



BRISBANE WATER
Project STTX- generator Connection Boxes

GENERATOR CONNECTION
O & M Manual
SP 049 Kianawah RD



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

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

Author : ***Brisbane Water Projects***

COMMON LOGIC PTY LTD

ACN. 011 029 262

Electrical Contractors

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

Electrical Manual - WB49 Kianawah Road

ISSUE NO 1
AS BUILT
21/06/2004

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JH05

JH05Mj49 Kianawah Road



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

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- Generator Connection Description
- ATS Connection Diagram

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- Parts List

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- Asbuilt Drawings
- Construction Markups

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

Section 5

- Parts information

PASTEL
MANILLA
DIVIDERS
5 TAB A4



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**Brisbane
Water**



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 1

Generator Connection Description

COMMON LOGIC Pty Ltd
Specialist Electrical Contractors
Electrical Manual

Subject: Semi Permanent Generator Change Over Switchgear

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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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Section
3

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3.0 DRAWINGS

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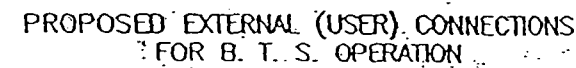
BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 1A

ATS Connection Diagram

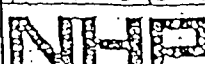
POWER SUPPLY



R. H. CIRCUIT BREAKER
(MARKED BLUE)

- METRIC

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

0	TemBreak CIRCUIT BREAKERS B.T.S. SCHEMATIC XMB (SMALL) MOTOR OPERATORS	SCALE NONE	SIZE A2 389 x 507	PASSED DATE 10.4.91
 INCORPORATED IN VICTORIA		ELECTRIC ENGINEERING PRODUCTS PTY LTD 13-17 RIVER ST, DEAKINS VIC 3083 Ph (03) 4799 1111 Fax (03) 4799 1112 Telex 61111 NHP AU (03) 4799 1111		GROUP
		DRAMK TRACED CHECKED		04
				SHEET 2/2

CNO REF: 040102

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INCORPORATED IN MICHIGAN

ELECTRA-TECHNICAL PRODUCTS PTE LTD
 45-67 PETER ST. SINGAPORE 1100
 TEL (03) 233 2970 Fax No. (03) 233 8075
 Telex No. (03) 431 0628
 OFFICE AT SINGAPORE BRIDGE ROAD
 100-110 ROBINSON ROAD SINGAPORE

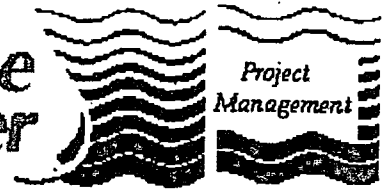
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GENERATOR CONNECTION O & M Manual

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
ABK	MEN368	MENNEKES 368 125A 5P PANEL INLET	Mennekes Web Page
NHP	93.2	JUMPER LINK 20WAY SUITS 38.5	NHP Catalogue F1
NHP	96.72	2P 12AMP RELAY BASE FOR 56.32 RLY	NHP Catalogue F1
NHP	96.74	4P 12AMP RELAY BASE FOR 56.34 RLY	NHP Catalogue F1
NHP	38.51 24VDC	24V DC RELAY 1CO 6A	NHP Catalogue F1
NHP	56.32 0074 24VDC	RELAY FPIN 2CO 12A 24VDC	NHP Catalogue F1
NHP	56.34 24VDC	RELAY FPIN 4CO 12A 24VDC	NHP Catalogue F1
NHP	99.013-024	LED & DIODE MODULE PLUG-IN	NHP Catalogue F1
NHP	CS4-22Z-240VAC	2N/O 2N/C 240VAC RELAY	NHP Catalogue CA4
NHP	2H1407DAA	FRONT TERMINAL COVER FOR XS125 (QTY 2)	NHP Web Page
NHP	2H2135DAA	C/B SHROUDS FOR XS250 (QTY 2)	NHP Web Page
NHP	BS2N233(NON AUTO)	TRANSFER SW BTSS250NJ25033 NON AUTO	NHP Web Page
NHP	CLSBB25033	250A BUSBAR LOAD SIDE 3P X23	
NHP	D5-3NL3A	LED LAMP BLOCK C/W COUPLER AMBER 24V AC/DC	NHP Flyer D5-3NF
NHP	D5-3NL3A	LED LAMP BLOCK C/W COUPLER AMBER 24V AC/DC	NHP Flyer D5-3NF
NHP	D5P-P5	YELLOW PILOT LIGHT STANDARD	NHP Web Page
NHP	DPA-01-D-M48	PHASE FAIL/SEQ	NHP Flyer CGM
NHP	DSRCB1030P	10A 2P DIN SAFE MCB WITH PIGTAIL	NHP Catalogue Page
NHP	DSRCB1030P	10A 2P DIN SAFE MCB WITH PIGTAIL	NHP Catalogue Page
NHP	DSRCBH1030A	DINT MCB/RCD 1P 10A 30MA 10KA	NHP Catalogue Page
NHP	DSRCBH1030A	MCB/RCD 1P 10A 30MA 10KA DIN-T	NHP Catalogue Page
NHP	DSRCBH3230A	MCB/RCD 1P 32A 10KA	NHP Catalogue Page
NHP	DTCB10332C	DINT 10KA 3P 32A CB	NHP Catalogue Page
NHP	DTCB6106C	DINT 6KA 1P 6A CB	NHP Catalogue Page
NHP	DTCB6306C	DINT 6KA 3P 6A CB	NHP Catalogue Page
Pheonix	441504	EARTH TERMINALS	Pheonix Web Page
Pheonix	800886	E/NS35N END CLAMP DIN RAIL	Pheonix Web Page
Pheonix	3004362	UK5N 4MM FEEDTHRU TERMINAL GREY	Pheonix Web Page
Weidmuller	102840	WFF70	Weidmuller Catalogue Page
Weidmuller	106456	WAH70 covers	Weidmuller Catalogue Page





**Brisbane
Water**



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GENERATOR CONNECTION O & M Manual

Section 3

Asbuilt Drawings

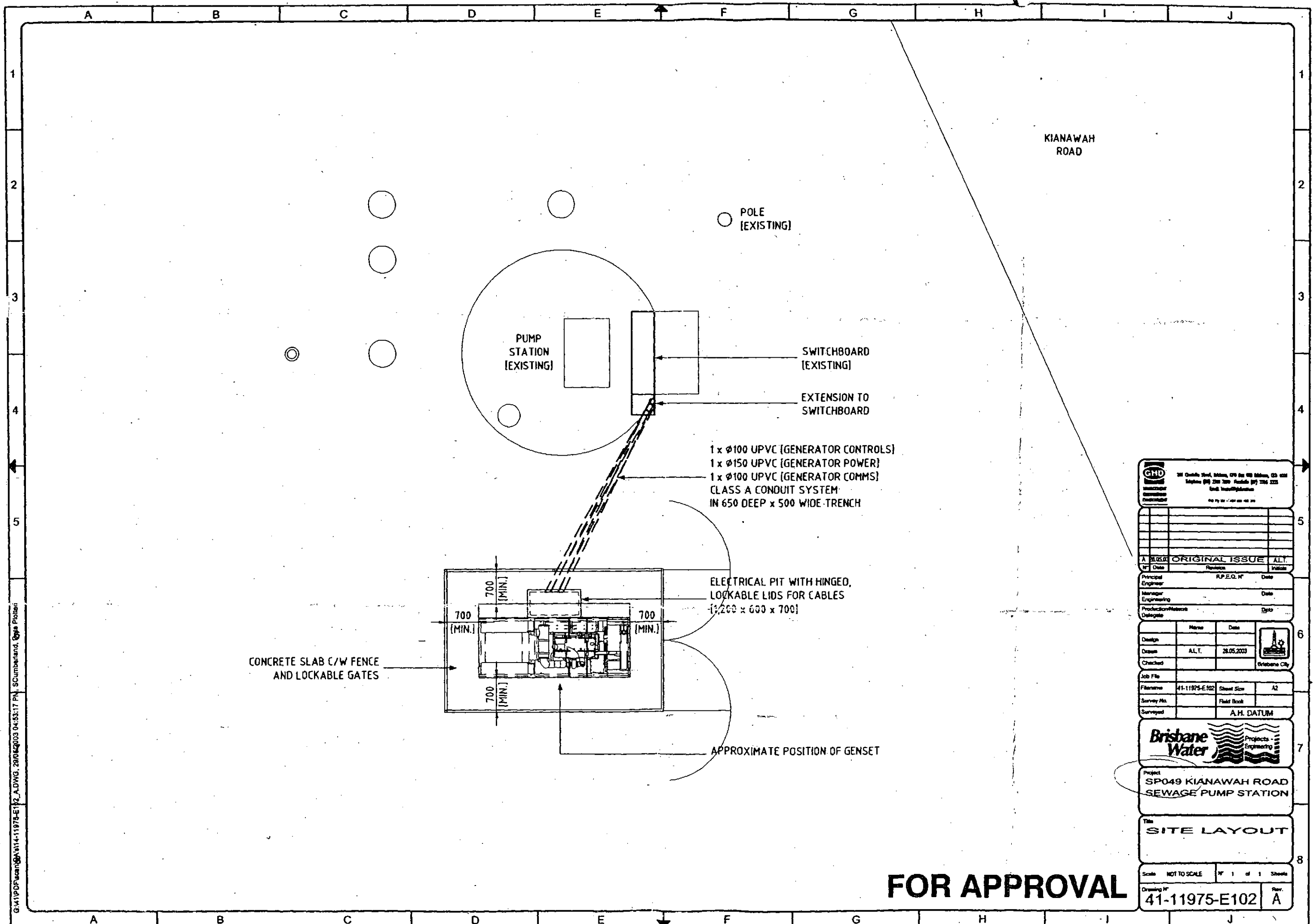


BRISBANE WATER

GENERATOR CONNECTION O & M Manual

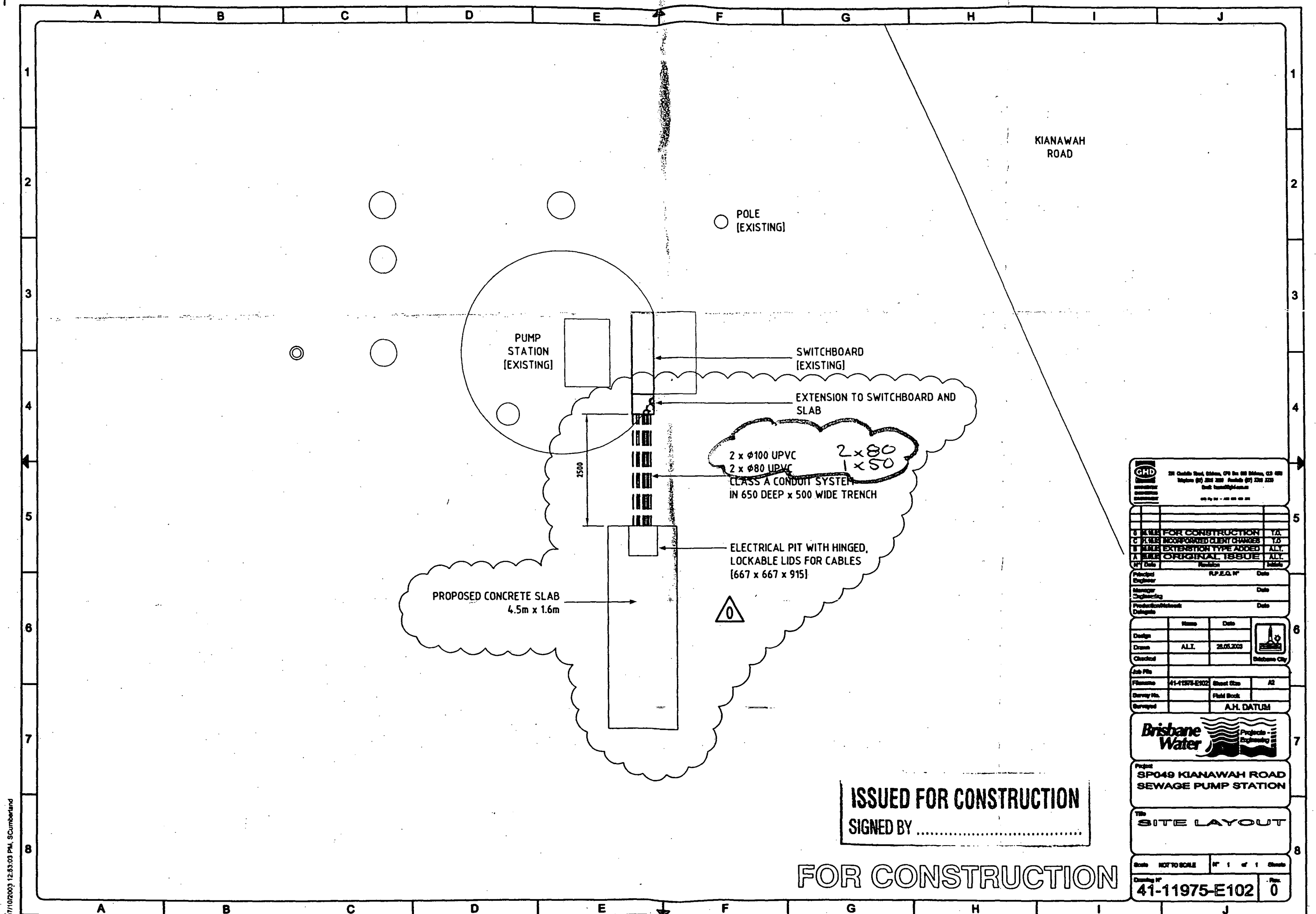
Section 3A

Construction Markups



GHD 3rd Quality Street, Sydney, NSW 1580, Australia Sydney (61) 2 955 9500, Perth (61) 8 944 4444 Email: info@ghd.com.au	
A 11975-E102 ORIGINAL ISSUE No Date Revision Initials	
Principal Engineer	R.P.E.Q. No. Date
Manager Engineering	Date
Production/Marketing Delegate	Date
Design	Name Date
Drawn	ALL 28.05.2003
Checked	Brisbane City
Job File	
Filename	41-11975-E102 Sheet Size A2
Survey No.	Field Book
Surveyed	A.H. DATUM
Brisbane Water Projects Engineering	
Project SP049 KIANAWAH ROAD SEWAGE PUMP STATION	
Title SITE LAYOUT	
Scale	NOT TO SCALE
Sheet	1 of 1
Drawing No.	41-11975-E102
Rev.	A

FOR APPROVAL



ISSUED FOR CONSTRUCTION
SIGNED BY

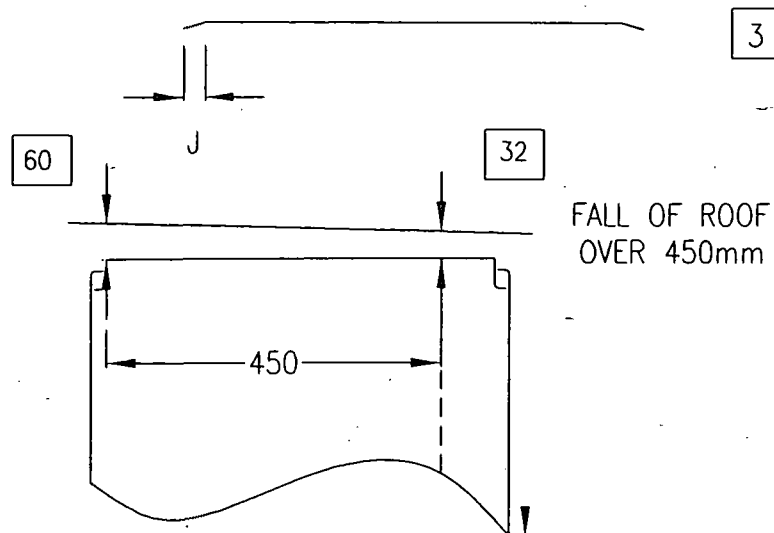
FOR CONSTRUCTION

GHD		201 Oaklands Road, Brisbane, QLD 4008 Telephone (07) 222 2222 Facsimile (07) 222 2222 Email: ghd@ghd.com.au	
Principal Engineer		R.P.E.O.N.	
Manager Engineering		Date	
Project/Work/Task Delegate		Date	
Design	Name	Date	
Drawn	ALI	20.05.2003	
Checked			
Job File			
Plan/Spec	41-11975-E102	Sheet No.	A2
Survey File		Field Book	
Surveyed		A.H. DATUM	
Brisbane Water			
Project SP049 KIANAWAH ROAD SEWAGE PUMP STATION			
Title SITE LAYOUT			
Scale		NOT TO SCALE	
Drawing No.		41-11975-E102	
Rev.		0	

07/10/2003 12:53:03 PM, SCumberland

IF IN DOUBT, ASK.

ROOF SIDE VIEW



3 ROOF TYPE

EXISTING BOARD DEPTH

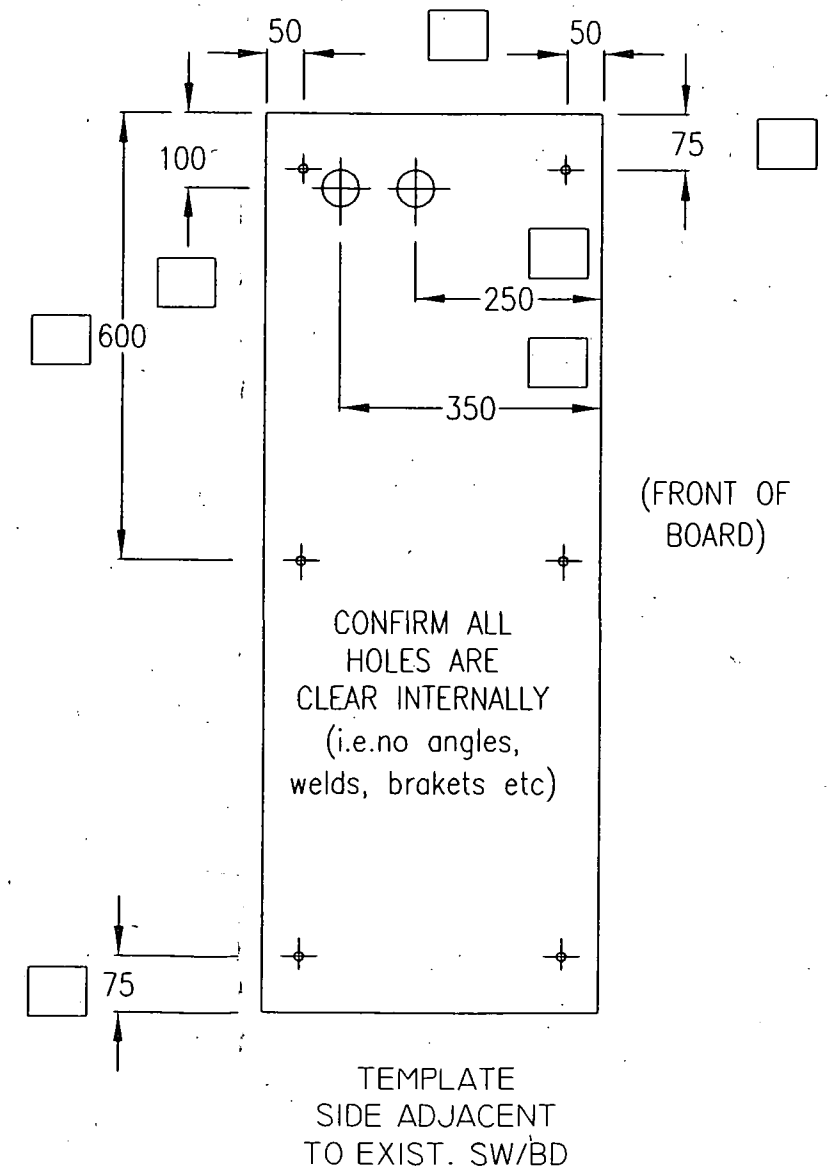
MINIMUM SPACE FOR ANTENNA

35

FRONT O/HANG

20 SIDE O/HANG

TOP VIEW



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

CENTENARY HWY
MACQUARIE ST
PROGRESS RD
KIANAWAH RD

PAINT COLOUR #4 POLISH
MATERIAL STAINLESS STEEL

(TOTAL OF ALL EXTENSIONS)

220 + NIL

Note #1

(BASE) 160

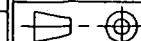
Note #2.

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

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

DATE 25/08/03
DRAWN YGF
SCALE NTS
APPROVED

BRISBANE WATER
SP LHS MTC AL SITES

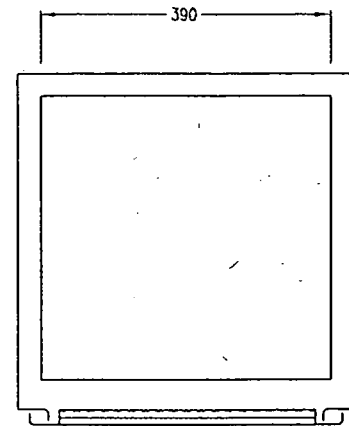


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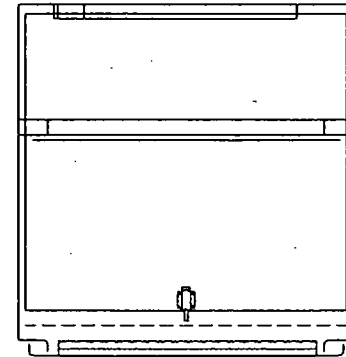
A3 sheet 1/1

ISSUE B

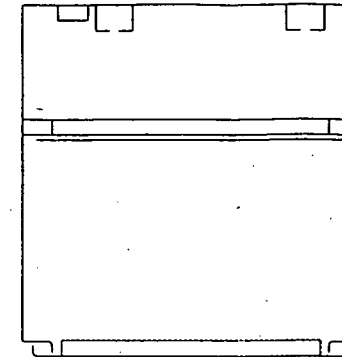
IF IN DOUBT, ASK.



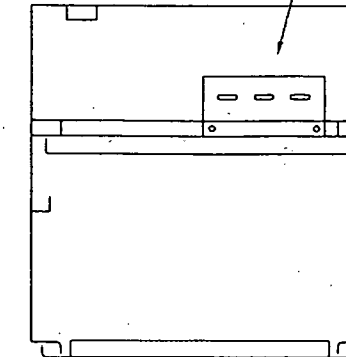
BOTTOM VIEW



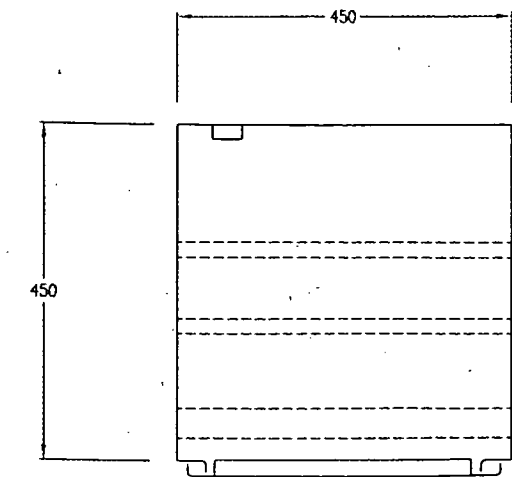
SECTION D-D



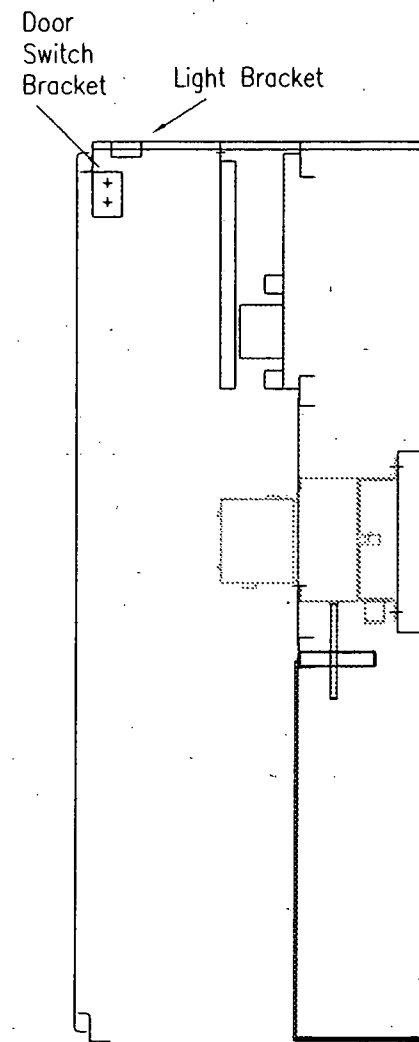
SECTION C-C



SECTION B-B



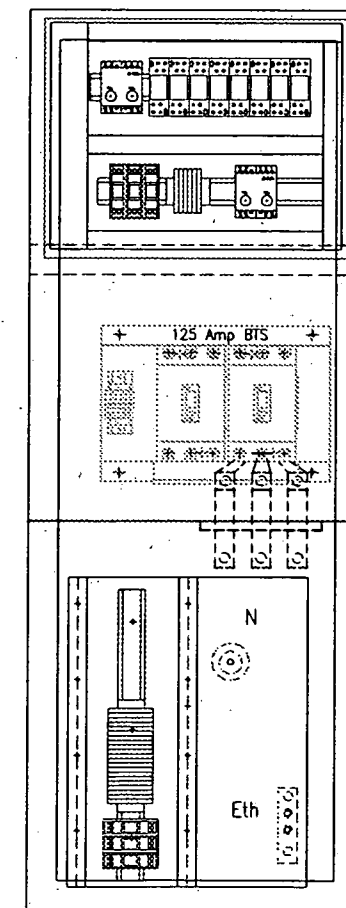
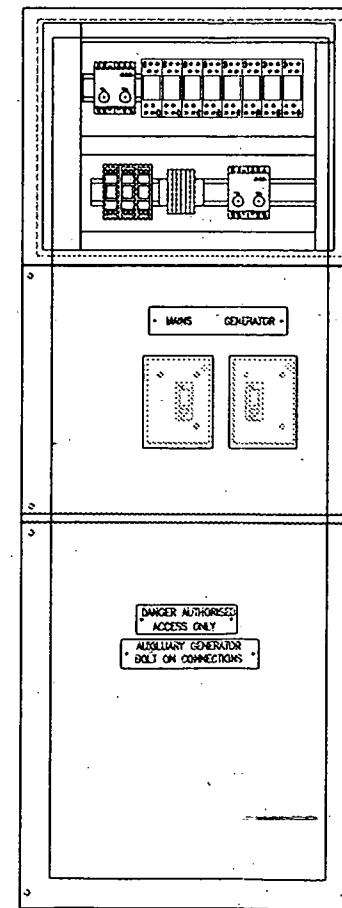
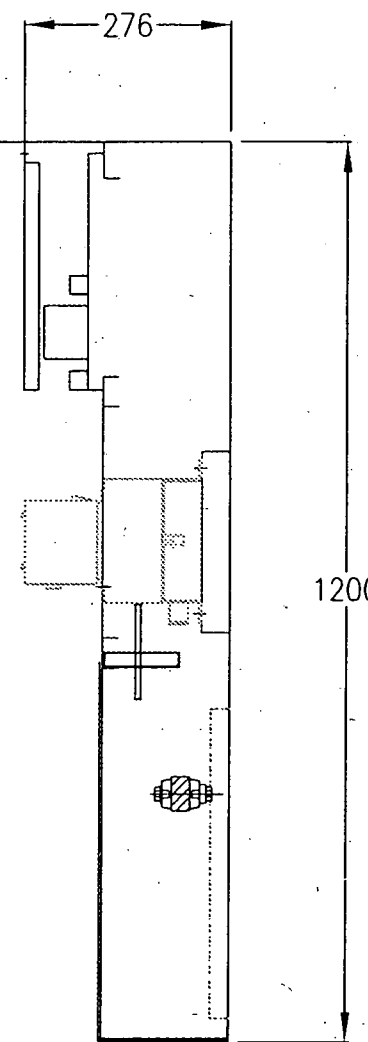
TOP VIEW



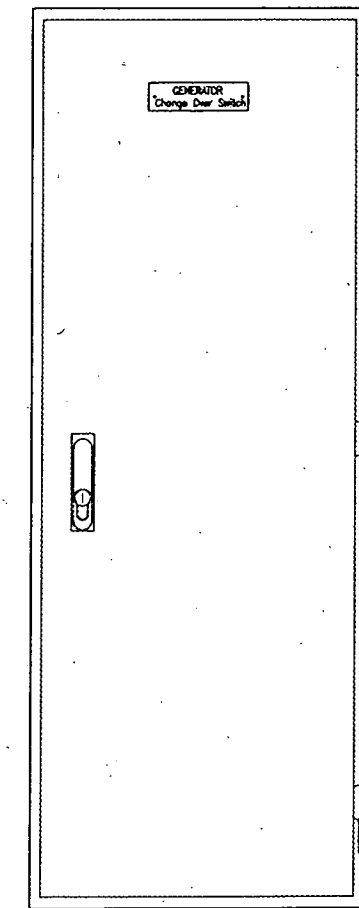
SECTION A-A

Screw on Perspex Shroud support angle

DOOR HEAT INSULATION
Note: Required only on external sites. Fix to door with studs.



FRONT VIEW
(DOOR REMOVED)



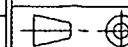
FRONT VIEW

Door to hinge left or right depending on order.

			FWN	
			LWN	
			SWN	
			FTN	
			LTN	
			STN	
1/12/03	E	AS BUILT		
2/10/03	A	ISSUED FOR APPROVAL		

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DRAWN	GCK
SCALE	NTS
APPROVED	



JH05DD01

A3 sheet 1/1

ISSUE B



**Brisbane
Water**



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 4

Site Testing

COMMON LOGIC Pty Ltd
Specialist Electrical Contractors

Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels

Sheet: 1
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Section

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Test Carried out by.....

Signed...

Date...

Test witnessed by.....

Signed...

Date...

Authorised By:



COMMON LOGIC Pty Ltd
Specialist Electrical Contractors

Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels

Sheet: 2
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Section

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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	5405	Job Description	Kianawah 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:

COMMON LOGIC Pty Ltd
Specialist Electrical Contractors

Site Acceptance Tests

Subject: SAT for BW Generator Change Over Panels

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Section

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2.0 ELECTRICAL EARTHING SYSTEM

2.1 Electrical continuity and resistance of earthing system

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

⊗ Test resistance of the Earthing system < 0.5 ohms

2.2 Continuity Test Sheet

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

3.0 INSULATION RESISTANCE/ HIGH POT TEST

3.1 Insulation Resistance Test

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

☒ Insulation test conducted on all internal circuits

→ All Selector Switches, Isolators and CB's are in the off position

→ All electronic equipment susceptible to high voltage damage to be isolated.

3.2 Low Voltage Switchboards Insulation Test

MEGGAR VOLTAGE 1000V VOLTS

INSTRUMENT DETAILS 7025080

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

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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	✓	—	✓
3	Cables tight and correct phase rotation. Colour match.	✓	✓	✓
4	Main Switch Correct Rating/Label	✓	✓	✓
5	Neutral cable connected and continuous and tight.	✓	✓	Aug

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

4.3 Terminal Visual Checklist

→ Carry out visual and mechanical checks on Site terminals

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Signed...

Date...

Test witnessed by.....

Signed...

Date...

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Site Acceptance Tests

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

4.4 Relay Visual Checklist

→ Carry out visual and mechanical checks on Relays

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

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Date...

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Signed...

Date...

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Site Acceptance Tests

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5.0 CONTINUITY & PRE-COMMISSIONING TEST

5.1 Continuity Test

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

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

ITEM NO	Test description			
		Action	Observation	Result of test
1	Transfer to Mains	Press Button 1	Observe Relay GTSM	✓
2	Transfer to Gen	Press Button 2	Observe Relay GTSG	✓
3	Generator Failed	Press Button 3	Observe Relay GF	✓
4	Generator Fault	Press Button 4	Observe Relay GFR	✓
5	Gen Running	Press Button 5	Observe Relay GRUN	✓
			Check Door Indicator is on when relay is ON	
6	Generator Connected	Press Button 6	Observe Relay GCONN	✓
7	Doors Opened	Press Button 7	Observe Relay GOPEN	✓
8	CB Tripped	Press Button 8	Observe Relay GCBT	✓
9	Not in Auto	Press Button 9	Observe Relay GNAUTO	✓
10	Generator Not On Site	Press Button 10	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	✓
5	Remote Stop	Press PB 16	Indicator is on When PB is ON	✓
6	Generator is missing	Press PB 10	Indicator is on when PB is ON	✓

Fuel low

Press button 5

✓

Test Carried out by... Rob McNamee

Signed... Date... 11-5-04

Test witnessed by... Ron McNamee

Signed... Date... 11-5-04

Authorised By:

Subject: SAT for BW Generator Change Over Panels

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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

**Brisbane
Water**

PROJECTS – ENGINEERING

Sewerage System Performance Improvements Backup Diesel Generators for Pump Stations

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

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

Document ID : Genset Functional Tests

Date of Issue : June 2003

Revision : Rev 1

Actions are shown in RED

1 MANUAL MODE FUNCTIONAL TESTS

1.1 Manual Mode Start

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

Press the MANUAL START push button to start the generator.

The generator set is allowed 3 attempts to start.

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

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

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

RESULTS: PASS/FAIL _____ NOTES _____

1.2 Stopping the generator in the Manual Mode.

Press the MANUAL STOP push button.

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

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

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

RESULTS: PASS/FAIL _____ NOTES _____

2 TEST MODE FUNCTIONAL TESTS

2.1 Test Mode Start – and test of Manual Mode interruption

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

The generator shall begin to crank.

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

Press the MANUAL STOP push button.

RESULTS: PASS/FAIL _____ NOTES _____

2.2 Continue Test

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

The generator shall begin to crank.

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

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

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

RESULTS: PASS/FAIL _____ NOTES _____

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

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

The GEN ATS shall Open and the MAINS ATS shall Close

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

During this time turn off the Mains to the site

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

RESULTS: PASS/FAIL _____ NOTES _____

2.4 Stopping generator in the Test Mode.

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

The GEN ATS shall Open and the MAINS ATS shall Close

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

RESULTS: PASS/FAIL _____ NOTES _____

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

Make GENSET unavailable

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

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

RESULTS: PASS/FAIL _____ NOTES _____

3 AUTOMATIC MODE FUNCTIONAL TESTS

3.1 Automatic Start

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

Turn off the Mains to the switchboard.

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

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

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

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

RESULTS: PASS/FAIL _____ NOTES _____

C

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

Turn on the Mains to the switchboard

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

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

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

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

During this time turn off the Mains to the site

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

RESULTS: PASS/FAIL _____ NOTES _____

3.3 Stopping the generator in the Auto Mode - continued.

Turn on the Mains to the switchboard

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

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

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

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

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

RESULTS: PASS/FAIL _____ NOTES _____

3.4 Automatic ATS Transfer To Genset- Mains ATS Failure

Disable MAINS ATS CB

Restart the generator in Auto by turning off the Mains

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

The system shall then return back to MAINS ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL _____ NOTES _____

3.5 Automatic ATS Transfer - Gen ATS Failure

Re-enable the MAINS ATS CB

Disable GEN ATS CB

Restart the generator in Auto by turning off the Mains

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

The system shall return back to MAINS ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL _____ NOTES _____

3.6 Automatic ATS Transfer To Mains - Gen ATS Failure

Disable GEN ATS CB

Restart the generator in Auto by turning off the Mains

The GEN ATS will fail to Open.

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

The system shall return back to GEN ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL _____ NOTES _____

3.7 Automatic ATS Transfer To Mains - Mains ATS Failure

Re-enable the GEN ATS CB

Disable MAINS ATS CB

Restart the generator in Auto by turning off the Mains

The MAINS ATS will fail to Close.

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

The system shall return back to GEN ATS operation.

RESULTS: PASS/FAIL _____ NOTES _____

3.8 Running in Auto and umbilical loses connection.

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

Turn off the Mains to the switchboard.

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

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

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

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

Remove umbilical plug

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

RESULTS: PASS/FAIL _____ NOTES _____

3.9 Running in Auto and genset trips or faults.

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

Turn off the Mains to the switchboard.

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

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

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

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

Cause Genset trip or fault

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

RESULTS: PASS/FAIL _____ NOTES _____

4 REMOTE START/STOP TESTS

4.1 Remote start command.

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

Initiate a Remote Start Command from the BW Control Room

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

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

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

RESULTS: PASS/FAIL _____ NOTES _____

4.2 Remote stop command.

Initiate a Remote Start Command from the BW Control Room

The GEN ATS shall Open and the MAINS ATS shall Close

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

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

RESULTS: PASS/FAIL _____ NOTES _____

4.3 Remote Start with genset unavailable.

Make GENSET unavailable

Initiate a Remote Start Command from the BW Control Room

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

RESULTS: PASS/FAIL _____ NOTES _____

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

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

Turn off the Mains to the switchboard.

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

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

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

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

Initiate a Remote Start Command from the BW Control Room

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

RESULTS: PASS/FAIL _____ NOTES _____

5 SPECIFIC PROBLEM CHECKS (Variations to Functional Spec)

5.1 RTU IO and IDTS Alarms

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

5.2 From discussions on Indooroopilly Rd:

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

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

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

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

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

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

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

5.3 From M&E:

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

The generator started and the ATS Switched to generator supply.

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

5.4 From Contract:

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

6 FAULTS - TO BE TESTED WHERE REQUIRED

6.1 HIGH HIGH Alarm Operation.

The Generator CB is Opened immediately.

The generator is shut down immediately.

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

Emergency Stop Fault

MEN Fault

Low Oil Pressure Shutdown Fault, 10 Seconds Startup Delay

High Engine Temperature Shutdown Fault, 30 second Startup Delay

Low Radiator Level Fault, 5 Second Delay

Over Speed Fault

6.2 HIGH Alarm Operation

The Generator CB is Opened immediately.

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

The following alarms will initiate a HIGH Alarm condition:-

Generator Under Speed Fault, 5 Second Delay

Alternator Under Voltage Fault, 5 Second Delay

Alternator Over Voltage Fault, 5 Second Delay

Generator CB Tripped Fault

Alternator High Temperature Fault, 30 Second Startup Delay

6.3 MEDIUM Alarm Operation.

A Normal Shutdown shall be Initiated.

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

The following alarms will initiate a MEDIUM Alarm condition :-

Fuel Empty Level Fault, 5 Second Delay

Fail To Start Fault, 3 Attempts

6.4 LOW Alarm Operation.

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

The following alarms will initiate a LOW Alarm condition :-

Low Oil Pressure Warning Alarm, 10 Seconds Startup Delay

High Engine Temperature Warning Alarm, 30 Second Startup Delay

Fuel Low Level Alarm, 5 Second Delay

Battery Charger AC Supply Failed Alarm, 60 Second Delay

Control Battery Low Volts Alarm, 30 Second Delay

Start Battery Low Volts Alarm, 60 Second Delay

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

3.1. To operate G1 in a Non-Permanent Site Location in MANUAL Mode.

3.2. Connect the generator cables to the site generator CB ensuring the site generator CB is OFF. See BCC procedures.

3.3. A plug with shorting links is required to be installed. It is required to be plugged into the 27 Pin Station Plug.

3.3.1. Pins 11 and 12 are required to be connected. This is to indicate that the Mains ATS is Closed. If they are not connected a MAINS ATS Alarm shall be indicated.

3.4. Select from the AUTO – TEST – MAN- OFF selector switch to the MANUAL position.

3.5. Press the MANUAL START push button to start the generator.

3.6. The generator will begin to crank.

3.6.1. If it fails to start within the 10 seconds, the starter motor is stopped and a delay of 10 seconds before it will attempt to restart.

3.6.2. The generator set is allowed 3 attempts to start.

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

3.6.4. When the generator starts, the starter motor is stopped by a stop cranking input which measures the speed of the generator.

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

3.6.6. If the oil pressure is not up to pressure after the 10 second time delay, the generator shall shut down on LOW OIL PRESS Alarm.

3.6.7. Once the generator is running there is a 5 second warm up time before it is ready to accept load.

3.7. To connect the generator to the site load.

3.7.1. Manually switch over to the generator supply via the site CB's. See BCC procedures.

3.7.2. Do not use the MANUAL TRANSFER TO GEN or the MAN TRANSFER TO MAINS push buttons.

3.8. To disconnect the generator from the site load.

3.8.1. Manually switch over to the mains supply via the site CB's. See BCC procedures.

3.8.2. Do not use the MANUAL TRANSFER TO GEN or the MAN TRANSFER TO MAINS push buttons.

3.9. To stop the generator in the MANUAL Mode.

3.9.1. When the generator is running, it may be stopped by pressing the MANUAL STOP push button.

3.9.2. The generator will enter the cool down time of 1 second.

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

3.9.4. Once the generator has shut down there is a 15 second delay before it may be restarted. This is to ensure the engine has mechanically stopped.



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 4B

**Site Testing
NCS Alarms**



BRISBANE WATER

Network Control Systems

IDTS POINT COMMISSIONING SHEET AND GENERATOR SUPPLY OPERATIONAL CHECKS

Pump Station Generator Connection Project (STTX- I910)

DATE: 10/6/04

Site Name: SP 049 Kianawah RD

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

2. The system is designed to provide a reliable and efficient means of generating electricity for the purpose of powering the various loads connected to the system.

3. The system is designed to be capable of operating in a stand-alone mode or in conjunction with a grid supply, depending on the requirements of the user.

4. The system is designed to be capable of operating in a safe and secure manner, with all necessary safety measures in place to protect the user and the equipment.

Brisbane Water – Network Control Systems Section

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

IDTS Point : Generator Offsite

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

IDTS Point : Security Door_limit_switch

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

IDTS Point : Generator Low_fuel

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

IDTS Point : Generator Warning

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

IDTS Point : Generator Common_fault

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

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IDTS Point : Generator Automatic

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

IDTS Point : Generator CB_tripped

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

IDTS Point : Generator Running

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

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

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

IDTS Point : Power_supply Energex_power

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

Brisbane Water – Network Control Systems Section

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

NOTE: The purpose of these operational checks is;

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

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



**Brisbane
Water**



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 4C

Site Testing Generator

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

SEP 009/B

DATE: 21/7/03

JOB NO: 14291

ENG. SERIAL NO: 726352

ALT. SERIAL NO: 20023531 / 1

TESTING OFFICER: PAUL HLAVKA
JOHN ROTH



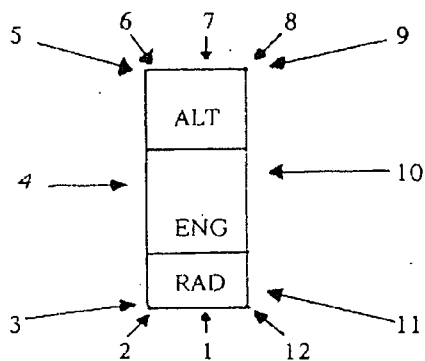
GENERATOR SET SOUND PRESSURE LEVEL TEST REPORT

SEP 0023/D

47 Proprietary Street
Tingalpa Q 4173
BRISBANE AUSTRALIA

CLIENT: B.W. SP049 DATE: _____
 SERIAL NO: 0307009 JOB NO: 14291
 ENGINE TYPE: 4045H ENG. SERIAL NO: 726352
 ALTERNATOR TYPE: 274E ALT. SERIAL NO: 20023531/1
 SOUND LEVEL INSTRUMENT: _____

Remarks:

Distance: 7 mHeight: 1.5 m

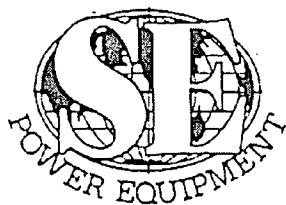
Position Layout

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

QUALITY ASSURANCE OFFICER: _____

CUSTOMER TESTING OFFICER: _____

TESTING OFFICER: D. CooperWITNESS TESTING OFFICER: PAUL HLAVKA



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

SEP0084

TRANSIENT LOAD RESPONSE TEST SHEET

Transient response for load changes: Load PF 0.8

% Change Electrical kW	0-25	0-50	0-75	0-100	100-0	75-0	50-0	25-0
Change in Electrical kW	17	42	57			57	42	22
% Change HZ	5	2.5	2.5			1.5	1.5	1.5
% Change Volts	0	0	1			0	0	0
Recovery secs	1	2.5	2.5			2	1.5	1.5

CLIENT: BRIS. WATER SP049

S/N: 0307009

ENGINE: 4045H

ACT: 274E

GOVERNOR: G.A.C.



47 Proprietary Street
Tingalpa Q 4173
BRISBANE AUSTRALIA

DIESEL GENERATOR SET LOAD TEST REPORT

SEP 0064/D

CLIENT: BRISBANE WATER SP049 DATE: 21/7/03
 SERIAL NO: 0307009 JOB NO/CONTRACT NO: 14291
 ENGINE TYPE: 4045H ENG. SERIAL NO: 726352
 ALTERNATOR TYPE: 274E ALT. SERIAL NO: 20023531 / 1
 GOVERNOR TYPE: G.A.C. STARTER MOTOR: STD
 OVERSPEED TYPE: PLC UNDERSPEED TYPE: PLC
 SHUTDOWN SOLENOID: G.A.C. HIGH WATER: HOBBS
 LOW OIL PRESSURE SHUTDOWN: HOBBS

A: 110 (+10%) KW: 79 (+10%)

TECHNICIAN: _____ INSPECTOR: PAUL HLAVKA

TIME	1540	1545	1605	1635	1705	1735	1750	1755		
OIL PRESSURE	500	450	300	300	290	290	290	290		
OIL TEMPERATURE	-	-	-	-	-	-	-	-		
JACKET WATER TEMPERATURE	0	65	85	85	85	85	85	85		
17MP'S	0	85.7	124.5	124.3	124.1	124	124.3	0		
VOLTS 416.6	240 240 240	✓	✓	✓	✓	✓	✓	✓		
AMBIENT TEMPERATURE	22	22	20	20	20	20	20	20		
HZ	50.1	50.1	50.1	50.1	50	50	50.2	50.2		
KW	0	61	89.9	89.9	89.4	89.4	46	0		
LOAD%	0	75%	110%	110%	110%	110%	50%	0		
REMARKS										

Generator_Load_Test_Report.doc

47 Proprietary Street
Tingalpa Q 4173
BRISBANE AUSTRALIA



SEP 0013

FINAL INSPECTION CHECKLIST

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

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

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

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

MODEL: SP049 SERIAL NO: 0307009 ENGINE NO: 726352
JOB NO: 14291 DATE: 21/7/03 CUSTOMER: B.W

BASE

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

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

RADIATOR

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

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

ENGINE

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

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

CONTROL SYSTEM (where applicable)

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

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

FINAL INSPECTION CHECKLIST

PAGE 2

CONTROL SYSTEM (cont)

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

ALTERNATOR

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

FINISH

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

GENERAL INSPECTION

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

SIGNED: D. COOPER / PAUL HLAVKA INSPECTOR_____
QUALITY ASSURANCE

COMMENTS: _____



**Brisbane
Water**



BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 4D

Electrical Testing Certificate

COMMON LOGIC Pty Ltd

A.C.N. 011 029 262

Job Card Number: **0201****Variation To Fixed Price Proj****Cost Plus Labour Proj.**☐ **Out****Service****CUSTOMER:**Project No: **SP49**Representative Name: **Peter Renner**Position: **CM**Date: **13/2/04**Signature on Completion: **P. Renner**

Power Authority Forms

Pre-Start Safety Mtg.

Risk Assessment

C/E Representative

CLINT WALKER

Position:

LICENCED ELECTRICIANDate: **13/2/04**

Mobile Phone No:

0407 58710

START	FINISH	DETAILS	Hrs.	No MEN	TOTAL	RATE	CHARGED
		TRAVEL TO SITE					
		CHANGE OVER OF					
		MAINS CABLE FOR					
		EMERGENCY					
		GENERATOR					
		"					
		KIAWAHWA					

PLEASE SEE ATTACHED FORM FOR ADDITIONAL ☐

TOTAL LABOUR CHARGED:

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

PLEASE SEE ATTACHED FORM FOR ADDITIONAL ☐

TOTAL MATERIALS:

PROGRESS CLAIM
WORKS NOT COMPLETED
AND NOT TESTED



FURTHER WORK
REQUIRED TO
COMPLETE PROJECT.



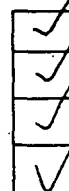
PROJECT COMPLETED
NO FURTHER ACTION
REQUIRED



WHITE COPY - CUSTOMER

YELLOW COPY - OFFICE

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: **4119**

POLARITY TEST.



INSULATION RES. TEST.



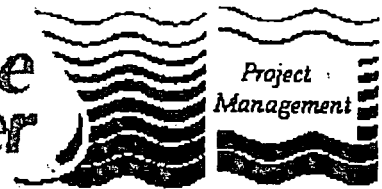
ETH CONTINUITY TEST



FUNCTIONAL TEST



**Brisbane
Water**



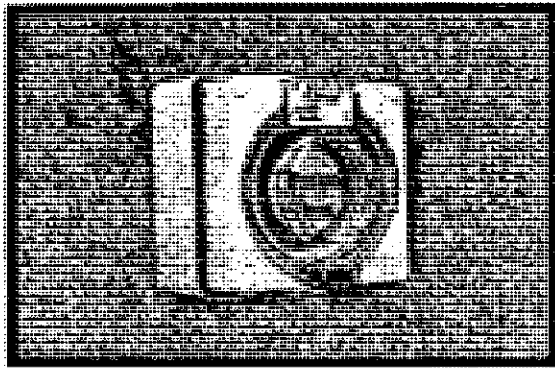
BRISBANE WATER

GENERATOR CONNECTION O & M Manual

Section 5

Parts Information

Catalogue No. 56AI310



Colour Options

- | | |
|----|------------------|
| GY | Grey |
| RO | Resistant Orange |

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

Description:

Appliance Inlets, 250V 10A - 3 Flat pins

Item Type

02 Industrial Products

Business Area

40 Industrial Switchgear

Product Group

400 56 Series Industrial Switchgear

Item Group

40001 Appliance Inlets

Brochures Available:

56AI Series installation instructions

56 Series flyer

56 and 66 Series technical data

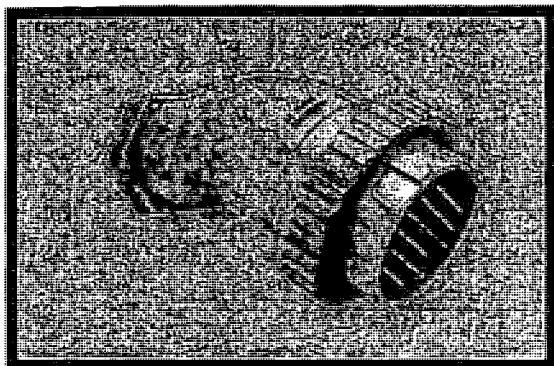
56 Series Features

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial

Catalogue No. WIPM27



Colour Options

☐ No colour options

☐ TR Transparent

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

Description:

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

Item Type

02 Industrial Products

Business Area

40 Industrial Switchgear

Product Group

403 Wilco Hi-Impact Industrial Switchgear

Item Group

40303 Plugs & Extension Sockets

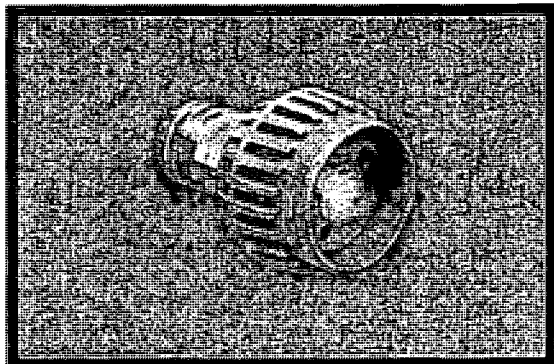
Brochures Available:

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial

Catalogue No. 56CSC310



Colour Options

- | | |
|----|------------------|
| EO | Electric Orange |
| RO | Resistant Orange |

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

Description:

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

Item Type

02 Industrial Products

Business Area

40 Industrial Switchgear

Product Group

400 56 Series Industrial Switchgear

Item Group

40004 Plugs & Extension Sockets

Brochures Available:

56CSC and 56PO series wiring instructions

56CSC310, 56CSC315 wiring instructions

56 Series flyer

56 and 66 Series technical data

56 Series Features

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial

A Specifiers guide to Clipsal Industrial

Products




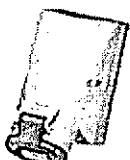
Product
Locator

Technical
Information

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

Internationally Rated Devices

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

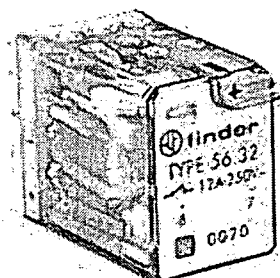
	<p>PLUGS</p> <p>Plugs feature screwless two-piece construction for snap tog pull apart assembly. A pivoting cable strain relief provides e terminal access. Units have a self-sealing cable grommet w requires no cutting to accommodate various HAR cable size Backed-out terminal screws reduce installation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

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

©2000 Mennekes Electronics, Inc.

NHP Item Info

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



Catalogue Number:

56.32.0070 24VDC

Description:

PLEASE ORDER 5632007424VDC

List Price \$ (Not including GST):



Unit of Measure:

EA

Price Schedule:

B2

Relays-plug-in type

Flat pin

Contact arrangement

2 C/O

Voltage

24V DC

Number of pins

8

Features

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

Benefits

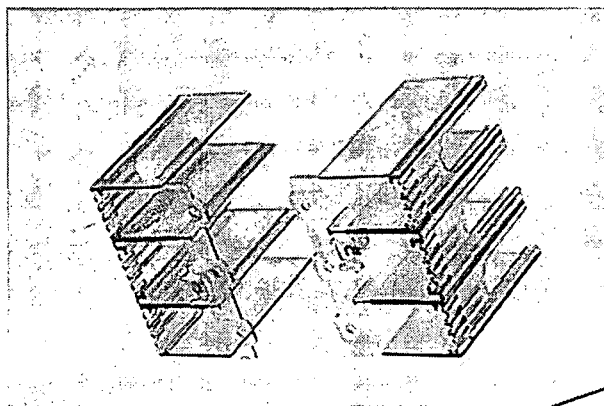
- Capable of switching a number of substantial loads.
- Visual indication for coil operation and latching enables simultaneous testing.
- Can fit directly onto printed circuit boards for power switching.
- Reduced panel space required to keep switchboard costs to a minimum.
- This relay can be offered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

Ordering Information

- DC supply version also available without LED - 563224VDC

NHP Item Info

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



Catalogue Number:

2H1407DAA

Description:

COVER TERMINAL 3P FC X1

List Price \$ (Not including GST):



Unit of Measure:

EA

Price Schedule:

T2

Circuit breakers-Moulded Case (MCCB)

Accessories-Terminal covers

Type

3 Pole FC terminal cover

Frame size

125A

Features

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

Benefits

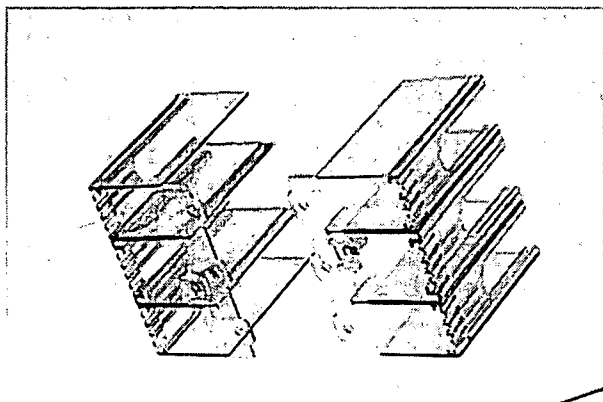
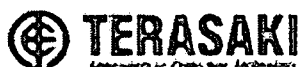
- The terminal cover is designed to protect breaker terminals and other live parts from exposure.
- Terminal covers are available for front or rear connection, and plug-in types.

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

NHP Item Info

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



Catalogue Number:

2H2135DAA

Description:

COVER TERMINAL 3P FC XS2

List Price \$ (Not including GST):



Unit of Measure:

EA

Price Schedule:

T2

Circuit breakers-Moulded Case (MCCB)

Accessories-Terminal covers

Type

3 Pole RC terminal cover

Frame size

250A

Features

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

Benefits

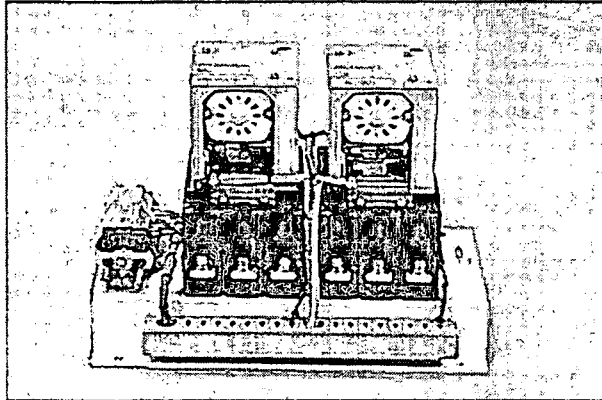
- The terminal cover is designed to protect breaker terminals and other live parts from exposure.

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

NHP Item Info

NHP E-Cat online website
Friday, June 18, 2004 12:37:55 PM
User: Not logged in



Catalogue Number:

BS2N233

Description:

TRANSFER SW BTSS250NJ25033

List Price \$ (Not including GST):



Unit of Measure:

EA

Price Schedule:

Transfer switches

Basic (BTS)

Amp rating

250A 3P / 250A 3P

kA rating

35

Features

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

Benefits

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

Ordering Information

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

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

**sprecher+
schuh**

*The ultimate
in pushbuttons*

NHP

*Full voltage,
superior brightness
and long life*

D5-3N

Integrated LED Lamp Blocks

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

NHP

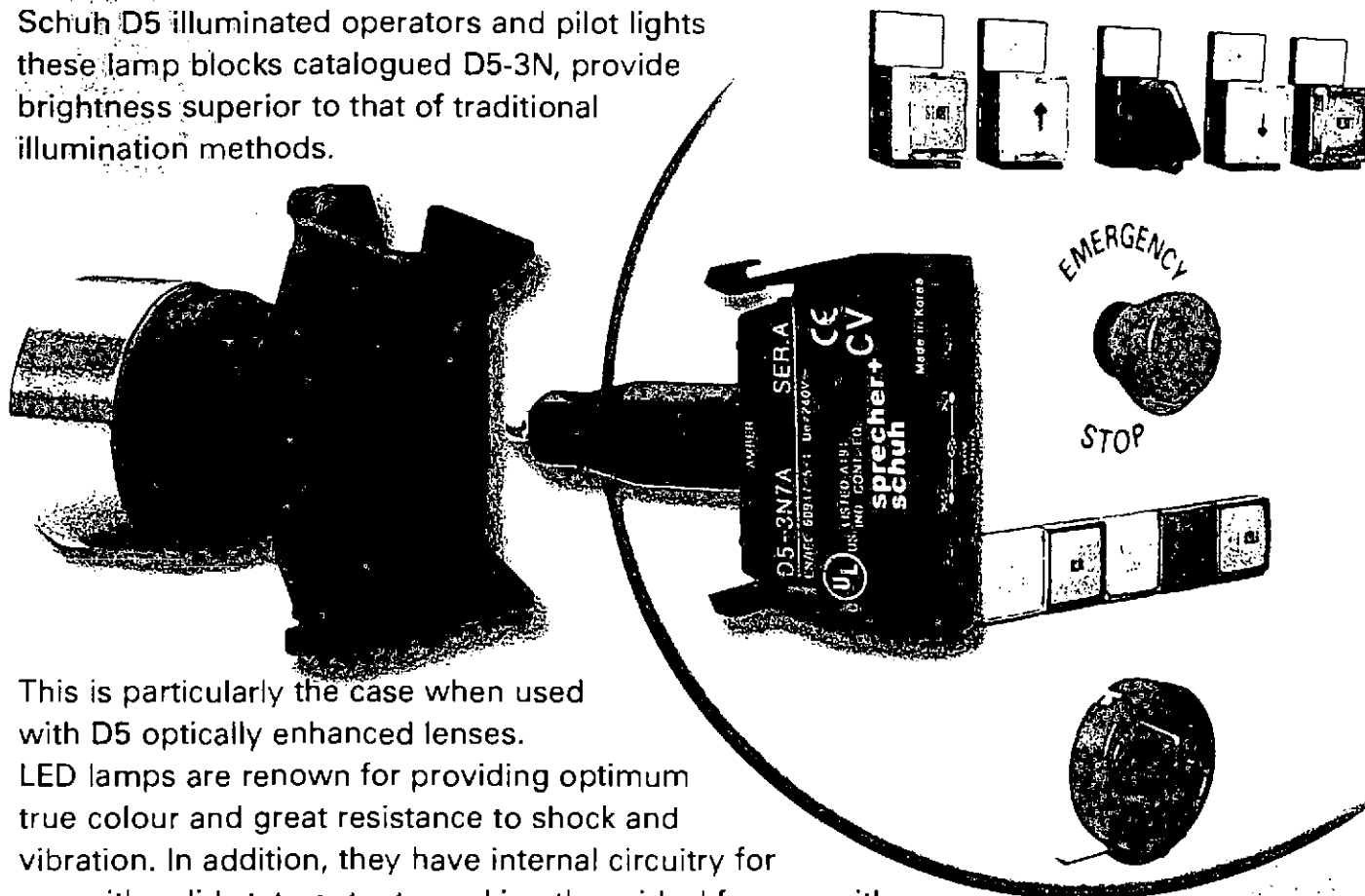
ELECTRICAL ENGINEERING PRODUCTS PTY LTD

sprecher+schuh
The ultimate
in pushbuttons

NHP

NHP

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



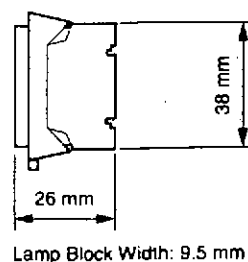
This is particularly the case when used with D5 optically enhanced lenses. LED lamps are renowned for providing optimum true colour and great resistance to shock and vibration. In addition, they have internal circuitry for use with solid state outputs, making them ideal for use with PLC inputs. The new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

Ordering Information

Available colours:

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

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



Voltage	Nominal Current Consumption 'I'	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: 'I' Approximate permissible leakage current 3 mA

NHP

ELECTRICAL ENGINEERING PRODUCTS PTY LTD

www.nhp.com.au

A.B.N. 84 004 304 812

Melbourne Sydney Newcastle Brisbane Townsville Rockhampton Toowoomba Cairns Adelaide Perth Darwin Hobart

PH: +61 8 9429 2599 +61 2 9748 9444 +61 2 4960 2220 +61 7 3891 6008 +61 7 4779 0700 +61 7 4327 2277 +61 7 4534 4709 +61 7 4035 6888 +61 8 8297 0055 +61 8 9277 1777 +61 8 8947 2666 +61 3 6228 9575

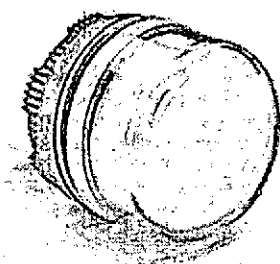
FAX: +61 8 9429 1075 +61 2 9848 4353 +61 2 4960 2203 +61 7 3891 6139 +61 7 4775 1457 +61 7 4322 2947 +61 7 4833 1796 +61 7 4035 6939 +61 8 8371 0952 +61 8 9277 1700 +61 8 8947 2049 +61 3 6228 9757

FLYER 05-2007

D5-3NF 06/02 14M

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

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

Benefits

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

Copyright NHP Electrical Engineering Products Pty. Ltd.

All prices are exclusive of GST.

Din-Safe MCBs (RCBO)

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

Din-Safe MCB with pigtail

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

Din-Safe MCB standard terminal configuration

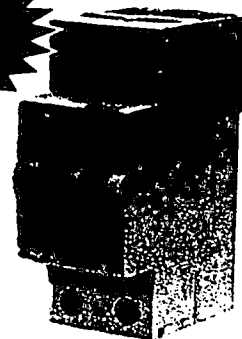
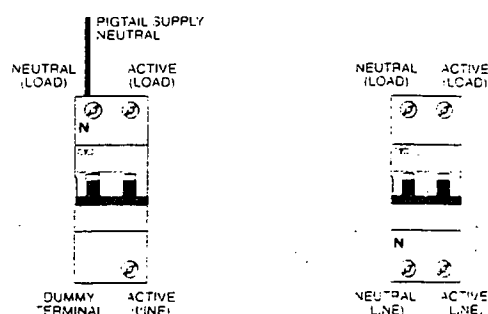
Poles	Amp rating	Voltage	Short circuit	Phase	Trip ¹⁾ Sens.	Cat. No ²⁾
2	6	240	10 kA	1+N ¹⁾	10 mA	<input type="checkbox"/> DSRCB0610A
2	6	240	10 kA	1+N ¹⁾	30 mA	<input type="checkbox"/> DSRCB0630
2	10	240	10 kA	1+N ¹⁾	10 mA	<input type="checkbox"/> DSRCB1010A
2	10	240	10 kA	1+N ¹⁾	30 mA	DSRCB1030
2	10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

Application

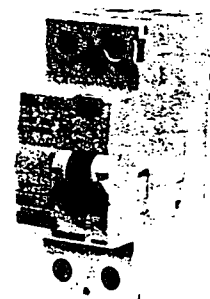
Din-Safe MCB is a combined MCB/RCD providing thermal overload, short circuit and earth leakage protection in the one integral unit.

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

Terminal configuration



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



DIN-Safe MCB standard terminal configuration

Characteristics

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

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

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

- Notes:
- ¹⁾ Unprotected neutral, not switched.
 - ²⁾ Unprotected neutral, switched.
 - ³⁾ Fits Din-T chassis (special configuration) refer page TBA.
 - ⁴⁾ Mines department approval applies to 30 mA only.
- Nuisance tripping may be experienced in VFD and motor starting applications refer NHP.
- ☐ Available on indent only.

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

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

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

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

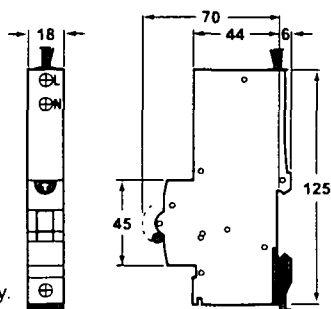
²⁾ Mines Dept. approval applies to 30 mA units only.

Operation

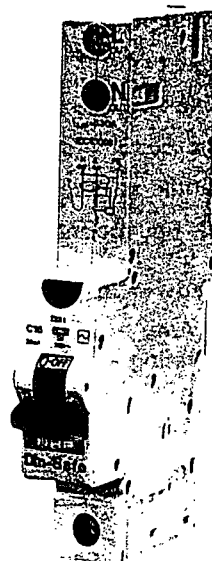
This unit combines the overload and short circuit protection of an MCB with earth leakage protection of an RCD. The unit occupies one, sub-circuit (one pole) of the distribution board and provides single phase protection against overload, short circuit and earth leakage current.

- 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)



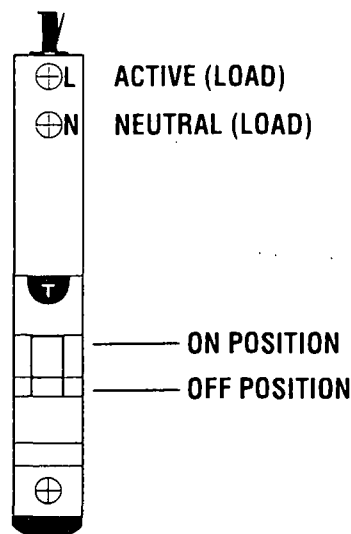
☐ Available on indent only.



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

Use at DC

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

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

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

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

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

Storage temperature

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

Operating temperature

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

Use at 400 Hz

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

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

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

Notes: ¹⁾ 2 pole MCB connected in series.

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

☐ Available on indent only.

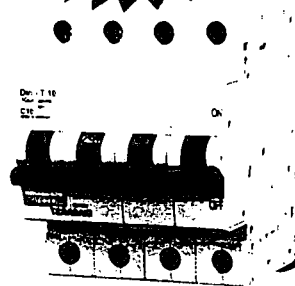
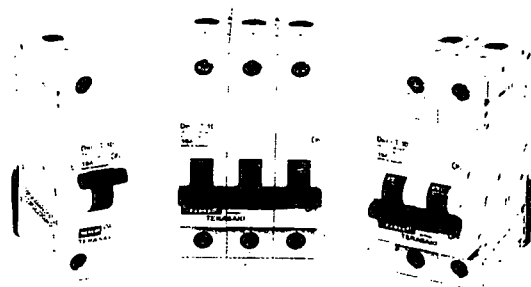
Din-T10 series 10 kA MCB (cont.)

3 pole 3 modules

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

4 pole 4 modules ¹⁾

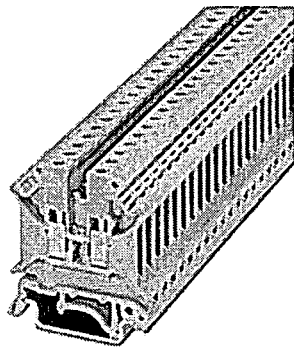
6	DTCB10406B	DTCB10406C	<input type="checkbox"/> DTCB10406D
10	DTCB10410B	DTCB10410C	<input type="checkbox"/> DTCB10410D
13	<input type="checkbox"/> DTCB10413B	<input type="checkbox"/> DTCB10413C	<input type="checkbox"/> DTCB10413D
16	DTCB10416B	DTCB10416C	<input type="checkbox"/> DTCB10416D
20	DTCB10420B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

DTCB10
1 - 4 pole typesNotes: ¹⁾ All poles include over-current and short circuit protection.☐ Available on indent only

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

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

UK 5 N



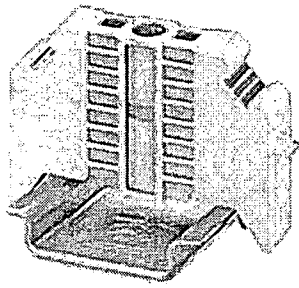
Universal terminal block with screw connection, cross section: 0.2 - 4 mm², AWG: 30 - 10, width: 6.2 mm, color: gray

-  Accessories
-  Technical data
-  Certificates
-  PDF File

[add to cart](#)[view cart](#)

General data

Order number	3004362
Type	UK 5 N
Barcode number	4017918090760
Unit pack	50 Pcs.
Customs tariff	85369010000
Max. conductor cross section, flexible	4 mm ²
Conductor cross section, rigid max.	6 mm ²
Conductor cross section AWG/kcmil max	10
Nominal current I _N	41 A

E/NS 35 N

End bracket, width: 9.5 mm, color: gray

- ☐ Accessories
- ☐ Technical data
- ☐ Drawings
- ☐ PDF File



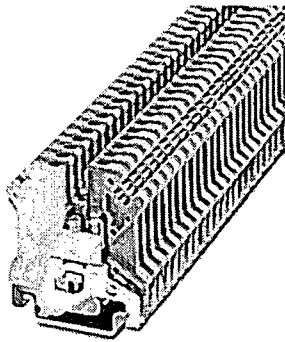
add to cart



view cart

General data

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

USLKG 5

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

-  Accessories
-  Technical data
-  PDF File



add to cart

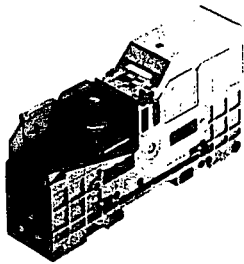


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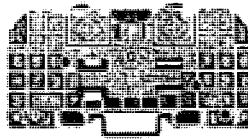
General data

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

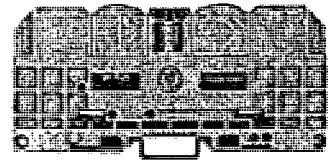
Tab connection terminals



WFF 35



WFF 70



Max. technical data

Dimensions

Width/length/height (mm)

Width/length/height (mm)

Bolt size

without WAH

with WAH

M

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

Rated voltage/rated current/rated cross-section

Rated impulse voltage/pollution severity

Further technical data

Tightening torque range

Nm

Clampable conductor

Cable lug DIN 46235

mm²

Cable lug DIN 46234

mm²

2 x cable lug DIN 46235

mm²

2 x cable lug DIN 46 234

mm²

Strips

mm

Strips

mm

Strips

mm

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

Continuous current rating of cross-connection 2-pole

A

Continuous current rating of cross-connection 3-pole

A

UL / CSA rated data

Voltage / current / conductor size

UL

Voltage / current / conductor size

CSA

Ordering data

Version

Wemid

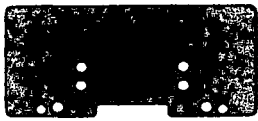
Blue Wemid

With covers

Wemid

Wemid

Partition (thickness 2 mm)



Cross-connection

WQL



Auxiliary / control conductor terminal



Cover



Warning sign



Yellow, Self-adhesive

With lightning flash

Can be stuck to WAH only

Fixing screw



For direct assembly

Screwdriver

Cupul washers



For aluminium conductors

Marking tags



Print

Consecutive horizontal

Consecutive vertical

Blank

Printed

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

168 A/50 mm²

27/107/54

27/136/60

6

1000 V/125 A/35 mm²

8 kV/3

3.0...6.0

6...25

2.5...50

6...25

2.5...35

3 x 13 x 0.5

6 x 13 x 0.5

2 x 15.5 x 0.8

2.08...50

C 4

135

135

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

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

Cat. No.

102830

102838

102930

106710

106490

106540

107050

106446

106448

106445

106970

156390

106370

902450

015620

047346

047356

180992

156895

156390

156390

106370

902450

015630

047346

047356

180992

156895

250 A/95 mm²

32/132/63

32/179/71.5

8

1000 V/192 A/70 mm²

8 kV/3

6.0...12

16...70

2.5...120

16...70

2.5...70

2 x 15.5 x 0.8

4 x 20 x 1

4 x 15.5 x 0.8

6 x 15.5 x 0.8

2.08...120

C 6

207

207

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

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

Cat. No.

102840

102848

102940

106720

106500

106550

106620

106456

106458

106455

106980

156390

106370

902450

015630

047346

047356

180992

156895

156390

156390

106370

902450

015630

047346

047356

180992

156895



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



Monitoring & Control Technology

NHP

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

Advantage SERIES:

I & 3 Phase Monitoring

Phase Sequence & Phase Loss

Latch Function

AC/DC Over Voltage

AC/DC Over Current

Up to 500 V AC/DC monitoring

AdvantagePlus SERIES:

I & 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

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

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"

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

A CARLO GAVAZZI BRAND

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

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



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

Phase asymmetry

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



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

**Mains
Over-/Undervoltage
monitoring**

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



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

Undercurrent

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



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

**Regenerated
voltage by
3-phase motors**

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



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

Phase reversal

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



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

C-Tick Compliance**NHP ELECTRICAL ENGINEERING PRODUCTS PTY LTD**

www.nhp.com.au

A.B.N. 84 004 304 812

Version 6

**MELBOURNE:****SYDNEY:****NEWCASTLE:****BRISBANE:****TOWNSVILLE:****ROCKHAMPTON:****TOOWOOMBA:****CAIRNS:****ADELAIDE:****PERTH:****DARWIN:****HOBART:****NEW ZEALAND:**

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2/65 Albert Road Moonah Tasmania 7009

7 Lockhart Place Mt Wellington Auckland 1006

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CA4 Miniature Contactors

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



Compact 45 mm width



Electronic motor protection

- High switching capacity

- Clip-on accessories

- DIN rail or screw mounting

- Auxiliary contacts for low voltage



Accurate thermal protection



Clip on accessories

NHP

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

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



NHP Premises, Melbourne

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

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

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



National Distribution Warehouse (5200sq metres)

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

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

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



Sydney Premises

Rockwell Automation

sprecher+schuh



Sprecher + Schuh administrative building at Aarau



Part of the low voltage factory at Aarau

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

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

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

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

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

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

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

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

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

The Ultimate in Motor Control

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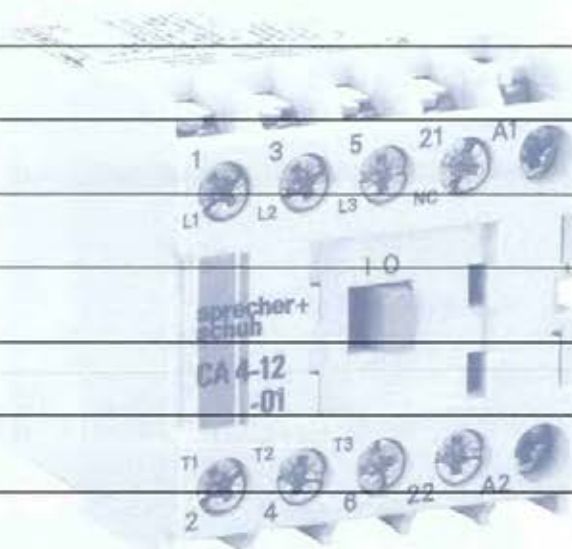
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MINI CONTACTOR AND RELAY SYSTEM

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		Cat. No.
std.	max.			
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		Cat. No.
std.	max.			
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)

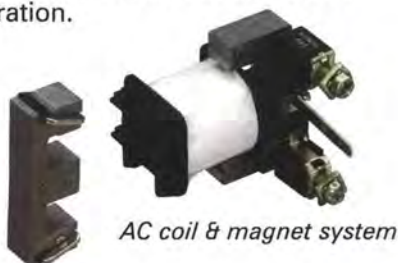
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CA 4 AC & DC coils

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

CA4

CEP 7 Electronic Overload

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

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

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



Features

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



CA 4 with CEP 7

CT 4 Thermal Overload

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



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

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

Features

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



CA 4 with CT 4

TIME UNDER CONTROL

NHP

CRZE 4 Timing Element

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

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

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

0.1...3 seconds

1...30 seconds



CRZY 4 Timing Element

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

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



Dependable Interlocking

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

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



Two CA 4's interlocked (2.6 kW)



CA 4 with a CRZY 4 timer fitted

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.

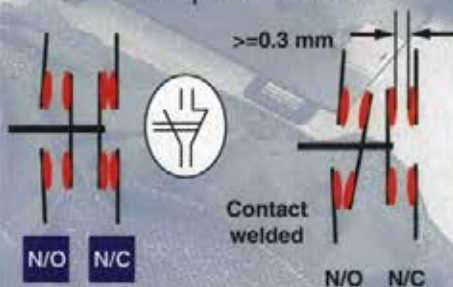
Rear housing

Contacts

Front housing

Coil assembly (DC)

Positive Guidance Design Requirements



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

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

CA4

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

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

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

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

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



**Backed by
decades of
experience**

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



CA 4

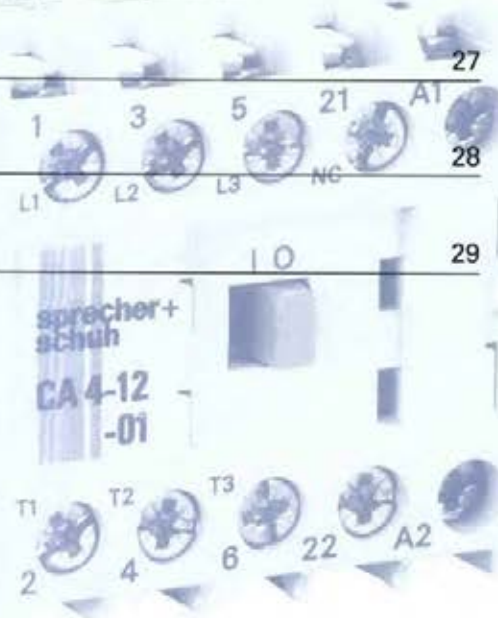
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AC AND DC CONTACTORS

CA 4 Contactor

AC coil ¹⁾

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



CA 4 contactor

AC Coil 4-pole

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

DC coil ¹⁾

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



CS 4 relay

Basic relay CS 4 4-pole ¹⁾

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

Contact diagram



- Notes: ¹⁾ CA 4/CS 4 not available without coil. Coils and contacts not replaceable.
²⁾ Add coil voltage AC 24, 32, 110, 240, 415 V 50 Hz when ordering.
 Add coil voltage DC 12, 24, 48, 110, 125, 220 V when ordering.

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

CA 4/CS 4 ACCESSORIES

NHP



Auxiliary contact block



RC link



Mechanical Interlock



KCD 4

CR4-P
DIN rail adaptor

CRZE 4 Timer

Auxiliary Contact Blocks CA 4-P

For contactors CA 4... -10 ')

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

For contactors CA 4...-01 ')

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

Accessories

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

Connection links

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

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

Adaptor CR 4-P

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

Timing elements CRZE 4 and CRZY 4

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

RC link CRC 4

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

Auxiliary contact blocks CA 4-P

Terminal markings in compliance with EN 50 012.

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

Mechanical interlock CM 4

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

Notes: ¹⁾ The contact selection is to comply with contact numbering sequence.

The auxiliary contacts from page 3-6 can also be used if terminal numbering is not a pre-requisite.

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

STATE OF THE ART MOTOR PROTECTION

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

**Self
Powered
Design**

Manual reset

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

Automatic and manual reset

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

Remote reset magnet

To suit CEP7-M32 and CEP7-A32

Cat. No.

CMR7...V ')

Accessories

Cover for preventing overload adjustment

Cover for preventing current adjustment only

Separate mounting bracket

Cat. No.

CMS7-BC4

CMS7-BC5

CEP7-37-PA

Notes:) 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

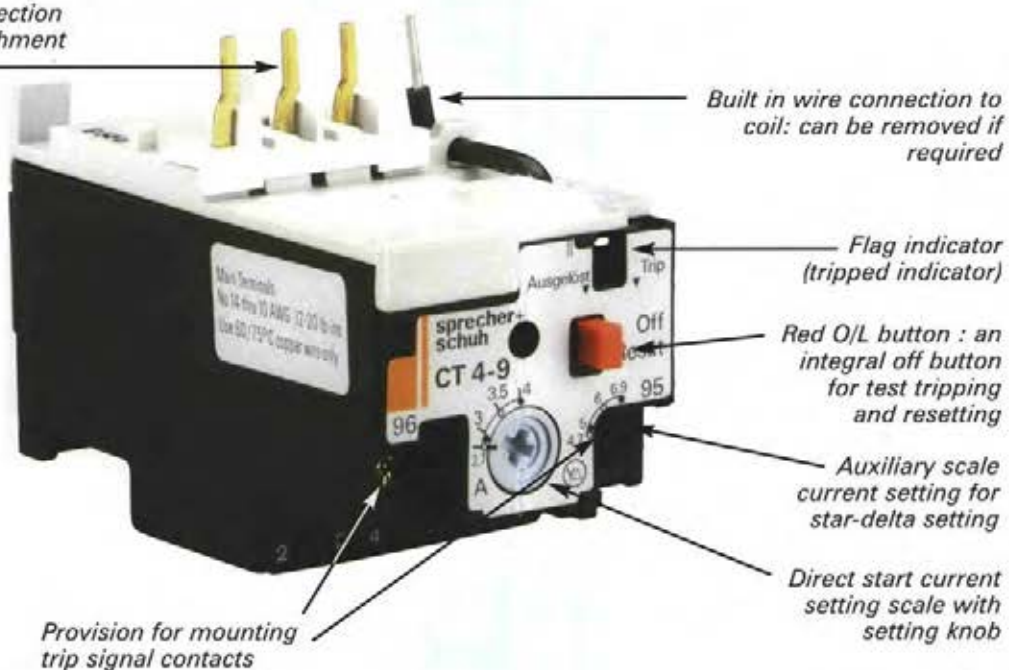
- Consistent and reliable protection
- Superior class 10 characteristics
- Protection from single phase conditions
- Ambient temperature compensation
- Maximum 660 V
- Snap-on signal contacts
- Manual reset
- Trip indicator complies with AS 1023



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

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
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Terminal Cross-Section

Terminal Type

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

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

Control Circuit

Operating Voltage

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

Coil Consumption

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

Operating Times

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

General

Rated Voltage Withstand U

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

Rated Impulse Strength U _{imp}	8 kV
---	------

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
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Type of Protection	IP 20
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Finger Protection	safe from touch by fingers and back of hand per vde 0106, part 100
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TECHNICAL INFORMATION

NHP

CA 4 Miniature Contactors

Rated Insulation Voltage U_i			CA4		
to IEC 947-1	[V]	500 V	-05	-09	-12
UL/CSA	[V]	600 V			
Rated Impulse Voltage U_{imp}					
	[kV]	8			
Rated Voltage U_e					
-Main Contacts					
AC 50/60 Hz	[V]	230, 240, 400, 415, 500			
DC	[V]	24, 48, 110, 220, 440			
Operating Frequency for AC Loads					
	[Hz]	50/60 Hz			
Switching Motor Loads			CA4		
Standard IEC Ratings			-05	-09	-12
AC 2, AC 3, AC 4	230 V [A]	6.5 12 12			
DOL & Reversing	240 V [A]	6.5 12 12			
50 Hz/60 °C	400 V [A]	5.3 9 12			
	415 V [A]	5.3 9 12			
	500 V [A]	4 7 7			
	230 V [kW]	1.5 3 3			
	240 V [kW]	1.5 3 3			
	400 V [kW]	2.2 4.5 5.5			
	415 V [kW]	2.2 4.5 6.1			
	500 V [kW]	2.2 4 4			
Maximum Operating Rate					
At 9 A for AC 3; 20 A for AC 2/4	AC 2 [ops/hr]	300			
Starting time $t_A = 0.25$ s	AC 3 [ops/hr]	600			
AC 4 (200,000 Op. Cycles)	AC 4 [ops/hr]	300			
50 Hz	230 V [A]	3.9			
	240 V [A]	3.9			
	400 V [A]	3.3			
	415 V [A]	3.3			
	230 V [kW]	0.92			
	240 V [kW]	0.96			
	400 V [kW]	1.5			
	415 V [kW]	1.6			
Max. Operating Rate	[ops/hr]	250			

(Star Delta) 50 Hz	230 V	[A]	11	21	21
	240 V	[A]	11	21	21
	400 V	[A]	9.2	16	21
	415 V	[A]	9.2	16	21
	500 V	[A]	6.9	12	12
	230 V	[kW]	3	5.5	5.5
	240 V	[kW]	3	5.5	5.5
	400 V	[kW]	4	7.5	10
	415 V	[kW]	4	7.5	11
	500 V	[kW]	4	7.5	7.5
AC 1 Load, 3 Ø Switching			I_e	[A]	20 20 20
Ambient 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 Temperature 60 °C	I_e	[A]	16	16	16
	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. Lamps-AC 5a,	Open	[A]	18	18	18
	Enclosed	[A]	14.5	14.5	14.5
Single compensated	10 kA	[μF]	750		
Max. capacitance at	20 kA	[μF]	400		
prospective short circuit current available at the contactor					
Incandescent Lamps-AC 5b, Electrical endurance ~100,000 operations			[A]	9.3	9.3 9.3

TECHNICAL INFORMATION

CA 4 Miniature Contactors

Electrical Data

Switching power transformers AC 6a

Inrush Rated transformer current = 30		CA4		
		-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

			0.5	0.9	1.2
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

		CA4		
		-05	-09	-12
I_{cw} 60 °C				
10 s	[A]	60	96	96

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

Coil Data

Voltage Range

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

Coil Consumption

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

Operating Times

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



CA 4 contactor

TECHNICAL INFORMATION

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

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

Protection Against Accidental Contact

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

Environmental and General Specifications

Ambient Temperature

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

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

Resistance to corrosion/ Humidity Damp-alternating climate:
cyclic to IEC 68-2, 56 cycles.

Dry heat: IEC 68-2, +100 °C (212 °F),
relative humidity < 50 %, 7 days.
Damp tropical: IEC 68-2, +40 °C (104 °F),
relative humidity < 92 %, 56 days

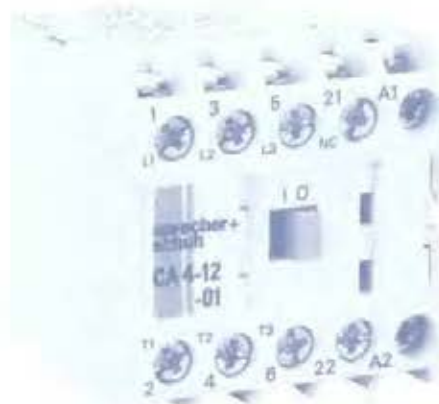
Shock Resistance IEC 68-2: Half sinusoidal
shock 11 ms, 30 g
(in all three directions)

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

Operating Position Refer to Dimension Pages

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





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



TECHNICAL INFORMATION

CA 4 Miniature Contactors

Auxiliary Contacts

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









CRZE4/CRZY4 Electronic Timers

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

TECHNICAL INFORMATION

NHP

CEP 7/CT 4 Overloads

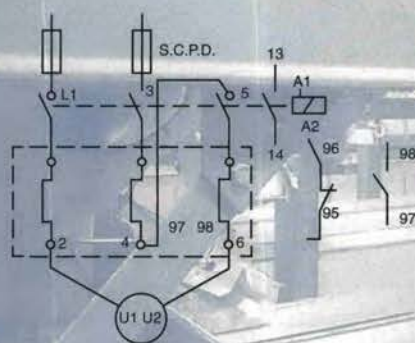
Electrical data					
Main Circuits		CEP7-A/M-32			CT4-9
Rated insulation voltage U_i					
UL	[V]	600			600
CSA	[V]	690			690
Rated impulse strength U_{imp}		[kV]	6		X
Rated operating voltage U_e		[V]	690		690
Terminal Cross-section					
Terminal type					
Terminal screws			M4		M4
Flexible with wire ferrule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

TECHNICAL INFORMATION

CEP 7/CT 4 Overloads

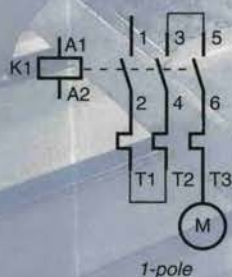
General data	CEP7-A/M-32	CT4-9
Weight [kg]	0.14	X
Standards	IEC 947, EN 60 947, DIN VDE 0660	
Approvals	CE, UL, CSA, PTB	
Corrosion resistance	95 % relative humidity without condensation, 30...60 °C	humid/warm, constant
Ambient temperature		humid/warm, cyclic
Open	-20...+60 °C	-25...+50 °C
Enclosed	-20...+40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

Connection Diagram CEP 7 Single Phase Wiring

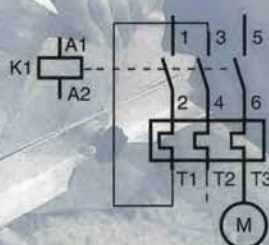


The CEP 7S must be wired as indicated to provide "self-powering" of the overload relay

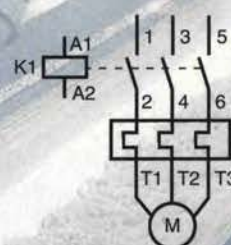
Connection Diagram CT 4



1-pole



2-pole



3-pole

UTILISATION CATEGORIES

NHP

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

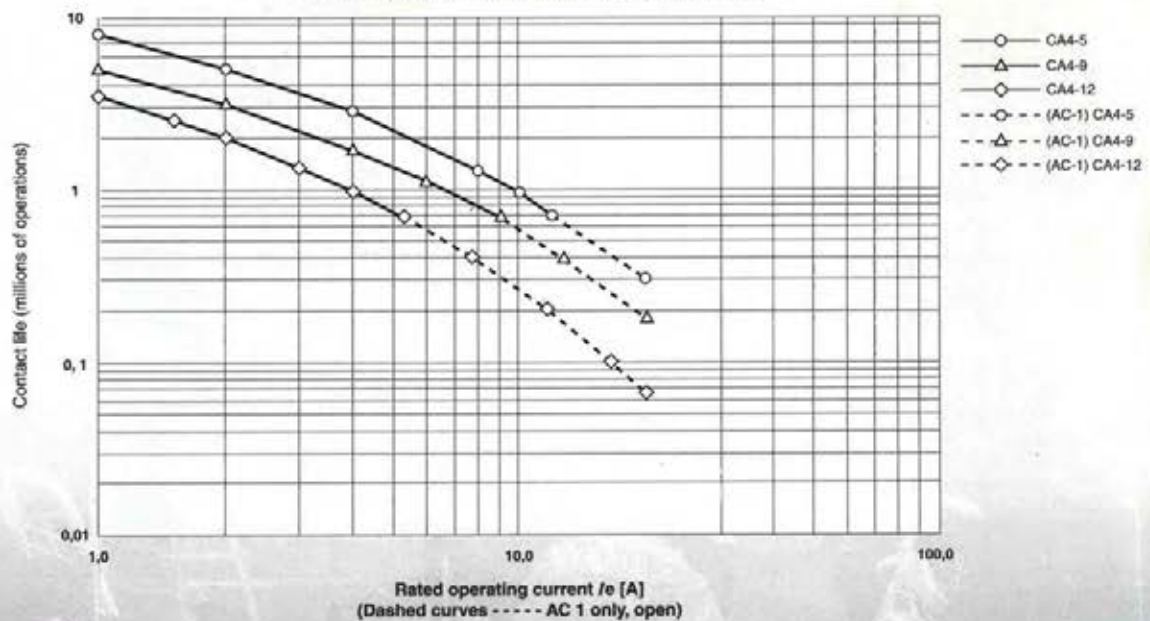
- Notes:**
- ¹⁾ All category listings according to IEC 947-4 and AS 3497-4
 - ²⁾ **Plugging** is understood as stopping or reversing the motor rapidly by reversing the motor primary connections while the motor is running.
 - ³⁾ **Inching** is understood as energising a motor once or repeatedly for short periods to obtain small movements of the mechanism.

ELECTRICAL LIFE GRAPHS

CA 4 Contactors

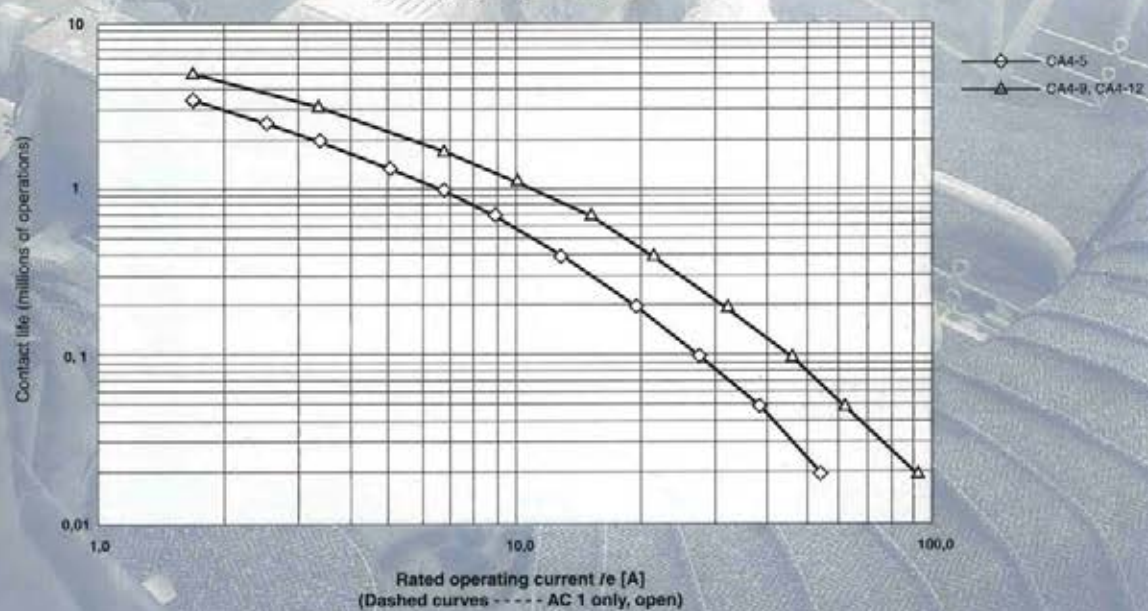
CA 4 Contactors

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



CA 4 Contactors

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

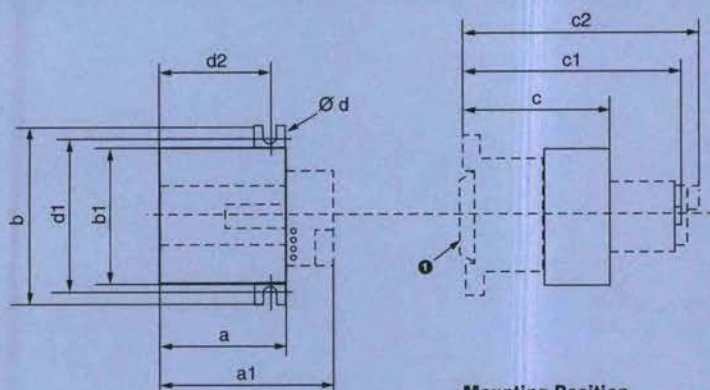


DIMENSIONS

NHP

CA 4 Contactor CS 4 Control Relay

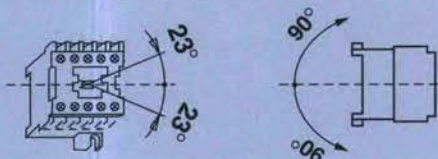
Series CA 4



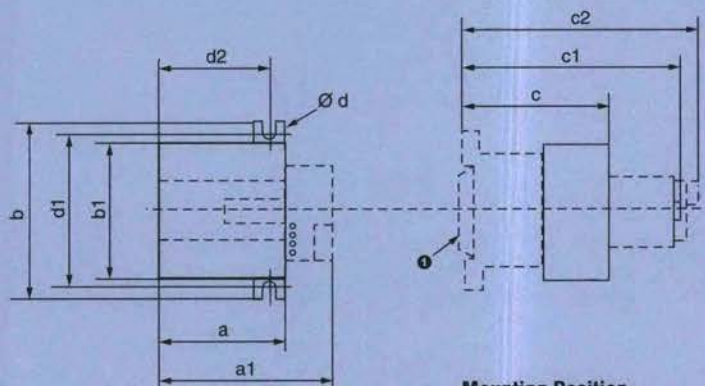
Type	a	a1	b	b1	c	C1	C2	Ød	d1	d2
CA 4-9	45	67	56	47	48	74	77	4.2	50	40

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

Mounting Position



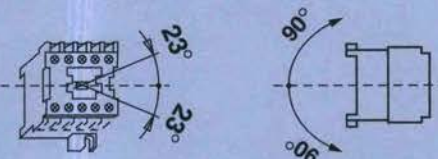
Series CS 4 industrial control relays



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

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

Mounting Position

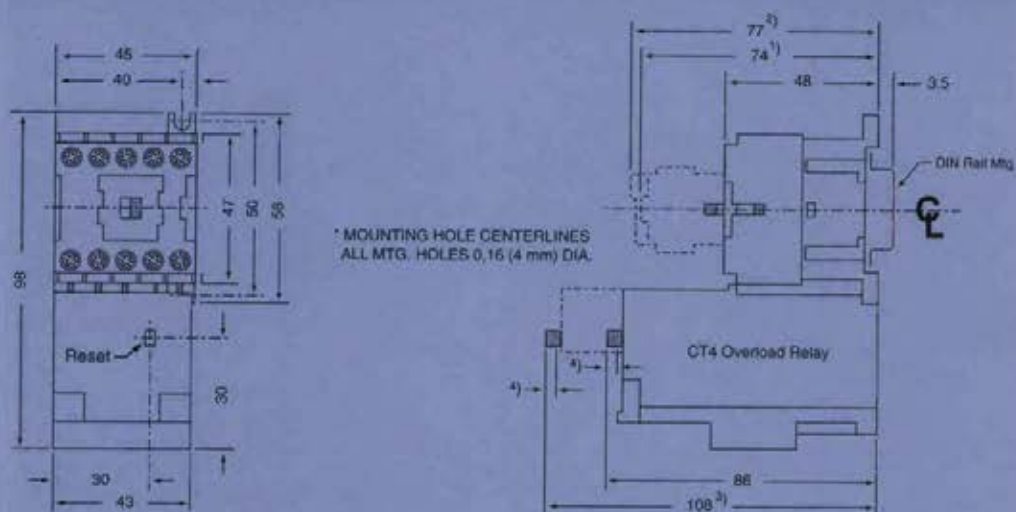


Note: DIN Rail mounting 35 mm to EN 50 022.

DIMENSIONS

CT 4 Thermal Overload Relay

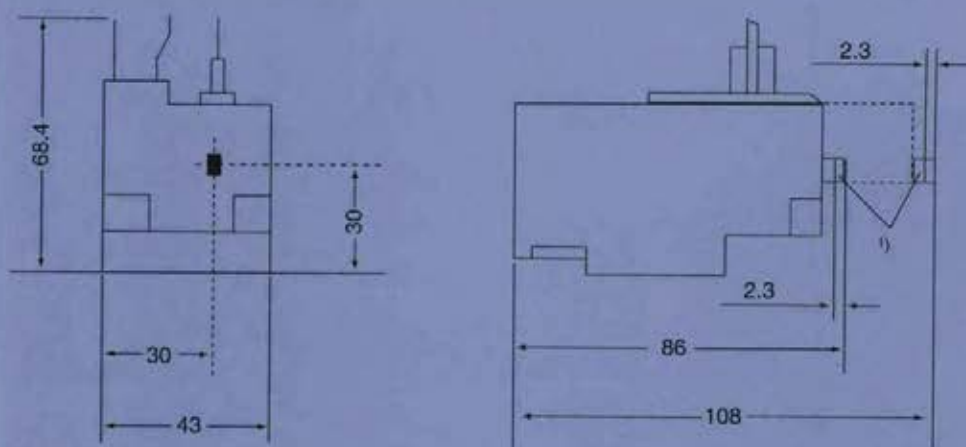
Series CT 4 (mounting to CA 4 contactors)



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

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

Series CT 4



- Notes:**
- ¹⁾ Minimum reset travel = 2.3 mm

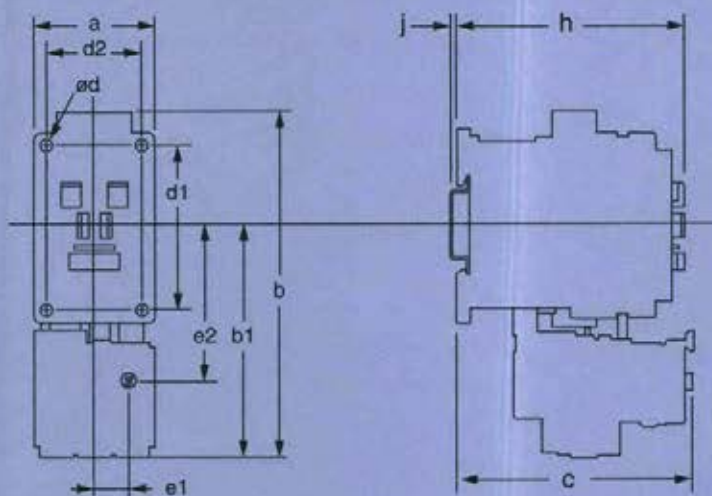
Dimensions in (mm)

DIMENSIONS

NHP

CEP 7 Electronic Overload Relay

Series CEP 7 (mounting to CA 4 contactors)

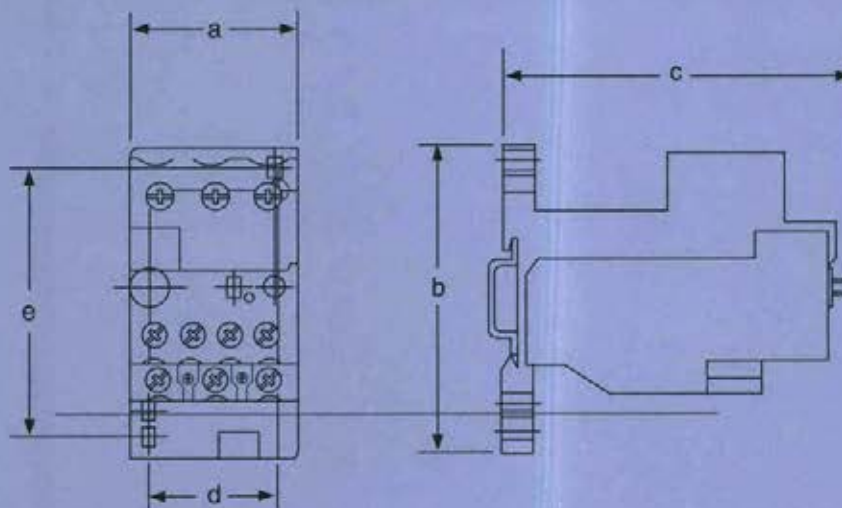


Dimensions when

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

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

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

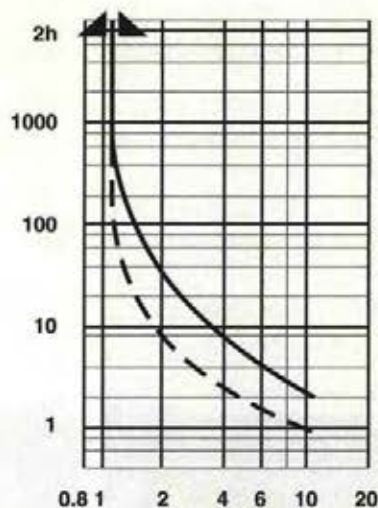


Cat. No.	a Width	b Height	c Depth	d	e
CEP7-37-P-A	45	90	75	30	75

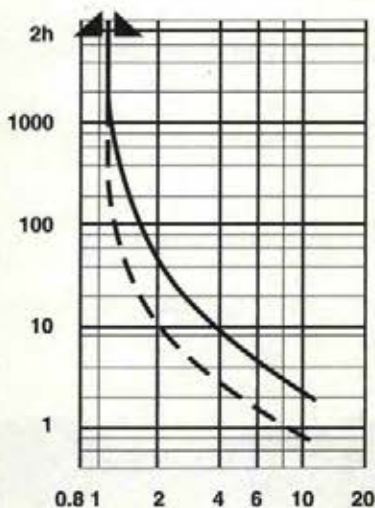
Dimensions are in (mm) and are not intended for manufacturing purposes

CEP 7/CT 4 OVERLOAD GRAPH

CT4-0.1 2.7



CT4-2.7 9.0



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

Mean value of tolerance bands, heated in three phases.

Curves: — from cold state

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

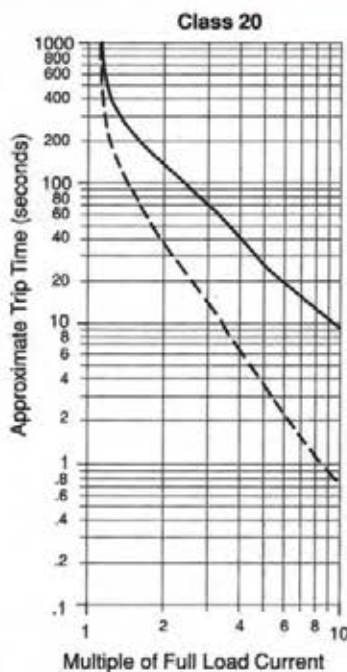
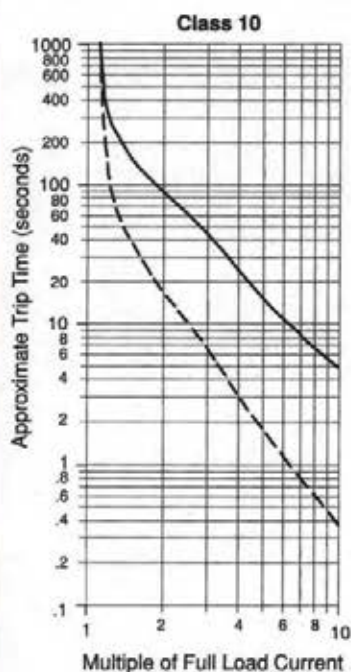
Tolerance: trip time $\pm 20\%$ ($\pm 10\%$ for current).

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

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

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

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



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

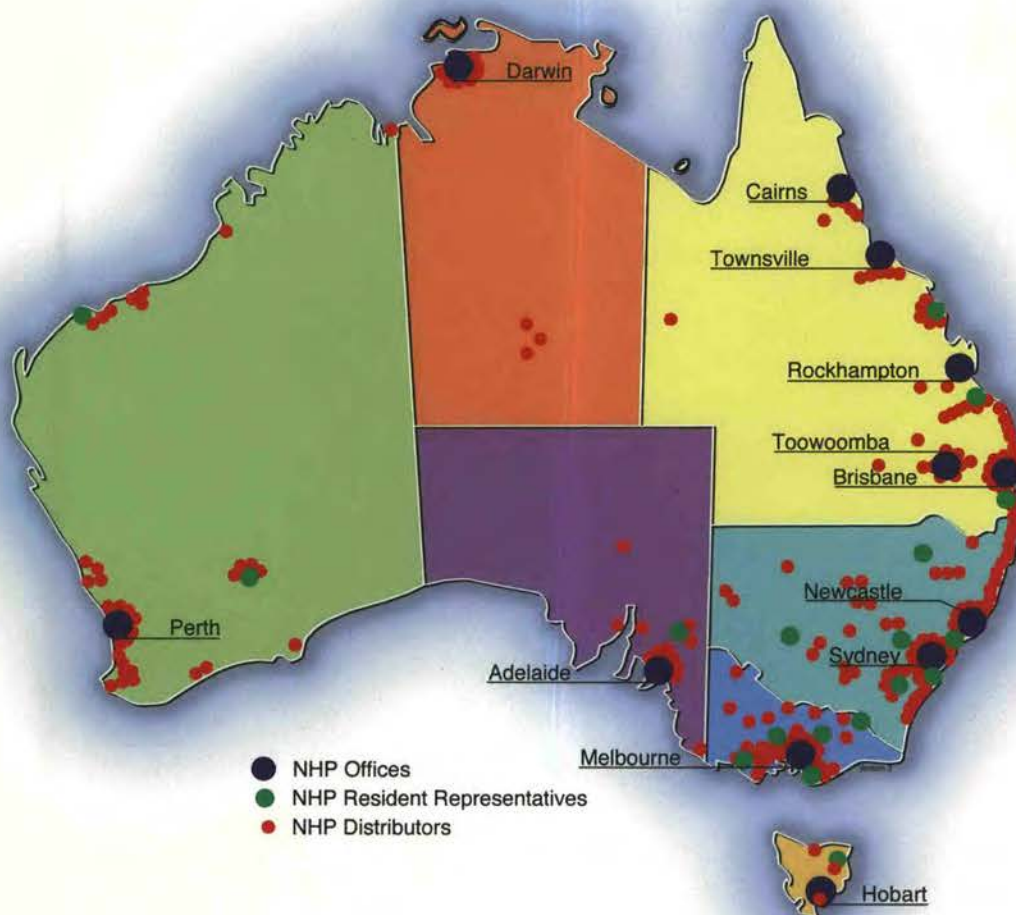
Approximate trip time for 3-phase balanced condition from hot start.

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

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



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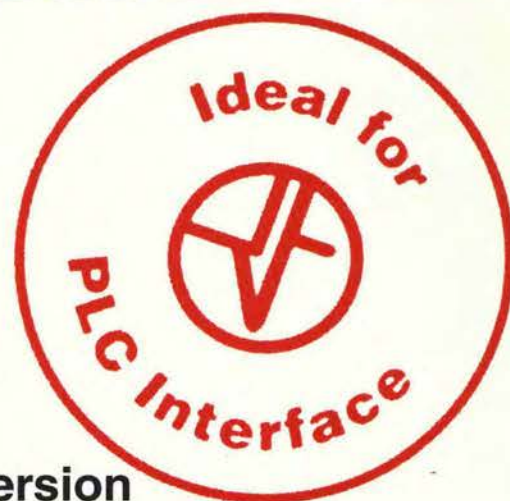
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Relay Interface Module 6 A

SERIES 38



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

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ELECTRICAL ENGINEERING PRODUCTS PTY LTD

SERIES 38

Relay Interface Module 6 A



Suitable for:

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

ORDERING DETAILS

Cat. No. 38.51 ...

1 x 6 A C/O contact

COIL DATA

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

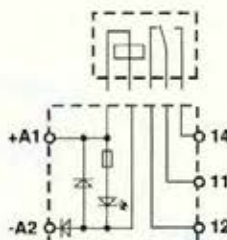
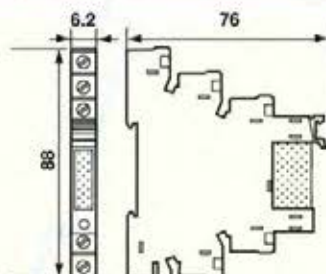
TECHNICAL DATA

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

CONTACT DATA

Rated current ...	6 A (AC 1)
Maximum peak current ...	30 A (0.5 s)
Rated voltage ...	250 V AC
Maximum switching voltage ...	400 V AC
Nominal rate in AC 1 ...	1,500 VA
Nominal rate in AC 15 (230 V) ...	300 VA
Minimum switching load ...	500 mW (12 V / 10 mA)
Contact resistance ... -initial	≤50 mΩ
Contact material ...	AgSnO ₂

DIMENSIONS (mm)



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