
Rated Operational Voltage Ue	415 VAC
Rated Insulation Voltage Ui	660 V
Rated Auxiliary Voltage	24 VDC / 240 VAC
Rated Current (Main Bus)	250 AMPS
Short Circuit Current Icw	35 kA
Duration of Icw	1 sec
Degree of Protection	IP 56 to AS 1939
Measure of Protection by barriers and enclosures	
Service Conditions	Indoors
Mass	Not exceeding 2000kg
Forms of Segregation	Form 1
Earthing System	TN-S

PAINTING
Surface Preparation.
After welding and drilling, finish smooth and coat with iron phosphate.
Metalwork finished smooth, and degreased with solvent prior to painting.
Apply DULUX ALPHATECH 3000 powder coat to manufacturer's recommendations.
CUBICLE & EXTERNAL COMPONENTS :- DULUX Arrowhead (54256)
INTERIOR ITEMS (mounting panels, escutcheons, etc) :- DULUX Bright White (32164)
Minimum Dry Film Thickness all surfaces 80 microns.

PLINTH :- Hot dipped galvanised, natural finish.

WIRING
All wiring to be PVC V90 HT 0.6/1kv Grade with tinned conductor.
Control and instrumentation wiring has flexible copper conductors, and is colour coded as detailed below, numbered each end, and terminated by the use of appropriate pre-insulated crimp lugs.
Power wiring to be minimum 2.5sqmm stranded copper conductors, phase colour coded as detailed below.
Low level instrumentation signals & 4-20mA signals wired in shielded pair minimum size 0.5sqmm. Earthed at one end only.
Earth cables minimum 2.5sqmm flexible.
Doors and hinged escutcheons bonded with 4sqmm flexible earth strap.
Wire numbering will be equal to Grafoplast TRASP system.
Wire numbers are readable left to right, top to bottom as shown.

COLOUR CODE

Phase wiring (A,B & C)	Red, White, Blue	2.5sqmm (min)
Potential Metering (240/415 VAC)	Red, White, Blue, Black	1.5sqmm
Current Metering (Secondary)	Red, White, Blue, Grey	2.5sqmm
240 VAC Control Active	Red	1.5sqmm
240 VAC Neutral	Black	1.5sqmm
24 V ELV Positive	Grey	1.5sqmm
24 V ELV Negative	Grey	1.5sqmm
24 V RTU Positive	Grey	0.5sqmm
24 V RTU Negative	Grey	0.5sqmm
Intrinsically safe wiring	Blue	1.5sqmm
Earth	Green/Yellow	2.5sqmm (min)
Door & Escutcheon Earth Bonds	Green/Yellow	4 sqmm

LABELS
Internal labels W/B/W engraved traffolyte to label schedule.
Warning labels R/W/R engraved traffolyte.

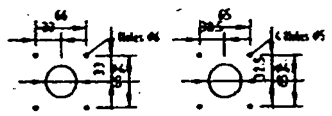
B

Compartment labels — Material W/B/W
RTU — 10mm

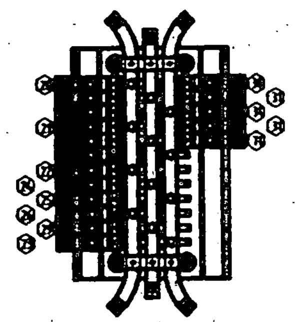
Warning labels — Material R/W/R
DANGER 415V — 7mm
ISOLATE ELSE WHERE — 5mm

Other labels — Material W/B/W
PUMP STATUS
ON - RUNNING
SLOW FLASH - FAULT
FAST FLASH - START INHIBITED
— 4mm

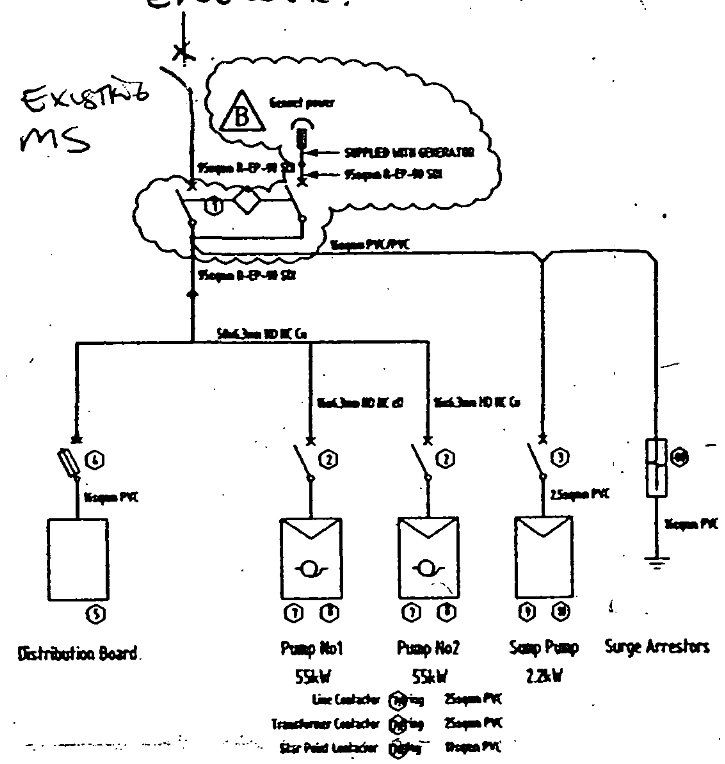
Internal labels secured by M3 chrome plated metal threads.
Labels obstructed by switchboard wiring are relocated to adjacent duct lid.
The duct lid is secured by a single cable tie at one corner.
External labels secured by M3 316 stainless steel metal threads.



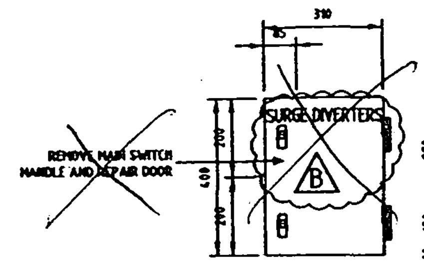
DETAIL L1 DETAIL L2
(CIRCUIT BREAKER & CFS HANDLE MOUNTING DETAIL)



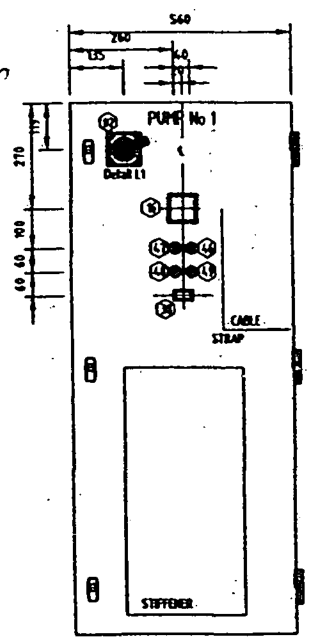
DETAIL M
SUB-DISTRIBUTION BOARD ARRANGEMENT



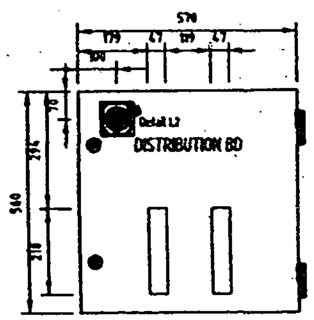
POWER WIRING DETAIL



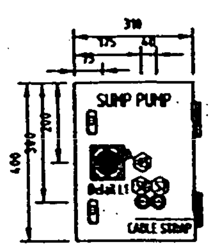
Detail R2



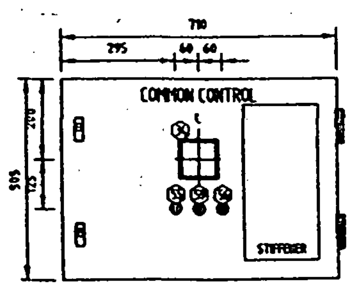
Detail R4
(2 OFF REQUIRED)



Detail R1



Detail R3

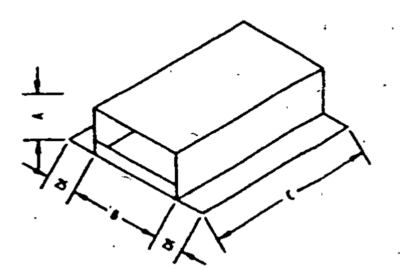


Detail R5

B

ITEM	DESCRIPTION	CUT OUT
01		
02, 03	Pump Circuit Breaker	Refer Detail L1
04	Sub-distribution Board CFS	Refer Detail L2
05	Sub-distribution Board Chassis	218x47
16	Pump Ammeter	68x68
34	Analogue Level Meter	92x92
38	Pump Hours Run Meter	45x22.5
46	Pump Status Indicator	Ø22.5
47	Pump Start Push-button	Ø22.5
48	Emergency Stop Push-button	Ø22.5
49	Pump Local Reset Push-button	Ø22.5
55	Local/Remote Selector Switch	Ø22.5
56	Site Attention Alarm Reset Push-button	Ø22.5
57	Sump Pump Start Push-Button	Ø22.5
58	Sump Pump Stop Push-Button	Ø22.5
59	Attention Indicator	Ø22.5

DETAIL R
(DOOR & ESCUTCHEON CUTOUT DETAIL)



ITEM	A	B	C	Qty
05	186	200	300	1
04	50	105	105	1
03	50	80	150	1
02	247	90	65	2

Hat Sections (Supplied Loose)

NOTES

GHD
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GHD Pty Ltd - ACN 008 488 373

No	DATE	AMENDMENT	INITIALS
B	15.04.03	GENERATOR ADDED	A.L.T.
A	6.97	TITLE BLOCK ADDED	O.L.P.

AMENDMENT & ISSUE REGISTER

MANAGER — DATE:
DIRECTOR OF TECHNOLOGY SERVICES — DATE:
DIRECTOR OF PLANNING & DESIGN — DATE:
DIRECTOR OF WATER SUPPLY — DATE:
DIRECTOR OF CONSTRUCTION — DATE:

DESIGN
DRAWN
TRACED
CHECKED
ENGINEER IN CHARGE
SUPERVISING ENGINEER
A2 REDUCED

REFERENCES
CADD FILE No. 7TT272A
THIS DRAWING WAS PRODUCED USING AUTOCAD

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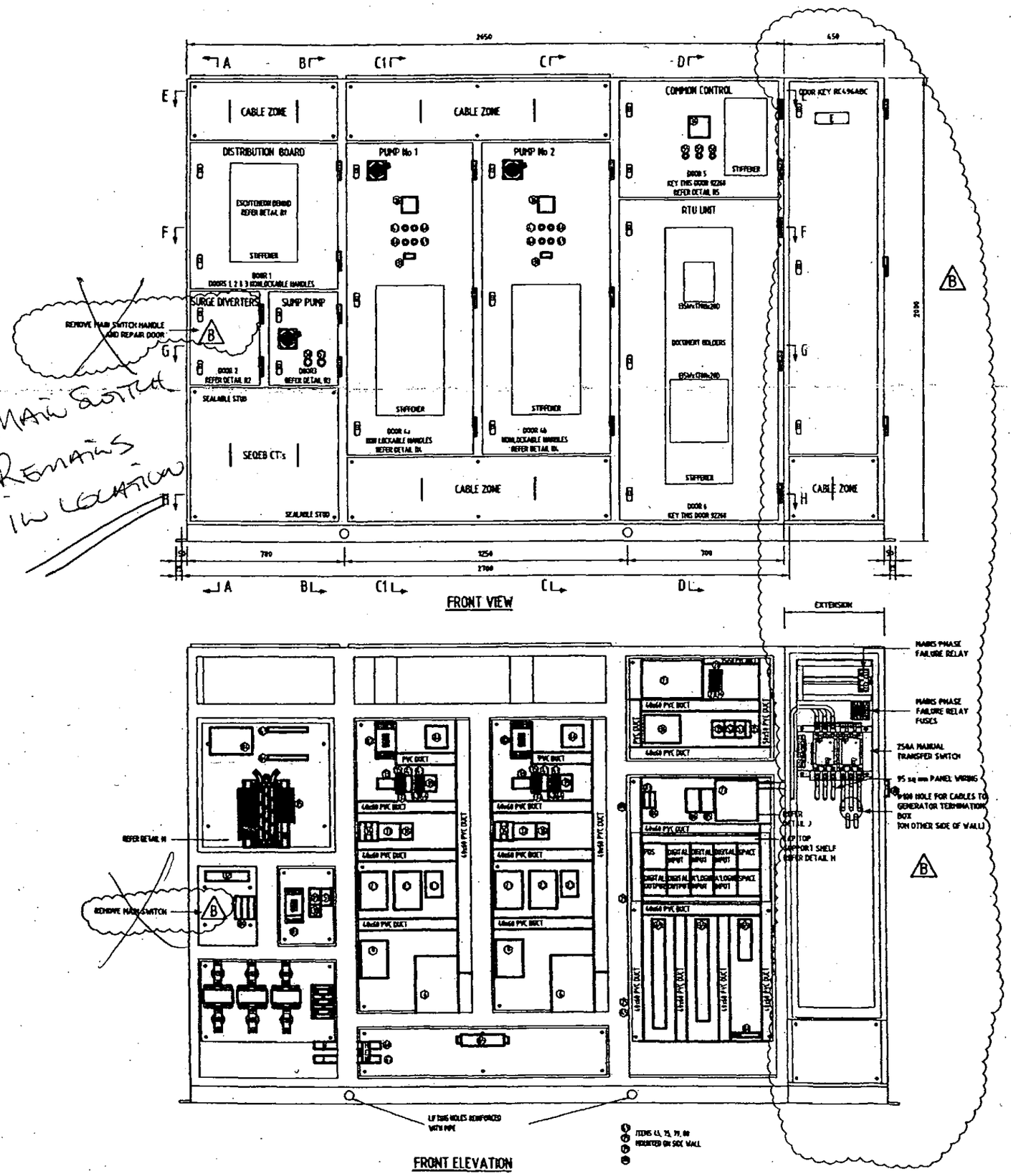
ASSET MANAGEMENT PROFESSIONAL SERVICES

PROJECT
WITTON ROAD CONVENTIONAL PUMP STN.
SP81

TITLE
SWITCHBOARD CONSTRUCTION NOTES

SCALE: N.T.S.
No. 1 OF SHEETS
1184-21
DRAWING No.
486/7/7-KI1T272E



NOTES

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Email: brsmail@ghd.com.au
GHD Pty Ltd – ACN 008 488 373

No	DATE	AMENDMENT	INITIALS
B	15.04.03	GENERATOR ADDED	A.L.T.
A	6.97	TITLE BLOCK ADDED	D.L.P.

AMENDMENT & ISSUE REGISTER

MANAGER	DIRECTOR OF TECHNOLOGY SERVICES
DATE:	DATE:

DIRECTOR OF PLANNING & DESIGN	DIRECTOR OF WATER SUPPLY	DIRECTOR OF CONSTRUCTION
DATE:	DATE:	DATE:

DESIGN			ENGINEER IN CHARGE
DRAWN			SUPERVISING ENGINEER
TRACED			
CHECKED			A2 REDUCED

REFERENCES

CADD FILE No. T1T271A

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ASSET MANAGEMENT PROFESSIONAL SERVICES

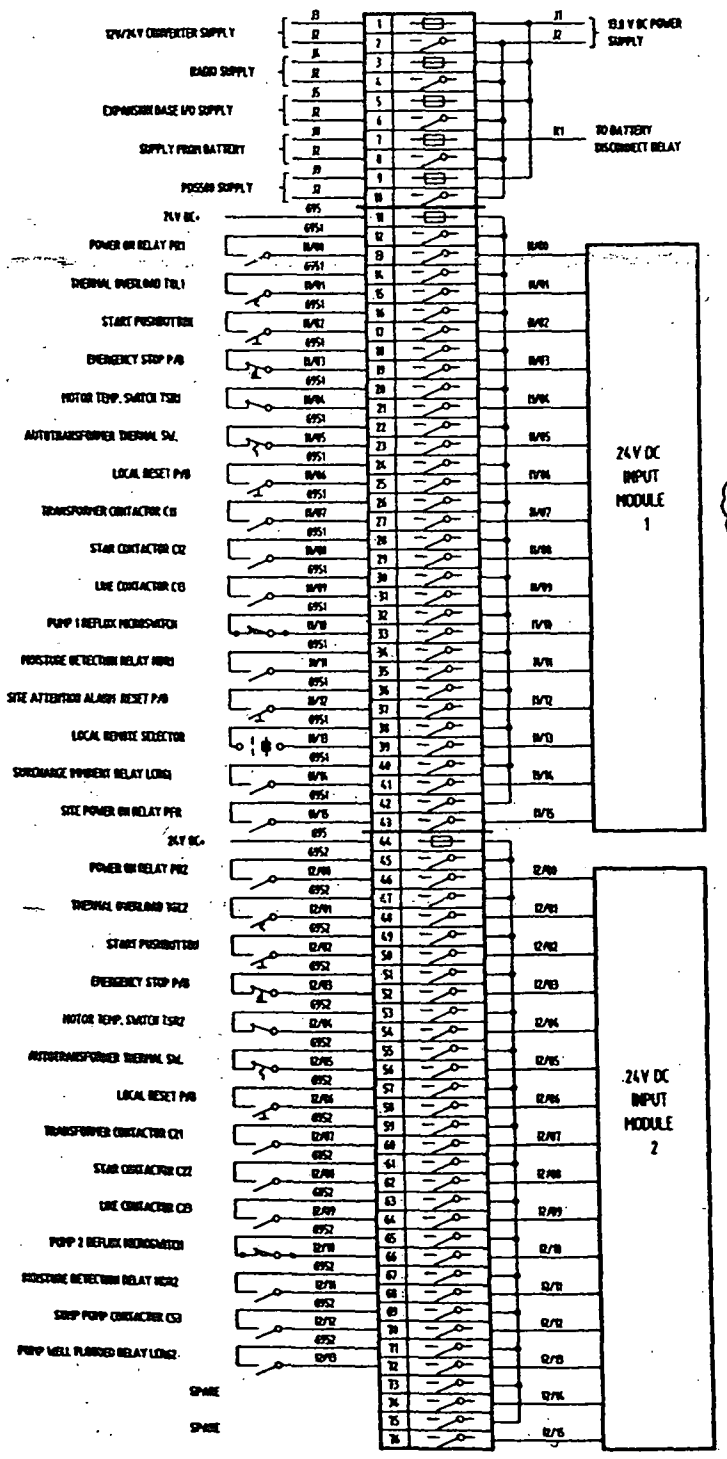
PROJECT
WITTON ROAD CONVENTIONAL PUMP STN.
SP81

TITLE
SWITCHBOARD GENERAL ARRANGEMENT

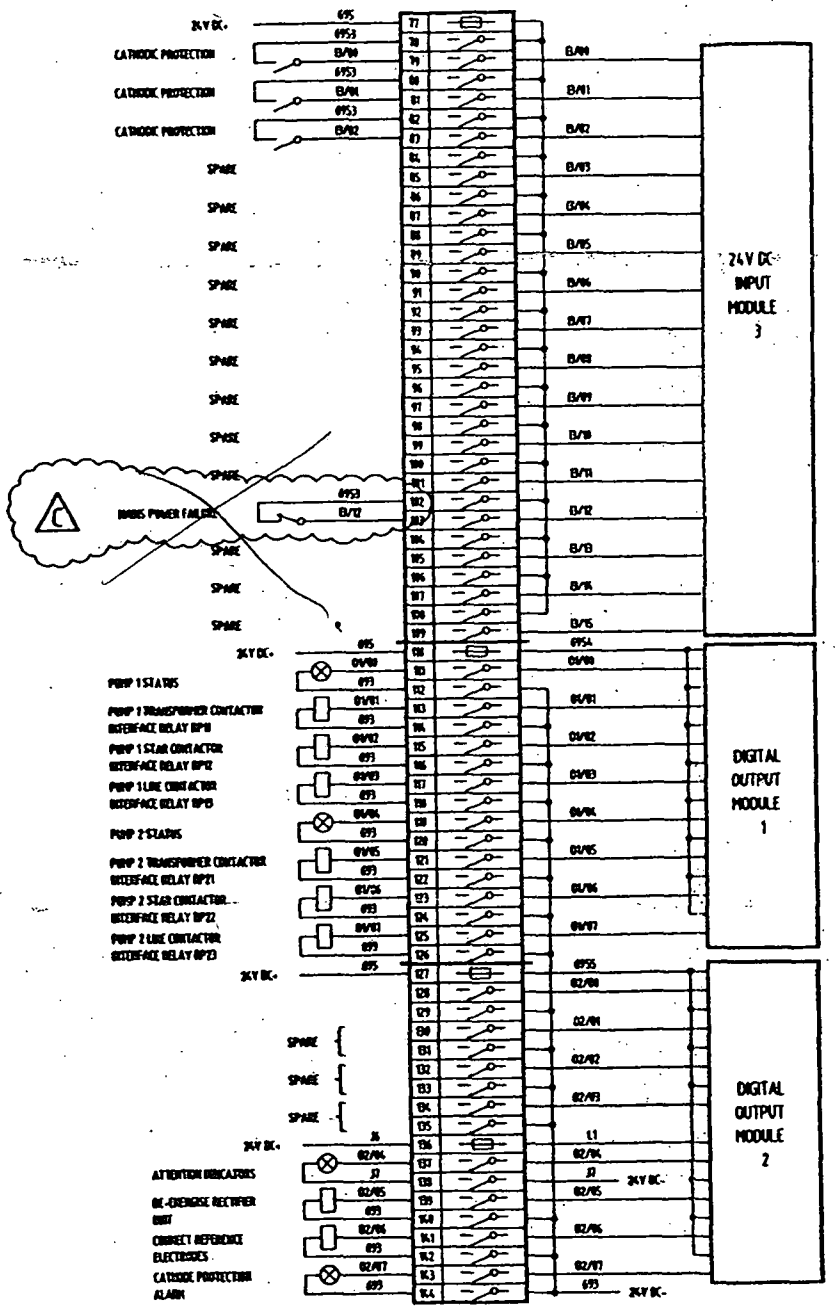
SCALE: N.T.S. | No. 1 OF SHEETS

DRAWING No. 486/7/7-K1T271E | T184-20 | AMEND.

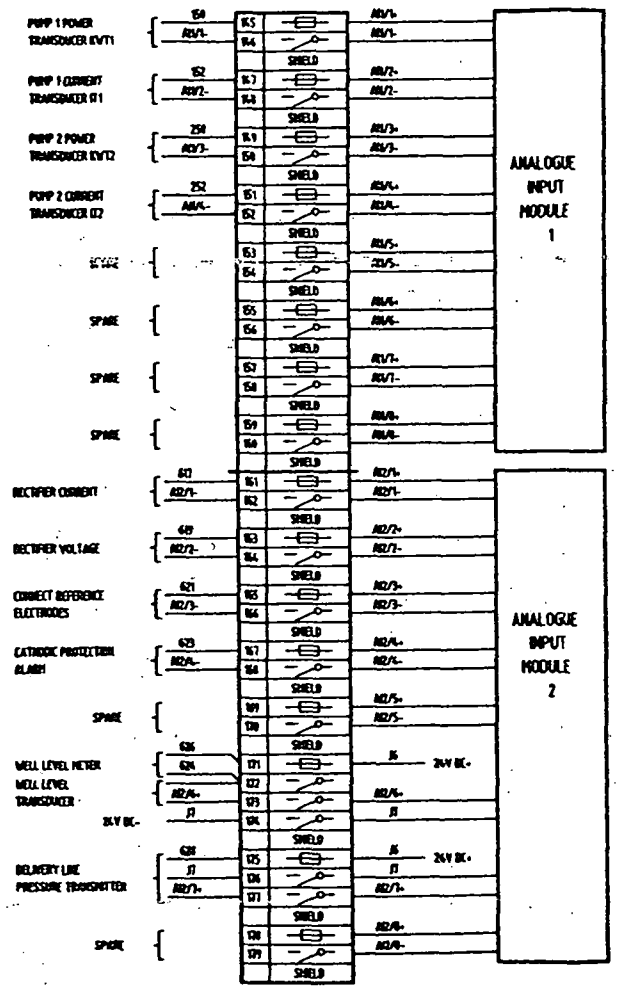
RTU
TERMINAL STRIP



RTU
TERMINAL STRIP



RTU
TERMINAL STRIP



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GHD
MANAGEMENT ENGINEERING ENVIRONMENT
201 Charlotte Street, Brisbane, GPO Box 668 Brisbane, QLD 4001
Telephone (07) 3316 3000 Facsimile (07) 3316 3333
Email: bnemail@ghd.com.au
GHD Pty Ltd – ACN 008 488 373

No	DATE	AMENDMENT	INITIALS
C	15.04.03	GENERATOR ADDED	A.L.T.
B	6.97	MODIFIED	O.L.P.
A	6.97	TITLE BLOCK ADDED	O.L.P.

AMENDMENT & ISSUE REGISTER

MANAGER	DIRECTOR OF TECHNOLOGY SERVICES
DATE:	DATE:

DIRECTOR OF PLANNING & DESIGN	DIRECTOR OF WATER SUPPLY	DIRECTOR OF CONSTRUCTION
DATE:	DATE:	DATE:

DESIGN			ENGINEER IN CHARGE
DRAWN			SUPERVISING ENGINEER
TRACED			
CHECKED			A2 REDUCED

REFERENCES

CADD FILE No. 7T269B

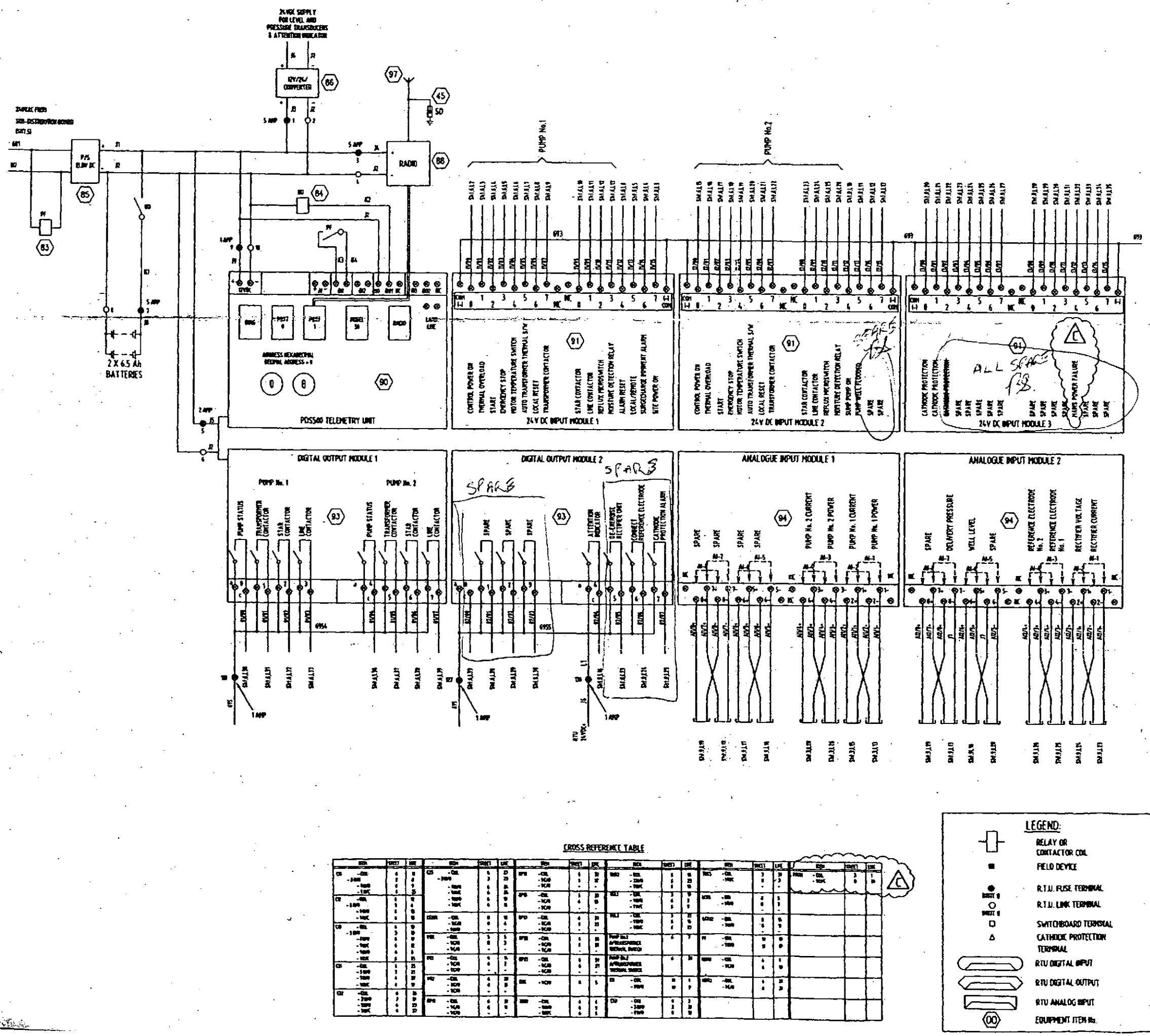
THIS DRAWING WAS PRODUCED USING AUTOCAD

Brisbane City
Brisbane Water
ASSET MANAGEMENT PROFESSIONAL SERVICES

PROJECT
WITTON ROAD CONVENTIONAL PUMP STN.
SP81

TITLE
RTU TERMINATION DIAGRAM

SCALE: N.T.S.
No. 1 OF SHEETS
DRAWING No. 486/7/7-KI1T269E
TB4-00
AMEND. C



NOTES

1. TERMINAL NUMBER SHOWN EITHER IMMEDIATELY BELOW, RIGHT OR LEFT OF TERMINAL.

CROSS REFERENCE TABLE

LEGEND:

- RELAY OR CONTACTOR COIL
- FIELD DEVICE
- R.T.U. FUSE TERMINAL
- R.T.U. LINK TERMINAL
- SWITCHBOARD TERMINAL
- CATHODIC PROTECTION TERMINAL
- RTU DIGITAL INPUT
- RTU DIGITAL OUTPUT
- RTU ANALOG INPUT
- EQUIPMENT ITEM No.

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A	6.97	TITLE BLOCK ADDED	D.L.P.

AMENDMENT & ISSUE REGISTER

MANAGER DATE:		DIRECTOR OF TECHNOLOGY SERVICES DATE:
DIRECTOR OF PLANNING & DESIGN DATE:	DIRECTOR OF WATER SUPPLY DATE:	DIRECTOR OF CONSTRUCTION DATE:

DESIGN			ENGINEER IN CHARGE
DRAWN			SUPERVISING ENGINEER
TRACED			
CHECKED			A2 REDUCED

REFERENCES

CADD FILE No. 7TT268B

THIS DRAWING WAS PRODUCED USING AUTOCAD

Brisbane City

Brisbane Water
ASSET MANAGEMENT PROFESSIONAL SERVICES

PROJECT
WITTON ROAD CONVENTIONAL PUMP STN. SP81

TITLE
PLC / RTU SCHEMATIC WIRING DIAGRAM

SCALE: N.T.S.

No. 1 OF SHEETS

DRAWING No. 486/7/7-K11T268E

TYPE - 10

AMEND. C

LIGHT

ATTENTION
IF ALARM ACTIVE
CONTACT CONTROL
ROOM (EXISTING)

SITE ATTENTION INDICATOR
MOUNTED IN A VISIBLE LOCATION
ABOVE WELL OPENING
(EXISTING)

WELL OPENING
(EXISTING)

ACCESS
(EXISTING)

SWITCHBOARD
(EXISTING)

WET WELL
ACCESS
(EXISTING)

CHIMNEY
(EXISTING)

ELECTRODE BOX
(EXISTING)

B

SWITCHBOARD
EXTENSION FOR
GENERATOR INCOMER

GENERATOR
TERMINATION BOX
MOUNTED ON WALL

VSC
(EXISTING)

RADIO ANTENNA FASCIA
MOUNTED AT CORNER
OF BUILDING
(EXISTING)

B

GENSET

SUGGESTED POSITION
OF TEMPORARY GENSET

SEE ATTACHED
DRW.

DRIVEWAY

PAD MOUNTED SUBSTATION

LEGEND:-

CONDUIT

NOTES

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AMENDMENT & ISSUE REGISTER

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DATE:	DATE:

DIRECTOR OF PLANNING & DESIGN	DIRECTOR OF WATER SUPPLY	DIRECTOR OF CONSTRUCTION
DATE:	DATE:	DATE:

DESIGN			ENGINEER IN CHARGE
DRAWN			SUPERVISING ENGINEER
TRACED			
CHECKED			A2 REDUCED

REFERENCES

CADD FILE No. 777276A

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Brisbane City

Brisbane Water

ASSET MANAGEMENT
PROFESSIONAL SERVICES

PROJECT
WITTON ROAD CONVENTIONAL PUMP STN.
SP81

TITLE
SITE LAYOUT

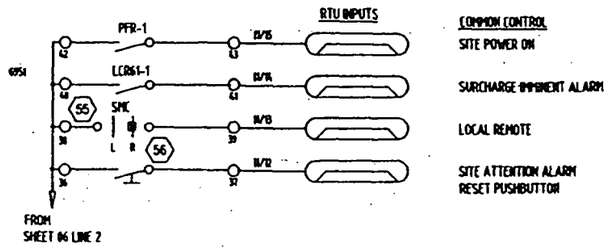
SCALE: N.T.S.

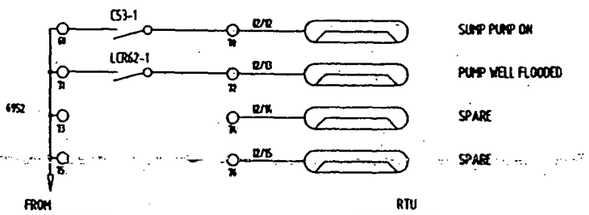
No. 1 OF SHEETS

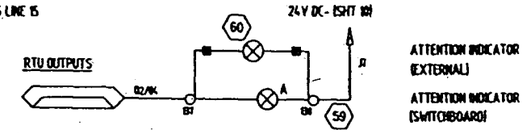
DRAWING No. 1184-30
486/7/7-K11T276E

AMEND.

ELV CONTROL

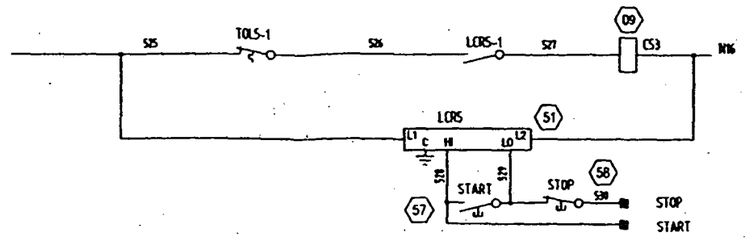




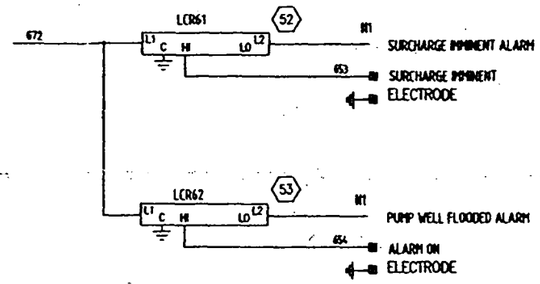


240V AC CONTROL

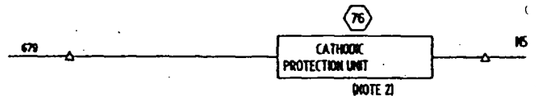
240V AC FROM PUMP CONTROL CIRCUIT (SHT 3)



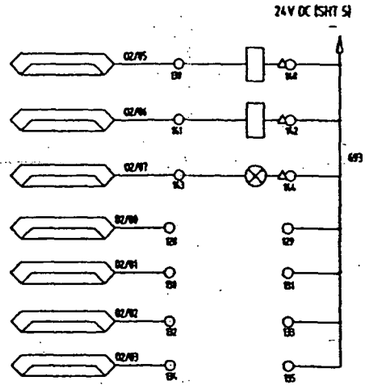
240V AC FROM SUB-DISTRIBUTION BOARD (SHT 5)

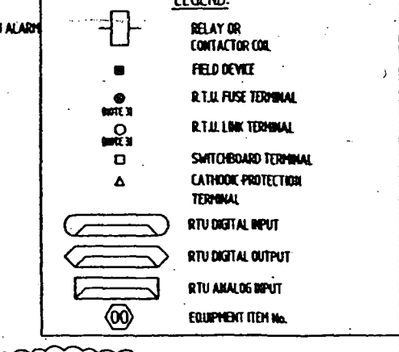


240V AC FROM SUB-DISTRIBUTION BOARD (SHT 5)

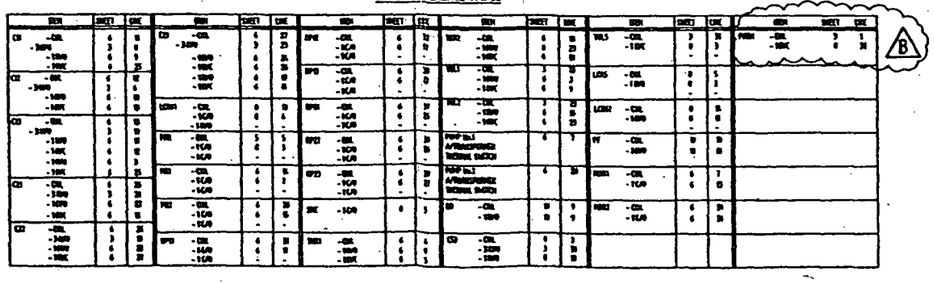


24V DC (SHT 5)





CROSS REFERENCE TABLE



NOTES

1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST COMPATIBLE LABELLING.
   THE FOLLOWING PREFIXES ARE USED:
   MAIN PUMP No. 1 = 1
   MAIN PUMP No. 2 = 2
   COMMON WIRING = 6 (i.e. FLOW, LEVEL, PRESSURE)
2. CATHODIC PROTECTION
   THIS UNIT IS SUPPLIED BY OTHERS.
   RTU I/O CABLING IS INSTALLED TO PROPOSED CATHODIC PROTECTION TERMINAL STRIP FOR CONNECTION BY OTHERS.
3. TERMINAL NUMBER SHOWN EITHER IMMEDIATELY BELOW, LEFT OR RIGHT OF TERMINAL.

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DIRECTOR OF CONSTRUCTION DATE:	

DESIGN			ENGINEER IN CHARGE
DRAWN			SUPERVISING ENGINEER
TRACED			
CHECKED			A2 REDUCED

REFERENCES

CADD FILE No. 77T266A

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Brisbane City

Brisbane Water
ASSET MANAGEMENT PROFESSIONAL SERVICES

PROJECT
WITTON ROAD CONVENTIONAL PUMP STN.
SP81

TITLE
SUMP PUMP IMMINENT & CATHODIC PROTECTION SCHEMATIC WIRING DIAGRAM

SCALE: N.T.S.
No. 1 OF SHEETS

DRAWING No. 486/7/7-K1T266E
TI84-88
AMEND. B

SEQEB METERING

SEQEB 3 PHASE, 415V SUPPLY

L1 L2 L3 N

PFRM FM1 FM2 FM3 P F R

GENERATOR OUTPUT POWER 400A PLUGS (KEYED)

LOCKABLE GENERATOR TERMINATION BOX LOCATED ON OUTSIDE WALL OF PUMP STATION

AUTOMATIC SITE.

EXISTING MAIN SWITCH.

250A BASIC (AUTOMATIC) TRANSFER SWITCH (NOTE 1)

70kA

PUMP CONTROL, SHEET 6 240V AC

(NOTE 1&2)

CT1 5A

PUMP No.1 45kW F.L.C.=98A

TL1

TEST LINKS

KWT1 Al1/1+ Al1/1- 4-20mA PUMP No.1 kW

IT1 Al1/2+ Al1/2- 4-20mA PUMP No.1 AMPS

240V AC AUX. SUPPLY FROM kW & CURRENT TRANSDUCERS CIRCUIT BREAKER

240V AC PUMP CONTROL, SHEET 6

CT2 5A

PUMP No.2 45kW F.L.C.=98A

TL2

KWT2 Al1/3+ Al1/3- 4-20mA PUMP No. 2 kW

IT2 Al1/4+ Al1/4- 4-20mA PUMP No. 2 AMPS

240V AC AUX. SUPPLY FROM kW & CURRENT TRANSDUCERS CIRCUIT BREAKER

(NOTE 1&2)

240V AC PUMP CONTROL SHEET 08

SUBMERSIBLE PUMP 2.2kW F.L.C.=4.8A

8A

SUB-DISTRIBUTION BOARD ISOLATOR 63A/63A

CONTINUED ON SHEET 05

CROSS REFERENCE TABLE

NOTES

1. INCOMING & PUMP CIRCUIT BREAKERS ARE LINE SIDE SHROUDED.
2. CIRCUIT BREAKERS RATINGS TO SUIT LOAD & ENSURE TYPE 2 COORDINATION WITH CONTACTORS & OVERLOADS TO IEC 947-4-1.
3. TERMINAL NUMBERS SHOWN EITHER IMMEDIATELY BELOW, RIGHT OR LEFT OF TERMINAL.
4. ALL FUSE TERMINALS ARE TO BE FITTED WITH 100mA FUSE-LINKS UNLESS SHOWN OTHERWISE.

AUTOTRANSFORMER NOTES

1. WITH PUMP OFF ALL CONTACTORS ARE OPEN.
2. UPON RECEIVING START SIGNAL, STAR & TRANSFORMER CONTACTORS CLOSE.
3. AFTER A PRE-DETERMINED DELAY THE STAR CONTACTOR OPENS & THE LINE CONTACTOR CLOSES.
4. THE TRANSFORMER CONTACTOR THEN OPENS IMMEDIATELY.
5. THE PUMP IS NOW ON LINE AT RATED VOLTAGE & SPEED.

LEGEND:

- RELAY OR CONTACTOR COIL
- FIELD DEVICE
- R.T.U. FUSE TERMINAL (NOTE 3)
- R.T.U. LINK TERMINAL (NOTE 3)
- SWITCHBOARD TERMINAL
- CATHODIC PROTECTION TERMINAL
- RTU DIGITAL INPUT
- RTU DIGITAL OUTPUT
- RTU ANALOG INPUT
- EQUIPMENT ITEM No.

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DRAWN		SUPERVISING ENGINEER
TRACED		
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REFERENCES

CADD FILE No. 77T263A

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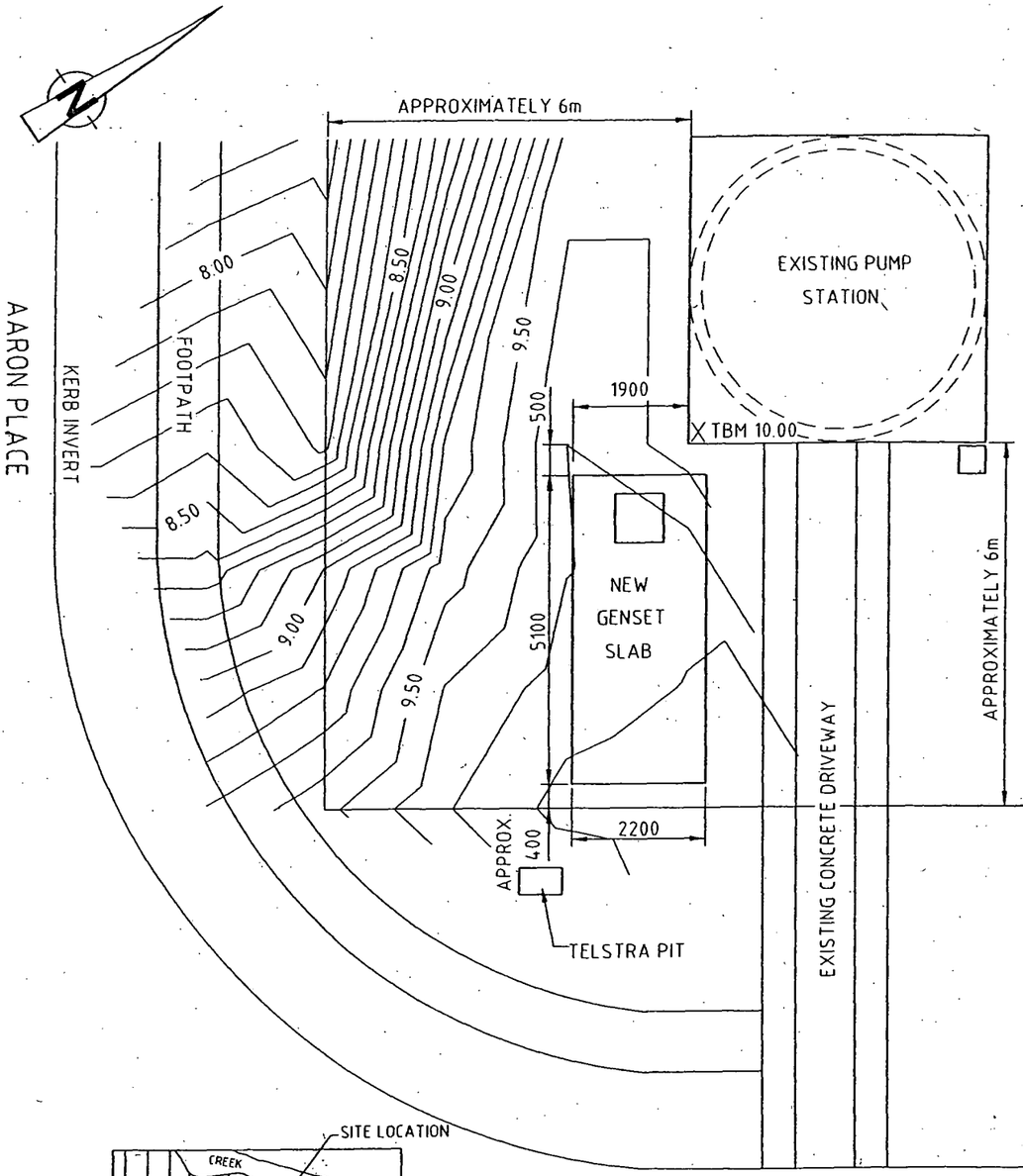
Brisbane City — Brisbane Water — ASSET MANAGEMENT PROFESSIONAL SERVICES

PROJECT
WITTON ROAD CONVENTIONAL PUMP STN.
SP81

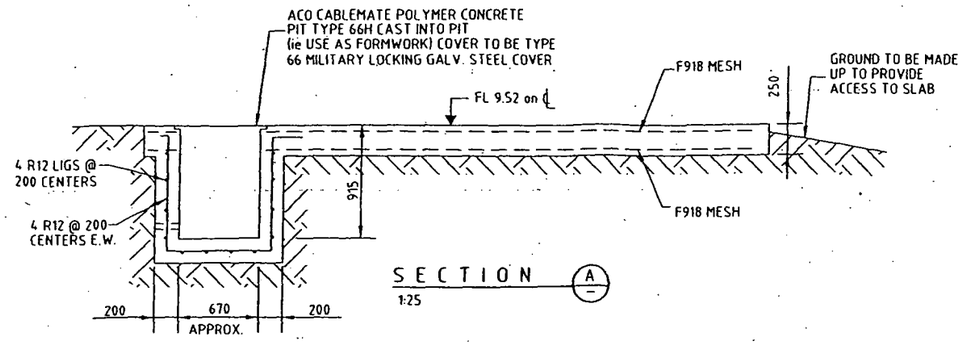
TITLE
PUMP No.1, PUMP No.2 & INCOMER POWER SCHEMATIC WIRING DIAGRAM

SCALE: N.T.S. | No. 1 OF SHEETS

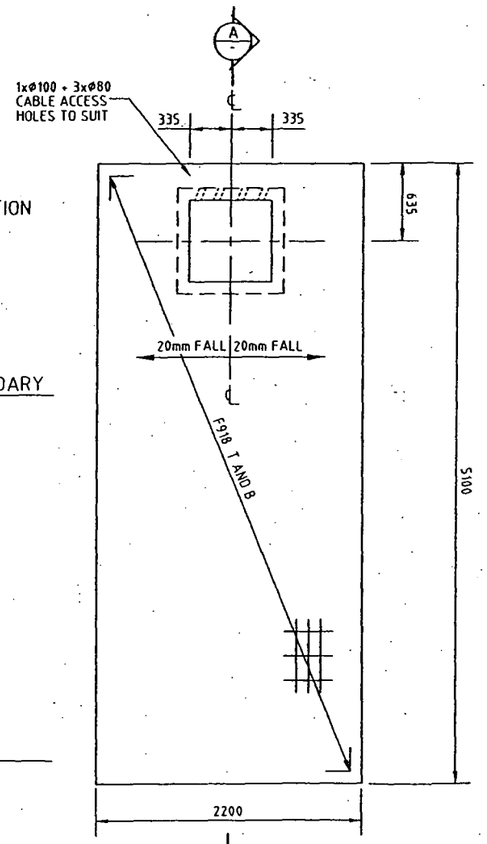
DRAWING No. 486/7/7-KI1T263E | T184-03 | AMEND. B



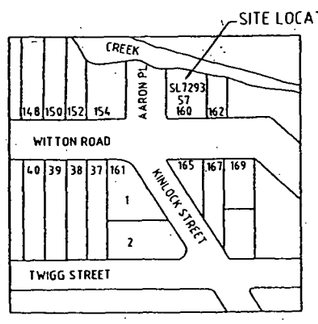
PLAN
SCALE 1:50



SECTION A-A
1:25



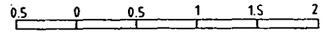
GENSET SLAB
SCALE 1:25



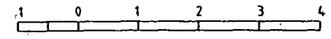
LOCALITY PLAN
N.T.S

NOTES.

1. ALL CONCRETE WORK IS TO BE EXECUTED IN ACCORDANCE WITH THE CURRENT EDITION OF A.S.3600 - CONCRETE STRUCTURES CODE.
2. THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE TEST CYLINDERS(f'c) AT 28 DAYS MUST NOT BE LESS THAN 32 MPa
3. TEST RESULTS ARE TO CONFORM WITH THE ACCEPTABILITY REQUIREMENTS OF THE CURRENT EDITION OF A.S.3690.
4. THE MAXIMUM SIZE OF AGGREGATE SHALL BE 20mm.
5. THE CONCRETE SHALL SLUMP TEST AT NOT LESS THAN 50mm AND NOT MORE THAN 80mm
6. ALL CONCRETE TO BE VIBRATED.
7. REINFORCEMENT GRADES:
   R - GRADE R250N HOT ROLLED PLAIN ROUND BARS TO A.S. 4671
   N - HIGH YIELD DEFORMED GRADE D500N TO A.S. 4671
   RF - HARD DRAWN STEEL WIRE REINFORCING FABRIC TO A.S. 4671
8. CONCRETE COVER TO MAIN REINFORCEMENT TO BE:
   SLABS - 30mm TOP COVER AND 30mm BTM COVER
   BEAMS - 40mm ALL ROUND
   COLUMNS - 40mm ALL ROUND
   FABRIC MINIMUM LAPS TO BE AS FOLLOWS:-
   SQUARE MESH - 225mm
   RECTANGULAR MESH - 125mm FOR 100 WIRE SPACING
   - 225mm FOR 200 WIRE SPACING
9. ALL TACK WELDING AND WELDING OF REINFORCEMENT IS SUBJECT TO ENGINEER'S APPROVAL AND GENERALLY TO CONFORM WITH A.S. 4671.
10. STEEL CHAIRS PLASTIC TIPPED, OR PLASTIC CHAIRS OR CONCRETE BLOCKS TO BE USED TO SUPPORT REINF'T. AND TO GIVE THE CORRECT CONC. COVER.
11. MAXIMUM SPACING BETWEEN CHAIRS OR BLOCKS TO BE 1200mm.
12. ALL CONCRETE SURFACES TO BE CURED BY WETTING AND POLYETHYLENE SHEETING IMMEDIATELY CONCRETE IS PLACED FOR A PERIOD OF 14 DAYS.
13. WPM TO BE 200th POLYTHENE UNDER SLAB LAPPED AND TAPED 200mm.
14. PRIOR TO CONCRETING REMOVE ANY TOP SOIL OR ORGANIC MATTER FROM BENEATH SLAB
15. ASSUMED GROUND BEARING CAPACITY 30 kPa
16. ALL DIMENSIONS, LEVELS AND SERVICE LOCATIONS TO BE CHECKED ON SITE PRIOR TO CONSTRUCTION



SCALE OF METRES
1:25 (AT A1 SIZE)



SCALE OF METRES
1:50 (AT A1 SIZE)

NOTE: ASSUMED DATUM
W.C.G. DWG NO. 0336/09-01 REV C

NO.	REVISIONS	INITS.	DATE
C	NOTE AMENDED	SMR	17-11-03
B	DRAWING NUMBER CHANGED & MINOR REVISIONS	SMR	13-11-03
A	INITIAL ISSUE	SMR	07-11-03

ASSOCIATED CONSULTANT

CLIENT
BRISBANE WATER

WITTON ROAD
PUMP STATION SP81
GENERATOR FOUNDATION

DESIGNED	FRC	28-10-03	CHECKED	SLG	13/11
DRAWN	SMR	28-10-03	CHECKED	GPW	
APPROVED	GPWad				
SCALE	AS SHOWN		DATUM		
CAD FILE					

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Civil & Structural Engineers
12th Floor, 141 Queen St,
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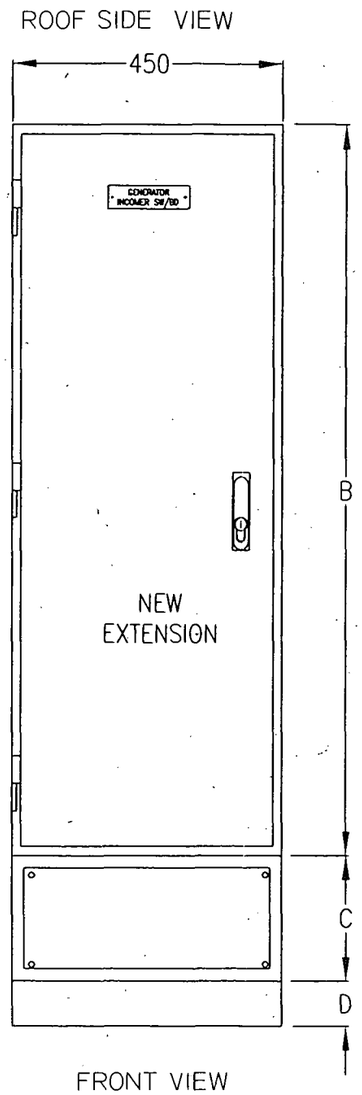
Brisbane Qld 4001 Australia
Ph. (07) 3229 1183
Fax (07) 3221 7088
E-mail mail@wadeconsult.com

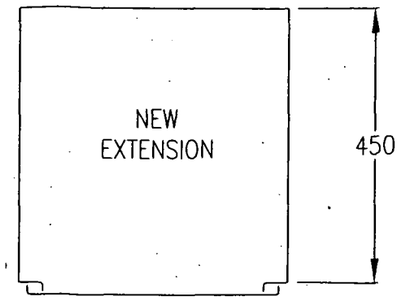
DRAWING No.
486/5/7-KI050

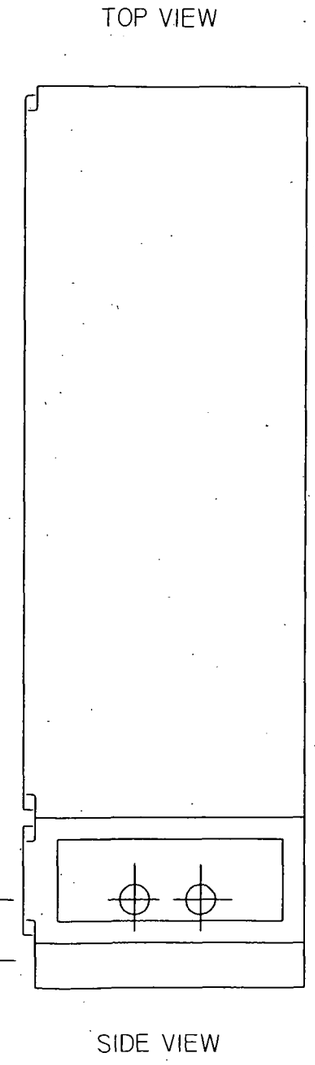
AMDT. C

IF IN DOUBT, ASK.

Notes.
Mounted to Left or Right of existing board or free standing.
Cable entry via side of extension.
Both sides of extension to accept a gland plate.
Template to be provided.
All bottom entry via bakerlite internal gland plates.
All sites are Semi Permanent sites.







Witton Rd
Sandgate Rd
Sunset Rd

PAINT COLOUR Electrical Orange

MATERIAL Mild Steel

1/12/03	B	AS BUILT
2/10/03	A	ISSUED FOR APPROVAL

FWN
LWN
SWN
FTN
LTN
STN

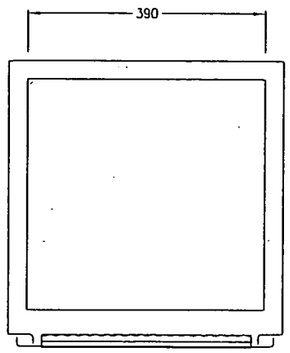
COMMON LOGIC PTY. LTD.
PO. BOX 2008
Mansfield QLD. 4122
Tele: 07 3849 7449

DATE	25/08/03
DRAWN	YGF
SCALE	NTS
APPROVED	

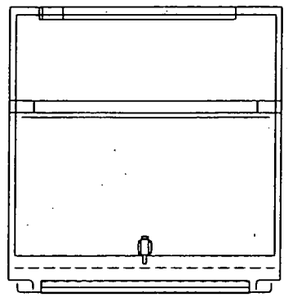
BRISBANE WATER
Free Standing MS with Extension Base

JH05DF02 | A3 sheet 1/1 | ISSUE B

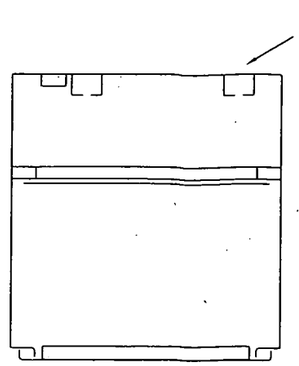
IF IN DOUBT, ASK.



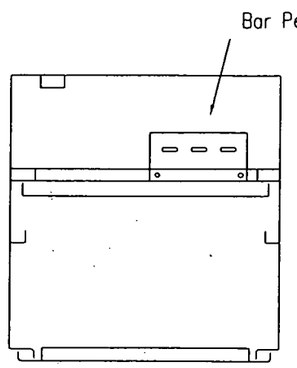
BOTTOM VIEW



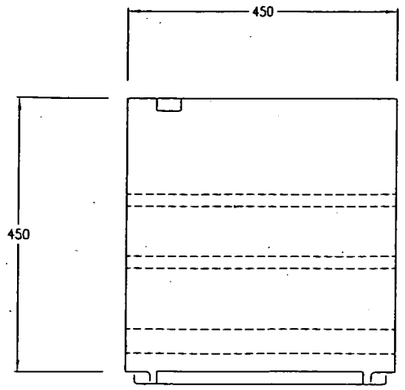
SECTION D-D



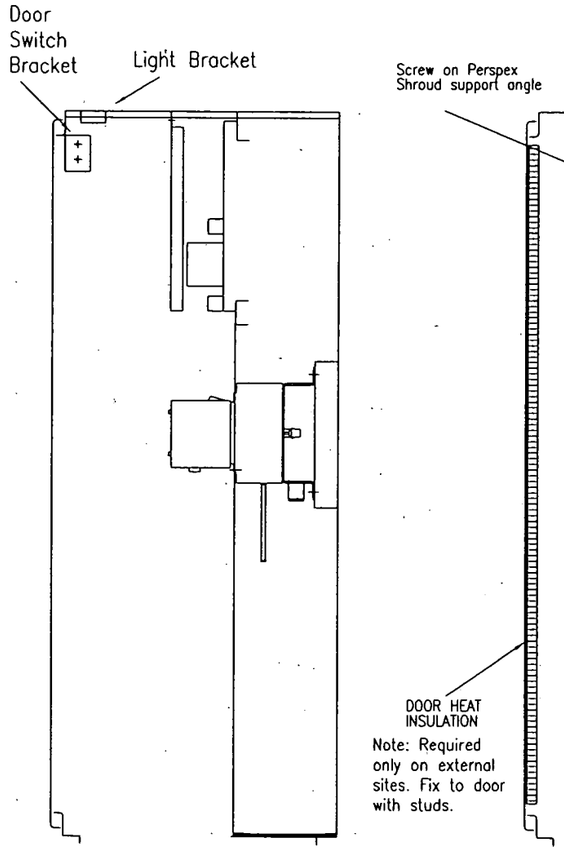
SECTION C-C

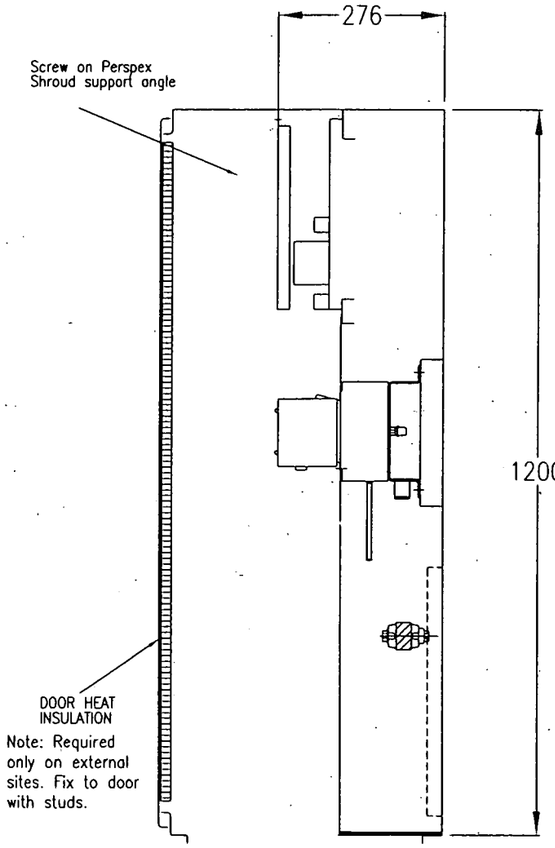


SECTION B-B

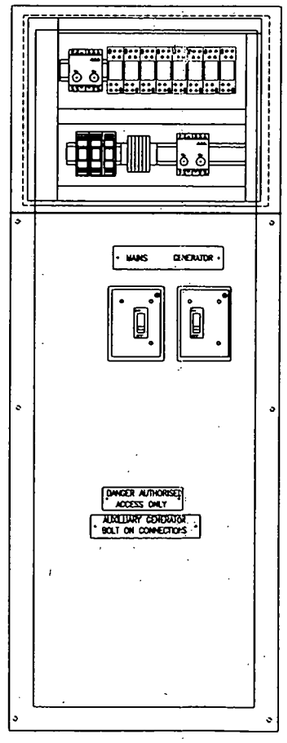


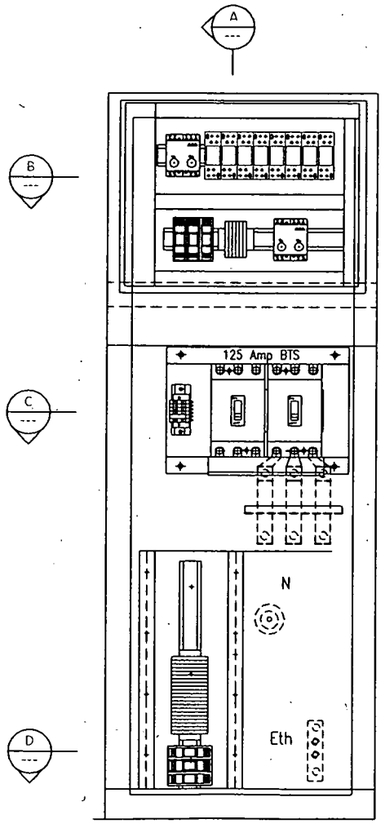
TOP VIEW



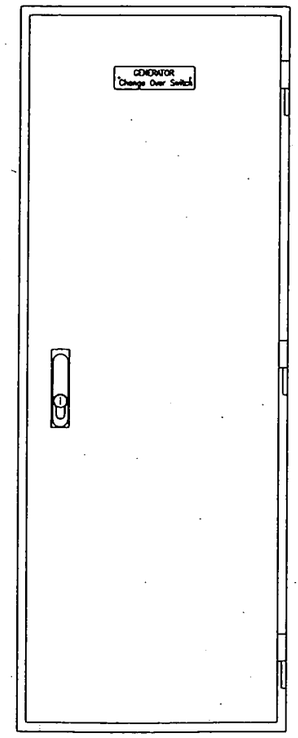


SECTION A-A





FRONT VIEW
(DOOR RMEOVED)



FRONT VIEW

Door to hinge left or right depending on order.

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

Brisbane City

Brisbane Water Project Management

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 Of: 7	Section

Page Revision No: 0 Date: 06/05/04 Manual Issue No: 0 Date: 06/05/04

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1.3 SAFETY PRECAUTIONS 2

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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**	
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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	SH05	**Job Description**	Witton Rd
	Name	**Signature**	**Date**
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.

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COMMON LOGIC Pty Ltd **Specialist Electrical Contractors**	**Site Acceptance Tests**	
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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		
	Test resistance of Earthing system to compartment Answer in Ohms	Extension	Main Eth Bar	Generator
1	All Earth's wired and continuous	<0.5Ω	<0.5Ω	<0.5Ω
2	All metal work earthed where required	✓	✓	✓
3	Isolate Individual Earth Systems and check continuity.	✓	✓	Plug

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 9025080

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

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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 Com
	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	Manual Operation OK	—	—
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

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Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels | Sheet: 5 Of: 7 | Section

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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 Drns	✓
2	All relay coils correct voltage	✓
3	Does relay require Diode fitted?	—
4	Common Bus Link on relays fitted	✓
5	All numbering correct	✓

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COMMON LOGIC Pty Ltd
Specialist Electrical Contractors

Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels | Sheet: 6 Of: 7 | Section

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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 6	Observe Relay GRUN	✓
			Check Door Indicator is on when relay is ON	
6	Generator Connected	Press Button 7	Observe Relay GCONN	✓
7	Doors Opened	Press Button 8	Observe Relay GOPEN	✓
8	CB Tripped	Press Button 9	Observe Relay GCBT	✓
9	Not in Auto	Press Button 10	Observe Relay GNAUTO	✓
10	Generator Not On Site	Press Button 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	✓
	Low fuel	Press button 5		✓

Test Carried out by... Rob McLarva Signed... Date. 8-5-04

Test witnessed by.... Ron McLarva Signed... Date. 8-5-04

Authorised By:

COMMON LOGIC Pty Ltd **Specialist Electrical Contractors**	Site Acceptance Tests	
Subject: SAT for BW Generator Change Over Panels	Sheet: 7 Of: 7	Section
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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	✓

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Test witnessed by..... Signed... Date...

Authorised By:

Brisbane City

Brisbane Water Project Management

BRISBANE WATER

GENERATOR CONNECTION
O & M Manual

Section 4A

Site Testing
Functional Description

Brisbane City

Brisbane Water

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 looses 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 amd 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 City

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BRISBANE WATER

GENERATOR CONNECTION
O & M Manual

Section 4B

Site Testing
NCS Alarms

Brisbane City

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BRISBANE WATER

Network Control Systems

IDTS POINT COMMISSIONING SHEET AND GENERATOR SUPPLY OPERATIONAL CHECKS

Pump Station Generator Connection Project (STTX- I910)

DATE: 10/5/04

Site Name: SP081 Witton

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

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

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 Surcharge 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
Sites: Billan St, Musgrave Rd, Centenary Hwy / Kooringal Dr, Manet St, Sanananda St and Sinnamon Rd.	Confirm the RTU will run a maximum of one pump under generator supply.	√ Yes
Site: 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

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	Fixed speed pump sites: Confirm that the duty pump lowers the well to the Duty A stop level and stops	√ Yes
	Variable speed pump sites: 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. Tested and Site Left In On/Auto Position (10-5-04)
2. Unable to run pump 1 as generator will not carry load (10-5-04)
3. Generator looked at by SE Power 20-5-04
4. Pump 1 run on Generator 5 times to prove
5. Site left in Auto (20-5-04)

IDTS Points and Generator Supply

Operational Checks commissioned by ...**Peter Rennex** **Date 10/5/04**

Brisbane City

Brisbane Water Project Management

BRISBANE WATER

GENERATOR CONNECTION
O & M Manual

Section 4C

Site Testing
Generator

SE Power Equipment

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

DIESEL GENERATOR SET
CONTROL FUNCTION TEST REPORT

SEP 009/B

CUENT: BRISBANE WATER SP081
SERIAL NO: 0307007
ENGINE TYPE: 4045H
ALTERNATOR TYPE: 274D

DATE: 24/07/03.
JOB NO: 14291
ENG. SERIAL NO: 709697
ALT. SERIAL NO: X03D160124

GENSET CONTROL FUNCTIONS	FUNCTION	LAMP	REMARKS
Engine High Temp. Alarm	✓	✓	
Engine High Temp. Shutdown	✓	✓	
Low Water Level Alarm	✓	✓	
CB Tripped/Alt., Overload	✓	✓	
Low Oil Pressure Alarm	✓	✓	
Low Oil Pressure Shutdown	✓	✓	
Emergency Stop	✓	✓	
Start Fail Alarm	✓	✓	
Genset Running	✓	✓	
MEN Fault	✓	✓	
Starter Motor Relay	✓	✓	
Fuel Low	✓	✓	
Fuel Empty	✓	✓	
Engine Gauges	✓	✓	
Status Lamps/Controls	✓	✓	
Underspeed Shutdown	✓	✓	
Overspeed Shutdown	✓	✓	
Remote Start/Stop	✓	✓	
Lamp Test	✓	✓	
Alarm Shudown	✓	✓	
Alt Undervolts	✓	✓	
Alt Overvolts	✓	✓	
Charger AC Failed	✓	✓	
Control Batt. Low Volts	✓	✓	
Start Batt. Low volts	✓	✓	
Canopy doors Open	✓	✓	
Audible Alarm/Mute	✓	✓	
Remote ATS Controls	✓	✓	
Alternator High Temperature			NOT ON THIS SET

CUSTOMER TESTING OFFICER:

TESTING OFFICER: PAUL HLAVKA
JOHN ROTH

~~GAS~~ GENERATOR SET

SEP 0023/ D

SOUND PRESSURE LEVEL TEST REPORT

47 Proprietary Street
Tingalpa Q 4173
BRISBANE AUSTRALIA

CLIENT: BRISBANE WATER SP081 DATE: 24/07/03

SERIAL NO: 0307007 JOB NO: 14291

ENGINE TYPE: 4045H ENG. SERIAL NO: 709697

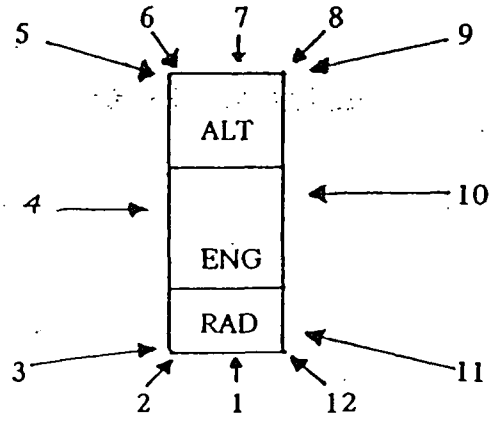
ALTERNATOR TYPE: 274D ALT. SERIAL NO: X03D160124

SOUND LEVEL INSTRUMENT: RION NL-04

Remarks:

Distance: 7 m

Height: 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

DIESEL GENERATOR SET
LOAD TEST REPORT

SEP 0064/D

CLIENT: BRISBANE WATER SP081 DATE: 24/07/03

SERIAL NO: 0301007 JOB NO/CONTRACT NO: 14291

ENGINE TYPE: 4045H ENG. SERIAL NO: 709697

ALTERNATOR TYPE: 274D ALT. SERIAL NO: X03A160124

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%)

TECHNICAN: INSPECTOR:

TIME	11.00	1115	1145	1215	1245	1315	1330	1335		
OIL PRESSURE	500	350	310	290	290	290	300	310		
OIL TEMPERATURE	—	—	—	—	—	—	—			
JACKET WATER TEMPERATURE	—	75	80	85	85	85	85	75		
RPM'S	—	43	84.9	125	125	85	43	0		
VOLTS 419.2	242 242 242	242 242 242	242 242 243	242 242 242	242 242 242	242 242 243	242 242 243	242 242 242		
AMBIENT TEMPERATURE	20	20	20	20	20	20	20	20		
HZ	50	50	50	50	50.2	50.2	50.2	50.2		
KW	0	31.8	61.9	91.6	91.6	61.9	31.9	0		
LOAD%	0	40%	75%	110%	110%	75%	40%	0		

REMARKS

Generator_Load_Test_Report.doc

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: SP081 SERIAL NO: 0307007 ENGINE NO: 709697

JOB NO: 14291 DATE: _____ CUSTOMER: B.W.

==========

BASE

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

RADIATOR

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

ENGINE

FANGUARD ADJUSTMENT.

(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. ☑

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. ☑

FINAL INSPECTION CHECKLIST PAGE 2

CONTROL SYSTEM (cont)

(8) Perspex shield secure, clean and no sharp corners. ☐
(9) Cables correct, no damage. ☑
(10) Locks and keys satisfactory. ☑

ALTERNATOR

(1) Alternator is correctly mounted. ☑
(2) Alternator leads are correctly mounted inside terminal box and marked correctly. ☑
(3) A.V.R. is mounted, connected properly and set to correct setting. ☑
(4) Coupling and adaptor are properly fastened between engine and alternator with correct size and tensile grade bolts. ☑
(5) All options ordered are fitted and function properly. ☑
(6) Alternator is correctly wired for the appropriate voltage as per either Order or Bills of Material. ☑
(7) Earth stud fitted. ☑

FINISH

(1) Plant is painted to correct colour. ☑
(2) All blemishes in finish, especially paint runs, are completely removed. ☑

GENERAL INSPECTION

(1) Genset is manufactured to correct engine/alternator/radiator/bases configuration as specified on Bill of Materials. ☑
(2) All documents are in a sealed plastic bag and secured inside alternator terminal box. ☐
   a) Engine Handbook
   b) Alternator Handbook
   c) Warranty Card
   d) Packing List
   e) Test Sheet
(3) No Oil/No Water label is attached to positive battery lead. ☐
(4) All labels are straight and in correct location. ☑

SIGNED: D. Cooper/PAUL HLAVKA INSPECTOR

QUALITY ASSURANCE

COMMENTS: _____

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: BRIS. WATER

S/N: 0307007

ENGINE: 4045H

ALTENATOR: 274D

GOV. : G.A.C.

Brisbane City

Brisbane Water Project Management

BRISBANE WATER

GENERATOR CONNECTION
O & M Manual

Section 4D

Electrical Testing Certificate

COMMON LOGIC Pty Ltd

A.C.N. 011 029 262

Job Card Number: 0206

Variation To Fixed Price Proj		CUSTOMER	Project No. SP81
Cost Plus Labour Proj.	✓	Representative Name: Peter Rennex	
Call Out		Position:	Date: 26/2/04
Service	✓	Signature on Completion: [signature]	

Power Authority Forms	✓	C/L Representative: CLINT WALKER	
Pre-Start Safety Mtg.	✓	Position: LICENSED ELECTRICIAN	Date: 26/2/04
Risk Assessment	✓	Mobile Phone No: 0407 586 760	

START	FINISH	DETAILS	Hrs	No. MEN	TOTAL	RATE	CHARGED
		TRAVEL TO SITE					
		CHANGEOVER MAINS					
		FOR EMERGENCY					
		GENERATOR					
		Witton Rd					

PLEASE SEE ATTACHED FORM FOR ADDITIONAL ☐ TOTAL LABOUR CHARGED:

ITEM No:	PART No:	ITEM DESCRIPTION	No. ITEM	COST ITEM	TOTAL COST	%	CHARGED
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							

PLEASE SEE ATTACHED FORM FOR ADDITIONAL ☐ TOTAL MATERIALS:

PROGRESS CLAIM WORKS NOT COMPLETED AND NOT TESTED ☐ FURTHER WORK REQUIRED TO COMPLETE PROJECT. ☑ PROJECT COMPLETED NO FURTHER ACTION REQUIRED ☐

WHITE COPY – CUSTOMER YELLOW COPY – OFFICE

I Certify that the Electrical work listed above has been tested in accordance with the prescribed procedure and that such work complies with the requirements of the State Electricity Act.

4111A

Signature: ....

- ✓ POLARITY TEST.
- ✓ INSULATION RES. TEST.
- ✓ ETH CONTINUITY TEST
- ✓ FUNCTIONAL TEST

Common Logic Pty Ltd Unit 9/58 Wecker Road, Mansfield 4122 • Ph: (07) **3849 7449** • Fax: (07) 3343 5210

Brisbane City

Brisbane Water Project Management

BRISBANE WATER

GENERATOR CONNECTION
O & M Manual

Section 5

Parts Information

ACO CABLEMATE

Type 66H Polymer Concrete Pit

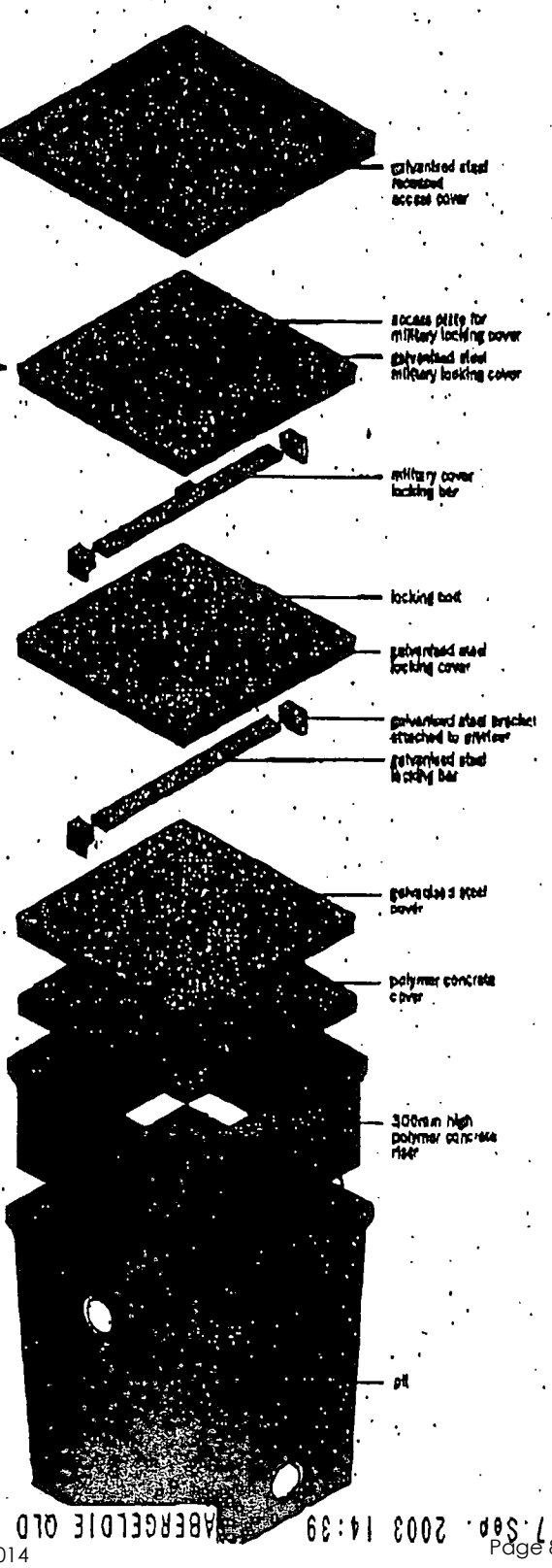
667mm x 667mm x 915mm depth

Pit Data

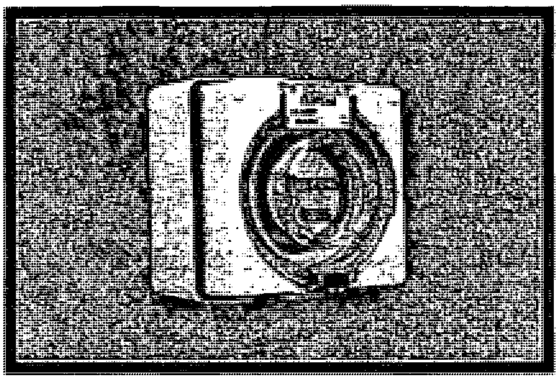
Description	Part No.	Weight kg
Type 66H Polymer Concrete Pit	75220	46.4
Type 66H Polymer Concrete Pit for Locking Cover	75288	47.0
Type 66 Polymer Concrete Extention Riser	75126	17.4
Type 66 Polymer Concrete Extension Riser for Locking Cover	75133	18.0

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	26.9
Type 66 Light Duty Recessed Access Cover - Lock & Seal	75201	29.1
Type 66 Med Duty Recessed Access Cover - Lock & Seal	75218	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

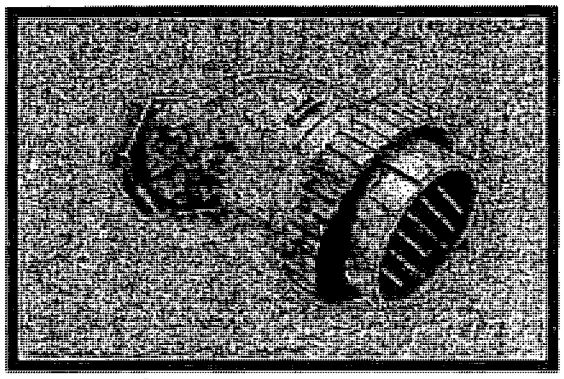
56 Series Features

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

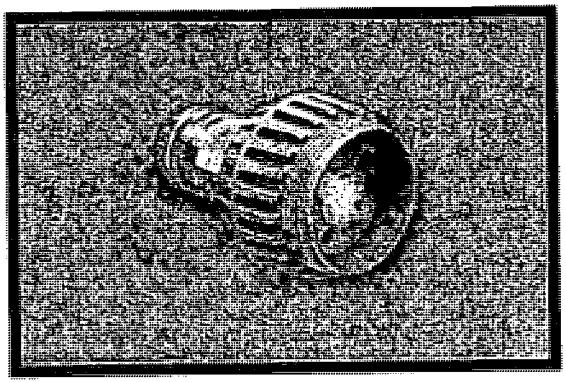
Brochures Available:

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

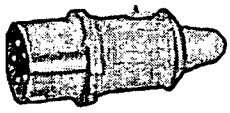
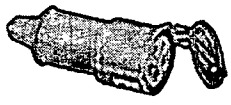
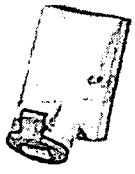
Product Locator

Technical Information

Wiring Devices: Plugs | In-Line Connectors | Panel Mount Plugs | Panel Mount Receptacles | Internationally Rated Devices

Internationally Rated Devices

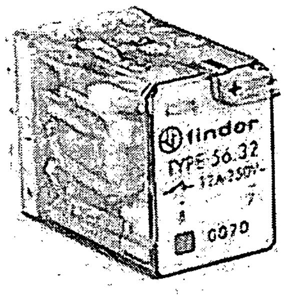
Mennekes, a global manufacturer of industrial electrical products, has products to sat electrical connection needs anywhere in the world. Our products are approved by nur international agencies. Internationally rated products range from 16 Amp to 125 Amp, A.C. through 500V A.C. 3,4, and 5 wire. All units 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 wi 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 mismating of plug devices with different voltages.

Company | Products | Locations | Contact Us

Item Info

NHP E-Cat online website
Friday, June 18, 2004 4:12:30 PM
User: Not logged in



Catalogue Number:

56.32.0070 24VDC

Description:

PLEASE ORDER 5632007424VDC

List Price $ (Not including GST):

Unit of Measure:

EA

Price Schedule:

B2

Relays-plug-in type

Flat pin

Contact arrangement

2 C/O

Voltage

24V DC

Number of pins

8

Features

- 2 pole changeover contacts rated at 12 amps (250VAC-AC1).
- LED and press to test as standard.
- 4.8mm x 0.5mm flat pins suitable for plug-in sockets.
- Available in 11 AC/DC coil voltages.
- PCB mounting as option.
- Designed and manufactured to common standards.
- Small dimensions.
- Approved by international standards.
- A large range of bases and sockets including various types of mounting such as Din rail, rear connected panel mounting, plug-in PCB mounting.
- Selection of options include manual test button, flange mounting, high temperature versions and hermetically sealed versions.

Benefits

- Capable of switching a number of substantial loads.
- Visual indication for coil operation and latching enables simultaneous testing.
- Can fit directly onto printed circuit boards for power switching.
- Reduced panel space required to keep switchboard costs to a minimum.
- This relay can be offered to manufacturers who export equipment that require these compliance approvals.

Ordering Information

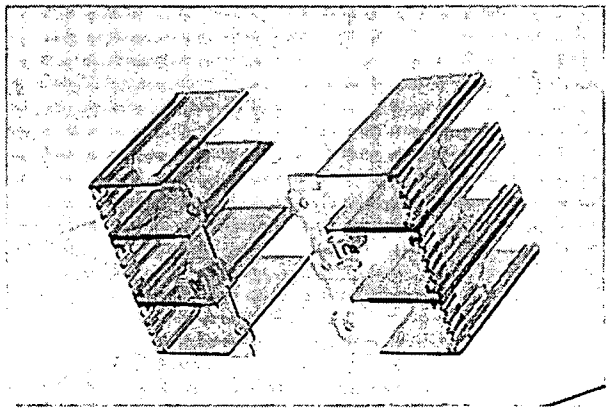
- DC supply version also available without LED - 563224VDC

All prices are exclusive of GST.

NHP **Item Info**

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

TERASAKI



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

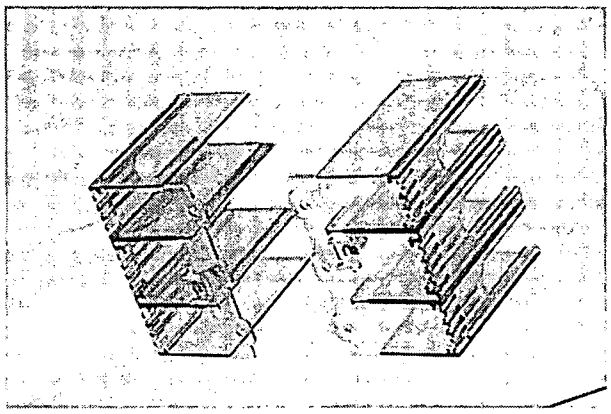
- The terminal cover is designed to protect breaker terminals and other live parts from exposure.
- Terminal covers are available for front or rear connection, and plug-in types.

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

TERASAKI



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.

All prices are exclusive of GST.

NHP **Item Info**

NHP E-Cat online website
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User: Not logged in

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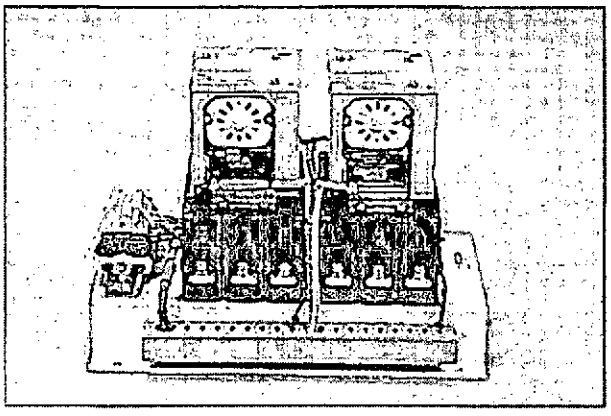


Catalogue Number:

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

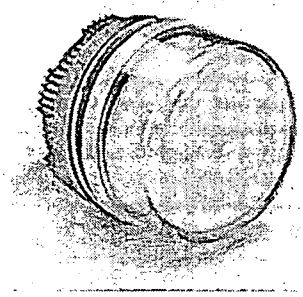
- Assembled to order.
- 4 pole and other configurations available on request.

All prices are exclusive of GST.

NHP **Item Info**

NHP E-Cat online website
Friday, June 18, 2004 2:59:42 PM
User: Not logged in

sprecher+schuh



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 Buzer

Mounting Size
22.5mm

Specification
Lamp Body Only

Shape
Round

Style / Frame
Standard

Colour
Yellow

Lamp Block
Operator Only

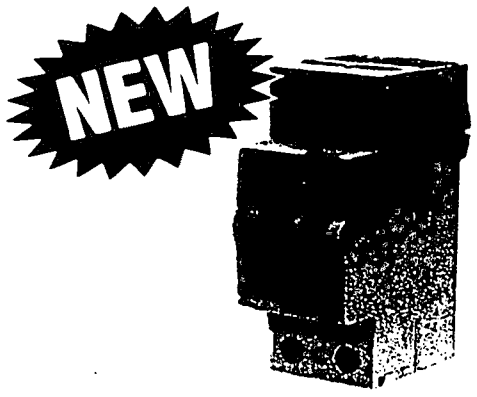
Features
- SiPart of the vast D5 range of matching 22.5 mm. control and signalling units providing IP 66 front protection
- Assembled round plastic pilot light front element
- Standard yellow lens cap with diffuser
- 4 other colours available
- Easy to mount
- Accepts coupling plate with clip-on standard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

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 neutral pigtail
suits standard 3 phase chassis

Din-Safe MCB with pigtail

Poles	Amp rating	Voltage	Short circuit	Phase	Trip [4] Sens.	Cat. No
2	6	240	10 kA	1+N [1]	30 mA	[1] 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

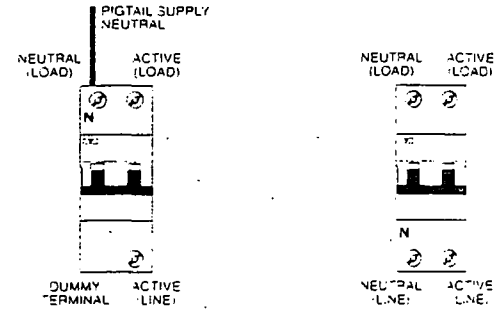
Poles	Amp rating	Voltage	Short circuit	Phase	Trip [4] Sens.	Cat. No [3]
2	6	240	10 kA	1+N [2]	10 mA	[1] DSRCB0610A
2	6	240	10 kA	1+N [2]	30 mA	[1] DSRCB0630
2	10	240	10 kA	1+N [2]	10 mA	[1] DSRCB1010A
2	10	240	10 kA	1+N [2]	30 mA	DSRCB1030
2	10	240	10 kA	1+N [2]	100 mA	[1] DSRCB10100
2	16	240	10 kA	1+N [2]	10 mA	[1] DSRCB1610A
2	16	240	10 kA	1+N [2]	30 mA	DSRCB1630
2	16	240	10 kA	1+N [2]	100 mA	[1] DSRCB16100
2	20	240	10 kA	1+N [2]	10 mA	[1] DSRCB2010A
2	20	240	10 kA	1+N [2]	30 mA	DSRCB2030
2	20	240	10 kA	1+N [2]	100 mA	[1] DSRCB20100
2	25	240	10 kA	1+N [2]	30 mA	DSRCB2530
2	32	240	10 kA	1+N [2]	30 mA	DSRCB3230
2	40	240	10 kA	1+N [2]	30 mA	DSRCB4030

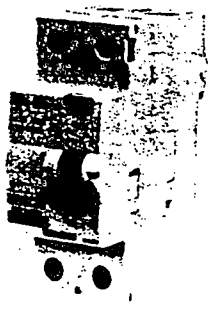
Application

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
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.

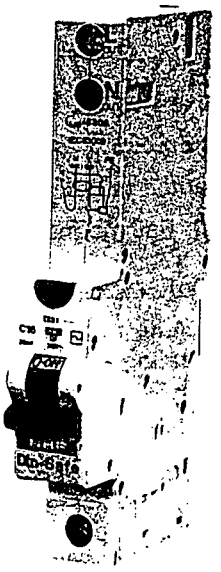
Nuisance tripping may be experienced in VFD and motor starting applications refer NHP.

[1] 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.

NEW



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

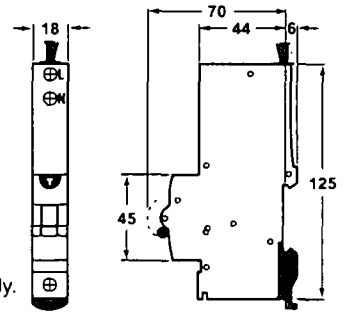
Note: [1] Neutral not switched
[2] Will not accept side mounting accessories
[3] Mines Dept. approval applies to 30 mA units only.

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 (IΔn) 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)

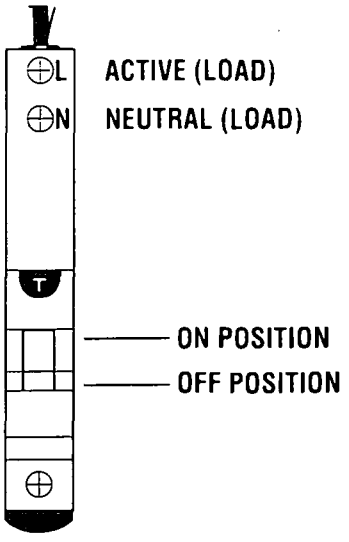


[I] Available on indent only.

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.

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

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

In (A)	C – Curve 5-10In	D – Curve 10-20In
1 pole 1 module		
2	DTCB6102C	DTCB6102D
4	DTCB6104C	DTCB6104D
6	DTCB6106C	DTCB6106D
10	DTCB6110C	DTCB6110D
13	[i] DTCB6113C	[i] DTCB6113D
16	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	[i] DTCB6213C	[i] DTCB6213D
16	DTCB6216C	DTCB6216D
20	DTCB6220C	DTCB6220D
25	DTCB6225C	DTCB6225D
32	DTCB6232C	DTCB6232D
40	DTCB6240C	DTCB6240D
50	DTCB6250C	DTCB6250D
63	DTCB6263C	DTCB6263D
3 pole 3 modules		
2	DTCB6302C	[i] DTCB6302D
4	DTCB6304C	[i] DTCB6304D
6	DTCB6306C	[i] DTCB6306D
10	DTCB6310C	DTCB6310D
13	[i] DTCB6313C	[i] DTCB6313D
16	DTCB6316C	DTCB6316D
20	DTCB6320C	DTCB6320D
25	DTCB6325C	DTCB6325D
32	DTCB6332C	DTCB6332D
40	DTCB6340C	DTCB6340D
50	DTCB6350C	DTCB6350D
63	DTCB6363C	DTCB6363D

Notes: [1] 2 pole MCB connected in series.
The line side is the "OFF" (bottom) side of the MCB.
[i] Available on indent only.

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	[i] DTCB10305C	[i] DTCB10305D
1	DTCB10301B	[i] DTCB10301C	[i] DTCB10301D
2	DTCB10302B	DTCB10302C	[i] DTCB10302D
4	DTCB10304B	DTCB10304C	[i] DTCB10304D
6	DTCB10306B	DTCB10306C	[i] DTCB10306D
10	DTCB10310B	DTCB10310C	DTCB10310D
13	[i] DTCB10313B	[i] DTCB10313C	[i] 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	[i] DTCB10406D
10	DTCB10410B	DTCB10410C	[i] DTCB10410D
13	[i] DTCB10413B	[i] DTCB10413C	[i] DTCB10413D
16	DTCB10416B	DTCB10416C	[i] DTCB10416D
20	DTCB10420B	DTCB10420C	[i] DTCB10420D
25	DTCB10425B	DTCB10425C	[i] DTCB10425D
32	DTCB10432B	DTCB10432C	[i] DTCB10432D
40	DTCB10440B	DTCB10440C	DTCB10440D
50	DTCB10450B	DTCB10450C	DTCB10450D
63	DTCB10463B	DTCB10463C	DTCB10463D

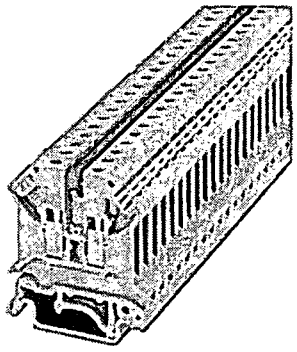
DTCB10
1 - 4 pole types

Notes: [1]) All poles include over-current and short circuit protection.
[i] 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

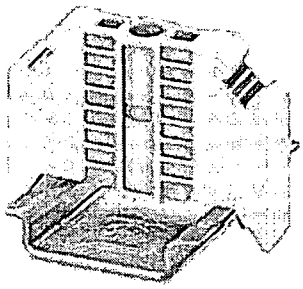
- Accessories
- Technical data
- Certificates
- PDF File

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

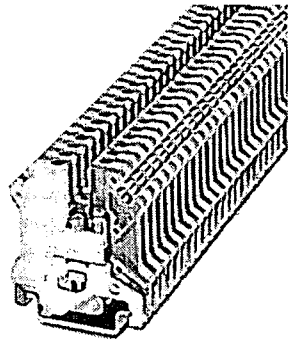
- Accessories
- Technical data
- Drawings
- PDF File

add to cart view cart

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

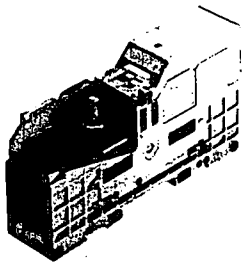
- Accessories
- Technical data
- PDF File

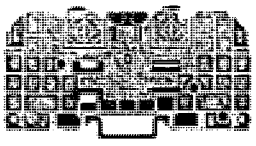
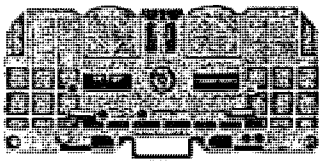
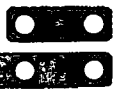
add to cart view cart

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		168 A/50 mm²			250 A/95 mm²		
Dimensions							
Width/length/height (mm)	without WAH	27/107/54			32/132/63		
Width/length/height (mm)	with WAH	27/136/60			32/179/71.5		
Bolt size	M	6			8		
VDE rated data, 0611, Part 1/8.92 / IEC 947-7-1							
Rated voltage/rated current/rated cross-section		1000 V/125 A/35 mm²			1000 V/192 A/70 mm²		
Rated impulse voltage/pollution severity		8 kV/3			8 kV/3		
Further technical data							
Tightening torque range	Nm	3.0...6.0			6.0...12		
Clampable conductor							
Cable lug DIN 46235	mm²	6...25			16...70		
Cable lug DIN 46234	mm²	2.5...50			2.5...120		
2 x cable lug DIN 46235	mm²	6...25			16...70		
2 x cable lug DIN 46 234	mm²	2.5...35			2.5...70		
Strips	mm	3 x 13 x 0.5			2 x 15.5 x 0.8	4 x 20 x 1	
Strips	mm	6 x 13 x 0.5			4 x 15.5 x 0.8		
Strips	mm	2 x 15.5 x 0.8			6 x 15.5 x 0.8		
Max. Connection Area in mm² Gauge for flat connections to 50043 Size		2.08...50	C 4		2.08...120		C 6
Continuous current rating of cross-connection 2-pole	A	135			207		
Continuous current rating of cross-connection 3-pole	A	135			207		
UL / CSA rated data							
Voltage / current / conductor size	UL	600 V/115 A/14...2 AWG			600 V/175 A/14...2/0 AWG		
Voltage / current / conductor size	CSA	600 V/130 A/14...2 AWG			600 V/170 A/14...2/0 AWG		
Ordering data	**Version**		Cat. No.	Qty.		Cat. No.	Qty.
	Wemid		**102830**	10		**102840**	10
	Blue Wemid		**102838**	10		**102848**	10
With covers	Wemid		**102930**	10		**102940**	10
	Wemid						
Partition (thickness 2 mm)		Type	Cat. No.	Qty.	Type	Cat. No.	Qty.
		WTW WFF 35	**106710**	10	WTW WFF 70	**106720**	10
Cross-connection							
WOL 		WOL 2/35	**106490**	5	WOL 2/70	**106500**	5
		WOL 3/35	**106540**	5	WOL 3/70	**106550**	-
Auxiliary / control conductor terminal							
		WZAF 35	**107050**	10	WZAF 70	**106620**	10
Cover							
	Beige PA 66	WAH 35	**106446**	20	WAH 70	**106456**	20
	Blue PA 66	WAH 35 BL	**106448**	20	WAH 70 BL	**106458**	20
	Light-green PA 66	WAH 35 HG	**106445**	20	WAH 70 HG	**106455**	20
		WAP*	**106970**	20	WAP*	**106980**	20
Warning sign							
	Yellow, Self-adhesive	WD 1	**156390**	5	WD 1	**156390**	5
	With lightning flash	Qty. = 5 cards with 6 lables on each			Qty. = 5 cards with 6 lables on each		
	Can be stuck to WAH only						
Fixing screw							
	For direct assembly	M 6 x 16	**106370**	20	M 6x16	**106370**	20
	Screwdriver	SD	**902450**	-	SD	**902450**	-
Cupal washers							
	For aluminium conductors	CPSB M 6	**015620**	50	CPSB M 8	**015630**	50
Marking tags	**Print**						
DEK 	Consecutive horizontal	DEK 5	**047346**	-	DEK 5	**047346**	-
DEK	Consecutive vertical	DEK 5	**047356**	-	DEK 5	**047356**	
WS	Blank	WS 12/6,5	**160992**	-	WS 12/6,5	**160992**	
WS DEK  WS	Printed	WS 12/6,5	**156895**	-	WS 12/6,5	**156895**	-

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

* 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.

CARLO GAVAZZI

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A CARLO GAVAZZI BRAND

NHP

CARLO GAVAZZI

Monitoring & Control Relays

"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.

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.

Advantage SERIES:

- 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*

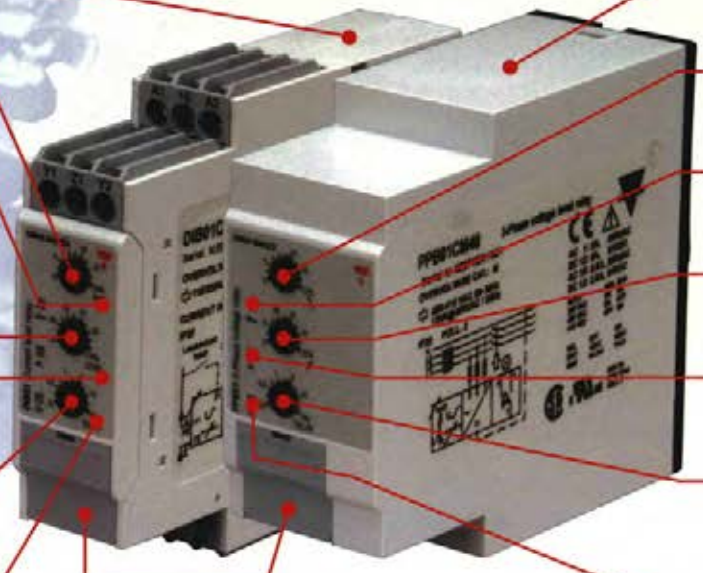
PPA
3 Phase

- *3 Phase*
- *Phase sequence and phase loss*

Accurate **Responsive** **Quality**

NHP

Reliability... you can count on



„AdvantagePlus SERIES

DIB
Current

DUB
Voltage

DPB
3 Phase

DFB
Frequency

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

DWB
Power Factor

- 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"

electromatic
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

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Version 6
www.nhp.com.au

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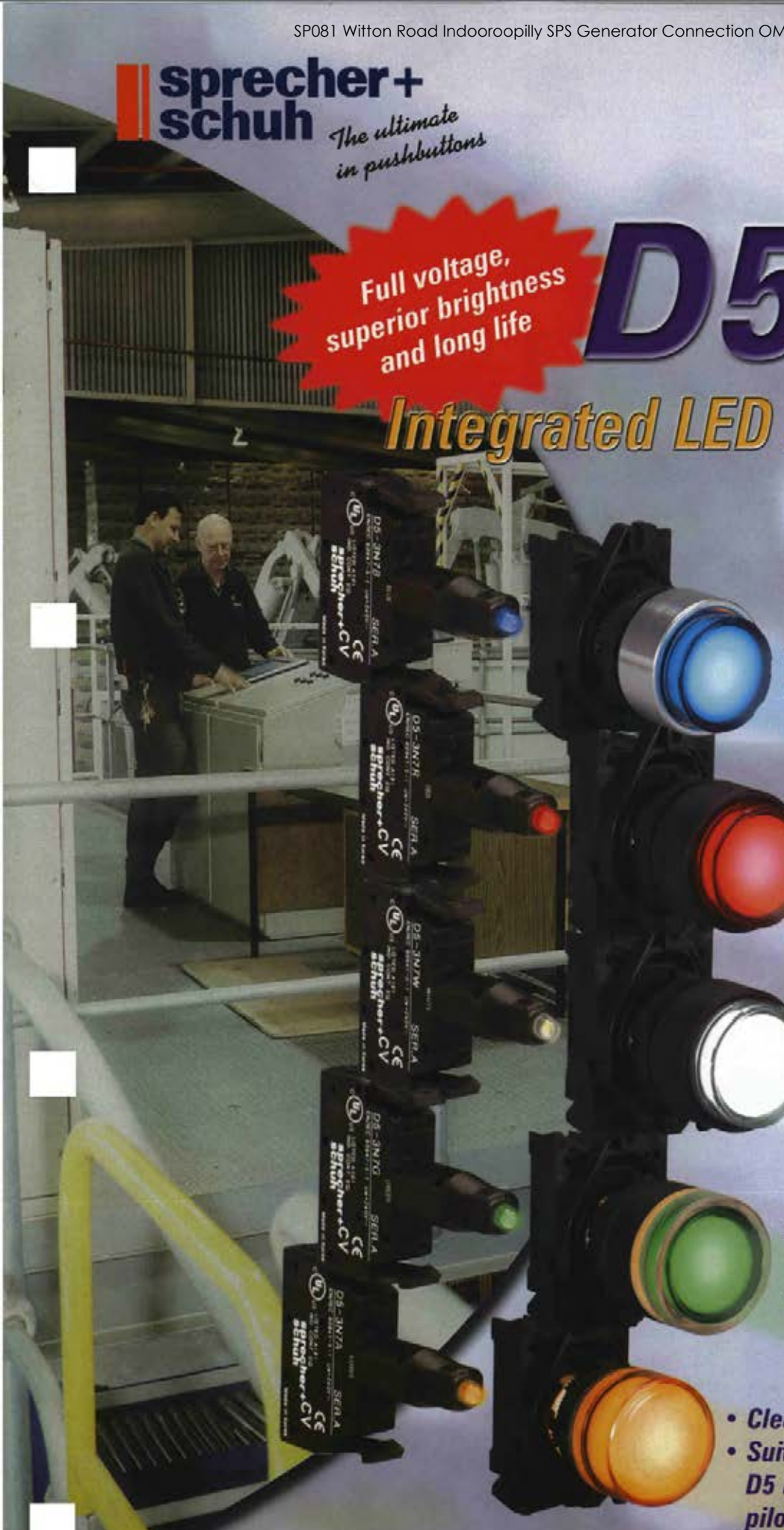
The ultimate in pushbuttons

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

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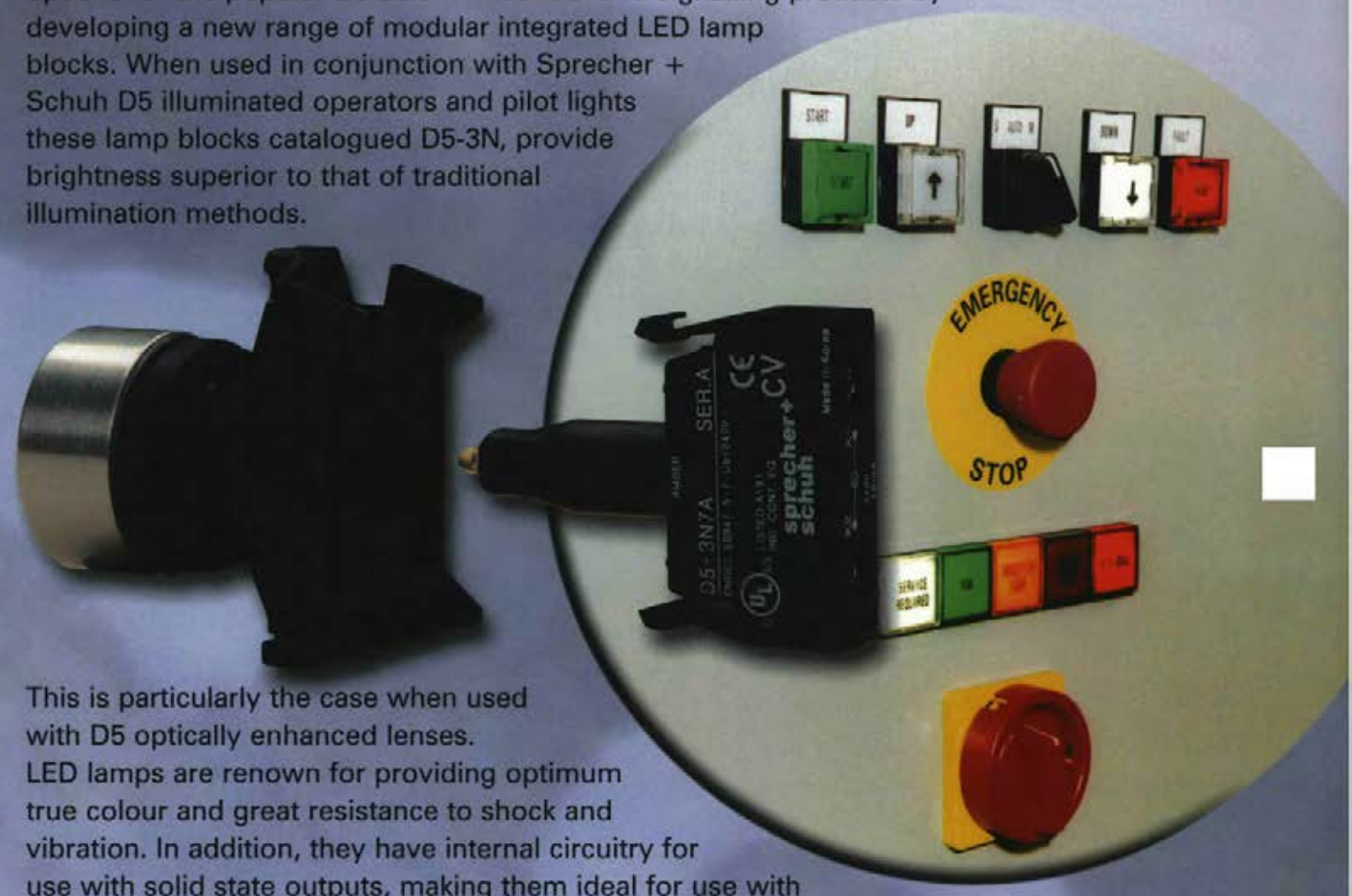
sprecher+schuh *The ultimate in pushbuttons*

NHP CAT 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.



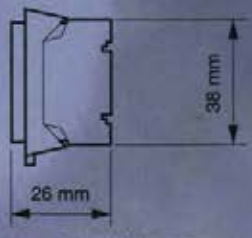
This is particularly the case when used with D5 optically enhanced lenses. LED lamps are renown for providing optimum true colour and great resistance to shock and vibration. In addition, they have internal circuitry for use with solid state outputs, making them ideal for use with PLC inputs. The new 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.

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FAX: +61 3 9429 1075	+61 2 9648 4353	+61 2 4960 2203	+61 7 3891 6139	+61 7 4775 1457	+61 7 4922 2947	+61 7 4633 1798	+61 7 4035 6999	+61 8 8371 0962	+61 8 9277 1700	+61 8 8947 2049	+61 3 6228 9757

sprecher+schuh

The ultimate in Motor Control

Catalogue
CA4
June 2002

MOTOR CONTROL
Miniature contactors and starters

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
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NHP

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

Rockwell Automation

sprecher+schuh

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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NHP

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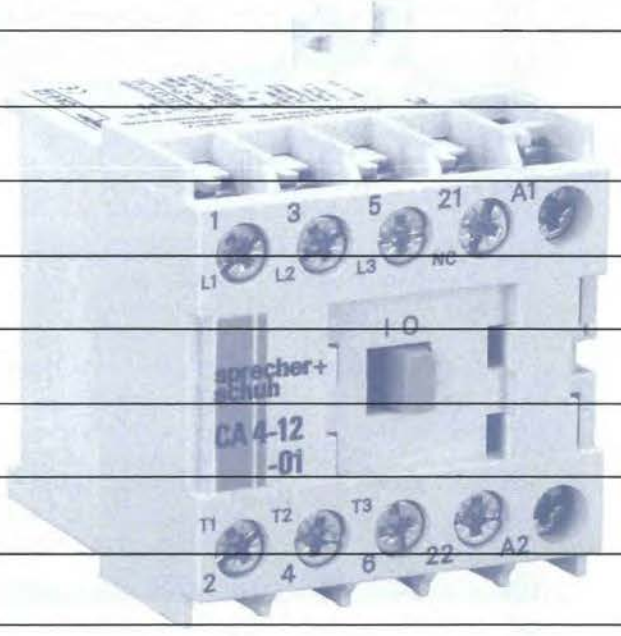


sprecher+ schuh

MINI CONTACTOR AND RELAY SYSTEM

CA4

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

CA4

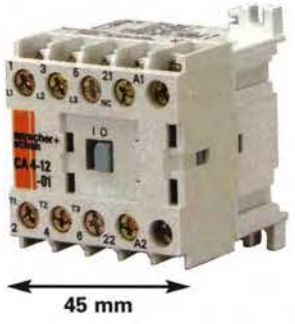
Compact Dimensions

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 CEP 7 electronic overload relay

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

CA 4 contactor fitted with auxiliary contact block

sprecher+schuh

THREE RATINGS IN ONE FRAME SIZE

CA4

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

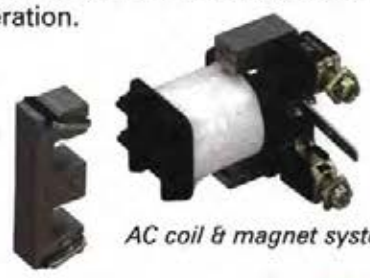
CA4

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:

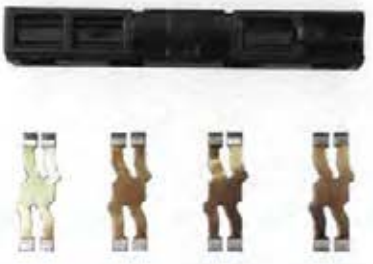
  H-contact bridges with non-wear, self-aligning wiping contacts having a 4-way current path feature.

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.



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ADVANCED MOTOR PROTECTION

CA4

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

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

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CS 4 MINIATURE RELAY SYSTEM

CA4

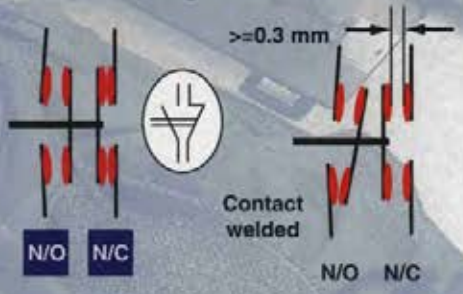
CS 4 Miniature Relay

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.

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).

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.

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

CA4

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

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WORLD CLASS QUALITY CA 4 MINIATURE CONTACTORS

CA4

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.

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CA 4 NHP

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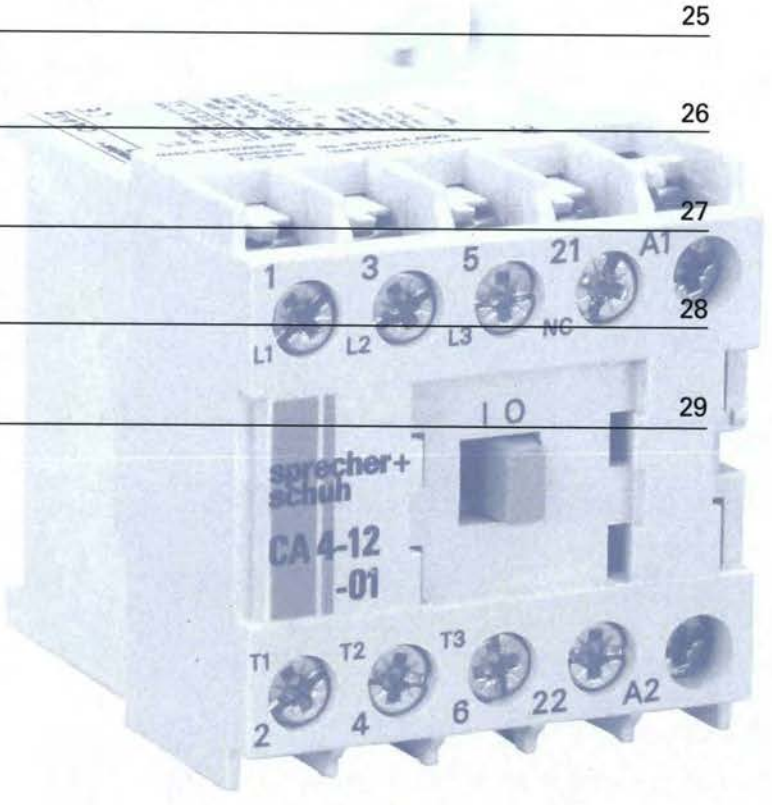

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AC AND DC CONTACTORS

CA4

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])

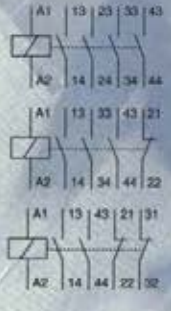
AC 3 kW	AC 2 amps	Aux. Contacts std.	max.	Cat. No. [2])
2.6	5.3	1 N/O	5	CA 4-5C-10...V
2.6	5.3	1 N/C	5	CA 4-5C-01...V
4.5	9	1 N/O	5	CA 4-9C-10...V
4.5	9	1 N/C	5	CA 4-9C-01...V
6.1	12	1 N/O	5	CA 4-12C-10...V
6.1	12	1 N/C	5	CA 4-12C-01...V

CS 4 relay

Basic relay CS 4 4-pole [1])

Contacts N/O	Contacts N/C	AC or DC	Cat. No. [2])
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

CA4

Auxiliary Contact Blocks CA 4-P

Auxiliary contact block

For contactors CA 4... -10 [1] Contact arrangement	Cat. No.	For contactors CA 4...-01 [1] Contact arrangement	Cat. No.
21 31 / 22 32	CA 4-P-02	53 63 / 54 64	CS 4-P-20
21 33 / 22 34	CA 4-P-11	53 61 / 54 62	CS 4-P-11
43 53 21 31 / 44 54 22 32	CA 4-P-22	53 63 73 83 / 54 64 74 84	CS 4-P-40

Accessories

RC link

Mechanical Interlock

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**

KCD 4

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**

CR4-P DIN rail adaptor

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).

CRZE 4 Timer

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.

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STATE OF THE ART MOTOR PROTECTION

CA4

- 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 [1]

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

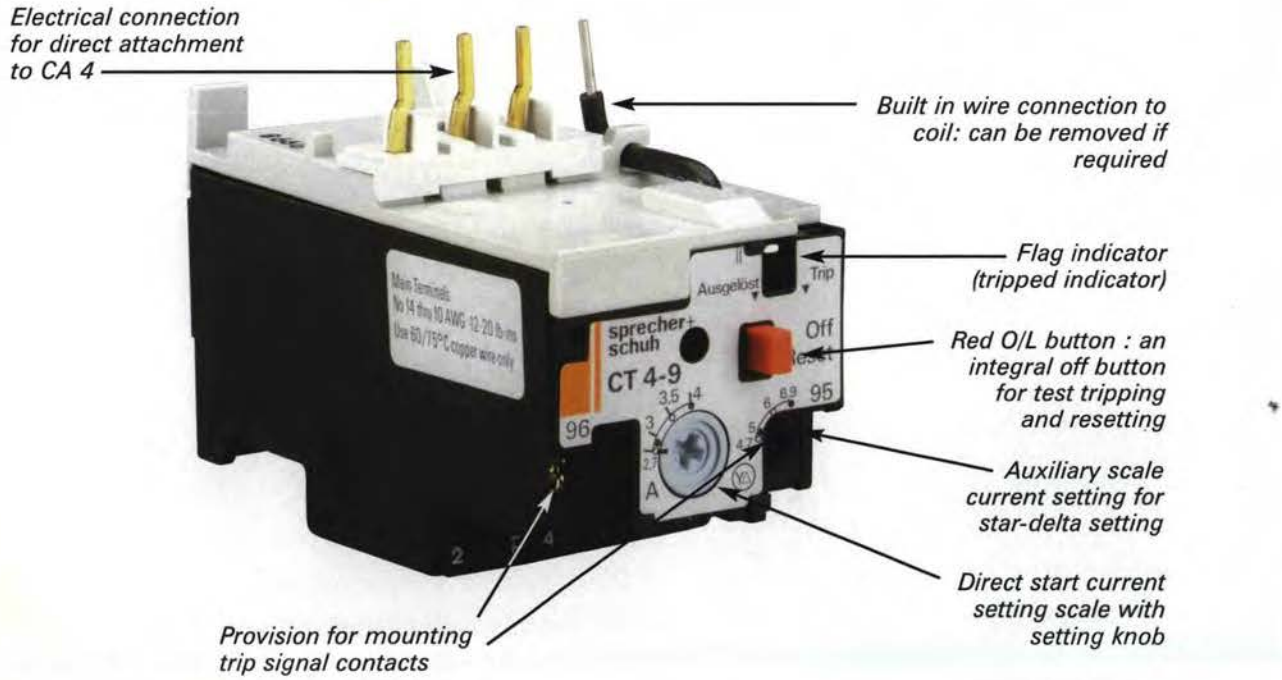
NHP

CA4

- 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**



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TECHNICAL INFORMATION

CS 4 Control Relay

Electrical

Contact Ratings - IEC 947			CS 4 Relays
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

			CS 4 Relays
Mechanical Life		[Mil]	10
Electrical Life			
AC 15 (240 V, 3 A) AC Operations		[Mil]	~
AC 1 (230 V, 6 A)		[Mil]	0.7
Weight		[g]	153
Terminal Cross-Section			
Terminal Type			
	1 Conductor	[mm²]	0.75...2.5
	2 Conductor	[mm²]	0.75...2.5
	1 Conductor	[mm²]	0.75...2.5
	2 Conductor	[mm²]	0.75...2.5
Max. Wire Size		[AWG]	18...14
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
Rated Voltage U_e	
AC	230, 240, 400, 415, 500 V
DC	24, 48, 110, 220, 440 V
Rated Frequency	50/60 Hz, DC
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
Type of Protection	IP 20
Finger Protection	safe from touch by fingers and back of hand per vde 0106, part 100

TECHNICAL INFORMATION NHP

CA 4 Miniature Contactors

Rated Insulation Voltage U_i			
to IEC 947-1	[V]	500 V	
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	
DC	[V]	24, 48, 110, 220, 440	
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
DOL & Reversing	240 V	[A]	6.5	12	12
50 Hz/60 °C	400 V	[A]	5.3	9	12
	415 V	[A]	5.3	9	12
	500 V	[A]	4	7	7
	230 V	[kW]	1.5	3	3
	240 V	[kW]	1.5	3	3
	400 V	[kW]	2.2	4.5	5.5
	415 V	[kW]	2.2	4.5	6.1
	500 V	[kW]	2.2	4	4

Maximum Operating Rate			
At 9 A for AC 3; 20 A for AC 2/4	AC 2	[ops/hr]	300
Starting time t_A= 0.25 s	AC 3	[ops/hr]	600
AC 4 (200,000 Op. Cycles)	AC 4	[ops/hr]	300
50 Hz	230 V	[A]	3.9
	240 V	[A]	3.9
	400 V	[A]	3.3
	415 V	[A]	3.3
	230 V	[kW]	0.92
	240 V	[kW]	0.96
	400 V	[kW]	1.5
	415 V	[kW]	1.6
Max. Operating Rate		[ops/hr]	250

			CA4		
			-05	**-09**	**-12**
(Star Delta)	230 V	[A]	11	21	21
50 Hz	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
AC 1 Load,					
3 Ø Switching	I_e	[A]	20	20	20
Ambient	230 V	[kW]	8	8	8
Temperature 40 °C	240 V	[kW]	8.3	8.3	8.3
	400V	[kW]	14	14	14
	415 V	[kW]	14	14	14
	500 V	[kW]	17	17	17
Ambient	I_e	[A]	16	16	16
Temperature 60 °C	230 V	[kW]	6.4	6.4	6.4
	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
Lighting Loads					
Elec. Dischrg.	Open	[A]	18	18	18
Lamps-AC 5a,	Enclosed	[A]	14.5	14.5	14.5
Single compensated	10 kA	[µF]		750	
Max. capacitance at	20 kA	[µF]		400	
prospective short circuit current available at the contactor				-	
Incandescent Lamps-AC 5b, Electrical endurance ~100,000 operations		[A]	9.3	9.3	9.3

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TECHNICAL INFORMATION

CA 4 Miniature Contactors

Electrical Data

Switching power transformers AC 6a

Inrush / Rated transformer current = 30			CA4 -05	CA4 -09	CA4 -12
	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 I_{cw} 60 °C			-05	-09	-12
	10 s	[A]	60	96	96

Off Time Between Operations	[Min]	3	

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

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, Loyd's Registry of Shipping, Bureau Veritas, Maritime Register of Shipping, Elektrizitats-Inspektorat Finland

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TECHNICAL INFORMATION

CA 4 Miniature Contactors

Auxiliary Contacts

Current Switching			Built-in Auxiliary Contacts	Auxiliary Contact Blocks
AC 1 Ith	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 End Ferrule	1 Conductor	[mm²]	0.75...2.5	0.75...2.5
	2 Conductor	[mm²]	0.75...2.5	0.75...2.5
 Solid/Stranded-Conductor	1 Conductor	[mm²]	0.75...2.5	0.75...2.5
	2 Conductor	[mm²]	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	
CRZE4 (AC or DC)	110 V (-23 %) - 250 V (+10 %)
CRZY4 (AC only)	110 V (-23 %) - 120 V (+10 %)
	220 V (-20 %) - 250 V (+10 %)
Voltage drop	5 V max
Load current for reliable operation	10 mA min
Load Current at 220 V	
20 °C	600 mA
40 °C	440 mA
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

Repeat accuracy	± 5 %
Time interval for start commands	
CRZE4	1.4 x set time
CRZY4	2 x set time
Ambient temperature	
Storage	-40 °C to + 80 °C
Operation	-20 °C to + 55 °C

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

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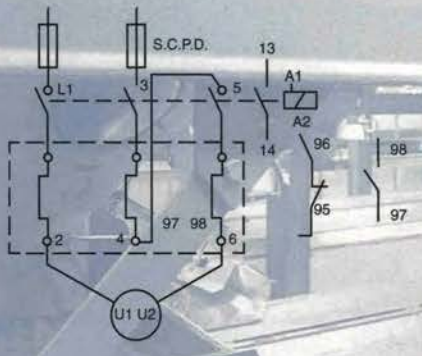
TECHNICAL INFORMATION

CEP 7/CT 4 Overloads

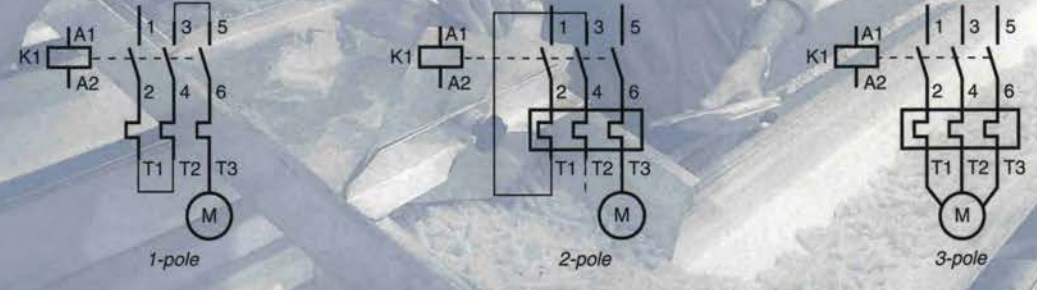
General data	CEP7-A/M-32	CT4-9
Weight [kg]	0.14	X
Standards	IEC 947, EN 60 947, DIN VDE 0660	
Approvals	CE, UL, CSA, PTB	
Corrosion resistance	95 % relative humidity without condensation, 30...60 °C	humid/warm, constant
Ambient temperature		humid/warm, cyclic
Open	-20...+60 °C	-25...+50 °C
Enclosed	-20...+40 °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 AC 8b (automatic reset) of overload	Switching of Hermetically sealed compressor motors (air tight sealed)
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.

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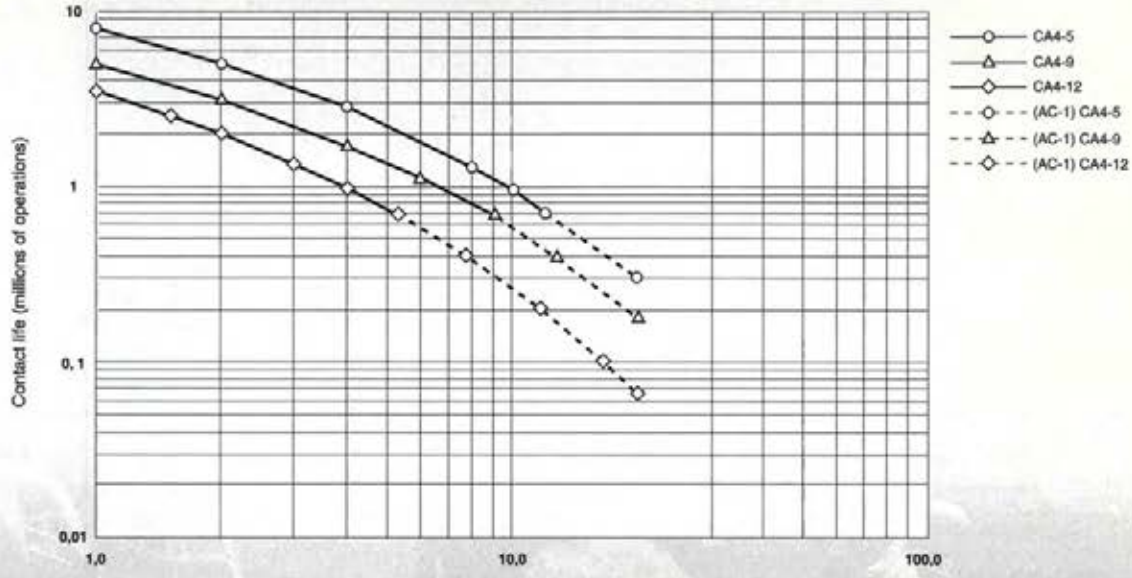
ELECTRICAL LIFE GRAPHS

CA 4 Contactors

CA4

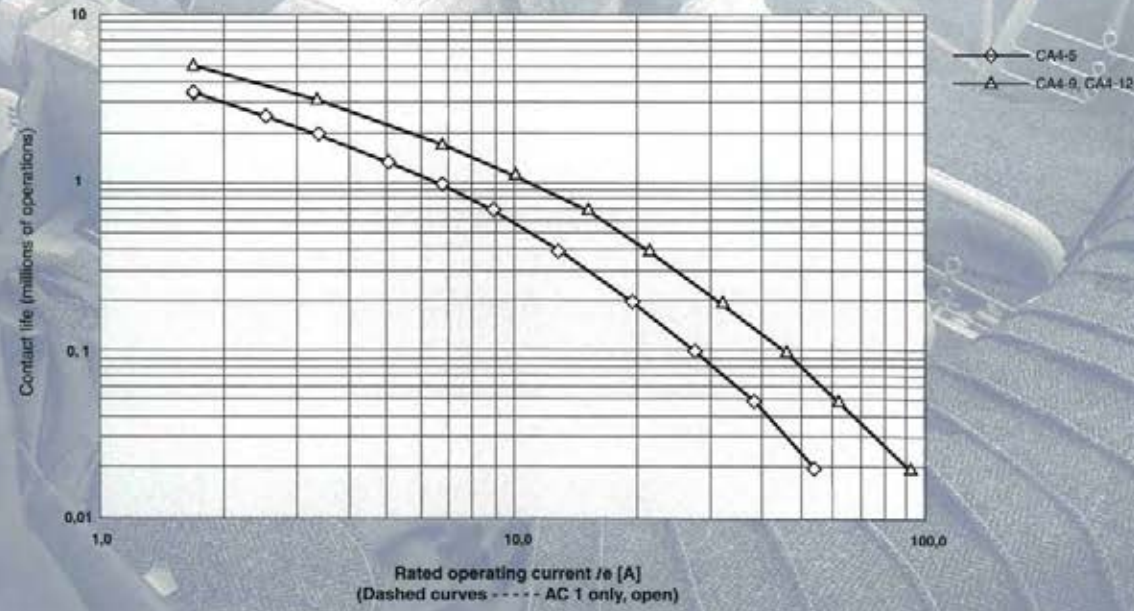
CA 4 Contactors

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



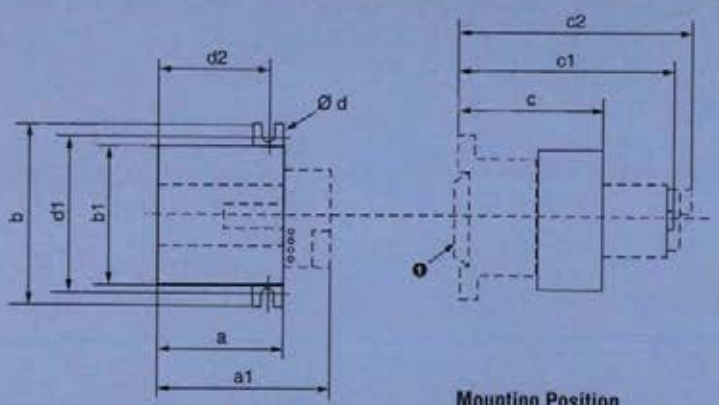
DIMENSIONS

NHP

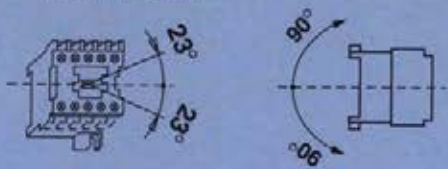
CA 4 Contactor CS 4 Control Relay

CA4

Series CA 4



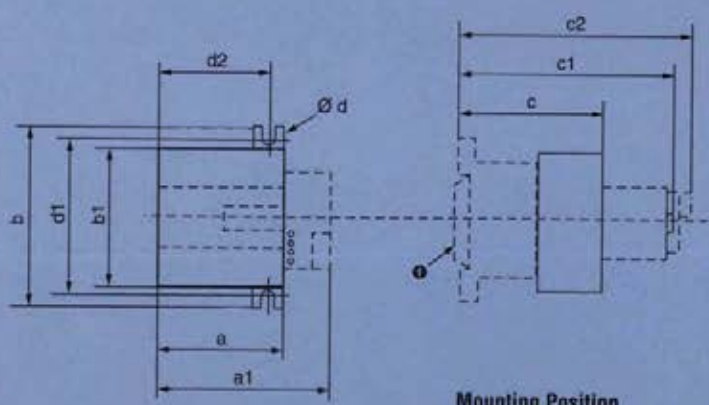
Mounting Position



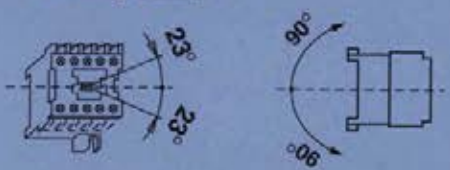
Type	a	a1	b	b1	c	C1	C2	Ød	d1	d2
CA 4-9	45	67	56	47	48	74	77	4.2	50	40

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

Series CS 4 industrial control relays



Mounting Position



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.

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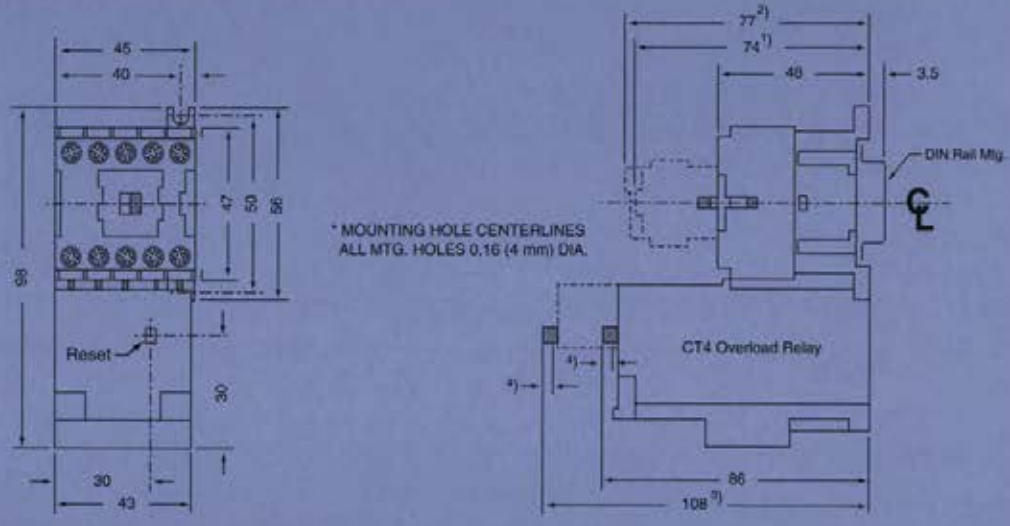
DIMENSIONS

CA4

CT 4 Thermal Overload Relay

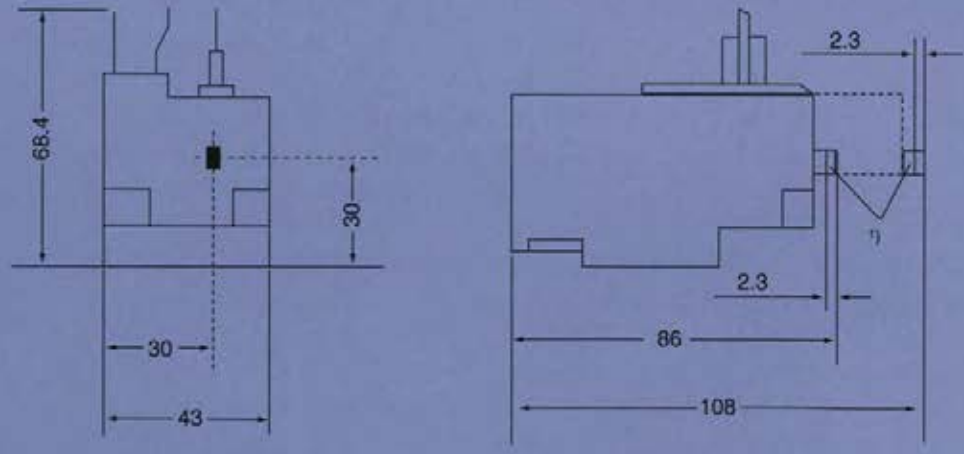
Series CT 4 (mounting to CA 4 contactors)



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

Series CT 4



Notes: 1) Minimum reset travel = 2.3 mm

Dimensions in (mm)

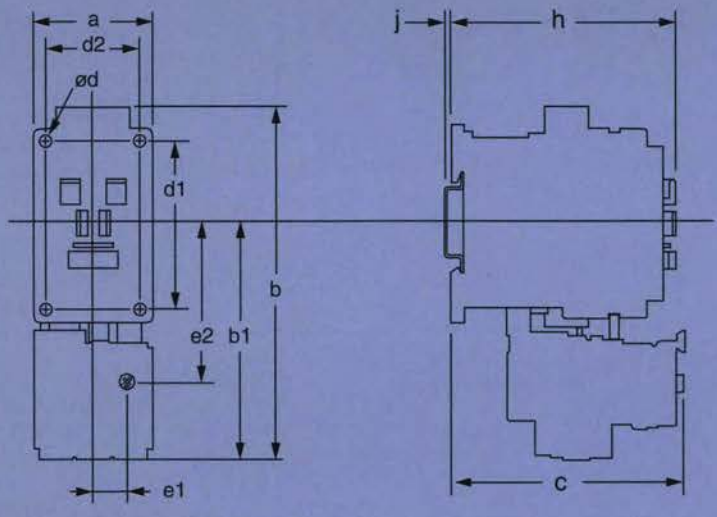
DIMENSIONS

NHP

CA4

CEP 7 Electronic Overload Relay

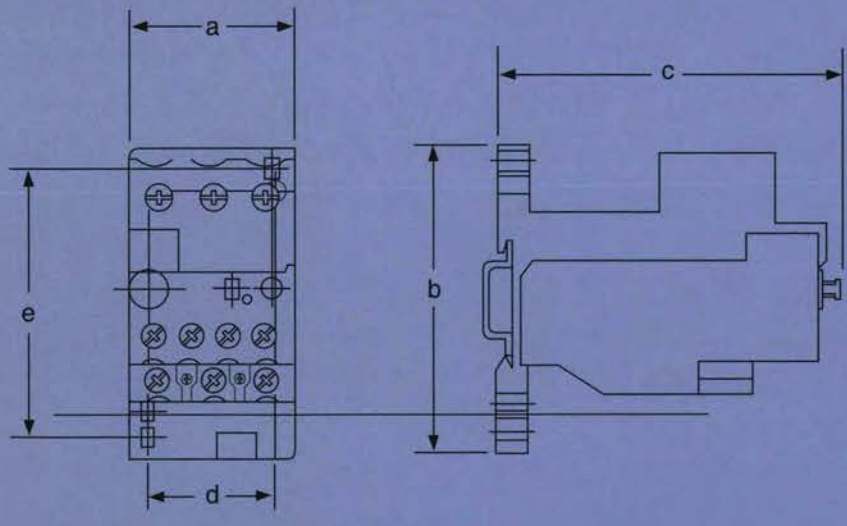
Series CEP 7 (mounting to CA 4 contactors)



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

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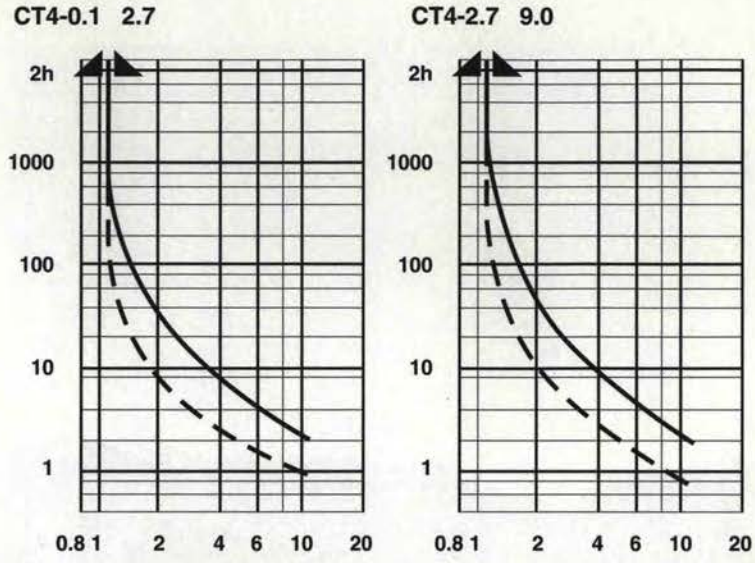
CEP 7/CT 4 OVERLOAD GRAPH

CA4



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).

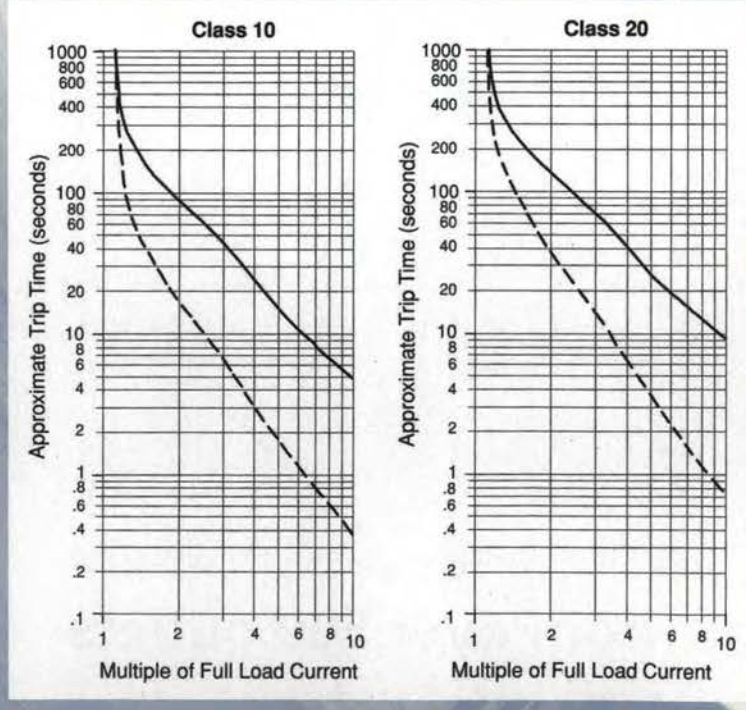
Tolerance: trip time ±20 % (±10 for current).

Function Limits and Temperature Compensation: from -25 °C...+70 °C.

Tripping Limits: specified in IEC 292-1 for -5 °C...+60 °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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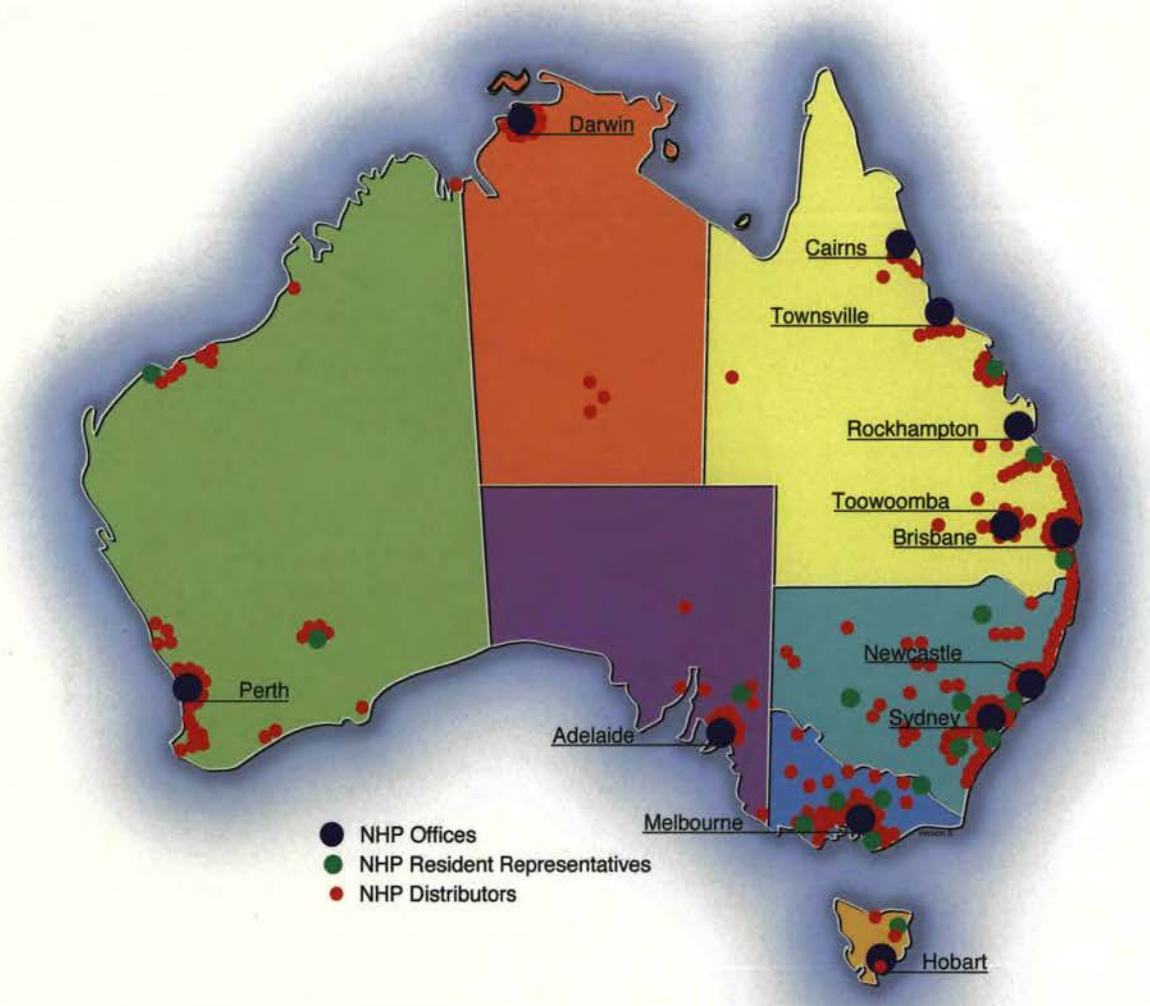

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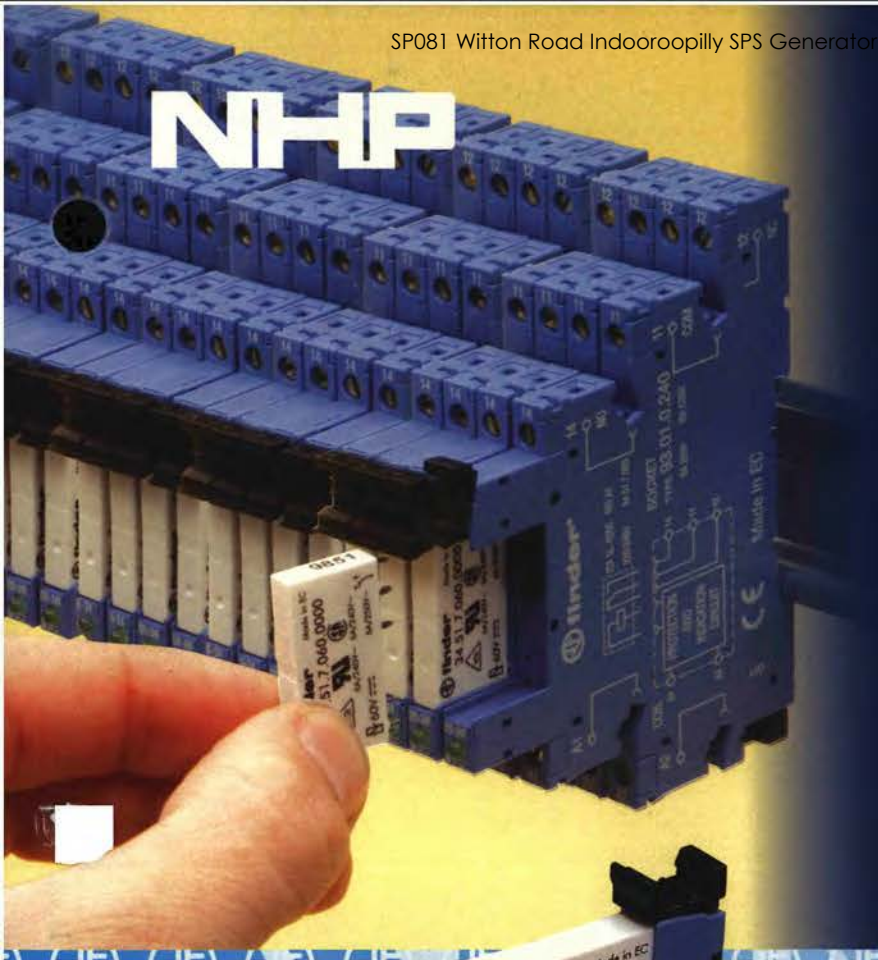

Relay Interface Module 6 A

SERIES 38

Ideal for PLC Interface

- Compact design
- Sensitive DC coil version
- Integral LED + diode
- Simple removal of relay with plastic retaining clip
- 35 mm DIN rail mounting
- CE and UL approved

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SERIES 38

Relay Interface Module 6 A

ORDERING DETAILS

Cat. No. 38.51 ...	1 x 6 A C/O contact

COIL DATA

Voltages available (AC/DC)	24, 240
Voltages available (Sensitive DC)	12, 24
Rated Power ...	0.3 W
Operating Range ...	0.7 to 2.2 U_N
Holding Voltage ...	0.4 U_N
Drop Out Voltage ...	0.1 U_N
Wire thermal insulation Class ...	F(+155 °C)

TECHNICAL DATA

Dielectric Strength-coil to contacts ...	4 kV
Ambient Temperature ...	-40 °C to 70 °C
Mechanical Life ...	10 . 10^6 cycles
Electrical life at rated load (AC 1) ...	60 . 10^3 cycles
Maximum switching frequency:	
- without load ...	36,000 cycles/h
- at rated load ...	1,800 cycles/h
Operated time:	
- pick up time ...	≤7 ms
- drop out time ...	≤11 ms
Type of duty ...	Continuous

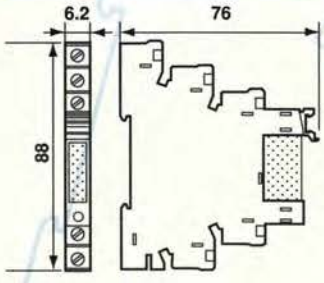
CONTACT DATA

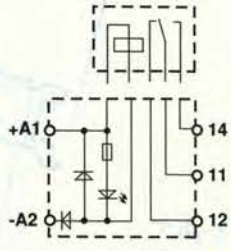
Rated current ...	6 A (AC 1)
Maximum peak current ...	30 A (0.5 s)
Rated voltage ...	250 V AC
Maximum switching voltage ...	400 V AC
Nominal rate in AC 1 ...	1,500 VA
Nominal rate in AC 15 (230 V) ...	300 VA
Minimum switching load ...	500 mW (12 V / 10 mA)
Contact resistance ... -initial	≤50 mΩ
Contact material ...	$AgSnO_2$

Suitable for:

- **Automatic gates**
- **Elevators**
- **Alarm systems**
- **Industrial automation**
- **Furnace systems**
- **Electronic controls**
- **Industrial controls**
- **Air conditioning**
- **Medical equipment**

DIMENSIONS (mm)





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