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Water**



**BRISBANE WATER**

**Project STTX- generator Connection Boxes**

# **GENERATOR CONNECTION O & M Manual SP 178 Oldfield Rd**



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

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

Author : ***Brisbane Water Projects***



SCSQ

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# **COMMON LOGIC PTY LTD**

ACN. 011 029 262

## **Electrical Contractors**

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

### ***Electrical Manual - WB178 Oldfield Road***

ISSUE NO 1  
AS BUILT  
21/06/2004

Unit 9/58 Wecker Road, Mansfield, Queensland 4122  
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JH05

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JH05Mj178Oldfield-Rd



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## ***BRISBANE WATER***

# **GENERATOR CONNECTION O & M Manual**

## **Section 1**

- Generator Connection Description
- ATS Connection Diagram

## **Section 2**

- Parts List

## **Section 3**

- Asbuilt Drawings
- Construction Markups

## **Section 4**

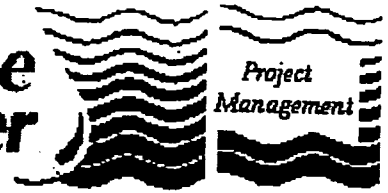
- Site Testing
- Site Testing Functional description
- Site Testing NCS alarms
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- Parts information



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# **GENERATOR CONNECTION O & M Manual**

## **Section 1**

### **Generator Connection Description**



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**Specialist Electrical Contractors**
**Electrical Manual**

Subject: Semi Permanent Generator Change Over Switchgear

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**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.

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## **2.0 OPERATIONAL DESCRIPTION**

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

### **2.1 GENERATOR**

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

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

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

### **2.2 RTU**

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

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

### **2.3 PUMP STARTER MCC**

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

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

#### **2.3.1. MCC MAIN SWITCH**

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

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

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

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

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

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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.

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**2.4.2. RTU INTERFACE**

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

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

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

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

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

**2.4.3. ATS AND CONTROL**

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

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

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

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

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

**Manual Operation:**

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

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

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

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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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**3.0      DRAWINGS**

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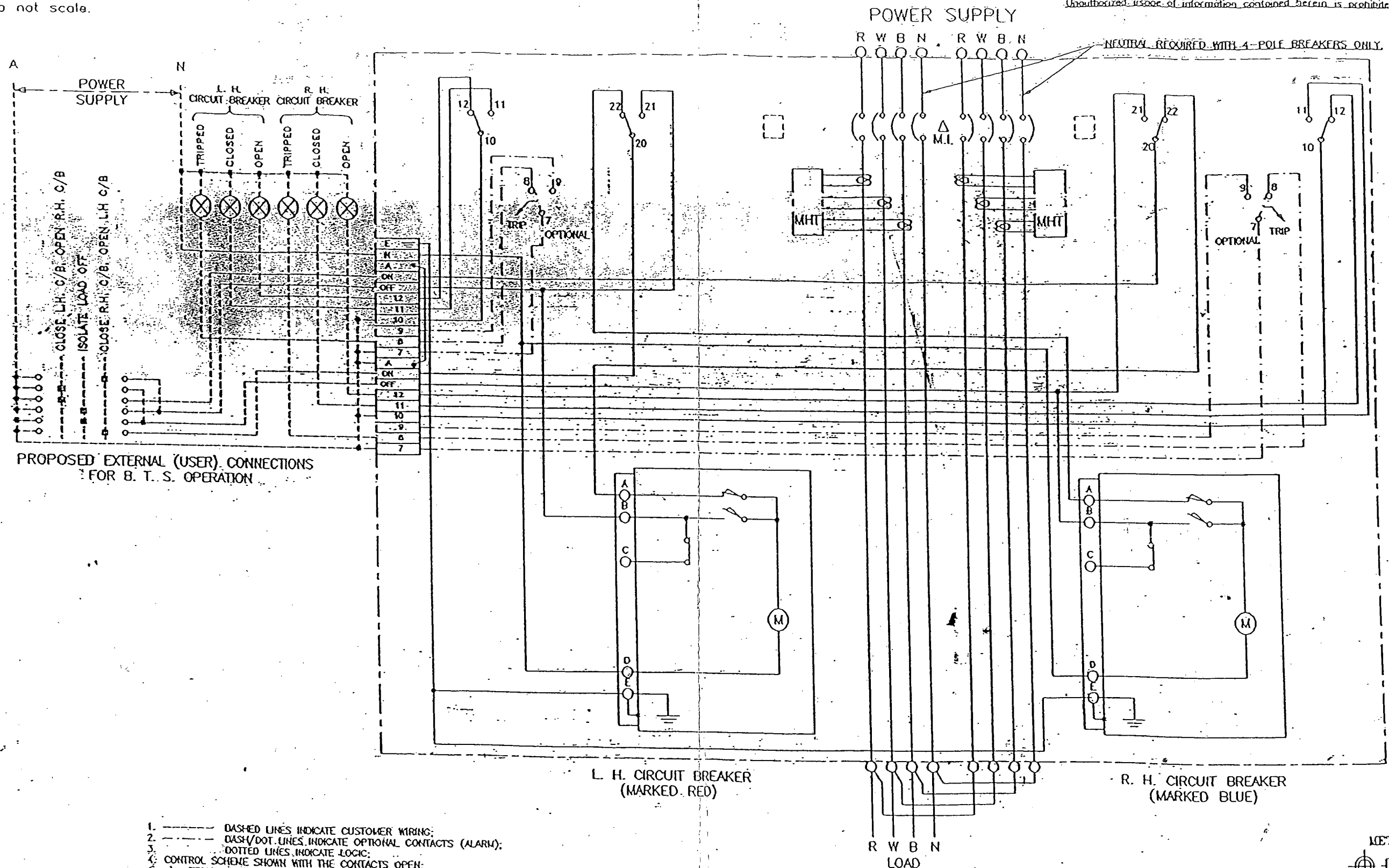
## **Section 1A**

### **ATS Connection Diagram**



Reduced print.  
Do not scale.

Unauthorized use of information contained herein is prohibited.



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. 12 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. WHITE ONLY FOR ELECTRONIC BREAKER.

CAO REF: 0401021

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REFERENCE	DRAWING NO.	ISSUE
NRP	233	10.9.1988

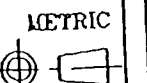


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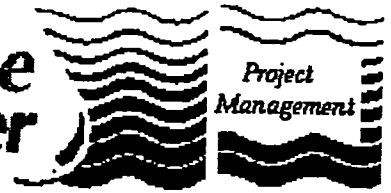
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B	NOTE 11 ADDED	6/8/93	P.C.T	
A	DRAWING REVISED DUE TO UPDATED	20.6.91	O.V.M	
NO.	REVISION	DATE	DRAWN	CHECKED
1	TEMP BREAK CIRCUIT BREAKERS			
2	B.T.S. SCHEMATIC			
3	AMB (SWALL) MOTOR OPERATOR			



GROUP	DRAWING No.
04	010
SHEET	2/2



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# **GENERATOR CONNECTION O & M Manual**

## **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
Dore	BBLV50E	51MM INSULATOR STAND OFF	Dore Electrics Catalogue
Dore	BBLV50H	600V STAND OFF INSULATOR	Dore Electrics Catalogue
Dore	BBLV75S	600V STAND OFF INSULATOR TYPE C M10	Dore Electrics Catalogue
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	BS12S1233 (AUTO)	TRANSFER SW BTSS1250SE125033 AUTO	NHP Catalogue Page
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
NHP	NV20FW	FITTING FUSE HOLDER 20A CLIPIN F/W	NHP Flyer NCF-F
NHP	OETL1250K3	L/BREAK SWITCH 3P 1250A C/W STD HANDLE & SHAFT	NHP Web Page
NHP	OETLZX128	SHROUDS	NHP Web Page
NHP	OX12X325	EXTENDED SHAFT 12/325MM	NHP Web 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



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# **GENERATOR CONNECTION O & M Manual**

## **Section 3**

### **Asbuilt Drawings**



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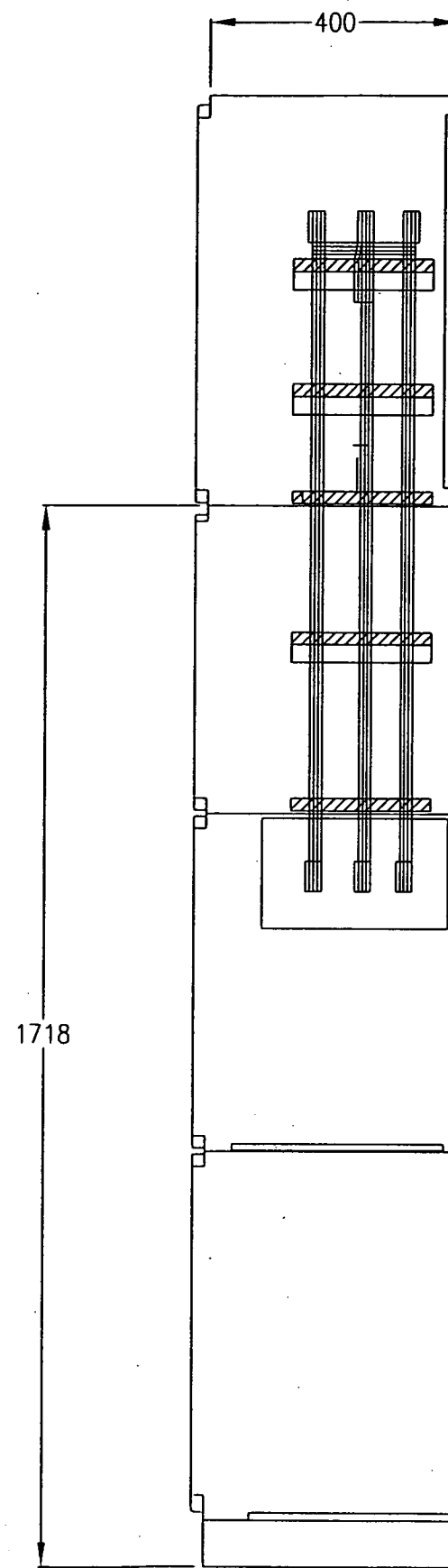
***BRISBANE WATER***

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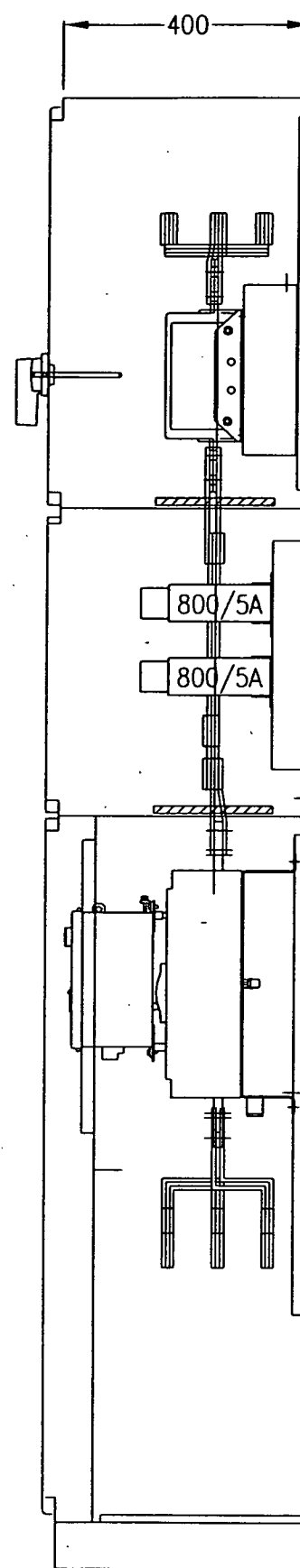
## **Section 3A**

### **Construction Markups**

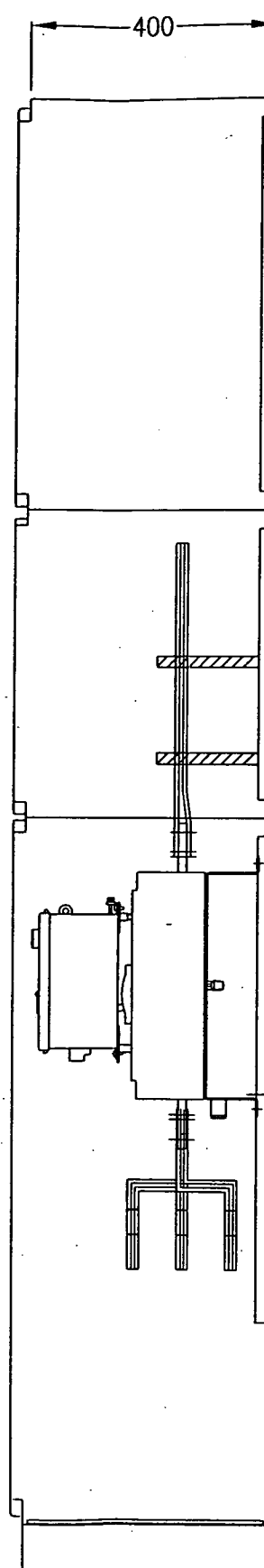
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SECTION A-A



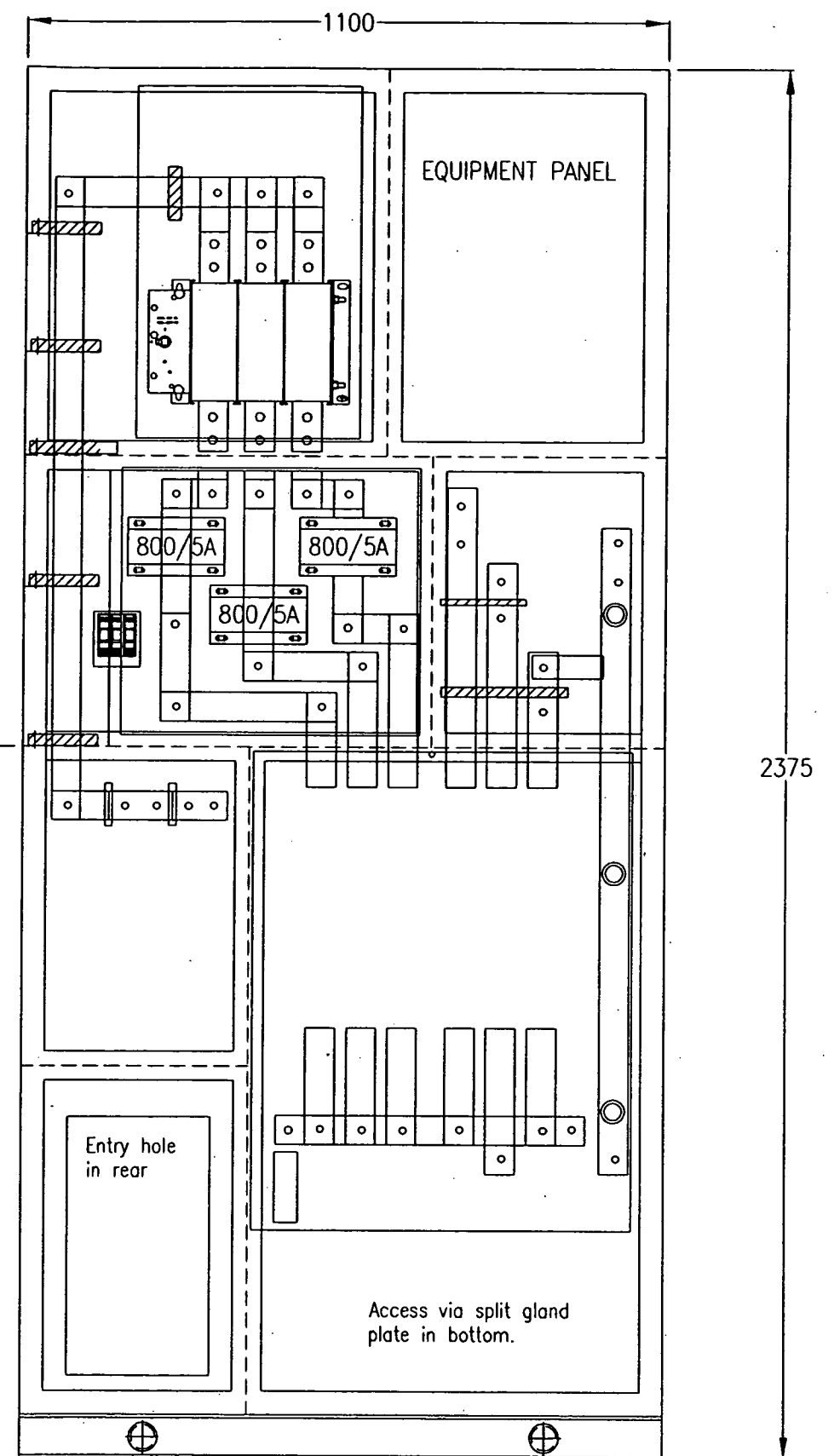
SECTION B-B



SECTION C-C

MAIN SWITCH  
1250AmpBUS BAR  
2-50x6.3mmCover over  
mains bus.

1219

FRONT VIEW  
(DOORS & COVERS REMOVED)

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11/11/03	MB	ISSUED FOR CONSTRUCTION			
20/10/03	MA	ISSUED FOR APPROVAL			

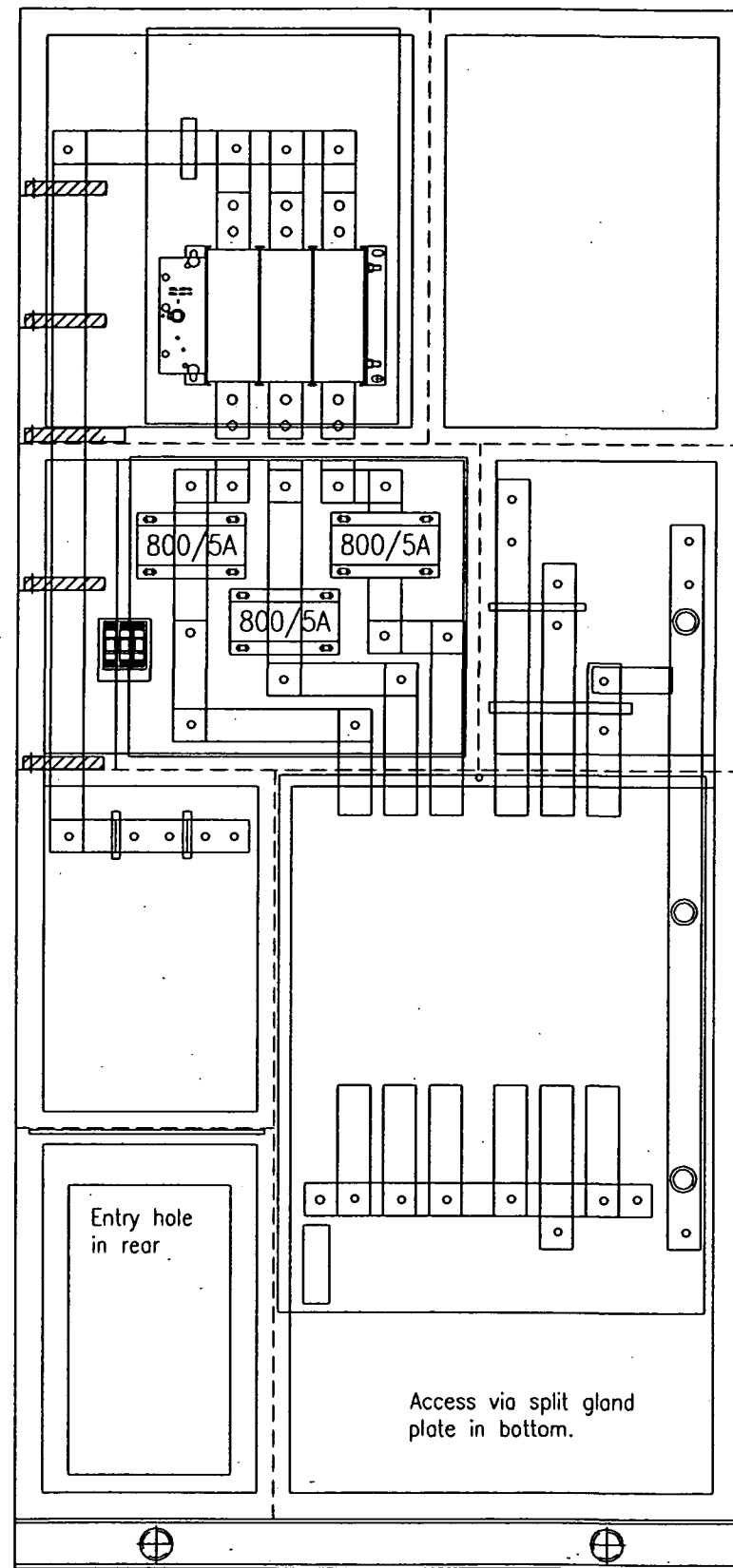
FWN	
LWN	
SWN	
FTN	
LTN	
STN	

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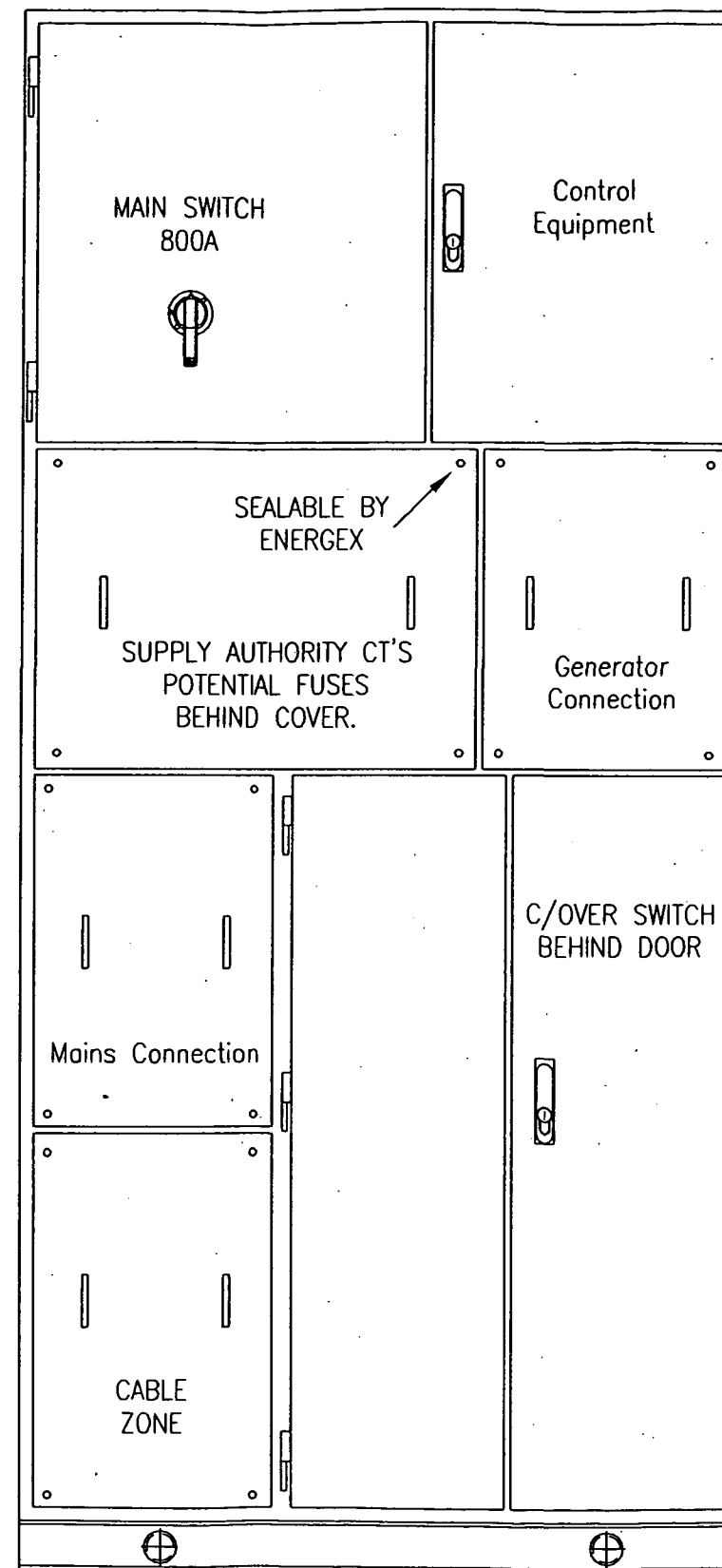
DATE	05/09/03
DRAWN	GCK
SCALE	NTS
APPROVED	

BRISBANE WATER, Oldfield Rd			
GENERATOR SW/BD EXTENSION SECTIONS A, B, FRONT VIEW.			
	JG05DK02	A3 sheet 2/2	ISSUE A

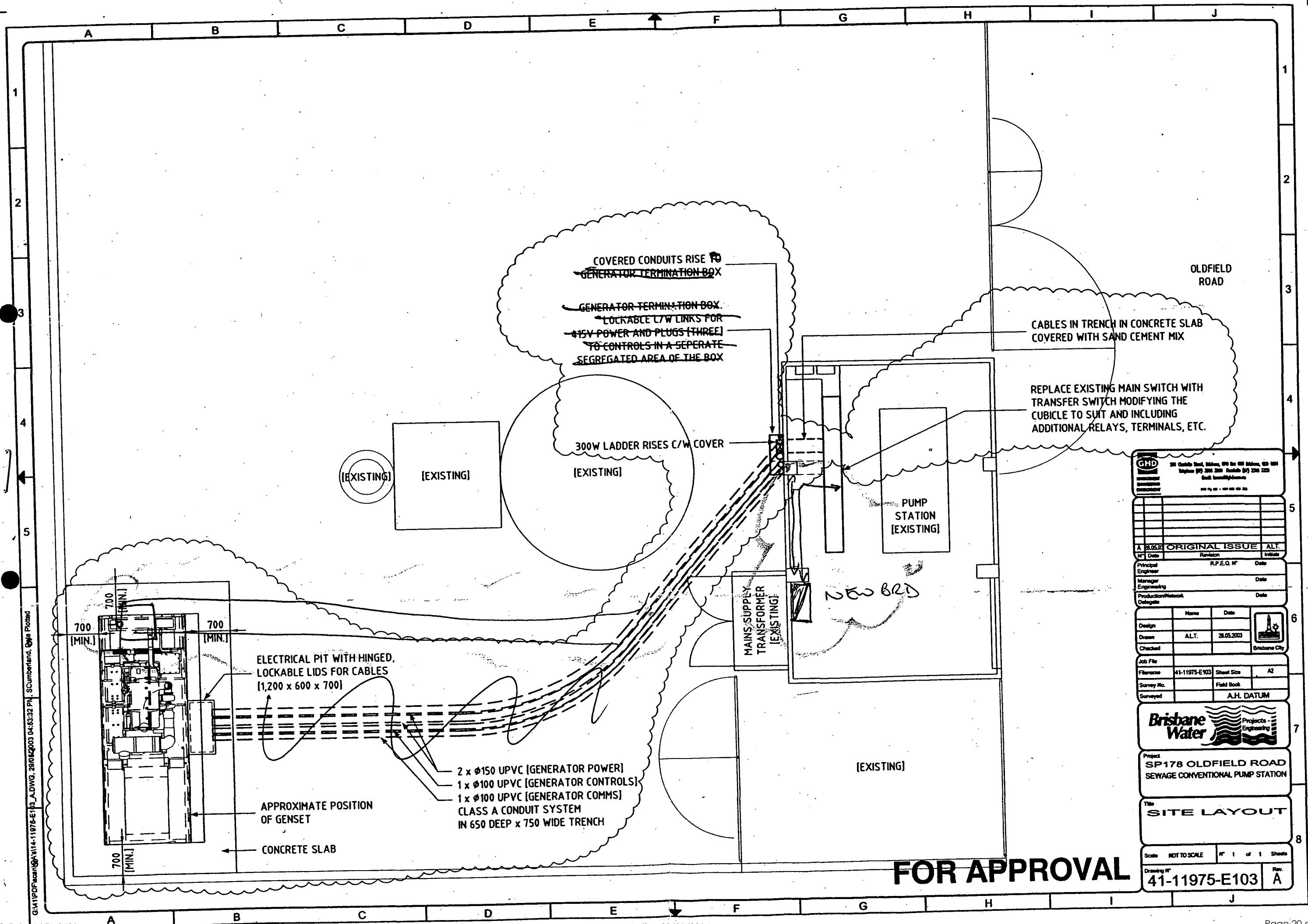
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FRONT VIEW

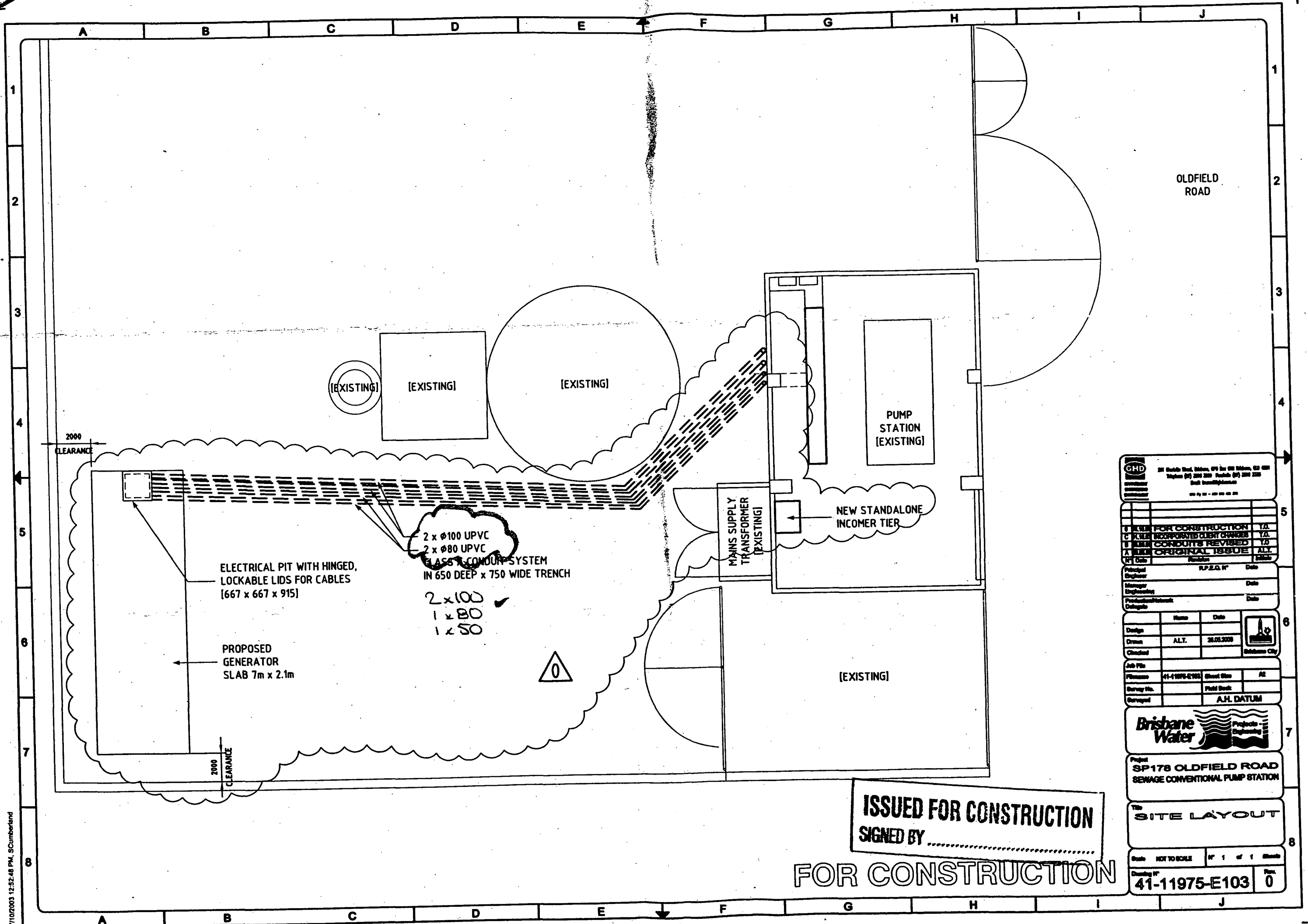


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8/10/03	MA	ISSUED FOR APPROVAL	SWN		PTY. LTD.	SCALE	NTS	
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			LTN		Mansfield QLD. 4122			ISSUE A
			STN		Tele: 07 3849 7449			

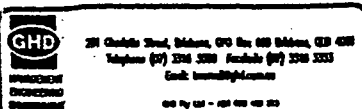
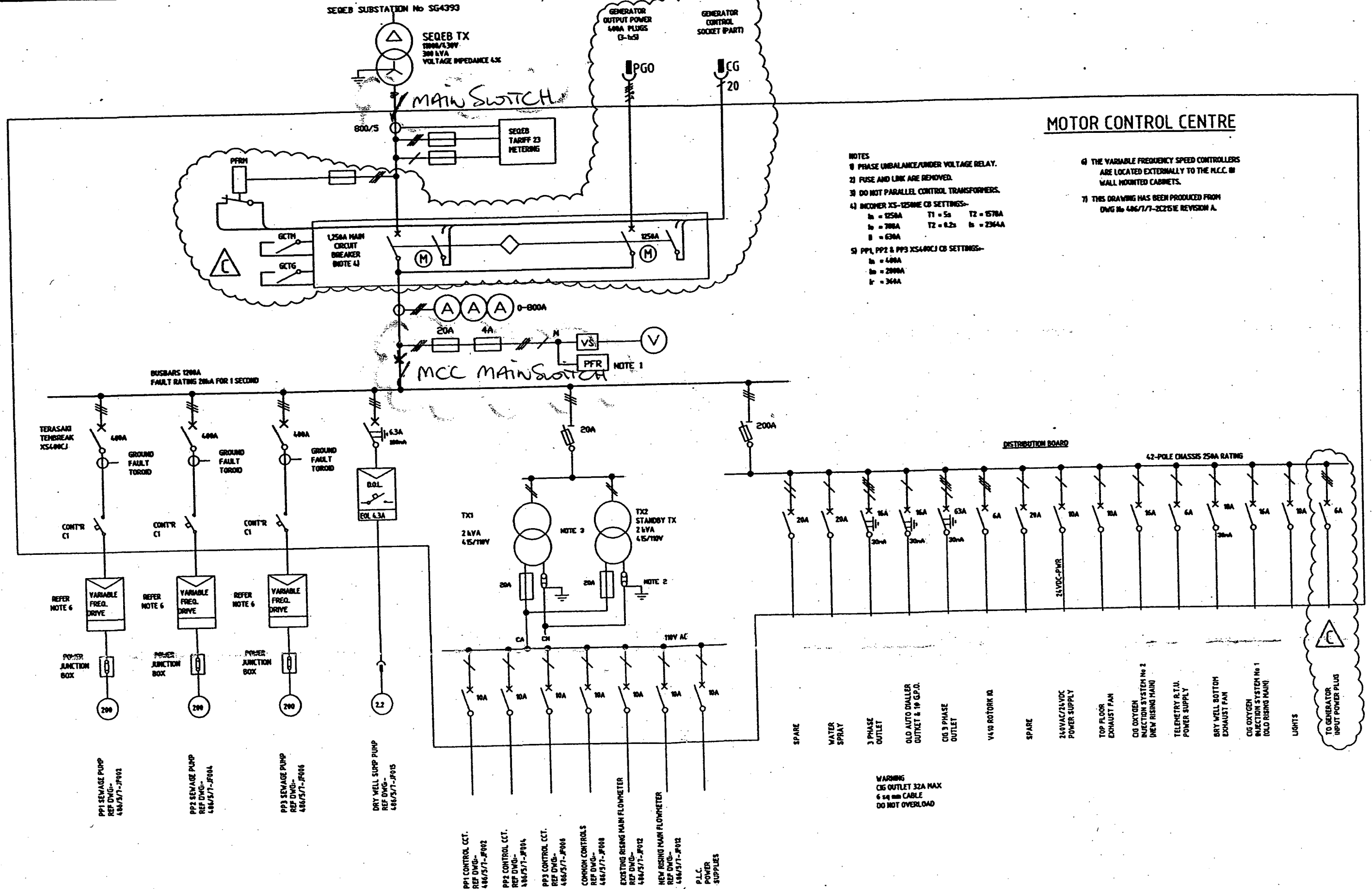


<b>GHD</b> 200 Adelaide Road, Melbourne, VIC 3000 Australia Telephone (03) 306 2200 Facsimile (03) 306 2201 Email: info@ghd.com.au Web: www.ghd.com.au	
<b>ORIGINAL ISSUE</b> No. Date Revision Date Initials	
Principal Engineer	R.P.E.Q. No. Date
Manager Engineering	Date
Production/Network Delegate	Date
Design	Name Date
Drawn	ALT. 28.05.2003
Checked	Brisbane City
Job File	
Filename	41-11975-E103 Sheet Size A2
Survey No.	Field Book
Surveyed	A.H. DATUM
<b>Brisbane Water</b> Projects Engineering	
Project <b>SP178 OLDFIELD ROAD SEWAGE CONVENTIONAL PUMP STATION</b>	
<b>SITE LAYOUT</b>	
Scale	NOT TO SCALE
Sheet	1 of 1
Drawing No.	41-11975-E103
Rev.	A





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FOR CONSTRUCTION	Y.O.		
INCORPORATED CLIENT CHANGES	Y.O.		
CONDUITS REVISED	Y.O.		
ORIGINAL ISSUE	Y.O.		
Rev	Revision	Date	Drawn
Principal Engineer	R.P.E.D. #	Date	
Manager Engineering		Date	
Project/Network		Date	
Design	Name	Date	
Drawn	ALT.	28.05.2008	
Checked			Brisbane City
Job File			
Filename	41-11975-E103	Sheet No.	A2
Survey No.		Field Book	
Surveyed		A.H. DATUM	
Project SP178 OLDFIELD ROAD SEWAGE CONVENTIONAL PUMP STATION			
Title SITE LAYOUT			
Scale	NOT TO SCALE	No	1 of 1 Sheets
Drawing No	41-11975-E103	Rev.	0



PROJECT  
 OLDFIELD ROAD  
 SEWAGE PUMPING STATION  
 SP178

TITLE  
 MOTOR CONTROL CENTRE  
 SINGLE LINE DIAGRAM

SCALE  
 DRAWING NO  
 486/5/7-JF001

NO OF SHEETS  
 1 OF 1  
 SHEET NO  
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NO	DATE	DESCRIPTION	BY	CHECKED	DATE
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2	12/02	ROTORK 10 ADDED	W.M.		
3	02/02	AS BUILT	R.B.		
4	12/99	ISSUED FOR CONSTRUCTION	R.W.		
5	01/00	AMENDMENT	W.M.		

NO	DATE	DESCRIPTION	BY	CHECKED	DATE
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2	12/02	ROTORK 10 ADDED	W.M.		
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5	01/00	AMENDMENT	W.M.		

NO	DATE	DESCRIPTION	BY	CHECKED	DATE
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2	12/02	ROTORK 10 ADDED	W.M.		
3	02/02	AS BUILT	R.B.		
4	12/99	ISSUED FOR CONSTRUCTION	R.W.		
5	01/00	AMENDMENT	W.M.		

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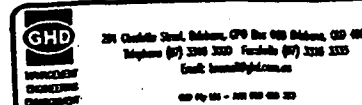
## TITLE

## CABLE DATA

REV	CABLE NUMBER	CABLE SPECIFICATION		NUMBER CORES	SIZE SQ mm	DIELECTRIC CABLE CONDUCTOR	TYPE	VOLTS BY CODE	OPERATING VOLTS	CABLE LENGTH		REFERENCE DRAWINGS	CABLE REMARKS
		FROM	TO							ESTIMATED	ACTUAL		
	PP1-P1	SEWAGE PUMP PP1 - CIRCUIT BREAKER	SEWAGE PUMP PP1 - V.F. DRIVE CUBICLE	3C+E	185	50mm	PVC/PVC	0.6/1kV	415V	6		486/5/7-JF001 & JF002	UNSCREENED CABLE
	PP1-P2	PP1 - V.F. DRIVE CUBICLE	SEWAGE PUMP PP1 - POWER JUNCTION BOX	3C+E	185	51mm	PVC/PVC	0.6/1kV	415V	15		486/5/7-JF001 & JF002	EXISTING CABLE
	PP2-P1	SEWAGE PUMP PP2 - CIRCUIT BREAKER	SEWAGE PUMP PP2 - V.F. DRIVE CUBICLE	3C+E	185	50mm	PVC/PVC	0.6/1kV	415V	6		486/5/7-JF001 & JF004	UNSCREENED CABLE
	PP2-P2	PP2 - V.F. DRIVE CUBICLE	SEWAGE PUMP PP2 - POWER JUNCTION BOX	3C+E	185	51mm	PVC/PVC	0.6/1kV	415V	15		486/5/7-JF001 & JF004	EXISTING CABLE
	PP3-P1	SEWAGE PUMP PP3 - CIRCUIT BREAKER	SEWAGE PUMP PP3 - V.F. DRIVE CUBICLE	3C+E	185	50mm	PVC/PVC	0.6/1kV	415V	6		486/5/7-JF001 & JF006	UNSCREENED CABLE
	PP3-P2	PP3 - V.F. DRIVE CUBICLE	SEWAGE PUMP PP3 - POWER JUNCTION BOX	3C+E	185	51mm	PVC/PVC	0.6/1kV	415V	15		486/5/7-JF001 & JF006	EXISTING CABLE
A	PP1-C10	SEWAGE PUMP PP1 - STARTER PANEL	SEWAGE PUMP PP1 - V.F. DRIVE CUBICLE	12C+E	15	22mm	PVC/PVC	0.6/1kV	110V	6		486/5/7-JF002 & JF003	
A	PP2-C10	SEWAGE PUMP PP2 - STARTER PANEL	SEWAGE PUMP PP2 - V.F. DRIVE CUBICLE	12C+E	15	22mm	PVC/PVC	0.6/1kV	110V	6		486/5/7-JF004 & JF005	
A	PP3-C10	SEWAGE PUMP PP3 - STARTER PANEL	SEWAGE PUMP PP3 - V.F. DRIVE CUBICLE	12C+E	15	22mm	PVC/PVC	0.6/1kV	110V	6		486/5/7-JF006 & JF007	
	RTU-16	SWITCHBOARD - P.L.C. CUBICLE	R.T.U. CUBICLE	10 PAIR	0.5	14mm	DEKORON	500V	24VDC	10		486/5/7-JF022 & JF014	
A	PP1-11	SEWAGE PUMP PP1 - V.F. DRIVE CUBICLE	SWITCHBOARD - P.L.C. CUBICLE	10 PAIR	0.5	11mm	DEKORON	500V	24VDC	10		486/5/7-JF022	
A	PP2-11	SEWAGE PUMP PP2 - V.F. DRIVE CUBICLE	SWITCHBOARD - P.L.C. CUBICLE	10 PAIR	0.5	11mm	DEKORON	500V	24VDC	10		486/5/7-JF022	
A	PP3-11	SEWAGE PUMP PP3 - V.F. DRIVE CUBICLE	SWITCHBOARD - P.L.C. CUBICLE	10 PAIR	0.5	11mm	DEKORON	500V	24VDC	10		486/5/7-JF022	
C	PG1	GENERATOR VIA U/G CONDUIT	SWITCHBOARD - INCOMER CUBICLE	11-K	150	24.0mm	FLEXIBLE	0.6/1kV	415V				SUPPLIED AS PART OF GENERATOR (POWER OUT)
C	CG1	GENERATOR VIA U/G CONDUIT	SWITCHBOARD - INCOMER CUBICLE	4C+E	2.5	18.3mm	FLEXIBLE	0.6/1kV	415V				SUPPLIED AS PART OF GENERATOR (POWER IN)
C	CG2	GENERATOR VIA U/G CONDUIT	SWITCHBOARD - INCOMER CUBICLE	20C	0.5	20.7mm	FLEXIBLE	0.6/1kV	24DC				SUPPLIED AS PART OF GENERATOR (CONTROL)
C	XG1	GENERATOR VIA U/G CONDUIT	SWITCHBOARD - INCOMER CUBICLE	2-DRAIN	0.5	7.5mm	FLEXIBLE	0.6/1kV	-				SUPPLIED AS PART OF GENERATOR (COMMS)

## NOTES

- THIS SCHEDULE SHOULD BE READ IN CONJUNCTION WITH THE REFERENCED DRAWINGS IN "G" COLUMN.
- ALL CABLE CONDUCTORS ARE COPPER
- CABLE No. LEGEND  
P = POWER  
C = CONTROL  
I = INSTRUMENTATION
- ALL CABLE LENGTHS TO BE CONFIRMED ON SITE AT NO EXTRA COST TO BCC
- ALL CABLES SHALL BE TAGGED AS SHOWN IN THE CABLE NUMBER COLUMN.
- NOTE THAT THIS CABLE SCHEDULE IS ONLY APPLICABLE TO NEW CABLES INCLUDED AS PART OF THE S2 UPGRADE PROJECT. IT IS NOT A COMPLETE SCHEDULE OF ALL PRE-EXISTING ON SITE CABLES.



Brisbane Water



PROJECT  
OLDFIELD ROAD  
SEWAGE PUMPING STATION  
SP178

TITLE  
SEWAGE PUMPS PP1, 2 & 3  
VARIABLE FREQUENCY DRIVES  
CABLE SCHEDULE

SCALE  
DRAWING NO.  
486/5/7-JF025

NO. OF SHEETS  
C

REV	DATE	DESCRIPTION	BY	CHECKED	DATE
C	03/03	GENERATOR ADDED	ALT		
B	02/09	AS BUILT			
A	01/09	PP1 & PP2-TM ADDED. CM WAS MINORISED AS CL	BN		
0	12/99	ORIGINAL CONSTRUCTION ISSUE	BN		
		AMENDMENT			

NO.	DATE	DESCRIPTION	BY	CHECKED	DATE
1	03/03	GENERATOR ADDED	ALT		
2	02/09	AS BUILT			
3	01/09	PP1 & PP2-TM ADDED. CM WAS MINORISED AS CL	BN		
4	12/99	ORIGINAL CONSTRUCTION ISSUE	BN		
		AMENDMENT			

NO.	DATE	DESCRIPTION	BY	CHECKED	DATE
1	03/03	GENERATOR ADDED	ALT		
2	02/09	AS BUILT			
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		AMENDMENT			

NO.	DATE	DESCRIPTION	BY	CHECKED	DATE
1	03/03	GENERATOR ADDED	ALT		
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4	12/99	ORIGINAL CONSTRUCTION ISSUE	BN		
		AMENDMENT			



**Brisbane  
Water**



***BRISBANE WATER***

# **GENERATOR CONNECTION O & M Manual**

## **Section 4**

### **Site Testing**

Subject: SAT for BW Generator Change Over Panels

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Test Carried out by.....

Signed...

Date...

Test witnessed by.....

Signed...

Date...

Authorised By:

Subject: SAT for BW Generator Change Over Panels

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## 1.0 SITE ACCEPTANCE TEST

### 1.1 Introduction

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

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

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

### Legend of Symbols

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

### 1.2 Production Unit Information

Job Number	3405	Job Description	Old Field 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.

Test Carried out by.....

Signed...

Date...

Test witnessed by.....

Signed...

Date...

Authorised By:

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# Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels

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## 2.0 ELECTRICAL EARTHING SYSTEM

### 2.1 Electrical continuity and resistance of earthing system

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

☒ Test resistance of the Earthing system 1.5  $\Omega$  ohms

### 2.2 Continuity Test Sheet

ITEM	DETAIL	COMPARTMENT DESIGNATION AND TEST RESULT		
		Extension	Main Eth Bar	Generator
	Test resistance of Earthing system to compartment Answer in Ohms			
1	All Earth's wired and continuous	1.5 $\Omega$	1.5 $\Omega$	1.5 $\Omega$
2	All metal work earthed where required	/	/	/
3	Isolate Individual Earth Systems and check continuity.	/	/	/

## 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 1000 V VOLTS

INSTRUMENT DETAILS 825000

ACROSS	RESULT (M.OHM)	High Pot
Join Red, White & Blue Phases and Neutral, Test to Earth	7400 M $\Omega$	
Red Phase to White, Blue & N	7400 M $\Omega$	
White Phase to Red, Blue and N	7400 M $\Omega$	
Blue Phase to Red, White & N	7400 M $\Omega$	
N to Red, White & Blue	7400 M $\Omega$	

Test Carried out by.....

Signed....

Date....

Test witnessed by.....

Signed...

Date...

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Subject: SAT for BW Generator Change Over Panels

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**4.0 GENERAL WIRING AND VISUAL INSPECTION****4.1 General Wiring and Visual Inspection**☐ Electrical Construction Coversheet Completed and correct.**4.2 Switchgear Visual Checklist**

→ Carry out visual and mechanical checks to Switchgear

ITEM NO:	DETAIL	Switchboard compartments		
		Transfer switch compartment	Main switch area	Generator in general
1	Main Switch totally isolates SWBD	Both off	✓	See Gen
	Mains transfer switch device isolates mains from load. (IE switchboard)	Both off	—	
2	Generator transfer switch operates and isolates generator from the load. And mechanical interlock works	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

Test Carried out by.....

Signed...

Date...

Test witnessed by.....

Signed...

Date...

Authorised By: .



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# Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels

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

Test Carried out by.....

Signed...

Date...

Test witnessed by.....

Signed...

Date...

Authorised By:

Subject: SAT for BW Generator Change Over Panels

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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			Result of test
		Action	Observation	
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 McGarva

Signed: *[Signature]* Date: 8-5-04

Test witnessed by..... Ron McGarva

Signed: *[Signature]* Date: 8-5-04

Authorised By:

Subject: SAT for BW Generator Change Over Panels

Sheet: 7  
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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	✓

Test Carried out by.....

Signed...

Date...

Test witnessed by.....

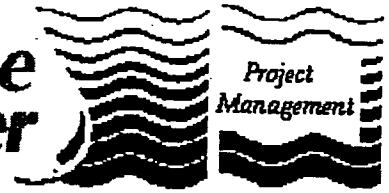
Signed...

Date...

Authorised By:



**Brisbane  
Water**



***BRISBANE WATER***

# **GENERATOR CONNECTION O & M Manual**

## **Section 4A**

### **Site Testing Functional Description**



## PROJECTS – ENGINEERING

### Sewerage System Performance Improvements Backup Diesel Generators for Pump Stations

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

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

Document ID : Genset Functional Tests

Date of Issue : June 2003

Revision : Rev 1

Actions are shown in RED

## 1 MANUAL MODE FUNCTIONAL TESTS

### 1.1 Manual Mode Start

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

Press the MANUAL START push button to start the generator.

The generator set is allowed 3 attempts to start.

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

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

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

### 1.2 Stopping the generator in the Manual Mode.

Press the MANUAL STOP push button.

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

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

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

## 2 TEST MODE FUNCTIONAL TESTS

### 2.1 Test Mode Start – and test of Manual Mode interruption

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

The generator shall begin to crank.

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

Press the MANUAL STOP push button.

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

### 2.2 Continue Test

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

The generator shall begin to crank.

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

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

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

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

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

The GEN ATS shall Open and the MAINS ATS shall Close

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

During this time turn off the Mains to the site

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

### 2.4 Stopping generator in the Test Mode.

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

The GEN ATS shall Open and the MAINS ATS shall Close

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

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

Make GENSET unavailable

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

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

## 3 AUTOMATIC MODE FUNCTIONAL TESTS

### 3.1 Automatic Start

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

Turn off the Mains to the switchboard.

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

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

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

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

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

Turn on the Mains to the switchboard

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

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

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

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

During this time turn off the Mains to the site

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

**3.3 Stopping the generator in the Auto Mode - continued.**

Turn on the Mains to the switchboard

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

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

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

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

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

**3.4 Automatic ATS Transfer To Genset- Mains ATS Failure**

Disable MAINS ATS CB

Restart the generator in Auto by turning off the Mains

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

The system shall then return back to MAINS ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

**3.5 Automatic ATS Transfer - Gen ATS Failure**

Re-enable the MAINS ATS CB

Disable GEN ATS CB

Restart the generator in Auto by turning off the Mains

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

The system shall return back to MAINS ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_



**3.6 Automatic ATS Transfer To Mains - Gen ATS Failure**

Disable GEN ATS CB

Restart the generator in Auto by turning off the Mains

The GEN ATS will fail to Open.

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

The system shall return back to GEN ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

**3.7 Automatic ATS Transfer To Mains - Mains ATS Failure**

Re-enable the GEN ATS CB

Disable MAINS ATS CB

Restart the generator in Auto by turning off the Mains

The MAINS ATS will fail to Close.

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

The system shall return back to GEN ATS operation.

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

**3.8 Running in Auto and umbilical loses connection.**

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

Turn off the Mains to the switchboard.

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

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

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

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

Remove umbilical plug

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

**3.9 Running in Auto and genset trips or faults.**

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

Turn off the Mains to the switchboard.

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

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

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

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

Cause Genset trip or fault

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

## 4 REMOTE START/STOP TESTS

### 4.1 Remote start command.

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

Initiate a Remote Start Command from the BW Control Room

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

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

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

### 4.2 Remote stop command.

Initiate a Remote Start Command from the BW Control Room

The GEN ATS shall Open and the MAINS ATS shall Close

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

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

### 4.3 Remote Start with genset unavailable.

Make GENSET unavailable

Initiate a Remote Start Command from the BW Control Room

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

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

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

Turn off the Mains to the switchboard.

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

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

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

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

Initiate a Remote Start Command from the BW Control Room

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

RESULTS: PASS/FAIL \_\_\_\_\_ NOTES \_\_\_\_\_

## 5 SPECIFIC PROBLEM CHECKS (Variations to Functional Spec)

### 5.1 RTU IO and IDTS Alarms

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

**5.2 From discussions on Indooroopilly Rd:**

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

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

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

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

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

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

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

**5.3 From M&E:**

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

The generator started and the ATS Switched to generator supply.

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

**5.4 From Contract:**

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

## **6 FAULTS - TO BE TESTED WHERE REQUIRED**

### **6.1 HIGH HIGH Alarm Operation.**

The Generator CB is Opened immediately.

The generator is shut down immediately.

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

Emergency Stop Fault

MEN Fault

Low Oil Pressure Shutdown Fault, 10 Seconds Startup Delay

High Engine Temperature Shutdown Fault, 30 second Startup Delay

Low Radiator Level Fault, 5 Second Delay

Over Speed Fault

### **6.2 HIGH Alarm Operation**

The Generator CB is Opened immediately.

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

The following alarms will initiate a HIGH Alarm condition:-

Generator Under Speed Fault, 5 Second Delay

Alternator Under Voltage Fault, 5 Second Delay

Alternator Over Voltage Fault, 5 Second Delay

Generator CB Tripped Fault

Alternator High Temperature Fault, 30 Second Startup Delay

### **6.3 MEDIUM Alarm Operation.**

A Normal Shutdown shall be Initiated.

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

The following alarms will initiate a MEDIUM Alarm condition :-

Fuel Empty Level Fault, 5 Second Delay

Fail To Start Fault, 3 Attempts

### **6.4 LOW Alarm Operation.**

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

The following alarms will initiate a LOW Alarm condition :-

Low Oil Pressure Warning Alarm, 10 Seconds Startup Delay

High Engine Temperature Warning Alarm, 30 Second Startup Delay

Fuel Low Level Alarm, 5 Second Delay

Battery Charger AC Supply Failed Alarm, 60 Second Delay

Control Battery Low Volts Alarm, 30 Second Delay

Start Battery Low Volts Alarm, 60 Second Delay

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

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



**Brisbane  
Water**



***BRISBANE WATER***

# **GENERATOR CONNECTION O & M Manual**

## **Section 4B**

**Site Testing  
NCS Alarms**



# **BRISBANE WATER**

**Network Control Systems**

## **IDTS POINT COMMISSIONING SHEET AND GENERATOR SUPPLY OPERATIONAL CHECKS**

### **Pump Station Generator Connection Project (STTX-I910)**

**DATE:** 14/5/04

**Site Name:** SP 178 Oldfield Rd

**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 Surge Imminent probe.

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



## Brisbane Water – Network Control Systems Section

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

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

**Commissioning Notes:**

1. All tested OK and Site Left In Off Position
2. Wiring issues for Common Logic resolved (12/5/04)
3. Site tested 3 times
4. Issue with Reset on VSD for all Pumps (M&E issue)
5. Issues with VSD resolved by M&E and site tested and left in Auto 20/5/04
6. Mains available lamp to be installed

**IDTS Points and Generator Supply**

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



***BRISBANE WATER***

# **GENERATOR CONNECTION O & M Manual**

## **Section 4C**

### **Site Testing Generator**

47 Euphrasy Street, Hingham, MA 0193  
Telephone: (508) 549-1541  
P.O. Box 2906 Hingham, B.C., Q1C 4T3

SEP 0098

DATE: 3/3/03  
JOB NO: 14291  
ENG. SERIAL NO: 9145066  
ALT. SERIAL NO. A03B016997

[illegible]

TESTING OFFICER: Hendon  
by P.H.



# DIESEL GENERATOR SET LOAD TEST REPORT

SEP 0064/D

Attestation Seal:  
Tasika U 4171  
DIESEL ADMIN/SLB

CLIENT: BRISBANE WATER SP178 DATE: 2/9/03  
 SERIAL NO. 0308007 JOB NO/CONTRACT NO: 14591  
 ENGINE TYPE BFRN1015CF ENG. SERIAL NO: 9145066  
 ALTERNATOR TYPE HCI734E ALT. SERIAL NO. 1038016987  
 GOVERNOR TYPE EMR STARTER MOTOR: Dev-2  
 OVERSPEED TYPE " UNDERSPEED TYPE EMR  
 SHUTDOWN SOLENOID " HIGH WATER: "  
 LOW OIL PRESSURE SHUTDOWN: "

567 ± 10% KW: 408 ± 10%

TECHNICIAN: \_\_\_\_\_ INSPECTOR: PAUL H.

TIME	1130	1100	1030	1000	1235	1245	1200			
OIL PRESSURE	500	500	480	450	450	430	430			
OIL TEMPERATURE	NA	NA	NA	NA	NA	NA	NA			
JACKET WATER TEMPERATURE	0	80	85	85	90	90	85			
GPH'S	0	127	250	340	532	531	0			
VOLTS	241	241	241	241	241	241	241			
AMBIENT TEMPERATURE	18	18	20	20	20	20	20			
Hz	50	50	50	50	50.1	50.1	50.1			
KW	0	180.5	185.6	239	405.4	407.4	0			
LOAD%	0	25%	50%	75%	100%	100%	0			
REMARKS										

Generator Load Test Report



# GENERATOR SET SOUND PRESSURE LEVEL TEST REPORT

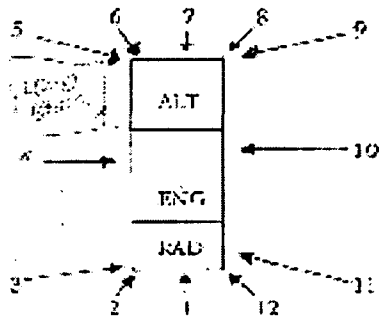
SEP 0023/D

47 Proprietary Street  
Tugralpa Q 4172  
QUEENSLAND AUSTRALIA

CLIENT: 3213 WATER SP178 DATE: 3/9/03  
 SERIAL NO: 0308007 JOB NO: 14291  
 ENGINE TYPE: BISM1045CP ENG. SERIAL NO: 09145066  
 ALTERNATOR TYPE: HT5734E ALT. SERIAL NO: A032016997  
 SOUND LEVEL INSTRUMENT: ELON

Remarks:

Distance: 7 m 14  
 Height: 15 m



Position Layout

POSITION	SOUND LEVEL dB(A)	LOAD %				
		25	50	75	100	110
1			58.7	58.1	59	
2						
3						
4			59	59	59.1	
5						
6	LOAD BANK					
7			61.7	60	62.2	
8						
9						
10			60	60	60.2	
11						
12						
Average						

QUALITY ASSURANCE OFFICER: \_\_\_\_\_  
 CUSTOMER TESTING OFFICER: Y. H.  
 TESTING OFFICER: \_\_\_\_\_  
 BUSINESS TESTING OFFICER: \_\_\_\_\_



47 Proprietary Street  
 Twickenham, QUL 4112  
 TEL: (087) 3052 1744

SEP00084

### TRANSIENT LOAD RESPONSE TEST SHEET

Transient response for load changes: Load PF 0.8

N Change described kW	0-25	0-50	0-75	0-100	100-0	75-0	50-0	25-0
Change in Electrical kW								
N Change Hz	2	4	6			2	4	6
N Change volts	0	2	4			1	2	3
Recovery time	2	3	16			4	2	0

CLIENT: BDIS WATER SUPPLY

Job No: 14291

S/N: 0308007



47 Proprietary Street  
Tingalpa Q 4573  
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: B.W. SP178 SERIAL NO: 0308007 ENGINE NO: 9145066  
JOB NO: 14291 DATE: \_\_\_\_\_ CUSTOMER: B.W.

#### BASE

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



#### RADIATOR

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



#### ENGINE

- (1) Fan is correctly mounted.
- (2) All guards in place and secure.
- (3) Wiring loom is correct to drawing, securely fixed and marked and is terminated in an appropriate terminal box.
- (4) Battery leads attached and secure and long enough for termination by battery.
- (5) Air cleaner is properly mounted.
- (6) Magnetite 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 cracks less than 0.1 mm.
- (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 sub-circuitry are completely secure and marked correctly.
- (4) Door seals are fitted around doors.
- (5) Doors closed correctly.
- (6) All cracks less than 0.1 mm.
- (7) All danger labels in position.



FINAL INSPECTION CHECKLIST

PAGE 2

CONTROL SYSTEM (cont):

- (8) Magnet field secure, clean and no sharp corners.
- (9) Cables correct, no damage.
- (10) Tools and keys satisfactory.

ALTERNATOR

- (1) Alternator is correctly mounted.
- (2) Alternator leads are correctly mounted inside terminal box and secured 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 Bill of Materials.
- (7) Earth bond fitted.

FINISH

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

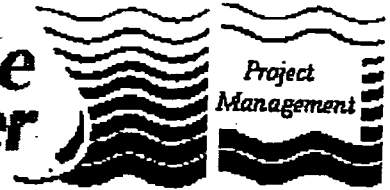
GENERAL INSPECTION

- (1) Generator is manufactured to correct engine/alternator/variator/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/fuel/water leak, in attached to position battery lead.
- (4) All labels are straight and in correct location.

SIGNED: Tom HLAVERO INSPECTOR\_\_\_\_\_  
QUALITY ASSURANCECOMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
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**Brisbane  
Water**



***BRISBANE WATER***

# **GENERATOR CONNECTION O & M Manual**

## **Section 4D**

### **Electrical Testing Certificate**

Job Card Number: 0212

### Variation To Fixed Price Proj

## Cost Plus Labour Profit

## Call Out Service

# CUSTOMER

Project No. **SK-77**

**Representative Name:**

Date: 9/27/84

## Position

### Signature on Completion

## Power Authority Forms

C/L Representative: E. Walker

**Pre-Start Safety Mtg**

Position: ☒ Area ☐ Co ☐ Co

Date: 5/5/04

## Risk Assessment

Mobile Phone No: 74597 58510

[illegible]

PLEASE SEE ATTACHED FORM FOR ADDITIONAL ☐

**TOTAL LABOUR CHARGED:**

PLEASE SEE ATTACHED FORM FOR INSTRUCTIONS							
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**

**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.**

Signature: \_\_\_\_\_

**POLARITY TEST.**

INSULATION RES. TEST.

## ETH CONTINUITY TEST

## FUNCTIONAL TEST



**Brisbane  
Water**



***BRISBANE WATER***

# **GENERATOR CONNECTION O & M Manual**

## **Section 5**

### **Parts Information**

# ACO CABLEMATE

## Type 66H Polymer Concrete Pit

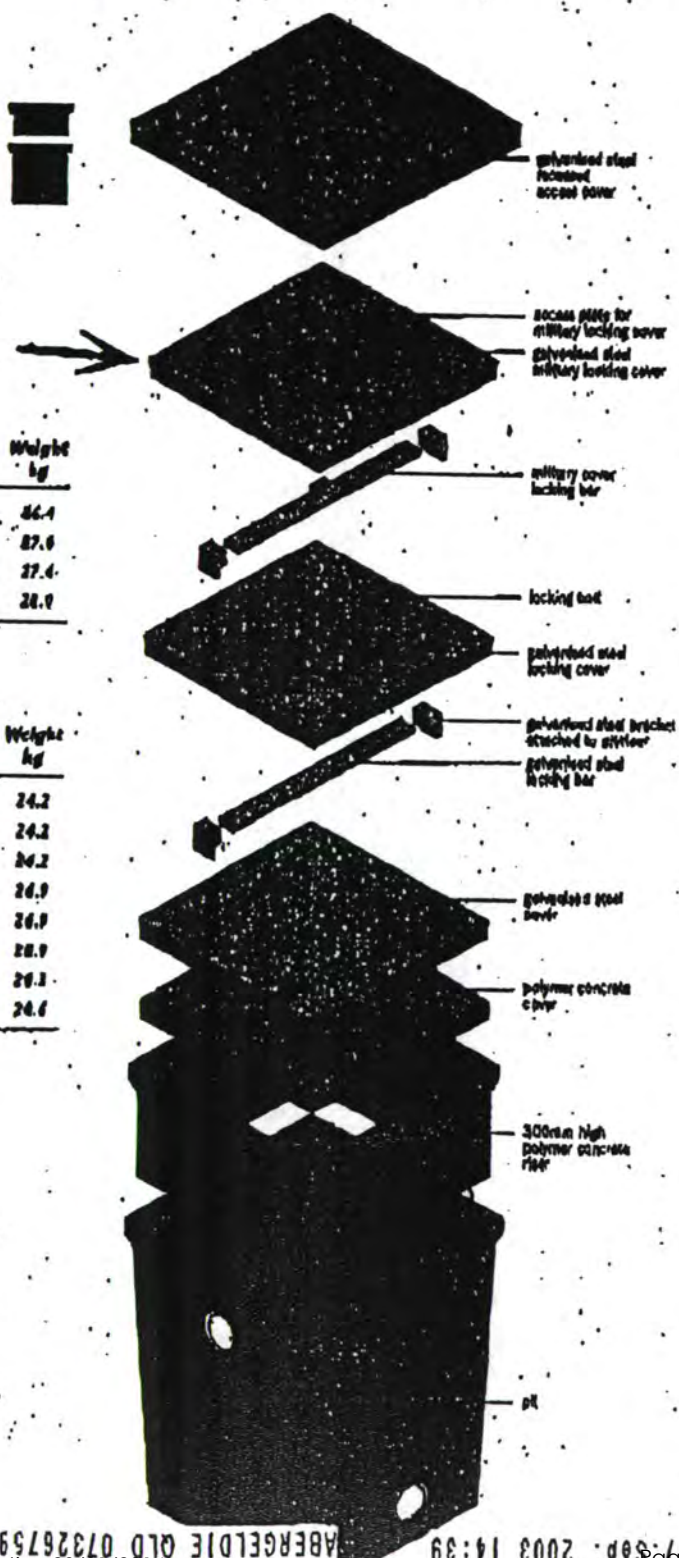
667mm x 667mm x 915mm depth

### Pit Data

Description	Part No.	Weight kg
Type 66H Polymer Concrete Pit	75124	86.4
Type 66H Polymer Concrete Pit for Locking Cover	75125	87.6
Type 66 Polymer Concrete Extension Riser	75126	27.4
Type 66 Polymer Concrete Extension Riser for Locking Cover	75133	28.9

### Cover Data

Description	Part No.	Weight kg
Type 66 Polymer Concrete Lid - Blank	75149	24.2
Type 66 Polymer Concrete Lid - Communications	75154	24.2
Type 66 Polymer Concrete Lid - Electricity	75169	24.2
Type 66 Galvanised Steel Cover	75177	26.9
Type 66 Locking Galvanised Steel Cover	75185	26.9
Type 66 Military Locking Galvanised Steel Cover	75193	28.9
Type 66 Light Duty Recessed Access Cover - Lock & Seal	75201	26.2
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*

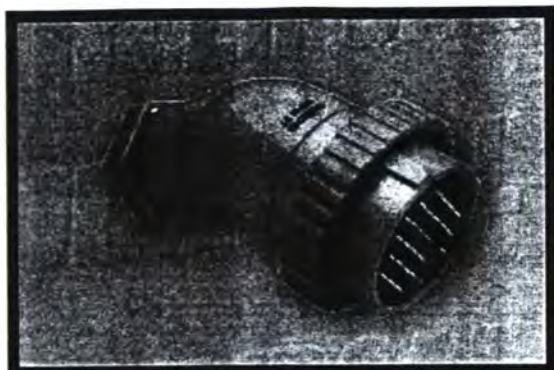
*56 Series Features*

*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*

**PRICE BOOK JUNE 2003****DORE ELECTRICS**

PH: 07 3349 5300 FAX: 07 3349 5344

**Insulators (Stand-Off)**

SCHEDULE 1

**600Volts Rated - Compression Moulded - Glass Re-Inforced Polyester Material**

- High Dielectric Strength
- Arc Quenching and Non Tracking
- Non Flammable
- Wear and Corrosion Resistant
- Chemical and Oil Resistant
- High Mechanical Strength
- Dimensional Stability
- Moulded In Brass Inserts
- Metric and Imperial Thread Sizes
- Quality Finish and Appearance

Part No.	Type	Height	Thread	Price
BBLV25	A	25mm	M6	\$5.50
BBLV25H	H	25mm	M6	\$5.88
BBLV30H	H	30mm	M8	\$5.88
BBLV35D	D	35mm	M8	\$5.98
BBLV35E	E	35mm	M8	\$6.00
BBLV35	B	35mm	M8	\$8.00
BBLV35M10	B	35mm	M10	\$8.00
BBLV38	B	38mm	M8	\$8.35
BBLV40H8	H	40mm	M8	\$6.10
BBLV40H	H	40mm	M10	\$6.10
BBLV45	B	45mm	M10	\$8.50
BBLV50	B	50mm	M10	\$8.60
BBLV50H	H	50mm	M10	\$6.20
BBLV50E	E	51mm	M8	\$6.10
BBLV50S	C	50mm	M10	\$7.80
BBLV60H	H	60mm	M12	\$6.96
BBLV63S	C	63mm	M10	\$8.10
BBLV75D	D	75mm	M10	\$6.96
BBLV75D12	D	75mm	M12	\$7.00
BBLV75S	C	75mm	M10	\$8.35
BBLV75	B	75mm	M10	\$11.50
BBLV76E	E	76mm	M10	\$7.56



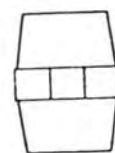
Type A



Type B



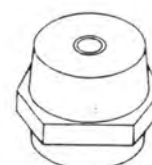
Type C



Type E



Type D



Type H

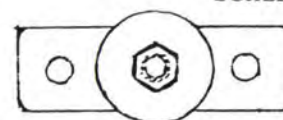
SCHEDULE 1

**Bracket (Horizontal - Vertical)**

Part No.	Description	Price
ACCP2	For Transformation Horizontal - Vertical	\$5.00

**Standoff with foot**

Part No.	Type	Height	Thread	Price
NBB745	F	30mm	M8	\$8.10



SCHEDULE 1

# Basic Transfer Switches (BTS) with motor

MCCBs used	Ampere Range	Interrupting cap. (415 V)		OCR type	Overall 3 pole *) dimensions (mm)			Cat. No. *) 3 pole BTS	Cat. No. *) 4 pole BTS
		Icu	Ics		W	H *)	D		
XS125CJ	40-63	18	9	Therm Mag	305	209	235	BS1C633	BS1C644
XS125CJ	63-100	18	9	Therm Mag	305	209	235	BS1C133	BS1C144
XS125CJ	79-125	18	9	Therm Mag	305	209	235	BS1C233	BS1C244
XS125NJ	40-63	30	15	Therm Mag	305	209	235	BS1N633	BS1N644
XS125NJ	63-100	30	15	Therm Mag	305	209	235	BS1N133	BS1N144
XS125NJ	79-125	30	15	Therm Mag	305	209	235	BS1N233	BS1N244
XH125NJ	40-63	50	25	Therm Mag	305	209	235	BH1N633	BH1N644
XH125NJ	63-100	50	25	Therm Mag	305	209	235	BH1N133	BH1N144
XH125NJ	79-125	50	25	Therm Mag	305	209	235	BH1N233	BH1N244
XH125PJ	40-63	50	50	Therm Mag	305	209	235	BH1P633	BH1P644
XH125PJ	63-100	50	50	Therm Mag	305	209	235	BH1P133	BH1P144
XH125PJ	79-125	50	50	Therm Mag	305	209	235	BH1P233	BH1P244
XH160PJ	100-160	50	50	Therm Mag	336	237	258	BH2P133	BH2P144
XS250NJ	100-160	35	18	Therm Mag	336	237	241	BS2N133	BS2N144
XS250NJ	163-250	35	18	Therm Mag	336	237	241	BS2N233	BS2N244
XH250NJ	100-160	50	25	Therm Mag	336	237	258	BH2N133	BH2N144
XH250NJ	100-250	50	25	Therm Mag	336	237	258	BH2N233	BH2N244
XS400CJ	100-250	35	18	Therm Mag	500	323	325	BS4C233	BS4C244
XS400CJ	250-400	35	18	Therm Mag	500	323	325	BS4C433	BS4C444
XS400NJ	163-250	50	25	Therm Mag	500	323	325	BS4N233	BS4N244
XS400NJ	250-400	50	25	Therm Mag	500	323	325	BS4N433	BS4N444
XH400PJ	250-400	65	50	Therm Mag	500	323	325	BH4P433	BH4P444
XS400SE	125-250	50	25	Electronic	500	323	325	BS4S233	BS4S244
XS400SE	200-400	50	25	Electronic	500	323	325	BS4S433	BS4S444
XH400SE	125-250	65	33	Electronic	500	323	325	BH4S233	BH4S244
XH400SE	200-400	65	33	Electronic	500	323	325	BH4S433	BH4S444
XH400PE	125-250	65	50	Electronic	500	323	325	BH4P233	BH4P244
XH400PE	200-400	65	50	Electronic	500	323	325	BH4P433	BH4P444
XS630CJ	250-400	45	23	Therm Mag	550	433	341	BS6C433	BS6C444
XS630CJ	400-630	45	23	Therm Mag	550	433	341	BS6C633	BS6C644
XS630NJ	250-400	65	33	Therm Mag	550	433	341	BS6N433	BS6N444
XS630NJ	400-630	65	33	Therm Mag	550	433	341	BS6N633	BS6N644
XH630PJ	250-400	85	50	Therm Mag	550	433	341	BH6P433	BH6P444
XH630PJ	400-630	85	50	Therm Mag	550	433	341	BH6P633	BH6P644
XS630SE	315-630	65	33	Electronic	550	433	341	BS6S633	BS6S644
XH630SE	315-630	65	33	Electronic	550	433	341	BH6S633	BH6S644
XH630PE	315-630	65	50	Electronic	550	433	341	BH6P633	BH6P644
XS800NJ	500-800	65	33	Therm Mag	550	433	341	BS8N833	BS8N844
XH800PJ	500-800	85	50	Therm Mag	550	433	341	BH8P833	BH8P844
XS800SE	400-800	50	25	Electronic	550	433	341	BS8S833	BS8S844
XH800PE	400-800	65	50	Electronic	550	433	341	BH8P833	BH8P844
XS1250SE	500-1000	65	49	Electronic	553	530	300	BS12S1033	BS12S1044
XS1250SE	625-1250	65	49	Electronic	553	530	300	BS12S1233	BS12S1244
XS1600SE	800-1600	85	64	Electronic	553	570	320	BS16S1633	BS16S1644
XS2000SE	1000-2000	100	64	Electronic	774	490	361 *)	BS20E2033	BS20E2044
XS2500SE	1250-2500	100	64	Electronic	774	490	361 *)	BS25E2533	BS25E2544
TL100NJ	40-63	85	85	Therm Mag	305	300	235	BT1N633	BT1N644
TL100NJ	63-100	85	85	Therm Mag	305	300	235	BT1N133	BT1N144
TL250NJ	163-250	100	100	Therm Mag	500	323	325	BT2N233	BT2N244
TL400NE	200-400	100	100	Electronic	500	323	325	BT4E433	BT4E444
TL630NE	315-630	125	70	Electronic	553	490	320	BT6E633	BT6E644
TL800NE	400-800	125	70	Electronic	553	490	320	BT8E833	BT8E844
TL1250NE	625-1250	125	65	Electronic	553	490	320	BT12E1233	BT12E1244

Note: \*) Ordering sheet refer page 9 - 21.

\*) Height includes attached busbar on sizes 630 A & above.

\*) Depth does not include rear connect busbars.

\*) Detailed dimensions 3/4 pole refer following pages.



# NHP Item Info

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



Catalogue Number:

**D5P-P5**

Description:

**PILOT LIGHT ELEMENT YELLOW**

List Price \$ (Not including GST):



Unit of Measure:

**EA**

Price Schedule:

**A2**

## Pushbutton Products

### Pilot Light and Buzzer

#### Mounting Size

22.5mm

#### Specification

Lamp Body Only

#### Shape

Round

#### Style / Frame

Standard

#### Colour

Yellow

#### Lamp Block

Operator Only

#### Features

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

#### Benefits

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

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

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

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

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

Note: <sup>1)</sup> Neutral not switched  
<sup>2)</sup> Will not accept side mounting accessories

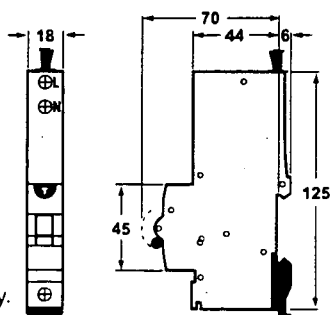
<sup>3)</sup> Mines Dept. approval applies to 30 mA units only.

### Operation

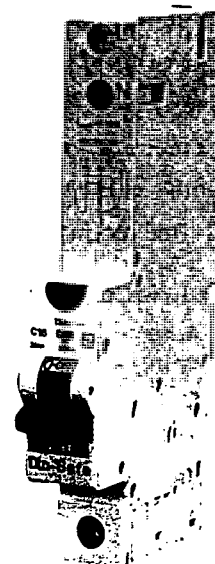
This unit combines the overload and short circuit protection of an MCB with earth leakage protection of an RCD. The unit occupies one, sub-circuit (one pole) of the distribution board and provides single phase protection against overload, short circuit and earth leakage current.

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

### Dimensions (mm)



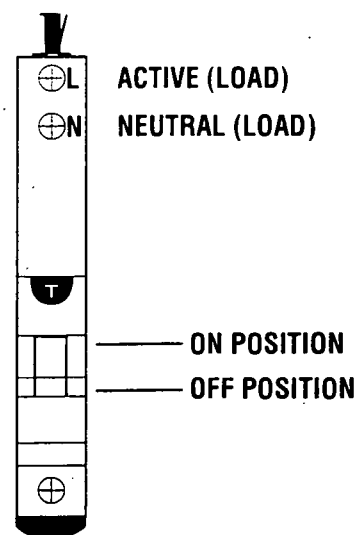
❑ Available on indent only.



### Application

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

### Connection diagram



### Accessories

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

### Technical data

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

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

## 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).

DTCB6  
1 pole

## 1 pole 1 module

In (A)	C - Curve 5-10In	D - Curve 10-20In
2	DTCB6102C	DTCB6102D
4	DTCB6104C	DTCB6104D
6	DTCB6106C	DTCB6106D
10	DTCB6110C	DTCB6110D
13	<input type="checkbox"/> DTCB6113C	<input type="checkbox"/> DTCB6113D
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	<input type="checkbox"/> DTCB6213C	<input type="checkbox"/> 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	<input type="checkbox"/> DTCB6302D
4	DTCB6304C	<input type="checkbox"/> DTCB6304D
6	DTCB6306C	<input type="checkbox"/> DTCB6306D
10	DTCB6310C	DTCB6310D
13	<input type="checkbox"/> DTCB6313C	<input type="checkbox"/> DTCB6313D
16	DTCB6316C	DTCB6316D
20	DTCB6320C	DTCB6320D
25	DTCB6325C	DTCB6325D
32	DTCB6332C	DTCB6332D
40	DTCB6340C	DTCB6340D
50	DTCB6350C	DTCB6350D
63	DTCB6363C	DTCB6363D

## Short circuit capacity 6 kA

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

## DC use

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

## Use at DC

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

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

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

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

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

## Storage temperature

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

## Operating temperature

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

## Use at 400 Hz

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

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

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











Notes: <sup>1)</sup> 2 pole MCB connected in series.

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










☐ Available on indent only.

## Din-T10 series 10 kA MCB (cont.)


## 3 pole 3 modules

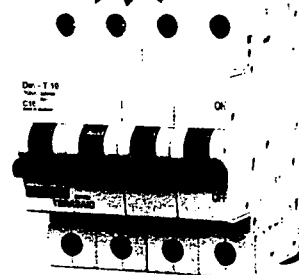
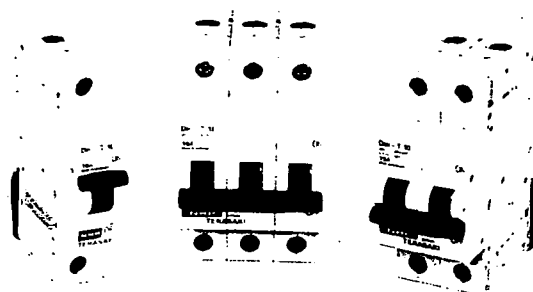
In (A)	B - Curve 3-5 In	C - Curve 5-10 In	D - Curve 10-20 In
0.5	DTCB10305B	 DTCB10305C	 DTCB10305D
1	DTCB10301B	 DTCB10301C	 DTCB10301D
2	DTCB10302B	DTCB10302C	 DTCB10302D
4	DTCB10304B	DTCB10304C	 DTCB10304D
6	DTCB10306B	DTCB10306C	 DTCB10306D
10	DTCB10310B	DTCB10310C	DTCB10310D
13	 DTCB10313B	 DTCB10313C	 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 <sup>1)</sup>

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

Notes: <sup>1)</sup> All poles include over-current and short circuit protection.

 Available on indent only



DTCB10  
1 - 4 pole types

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

## Strömberg



Catalogue Number:

**OETL 1250K3**

Description:

**SWITCH LOAD,3P 1250A**

List Price \$ (Not including GST):



Unit of Measure:

**EA**

Price Schedule:

**B2**

## Load-break switches

### Base mount

#### Current AC21

1250

#### Current AC23

800

#### Power AC23

400

#### No. of poles

3

#### Handle pos.

Outboard

#### Switch style

Standard

#### Features

- Compact modular design to IEC and Aus. Standards
- High short-circuit rating
- Made from track-resistant materials
- Strong black plastic operating handle to IP65
- Door interlocked in ON position
- Positive switch position indication ON-OFF / I-O
- Adjustable shaft length
- Up to 3 padlocks can be fitted in Off position
- Visible contacts through removable windows
- Facility to add multiple positive break aux. switches
- Keyhole mounting holes
- Terminal bolt kits included
- Availability to fit many different accessories, eg. Change-over mechanisms, mechanical and electrical interlocks, parallel operation and motor operation

#### Benefits

- Proven reliable performance under the most arduous of operating conditions
- Minimum space requirements
- Dust and hose proof at handle sealing
- Designed for maximum operator safety
- Contacts can be seen to be open and secured with padlocks by up to 3 different trades people for maximum safety.
- Simple and flexible mounting and connecting facilities
- Easily adapted to suit different cubicle depths
- Adequate provision of remote status indication
- Can be adapted for many special applications including remote control

#### Ordering Information



# NHP Item Info

NHP E-Cat online website  
Friday, June 18, 2004 1:52:25 PM  
User: Not logged in

## Strömberg

Catalogue Number:

OETL ZX128

Description:

SHROUD TERM,1P OETL200..315

List Price \$ (Not including GST):



Unit of Measure:

EA

Price Schedule:

B2

## Load-break switches

### Shrouds

#### Type

Terminal

#### To suit

OETL 200-315

#### Mounting pos.

Lineside or Loadside

#### No. of poles

1

#### Features

- Terminal shroud ZX 128, to suit OETL 200... 315A loadbreak switches.
- The clear, insulated shrouds cover line and/or load side terminals. They are individual or 1 pole shrouds.
- Three pole requires 6 pieces for full protection, four pole requires 8 pieces.

#### Benefits

- Terminal shrouds offer touch protection against accidental contact at the point of termination.
- Each shroud carries a brightly coloured warning label.

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

# NHP Item Info

NHP E-Cat online website  
Friday, June 18, 2004 1:53:42 PM  
User: Not logged in

## Strömberg



Catalogue Number:

**OXP 12X325**

Description:

**SHAFT, 12/325**

List Price \$ (Not including GST):



Unit of Measure:

**EA**

Price Schedule:

**B2**

## Load-break switches

### Shafts

#### Type

12mm

#### To suit

OETL 400-1600, OS 200-800

#### Length (mm)

325mm

#### Features

- Extended square shaft to suit OETL 400... 1600 loadbreak switches.
- Shaft size: 12mm.
- Shaft length: 325mm.
- Accessories available to suit shafts include:
  - shaft extension sockets,
  - adaptors for extension sockets,
  - handle support brackets and
  - 90deg angle kits.

#### Benefits

- These high quality metal shafts can be ordered separately or at the time of switch purchase. Naturally they are available as spare or replacement parts.
- The shafts can be cut to length depending on requirements.

#### Ordering Information

- Shafts can be cut down to size.

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

## USLKG 5



Ground terminal block with screw connection, cross section: 0.2 - 4 mm<sup>2</sup>, AWG: 26 - 10, width: 6.2 mm, color: green-yellow

- Accessories
- Technical data
- PDF File



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### General data

Order number	0441504
Type	USLKG 5
Barcode number	4017918002190
Unit pack	50 Pcs.
Customs tariff	85369010000
Max. conductor cross section, flexible	4 mm <sup>2</sup>
Conductor cross section, rigid max.	4 mm <sup>2</sup>
Conductor cross section AWG/kcmil max	12

## E/NS 35 N



End bracket, width: 9.5 mm, color: gray

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



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### General data

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

## UK 5 N



Universal terminal block with screw connection, cross section: 0.2 - 4 mm<sup>2</sup>, AWG: 30 - 10, width: 6.2 mm, color: gray

- Accessories
- Technical data
- Certificates
- PDF File



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### 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 mm <sup>2</sup>
Conductor cross section, rigid max.	6 mm <sup>2</sup>
Conductor cross section AWG/kcmil max	10
Nominal current I <sub>N</sub>	41 A



## Din-Safe MCBs (RCBO)

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

### Din-Safe MCB with pigtail

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

### Din-Safe MCB standard terminal configuration

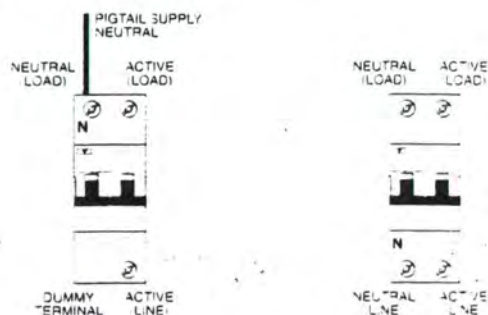
Poles	Amp rating	Voltage	Short circuit	Phase	Trip <sup>1)</sup> Sens.	Cat. No <sup>3)</sup>
2	6	240	10 kA	1+N <sup>2)</sup>	10 mA	<input type="checkbox"/> DSRCB0610A
2	6	240	10 kA	1+N <sup>2)</sup>	30 mA	<input type="checkbox"/> DSRCB0630
2	10	240	10 kA	1+N <sup>2)</sup>	10 mA	<input type="checkbox"/> DSRCB1010A
2	10	240	10 kA	1+N <sup>2)</sup>	30 mA	DSRCB1030
2	10	240	10 kA	1+N <sup>2)</sup>	100 mA	<input type="checkbox"/> DSRCB10100
2	16	240	10 kA	1+N <sup>2)</sup>	10 mA	<input type="checkbox"/> DSRCB1610A
2	16	240	10 kA	1+N <sup>2)</sup>	30 mA	DSRCB1630
2	16	240	10 kA	1+N <sup>2)</sup>	100 mA	<input type="checkbox"/> DSRCB16100
2	20	240	10 kA	1+N <sup>2)</sup>	10 mA	<input type="checkbox"/> DSRCB2010A
2	20	240	10 kA	1+N <sup>2)</sup>	30 mA	DSRCB2030
2	20	240	10 kA	1+N <sup>2)</sup>	100 mA	<input type="checkbox"/> DSRCB20100
2	25	240	10 kA	1+N <sup>2)</sup>	30 mA	DSRCB2530
2	32	240	10 kA	1+N <sup>2)</sup>	30 mA	DSRCB3230
2	40	240	10 kA	1+N <sup>2)</sup>	30 mA	DSRCB4030

### Application

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

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

### Terminal configuration



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



DIN-Safe MCB standard terminal configuration

### Characteristics

- Width: 2 modules.
- For type AC residual currents.
- Rated voltage: 240 V/50-60 Hz.
- Tripping characteristics of MCB part: IEC 898 - C curve.
- Short circuit capacity: 10 kA.
- Terminal capacity: 25 mm<sup>2</sup>.
- 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:**
- <sup>1)</sup> Unprotected neutral, not switched.
  - <sup>2)</sup> Unprotected neutral, switched.
  - <sup>3)</sup> Fits Din-T chassis (special configuration) refer page TBA.
  - <sup>4)</sup> Mines department approval applies to 30 mA only.
- Nuisance tripping may be experienced in VFD and motor starting applications refer NHP.
- ☐ Available on indent only.



# NHP COMPACT FUSES



**A complete range of  
low voltage  
BS and DIN fuses**

**NHP ELECTRICAL ENGINEERING PRODUCTS PTY LTD**





## HRC cartridge fuse links

NHP Compact industrial bolted pattern. Centre contacts. ASTA certified to BS 88: Part 2: 1988. Complies with IEC 269 parts 1 and 2. Tested to 80kA at 415V AC. 550V AC.<sup>1)</sup>

Current motor rating (A)	Fixing centres (mm)	BS88 ref	NHP Cat No.
Nominal Motor			
2	-		NTB2 <sup>1)</sup>
4	-		NTB4 <sup>1)</sup>
6	-		NTB6 <sup>1)</sup>
10	-		NTB10 <sup>1)</sup>
16	-		NTB16 <sup>1)</sup>
20	-		NTB20 <sup>1)</sup>
25	-	97	NTB25 <sup>1)</sup>
32	-		NTB32 <sup>1)</sup>
40	-		NTB40 <sup>1)</sup>
50	-		NTB50 <sup>1)</sup>
63	-		NTB63 <sup>1)</sup>
63	80		NTB63M80 <sup>2)</sup>
63	100		NTB63M100 <sup>2)</sup>
2	-		NTBC2
4	-		NTBC4
6	-		NTBC6
10	-		NTBC10
16	-		NTBC16
20	-		NTBC20
25	-	111	NTBC25
32	-	B1	NTBC32
40	-		NTBC40
50	-		NTBC50
63	-		NTBC63
63	80		NTBC63M80 <sup>1)</sup>
63	100		NTBC63M100 <sup>2)</sup>
80	-		NTC80
100	-		NTC100
100	125	111	NTC100M125 <sup>2)</sup>
100	160		NTC100M160 <sup>2)</sup>
100	200		NTC100M200 <sup>2)</sup>
125	-		NTF125
160	-		NTF160
200	-	111	NTF200
200	250	B2	NTF200M250 <sup>2)</sup>
200	315		NTF200M315 <sup>2)</sup>
250	-		NTKF250
315	-	111	NTKF315
315	400	B3	NTKF315M400 <sup>2)</sup>
250	-	133	NTKM250
315	-		NTKM315
355	-	111	NTMF355
400	-	B4	NTMF400
355	-	133/184	NTM355
400	-	C1	NTM400
450	-		NTTM450
500	-	133/184	NTTM500
560	-		NTTM560
630	-		NTTM630
450	-	165/229	NTT450
500	-		NTT500
560	-		NTT560
630	-		NTT630
710	-	165/229	NTLT710
800	-		NTLT800
710	-	133/184	NTLM710
800	-	C3	NTLM800
1000	-		NTXU1000
1250	-	149	NTXU1250

## HRC fuse fittings – 2 to 1250 Amps

NHP Compact fuse gear includes a range of moulded HRC fuse fittings, designed to accept bolt-in and clip-in HRC fuse-links.

Each fuse fitting is fully shrouded to prevent accidental contact with live parts when inserting or withdrawing a carrier and once a fuse carrier has been completely removed.

The fuse carrier and base mouldings are manufactured from high quality thermosetting material finished in black.

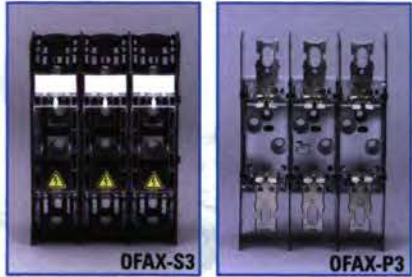
NHP fuse fittings accept NHP Compact HRC fuse-links and are available in ratings of 20, 32, 63, 100 and 200 amp and can be supplied in front connected and front/busbar connected.

They are designed to comply with BS88: Part 2,

1988 and are suitable for systems up to 660V. Suitable HRC fuse-links are also to BS88: Part 2, 1988.

The NHP "NV" range of clip-in HRC fuse fittings are available in 20, 32 and 63 amp at 415V. These fuse fittings can be either screw fixed to a mounting panel or mounted directly on standard DIN rail. They comply with BS88: Part 1, 1988 and accept NHP NNS and NES clip-in HRC fuse-links to the same standard.

Clip-in type fuse fittings allow fuse-links to be replaced quickly and simply, as no tools are required. fuse-links are removed from the holder using side pressure on the fuse-link while replacement involves a simple push fit.



### Stromberg OFAX DIN fuse bases

NHP has a range of single and three pole DIN fuse bases for sizes 00 and 1 DIN fuses.

Fully shrouded and open versions are available.



### NHP DIN fuse



### Din fuse extractor handle and bracket

Our NHP DIN fuse extractor handle suits sizes 00 to 3 DIN fuses.

Notes: <sup>1)</sup> Tested to 550V.  
<sup>2)</sup> 'M' in Cat. No. denotes motor starting type.  
<sup>3)</sup> Tested to 500V.

## HRC DIN type fuse-links (Also referred to as NH type)

N-Type 600V AC 500V AC<sup>1)</sup>. Manufactured to DIN43620/1, IEC269-2-1. Rated breaking capacity 120kA r.m.s. Time current gL to VDE 0636/21. Characteristics gG to IEC 269-2-1.

All NHP Compact DIN fuses feature "pop up" blown fuse indication

Current rating A	Length mm	NHP Cat No.
SIZE 00	6	78.5
	10	78.5
	16	78.5
	20	78.5
	25	78.5
	32	78.5
	35	78.5
	40	78.5
	50	78.5
	63	78.5
	80	78.5
	100	78.5
	125	78.5
	160	78.5
SIZE 1	25	133.0
	35	133.0
	50	133.0
	63	133.0
	80	133.0
	100	133.0
	125	133.0
	160	133.0
	200	133.0
	224	133.0
	250	133.0
SIZE 2	80	148.0
	100	148.0
	125	148.0
	160	148.0
	200	148.0
	224	148.0
	250	148.0
	315	148.0
	355	148.0
	400	148.0
SIZE 3	315	150.0
	355	150.0
	400	150.0
	500	150.0
	630	150.0

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QUALITY  
MANAGEMENT  
SYSTEM  
ISO 9001:2008 CERTIFIED

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Version 1





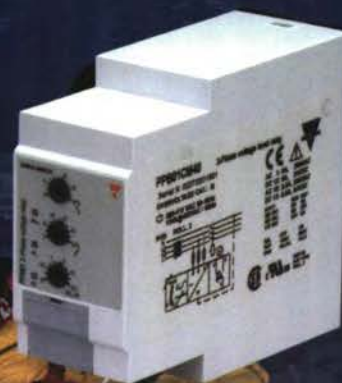
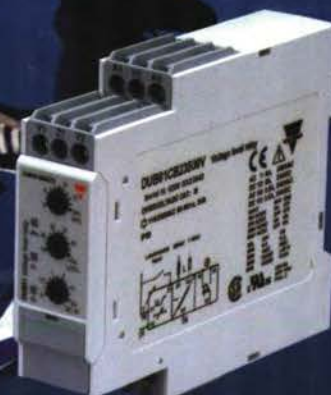
**NHP**

# 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**

**NHP ELECTRICAL ENGINEERING PRODUCTS PTY LTD**

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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

## Advantage Plus SERIES:

1 & 3 Phase True RMS Monitoring

AC/DC Over or Under Current

AC/DC Over or Under Voltage

Phase Sequence

Phase Loss

Time Delay Setting (0.1 - 30 sec)

AC/DC Over or Under Current - mV input

AC/DC Over & Under Voltage

Phase Asymmetry

Latch & Inhibit Function

## Advantage SERIES

DIN Rail



**DIA**  
Current



**DUA**  
Voltage



**DPA**  
3 Phase

Plug-In



**PIA**  
Current

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



**PUA**  
Voltage

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



**PPA**  
3 Phase

- 3 Phase
- Phase sequence and phase loss

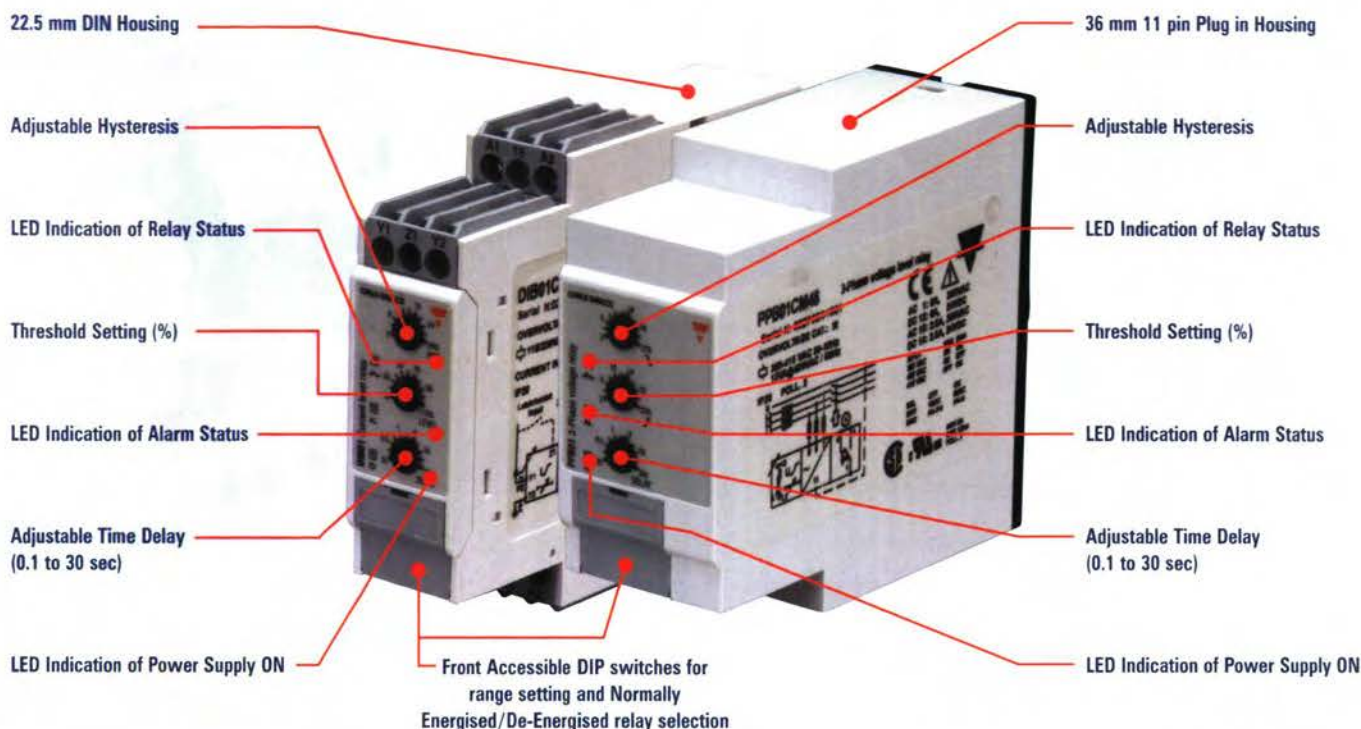
Accurate

Responsive

Quality



# Reliability... you can count on



## AdvantagePlus SERIES



**DIB**  
Current



**DUB**  
Voltage



**DPB**  
3 Phase



**DFB** Frequency  
**DWB** Power Factor



**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

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

**Advanced**

**Reliable**

**Flexible**

*"Get the Advantage"*





### 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



# NHP

## ELECTRICAL ENGINEERING PRODUCTS PTY LTD

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38 Belmont Ave. Rivervale W.A. 6103

3 Steele Street Winnellie N.T. 0820

2/65 Albert Road Moonah Tasmania 7009

7 Lockhart Place Mt Wellington Auckland 1006

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**sprecher+  
schuh** *The ultimate  
in pushbuttons*

**NHP**

Full voltage,  
superior brightness  
and long life

# D5-3N

## Integrated LED Lamp Blocks

- 5 Colour choices
- Available in voltages up to 240 V AC

- 11 year lamp life (100,000 hours)
- Maintenance free

- Vibration and shock resistant
- Snap lock fit to existing D5 coupling latch

- Superior illumination qualities
- IP 20 finger protection on live components

- Clear identification of function
- Suitable for use with existing D5 illuminated operators and pilot lights

**NHP** ELECTRICAL ENGINEERING PRODUCTS PTY LTD



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



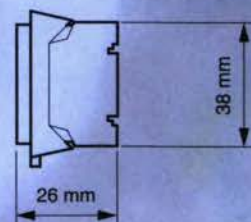
This is particularly the case when used with D5 optically enhanced lenses. LED lamps are renowned for providing optimum true colour and great resistance to shock and vibration. In addition, they have internal circuitry for use with solid state outputs, making them ideal for use with PLC inputs. The new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

### Ordering Information

Available colours:

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

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



Lamp Block Width: 9.5 mm

Voltage	Nominal Current Consumption <sup>1)</sup>	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: <sup>1)</sup> Approximate permissible leakage current 3 mA.



# CA4 Miniature Contactors

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



Compact 45 mm width



Electronic motor protection



Accurate thermal protection



Clip on accessories

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

**NHP** ELECTRICAL ENGINEERING PRODUCTS PTY LTD

A.B.N. 84 004 304 812





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

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



NHP Premises, Melbourne

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

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

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



National Distribution Warehouse (5200sq metres)

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

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

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



Sydney Premises



Sprecher + Schuh administrative building at Aarau



Part of the low voltage factory at Aarau

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

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

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

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

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

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

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

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

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

**The Ultimate in Motor Control**



# INDEX

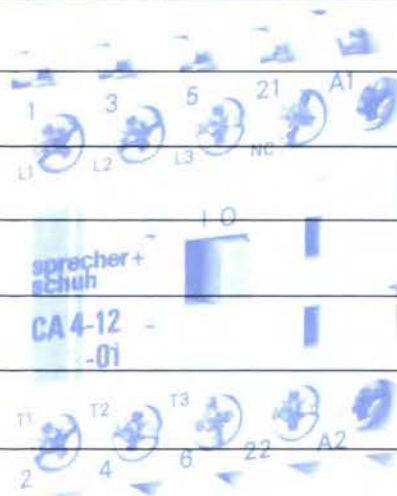
**NHP**

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## MINI CONTACTOR AND RELAY SYSTEM

### CA 4 Contactor

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

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



### CS 4 Relay

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

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

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

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



### CT 4 Thermal Overload

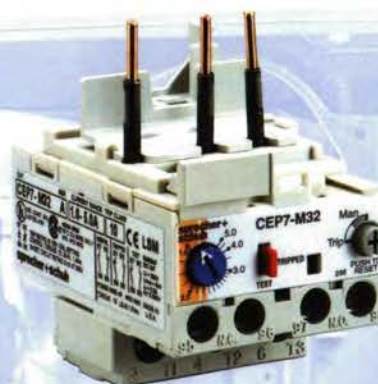
The **CT 4** thermal overload relay is a reliable and proven solution for providing economical motor protection. It fits directly to CA 4 contactors and can cater for current ranges from 0.1 to 9 amps.



### CEP 7 Electronic Overload

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

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





## AC CONTACTORS CA 4

**NHP**

### Compact Dimensions

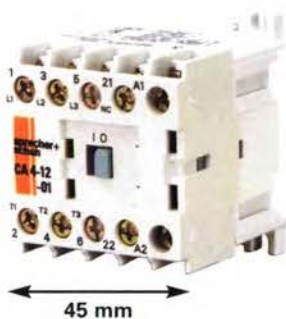
The examples shown demonstrate the compactness and versatility of the CA 4 contactor.

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

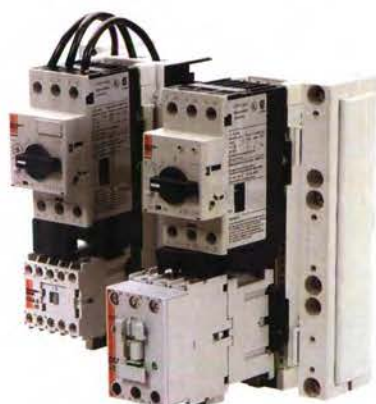
CA 4 is equally effective in simple or complex motor starter applications.



*CA 4 contactor fitted to CT 4 thermal overload*



*Compact 45 mm wide*



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



*CA 4 contactor fitted to CEP 7 electronic overload relay*



*CA 4 contactor fitted with auxiliary contact block*

## THREE RATINGS IN ONE FRAME SIZE

### Features

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

### Three Ratings

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

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

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

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

### AC Coil

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

### AC Coil 4-pole

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

### DC Coil

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

Maximum  
performance  
minimum space





## UNDER VOLTAGE RELIABILITY (AC/DC COIL)

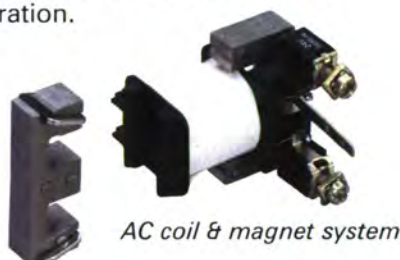
**NHP**

### CA 4 AC & DC coils

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

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

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



AC coil & magnet system



DC coil & magnet system

### Low Heat Losses

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

AC pick-up = 24 VA

AC hold = 4 VA

DC pick-up and hold = 2.5 W

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



### Efficiency with Wiring

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

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

No special tools are required to fasten the terminals.



### Contact Configuration

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

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

### Main Contacts of CA 4 Contactor

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

The image below shows the auxiliary contact block H-contacts

Clever contact design provides improved electrical connection and reliability.





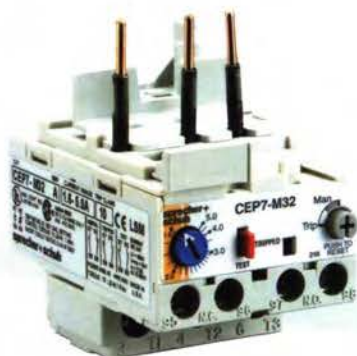
## ADVANCED MOTOR PROTECTION

### CEP 7 Electronic Overload

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

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

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



#### Features

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



CA 4 with CEP 7

### CT 4 Thermal Overload

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



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

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

#### Features

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



CA 4 with CT 4



## TIME UNDER CONTROL

**NHP**

### CRZE 4 Timing Element

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

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

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

0.1...3 seconds

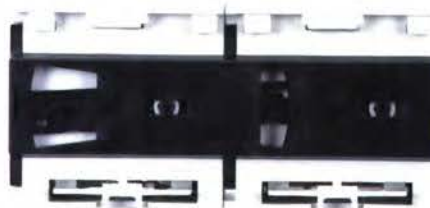
1...30 seconds



### 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.

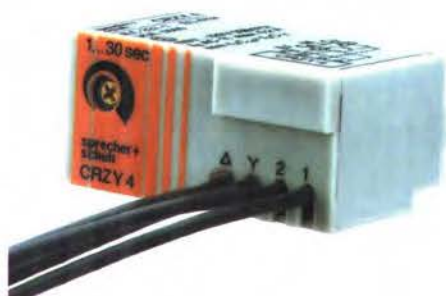


Two CA 4's interlocked (2.6 kW)

### 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.



CA 4 with a CRZY 4 timer fitted



## CS 4 MINIATURE RELAY SYSTEM

### CS 4 Miniature Relay

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

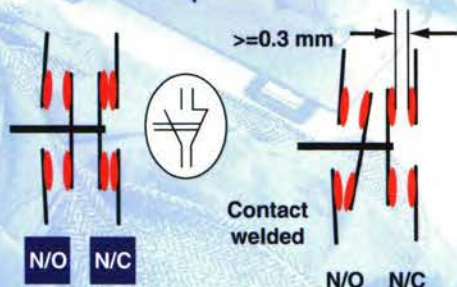
Just like the CA 4 contactor, the CS 4 relay shares the same dimension width of 45 mm. This also makes the CS 4 miniature relay an attractive selection for the most discerning user. It will satisfy many industrial applications, from the most complex electronics to the basic lighting circuit.



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



### 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

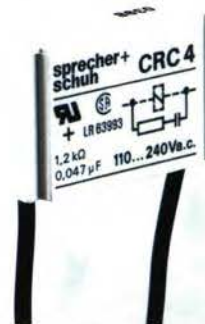
CS 4 auxiliary components allow you to convert the basic four pole relay into a:

- 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**

### CA 4 Mounted on an ACS Busbar System



### Miniature Contactor System



### CA 4 Miniature Starter System



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



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



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.



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



## WORLD CLASS QUALITY CA 4 MINIATURE CONTACTORS

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

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

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

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

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



**Backed by  
decades of  
experience**

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



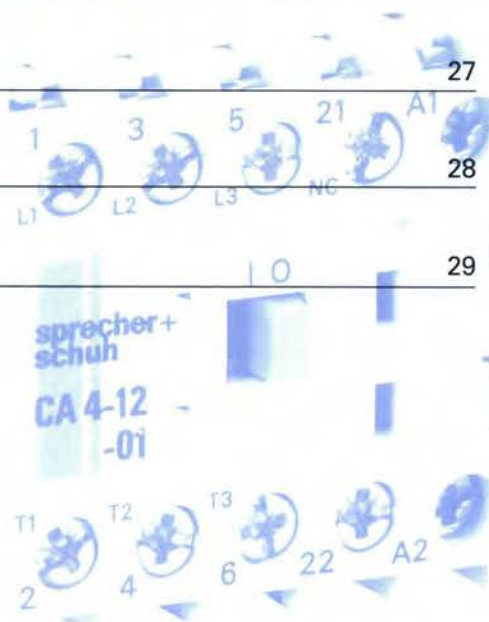
# CA 4

# NHP

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## AC AND DC CONTACTORS

### CA 4 Contactor

#### AC coil <sup>1)</sup>

AC 3 kW	AC 2/3 amps	Aux. Contacts std.	max.	Cat. No. <sup>2)</sup>
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



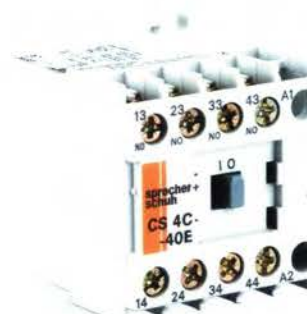
CA 4 contactor

#### 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 <sup>1)</sup>

AC 3 kW	AC 2 amps	Aux. Contacts std.	max.	Cat. No. <sup>2)</sup>
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 <sup>1)</sup>

Contacts N/O N/C	AC or DC	Cat. No. <sup>2)</sup>
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:** <sup>1)</sup> CA 4/CS 4 not available without coil. Coils and contacts not replaceable.

<sup>2)</sup> Add coil voltage AC 24, 32, 110, 240, 415 V 50 Hz when ordering.

Add coil voltage DC 12, 24, 48, 110, 125, 220 V when ordering.

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



## CA 4/CS 4 ACCESSORIES

NHP



Auxiliary contact block



RC link



Mechanical Interlock



KCD 4

CR4-P  
DIN rail adaptor

CRZE 4 Timer

## Auxiliary Contact Blocks CA 4-P

For contactors CA 4... -10 <sup>1)</sup>

Contact

arrangement

Cat. No.



CA 4-P-02



CA 4-P-11



CA 4-P-22

For contactors CA 4...-01 <sup>1)</sup>

Contact

arrangement

Cat. No.



CS 4-P-20



CS 4-P-11



CS 4-P-40

## Accessories

Description

Cat. No.

Mechanical interlock (requires no additional space)

CM 4 <sup>2)</sup>

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 &amp; CA 4

KT 7-25S-PEM12

## Connection links

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

For CA 4 to KTA 3

max. 9 amps

KCD 4

Connection links for reversing and star delta starters @ 60 °C

Reversing link set for CA 4-5/9

max. 9 amps

KCR 4

Star delta link set for CA 4

max. 9 amps

KCSD 4

## Adaptor CR 4-P

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

## RC link CRC 4

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

## 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.

## Auxiliary contact blocks CA 4-P

Terminal markings in compliance with EN 50 012.

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

## Mechanical interlock CM 4

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

**Notes:** <sup>1)</sup> 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.

<sup>2)</sup> Not available for use with DC contactors and relays.



## STATE OF THE ART MOTOR PROTECTION

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

**Self  
Powered  
Design**

### Manual reset

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

### Automatic and manual reset

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

### Remote reset magnet

To suit CEP7-M32 and CEP7-A32

Cat. No.

CMR7...V <sup>1)</sup>

### Accessories

Cover for preventing overload adjustment

Cat. No.

CMS7-BC4

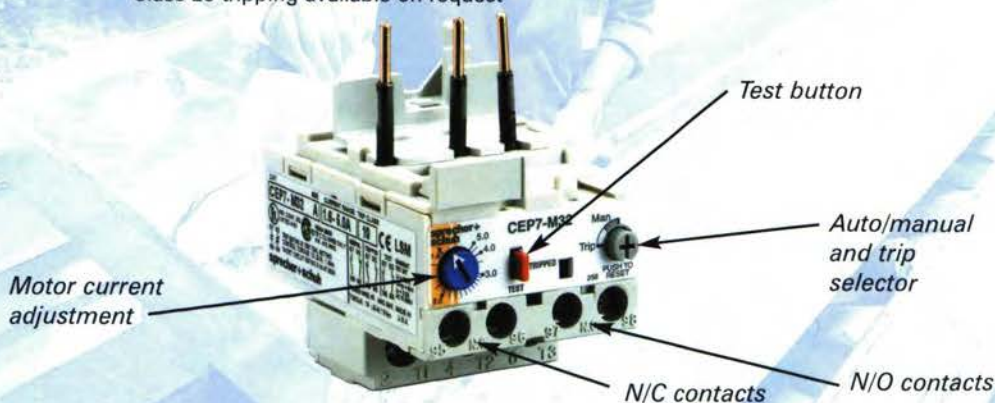
Cover for preventing current adjustment only

CMS7-BC5

Separate mounting bracket

CEP7-37-PA

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



## ECONOMICAL THERMAL OVERLOAD CT 4

**NHP**

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



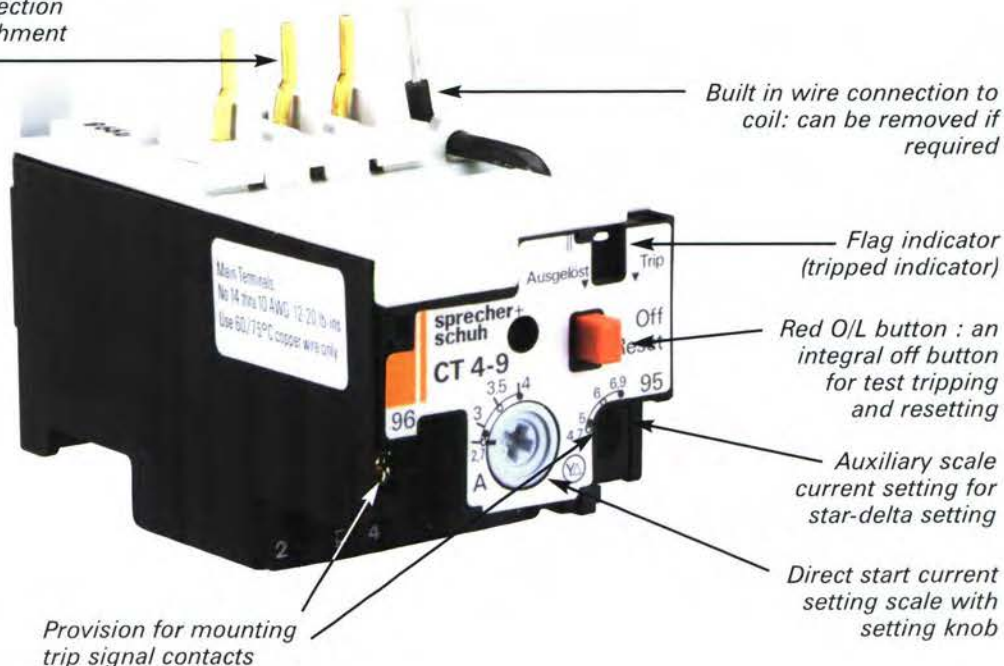
### CT 4 Thermal Overload Relays for Mounting on CA 4 Contactors

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

Auxiliary signal contact block (N/O)  
- clip on to thermal overload

CT 3K-P-10

Electrical connection  
for direct attachment  
to CA 4





## TECHNICAL INFORMATION

### CS 4 Control Relay

CS 4 Relays

CS 4 Relays

#### Electrical

##### Contact Ratings - IEC 947

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

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

##### Short Circuit Protection afforded by contactor

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

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

##### Switching DC

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

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

#### Mechanical

Mechanical Life	[Mil]	10
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##### Electrical Life

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

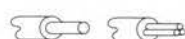
Weight	[g]	153
--------	-----	-----

##### 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
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# TECHNICAL INFORMATION

**NHP**

## CA 4 Miniature Contactors

Rated Insulation Voltage $U_i$				CA4					
to IEC 947-1		[V]	500 V			-05	-09	-12	
UL/CSA		[V]	600 V						
Rated Impulse Voltage $U_{imp}$									
		[kV]	8						
Rated Voltage $U_e$									
-Main Contacts									
AC 50/60 Hz		[V]	230, 240, 400, 415, 500	(Star Delta)	230 V	[A]	11	21	21
DC		[V]	24, 48, 110, 220, 440	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
Operating Frequency for AC Loads									
		[Hz]	50/60 Hz						
Switching Motor Loads									
Standard IEC Ratings									
AC 2, AC 3, AC 4									
DOL & Reversing									
50 Hz/60 °C									
	230 V	[A]	6.5	-05	-09	-12			
	240 V	[A]	6.5						
	400 V	[A]	5.3						
	415 V	[A]	5.3						
	500 V	[A]	4						
	230 V	[kW]	1.5						
	240 V	[kW]	1.5						
	400 V	[kW]	2.2						
	415 V	[kW]	2.2						
	500 V	[kW]	2.2						
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					
AC 1 Load, 3 Ø Switching									
Ambient		$I_e$	[A]	20	20	20			
Temperature 40 °C		230 V	[kW]	8	8	8			
		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,			[A]	9.3	9.3	9.3			
Electrical endurance									
~100,000 operations									

## TECHNICAL INFORMATION

### CA 4 Miniature Contactors

#### Electrical Data

##### Switching power transformers AC 6a

Inrush		= 30	CA4		
Rated transformer current			-05	-09	-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

			CA4		
			-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
<b>Resistance and Watt Loss <math>I_e</math> AC 3</b>		
Resistance per power pole	[mΩ]	-05 -09 -12 5.5 5.5 5.5
Watt Loss - 3 power pole	[W]	0.46 1.3 2.4
Coil and 3 power poles	AC	[W] 1.9 2.7 3.8
	DC	[W] 3.0 3.8 4.9

#### Coil Data

##### Voltage Range

AC: 50 Hz, 60 Hz, 50/60 Hz	Pickup	$[xU_s]$	0.85...1.1
	Dropout	$[xU_s]$	0.35...0.65
DC	Pickup	$[xU_s]$	0.85...1.1
	Dropout	$[xU_s]$	0.1...0.25

##### Coil Consumption

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

##### Operating Times

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



CA 4 contactor



# TECHNICAL INFORMATION

**NHP**

## 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	[mm <sup>2</sup> ]	0.75...2.5
	2 Wires	[mm <sup>2</sup> ]	0.75...2.5
	1 Wire	[mm <sup>2</sup> ]	0.75...2.5
	2 Wires	[mm <sup>2</sup> ]	0.75...2.5
	1 Wire	[mm <sup>2</sup> ]	18...14
	2 Wires	[mm <sup>2</sup> ]	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	[mm <sup>2</sup> ]	0.75...2.5
Wires		[AWG]	18...14
Control Modules	1 or 2	[mm <sup>2</sup> ]	0.75...2.5
Wires		[AWG]	18...14
Torque Requirement		[Nm]	1...1.5
		[Lb-in]	7...15

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

#### Protection Against Accidental Contact

back-of-hand proof per VDE 0106; Part 100

### Environmental and General Specifications

#### Ambient Temperature

Storage	-55...+80 °C (-67...176 °F)
Operation	-25...+60 °C (-13...140 °F)
Conditioned 15 % current reduction after AC 1 at T 60 °	-55...+70 °C (-13...158 °F)

**Altitude at installed site** 2000 meters above sea level per IEC 947-4

**Resistance to corrosion/ Humidity** Damp-alternating climate: cyclic to IEC 68-2, 56 cycles.  
Dry heat: IEC 68-2, +100 °C (212 °F), relative humidity < 50 %, 7 days.  
Damp tropical: IEC 68-2, +40 °C (104 °F), relative humidity < 92 %, 56 days

**Shock Resistance** IEC 68-2: Half sinusoidal shock 11 ms, 30 g (in all three directions)

**Vibration Resistance** IEC 68-2: Static > 2 g, in normal position no malfunction < 5 g

**Operating Position** Refer to Dimension Pages

**Standards** IEC 947-1/4, EN 60947; UL 508; CSA 22.2, No. 14, SEV1025

**Approvals** CE, UL, CSA, SEV, SUVA, Lloyd's Registry of Shipping, Bureau Veritas, Maritime Register of Shipping, Elektrizitats-Inspektorat Finland









## TECHNICAL INFORMATION

### CA 4 Miniature Contactors

#### Auxiliary Contacts

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









### CRZE4/CRZY4 Electronic Timers

Permissible voltage		Repeat accuracy	± 5 %
CRZE4 (AC or DC)	110 V (-23 %) - 250 V (+10 %)	Time interval for start commands	1.4 x set time
CRZY4 (AC only)	110 V (-23 %) - 120 V (+10 %)		
	220 V (-20 %) - 250 V (+10 %)	CRZE4	1.4 x set time
		CRZY4	2 x set time
Voltage drop		Ambient temperature	
	5 V max	Storage	-40 °C to + 80 °C
Load current for reliable operation		Operation	-20 °C to + 55 °C
	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		

# TECHNICAL INFORMATION

**NHP**

## CEP 7/CT 4 Overloads

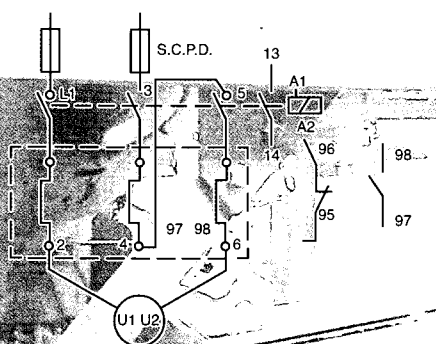
Electrical data				
Main Circuits		CEP7-A/M-32		CT4-9
Rated insulation voltage $U_i$				
UL	[V]	600		600
CSA	[V]	690		690
Rated impulse strength $U_{imp}$		[kV]	6	X
Rated operating voltage $U_e$		[V]	690	690
Terminal Cross-section				
Terminal type				
Terminal screws		M4		M4
Flexible with wire ferrule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

## TECHNICAL INFORMATION

### CEP 7/CT 4 Overloads

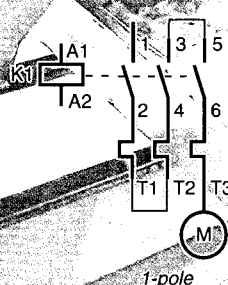
<b>General data</b>	<b>CEP7-A/M-32</b>	<b>CT4-9</b>
<b>Weight [kg]</b>	0.14	X
<b>Standards</b>	IEC 947, EN 60 947, DIN VDE 0660	
<b>Approvals</b>	CE, UL, CSA, PTB	
<b>Corrosion resistance</b>	95 % relative humidity without condensation, 30...60 °C	humid/warm, constant
<b>Ambient temperature</b>		humid/warm,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

### Connection Diagram CEP 7 Single Phase Wiring

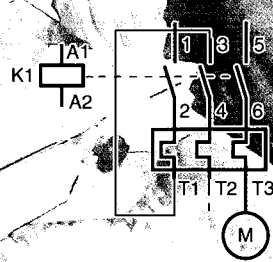


The CEP 7S must be wired as indicated to provide "self-powering" of the overload relay

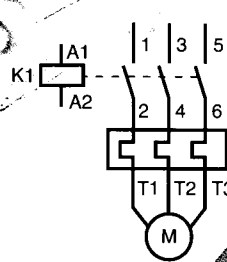
### Connection Diagram CT 4



1-pole



2-pole



3-pole



# UTILISATION CATEGORIES

**NHP**

Category <sup>1)</sup>	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 <sup>2)</sup> , inching <sup>3)</sup>
AC 5a	Switching of electric discharge lamp control
AC 5b	Switching of incandescent lamps
AC 6	Switching of power transformers
AC 6b	Switching of 3-phase capacitors. Inductance of leads between capacitors in parallel: min 6uH
AC 7a	Slightly inductive loads in house hold appliances and similar applications
AC 7b	Motor-loads for house hold applications
AC 8a (manual reset) of overload	Switching of Hermetically sealed compressor motors (air tight sealed)
AC 8b (automatic reset) of overload	
AC 12	Control of resistive loads and solid state loads with isolation by optocouplers
AC 13	Control of solid state loads with transformer isolation
AC 14	Control of small electromechanical loads
AC 15	Electromagnets for contactors, valves, solenoid actuators
AC 20	Connecting and disconnecting under no-load condition
AC 21	Switching of resistive loads, including moderate overloads
AC 22	Switching of mixed resistive and inductive loads, including moderate overloads
AC 23	Switching of motor loads or other highly inductive loads
DC 1	Non-inductive or slightly inductive loads, resistance furnaces
DC 3	Shunt motors: Starting , plugging <sup>2)</sup> , inching <sup>3)</sup>
DC 4	Series-motors: Starting, switching off motors during running
DC 5	Series-motors, starting, plugging <sup>2)</sup> , inching <sup>3)</sup> , 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: <sup>1)</sup> All category listings according to IEC 947-4 and AS 3497-4

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

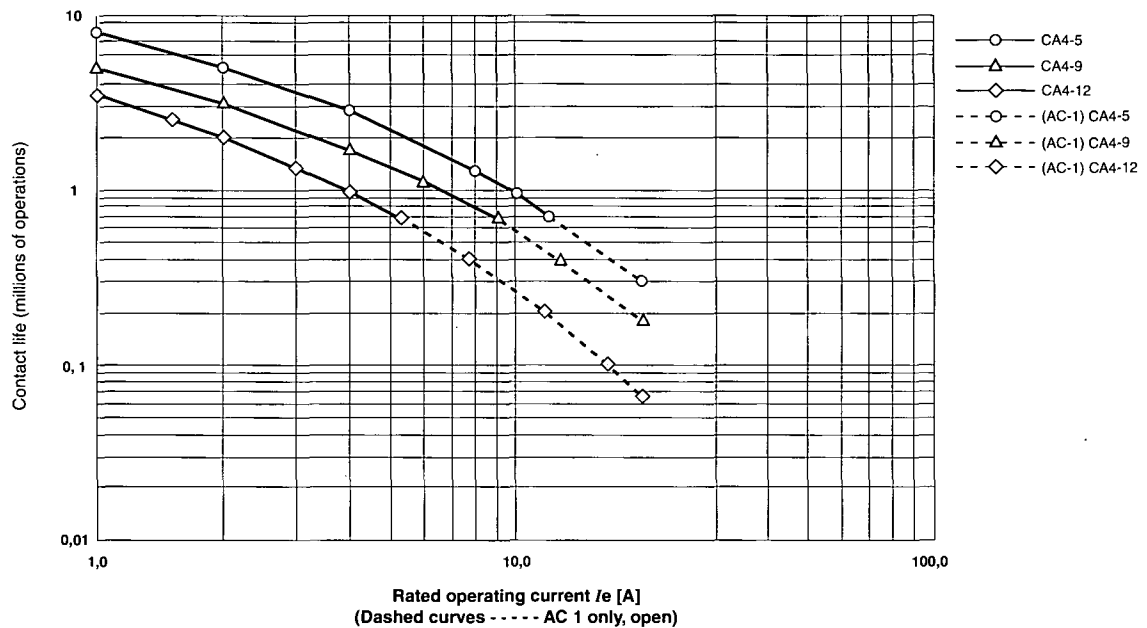
<sup>3)</sup> **Inching** is understood as energising a motor once or repeatedly for short periods to obtain small movements of the mechanism.

# ELECTRICAL LIFE GRAPHS

## CA 4 Contactors

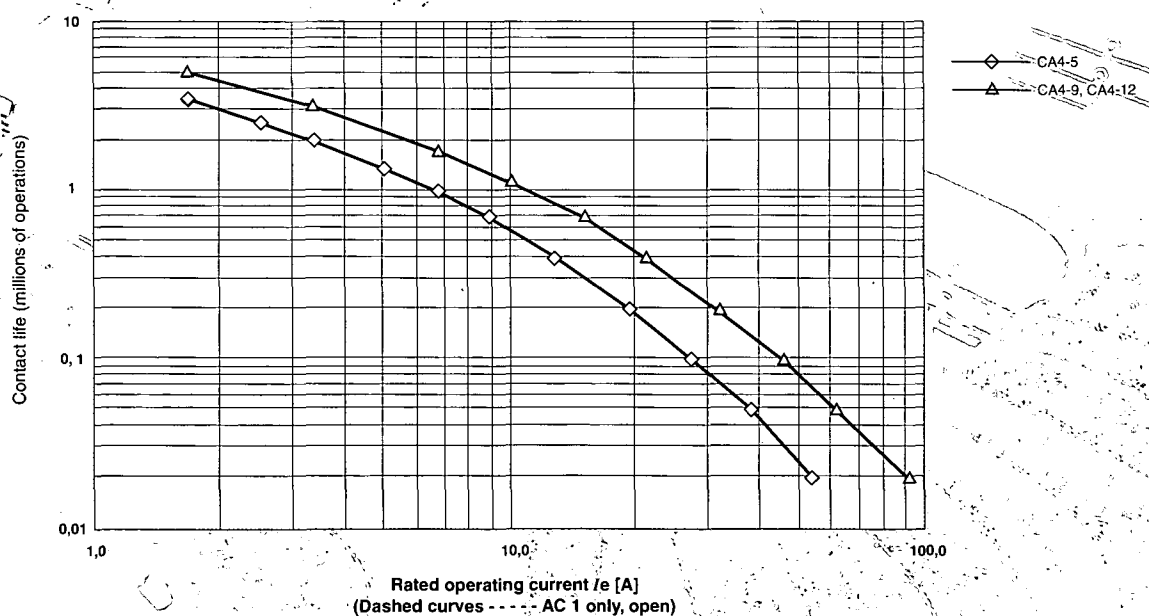
### CA 4 Contactors

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



### CA 4 Contactors

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

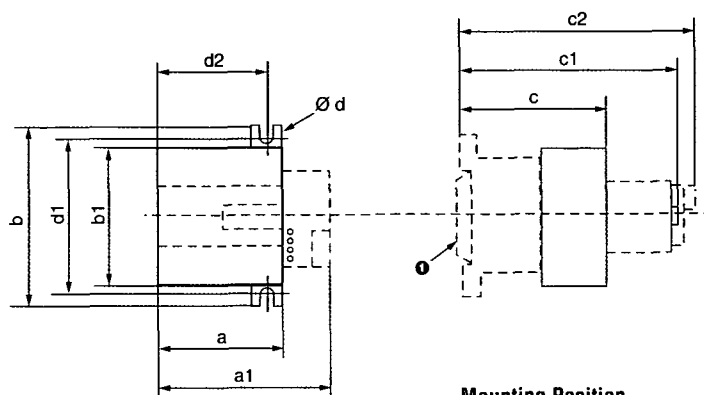


# DIMENSIONS

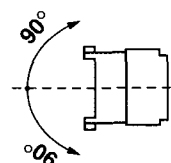
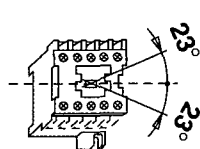
**NHP**

## CA 4 Contactor CS 4 Control Relay

### Series CA 4



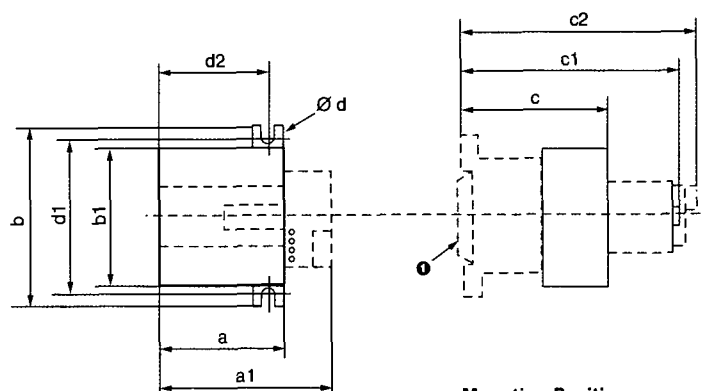
Mounting Position



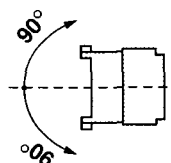
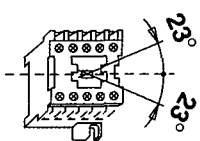
Type	a	a1	b	b1	c	C1	C2	Ød	d1	d2
CA 4-9	45	67	56	47	48	74	77	4.2	50	40

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

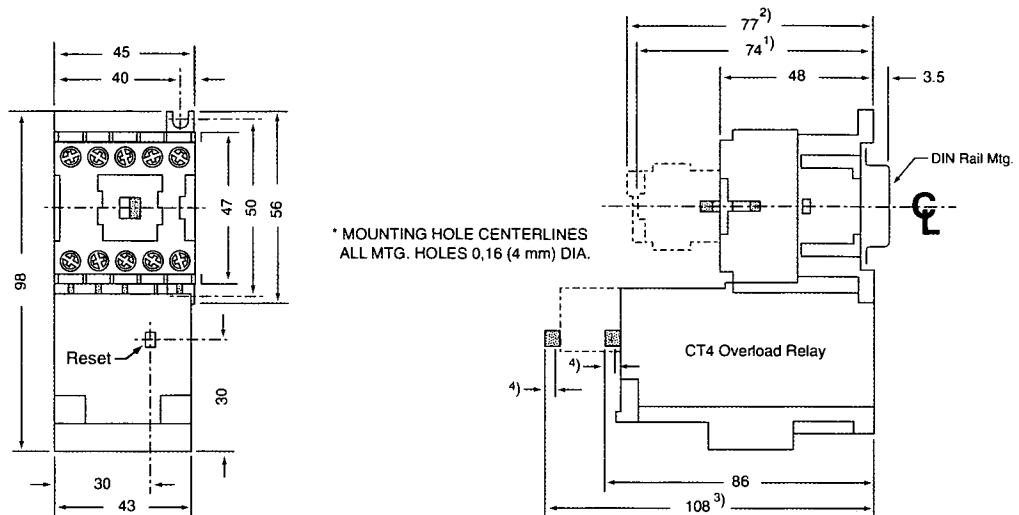
Note: DIN Rail mounting 35 mm to EN 50 022.



## DIMENSIONS

### CT 4 Thermal Overload Relay

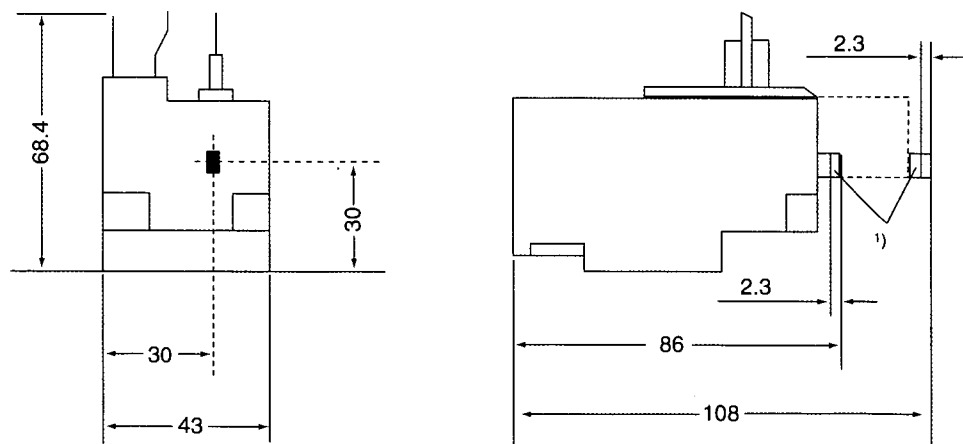
#### Series CT 4 (mounting to CA 4 contactors)



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

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

#### Series CT 4



- Notes:**
- <sup>1)</sup> Minimum reset travel = 2.3 mm

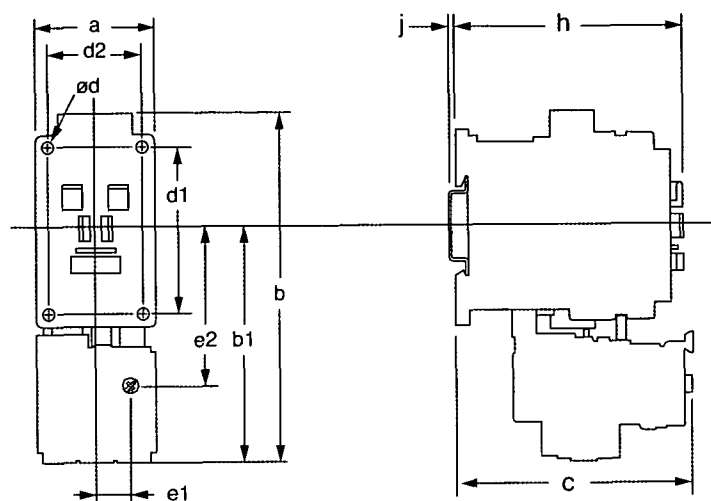
*Dimensions in (mm)*

# DIMENSIONS

**NHP**

## CEP 7 Electronic Overload Relay

### Series CEP 7 (mounting to CA 4 contactors)

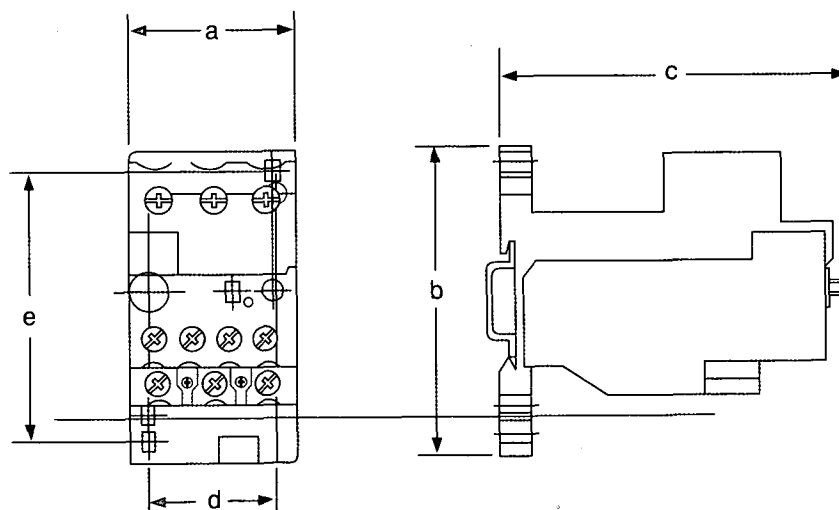


#### Dimensions when

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

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

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

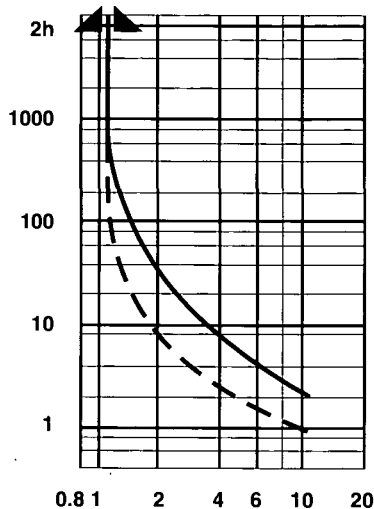


Cat. No.	a Width	b Height	c Depth	d	e
CEP7-37-P-A	45	90	75	30	75

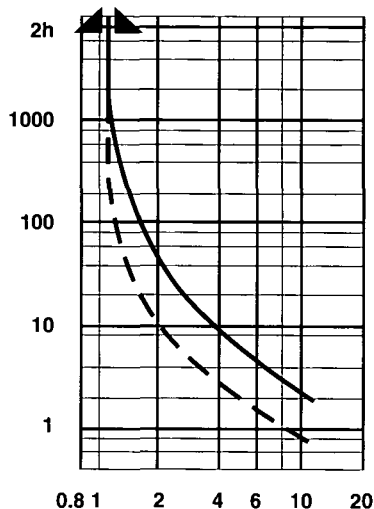
Dimensions are in (mm) and are not intended for manufacturing purposes

## CEP 7/CT 4 OVERLOAD GRAPH

CT4-0.1 2.7



CT4-2.7 9.0



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

Mean value of tolerance bands, heated in three phases.

Curves: — from cold state

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

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

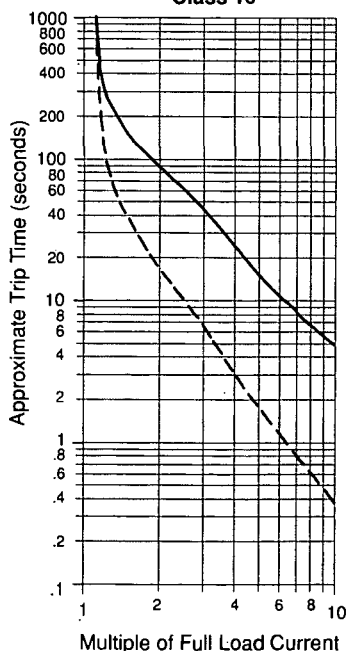
Function Limits and Temperature Compensation: from  $-25\text{ }^{\circ}\text{C}$ ... $+70\text{ }^{\circ}\text{C}$ .

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

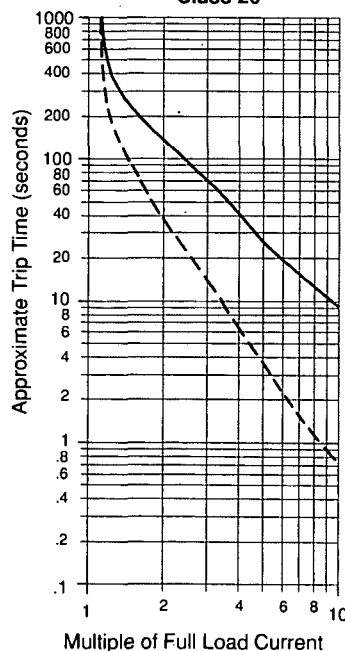
Two Phase Loading (phase failure): Trip limits 1.05...1.25 of set current  $I_{\text{ef}}$  in accordance with IEC 292-1. For motors up to 10 kW, the two-phase trip at max. 1.25  $I_{\text{ef}}$  guarantees heat build-up limitation to the value which occurs on three phase trip at 1.2  $I_{\text{ef}}$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

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

Class 10



Class 20



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

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

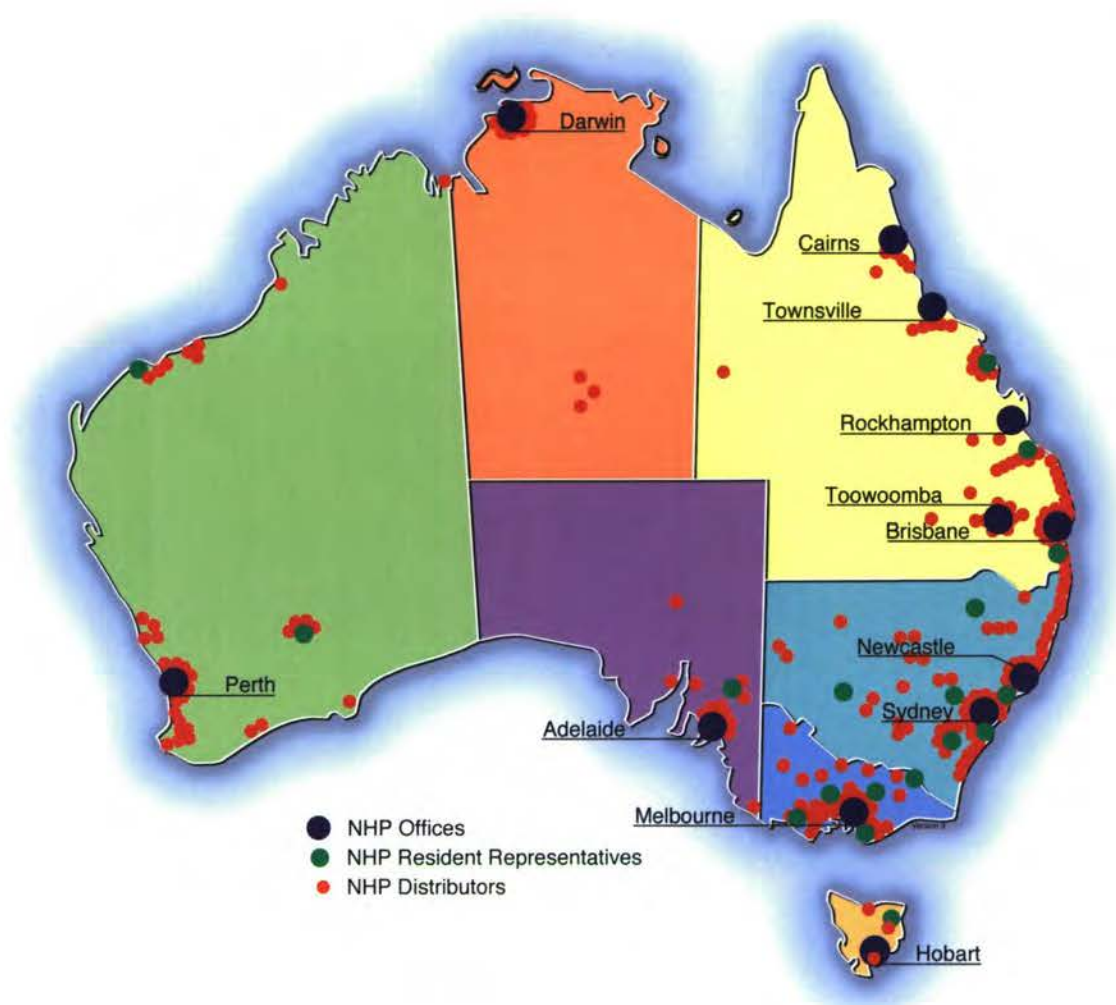
The CEP 7-A/M trip time under single-phase conditions (loss of 1-phase on a 3-phase system) varies according to the percentage of motor load. Estimate 2-3 seconds if phase loss occurs during running condition. If single phase condition is present when the motor is started, estimate 3-8 seconds for motor 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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Version 6:

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A.B.N. 84 004 304 812







# NHP

Catalogue

**F1**

January 2003

RELAYS & TIMERS  
Time controls



Actual size

## Relays that take control

*Industrial & general  
purpose relays*



# NHP ELECTRICAL ENGINEERING PRODUCTS LTD

A.B.N. 61 304 812





## The power in relays

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

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



## Production facilities

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

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

## Approvals

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

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



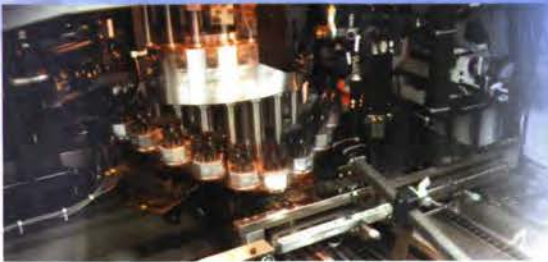


## Applications

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

Product users can rely on

- Ease of installation
- Suitability for a variety of systems



## The Australian connection

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



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

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

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

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

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



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

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

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



## Finder Relays - A Product Overview



### 38 Series

#### Relay Interface Modules - 6A

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



### 55 Series

#### Miniature general purpose relays - 7 A & 10 A

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



### 56 Series

#### Miniature Power Relays - 12 A

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



### 60 Series

#### General purpose relays - 10 A

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



### 62 Series

#### Power relays - 16 A

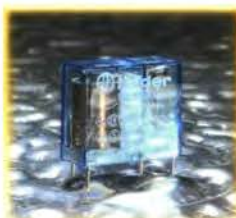
- Suitable for high power switching
  - Plug-in or quick connect mounting options
  - 2 & 3 changeover contacts available
- See page 11 & 12



### 65 Series

#### Power relays - 20 A & 30 A

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



### 40 & 44 Series

#### Miniature relays - 8 A, 10 A & 16 A

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



### 30 Series

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

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



### 34 Series

#### Ultra slim PCB relays - 6 A

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



### 20 & 26 Series

#### Step relays - 10 A & 16 A

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



## Relay Bases and Accessories

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



### 94 Series

Suitable for 55 series

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



### 96 Series

Suitable for 56 series

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



### 90 Series

Suitable for 60 series

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



### 92 Series

Suitable for 62 series

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



### 95 Series

Suitable for 40 & 44 series

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



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

See pages 8 and 19

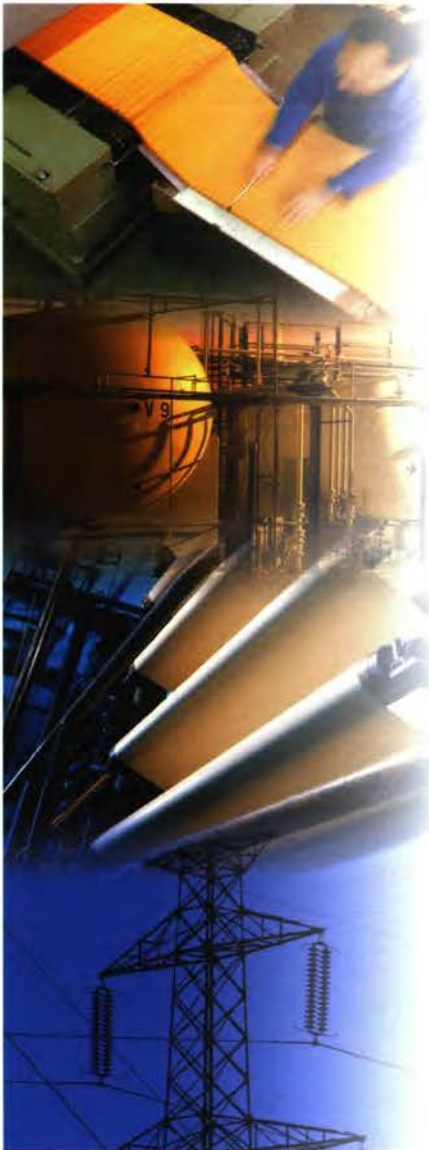
## LED and Diode Module Systems

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

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



## Product Features That Give You Value


**55 Series**

**56 Series**

**60 Series**

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

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

Their small presentation and high power switching capabilities make them versatile and user friendly. Finder has further developed the relays to enhance ease of installation, testing and use. The lockable test button feature is integral to the 55 series miniature general purpose relay, 56 series miniature power relay (2 pole version only) and 60 series general purpose relay.

### Lockable test button - maintenance made easy



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

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

**Case 2** The plastic pip is broken off (using an appropriate cutting tool). In this case, (in addition to the above function) when the test button is pushed and rotated, the contacts are latched in the operating state and remain so until the test button is rotated back to its former position. It is important to note that in both cases the test button actuation should be swift and decisive.



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	Bases and jumper links			18 - 20
	Plug in diodes/LED modules			20
	General technical information			21
	Coil specifications			22 - 23



# PLC Interface Relays - DIN Rail Mount

## 38 Series - The New Generation

# 6 A



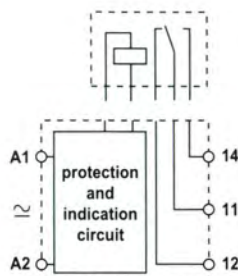
**Screwless  
terminals for  
quick installation**

### Technical Data

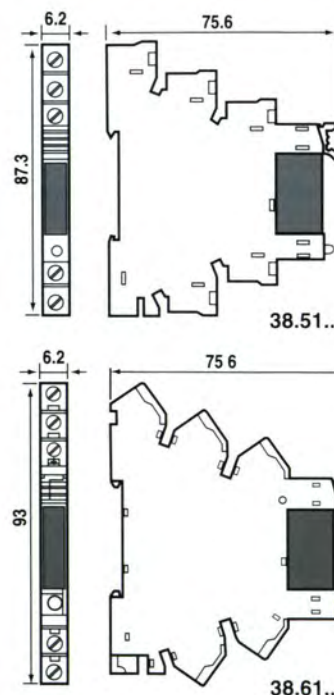
Nominal coil voltage	AC	24, 110, 240
	DC	12, 24, 110
Nominal coil sensitivity		0.3 W
Coil operating range	AC/DC	(1.4...1.6) $U_N$
Rated AC 1 load		1500 VA
Rated AC 15 load (230 V AC)		300 VA
Single phase motor rating		—
Breaking capacity in DC 1 30/110/220 V		6/0.2/0.15 A
Mechanical life	DC cycles	10.10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



### Connection Diagram



### Dimensions (mm)



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

38.51...V AC/DC	1 C/O	6 A
38.51...V DC	1 C/O	6 A
38.61...V AC/DC	1 C/O	6 A
38.61...V DC	1 C/O	6 A

## Accessories

**NEW**

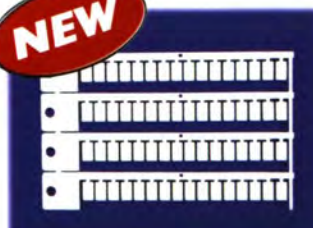


### 20 way jumper link

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

Cat. No. 93.20

**NEW**



### Identification labels

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

Cat. No. 93.64

**NEW**



### Plastic isolation plate

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

Cat. No. 93.01



## Miniature General Purpose Relays - Plug-in

### 55 Series - 2 Pole

### 10 A



Lockable test  
button, mechanical  
flag & LED

#### Technical Data

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

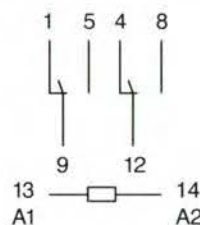
Cat. No.	Contact config.	Amps (AC 1)
55.320054...V AC	2 C/O	10 A
55.320074...V DC	2 C/O	10 A

#### Bases and accessories

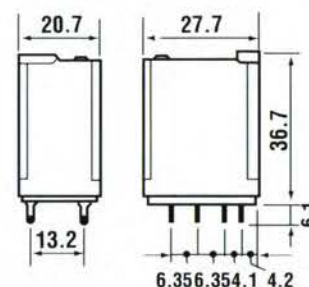
94.02 screw terminal base

Refer to page 18 for more details.

#### Connection Diagram



#### Dimensions (mm)



### 55 Series - 4 Pole

### 7 A



Lockable test  
button, mechanical  
flag & LED

#### Technical Data

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

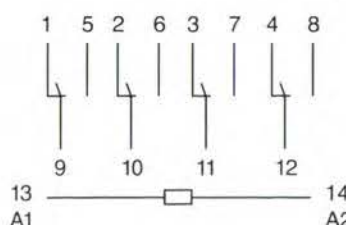
Cat. No.	Contact config.	Amps (AC 1)
55.34.0054...V AC	4 C/O	7 A
55.34.0074...V DC	4 C/O	7 A

#### Bases and accessories

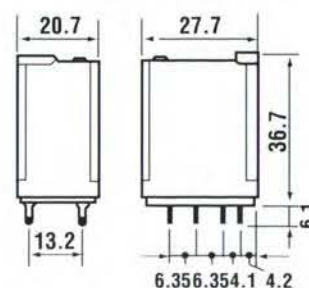
94.04 screw terminal base

Refer to page 18 for more details.

#### Connection Diagram



#### Dimensions (mm)





## Minature Power Relays - Plug-in

### 56 Series - 2 Pole

## 12 A



Lockable test  
button, mechanical  
flag & LED

#### Technical Data

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

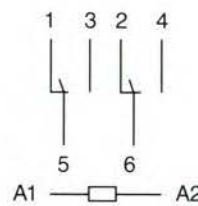
Cat. No.	Contact config.	Amps (AC 1)
56.32.0054...V AC	2 C/O	12 A
56.32.0074...V DC	2 C/O	12 A

#### Bases and accessories

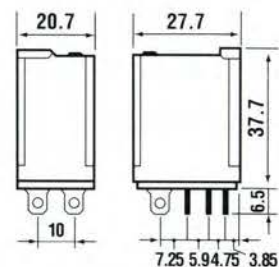
96.72 screw terminal base

Refer to page 19 for more details.

#### Connection Diagram

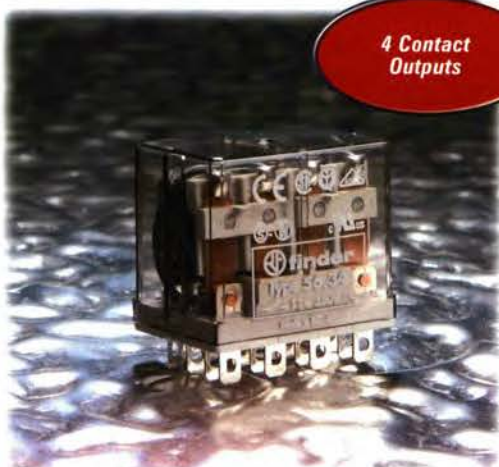


#### Dimensions (mm)



### 56 Series - 4 Pole

## 12 A



4 Contact  
Outputs

#### Technical Data

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

Cat. No.	Contact config.	Amps (AC 1)
56.34...V AC(V DC)	4 C/O	12 A

#### Bases and accessories

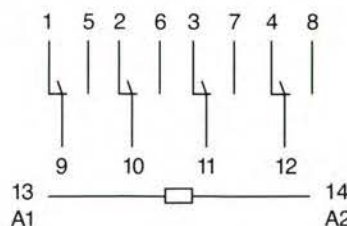
96.74 screw terminal base

99.010 LED module plug-in

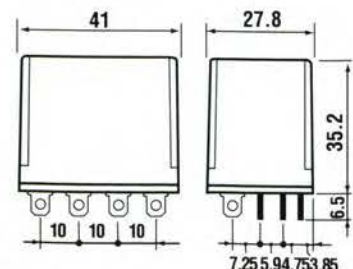
99.013 LED and diode module plug-in (DC only)

Refer to page 19 for more details.

#### Connection Diagram



#### Dimensions (mm)





## General Purpose Relays - Plug-in

### 60 Series - 2 & 3 Pole

### 10 A



**Integral LED  
& diode (DC only)**

#### Technical Data

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

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

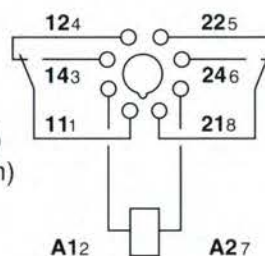
#### Bases and accessories

90.20 DIN rail mount base shrouded terminals for 60.12 (8 pin)

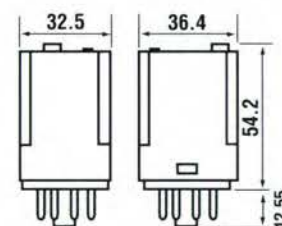
90.21 DIN rail mount base shrouded terminals for 60.13 (11 pin)

Refer to page 19 for more details.

#### Connection Diagram



#### Dimensions (mm)



### 62 Series - 2 & 3 Pole

### 16 A



**Suitable for  
high power  
switching**

#### Technical Data

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

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

#### Bases and accessories

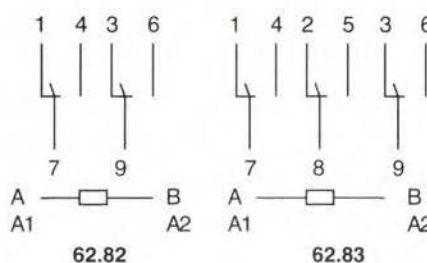
92.03 screw terminal base

99.020 LED module plug-in

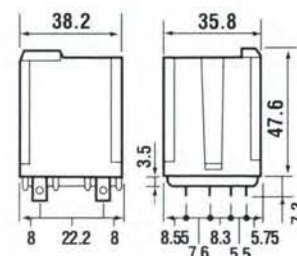
99.029 LED and diode module plug-in

Refer to page 19 for more details.

#### Connection Diagram



#### Dimensions (mm)





# 62 Series - 2 & 3 Pole

## 16 A

Flange Mount



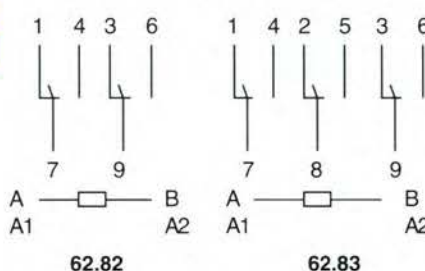
### Technical Data

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

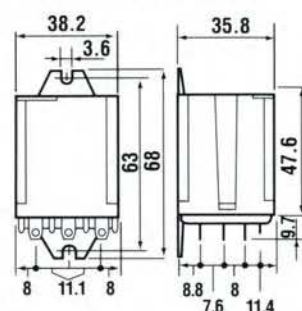
Cat. No.	Contact config.	Amps (AC 1)
62.82.0040...V AC(V DC)	2 C/O	16 A
62.83.0040...V AC(V DC)	3 C/O	16 A

**Bases and accessories**  
Not required

### Connection Diagram



### Dimensions (mm)



# 62 Series - 2 & 3 Pole

## 16 A

DIN Rail Mount



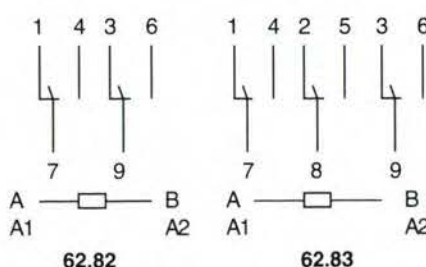
### Technical Data

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

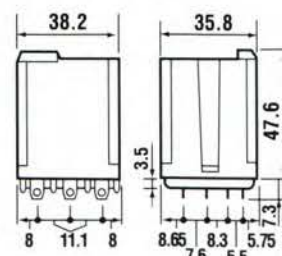
Cat. No.	Contact config.	Amps (AC 1)
62.82.0048...V AC(V DC)	2 C/O	16 A
62.83.0048...V AC(V DC)	3 C/O	16 A

**Bases and accessories**  
Not required

### Connection Diagram



### Dimensions (mm)

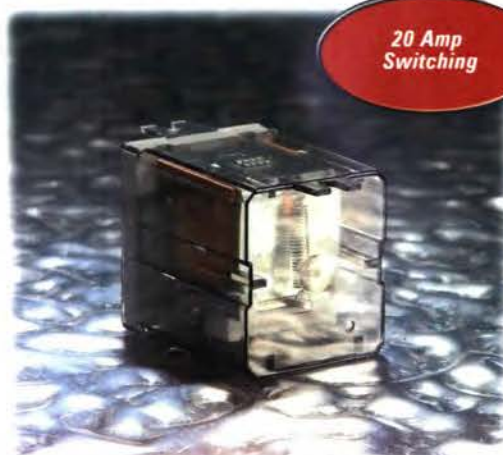




# Industrial Power Relays - Quick Connect

## 65 Series - 2 Pole

## 20 A



20 Amp  
Switching

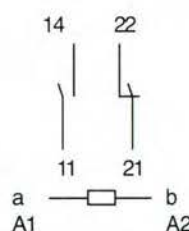
### Technical Data

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

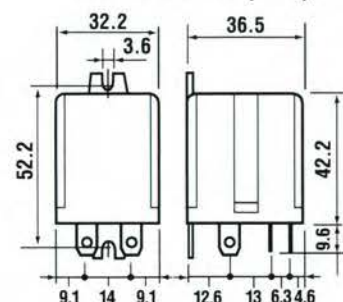
Cat. No.	Contact config.	Amps (AC 1)
65.31...V AC(V DC)	1 N/O + 1 N/C	20 A

**Bases and accessories**  
Not required

### Connection Diagram

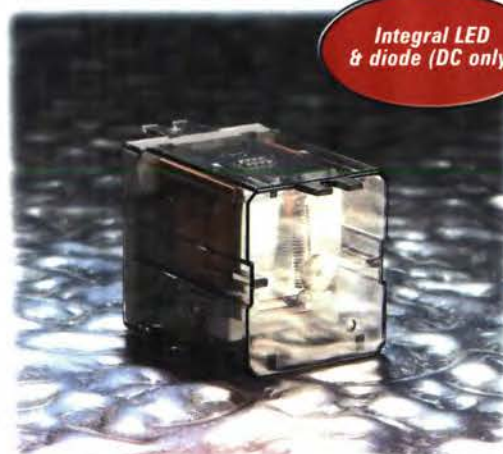


### Dimensions (mm)



## 65 Series - 1 Pole

## 30 A



Integral LED  
& diode (DC only)

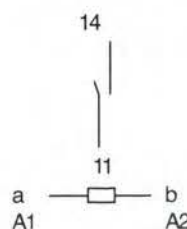
### Technical Data

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

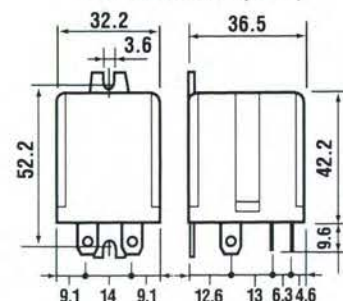
Cat. No.	Contact config.	Amps (AC 1)
65.31M...V AC(V DC)	1 N/O	30 A

**Bases and accessories**  
Not required

### Connection Diagram



### Dimensions (mm)

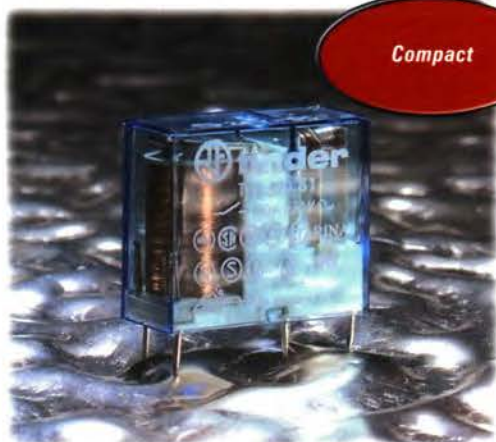




# Miniature Relays - PCB & Plug-in

## 40 Series - 1 Pole

### 10 A



Compact

### Technical Data

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

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

### Bases and accessories

95.05 screw terminal base

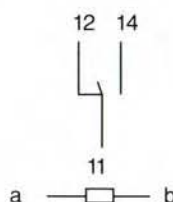
95.18 jumperlink 8 way

99.01 LED module plug-in

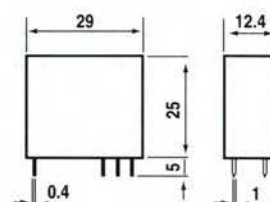
99.013 LED and diode module plug-in

Refer to page 20 for more details.

### Connection Diagram



### Dimensions (mm)



## 40 Series - 2 Pole

### 8 A



PCB Mount or Plug-in

### Technical Data

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

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

### Bases and accessories

95.05 screw terminal base

95.18 jumperlink 8 way

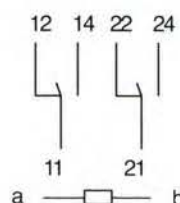
99.01 LED module plug-in

99.013 LED and diode module plug-in

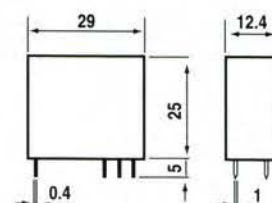
Refer to page 20 for more details.

14

### Connection Diagram



### Dimensions (mm)





## Miniature Relays - PCB &amp; Plug-in

## 40 Series - 1 Pole

16 A



Suitable for  
high power  
switching

## Technical Data

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

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

## Bases and accessories

95.05 screw terminal base

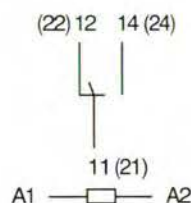
95.18 8 way jumperlink

99.01 LED module plug-in

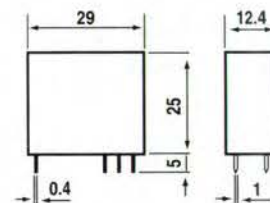
99.013 LED and diode module plug-in

Refer to page 20 for more details.

## Connection Diagram

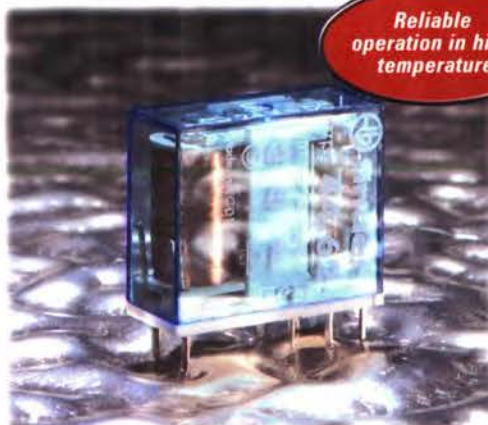


## Dimensions (mm)



## 44 Series - 2 Pole

10 A



Reliable  
operation in high  
temperature

## Technical Data

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

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

## Bases and accessories

95.05 screw terminal base

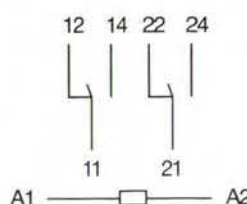
95.18 8 way jumperlink

99.01 LED module plug-in

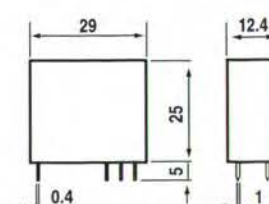
99.013 LED and diode module plug-in

Refer to page 20 for more details.

## Connection Diagram



## Dimensions (mm)





## 62 Series

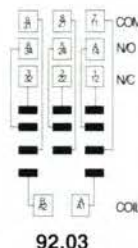


**NEW coil & contact terminals separated**

### 92.03

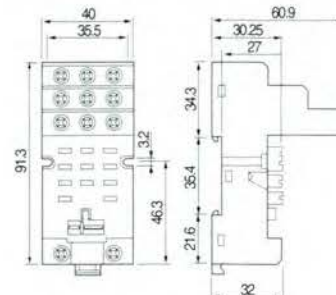
DIN rail mounting base with screw terminals  
For use with -  
62.32 (2 C/O, 8 pin) relay  
62.33 (3 C/O, 11 pin) relay  
Dimensions below  
**Note:** For other bases available, consult NHP  
Part A price list catalogue section 9

### Base configuration



92.03

### Dimensions (mm)



## 99 Series Plug-in Modules

## 99 Series

### LED and diode module system 99 Series

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

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



### 99.020 module LED only

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



### 99.029 module LED & diode

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

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



### 99.010 module LED only

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



### 99.013000 diode only

DC Voltages only



### 99.013 module LED & diode

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

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



## General Technical Information

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

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

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

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

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

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

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

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

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





## Coil Specifications

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

DC VERSION DATA (0.2 W sensitive)

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

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

DC VERSION DATA

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

### 38 Series - Relay Interface Modules 6 A

AC/DC VERSION DATA

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

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

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

AC VERSION DATA

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

DC VERSION DATA (0.65 W standard)

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

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

DC VERSION DATA (0.65 W standard)

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

### 55 Series - Miniature General Purpose Relays 5 - 10 A

AC VERSION DATA

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

DC VERSION DATA

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

### 56 Series - Miniature Power Relays 12

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

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

DC VERSION DATA (2 CO - DPDT)

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



## Coil Specifications

## 56 Series - Miniature Power Relays 12 A

## AC VERSION DATA (4 CO - 4PDT)

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

## DC VERSION DATA (4 CO - 4PDT)

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

## 60 Series- General Purpose Relays 10 A

## AC VERSION DATA

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

## DC VERSION DATA

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

## 62 Series - Power Relays 16 A

## AC VERSION DATA

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

## DC VERSION DATA

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

## 65 Series - Power Relays 20 - 30 A

## AC VERSION DATA

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

## DC VERSION DATA

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

## 20 Series - Modular Step Relays 16 A

## AC VERSION DATA

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

## DC VERSION DATA

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

## 26 Series - Step Relays 10 A

## AC VERSION DATA

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





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