

# QUEENSLAND URBAN UTILITIES

## SEWERAGE PUMP STATIONS RELIABILITY IMPROVEMENTS PROJECT (SPRI09bc)

### SP065 STEVENS ST SUBMERSIBLE SEWERAGE PUMP STATION UPGRADE

## SWITCHBOARD OPERATION AND MAINTENANCE MANUAL



ABN 50 115 075 048

TEL: (07) 3899 8866

379 THYNNE ROAD, MORNINGSIDe

FAX: (07) 3899 8766

BRISBANE, QLD 4170

EMAIL: [essalesqld@nilsen.com.au](mailto:essalesqld@nilsen.com.au)

Contract No. BW70103-06/07

**REVISION CONTROL**

<b>Revision</b>	<b>Date</b>	<b>Revision Details</b>	<b>Responsible Officer</b>
Issue 1	Feb 2013	Final Revision Submitted to QUU	

## Contents

<b>REVISION CONTROL .....</b>	<b>1</b>
<b>1 INTRODUCTION .....</b>	<b>3</b>
1.1 DESCRIPTION OF WORKS .....	4
1.1.1 PART A DESIGN AND CONSTRUCT .....	4
1.1.2 PART B INSTALLATION AND COMMISSIONING .....	5
1.2 FACILITY LOCATION AND MAP .....	7
<b>2 SWITCHBOARD INFORMATION AND TECHNICAL DATA .....</b>	<b>8</b>
2.1 SWITCHBOARD DESIGNATION AND MANUFACTURER INFORMATION .....	9
2.2 SWITCHBOARD EQUIPMENT SCHEDULE .....	9
2.3 MAINTENANCE INFORMATION .....	16
2.4 RECOMMENDED TEGG SERVICES .....	22
2.5 SWITCHBOARD COMPONENT MANUFACTURERS TECHNICAL DATA .....	25
2.6 SITE WIDE EQUIPMENT TECHNICAL DATA .....	235
<b>3 AS CONSTRUCTED DRAWINGS .....</b>	<b>289</b>
3.1 DRAWING REGISTER .....	290
3.2 AS CONSTRUCTED DRAWINGS .....	292
3.3 UNDERGROUND CABLE ROUTING DETAILS .....	321
<b>4 COMMISSIONING, CERTIFICATES AND TESTING INFORMATION .....</b>	<b>322</b>
4.1 FORM 16 .....	323
4.2 SWITCHBOARD MANUFACTURER TEST INFORMATION .....	328
4.3 QUU COMMISSIONING PLAN .....	339
4.4 QUU FACTORY ACCEPTANCE TESTS (FAT) .....	356
4.5 ENGINEER DESIGN CERTIFICATION .....	356
4.6 LEVEL PROBE COMMISSIONING INFORMATION .....	363
4.7 CONTRACTORS CERTIFICATE OF TESTING AND SAFETY .....	367

**SECTION 1: INTRODUCTION – CONTENTS PAGE**

1.1	DESCRIPTION OF WORKS .....	4
1.1.1	PART A DESIGN AND CONSTRUCT .....	4
1.1.2	PART B INSTALLATION AND COMMISSIONING.....	5
1.2	FACILITY LOCATION AND MAP .....	7

## 1 INTRODUCTION

### 1.1 DESCRIPTION OF WORKS

The description of works is broken up into two sections; section A contains information relating to switchboard design and manufacture. Part B contains information relating to the installation work, civil work, testing and commissioning of the switchboard upgrade.

The following sections are excerpts from the original "Scope of works and project specification" document.

#### 1.1.1 PART A DESIGN AND CONSTRUCT

The Contractor and its nominated Designers shall be responsible (but not limited) to the following scope of works under Part A:

- a) Design site specific detail drawings and documentation for the new switchboards using QUU's template designs attached in Appendix 3 of this specification for all Switchboards and ancillaries, including cabling and cable management systems (note: AutoCAD files of template drawings will be made available to the Designers for preparation of each site specific design);
- b) Assessment of the existing supply capacity (transformer and main feeder cabling) relative to the site demand, particularly where new pumps/ motors are to be used;
- c) Assessment of the existing pump/ motor details to aid correct sizing and selection of the drive (DOL, SS or VSD) and associated power/ control equipment;
- d) Carry out power system analysis and design for the new switchboard's protection devices coordination with the Supply Authority's mains supply fuse switches and liaise with the Supply Authority to resolve, if any abnormalities are found in the rating and fault discrimination of the protection devices;
- e) Carry out earthing system design in accord with AS3000 requirements. Implement in the electrical and civil detail designs for construction as part of site installation works.
- f) Assessment of the existing support structure and potential radio path obstacles (power lines, trees, buildings, etc.) associated with the telemetry radio communications (this is relative to any new location of the switchboard relative to the existing switchboard position – change to the radio path);
- g) Design new Switchboard position so that there is 2000 clearance between switchboard doorfaces and sewer access openings. If switchboard is more than 2m from wet well, fit a pump disconnect box adjacent to the wet well. Carry out detail design of new or extended concrete slabs, cable pits and conduits if required for any of the sites for the installation of new switchboards;
- h) Submit detail design drawings for each site to QUU for approval before proceeding with manufacture (Refer 2.2.4);
- i) Material procurement, fabrication and assembly of Switchboard(s) in compliance with the detail design prepared for each site. Note: procurement lead times are the responsibility of the Contractor and delays and/or alternatives shall not be considered a variation to the Works (Refer 2.2.4);
- j) Contractor's internal testing of switchboards to Contractor's quality standards;
- k) Preparation of Contractor's internal test results for QUU review prior to Factory Acceptance Test (FAT) to be witnessed by QUU;

- l) Preparation of FAT documentation, schedules and test sheets for QUU approval based upon current QUU standards / templates;
- m) Factory acceptance testing of new Switchboards witnessed by QUU and in the presence of the Part B Contractor (if different from Part A Contractor);
- n) Preparation of the final Switchboard assembly in readiness for transportation (by the Part-B Contractor).
- o) Switchboard loading onto Part B Contractor vehicle. The Contractor will be required to coordinate site delivery with the Part B Contractor and other third parties as required. The Contractor shall not seek compensation for any delays experienced by Part B works and site readiness to accept the Part A Switchboard;
- p) Inspection of the Switchboard installation prior to energisation onsite;
- q) Defect rectification;
- r) 12 Months unlimited and unconditional warranty from Practical Completion;
- s) Provision of spare parts as recommended by the switchboard manufacturer to support the installed fleet.

### 1.1.2 INSTALLATION AND COMMISSIONING

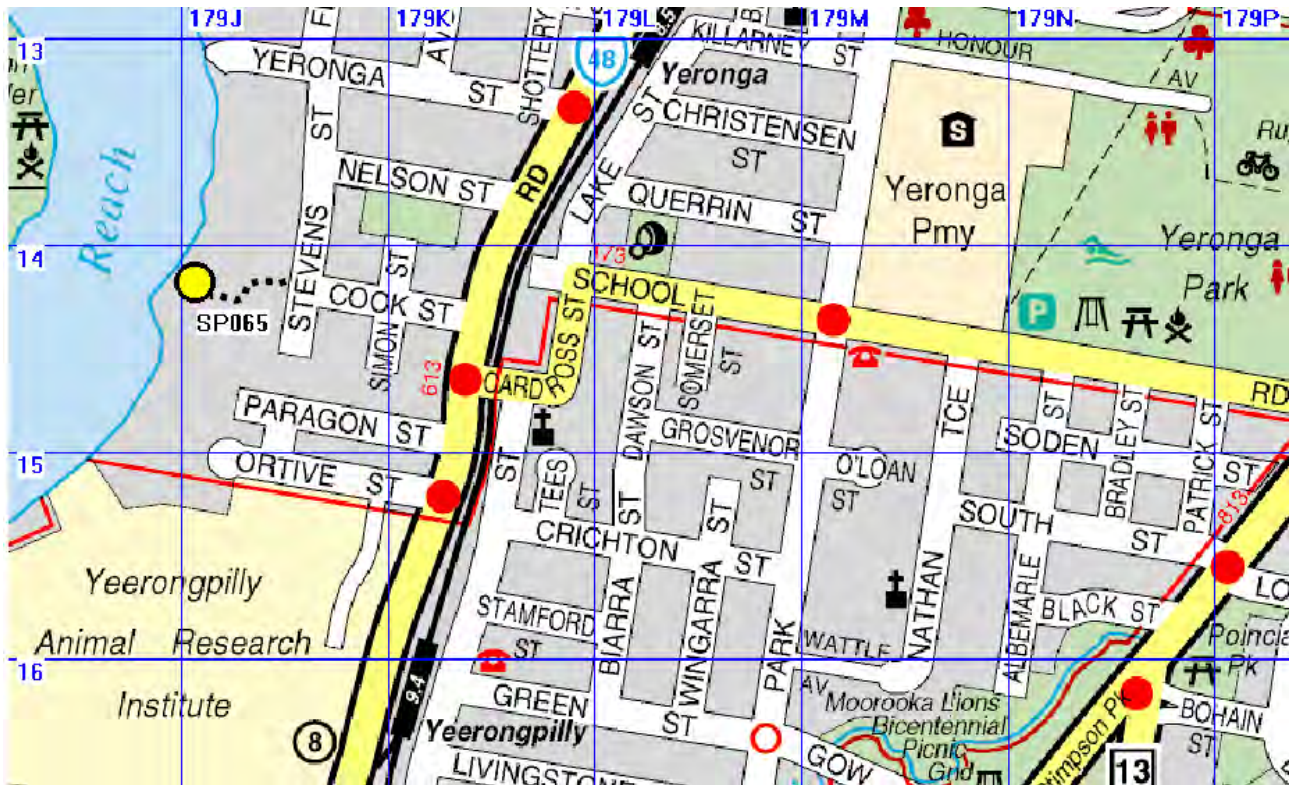
Note: the exact details of Part B: Site Works for each site shall be determined and documented during detail design. The following listed work items are generic requirements which are expected to apply for each site:

- a) Verification of field scope of works prior to submittal of quotation;
- b) Site safety management and taking all site responsibilities as the Principal Contractor on site;
- c) Preparation of all documentation required for site installation works including Contract Management Plan, Switchboard Changeover Commissioning Plan, etc as listed in this specification.
- d) Complete a QUU Site Induction Training course to all site staff prior to site access to obtain a Class A key (2 day course);
- e) Seek and obtain any approvals and permits needed to carry out the works from state, federal and local authorities as required;
- f) Site mobilisation and establishment of all temporary works;
- g) Carry out site surveys if required under detail design for construction of new switchboards slabs;
- h) Apply for QUU's Permit To Work at all sites within this Scope of Works;
- i) Design verification and installation of all civil works established during detail design for each site including earthing system as per the Part A Contractor's detail design.
- j) Design verification, supply and installation of all new electrical cabling works (if determined by the detail design that require replacement), together with all necessary supports, fixtures and fittings, required to complete the Contract Works.
- k) Materials and equipment procurement, transport, storage, protection and handling as specified for each site in the following sections;
- l) Switchboard delivery, off-loading and placing / securing into position;
- m) Provision of all field equipment and devices as listed in Section 3.3.1 Field Equipment;

- n) Supply, installation, termination and continuous operation of a temporary Switchboard suitable for the control and operation of wet well Duty pump(s). This shall be used to ensure the automatic flow control of the site during the transfer of power and control of the existing pumps from the existing Switchboard to the new Switchboard. No less than the number of existing Duty pumps shall be connected to this temporary Switchboard;
- o) Provide independent battery backed audible & visual level alarming for the site changeover and switchboard commissioning;
- p) On-site and off-site co-ordination with the Supply Authority for connection/disconnection of new/old Switchboard source of supply and all works associated with the provision, final connection, testing and certification of the new service as required;
- q) Modifications, as required, to the existing electrode box to house all new level probes as per Contractor's detail design;
- r) Replacement of any conduits and cable pits and detail design;
- s) Pre-commissioning and commissioning of the new Switchboards and all field connected equipment and systems, in conjunction with QUU. (Note: the Contractor shall provide assistance for full and complete on-site testing and commissioning of the RTU Code in conjunction with Queensland Urban Utilities);
- t) Development of a Site Acceptance Test (SAT) document for QUU approval (test plan/strategy and full complement of test sheets) that clearly defines the logical sequence and structured testing of the complete installation (Switchboard and all field devices) in accordance with the Contractor's detail drawings/documentation and QUU's standard templates. This includes preparation of a Switchboard changeover commissioning plan for the site installation works;
- u) Carry out SAT in conjunction with the QUU Commissioning Engineer and RTU Programmer;
- v) Onsite training for QUU field staff following successful completion of the SAT (date/time to be agreed by QUU);
- w) Complete removal and off-site disposal of the existing Switchboard, and all waste plant / equipment in accordance with current legislation, local regional and national statutory instruments. The existing Switchboard and all equipment contained within shall remain the property of Queensland Urban Utilities and shall be packaged, labelled and delivered to the QUU's Brisbane Depot at Eagle Farm.
- x) Restoration of site on completion;
- y) As Constructed drawings and documentation as detailed within this specification;
- z) Provide full compliance certification of all new electrical works;
- aa) Defect rectification based upon priority levels;
- bb) 12 Months unlimited and unconditional warranty from Practical Completion;

## 1.2 FACILITY LOCATION AND MAP

The Stevens St sewerage pump facility is located in Yeronga QLD 4104. See map below for details.



Map showing location of Stevens St switchboard

**SECTION 2: SWITCHBOARD INFORMATION AND TECHNICAL DATA – CONTENTS PAGE**

2.1	SWITCHBOARD DESIGNATION AND MANUFACTURER INFORMATION.....	9
2.2	SWITCHBOARD EQUIPMENT SCHEDULE.....	9
2.3	MAINTENANCE INFORMATION .....	16
2.4	RECOMMENDED TEGG SERVICES .....	22
2.5	SWITCHBOARD COMPONENT MANUFACTURERS TECHNICAL DATA.....	25
2.6	SITE WIDE EQUIPMENT TECHNICAL DATA.....	235

## **2 SWITCHBOARD INFORMATION AND TECHNICAL DATA**

### **2.1 SWITCHBOARD DESIGNATION AND MANUFACTURER INFORMATION**

SP065 – STEVENS STREET

Sunline Contract Number – Q12B04

Sunline Switchboard Number – Q12B04E

Contact Details:

Email – admin@sunline.net.au

Phone – (07)38813433

Fax – (07)38813611

Address – 7 Duntroon Street, Brendale QLD 4500

### **2.2 SWITCHBOARD EQUIPMENT SCHEDULE**

The following pages list all internal components within the Stevens St Switchboard.

ITEM	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	OPT	REMARKS
1					N	
2	1	MANUAL TRANSFER SWITCH	TERASAKI	MTSS2PE12533	F	Set Ir.0.5 (62.5A) Char=6
3		- TO SUIT MAIN SWITCHES 02 & 03 S25PE/125	TERASAIU	Q2 FITTED WITH N/O AUX CONTACT	F	
4	1	Q4 PUMP1 CIRCUIT BREAKER + T2HS Handle	TERASAIU	S125GJ/20 + T2HS12R5GM	-	Set Ir = 1 (20A) Im=6 (120A)
5	1	Q5 PUMP2 CIRCUIT BREAKER + T2HS Handle	TERASAKI	S125GJ/20 + T2HS12R5GM	-	Set Ir = 1 (20A) Im=6 (120A)
6					E	
7	1	Q7 ENERBEX PHASE FAILURE CIRCUIT BREAKER	TERASAKI	DTCB15306C	-	
8						
9	1	Q9 SUB-DISTRIBUTION BOARD CIRCUIT BREAKER	TERASAKI	E125NJ/50	-	Set Ir.0.8 (40A) Im=6 (300A)
10	1	Q10 STATION MAINS PHASE FAILURE CIRCUIT BREAKER	TERASAKI	DTCB6306C	-	
11	1	Q11 SA GPO CIRCUIT BREAKER	TERASAKI	DSRCBH-16-30A	.	
12	1	Q12 RTU LAPTOP GPO CIRCUIT BREAKER	TERASAKI	DSRCBH-10-30A	-	
13	1	Q13 SPARE	TERASAKI	DTCB6106C	E	
14	1	Q14 SPARE	TERASAKI	DTCB6110C	E	
15	1	Q15 GENERATOR AUXILIARY SUPPLY CIRCUIT BREAKER	TERASAKI	DSRCBH-10-30A	-	
16	1	Q16 SPARE CIRCUIT BREAKER	TERASAKI	DSRCBH-6-30A		
17	1	Q17 SURGE FILTER CIRCUIT BREAKER	TERASAKI	DTCB6110C	-	
18	1	Q18 EM PUMP CNTRL & SURCHARGE IMMINENT CB	TERASAKI	DTCB6106C	-	
19	1	Q19 SPARE CIRCUIT BREAKER	TERASAKI	DTCB6106C	K	
20	1	Q20 3 PHASE OUTLET CIRCUIT BREAKER	TERASAKI	DTCB6310C	-	PLUS DSRCM-32-30- 3PN
21	1	Q21 SPARE	TERASAKI	DTCB6106C	Q	
22					M	
23					V	
24		NOT USED				
25		NOT USED				
26	1	Q30 RTU POWER SUPPLY CIRCUIT BREAKER	TERASAKI	DTCB6104C	-	
27	1	Q31 SURGE FILTER ALARM RELAY CIRCUIT BREAKER	TERASAKI	DTCB6104C	-	
28	1	Q32 SPARE	TERASAKI	DTCB6104C	H	
29	1	Q33 SPARE	TERASAKI	DTCB6104C	-	
30		NOT USED				
31	2	PUMP 240VAC CONTROL CIRCUIT BREAKER	TERASAKI	DTCB6104C	-	04-1, 05-1
32	2	PUMP 24VDC CONTROL CIRCUIT BREAKER	TERASAKI	DTCB6110C	-	QD4, 005
33	1	BATTERY SHORT CCT PROTECTION CIRCUIT BREAKER	TERASAKI	DTCB6210C	-	QD6
34	2	PUMP 240VAC-24VDC POWER SUPPLY	WEIDMULLER	8951340000	-	120W 5A/24VDC
35						
36	1	DISTRIBUTION BOARD CHASSIS	TERASAKI	CD-2-24/18-3U	-	

37	3	F1 - SURGE DIVERter CIRCUIT FUSES	NHP	63AMP 63MS	-	FUSES & HOLDERS
38	3	SURE DIVERter	CRITEC	TDS1100-2SR-277	-	
39	1	SURE FILTER ALARM RELAY - SFAR	CRITEC	DAR-275V	-	
40	1	SURE REDUCTION FLIER - SRF	CRITEC	TDF-10A-240V	-	
41	1	ENEREX MAINS PHASE FAILURE RELAY - PFRE	CARLO GAVAZZI	DPB01CM48W4	-	
42						
43	1	STATION MAINS PHASE FAILURE RELAY - PFRS	CARLO GAVAZZI	DPB01CM48W4	-	
44		NOT USED				
45	1	MAIN NEUTRAL LINK	TBA	TBA	-	INSULATED
46	1	MAIN EARTH LINK	TBA	TBA	-	
47	1	DIST. BD NEUTRAL LINK - 24 WAY	TBA	TBA	-	INSULATED
48	1	DIST. BD EARTH LINK - 24 WAY	TBA	TBA	-	
49	1	SURGE DIVERter NEUTRAL LINK	CUPSAL	L5A	-	INSULATED
50	1	INSTRUMENT EARTH LIM(	TBA	TBA	-	INSULATED
51	1	FLTERED SUPPLY NEUTRAL LINK	CUPSAL	L7	-	INSULATED
52	1	3 PHASE SWITCHED OUTLET	CLIPSAL	56C410	-	USE ENCLOSURE AS SHROUD
53	1	1 PHASE OUTLET 15A	CLIPSAL	15/15-90B (SHROUD)	-	
54	1	LAPTOP GPO - TWIN 10A	CLIPSAL	25+449A+449AP	-	
55	1	1 PHASE OUTLET - GENERATOR ANCILLARY POWER	CLIPSAL	56SO310	F	IP56
56	1	3 PHASE N&E APPLIANCE INLET - GENERATOR POWER	MENNEKES	MEN361	F	c/w PROTECTIVE CAP 40787
57		NOT USED				
98						
59	2	PUMP SOFT STARTER	DANFOSS MCD 500	MCD5-0021B = MODBUS COMMS		
60	2	EXTERNAL KEYPAD KIT	DANFOSS LCP501	175G0096	-	
61						
62	2	PUMP LINE CONTACTOR - K1 (24VDC COIL)	SPRECHER & SCHUH	CA7-30		24VDC COIL
63						
64					C	
65	2	PUMP FAULT RELAY - K3	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05
66	1	PUMP1 RUN RELAY - 1K6	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05
67	1	PUMP2 RUN RELAY - 2K6	IDEC	RH2B-ULD-DC24V	0	+ SH2B-05
68	2	PUMP CONTROL CCT POWER ON RELAY - K5	DEC	RH2B-ULD-DC24V	-	+ SH2B-05
69	2	PUMP1 E/STOP RELAY - 1K4/2K4	IDEC	RH2B-ULD-DC24V	-	+ SH2B-06
70	2	POWER ON RESET TIMER - 1K7T / 2K7T	SPRECHER & SCHUH	RZ7-FSA 3E U23	-	ON DELAY
71					B	
72					B	
73	2	PUMP RUN COMMAND RELAY - K20	IDEC	RH2B-ULD-DC24V	-	•SH2B-05

74	2	PUMP FAULT RESET RELAY - K21	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05
75	2	PUMP EMERGENCY MODE INTERRUPT RELAY - K22	IDEC	RH2B-ULD-DC24V	-	•SH2B-05
76	2	PUMP START PUSHBUTTON - S1	SPRECHER & SCHUH	D7P-F3-PX10	-	
77	2	PUMP STOP PUSHBUTTON - S2	SPRECHER & SCHUH	D7P-F4-PX10	-	
78	2	PUMP EM/STOP PUSHBUTTON - S3	SPRECHER & SCHUH	D7P-MT34-PX01S	-	c/w D7-15YE112 • PX01S
79	2	PUMP RESET PUSHBUTTON - S4	SPRECHER & SCHUH	D7P-F6-PX10	-	•D7P-PX10
80	2	PUMP HOUR RUN METER - HRM	NHP	RQ4801080VDC	-	24VDC
81	2	PUMP POWER SOCKET OUTLET + INCLINE SLEEVE	MARECHAL	DS1 3114013972 + 51BA058	J	
82	2	PUMP POWER INLET PLUG + HANDLE	MARECHAL	DS1 3118013972 + 311A013	J	-NILSEN SUPPLY-
83						
84						
85					E	
86					E	
87					E	
88					E	
89					E	
90	1	PUMP 240VAC-24VDC POWER SUPPLY	WEIDMULLER	8951340000	-	120W 5A/24VDC
91	1	EMERGENCY PUMP MODE 24VDC CIRCUIT BREAKER	TERASAKI	DTCB6110C	-	QD18
92	1	LR3- WET WELL HIGH LEVEL RELAY	MULTITRODE	MTR-5	-	24VDC
93	1	WWR - WET WELL WASHER RELAY	IDEC	RH2B-ULD-DC24V		
94					0	
95	1	SIR - SURCHARGE IMMINENT LEVEL RELAY	MULTITRODE	MTR-5	-	24VDC
96	2	SINGLE POINT PROBES	MULTITRODE	2 off - 020130FSP-Shield	-	-NILSEN SUPPLY-
97	1	EMERGENCY PUMPING MODE RELAY PUMP1 - EMG1	IDEC	RH2B-ULD-DC24V	-	+SH2B-05
98	1	SURCHARGE IMMINENT DELAY TIMER - SIDT	SPRECHER & SCHUH	RZ7-FSA 3E U23	-	ON DELAY
99	1	EMERGENCY PUMPING MODE TIMER - EMGDT	OMRON	H3CA-A	-	DIGITAL MULTI-FUNCTION TIMER
100	1	EMERGENCY PUMPING MODE TIMER PUIP2- EMG2	SPRECHER & SCHUH	RZ7-FSA 3E U23	-	ON DELAY
101	2	EMERGENCY PUMPING MODE SWITCH - S5	SPRECHER & SCHUH	D7P-LSM25 + D7PX10	-	+ D7PN3Y + D7PX10
102	1	EM PUMP RTU RELAY - EMG3	IDEC	RH2B-ULD-DC24V	-	+SH2B-05
103					F	
104					F	
105					F	
106					F	
107					F	
108					F	
109					F	
110					F	

111					F	
112					F	
113					F	
114					F	
115	1	GRAPHIC DISPLAY - FREE ISSUE	REDLION	G306A000	-	FREE ISSUE
116		NOT USED				
117						
118	1	STATION LOCAL/REMOTE SWITCH - S10	KRAUS & NAIMER	CAD11-A720-600-FT2-F758	-	ENGRAVE 'LOCAL REMOTE'
119	1	ELECTRODES TEST RELAY - ETR	IDEC	RH4B-ULD-24VDC	-	+SH4B-05
120					P	
121	1	WET WELL LEVEL INDICATOR	CROMPTON INSTRUMENTS	244-01KG-HG-IP-SR 4-20mA	-	0-100% ADJ RED POINTER
122					J	
123	6	SW/BD DOOR MICRO SWITCHES	OMRON	DZ-10GW2-1B	-	8 OFF N/O
124	1	SW/BD DISCONNECT COMPART DOOR PROXIMITY SWITCH	PEPPERL & FUCHS	NCB5-18GM40-Z0	-	LOCATION TBA
125	4	SW/BD INTERNAL LED LIGHTS	LUMIFA	LF1B-C3S-2THWW4	-	
126					E	
127					S	
128					S	
129					K	
130					K	
131		NOT USED				
132					H	
133	1	WET WELL LEVEL PROBE — FREE ISSUE —	VEGA - VEGAWELL52	WL52XXA4AMD1DD1X	—	SET RANGE TO = 4m
134	1	WET WELL LEVEL ADJUSTMENT UNIT —FREE ISSUE—	VEGA - VEGADIS62	DIS62XXKMAXX	-	
135					G	
136	1	DELIVERY PRESSURE ADJUSTMENT UNIT	TBA	TBA	-	
137	1	DELIVERY PRESSURE TRANSMITTER	VEGA VEGABAR52	BR52XXCA1EHPMAS L=??	U	RANGE = 25m
138	1	TRICLOVE FITTING FOR VEGABAR52	VEGA	ADAPTOR 4	U	
139	1	RTU POWER SUPPLY 24VDC	POWERBOX	PB251-24CM-CC-T	-	
140	1	RADIO 24V/13.8VDC CONVERTER	POWERBOX	PBIH-2412J-CC	R	
141					I	
142	2	BATTERIES - INCLUDING SPILL TRAYS	YUASA	UXH50-12	-	
143	1	RADIO - FREE ISSUE -	TRIO	<<DR900-0?A02-D>>	R	FREE ISSUE
144	1	RADIO ANTENNA - NILSEN SUPPLY-	TRIO	YAGI ANT13AL	R	15 ELEMENT 13dB ALUM
145	1	RADIO COAX SURGE PROTECTION UNIT	POLYPHASER CORPORATION	IS-50NX-C2	R	Mounted on Din Rail
146	1	TELEMETRY UNIT - FREE ISSUE	LOGICA CMG	MD3311EAL/271D-0-7	-	FREE ISSUE
147					I	

148					I	
153						
156	1	ANTENNA MAST c/w 20mm NYLON CABLE GLAND	CT SHEETMETAL	SHEET 22	R	LENGTH = 6 MTRS
157	1	INTERNAL COAX CABLE (Radio to Lightning Arrester)	TRIO	TRIO - SMAM/NM/TL23	R	Cable No X01
158	1	EXTERNAL COAX CABLE (Lightning Arrester to Aerial)	R.F. INDUSTRIES	ANDREW - CNT400	R	Cable No X02 - NILSEN SUPPLY-
159	2	COAX PLUG (For CNT400 cable)	PULSE	N-203HS	R	Straight cable plug crimp
160	1	U CLAMPS	R.F. INDUSTRIES	UNV	R	
		SWITCHBOARD TERMINALS				
164	Lot	MINIATURE THERMAL CIRCUIT BREAKER	PHOENIX CONTACT	TCP 'x'A + UK6FSI/C	—	"x" = Current Rating
164	Lot	THROUGH TERMINALS (Grey & Blue as Required)	PHOENIX CONTACT	PIT 2.5		PIT 2.5-BU (for -VE)
164	Lot	DISCONNECT TERMINALS (Grey & Blue as Required)	PHOENIX CONTACT	PIT 2.5-MT	-	PIT 2.5-MT-BU (for -VE)
1643	Lot	COMBI PLUG TERMINALS (Grey & Blue as Required)	PHOENIX CONTACT	PIT 2.5/1P	—	PIT 2.5/1P-BU (for -VE)
164	Lot	COMBINATION PLUG/FUSE TERMINALS	PHOENIX CONTACT	ST 2.5-TWIN-TG/1P	—	+FUSE P-FU 5x20 led24
1645	Lot	COMBINATION PLUG/LINK TERMINALS	PHOENIX CONTACT	ST 2.5-TWIN-MT/1P	-	
165	Lot	COMBI PLUGS (Grey, Blue & Green as Required)	PHOENIX CONTACT	PP-H 2.5/1 (R,M & L)	—	Combinations to Suit
165	Lot	COMBI PLUGS Housing & Sleeve)	PHOENIX CONTACT	Housing = PH 25/x	-	Sleeve = CPH x
165	Lot	GROUP MARKER CARRIER	PHOENIX CONTACT	UBE	-	
165	Lot	PLUG-IN BRIDGE	PHOENIX CONTACT	FBS	-	AS REQUIRED
164	2	TEST PLUG	PHOENIX CONTACT	PS-5		
164	Lot	COVER PROFILE (SHROUDING) + CARRIER PLATE	PHOENIX CONTACT	AP-2 + AP2-TU	-	AS REQUIRED
165					-	
166					-	
		MISCELLANEOUS				
167						
168	1	ENERGEX PADLOCK - 45mm brass pin tumbler	H.A. REED LOCKSMITHS	KEY No 325 & S/S Shackle	-	c/w 2 KEYS
169	Lot	WET WELL CONDUIT SEALING BUNGS	RUBBER	TO SUIT CONDUITS	-	Detail "W"
170	Lot	S/STEEL FITTINGS AS DETAILED FOR PRESSURE TX	FITTINGS	STAINLESS STEEL	U	Sheet 19
171	1	EARTH ROD CONNECTION BOX	NESCO	PIT-03	-	
172	1	LINE TAP - BONDING TO EARTHING ROD	CLPSAL	BP26	-	
173	1	EARTHING ROD	COPPER ROD	13mm Diameter	-	
174					E	
175					a	
176					E	
177					E	
178					E	
179					E	

180					E	
181	2	CORROSION INHIBITOR	CORTEC	VPCI-110 OR 111	-	FROM AP CONTROLS
182					E	

## 2.3 SWITCHBOARD MAINTENANCE INFORMATION



SUNLINE SWITCHBOARDS PTY LTD

MAINTENANCE MANUAL FOR:

Project: QUU002 SPRI09bc SP065

This operation and Maintenance Manual has been prepared after perusal of the documents listed hereunder AS/NZS 3439. 1 - 2002 Low Voltage Switchgear & Control gear Assemblies AS 2467 - 981 Maintenance of Electrical Switchgear.

The recommendations contained herein are offered as a guideline for the preparation of maintenance programmes by Engineers and/or Maintenance Personnel.

Alternative programmes may be devised by the end user to suit his specific requirements, in event, it is recommended detailed reference be made to the above mentioned Standards.

The following Boards are covered by these instructions:-

- Pump Panel SP065

### MAINTENANCE PROGRAMME

A recommended Maintenance Program for the switchgear is detailed below.

#### A. Commissioning

The switchgear should be transported to site, located and leveled and the shipping sections bolted together.

Upon completion of this exercise the switchgear should be subjected to commissioning tests as outlined in attached Maintenance Data sheet 'A' prior to connection of mains and submains cables.

**B. Inspections**

An initial inspection of the switchboard should be performed within 12 months of commissioning and repeated at yearly intervals throughout the life of the switchgear. This may be programmed to coincide with a 'shut down' in the event of other works being carried out within the installation. For recommendation as to operations to be carried out during these inspections refer to attached Maintenance Data Sheet 'B'.

**C. Examinations**

The switchgear should be carefully examined at five (5) yearly intervals. For recommendations as to operations to be carried out during these periodic examinations refer to attached Maintenance Data Sheet 'C'.

**D. Overhaul**

The switchgear should be 'shut down' for a complete overhaul every fifteen (15) years. Depending on the size and complexity of the switchgear it may be necessary to program a total 'shut down' over a period of several days (week-end or holiday week-end). For recommendations as to operations to be carried out during this major overhaul exercise refer to attached Maintenance Data Sheet 'D'.

## MAINTENANCE DATA SHEET - A

### Commissioning Tests

Prior to placing the switchgear into service, examinations and testing, as detail hereunder, should be performed.

- Ensure correct tension of busbar joints.
- Ensure cubicle joining hardware is securely tightened.
- Ensure all control cables are joined at terminals adjacent to 'transport splits'. Particular attention should be given to cables associated with current transformer secondary windings.
- Ensure all Terminations (power, control and metering) are tightened correctly.
- Carry out Insulation Resistance Test and Dielectric Test as described below.

Insulation Resistance Test (AS/NZS.3000-2000, Clause 6.3.3.3.) Apply a D.C. Voltage (500 V min.) between all conductors (A, B, C & N) and earth.

Should ohmic readings be recorded below 10 megohms contact our Engineering Department.

Note: It is advisable that these tests be performed on the switchboard prior to the connection of mains and sub-mains cables. Remove all potential fuses to eliminate the possibility of 'back feed' through protection equipment. Close all mains and sub-mains switching devices during the tests.

- Clean interior of switchboard and wipe over exterior surfaces (covers etc.).
- Polish exterior panels (Kitten Cream Polish No. 1).

---

MAINTENANCE DATA SHEET – B

## Inspections

It is recommended that the switchgear be inspected within one year (12 months) from the date of commissioning and at annual intervals. This exercise should include the inspections detailed hereunder.

- Check for foreign matter such as dust, magnesium oxide, swarf, cable insulation, conductor stands etc. dislodged during operation and remove from enclosure.
- Visual inspection of heavy current busbar joints for signs of discoloration due to loose jointing hardware.
- Random check of tension of busbar jointing hardware.
- Touch Test to exterior and interior panels/shrouds etc. to establish that no abnormal temperature rises are present within the switchgear enclosure (particularly within the vicinity of heavy current busbars and switching devices).
- Visual internal examination and replacement of damaged parts of heavy current interruption devices which have been subjected to a fault current. Such devices include air circuit breakers and moulded case circuit breakers. Particular attention should be given to main and arcing contact wear and condition and correct fit and condition of arc control devices.
- Check all control and meter wiring for loose connections.
- Check to ensure all seals are in order.
- Check all cover fastening hardware is tight and that cover sealing strips are not damaged.
- Visually check all Spare Parts Cabinets to ensure any used items have been replaced. Replace.
- Visual inspection of paintwork for damage. Touch up if required.
- Thermographic scan of Busbar System.

---

MAINTENANCE DATA SHEET – C

## Examinations

It is recommended that the switchgear be examined at five (5) yearly intervals commencing from the date of commissioning. This exercise should include the examinations detailed hereunder.

- Check for foreign matter such as dust, swarf, cable insulation, conductor strands etc. dislodged during operation and remove from enclosure.
- Check condition of insulation and barriers for signs of splitting or deterioration. Replace or repair as necessary.
- Examine busbar system for any indication of abnormal temperatures. Infra-red scanning may be utilized if desired.
- Random check of tension of busbar jointing hardware.
- Touch Test to exterior and interior panels/shrouds etc. to establish that no abnormal temperature rises are present within the switchgear enclosure (particular within the vicinity of heavy current busbars and switching devices).
- Visual internal examinations and replacement of damaged parts of all heavy current interruption devices. Such devices include air circuit breakers and moulded case circuit breakers. Particular attention should be given to main and arcing contact wear and condition and correct fit and condition of arc control devices.
- Check all control and meter wiring for loose connections.
- Check to ensure all seals are in order.
- Check all cover fastening hardware is tight and that cover sealing strips are not damaged.
- Visual inspection of paintwork for damage. Touch up if required.
- Check labels to ensure that any changes to equipment functions have been correctly documented.

---

MAINTENANCE DATA SHEET - D

## Overhaul

It is recommended that the switchgear be shut-down and subjected to a complete overhaul at intervals not exceeding fifteen (15) years. This exercise will involve very careful planning as, if carried out correctly it may take several days to complete. Should temperature checks be required, these should be carried out prior to the overhaul with the switchboard operating under normal 'load' conditions.

The following aspects should be addressed during this operation.

- Remove all covers and segregation shrouds over busbars and examine the busbar system for:-
  - a) Split or 'holed' insulation.
  - b) Discoloration or annealing of busbars due to abnormal temperature.
  - c) Oxidization of conductors (not normal).
- Tighten all busbar hardware to recommended tensions.
- Strip down, lubricate and generally service all switching devices in accordance with manufacturer's recommendations. Replace any faulty equipment.
- Check for foreign matter such as dust, swarf, cable insulation, conductor strands etc. dislodged during operation and remove from enclosure.
- Check all wiring for loose connections.
- Carry out insulation Resistance Test and Dielectric Test as described below, with main switches and sub-mains switches closed.
- Insulation Resistance Test (AS/NZS.3000-2000, clause 6.3.3.3.) Apply a D.C Voltage (500V min.) between all conductors (A, B, C & N) and earth.
- Check to ensure all seals are in order.
- Check all cover fastening hardware is tight and that cover sealing strips are not damaged.
- Visual inspection of paintwork for damage. Touch up if required.
- Check operation of protective equipment (if deemed necessary).

## 2.4 RECOMMENDED TEGG SERVICES

In order to improve reliability of the switchboard installation, Nilsen recommends TEGG services after the defects liability period. TEGG servicing is an international standard of maintenance and testing and provides a guarantee for switchboard components backed by a 24/7 emergency call out service.

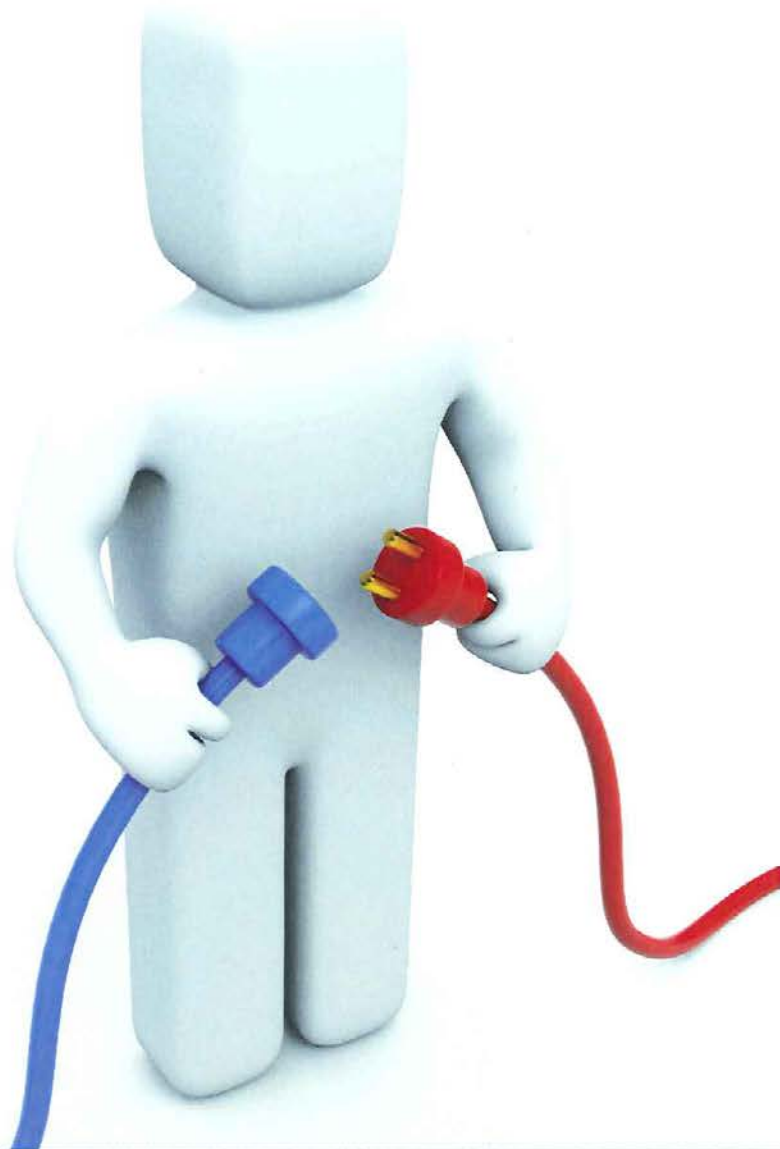
Please see the following pages for a summary of the services Nilsen Electrical – Engineering Services Division can provide.

For further information please see the contact details below.

 <b>MATTHEW COLLARD</b> Divisional Manager  <b>T</b> +61 7 3899 8866 <b>M</b> 0400 201 118 <a href="mailto:mattcollard@nilsen.com.au">mattcollard@nilsen.com.au</a>  <a href="http://www.nilsen.com.au">www.nilsen.com.au</a>  ENGINEERING SERVICES	
 <b>DAVID NANKAVILL</b> TEGG Maintenance Sales Representative  <b>T</b> +61 7 3899 8866 <b>M</b> 0409 695 315 <a href="mailto:davidnankavill@nilsen.com.au">davidnankavill@nilsen.com.au</a>  <a href="http://www.nilsen.com.au">www.nilsen.com.au</a>  ENGINEERING SERVICES	
 <b>JOSH STANBURY</b> Account Manager  <b>T</b> +61 7 3899 8866 <b>M</b> 0447 741 772 <a href="mailto:joshstanbury@nilsen.com.au">joshstanbury@nilsen.com.au</a>  <a href="http://www.nilsen.com.au">www.nilsen.com.au</a>  ENGINEERING SERVICES	



## **GUARANTEED PROGRAMS**



**TEGG PRIME**  
**TEGG PREMIUM**  
**TEGG BASIC**  
**TEGG BUILDERS**

**TEGG BUILDERS**

- Begins at the end of the new construction regular warranty period
- Energized testing
- De-energized testing optional
- Guaranteed repair or replacement on components that suffer a sudden and accidental breakdown
- Provides overtime for guaranteed repairs
- Includes extra expediting service (express freight)
- Includes downstream resultant damage protection for EDS
- Includes temporary power
- Includes emergency generator if required

**TEGG PRIME**

- Energised and de-energised testing
- De-energised preventative maintenance
- Guaranteed repair or replacement on components that suffer a sudden and accidental breakdown
- Provides overtime for guaranteed repairs
- Includes extra expediting service (express freight)
- Includes downstream resultant damage protection for EDS
- Includes temporary power
- Includes emergency generator if required

**TEGG PREMIUM**

- Provides full energised testing and analysis
- Minor services such as exterior cleaning of equipment
- Comprehensive Electrical Systems Analysis reporting
- Guaranteed repair or replacement on components that suffer a sudden and accidental breakdown
- Provides overtime for guaranteed repairs

**TEGG BASIC**

- Utilizes thermographic and ultrasonic technology for analysis of the electrical system
- 90-day guarantee repair or replacement
- Guaranteed repair service during normal business hours

**TEGG PROGRAM COMPARISON**

Features	TEGG Prime	TEGG Premium	TEGG Basic
Visual Inspection	Yes	Yes	Yes
Infrared Thermographic Inspection	Yes	Yes	Yes
Ultrasonic Inspection	Yes	Yes	Yes
Comprehensive IR Report	Yes	Yes	Yes
TEGG Task View	Yes	Yes	Yes
Predictive & Proactive Service	Yes	Yes	No
Electronic Equipment Inventory	Yes	Yes	No
Energized Testing & Analysis	Yes	Yes	No
De-Energized Testing & Analysis	Yes	Optional	No
De-Energized Preventive Maintenance	Yes	Optional	No
<b>Guaranteed Service</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Guaranteed Repair & Replacement	Life	Life	90 Days
24/7 Emergency Call Out	Yes	Yes	Yes
Overtime for Repairs on Guarantee	Yes	Yes	No
Downstream Resultant Damage Repairs	Yes	No	No
Express Shipments for Repairs	Yes	No	No
Temporary Power (Wiring)	Yes	No	No
Emergency Power (Generator)	Yes	No	No

[www.nilsen.com.au](http://www.nilsen.com.au)

## 2.5 SWITCHBOARD COMPONENT MANUFACTURERS TECHNICAL DATA

The following pages contain manufacturer's technical data for the components within the switchboard. The list below breaks the technical data down by page to assist with navigation.

### SWITCHBOARD COMPONENT TECHNICAL DATA LIST

ANDREW CNT-400 COAX CABLE .....	26
CARLO GAVAZZI MONITORING RELAYS DPB01CM .....	28
CLIPSAL 3PH & 1PH SWITCHED OUTLETS .....	33
CLIPSAL NUETRAL & EARTH LINKS ETC .....	43
CORTEC – CORROSION INHIBITOR VPCI-110 .....	52
CRITEC SURGE DIVERTER .....	54
CRITEC SURGE REDUCTION FILTER TDF .....	59
DANFOSS SOFT START VLT .....	61
DANFOSS CONTROL PANEL VLT LCP501 .....	73
DINLINE ALARM RELAY DAR-275V .....	75
IDEC INTERNAL LED LIGHTS .....	77
IDEC RH SERIES RELAY .....	80
MARECHAL DSN PLUGS .....	82
MULTITRODE MTR RELAY .....	94
MULTITRODE PROBE .....	95
NHP DINT CHASSIS .....	99
NHP MCB DSRCBH .....	101
NHP MCB DTCB6116C .....	111
OMRON – HC3A TIMER .....	121
OMRON DZ LIMIT SWITCH .....	136
PEPPER & FUCHS PROXIMITY SWITCH NCB5-18GM40-Z0 .....	141
PHEONIX THERMAL CIRCUIT BREAKER .....	143
POLYPHASER SURGE PROTECTION UNIT IS-50NX-C2 .....	148
POWERBOX CM SERIES .....	149
POWERBOX DC-DC CONVERTER .....	151
PULSE COAX CONNECTOR .....	154
RED LION DISPLAY .....	155
SPREECHER & SCHUH ELECTRONIC TIMING RELAY F-RZ7 .....	163
SPREECHER & SCHUH CA7 CONTACTORS .....	165
SPREECHER & SCHUH PUSH BUTTONS & SWITCHES .....	194
TERASAKI 3 POLE MCCB .....	199
TRIO RADIO MODEM .....	207
VEGABAR 52 PRESSURE TRANSMITTER .....	209
VEGADIS 62 ADJUSTMENT UNIT .....	211
VEGAWELL 52 PROBE .....	213
WEIDMULLER POWER SUPPLY 8951340000 .....	229
YUASA BATTERY UXH50-12 .....	233

# Product Specifications



## CNT-400

CNT-400, Cinta™ 50 Ohm Braided Coaxial Cable, variable, black PE jacket



## CHARACTERISTICS

### Construction Materials

Jacket Color	Black
Jacket Material	Non-halogenated PE
Braid Material	Tinned copper
Shield Tape Material	Aluminum
Dielectric Material	Foam PE
Inner Conductor Material	Copper-clad aluminum wire

### Dimensions

Cable Weight	0.10 kg/m
Diameter Over Dielectric	7.240 mm   0.285 in
Diameter Over Jacket	10.290 mm   0.405 in
Inner Conductor OD	2.740 mm   0.108 in
Nominal Size	0.400 in
Outer Conductor OD	8.080 mm   0.318 in

### Electrical Specifications

Cable Impedance	50 ohm
Capacitance	78 pF/m   24 pF/ft
dc Resistance, Inner Conductor	4.490 ohms/km   1.370 ohms/kft
dc Resistance, Outer Conductor	5.610 ohms/km   1.710 ohms/kft
dc Test Voltage	2500 V
Jacket Spark Test Voltage (rms)	8000 V
Maximum Frequency	16.20 GHz
Operating Frequency Band	30 – 6000 MHz
Peak Power	16.0 kW

[www.commscope.com/andrew](http://www.commscope.com/andrew)

Join the Evolution 

©2009 CommScope, Inc. All rights reserved.

All trademarks identified by ® or ™ are registered trademarks or trademarks, respectively, of CommScope. All specifications are subject to change.  
See [www.commscope.com/andrew](http://www.commscope.com/andrew) for the most current information.

page 1 of 3  
9/14/2009

# Product Specifications

CNT-400



Shielding Effectiveness	>90 dB
Velocity	85%

## Environmental Specifications

Installation Temperature	-40 °C to +85 °C ( -40 °F to +185 °F)
Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

## General Specifications

Cable Type	CNT-400
Braid Coverage	86% braid
Brand	Cinta™

## Mechanical Specifications

Bending Moment	0.7 N-m   0.5 ft lb
Flat Plate Crush Strength	0.7 kg/mm   40.0 lb/in
Minimum Bend Radius, Single Bend	25.40 mm   1.00 in
Tensile Strength	73 kg   160 lb

## Performance

Frequency	Attenuation (dB/100 m)	Attenuation (dB/100 ft)
30 MHz	2.49	0.76
50 MHz	3.18	0.97
150 MHz	4.92	1.50
220 MHz	6.23	1.90
450 MHz	8.86	2.70
900 MHz	12.80	3.90
1500 MHz	16.70	5.10
1800 MHz	18.40	5.60
2000 MHz	19.40	5.90
2400 MHz	21.65	6.60
2500 MHz	22.00	6.70
3000 MHz	24.60	7.50
4000 MHz	28.87	8.80
4500 MHz	30.84	9.40
5000 MHz	32.81	10.00
5200 MHz	33.46	10.20
5500 MHz	34.78	10.60
5800 MHz	35.76	10.90
6000 MHz	36.42	11.10

## Regulatory Compliance/Certifications

Agency	Classification
RoHS 2002/95/EC	Compliant

[www.commscope.com/andrew](http://www.commscope.com/andrew)

Join the Evolution

©2009 CommScope, Inc. All rights reserved.

All trademarks identified by ® or ™ are registered trademarks or trademarks, respectively, of CommScope. All specifications are subject to change.  
See [www.commscope.com/andrew](http://www.commscope.com/andrew) for the most current information.

page 2 of 3  
9/14/2009

# Monitoring Relays

## True RMS 3-Phase, 3-Phase+N, Multi-function

### Types DPB01, PPB01

CARLO GAVAZZI



DPB01



PPB01

- TRMS 3-phase over and under voltage, phase sequence and phase loss monitoring relays
- Detect when all 3 phases are present and have the correct phase sequence (except for N versions)
- Available versions (W4) supplied between phase and neutral
- Detect if all the 3-phase-phase or phase-neutral voltages are within the set limits
- Upper and lower limits separately adjustable
- Measure their own power supply
- Selection of measuring range by DIP-switches
- Adjustable voltage on relative scale
- Adjustable delay function (0.1 to 30 s)
- Output: 8 A SPDT relay N.E.
- For mounting on DIN-rail in accordance with DIN/EN 50 022 (DPB01) or plug-in module (PPB01)
- 22.5 mm Euronorm housing (DPB01) or 36 mm plug-in module (PPB01)
- LED indication for relay, alarm and power supply ON

## Product Description

3-phase or 3-phase+neutral line voltage monitoring relay for phase sequence, phase loss, over and under voltage (separately adjustable set

points) with built-in time delay function. Supply ranges from 208 to 480 VAC covered by two multivoltage relays.

## Ordering Key

**DPB 01 C M23**

Housing \_\_\_\_\_  
 Function \_\_\_\_\_  
 Type \_\_\_\_\_  
 Item number \_\_\_\_\_  
 Output \_\_\_\_\_  
 Power supply \_\_\_\_\_

## Type Selection

Mounting	Phase sequence detection	Output	Supply: 208 to 240 VAC	Supply: 380 to 415 VAC	Supply: 380 to 480 VAC
DIN-rail	yes	SPDT	<b>DPB 01 C M23</b>	<b>DPB 01 C M48 W4</b>	<b>DPB 01 C M48</b>
Plug-in	yes	SPDT	<b>PPB 01 C M23</b>	<b>PPB 01 C M48 W4</b>	
Plug-in	yes	SPDT		<b>PPB 01 C M48</b>	
DIN-rail	no	SPDT	<b>DPB 01 C M23 N</b>	<b>DPB 01 C M48 N W4</b>	<b>DPB 01 C M48 N</b>
Plug-in	no	SPDT	<b>PPB 01 C M23 N</b>	<b>PPB 01 C M48 N W4</b>	
Plug-in	no	SPDT		<b>PPB 01 C M48 N</b>	

## Input Specifications

<b>Input</b> L1, L2, L3, N  Note: Connect the neutral only if it is intrinsically at the star centre	DPB01: Terminals L1, L2, L3, N PPB01: Terminals 5, 6, 7, 11 Measure their own supply	<b>Ranges</b> Upper level  Lower level  <b>Note:</b> The input voltage must not exceed the maximum rated voltage or drop below the minimum rated voltage reported above.	+2 to +22% of the nominal voltage -22 to -2% of the nominal voltage
<b>Measuring ranges</b> 208 to 240 VAC  380 to 415 VAC  380 to 480 VAC	177 to 275 V <sub>L-L</sub> AC M23 versions 323 to 475 V <sub>L-L</sub> AC PPB01CM48 PPB01CM48N D/P PB01CM48W4 D/P PB01CM48NW4 323 to 550 V <sub>L-L</sub> AC DPB01CM48 DPB01CM48N	<b>Hysteresis</b> Set points from 2 to 5% Set points from 5 to 22%	1% 2%



## Output Specifications

<b>Output</b>	SPDT relay
Rated insulation voltage	250 VAC
<b>Contact ratings</b> (AgSnO <sub>2</sub> )	μ
Resistive loads AC 1	8 A @ 250 VAC
DC 12	5 A @ 24 VDC
Small inductive loads AC 15	2.5 A @ 250 VAC
DC 13	2.5 A @ 24 VDC
<b>Mechanical life</b>	≥ 30 x 10 <sup>6</sup> operations
<b>Electrical life</b>	≥ 10 <sup>5</sup> operations (at 8 A, 250 V, cos φ = 1)
<b>Operating frequency</b>	≤ 7200 operations/h
<b>Dielectric strength</b>	
Dielectric voltage	2 kVAC (rms)
Rated impulse withstand volt.	4 kV (1.2/50 μs)

## Supply Specifications

<b>Power supply</b>	Overvoltage cat. III (IEC 60664, IEC 60038)
Rated operational voltage through terminals:	
L1, L2, L3, N (DPB01)	
5, 6, 7, 11 (PPB01)	
D/P PB01CM23, D/P PB01CM23N	208 to 240 V <sub>L-L</sub> AC ±15% 45 to 65 Hz
D/P PB01CM48W4, D/P PB01CM48NW4, PPB01CM48, PPB01CM48N	380 to 415 V <sub>L-L</sub> AC ±15% (220 to 240 V <sub>L-N</sub> AC ±15%) 45 to 65 Hz
DPB01CM48, DPB01CM48N	380 to 480 V <sub>L-L</sub> AC ±15% (220 to 277 V <sub>L-N</sub> AC ±15%) 45 to 65 Hz
<b>Rated operational power</b>	
DPB01CM23x, PPB01CM23x	13 VA @ 230 ΔVAC, 50 Hz
DPB01CM48x, PPB01CM48x	13 VA @ 400 ΔVAC, 50 Hz Supplied by L1 and L2
DPB01CM48xW4 DPB01CM48xW4	13 VA @ 400 ΔVAC, 50 Hz Supplied by L1 and N

## General Specifications

<b>Power ON delay</b>	1 s ± 0.5 s or 6 s ± 0.5 s
<b>Reaction time</b>	
Incorrect phase sequence or total phase loss	< 200 ms
Voltage level	(input signal variation from -20% to +20% or from +20% to -20% of set value)
Alarm ON delay	< 200 ms (delay < 0.1 s)
Alarm OFF delay	< 200 ms (delay < 0.1 s)
<b>Accuracy</b>	(15 min warm-up time)
Temperature drift	± 1000 ppm/°C
Delay ON alarm	± 10% on set value ± 50 ms
Repeatability	± 0.5% on full-scale
<b>Indication for</b>	
Power supply ON	LED, green
Alarm ON	LED, red (flashing 2 Hz during delay time)
Output relay ON	LED, yellow
<b>Environment</b>	
Degree of protection	IP 20
Pollution degree	3 (DPB01), 2 (PPB01)
Operating temperature	
@ Max. voltage, 50 Hz	-20 to 60°C, R.H. < 95%
@ Max. voltage, 60 Hz	-20 to 50°C, R.H. < 95%
Storage temperature	-30 to 80°C, R.H. < 95%
<b>Housing</b>	
Dimensions	DPB01 22.5 x 80 x 99.5 mm PPB01 36 x 80 x 94 mm
Material	PA66 or Noryl
<b>Weight</b>	Approx. 120 g
<b>Screw terminals</b>	
Tightening torque	Max. 0.5 Nm according to IEC 60947
<b>Product standard</b>	EN 60947-5-1
<b>Approvals</b>	UL, CSA (except for W4 versions) CCC (GB14048.5) only DPB
<b>CE Marking</b>	L.V. Directive 2006/95/EC EMC Directive 2004/108/EC
<b>EMC</b>	
Immunity	According to EN 61000-6-2
Emissions	According to EN 61000-6-3

## Mode of Operation

Connected to the 3 phases (and neutral) DPB01 and PPB01 operate when all 3 phases are present at the same time, the phase sequence is correct (not N versions) and the phase-phase (or phase-neutral) voltage levels are within set limits.

If one or more phase-phase or phase-neutral voltages exceeds the upper set level or drops below the lower set level, the red LED starts

flashing 2 Hz and the output relay releases after the set time period. In any case if phase-neutral measurement is selected both phase-phase and phase-neutral voltages are monitored. If the phase sequence is wrong or one phase is lost, the output relay releases immediately.

Only 200 ms delay occurs. The failure is indicated by the red LED flashing 5 Hz during the alarm condition.

### Example 1 (mains network monitoring)

The relay monitors over and under voltage, phase loss and correct phase sequence.

In case of N versions, the relay monitors over and under voltage.

### Example 2 (load monitoring)

The relay releases in case of interruption of one or more phases, when one or more voltages drop below the lower set level or exceed the upper set level.

DPB01, PPB01

CARLO GAVAZZI

## Function/Range/Level and Time Delay Setting

Adjust the input range setting the DIP switches 3 and 4 as shown below.

Select the desired function setting the DIP switches 1 and 2 as shown below.

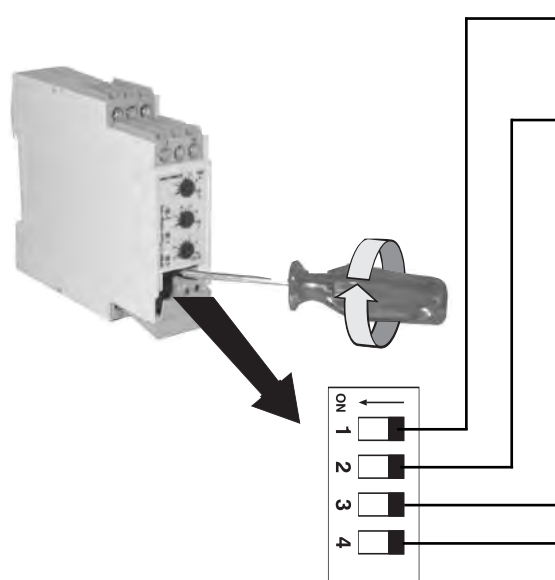
To access the DIP switches open the grey plastic cover as shown below

**Selection of level and time delay:**

**Upper knob:**  
Setting of lower level on relative scale.

**Centre knob:**  
Setting of upper level on relative scale.

**Lower knob:**  
Setting of delay on alarm time on absolute scale (0.1 to 30 s).



### Power ON delay

ON: 6 s  $\pm$  0.5 s  
OFF: 1 s  $\pm$  0.5 s

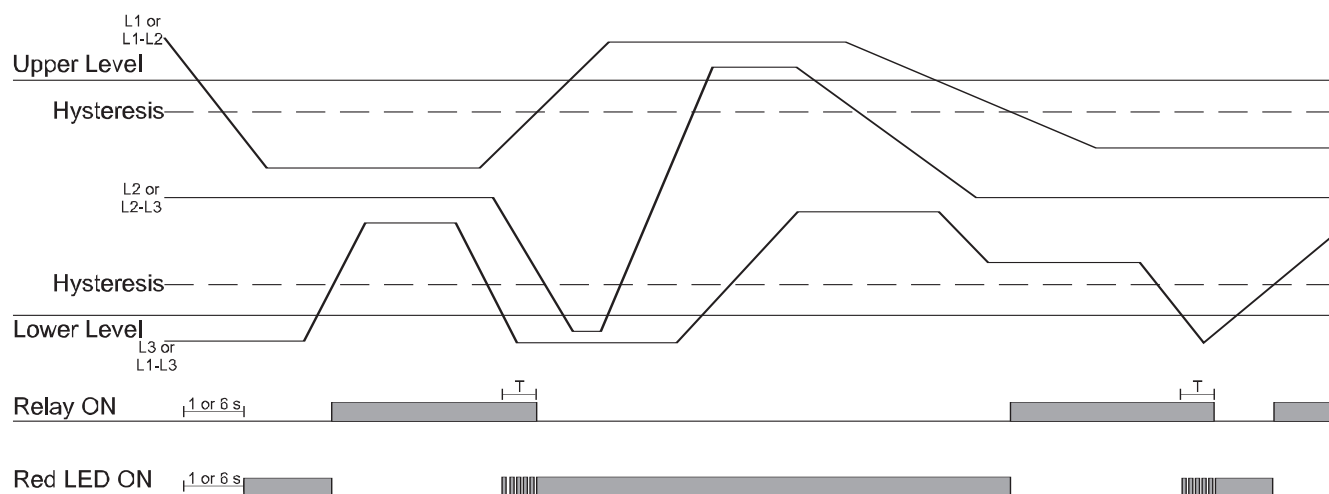
### Monitored voltage

ON: Phase-Neutral  
OFF: Phase-Phase

### Measuring range

SW3	ON	ON	OFF	OFF
SW4	ON	OFF	ON	OFF
M23 Ph-Ph Voltage	208 VAC	220 VAC	230 VAC	240 VAC
M48 Ph-Ph Voltage	380 VAC	400 VAC	415 VAC	480 VAC DPB01CM48, DPB01CM48N only
M48 Ph-N Voltage	220 VAC	230 VAC	240 VAC	277 VAC DPB01CM48, DPB01CM48N only

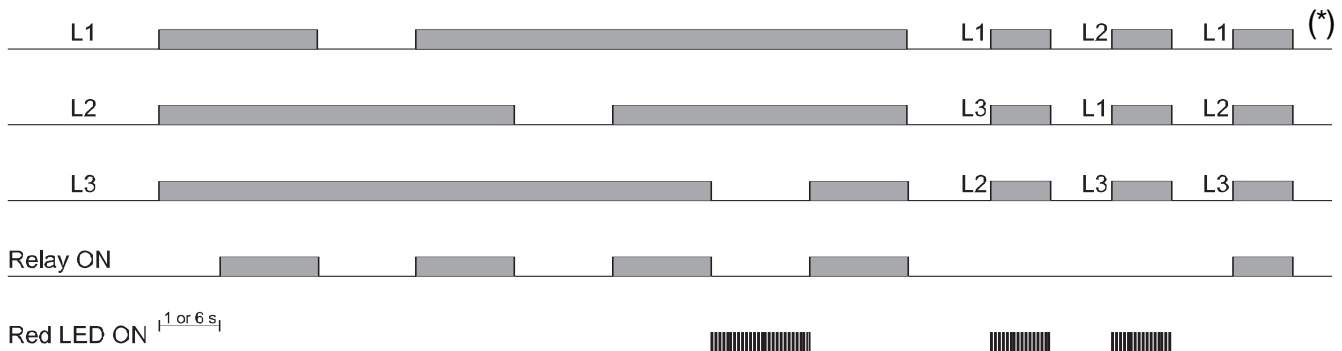
## Operation Diagrams



DPB01, PPB01



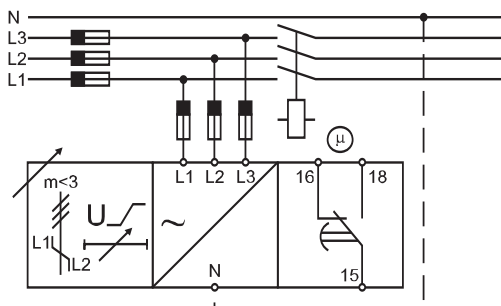
## Operation Diagrams (cont.)



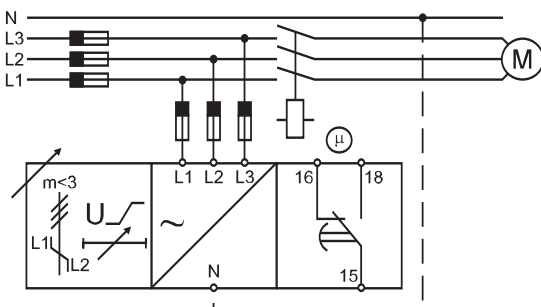
(\*) N versions don't detect incorrect phase sequence.

## Wiring Diagrams

Example 1

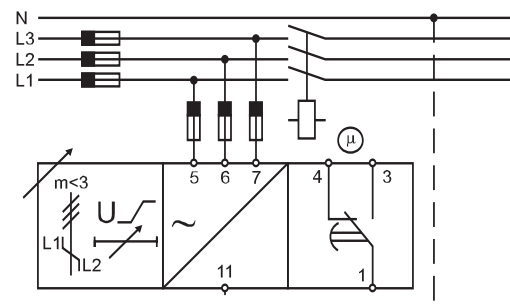


Example 2

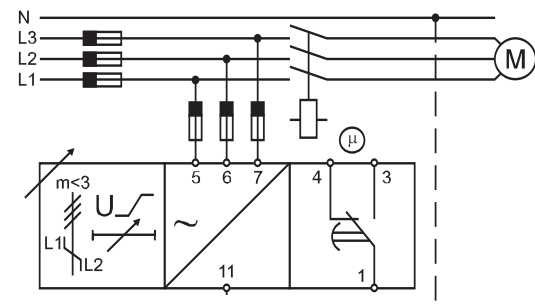


DPB01

Example 1



Example 2



PPB01

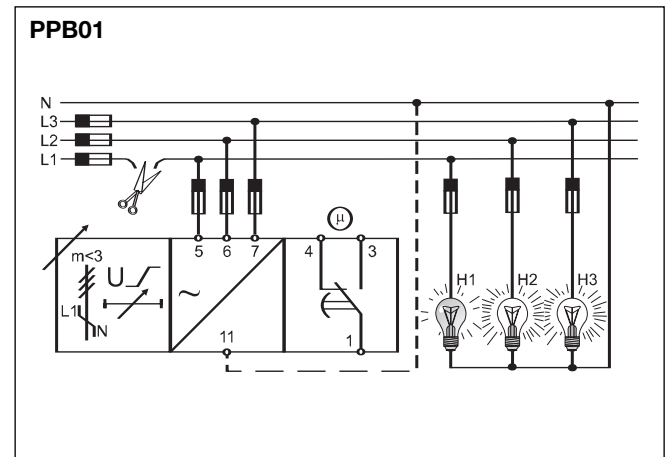
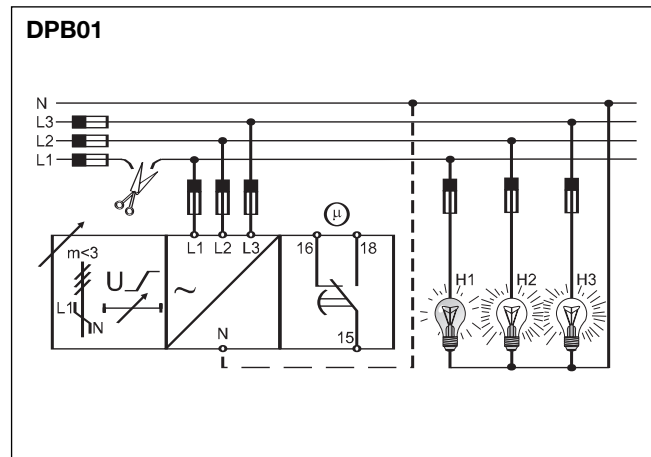
## DPB01, PPB01



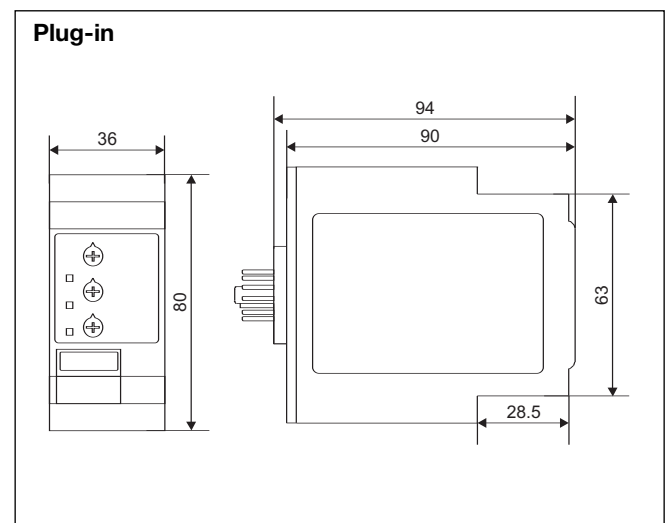
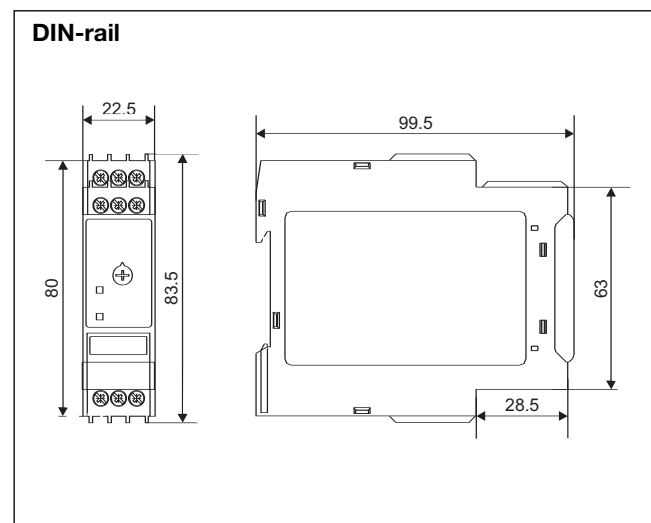
## Note

When DPB01 or PPB01 is used with phase indicator lamps (see examples in the following diagrams), the lamp H1 or H2 might be dimly lit when there is a phase loss in L1 or L2. This might happen if the lamps used are the typical low power indicator lamps, and there are no other loads present.

This fact can be avoided by using W4 models. Note that the neutral must be always connected to the device.



## Dimensions



**CLIPSAL**<sup>®</sup>

by **Schneider Electric**

## 56 & 66 Series Industrial Switchgear

Providing the strength, reliability and durability demanded of today's industry



[clipsal.com](http://clipsal.com)

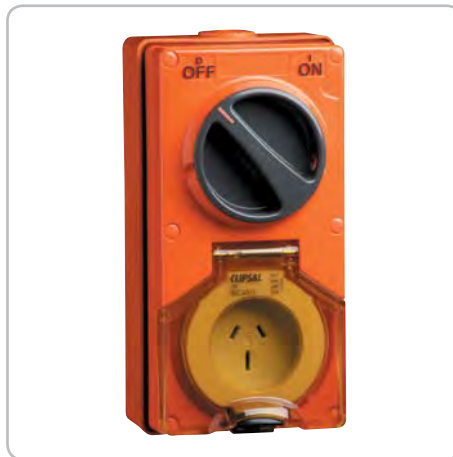
# Combination Switched Socket Outlets



**56C310,GY**

The Clipsal range of three phase combinations includes two module units and one-piece cover models. All internal phase connections between switches and sockets are factory wired.

The 4 and 5 pin, 10 and 20A one-piece cover models have integral wiring between the switch and socket outlet. Installation time is reduced by not having to check factory wire terminations. There is also no likelihood of wires falling out during installation.

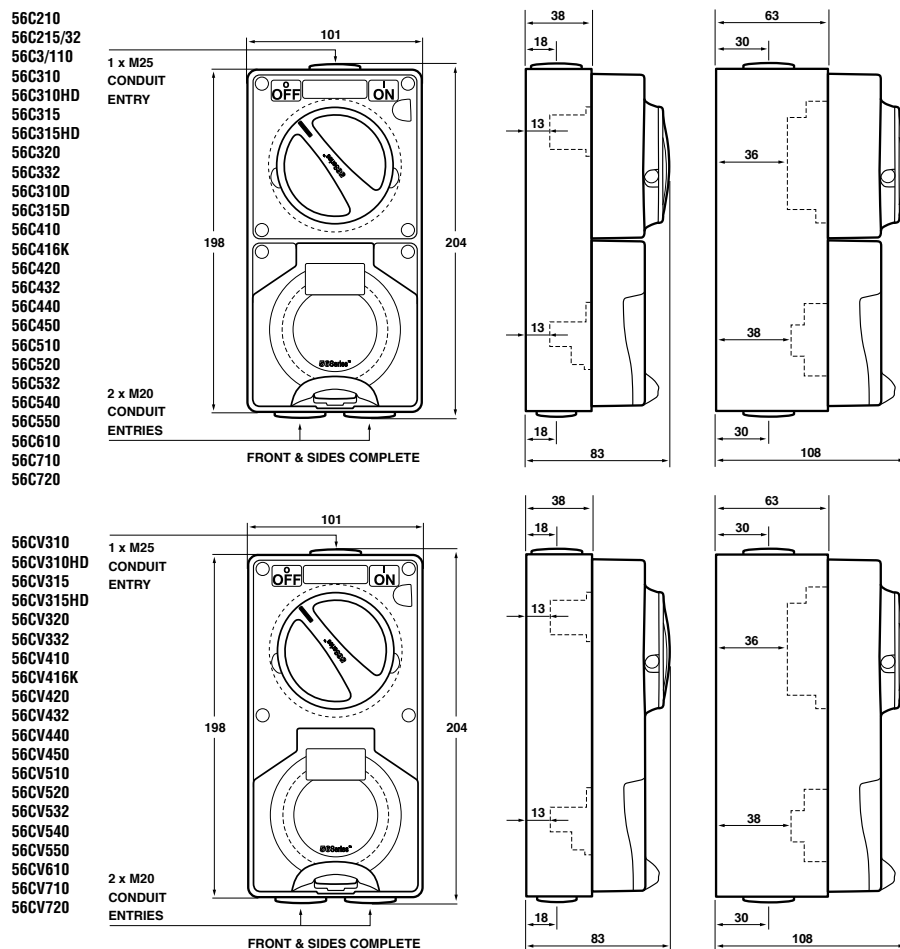


**56CV315,R0**

Combination sockets feature a clear dustproof and hoseproof flap with a snap catch latch. Both the superseded non IP56 plain plugs and the current IP66 retention ring plugs can be accommodated. 250V, 110V and extra low voltage two module combinations are also available.

Earth and neutral connectors accommodating 3 x 6mm<sup>2</sup> cables are supplied with 500V models.

## Dimensional Drawings



## Options available

- Less Enclosure - add LE to Catalogue Number e.g. 56C410 becomes 56C410LE.
- Versions with key operated switches available to special order.

Catalogue Number	No. of switch poles	I <sub>the</sub> (Amp)	U <sub>i</sub> / U <sub>e</sub> (Volt)
56C210	1 Pole	10A	110V
56C215/32	1 Pole	15A	32V
56C310	1 Pole	10A	110V
56C310RP	1 Pole	10A	250V
56C310	1 Pole	10A	250V
56C310HD	1 Pole	10A	250V
56C310L	1 Pole	10A	250V
56C315	1 Pole	15A	250V
56C315HD	1 Pole	15A	250V
56C320	1 Pole	20A	250V
56C320F	1 Pole	20A	250V
56C332	1 Pole	32A	250V
56C310D	2 Pole	10A	250V
56C315D	2 Pole	15A	250V
56C410	3 Pole	10A	500V
56C416K	3 Pole	16A	500V
56C420	3 Pole	20A	500V
56C432	3 Pole	32A	500V
56C440	3 Pole	40A	500V
56C450	3 Pole	50A	500V
56C510	3 Pole	10A	500V
56C520	3 Pole	20A	500V
56C532	3 Pole	32A	500V
56C540	3 Pole	40A	500V
56C550	3 Pole	50A	500V
56C610	3 Pole	10A	500V
56C710	3 Pole	10A	500V
56C720	3 Pole	20A	500V

Catalogue Number	No. of switch poles	I <sub>the</sub> (Amp)	U <sub>i</sub> / U <sub>e</sub> (Volt)
56CV310	1 Pole	10A	250V
56CV310HD	1 Pole	10A	250V
56CV315	1 Pole	15A	250V
56CV315HD	1 Pole	15A	250V
56CV320	1 Pole	20A	250V
56CV332	1 Pole	32A	250V
56CV410	3 Pole	10A	500V
56CV416K	3 Pole	16A	500V
56CV420	3 Pole	20A	500V
56CV432	3 Pole	32A	500V
56CV440	3 Pole	40A	500V
56CV450	3 Pole	50A	500V
56CV510	3 Pole	10A	500V
56CV520	3 Pole	20A	500V
56CV532	3 Pole	32A	500V
56CV540	3 Pole	40A	500V
56CV550	3 Pole	50A	500V
56CV610	3 Pole	10A	500V
56CV710	3 Pole	10A	500V
56CV720	3 Pole	20A	500V

Refer to page 57 for explanation of socket configurations.

# Combination Switched Socket Outlets

- Internal interlock facility available on three phase, one piece cover combinations - add I to Catalogue Number e.g. 56CV410 becomes 56CVI410.
- Resistant Orange - add RO to Catalogue Number e.g. 56CV410 becomes 56CV410,RO.
- Resistant White - add RW to Catalogue Number e.g. 56C410 becomes 56C410,RW.
- Two piece versions available in Chemical Grey. Chemical Grey - add CG to Catalogue Number e.g. 56C410 becomes 56C410,CG.

## TWO PIECE

le (A) Utilisation Category			M Rating	Number of Sockets	Cond. Term Size in mm <sup>2</sup>		IP Rating	O/A Dims. (H) x (W) x (D)	Matching Plug Straight	Matching Plug Angle	Socket Config
AC21A	AC22A	AC23A			Min.	Max/Cond.					
10	8	8	M80	2 Parallel Flat	1.5	6	66	204x101x83	56P210		D
15	10	8	M80	2 Polarised	1.5	6	66	204x101x83	56P215/32		E
10	8	8	M80	2 Round & Flat Earth	1.5	6	66	204x101x83	56P3/110		J
10	8	8	M80	3 Round	1.5	6	66	204x101x83	56P310RP		G
10	8	8	M80	3 Flat	1.5	6	66	204x101x83	56P310		A
10	10	11	M100	3 Flat w/heavy duty switch	1.5	6	66	204x101x108	56P310		A
10	8	8	M80	2 Flat & Round Earth	1.5	6	66	204x101x83	56P310SL		C
15	10	8	M80	3 Flat	1.5	6	66	204x101x83	56P315		B
15	15	15	M120	3 Flat w/heavy duty switch	1.5	6	66	204x101x108	56P315		B
20	20	21	M150	3 Round	2.5	6	66	204x101x108	56P320	56PA320	H
20	20	20	M150	3 Flat	2.5	6	66	204x101x108	56P320F		F
32	32	28	M180	3 Round	6	16	66	204x101x108	56P332	56PA332	I
10	10	11	M100	3 Flat double pole	1.5	6	66	204x101x108	56P310		A
15	15	15	M120	3 Flat double pole	1.5	6	66	204x101x108	56P315		B
10	10	11	M100	4 Round	1.5	6	66	204x101x108	56P410	56PA410	K
16	16	15	M120	Unique key config.	1.5	6	66	204x101x108	56P416K	56PA416K	M
20	20	21	M150	4 Round	2.5	6	66	204x101x108	56P420	56PA420	L
32	32	28	M180	4 Round	4	16	66	204x101x108	56P432	56PA432	N
40	40	35	M200	4 Round	10	16	66	204x101x108	56P440	56PA440	O
50	50	35	M250	4 Round	10	16	66	204x101x108	56P450	56PA450	P
10	10	11	M100	5 Round	1.5	6	66	204x101x108	56P510	56PA510	Q
20	20	21	M150	5 Round	2.5	6	66	204x101x108	56P520	56PA520	R
32	32	28	M180	5 Round	4	16	66	204x101x108	56P532	56PA532	S
40	40	35	M200	5 Round	10	16	66	204x101x108	56P540	56PA540	T
50	50	35	M250	5 Round	10	16	66	204x101x108	56P550	56PA550	U
10	10	11	M100	6 Round	1.5	6/2.5	66	204x101x108	56P610	56PA610	V
10	10	11	M100	7 Round	1.5	6/2.5	66	204x101x108	56P710	56PA710	W
20	20	21	M150	7 Round	2.5	6/2.5	66	204x101x108	56P720	56PA720	X

## ONE PIECE

le (A) Utilisation Category			M Rating	Number of Sockets	Cond. Term Size in mm		IP Rating	O/A Dims. (H) x (W) x (D)	Matching Plug Straight	Matching Plug Angle	Socket Config
AC21A	AC22A	AC23A			Min.	Max/Cond.					
10	8	8	M80	3 Flat	1.5	6	66	204x101x83	56P310		A
10	10	11	M100	3 Flat w/heavy duty switch	1.5	6	66	204x101x83	56P310		A
15	10	8	M80	3 Flat	1.5	6	66	204x101x83	56P315		B
15	15	15	M120	3 Flat w/heavy duty switch	1.5	6	66	204x101x108	56P315		B
20	20	21	M150	3 Round	2.5	6	66	204x101x108	56P320	56PA320	H
32	32	28	M180	3 Round	6	16	66	204x101x108	56P332	56PA332	I
10	10	11	M100	4 Round	1.5	10	66	204x101x108	56P410	56PA410	K
16	16	15	M120	Unique key config.	1.5	6	66	204x101x108	56P416K	56PA416K	M
20	20	21	M150	4 Round	2.5	10	66	204x101x108	56P420	56PA420	L
32	32	28	M180	4 Round	4	16	66	204x101x108	56P432	56PA432	N
40	40	35	M200	4 Round	6	16	66	204x101x108	56P440	56PA440	O
50	50	35	M250	4 Round	10	16	66	204x101x108	56P450	56PA450	P
10	10	11	M100	5 Round	1.5	10	66	204x101x108	56P510	56PA510	Q
20	20	21	M150	5 Round	2.5	10	66	204x101x108	56P520	56PA520	R
32	32	28	M180	5 Round	4	16	66	204x101x108	56P532	56PA532	S
40	40	35	M200	5 Round	6	16	66	204x101x108	56P540	56PA540	T
50	50	35	M250	5 Round	10	16	66	204x101x108	56P550	56PA550	U
10	10	11	M100	6 Round	1.5	6/2.5	66	204x101x108	56P610	56PA610	V
10	10	11	M100	7 Round	1.5	6/2.5	66	204x101x108	56P710	56PA710	W
20	20	21	M150	7 Round	2.5	6/2.5	66	204x101x108	56P720	56PA720	X

Note: AC utilisation categories to AS/NZS3947.3 I<sub>th</sub> - Conventional Enclosed Thermal Current U<sub>i</sub> - Insulation Voltage U<sub>o</sub> - Operational Voltage

# Surface Socket Outlets



56S0310,GY



56S0520,RO



56S0710,RW

## Extra Low Voltage and 3 Phase sockets

Clipsal Surface Socket Outlets range in size from 32V 10A to 500V 50A.

All sockets feature hoseproof and dust resistant flaps with automatic snap catch latches. The transparent flap enables instant visual inspection of socket condition and pin configuration.

The full range of sockets accommodate both the superseded IP56 plain plugs and the current IP66 retention ring plugs in order to rationalise the number of variations required.

Earth and neutral connectors accommodating 3 x 6mm<sup>2</sup> cable are supplied with all 500V models.

Terminal housings are moulded in tough polyester to minimise damage.

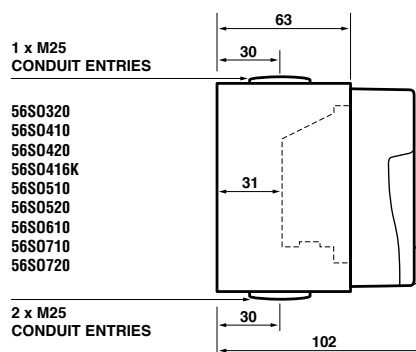
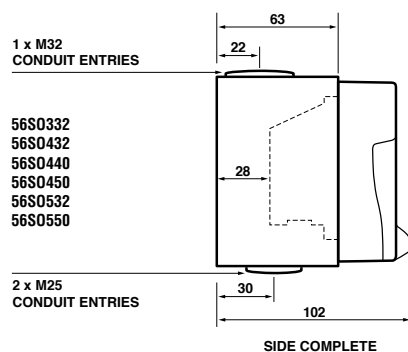
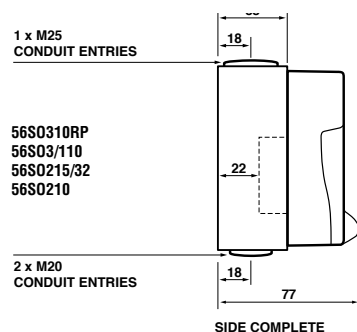
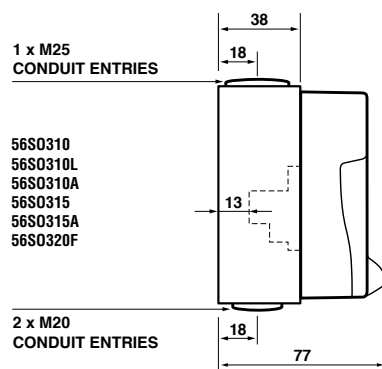
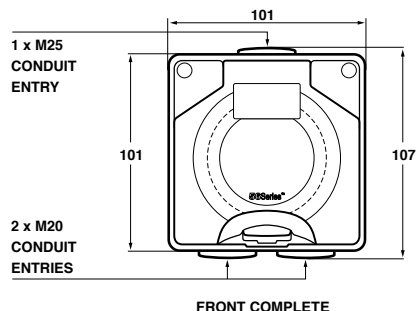
Catalogue Number	I <sub>the</sub> (Amp)	U <sub>i</sub> / U <sub>e</sub> (Volt)	Number of Sockets	Cond. Term Size in mm		IP Rating	O/A Dims. (H) x (W) x (D)	Matching Plug Straight	Matching Plug Straight	Socket Config.
				Min.	Max/Cond.					
56S0210	10A	110V	2 Parallel Flat	1.5	16	66	107x101x77	56P210		D
56S0215/32	15A	32V	2 Pin Polarised	1.5	6	66	107x101x77	56P215/32		E
56S03/110	10A	110V	2 Round Live & Flat Earth	1.5	6	66	107x101x77	56P3/110		J
56S0310RP	10A	250V	3 Round	1.5	6	66	107x101x77	56P310RP		G
56S0310	10A	250V	3 Flat	1.5	6	66	107x101x77	56P310		A
56S0315	15A	250V	3 Flat	1.5	6	66	107x101x77	56P315		B
56S0310A	10A	250V	3 Flat auto-switched D/P	1.5	10	66	107x101x77	56P310		A
56S0315A	15A	250V	3 Flat auto-switched D/P	1.5	10	66	107x101x77	56P315		B
56S0310L	10A	250V	2 Flat & Round Earth	1.5	6	66	107x101x77	56P310SL		C
56S0320	20A	250V	3 Round	2.5	6	66	107x101x102	56P320	56PA320	H
56S0320F	20A	250V	3 Flat Pins	2.5	6	66	107x101x77	56P320F		F
56S0332	32A	250V	3 Round	6	16	66	107x101x102	56P332	56PA332	I
56S0410	10A	500V	4 Round	1.5	6	66	107x101x102	56P410	56PA410	K
56S0416K	16A	500V	Unique key configuration	1.5	6	66	107x101x102	56P416K	56PA416K	M
56S0420	20A	500V	4 Round	2.5	6	66	107x101x102	56P420	56PA420	L
56S0432	32A	500V	4 Round	4	16	66	107x101x102	56P432	56PA432	N
56S0440	40A	500V	4 Round	6	16	66	107x101x102	56P440	56PA440	O
56S0450	50A	500V	4 Round	10	16**	66	107x101x102	56P450	56PA450	P
56S0510	10A	500V	5 Round	1.5	6	66	107x101x102	56P510	56PA510	Q
56S0520	20A	500V	5 Round	2.5	6	66	107x101x102	56P520	56PA520	R
56S0532	32A	500V	5 Round	4	16	66	107x101x102	56P532	56PA532	S
56S0540	40A	500V	5 Round	6	16	66	107x101x102	56P540	56PA540	T
56S0550	50A	500V	5 Round	10	16**	66	107x101x102	56P550	56PA550	U
56S0610	10A	500V	6 Round	1.5	6/2.5	66	107x101x102	56P610	56PA610	V
56S0710	10A	500V	7 Round	1.5	6/2.5	66	107x101x102	56P710	56PA710	W
56S0720	20A	500V	7 Round	2.5	6/2.5	66	107x101x102	56P720	56PA720	X

Note: 56S0320 and 56S0320F come with the facility to fit auxiliary switch 56S0AUX15.

\*\* - L1, L2, L3 Cable size max. 25mm<sup>2</sup> I<sub>the</sub> - Conventional Enclosed Thermal Current U<sub>i</sub> - Insulation Voltage

# Surface Socket Outlets

## Dimensional Drawings



## Spare Parts Internal Socket Housings

A full range of replacement internal socket housings is available for 3 phase 56SO models. They eliminate the need to replace an entire unit if only the internal socket housing is damaged. Socket terminal housings are moulded in durable polyester.

### Options available

- Less Enclosure - add LE to catalogue number e.g. 56SO410 becomes 56SO410LE.
- Resistant Orange - add RO to catalogue number e.g. 56SO410 becomes 56SO410,RO.
- Resistant White - add RW to catalogue Number e.g. 56SO310 becomes 56SO310RW.



56SO410G Series

Catalogue Number	$I_{the}$ (Amp)	$U_i$ (Volt)	Number of Sockets	Cond. Term Size in mm <sup>2</sup>		Socket Configuration
				Min.	Max/Cond.	
56SO320G	20A	250V	3 Round	2.5	6	H
56SO332G	32A	250V	3 Round	6	16	I
56SO410G	10A	500V	4 Round	1.5	6	K
56SO416KG	16A	500V	Unique key configuration	1.5	6	M
56SO420G	20A	500V	4 Round	2.5	6	L
56SO432G	32A	500V	4 Round	6	16	N
56SO440G	40A	500V	4 Round	10	16	O
56SO450G	50A	500V	4 Round	10	16	P
56SO510G	10A	500V	5 Round	1.5	6	Q
56SO520G	20A	500V	5 Round	2.5	6	R
56SO532G	32A	500V	5 Round	6	16	S
56SO540G	40A	500V	5 Round	10	16	T
56SO550G	50A	500V	5 Round	10	16	U
56SO610G	10A	500V	6 Round	1.5	6/2.5	V
56SO710G	10A	500V	7 Round	1.5	6/2.5	W
56SO720G	20A	500V	7 Round	2.5	6/2.5	X

$I_{the}$  - Conventional Enclosed Thermal Current  $U_i$  - Insulation Voltage

# Technical Tables

Cable Size - Nominal Area of Conductor mm <sup>2</sup>	No. and Diameter of Wires for Standard Conductor No./mm	Overall Diameter of AS/NZS300U Table E7 mm
0.5	1/0.80	2.5
1	1/1.13	2.9
1.5	1/1.38	3.2
	7/0.50	3.3
2.5	1/1.78	3.6
	7/0.67	3.8
4	7/0.85	4.8
6	7/1.04	5.3
10	7/1.35	6.3
16	7/1.70	7.3
25	19/1.35	9.4
35	19/1.53	10.4
50	19/1.78	12.0
70	19/2.14	13.8
95	37/1.78	16
120	37/2.03	17.7
150	37/2.25	19.7
185	37/2.52	22
240	61/2.25	25.1
300	61/2.52	27.9
400	61/2.85	31.4
500	61/3.20	34.9
630	127/2.52	38.9

Dimensions, standard copper and aluminium conductors 1 core 0.6/1kV PVC insulated cable to AS/NZS5000, 75°C

Note: For exact dimensions refer to manufacturers' details.

## Useful 3-Phase Formulae

$$\text{kW} = \frac{\text{Line Amps} \times \text{Line Volts} \times 1.732 \times \text{P.F.}}{1000}$$

$$\text{kVA} = \frac{\text{Line Amps} \times \text{Line Volts} \times 1.732}{1000}$$

$$\text{kW} = \text{kVA} \times \text{P.F.}$$

## Electric Motors

$$\text{Power Output} = \text{Power Input} \times \text{Efficiency}$$

$$\text{kW Output} = \text{kW Input} \times \text{Efficiency}$$

$$\text{kW Output} = \frac{1.732 \times \text{Line Volts} \times \text{Line Amps} \times \text{P.F.} \times \text{Efficiency}}{1000}$$

$$\text{kVA Input} = \frac{1.732 \times \text{Line Volts} \times \text{Line Amps}}{1000}$$

$$\text{Line Amperes} = \frac{1000 \times \text{kW Output}}{\text{Line Volts} \times 1.732 \times \text{P.F.} \times \text{Efficiency}}$$

$$\text{Line Amperes} = \frac{1000 \times \text{kVA Input}}{\text{Line Volts} \times 1.732}$$

The power factor is usually taken as 0.8 (as an all-round figure) but this varies with the speed and size of the motor. The efficiency varies from 85% in small motors to 90% and over for large motors.

Measure	Symbol	Unit
Length	S	m
Area	A	m <sup>2</sup>
Volume	V	m <sup>3</sup>
Weight	m	kg
Density	P	kg/m <sup>3</sup>
Time	t	s
Frequency	F	Hz
Rotary Speed	n	s <sup>-1</sup>
Linear Speed	v	ms <sup>-1</sup>
Acceleration	a	ms <sup>-2</sup>
Power	F	N (Newton)
Pressure	P	Pa (Pascal)
Torque	M	Nm
Work	W	J (Joule)
Power	P	W (Watt)
Reactive Voltampere		Var
Voltampere		V.A
Current	I	A (Ampere)
Operational Current	I <sub>th</sub>	A
Conventional Enclosed	I <sub>the</sub>	A
Thermal Current	61/2.85	31.4
Voltage	U	V (Volts)
Insulated Voltage	U <sub>i</sub>	V
Operational Voltage	U <sub>e</sub>	V
Resistance	R	(Ohm)
Impedance	Z	
Reactance	X	
Reluctance	S	A/Wb
Capacitance	C	F (Farad)
Quantity of Electricity	Q	C (Coulomb)
Magnetic Field Strength	H	A/m
Magnetic Flux	Ø	Wb (Weber)
Inductance	L	H (Henry)
Magnetic Flux Density	B	T (Tesla)
Temperature	t	°C (Centigrade)
Illuminance	E	lx (Lux)
Luminance	L	cd/m <sup>2</sup>
Luminous Flux	Ø	lm (Lumen)
Luminous Intensity	I	cd (Candela)

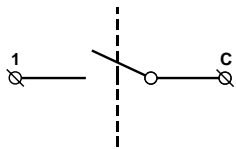
### Abbreviations for Multiples and Sub Multiples

T	tera	10 <sup>12</sup>
G	giga	10 <sup>9</sup>
M	mega	10 <sup>6</sup>
k	kilo	10 <sup>3</sup>
d	deci	10 <sup>-1</sup>
c	centi	10 <sup>-2</sup>
m	milli	10 <sup>-3</sup>
u	micro	10 <sup>-6</sup>
n	nano	10 <sup>-9</sup>
p	pico	10 <sup>-12</sup>

# Common Conversion Factors

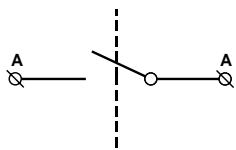
Quality	Non-SI Unit	Metric	Conversion Factors (approx.) Non-SI to Metric (SI) Units	Metric (SI) to Non-SI Units
Length	Inch (in)	Millimetre (mm) or Centimetre (cm)	1 in = 25.4mm	1 cm = 0.39 in
	Foot (ft)	Centimetre (cm) or Metre (m)	1 ft = 30.5 cm	1 m = 3.28 ft
	Yard (yd)	Metre (m)	1 yd = 0.914 m	1 m = 1.09 yd
	Mile	Kilometre (km)	1 mile = 1.61 km	1 km = 0.62 mile
Area	Square Inch (in <sup>2</sup> )	Square Millimetre (mm <sup>2</sup> )	1 in <sup>2</sup> = 645 mm <sup>2</sup>	1 mm <sup>2</sup> = 0.002 in <sup>2</sup>
	Square Inch (in <sup>2</sup> )	Square Centimetre (cm <sup>2</sup> )	1 in <sup>2</sup> = 6.45 cm <sup>2</sup>	1 cm <sup>2</sup> = 0.155 in <sup>2</sup>
	Square Foot (ft <sup>2</sup> )	Square Centimetre (cm <sup>2</sup> ) or Square Metre (m <sup>2</sup> )	1 ft <sup>2</sup> = 929 cm <sup>2</sup>	1 m <sup>2</sup> = 10.76 ft <sup>2</sup>
	Square Yard (yd <sup>2</sup> )	Square Metre (m <sup>2</sup> )	1 yd <sup>2</sup> = 0.836m <sup>2</sup>	1 m <sup>2</sup> = 1.20 yd <sup>2</sup>
	Acre	Hectare (ha)	1 acre = 0.405 ha	1 ha = 2.47 acres
	Square Mile	Square Kilometre (km <sup>2</sup> )	1 Square Mile = 2.59 km <sup>2</sup>	1 km <sup>2</sup> = 0.387 sq. mile
Volume	Cubic Inch (in <sup>3</sup> )	Cubic Centimetre (cm <sup>3</sup> )	1 in <sup>3</sup> = 16.4 cm <sup>3</sup>	1 cm <sup>3</sup> = 0.06 in <sup>3</sup>
	Cubic Inch (ft <sup>3</sup> )	Cubic Decimetre (dm <sup>3</sup> ) or	1 ft <sup>3</sup> = 28.3 dm <sup>3</sup>	1 m <sup>3</sup> = 35.3 ft <sup>3</sup>
	Cubic Yard (yd <sup>3</sup> )	Cubic Metre (m <sup>3</sup> )	1 yd <sup>3</sup> = 0.765m <sup>3</sup>	1 m <sup>3</sup> = 1.31 yd <sup>3</sup>
Volume (Fluids)	Fluid Ounce UK (fl. oz UK)	Millilitre (ml)	1 fl. oz (UK) = 28.4 ml	1 ml = 0.035 fl. oz (UK)
	Pint UK (pt UK)	Millilitre (ml) or Litre (l)	1 pint UK = 568 ml	1 l = 1.76 pint (UK)
	Gallon UK (gal UK)	Litre (l) or Cubic Metre (m <sup>3</sup> )	1 gal UK = 4.55 l	1 m <sup>3</sup> = 220 gallons (UK)
	Fluid Ounce US (Fl. oz US)	Millilitre (ml)	1 fl. oz (US) = 29.6 ml	1 ml = 0.034 fl. oz (US)
	Pint US (gal US)	Litre (l) or Millilitre	1 pint (US) = 473 ml	1 l = 2.11 pint (US)
	Gallon US (gal US)	Litre	1 gallon (US) = 3.79 l	1 l = 0.264 gallon (US)
Mass	Ounce (oz)	Gram (g)	1 oz = 28.3 g	1 g = 0.035 oz
	Pound (lb)	Gram (g) or kilogram (kg)	1 lb = 454 g	1 kg = 2.20 lb
	Ton	Tonne (t)	1 ton = 1.02 tonne	1 tonne = 0.984 ton
	tael	Gram (g)	1 tael = 37.8 g	1 g = 0.026 tael
	Catty	Kilogram (kg)	1 catty = 0.605 kg	1 kg = 1.65 cattoes
	Picul	Kilogram (kg)	1 picul = 60.50 kg	1 kg = 0.017 picul
Force	Pound Force (lbf)	Newton (N)	1 lbf = 4.45 N	1 N = 0.225 lbf
	Kilogram Force (kgf)	Newton (N)	1 kgf = 9.81 N	1 N = 0.102 kgf
Pressure	Pound Force per square inch (psi)	kilopascal (kPa)	1 psi = 6.86 kPa	1 kPa = 0.145 psi
	Kilogram force per square centimetre (kgf/cm <sup>2</sup> )	kilopascal (kPa)	1 kgf/cm <sup>2</sup> = 98 kPa	1 kPa = 0.01 kgf/cm <sup>2</sup>
	Inch of water (in H <sub>2</sub> O)	Pascal (Pa)	1 in H <sub>2</sub> O = 249 Pa	1 Pa = 0.004 in H <sub>2</sub> O
	Bar	kilopascal (kPa)	1 Bar = 100 kPa	1 kPa = 0.01 bar
Velocity	Mile per hour (mph)	Kilometre per hour (km/h)	1 mile = 1.61 km/h	1 km/h = 0.62 mph
Temperature	Fahrenheit temp. (F)	Celsius temp. (C)	$^{\circ}\text{C} = \frac{(^{\circ}\text{F} - 32)}{9}$	$^{\circ}\text{F} = \frac{(9 \times ^{\circ}\text{C}) + 32}{5}$
Density	Pound per cubic inch (lb/in <sup>3</sup> )	Gram per cubic centimetre (g/cm <sup>3</sup> ) = tonne per cubic metre (t/m <sup>3</sup> )	1 lb/in <sup>3</sup> = 27.7 t/m <sup>3</sup>	1 t/m <sup>3</sup> = 0.036 lb/in <sup>3</sup>
	Pound per cubic foot (lb/ft <sup>3</sup> )	Kilogram per cubic metre (kg/m <sup>3</sup> )	1 lb/ft <sup>3</sup> = 16.02 kg/m <sup>3</sup>	1 kg/m <sup>3</sup> = 0.06 lb/ft <sup>3</sup>
	Ton per cubic yard (ton/yd <sup>3</sup> )	Tonne per cubic metre (t/m <sup>3</sup> )	1 ton/yd = 1.33 t/m <sup>3</sup>	1 t/m <sup>3</sup> = 0.752 ton/yd <sup>3</sup>
Energy	British thermal unit (Btu)	Kilojoule (kJ)	1 Btu = 1.06 kJ	1 kJ = 0.948 Btu
	Therm	Megajoule (MJ)	1 Therm = 106 MJ	1 MJ = 9.48 x 10 <sup>-3</sup> therm
	Calorie (dietician)	Kilojoule (kJ)	1 Cal (dietician) = 4 kJ	1 kJ = 0.23 Cal (dietician)
Power	Horsepower (hp)	Kilowatt (kW)	1 hp = 0.746 kW	1 kW = 1.34 hp
Fuel Consumption	Mile per gallon (mpg)	Litres per 100 m	$\frac{(n) \times \text{mpg} = 282/100 \text{ km}}{n}$	$\frac{(n) \times 1/100 \text{ km} = 282}{n}$

# Switch Wiring Diagram Types

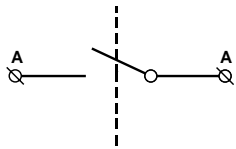


Switch is 30 Series mech.

56C215/32	56C310C	56SW110
56C210	56C3/110	56SW115
56C310	56C310RP	
56C315	56CV310	
	56CV315	

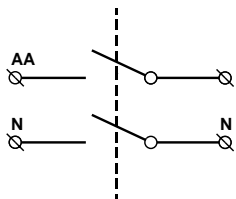


56C310HD  
56C315HD



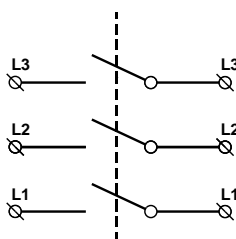
Switch terminals are not identified  
Switch is backwired  
Conductor termination is pressure plate type

56C320	56SW110HD
56CV310HD	56SW115H
56CV310HD	56SW120
	56SW132
	56SW150
	56SW163



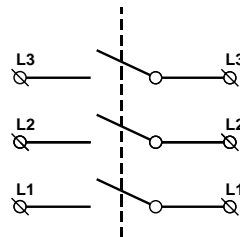
Switch terminals are not identified  
Switch is backwired  
Conductor termination is pressure plate type

56C310D
56C315D



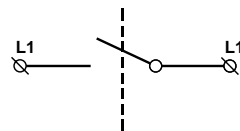
Switch terminals are not identified  
Switch is backwired  
Conductor termination is pressure plate type

56C410	56CV410	56CV710	56K1SW310
56C420	56CV420	56CV720	56K1SW320
56C416K	56CV510	56CV432	56K2SW310
56C510	56CV520	56CV532	56K2SW320
56C520	56CV416K	56CV440	
	56CV610	56CV450	



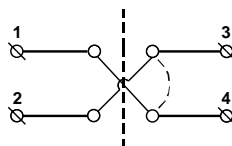
Switch terminals are not identified  
Switch is backwired  
Conductor termination is plain screw type

56SWH	66CV450	56SW363/2	56C610	56C432	56C550
56SWH 325	66CV463	56SW363	56C710	56C532	56CV540
56SWH 363		56SW350	56C720	56C450	56CV550
56SWH 340		56SW332	56C440	56C540	56SW310
56SWH 380					56SW320

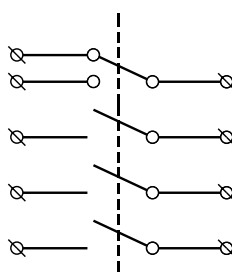


Switch terminals are not identified  
Switch is backwired  
Conductor termination is plain screw type

56K1SW120
K6K2SW120



56SW110/1  
56SSW10/1



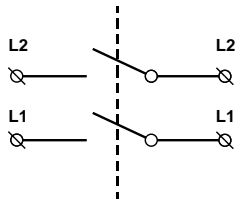
56SW363 with  
56SWAUX15

**MICRO**

Switch terminals are not identified  
Switch is backwired  
Conductor termination is plain screw type

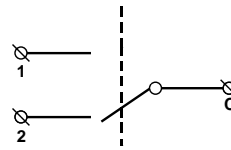
Replaces  
56C320C  
56C332C  
56C350C

# Switch Wiring Diagram Types



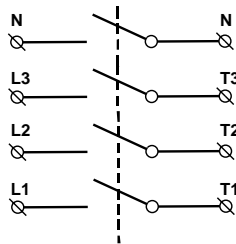
Switch is sidewired  
Conductor termination is pressure plate type

56SW220	56K1SW220
56SW232	56K2SW220
56SW250	
56SW263	



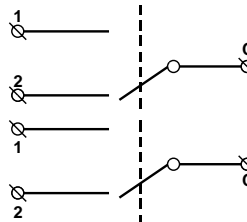
Switch is 30 Series mech.

56SW110/2
56SW115/2
56SSW10
56SSW15



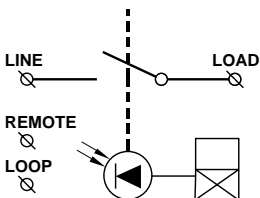
If neutral potential is applied to remote terminal timer function is overridden

56SW420
56SWH425
56SWH440
56SWH463
66CV550
66CV563
66CV750
66CV763



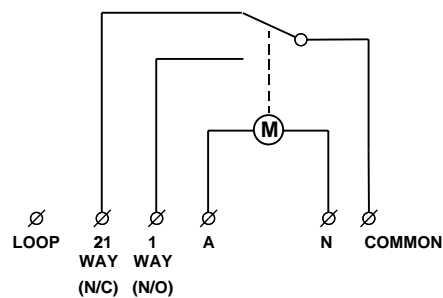
Circuit is shown in the 'OFF' position

56SSW2/10
56SSW2/15



Switch is sidewired  
Conductor termination is pressure plate type

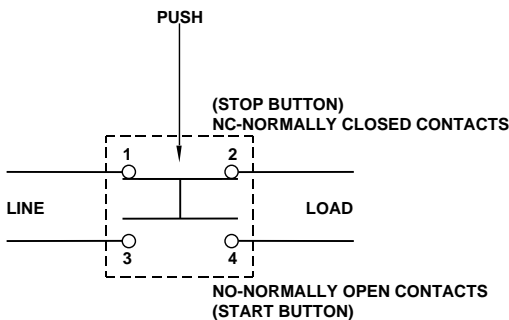
56SSR



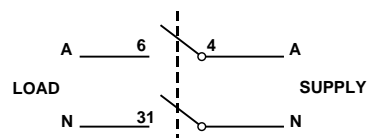
Switch is 30 Series mech.

Conductor termination is pressure plate type

56CTC
56CTC15
56CTC2SO
56CTC2SO15
56TC
56TC7
56TCDB

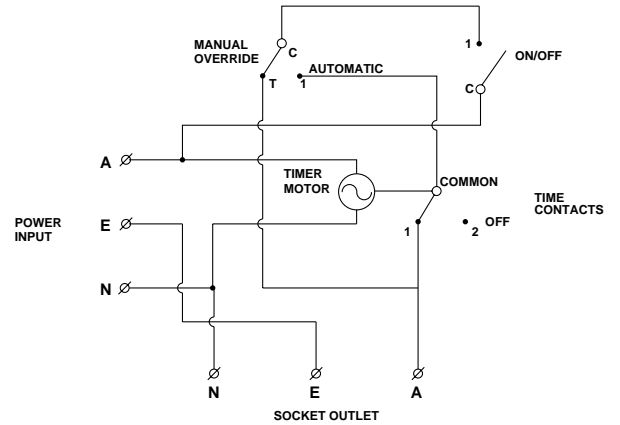
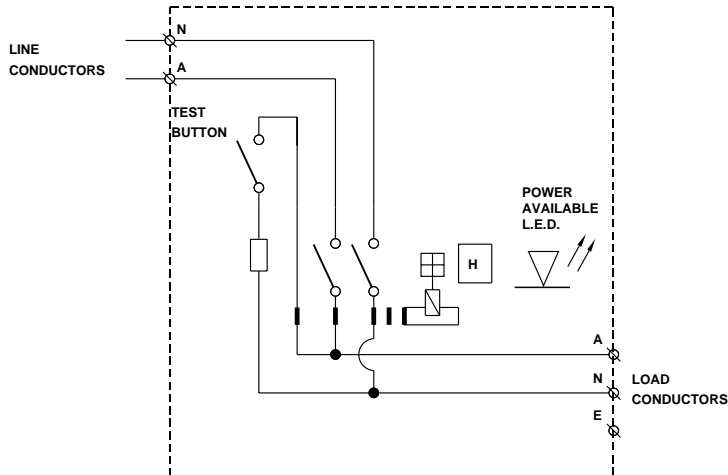


56PB	(No Marking, Colour Green, Non Latching)
56PBS	(Stop, Colour Red, Non Latching)
56PBS1	(Emergency Stop, Marked on Switch and Plate, Colour Red Mushroom, Latching)
56PBS2	(Stop, Colour Red Mushroom, Latching)
56/2PB	(Stop/Start, Colour Red/Green, Non Latching)
56/2PBS1	(Stop, Colour Red Mushroom, Latching)(Start, Colour Green, Non Latching)



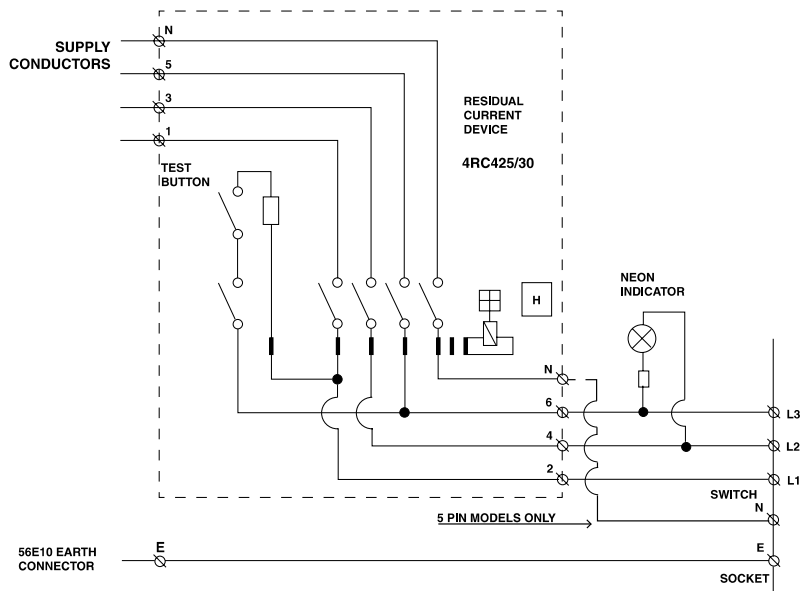
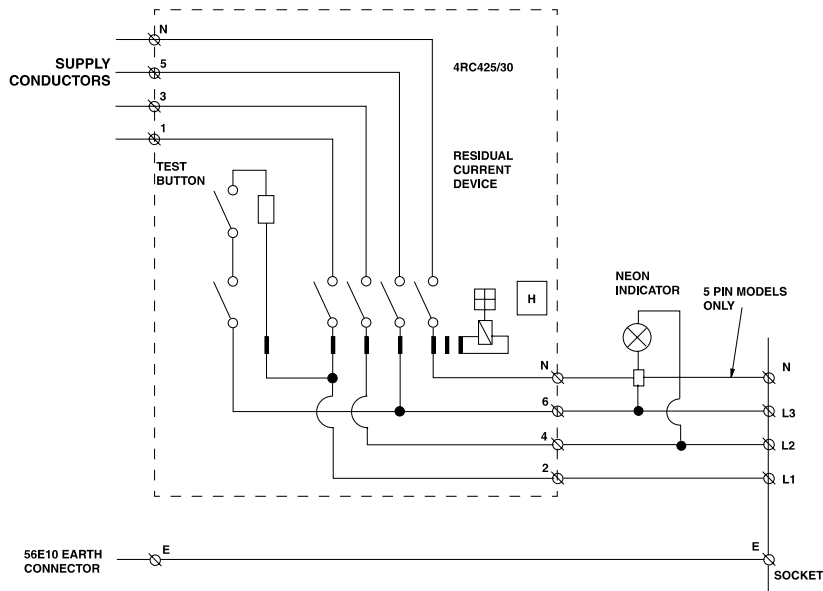
56SWT216

# Wiring Diagram Types



56CTC Series wiring identification

Switches are 30 series mech

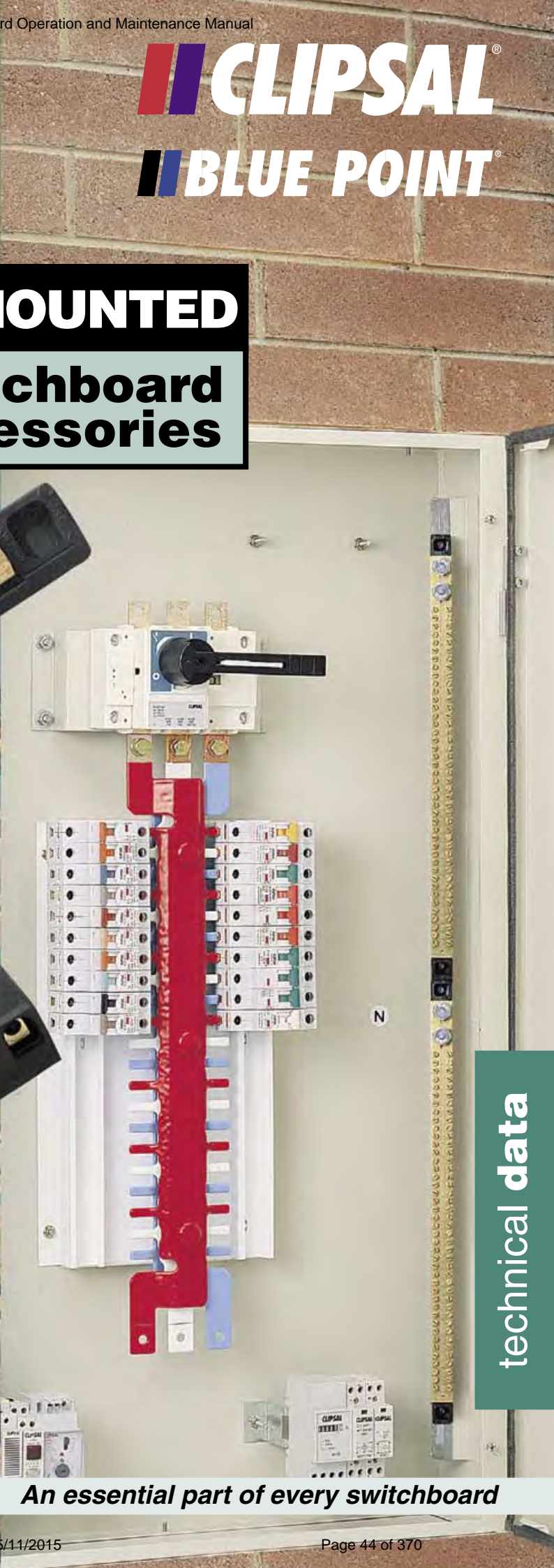
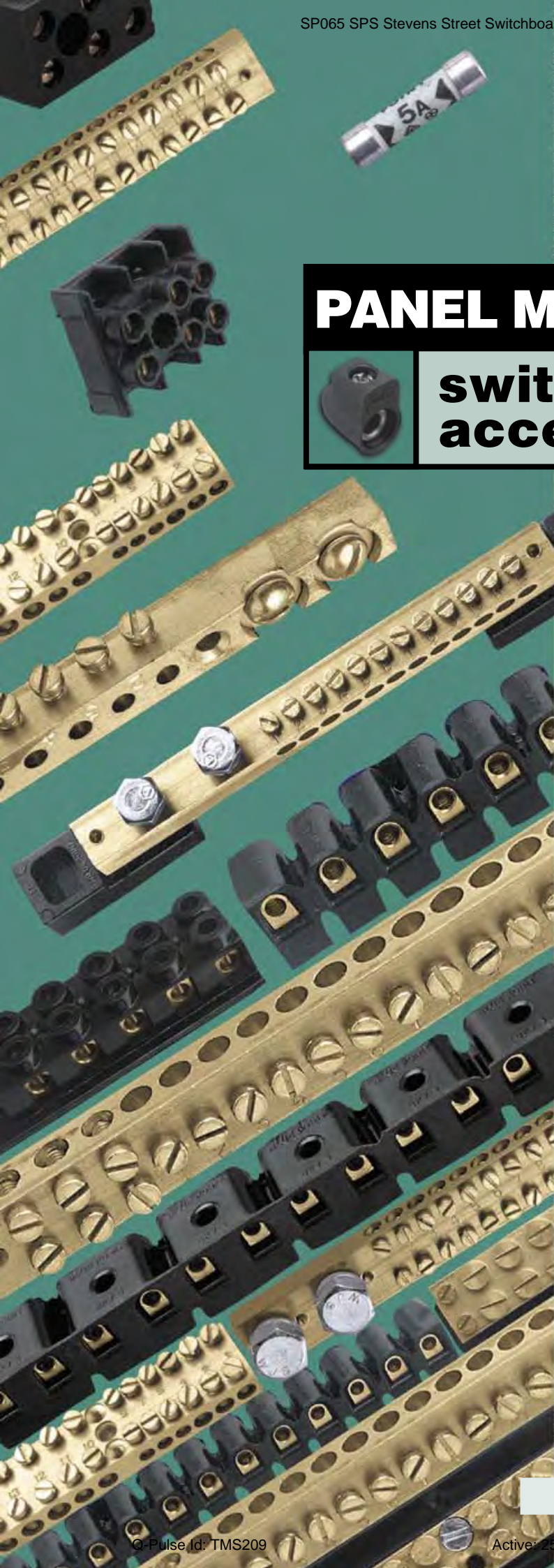


**CLIPSAL®**  
**BLUE POINT®**

## PANEL MOUNTED



**switchboard  
accessories**



technical data

***An essential part of every switchboard***

## HEAVY DUTY LINKS

### BP165/7

500V 165A 7 Hole Link.



BP165/7

### BP165/7ETP

500V 165A 7 Hole Link with tin-plate link and screws. Two screws per tunnel. Black unbreakable, transparent polycarbonate base and cover.

Dimensions: 100 x 43 x 40mm.

Terminal bar: 16 x 16 x 76mm.

2 tunnels: 9.5mm diameter accommodate 50mm<sup>2</sup> cables.

1 tunnel: 8.0mm diameter accommodates 35mm<sup>2</sup> cable.

2 tunnels: 7.1mm diameter accommodate 25mm<sup>2</sup> cables.

2 tunnels: 5.5mm diameter accommodate 16mm<sup>2</sup> cables.

Mounting centres: 71 x 29mm.

Available in red.

### BP165/7BW

500V 165A 7 Hole Back Wiring Link.

2 terminal tunnels: 9.5mm diameter accommodate 50mm<sup>2</sup> cable, have single screw connection.

5 remaining terminals have 2 screws per tunnel. See BP165/7 above.

Temperature rating: 120°C maximum.

### BP165/13

500V 165A 13 Hole Link. Two screws per tunnel. Black unbreakable, transparent polycarbonate base and cover.

Dimensions: 120 x 47 x 52mm.

Terminal Bar: 19 x 16 x 95.3mm.

2 tunnels: 9.5mm diameter accommodate 50mm<sup>2</sup> cable.

5 tunnels: 6.4mm diameter accommodate 16mm<sup>2</sup> cable.

6 tunnels: 4.8mm diameter accommodate 10mm<sup>2</sup> cable.

Mounting centres: 90 x 34mm.

Available in red.

Temperature rating: 125°C maximum.



BP165/13

### BP165/13ETP

Same as BP165/13 with electro tin-plate link and screws.

### BP350/7

500V 7 Hole Link. Incoming cables clamped with single grub screw. Supplied with Allen key. Two screws per take off tunnel. Black base and cover.

Dimensions: 120 x 47 x 52mm.

Terminal bar: 25.4 x 19 x 95.3mm.

2 tunnels: 15.0mm diameter accommodate 120mm<sup>2</sup> cables.

2 tunnels: 9.5mm diameter accommodate 50mm<sup>2</sup> cables.

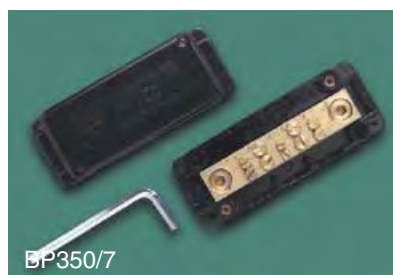
2 tunnels: 8.0mm diameter accommodate 35mm<sup>2</sup> cables.

1 tunnel: 5.5mm diameter accommodates 16mm<sup>2</sup> cables.

Mounting centres: 90 x 34mm.

Available in red.

Temperature rating 125°C maximum.



BP350/7

### BP350/7ETP

Same as BP350/7 with electro tin-plate link and screws.

### BP350/13

500V 13 Hole Link. Incoming cables clamped with single grub screw. Supplied with Allen key. Two screws per take off tunnel. Black unbreakable, transparent polycarbonate base and cover.

Dimensions: 120 x 47 x 52mm.

Terminal bar: 25.4 x 19 x 95.3mm.

2 tunnels: 15.0mm diameter accommodate 120mm<sup>2</sup> cables.

1 tunnel: 8.0mm diameter accommodates 35mm<sup>2</sup> cable.

8 tunnels: 5.5mm diameter accommodate 16mm<sup>2</sup> cable.

2 tunnels: 4.8mm diameter accommodate 10mm<sup>2</sup>.

Mounting centres: 90 x 34mm.

Available in red.

Temperature rating: 125°C maximum.



BP350/13

### BP350/13ETP

Same as BP350/13 with electro tin-plate link and screws.

## LINK BARS

### BP90A Series 90A Link Bars.

Bar Section: 13 x 9.5mm.

Bars have two 5.5mm diameter tunnels with two screws, for up to 16mm<sup>2</sup> cables.

One 5.2mm diameter tunnel with two screws for M.E.N.

All other tunnels 5.2mm diameter with one screw to accommodate up to 16mm<sup>2</sup> cables.

Single screw tunnels are numbered.



### BP165A Series 165A Link Bars

Bar Section: 19 x 9.5mm.

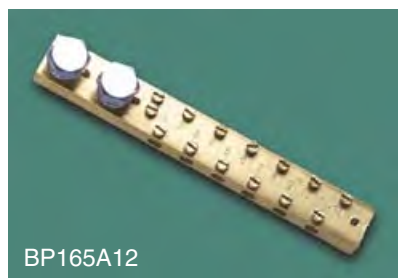
Bars have two 3/8" hexagon head bolts, for up to 165 amp. cable lugs.

One 5.8mm diameter tunnel with two screws for M.E.N.

All other tunnels 5.8mm diameter with one screw to accommodate up to 16mm<sup>2</sup> cables.

Single screw tunnels are numbered.

Available electro tin-plated.



### BP165B Series 165A Link Bars

Bar Section: 19 x 9.5mm.

Bars have one 3/8" hexagon head bolt for up to 165 amp cable lug.

One tunnel 5.8mm diameter, with two screws for M.E.N.

All other tunnels 5.8mm diameter with one screw to accommodate up to 16mm<sup>2</sup> cables.

Single screw tunnels are numbered.

Available electro tin-plated.

Un-numbered bars available on request.



Catalogue Number	Single Screw Tunnels	Overall Length (mm)
BP90A6	6	72
BP90A12	12	110
BP90A18	18	148
BP90A24	24	186
BP90A30	30	224
BP90A36	36	262

Catalogue Number	Single Screw Tunnels	Overall Length (mm)
BP165A12	12	145
BP165A18	18	188
BP165A24	24	230
BP165A30	30	273
BP165A36	36	315
BP165A42	42	358
BP165A48	48	401
BP165A54	54	443
BP165A60	60	486
BP165A72	72	571
BP165A80	80	628
BP165A84	84	656

Catalogue Number	Single Screw Tunnels	Overall Length (mm)
BP165B12	12	123
BP165B18	18	165
BP165B24	24	208
BP165B30	30	250
BP165B36	36	293
BP165B42	42	336
BP165B48	48	378
BP165B54	54	421
BP165B60	60	463
BP165B72	72	549
BP165B80	80	605
BP165B84	84	633

**BP165C Series 165A Link Bars**

Bar Section: 19 x 9.5mm.

Bars have one 3/8" hexagon head bolt for up to 165 amp cable lug.

All tunnels 5.8mm diameter with two screws to accommodate up to 16mm<sup>2</sup> cables.

Tunnels are numbered.

Available electro tin-plated.



BP165C12

**BP165D Series 165A Link Bars**

Bar Section: 19 x 9.5mm.

Bars have two 3/8" hexagon head bolts, for up to 165 amp. cable lugs.

All tunnels 5.8mm diameter with two screws accommodating up to 16mm<sup>2</sup> cables.

Tunnels all numbered.

Electro bars available on request.



BP165D18

Catalogue Number	Double Screw Tunnels	Overall Length (mm)
BP165C6	6	95
BP165C12	12	116
BP165C18	18	158
BP165C24	24	201
BP165C30	30	243
BP165C36	36	286
BP165C42	42	329
BP165C48	48	371
BP165C54	54	414
BP165C60	60	456
BP165C72	72	542
BP165C80	80	598
BP165C84	84	627

Catalogue Number	Double Screw Tunnels	Overall Length (mm)
BP165D6	6	95
BP165D12	12	138
BP165D18	18	180
BP165D24	24	223
BP165D30	30	266
BP165D36	36	308
BP165D42	42	351
BP165D48	48	393
BP165D54	54	436
BP165D60	60	478
BP165D72	72	564
BP165D80	80	621
BP165D84	84	650

Un-numbered bars on request.

**BP165D18 Series 165A Link****Bars**

Bar Section: 19 x 9.5mm.

Bars have two 3/8" hexagon head bolts, for up to 165 amp cable lugs.

All tunnels 5.8mm diameter with two screws, accommodate up to 16mm<sup>2</sup> cables.

Tunnels all numbered.

Available on request.

**Alternative Connections for****Link**

Most Link Bars in the BP165A, BP165B, BP165C, BP165D and BPN Series are available with various types of connections if required.

**Stud Connection**

8mm and 9.5mm Threaded Studs soldered in bars with hexagonal lock nuts.

**Line Taps**

Blue Point No. BP22, BP24, BP25, BP26 and BP28 Line Taps may also be incorporated if required.

## Medium Duty Neutral Bars With 2 x BP22 Line Taps Front Wiring

### BPMD2/10 Series

Complete with 2 x BP22 Line Taps.  
13 x 9.5mm brass.

All bars have 1-1/4 Whitworth screw with flat brass washer and 2 number BPMD2 Line Taps provided for incoming cables (16mm<sup>2</sup>).

All 4mm diameter tunnels with single screw per tunnel for up to 6mm<sup>2</sup> cable.

All tunnels are numbered.

Two 4mm diameter countersunk recessed fixing holes.

Back wired neutral bar.



## Bare Links with Mounting Blocks

### BPQL Series

90A Link Bars with moulded mounting blocks. (BP165FD)

Bar section 13 x 13mm.

Temperature rating: 190°C maximum.

Two 1/4" hexagon head studs for 90 ampere cable lugs.

All 5.5 diameter tunnels with single screw to accommodate up to 16mm<sup>2</sup> cables.

All tunnels are numbered.



Catalogue Number	Single Screw Tunnels	Overall Length (mm)
BPMD2/3	3	105
BPMD2/4	4	111
BPMD2/5	5	121
BPMD2/7	7	135
BPMD2/9	9	150
BPMD2/10	10	157
BPMD2/12	12	174
BPMD2/15	15	195
BPMD2/18	18	219
BPMD2/20	20	235
BPMD2/24	24	268
BPMD2/25	25	275
BPMD2/30	30	313
BPMD2/36	36	357

Catalogue Number	Single Screw Tunnels	Overall Length (mm)
BPQL12	12	143
BPQL18	18	182
BPQL24	24	219
BPQL30	30	257
BPQL36	36	295
BPQL48	48	363
BPQL50	50	383
BPQL60	60	447

## Line Taps

Line Taps can be drilled, tapped and fitted with screws on request.

### BP22

Line Tap for 16mm<sup>2</sup> cables.

Overall length 30mm.



### BP22ETP

As above but electro tin-plated.

### BP24

Line Tap for 35mm<sup>2</sup> cables.

Overall length 35mm.

### BP24ETP

As above but electro tin-plated.

### BP25

Line Tap for 50mm<sup>2</sup> cables.

Overall length 44mm.

### BP25ETP

As above but electro tin-plated.

### BP26

Line Tap for 95mm<sup>2</sup> cables.

Overall length 50mm.

### BP26ETP

As above but electro tin-plated.

### BP28

Line Tap for 185mm<sup>2</sup> cables.

Overall length 67mm.

### BP28ETP

As above but electro tin-plated.

## CLIPSAL NEUTRAL / ACTIVE / METER LINKS

Clipsal Links are produced from Impact Resistant materials to prevent cracking in transit or during installation.

The transparent covers enable you to check wiring and locate the sealing screw at a glance. The sealing screw (nylon with brass insert) resists stripping. Voltage and amperage ratings are clearly marked on both the cover and brass bar.

All links are available with black or red covers and bases for neutral, active or meter applications as required by local authorities.

### T-Type - 500 Volt 140 Ampere

#### L4T35

500V 140A 4 Hole Neutral Link with two screws per tunnel. Black base and cover.

#### L4T35R

500V 140A 4 Hole Active Link. Red base and cover.

Dimensions: 65 x 46 x 43mm.

Mounting centres: 28mm. 1 tunnel 8.7mm diameter accommodate 1 x 25mm<sup>2</sup> cable.

3 tunnels 7.7mm diameter accommodate 1 x 25mm<sup>2</sup> cable.

Certificate of Suitability No. CS2252N.



L4T35R

### Mini Links with Cover

#### 500V 100A

2 screws per tunnel.

#### L5

500V 100A 5 Hole Neutral Link with two screws per tunnel. Black base and cover.

#### L5R

500V 100A 5 Hole Active Link. Red base and cover.

Dimensions: 65 x 46 x 43mm.

Mounting centres: 46mm.

3 tunnels, 6.3mm diameter accommodate 1 x 16mm<sup>2</sup>.

2 tunnels, 5.8mm diameter accommodate 1 x 16mm<sup>2</sup>.

#### L5BW

500V 110A 5 Hole Back Wiring Neutral Link with two screws per tunnel. Black base and cover.

#### L5BWR

500V 110A 5 Hole Back Wiring Active Link. Red base and cover.

Dimensions: 65 x 46 x 43mm.

Mounting centres: 46mm.

5 tunnels, 7mm diameter accommodate 1 x 25mm<sup>2</sup>.

Transparent black cover, with cut outs.

#### L6

500V 100A 6 Hole Neutral Link with two screws per tunnel. Black base and cover.

#### L6R

500V 100A 6 Hole Active Link. Red base and cover.

Dimensions: 65 x 46 x 43mm.

Mounting centres: 46mm.

3 tunnels, 6.3mm diameter accommodate 1 x 16mm<sup>2</sup> cable.

3 tunnels, 5.8mm diameter accommodate 1 x 16mm<sup>2</sup> cable.

#### L6/25

500V 110A 6 Hole Neutral Link with 2 screws per tunnel. Black base and cover.

#### L6/25R

500V 110A 6 Hole Active Link. Red base and cover.

Dimensions: 65 x 46 x 43mm.

Mounting centres: 46mm.

2 tunnels, 7.5mm diameter accommodate 2 x 25mm<sup>2</sup> cable.

1 tunnel, 5.5mm diameter accommodates 1 x 16mm<sup>2</sup> cable.

3 tunnels, 4.7mm diameter accommodate 3 x 10mm<sup>2</sup> cable.

Transparent black cover with cut-outs.

#### L7

500V 100A 7 Hole Neutral Link with two screws per tunnel. Black base and cover.



L7

**L7R**

500V 100A 7 Hole Active Link.  
Red base and cover.

Dimensions: 65 x 46 x 43mm.  
Mounting centres: 46mm.  
3 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
4 tunnels, 5.8mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.

**L7BW**

500V 100A 7 Hole Back Wiring  
Neutral Link with two screws per  
tunnel. Black base and cover.

**L7BWR**

500V 100A 7 Hole Active Link.  
Red base and cover.

Dimensions: 65 x 46 x 43mm.  
Mounting centres: 46mm.  
2 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cables.  
5 tunnels, 5.8mm diameter  
accommodate 1 x 16mm<sup>2</sup> cables.  
Transparent black cover, with cut-outs.

**L8**

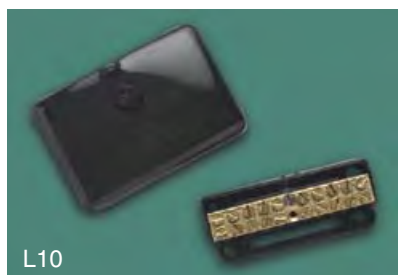
500V 100A 8 Hole Neutral Link with  
two screws per tunnel.  
Black base and cover.

Dimensions: 86 x 57 x 40mm.  
Mounting centres: 59 x 67mm.  
3 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
5 tunnels, 5.8mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
Transparent black cover with cut-outs.

**L10**

500V 100A 10 Hole Neutral Link with  
two screws per tunnel.

3 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
7 tunnels, 5.8mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
Dimensions: 86 x 57 x 40mm.



L10

**L10BW**

500V 100A 10 Hole Back Wiring  
Neutral Link with two screws per  
tunnel.

Dimensions: 86 x 57 x 40mm.

**L12**

500V 100A 12 Hole Neutral Link with  
two screws per tunnel.

2 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
4 tunnels, 5.5mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
6 tunnels, 4.5mm diameter  
accommodate 1 x 10mm<sup>2</sup> cable.  
Dimensions: 86 x 57 x 40mm.

**L14**

500V 100A 14 Hole Neutral Link  
with two screws in 8 tunnels and one  
screw in 6 tunnels.

2 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
6 tunnels, 5.5mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
6 tunnels, 4.5mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
Dimensions: 86 x 57 x 40mm.

**L16**

500V 100A 16 Hole Neutral Link  
with two screws in 6 tunnels and one  
screw in 10 tunnels.

2 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
4 tunnels, 5.5mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
10 tunnels, 4.5mm diameter  
accommodate 1 x 10mm<sup>2</sup> cable.  
Dimensions: 86 x 57 x 40mm.

**L18**

500V 100A 18 Hole Neutral Link  
with two screws in 6 tunnels and one  
screw in 12 tunnels.

2 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
4 tunnels, 5.5mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
12 tunnels, 4.5mm diameter  
accommodate 1 x 10mm<sup>2</sup> cable.  
Dimensions: 86 x 57 x 40mm.

**Tunnel Diameters**

Catalogue Number	4.7mm for 10mm <sup>2</sup> cable	6.3mm for 16mm <sup>2</sup> cable	5.7mm for 16mm <sup>2</sup> cable	7mm for 25mm <sup>2</sup> cable
L5	-	3	2	-
L5BW	-	-	-	5
L6	-	3	3	-
L6/25	3	-	1	2
L7	-	3	4	-
L7BW	-	2	5	-

**Tunnel Diameters**

Catalogue Number	6.3mm for 16mm <sup>2</sup> cable	5.5mm for 16mm <sup>2</sup> cable	4.5mm for 10mm <sup>2</sup> cable
L8	3	5	-
L10	3	7	-
L10BW	2	8	-
L12	2	4	6
L14	2	6	6
L16	2	4	10
L18	2	4	12

## Mini Links Less Cover

### 500V 100A

Mounting centres: 46mm.

#### L5A

5 Hole - two screws per tunnel.  
Black base.



#### L6A

6 Hole - two screws per tunnel.  
Black base.

#### L6RA

6 Hole - two screws per tunnel.  
Red base.

#### L7A

7 Hole - two screws per tunnel.  
Black base.

Overall dimensions: 57 x 30 x 26mm.

Mounting centres: 46mm.

Tunnel and cable detail same as L5 to L7 Series Covered Links.

## Standard Links Less Cover

### 500V 100A

Mounting centres: 59 - 67mm.

#### L8A

8 Hole - two screws per tunnel.



#### L10A

10 Hole - two screws per tunnel.

#### L12A

12 Hole - two screws per tunnel.

#### L14A

14 Hole - two screws per tunnel.

#### L16A

16 Hole - two screws in 6 tunnels,  
and one screw in 10 tunnels.

#### L18A

18 Hole - two screws per tunnel in 6  
tunnels, and one screw in 12 tunnels.

Overall dimensions: 80 x 32 x 22mm.

Mounting centres: 59 - 67mm.

Tunnel and cable detail same as L8 to L18 Series Covered Links.

All link bases are black.

## Brass Link Bars

### 500V 100A

#### L5P

5 Hole - two screws per tunnel.  
Length 41mm.

#### L6P

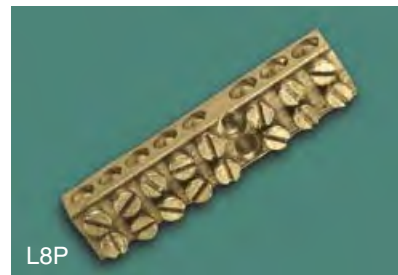
6 Hole - two screws per tunnel.  
Length 48mm.

#### L7P

7 Hole - two screws per tunnel.  
Length 54mm.

#### L8P

8 Hole - two screws per tunnel.  
Length 61mm.



#### L10P

10 Hole - two screws per tunnel.  
Length 75mm.

#### L12P

12 Hole - two screws per tunnel.  
Length 80mm.

Brass bar section: 13 x 10mm.

Tunnel and cable detail same as L5 to L12 Series Covered Links.

#### L14P

14 Hole - two screws in 8 tunnels  
and one screw in 6 tunnels.



#### L16P

16 Hole - two screws in 6 tunnels  
and one screw in 10 tunnels.

#### L18P

18 Hole - two screws in 6 tunnels  
and one screw in 12 tunnels.

Brass bar section: 19 x 10mm tunnel.

Cable detail same as L14 and L18 Series Covered Links.

**Products of Gerard Industries Pty Ltd**

ABN 27 007 873 529

**Head Office**

12 Park Terrace, Bowden  
 South Australia 5007  
 Telephone (08) 8269 0511  
 Facsimile (08) 8340 1724  
 Internet clipsal.com  
 E-Mail plugin@clipsal.com.au

**Blue Point Products Pty Ltd**

ABN 27 000 275 632

A subsidiary of Gerard Industries Pty Ltd  
 122 Canterbury Road, Padstow  
 New South Wales 2211  
 Telephone (02) 9708 1411  
 Facsimile (02) 9708 6585  
 Internet www.bluepointproducts.com.au  
 E-Mail sales@bluepointproducts.com.au

**Offices in all States**

<b>NSW</b>	Sydney	(02) 9794 9200
	Albury	(02) 6041 2377
<b>VIC</b>	Melbourne	(03) 9207 3200
	Country Areas	1800 653 893
<b>QLD</b>	Brisbane	(07) 3244 7444
	Townsville	(07) 4729 3333
<b>SA</b>	Adelaide	(08) 8268 0400
<b>WA</b>	Perth	(08) 9442 4444
<b>TAS</b>	Launceston	(03) 6343 5900
<b>NT</b>	Darwin	(08) 8947 0278

**Area Representatives**

<b>NSW</b>	Albury	(02) 6041 2377
	Central Coast	0418 430 361
	Coffs Harbour	0418 653 183
	Dubbo	0418 822 564
	Newcastle	0407 298 792
		0418 434 169
		0418 686 040
	South West Sydney	0419 868 353
	Tamworth	0417 714 339
	Wagga Wagga	0418 578 903
<b>ACT</b>	Wollongong	0418 423 581
	Canberra	0419 238 824
	Canberra/Goulburn	0418 164 070
	Canberra/Yass	0419 847 732
<b>VIC</b>	Bendigo	0418 570 213
	Geelong	0418 527 233
	Gippsland	0418 512 680
	Western Victoria	0419 380 444
<b>QLD</b>	Cairns	0418 773 254
	Gold Coast	0418 765 459
	Mackay	0418 752 134
	Maryborough	0418 664 338
	Northern Rivers	0418 768 902
	Rockhampton	0418 794 711
	Sunshine Coast	0418 711 786
	Toowoomba	0418 726 394
	Townsville	0418 180 372
<b>WA</b>	Bunbury	0418 931 684
	Kalgoorlie &	0417 928 981
	Eastern Gold Fields	
	Karratha	0418 937 249
<b>SA</b>	Riverland/Mildura/ Broken Hill	0418 596 145

**International Enquiries****Head Office Export Department**

Telephone + 61 8 8269 0587  
 Facsimile + 61 8 8340 7350  
 E-Mail export@clipsal.com.au

**New Zealand****Clipsal Industries (NZ) Ltd (Auckland)**

Telephone (09) 576 3403  
 Facsimile (09) 576 1015  
 E-Mail headoffice@clipsal.co.nz

**Customer Service**

Free Fax (0508) 250 305  
 Auckland/Mobile Phone (09) 572 0014  
 Free Phone (0508) CLIPSAL  
 2547725

You can find this brochure and many  
 others online in PDF format at:

**clipsal.com**

Follow the links off the home page  
 or access the following page directly:  
**clipsal.com/wat\_lib\_pdf.cfm**

**clipsal.com**

Gerard Industries Pty Ltd reserves the right to change specifications, modify designs and discontinue items without incurring obligation and whilst every effort is made to ensure that descriptions, specifications and other information in this catalogue are correct, no warranty is given in respect thereof and the company shall not be liable for any error therein.

©Copyright Gerard Industries Pty Ltd

Printed by Custom Press Pty Ltd (08) 8346 7999



## VpCI™ EMITTING SYSTEMS & ELECTRONIC PRODUCTS

# VpCI®-110 Emitter, Patented



### PRODUCT DESCRIPTION

Cortec® VpCI-110 emitters are designed to provide corrosion protection for metal components and parts enclosed in non-ventilated control boxes, cabinets, or tool boxes up to 10 cubic feet (283 liters) in volume. The Vapor phase Corrosion Inhibitor (VpCI) emits vapors which form a molecular layer on internal metal surfaces to protect critical, complex, and expensive electronic equipment and other metal components during operation, shipping, or storage. VpCI-110 is a small foam emitter through which corrosion inhibitors are slowly released, and moisture and air pollutants can enter to be absorbed. It provides long-term protection against corrosion even in the presence of adverse conditions including salt, moisture, airborne contaminants,  $H_2S$ ,  $SO_2$ ,  $NH_3$ , and others.

### TYPICAL APPLICATIONS

VpCI-110 can be effectively used for:

- Operations, packaging, and storage electrical equipment
- Marine navigation and communication electronic equipment
- Aerospace electrical controls
- Electric motors

- Switching equipment
- Fuse boxes and power boxes
- Medical equipment
- Electrical wireways and terminal boxes
- Scientific and measuring instruments
- Telecommunications equipment
- Remote electronics devices
- Tool-boxes, parts-storage, and other containers holding metals

### FEATURES

- Economical to use
- Provides continuous protection for up to 24 months during operation and/or shutdown
- Effective in polluted and humid environments
- Does not interfere with electrical, optical, or mechanical performance
- Multimetal protection
- Quick and easy installation
- Non-toxic and safe to handle
- Compact and space-saving
- Free of nitrites, halogens, and phosphates
- No spraying, wiping, or dipping required
- Low VOC values
- Meets Southern California Clean Air Act and other National and local regulations
- Self-stick back
- Self-stick date label
- Accepted by FDA for corrosion protection of electrical and electronic equipment within food processing plants
- Canadian Food Inspection Agency acceptance for indirect food contact
- NSN 6850-01-456-2971
- Conforms to MIL I-22110C
- Federal Standard 101, Ardec Technical Report 99-05, Picatinny Arsenal, New Jersey, USA



## METHOD OF APPLICATION

VpCI-110 is extremely simple and convenient to install. The device should be installed at the earliest possible time. Simply select a space within enclosure where corrosion protection would be useful. Verify the surface is clean and free of debris. Peel off the protective peel strip from the bottom of the device and attach it to the clean surface.

VpCI-110 emitters can be installed in any position. For volumes greater than 10 cubic feet (283 liters), use more than one device. If the enclosure is not totally airtight, or if the access doors are opened frequently, replace the VpCI-110 device more often than every 2 years. After periods of heavy maintenance replace the device. For additional protection spray the enclosure very lightly with ElectriCorr® VpCI-238 or VpCI-239.

## SPECIFICATIONS

Packaging	12 individually wrapped emitters per carton
Protection	up to 10 ft <sup>3</sup> (283 liters) per device
Standard Size	Foam device with adhesive backing 2.5" D x 2" H (6.4 cm D x 5 cm H)

## FOR INDUSTRIAL USE ONLY

### KEEP OUT OF REACH OF CHILDREN

### KEEP CONTAINER TIGHTLY SEALED

### NOT FOR INTERNAL CONSUMPTION

### CONSULT MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION

## LIMITED WARRANTY

All statements, technical information and recommendations contained herein are based on tests Cortec Corporation believes to be reliable, but the accuracy or completeness thereof is not guaranteed.

Cortec Corporation warrants Cortec® products will be free from defects when shipped to customer. Cortec Corporation's obligation under this warranty shall be limited to replacement of product that proves to be defective. To obtain replacement product under this warranty, the customer must notify Cortec Corporation of the claimed defect within six months after shipment of product to customer. All freight charges for replacement products shall be paid by customer.

Cortec Corporation shall have no liability for any injury, loss or damage arising out of the use of or the inability to use the products.


BEFORE USING, USER SHALL DETERMINE THE SUITABILITY OF THE PRODUCT FOR ITS INTENDED USE, AND USER ASSUMES ALL RISK AND LIABILITY WHATSOEVER IN CONNECTION THEREWITH. No representation or recommendation not contained herein shall have any force or effect unless in a written document signed by an officer of Cortec Corporation.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. IN NO CASE SHALL CORTEC CORPORATION BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Distributed by:



4119 White Bear Parkway, St. Paul, MN 55110 USA  
 Phone (651) 429-1100, Fax (651) 429-1122  
 Toll Free (800) 4-CORTEC, E-mail [info@cortecvci.com](mailto:info@cortecvci.com)  
 Internet <http://www.CortecVCI.com>

printed on recycled paper  100% post consumer  
 Revised 3/3/09, Cortec Corporation 2001-2009. All rights reserved. Supersedes: 5/31/06  
 ElectriCorr® and Cortec® are trademarks of Cortec Corporation  
 © 2009, Cortec Corporation. All Rights Reserved. Copying of these materials in any form without the written authorization of Cortec Corporation is strictly prohibited.

**ERITECH®****TDS**

## CRITEC® Transient Discriminating Surge Diverters

**ERICO®**

# Surge Protection And Surge Ratings

The stress, which an SPD will experience under surge conditions, is a function of many complex and interrelated parameters. These include:

- Location of the SPD(s) within the structure – are they located at the main distribution board or within the facility at secondary board, or even in front of the end-user equipment?
- Method of coupling the lightning strike to the facility – for example, is this via a direct strike to the structures LPS, or via induction onto building wiring due to a nearby strike?
- Distribution of lightning currents within the structure – for example, what portion of the lightning current enters the earthing system and what remaining portion seeks a path to remote grounds via the power distribution system and equipotential bonding SPDs?
- Type of power distribution system – the distribution of lightning current on a power distribution system is strongly influenced by the grounding practice for the neutral conductor. For example, in the TN-C system with its multiple earthed neutral, a more direct and lower impedance path to ground is provided for lightning currents than in a TT system.
- Additional conductive services connected to the facility – these will carry a portion of the direct lightning current and therefore reduce the portion which flows through the power distribution system via the lightning equipotential bonding SPD.
- Type of waveshape – it is not possible to simply consider the peak current which the SPD will have to conduct, one also has to consider the waveshape of this surge. It is also not possible to simply equate the areas under the current-time curves (also referred to as the action integral) for SPDs under different waveshapes.

Many attempts have been made to quantify the electrical environment and “threat level” which an SPD will experience at different locations within a facility. The new IEC<sup>SM</sup> standard on lightning protection, IEC 62305-4 “Protection against lightning - Part 4: Electrical and electronic systems within structures” has sought to address this issue by considering the highest surge magnitude which may be presented to an SPD based on the lightning protection level (LPL) being considered. For example, this standard postulates that under a LPL I the magnitude of a direct strike to the structure’s LPS may be as high as 200kA 10/350. While this level is possible, its statistical probability of occurrence is approximately 1%. In other words, 99% of discharges will be less than this postulated 200 kA peak current level.

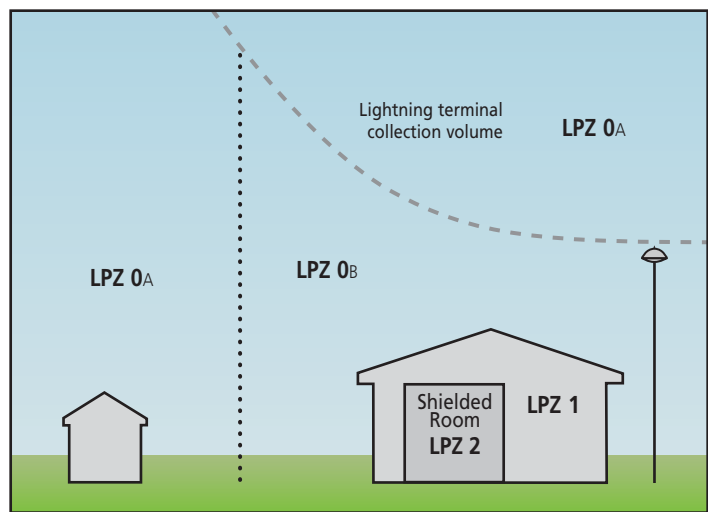
An assumption is made that 50% of this current is conducted via the building’s earthing system, and 50% returns via the equipotential bonding SPDs connected to

a three wire plus neutral power distribution system. It is also assumed that no additional conductive service exists. This implies that the portion of the initial 200 kA discharge experienced by each SPD is 25 kA.

Simplified assumptions of current dispersion are useful in considering the possible threat level, which the SPD(s) may experience, but it is important to keep in context the assumptions being made. In the example above, a lightning discharge of 200kA has been considered. It follows that the threat level to the equipotential bonding SPDs will be less than 25kA for 99% of the time. In addition, it has been assumed that the waveshape of this current component through the SPD(s) will be of the same waveshape as the initial discharge, namely 10/350, while in reality the waveshape have been altered by the impedance of building wiring, etc.

Many standards have sought to base their considerations on field experience collected overtime. For example, the IEEE® guide to the environment C62.41.1 and the recommended practice C62.41.2 present two scenarios of lightning discharge and different exposure levels under each of these depending on the location where the SPD is installed. In this standard, Scenario II depicts a direct strike to the structure, while Scenario I depicts a nearby strike and the subsequent conducted current into a structure via power and data lines. The highest surge exposure considered feasible to an SPD installed at the service entrance to a facility under Scenario I is 10kA 8/20, while under Scenario II it is considered to be 10kA 10/350 (exposure Level 3).

From the above, it is apparent that the selection of the appropriate surge rating for an SPD depends on many complex and interconnected parameters. When addressing such complexities, one needs to keep in mind that one of the more important parameters in selecting an SPD is its limiting voltage performance during the expected surge event, and not the energy withstand which it can handle.



Protection zones defined by specific product application.

# Advanced Technologies – The ERICO® Advantage

## Transient Discriminating Technology

To meet the fundamental requirements of performance, longer service life and greater safety under real world conditions, ERICO has developed Transient Discriminating (TD) Technology.

This quantum leap in technology adds a level of “intelligence” to the Surge Protection Device enabling it to discriminate between sustained abnormal over-voltage conditions and true transient or surge events. Not only does this help ensure safe operation under practical application, but it also prolongs the life of the protector since permanent disconnects are not required as a means of achieving internal over-voltage protection.

### Traditional Technologies

Conventional SPD technologies utilize metal oxide varistors and/or silicon avalanche diodes to clamp or limit transient events. However, these devices are susceptible to sustained 50/60Hz mains over-voltage conditions which often occur during faults to the utility system. Such occurrences present a significant safety hazard when the suppression device attempts to clamp the peak of each half cycle on the mains over-voltage. This condition can cause the device to rapidly accumulate heat and in turn fail with the possibility of inducing a fire hazard.

### The Core of TD Technology

The secret to ERICO's Transient Discriminating Technology is its *active frequency discrimination* circuit. This patented device can discriminate between a temporary over-voltage (TOV) condition

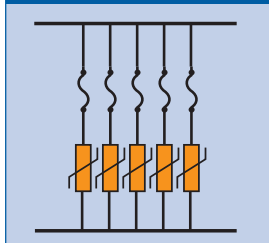
and a very fast transient, which is associated with lightning or switching-induced surges. When the transient frequencies are detected, the patented Quick-Switch within TD activates to allow the robust protection to limit the incoming transient. The frequency discriminating circuit that controls the Quick-Switch helps ensure that the SPD device is immune to the effects of a sustained 50 or 60Hz TOV. This allows the device to keep operating, in order to help provide safe and reliable transient protection, even after an abnormal over-voltage condition has occurred.

### Meeting & Exceeding UL® Standards

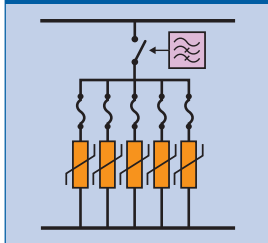
The CRITEC® range of surge protection devices from ERICO® employing TD Technology has been specifically designed to meet and exceed the new safety requirements of UL 1449 Edition 3. To meet the abnormal over-voltage testing of UL 1449 Edition 3, many manufacturers of SPD devices have incorporated fuse or thermal disconnect devices which permanently disconnect all protection from the circuit during an over-voltage event. Transient Discriminating Technology on the other hand will allow the SPD device to experience an abnormal over-voltage up to twice its nominal operating voltage and still remain operational even after this event! This allows the device to help provide safe, reliable and continuous protection to your sensitive electronic equipment. TD Technology is especially recommended for any site where sustained over-voltages are known to occur, and where failure of traditional SPD technologies cannot be tolerated.

The UL 1449 testing standard addresses the safety of an SPD device under temporary and abnormal overvoltage conditions, but does not specifically mandate a design that will give a reliable, long length of service in the real world. Specifically, UL 1449 tests that the SPD remains operational at 10% above nominal supply voltage, allowing SPD manufacturers to design products that permanently disconnect just above that. Most reputable manufacturer's designs allow for up to a 25% overvoltage, while ERICO's TD Technology gives even greater overhead.

**Traditional Technology**



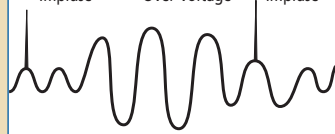
**Active TD Technology**



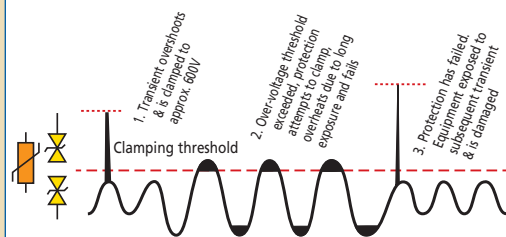
### TD TECHNOLOGY PROVIDES CONTINUED PROTECTION - EVEN AFTER OVER-VOLTAGES

#### Typical Supply Problems

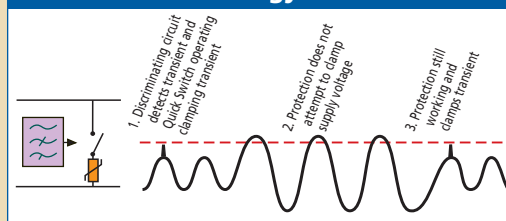
1. Transient Impulse
2. Substantial Over-voltage
1. Transient Impulse



#### Traditional Technology Response



#### TD Technology Solution



**CRITEC® TDS Surge Diverter - TDS1100 Series****Features**

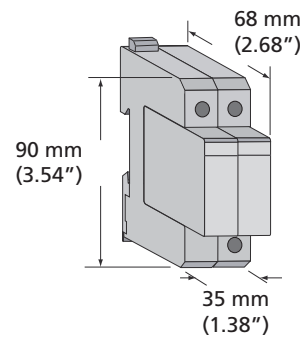
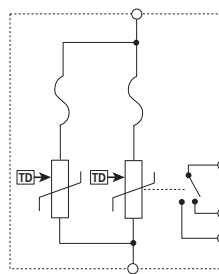
- CRITEC® TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 100kA 8/20 $\mu$ s maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems
- CE, UL® 1449 Edition 3 Listed

Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS1100 series of surge suppressors provide economical and reliable protection from voltage transients on power distribution systems. They are conveniently packaged for easy installation on 35 mm DIN rail within main distribution panelboards.

CRITEC® TD technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS1100 provides a set of voltage-free contacts for remote signaling that maintenance is due.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.



Model	TDS11002SR150	TDS11002SR240	TDS11002SR277	TDS11002SR560
Item Number for Europe	702409	702411	702412	702413
Nominal Voltage, $U_n$	120-150 VAC	220-240 VAC	240-277 VAC	480-560 VAC
Max Cont. Operating Voltage, $U_c$	170VAC	275VAC	320VAC	610VAC
Stand-off Voltage	240VAC	440VAC	480VAC	700VAC
Frequency	0-100Hz			
Short Circuit Current Rating, $I_{sc}$	200kAIC			
Back-up Overcurrent Protection	125AgL, if supply > 100A			
Technology	TD with thermal disconnect			
Max Discharge Current, $I_{max}$	100kA 8/20 $\mu$ s			
Impulse Current, $I_{imp}$	12.5kA 10/350 $\mu$ s			
Nominal Discharge Current, $I_n$	50kA 8/20 $\mu$ s   40kA 8/20 $\mu$ s			
Protection Modes	Single mode (L-G, L-N or N-G)			
Voltage Protection Level, $U_p$	400V @ 3kA 1.0kV @ 20kA	700V @ 3kA 1.2kV @ 20kA	800V @ 3kA 1.6kV @ 20kA	1.8kV @ 3kA 2.4kV @ 20kA
Status	N/O, N/C Change-over contact, 250V~/0.5A, max 1.5 mm <sup>2</sup> (#14AWG) terminals Mechanical flag / remote contacts (R model only)			
Dimensions H x D x W: mm (in)	90 x 68 x 35 (3.54 x 2.68 x 1.38)			
Module Width	2 M			
Weight: kg (lbs)	0.24 (0.53)			
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)			
Connection	$\leq 25$ mm <sup>2</sup> (#4AWG) stranded $\leq 35$ mm <sup>2</sup> (#2AWG) solid			
Mounting	35 mm top hat DIN rail			
Temperature	-40°C to 80°C (-40°F to 176°F)			
Humidity	0% to 90%			
Approvals	CE, IEC® 61643-1, UL® 1449 Ed 3 Recognized Component Type 2			
Surge Rated to Meet	ANSI/IEEE® C62.41.2 Cat A, Cat B, Cat C ANSI/IEEE® C62.41.2 Scenario II, Exposure 3, 100kA 8/20 $\mu$ s, 10kA 10/350 $\mu$ s IEC 61643-1 Class I and Class II UL® 1449 Ed3 In 20kA mode			
Replacement MOV Module	TDS150M150	TDS150M240	TDS150M277	TDS150M560

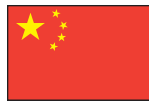


[www.erico.com](http://www.erico.com)



**AUSTRALIA**

Phone +61-2-9751-8500  
Fax +61-2-9475-5334



**CHINA**

Phone +86-21-3430-4878  
Fax +86-21-5831-8177



**HUNGARY**

Phone +068-00-165-38  
Fax +31-13-583-5499



**NORWAY**

Phone +800-100-73  
Fax +800-100-66



**SWITZERLAND**

Phone +0800-558-697  
Fax +0800-559-615



**BELGIUM**

Phone +0800-757-48  
Fax +0800-757-60



**DENMARK**

Phone +808-89-373  
Fax +808-89-372



**INDONESIA**

Phone +62-21-575-0941  
Fax +62-21-575-0942



**POLAND**

Phone +48-71-374-4022  
Fax +48-71-374-4043



**THAILAND**

Phone +66-2-267-5776  
Fax +66-2-636-6988



**BRAZIL**

Phone +55-11-3623-4333  
Fax +55-11-3621-4066



**FRANCE**

Phone +33-4-77-365-656  
Fax +33-4-77-553-789



**ITALY**

Phone +39-02-8474-2250  
Fax +39-02-8474-2251



**SINGAPORE**

Phone +65-6-268-3433  
Fax +65-6-268-1389



**UNITED ARAB  
EMIRATES**

Phone +971-4-881-7250  
Fax +971-4-881-7270



**CANADA**

Phone +1-800-677-9089  
Fax +1-800-677-8131



**GERMANY**

Phone +0-800-189-0272  
Fax +0-800-189-0274



**MEXICO**

Phone +52-55-5260-5991  
Fax +52-55-5260-3310



**SPAIN**

Phone +34-93-467-7726  
Fax +34-93-467-7725



**UNITED KINGDOM**

Phone +0808-2344-670  
Fax +0808-2344-676



**CHILE**

Phone +56-2-370-2908  
Fax +56-2-370-2914



**HONG KONG**

Phone +852-2764-8808  
Fax +852-2764-4486



**NETHERLANDS**

Phone +31-13-583-5400  
Fax +31-13-583-5499



**SWEDEN**

Phone +0207-909-08  
Fax +0207-989-64



**UNITED STATES**

Phone +1-440-248-0100  
Fax +1-440-248-0723

ANSI is a registered trademark of the American National Standards Institute. IEC is a registered trademark of the International Electrotechnical Commission. IEEE is a registered trademark of the Institute of Electrical and Electronics Engineers, Incorporated. NEMA is a registered trademark of the National Electrical Manufacturers Association. UL is a registered trademark of Underwriters Laboratories, Inc.

**WARNING**

ERICO products shall be installed and used only as indicated in ERICO's product instruction sheets and training materials. Instruction sheets are available at [www.erico.com](http://www.erico.com) and from your ERICO customer service representative. Improper installation, misuse, misapplication or other failure to completely follow ERICO's instructions and warnings may cause product malfunction, property damage, serious bodily injury and death.

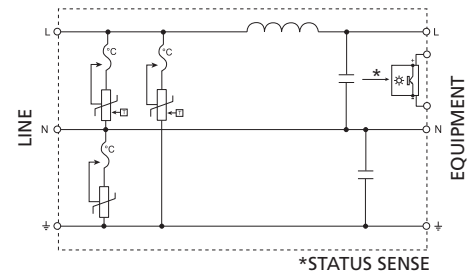
## CRITEC® Transient Discriminating Filter

### Features

- CRITEC® Transient Discriminating (TD) Technology provides increased service life
- In-line series protection
- High efficiency low pass sine wave filtering – ideal for the protection of switched mode power supplies
- Three modes of protection: L-N, L-PE & N-PE
- 35 mm DIN rail mount – simple installation
- LED status indication and opto-isolated output – for remote status monitoring
- CE, UL® 1449 Ed. 3 Listed

The TDF series has been specifically designed for process control applications to protect the switched mode power supply units on devices such as PLC controllers, SCADA systems and motor controllers. Units are UL® Recognized and available for 3A, 10A and 20A loads and suitable for 110-120V ac/dc and 220-240Vac circuits.

The TDF is a series connected, single phase surge filter providing an aggregate surge capacity of 50kA (8/20μs) across L-N, L-PE, and N-PE. The low pass filter provides up to 65dB of attenuation to voltage transients. Not only does this reduce the residual let-through voltage, but it also helps further reduce the steep voltage rate-of-rise providing superior protection for sensitive electronic equipment.



Model	TDF3A120V	TDF3A240V	TDF10A120V	TDF10A240V	TDF20A120V	TDF20A240V
Item Number for Europe	700001	700002	700003	700004	700005	700006
Nominal Voltage, U <sub>n</sub>	110-120 V	220-240 V	110-120 V	220-240 V	110-120 V	220-240 V
Distribution System	TN-C-S, TN-S					
Max Cont. Operating Voltage, U <sub>c</sub>	170VAC	340VAC	170VAC	340VAC	170VAC	340VAC
Stand-off Voltage	240V	400V	240V	400V	240V	400V
Frequency	0-60Hz	50/60Hz	0-60Hz			50/60Hz
Max Line Current, I <sub>L</sub>	3 A		10 A		20 A	
Operating Current @ U <sub>n</sub>	135 mA	250 mA	240 mA	480 mA	240 mA	480 mA
Max Discharge Current, I <sub>max</sub>	10kA 8/20μs N-PE 20kA 8/20μs L-N 20kA 8/20μs L-PE					
Protection Modes	All modes protected					
Technology	In-line series low pass sine wave filter TD Technology					
Voltage Protection Level, U <sub>p</sub>	500V @ 500A 250V @ 3kA	700V @ 500A 600V @ 3kA	500V @ 500A 250V @ 3kA	700V @ 500A 600V @ 3kA	500V @ 500A 250V @ 3kA	700V @ 500A 600V @ 3kA
Filtering	-62dB @ 100kHz		-65dB @ 100kHz		-53dB @ 100kHz	
Status	Green LED. On=Ok. Isolated opto-coupler output					
Dimensions H x D x W: mm (in)	90 x 68 x 72 (3.54 x 2.68 x 2.83)		90 x 68 x 144 (3.54 x 2.68 x 5.67)			
Module Width	4 M		8 M			
Weight: kg (lbs)	0.7 (1.54)		1.48 (3.25)		1.57 (3.46)	
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA®-1)					
Connection	1 mm <sup>2</sup> to 6 mm <sup>2</sup> (#18AWG to #10)					
Mounting	35 mm top hat DIN rail					
Back-up Overcurrent Protection	3A		10A		20A	
Temperature	-35°C to 55°C (-31°F to 131°F)					
Humidity	0% to 90%					
Approvals	C-Tick, CE (NOM 3A, 120V), CSA 22.2, UL® 1283, UL® 1449 Ed 3 Recognized Component Type 2					
Surge Rated to Meet	ANSI/IEEE® C62.41.2 Cat A, Cat B, Cat C					

(1) Opto-coupler output can be connected to DINLINE Alarm Relay (DAR275V) to provide Form C dry contacts.

ANSI is a registered trademark of the American National Standards Institute. IEEE is a registered trademark of the Institute of Electrical and Electronics Engineers, Incorporated. NEMA is a registered trademark of the National Electrical Manufacturers Association. UL is a registered trademark of Underwriters Laboratories, Inc.

#### WARNING

ERICO products shall be installed and used only as indicated in ERICO's product instruction sheets and training materials. Instruction sheets are available at [www.erico.com](http://www.erico.com) and from your ERICO customer service representative. Improper installation, misuse, misapplication or other failure to completely follow ERICO's instructions and warnings may cause product malfunction, property damage, serious bodily injury and death.

Copyright ©2008 ERICO International Corporation. All rights reserved.

CADDY, CADWELD, CRITEC, ERICO, ERIFLEX, ERITECH, and LENTON are registered trademarks of ERICO International Corporation.

[www.erico.com](http://www.erico.com)

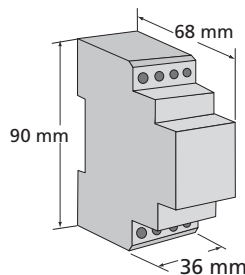
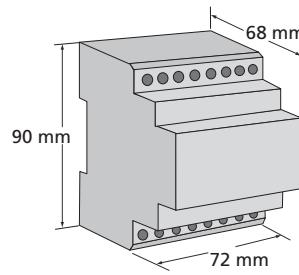
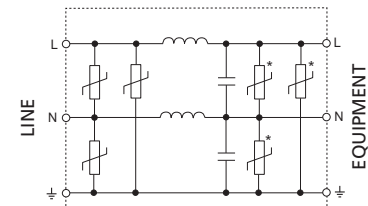
**ERICO®**

**CRITEC® Dinline Surge Filter****Features**

- In-line series protection
- EMI/RFI noise filtering – protects against industrial electrical noise
- Compact design – fits into motor control and equipment panels
- Three modes of protection: L-N, L-PE & N-PE
- 35 mm DIN rail mount – simple installation
- LED power indicator

The “two port” DSF series has been specifically designed for process control applications to protect the switched mode power supply units on devices such as PLC controllers, SCADA systems and motor controllers. The 30V unit is suitable for 12V and 24Vac/dc signaling and control systems.

The 6A DSF series incorporates a space efficient, low pass, series filter which provides attenuation to high frequency interference. The larger 20A model provides status indication and a higher surge rating, making this ideal for the protection of higher risk equipment.

**DSF6A****DSF20A**

\*DSF20A275V only

Model	DSF6A30V	DSF6A150V	DSF6A275V	DSF20A275V
Item Number for Europe	702090	701000	701030	701020
Nominal Voltage, U <sub>n</sub>	24	110-120 V	220-240 V	
Distribution System	1Ph 2W+G			
System Compatibility	TN-S, TN-C-S			
Max Cont. Operating Voltage, U <sub>c</sub>	30VAC, 38VDC	150VAC	275VAC	
Frequency	0-60Hz	50/60Hz		
Max Line Current, I <sub>L</sub>	6 A			20 A
Operating Current @ U <sub>n</sub>	7 mA			
Max Discharge Current, I <sub>max</sub>	4kA 8/20µs	16kA 8/20µs		15kA 8/20µs L-N 15kA 8/20µs L-PE 25kA 8/20µs N-PE
Protection Modes	All modes protected			
Technology	In-line series filter MOV			
Voltage Protection Level, U <sub>p</sub>	110V @ 3kA	400V @ 3kA	750V @ 3kA	710V @ 3kA
Filtering	-3dB @ 300kHz			-3dB @ 62kHz
Status	LED power indicator			Status indicator
Dimensions H x D x W: mm (in)	90 x 68 x 36 (3.54 x 2.68 x 1.42)			90 x 68 x 72 (3.54 x 2.68 x 2.83)
Module Width	2 M			4 M
Weight: kg (lb)	0.2 (0.441)			0.7 (1.543)
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)			
Connection	1 mm <sup>2</sup> to 6 mm <sup>2</sup> (#18AWG to #10AWG)			
Mounting	35 mm top hat DIN rail			
Back-up Overcurrent Protection	6A			20A
Temperature	-35°C to 55°C (-31°F to 131°F)			
Humidity	0% to 90%			
Approvals	C-Tick, CE, NOM, UL® 1449 Ed 3 Recognized Component Type 2		C-Tick, CE	
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B			

ANSI is a registered trademark of the American National Standards Institute. IEEE is a registered trademark the Institute of Electrical and Electronics Engineers, Incorporated. NEMA is a registered trademark the National Electrical Manufacturers Association. UL is a registered trademark Underwriters Laboratories, Inc.

**WARNING**

ERICO products shall be installed and used only as indicated in ERICO's product instruction sheets and training materials. Instruction sheets are available at [www.erico.com](http://www.erico.com) and from your ERICO customer service representative. Improper installation, misuse, misapplication or other failure to completely follow ERICO's instructions and warnings may cause product malfunction, property damage, serious bodily injury and death.

Copyright ©2008 ERICO International Corporation. All rights reserved.

CADDY, CADWELD, CRITEC, ERICO, ERIFLEX, ERITECH, and LENTON are registered trademarks of ERICO International Corporation.

[www.erico.com](http://www.erico.com)

**ERICO®**  
E817S-WWEN E800LT07WWEN 00813.6M8



# Danfoss VLT® Soft Starter

## The single speed drive



# 3–1600 A

**For all soft start applications**

VLT® Soft Starters cover the full range – from simple start-stop operation to high end performance.

# Soft starts:

## Protects processes, products and equipment with smooth motor control

**An AC motor switched directly on to the mains power supply will struggle to reach its nominal speed as quickly as possible.**

This draws maximum current from the power supply and accelerates the application with its maximum torque. Depending on the application, this can cause different problems.

Applications like pumps, conveyers, centrifuges and bandsaws must be started slowly, and sometimes stopped slowly, to prevent mechanical shocks such as water hammer, and strains on bands, couplings and shafts.

### Principle of Phase Angle Control

A soft starter is an electronic device that regulates the voltage to the motor and this provides a smooth transition from standstill to full speed operation of the application.

VLT® Soft Starters all use the principle of phase angle control: Back-to-back coupled thyristors ramp up the motor voltage.

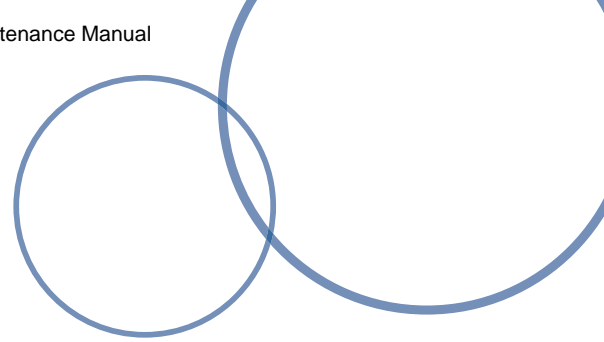
In some VLT® Soft Starters, current transformers measure the motor current, providing feedback for starting current control but also for numerous motor and application protection functions.

### VLT® Soft Starters cover a comprehensive range

Soft starting and stopping can be controlled in a number of ways depending on the application. Some applications require non-linear voltage ramp-up and the voltage ramp is therefore related to the actual current drawn. Conversely, a band-saw usually requires a quick stop function provided by a DC brake.

Then again, a number of applications require a kick-start torque for an instantaneous period of time followed by a soft ramp-up acceleration. VLT® Soft Starters cover all of these applications and much more.





VLT® Soft Starter MCD 500	VLT® Compact Starter MCD 200	VLT® Soft Starter MCD 100
<ul style="list-style-type: none"> <li>Fully featured Soft Starter for motors up to 1100 HP</li> <li>Total motor starting solution</li> <li>Advanced protection features</li> <li>Adaptive Acceleration Control</li> <li>Inside Delta connection</li> <li>4 line graphical display</li> <li>Multiple programming setup menus</li> </ul>	<ul style="list-style-type: none"> <li>Compact Soft Starter for motors up to 150 HP</li> <li>Voltage ramps, current limit start and integrated motor protection</li> <li>Integral bypass design reduces heat dissipation</li> <li>Wide power range with advanced accessory modules</li> </ul>	<ul style="list-style-type: none"> <li>Micro Soft Start controller for motors up to 15 HP</li> <li>Extremely robust SCR design with heavy ratings as standard</li> <li>Unlimited number of starts per hour</li> <li>Contactors style design for easy selection, installation and commissioning</li> </ul>



# VLT® Soft Starter MCD 500

**VLT® Soft Starter MCD 500 is a total motor starting solution. Current transformers measure motor current and provide feedback for controlled motor ramp profiles.**

AAC, the Adaptive Acceleration Control, automatically employs the best starting and stopping profile for the application. Adaptive Acceleration Control means that for each start and stop, the soft starter compares and adapts the process to the chosen profile best suited to the application.

The VLT® Soft Starter MCD 500 has a four-line graphical display and a logic keypad making programming easy. Advanced setup is possible displaying operational status.

Three menu systems: Quick Menu, Application Setup and Main Menu provide optimum programming approach.

## The perfect solution, also for more severe applications:

- Pumps
- Conveyors
- Fans
- Mixers
- Compressors
- Centrifuges
- Mills
- Saws
- And many more

## Power range

21 – 1600 A, 10-1100 HP  
(1.2 MW inside Delta Connection)  
Versions for 200 – 690 VAC



Features	Benefits
<b>User friendly</b>	
AAC Adaptive Acceleration Control	– Automatically adapts to the chosen starting and stopping profile
Adjustable bus bars allow for both top and bottom entry on 360-1600 amp models (200-1100 HP)	– Space saving, less cable cost and easy retrofitting
DC injection braking distributed evenly over three phases	– Less installation cost and less stress on the motor
Inside Delta (6-wire connection)	– Smaller soft starter can be selected for the application
Log menus, 99 events and trip log provide information on events, trips and performance	– Eases analysis of the application
Auto Reset	– Less down-time
Jog (slow-speed operation)	– Application flexibility
Second-order thermal model	– Allows motors to be used to their full potential without damage from overloading
Internal bypass contactors (21 – 215 A, 10-150 HP)	– Save space and wiring compared to external bypass – Very little heat dissipates when running. Eliminates costly external fans, wiring or bypass contactors
Auto-start/stop clock	– Application flexibility
Compact size – amongst the smallest in their class	– Saves space in cabinets and other application setups
4-line graphical display	– Optimum programming approach and setup for viewing operational status
Multiple programming setup (Standard Menu, Extended Menu, Quick Set)	– Simplifies the programming, allowing maximum flexibility
8 language display options	– Serving the whole world

## Dimensions

Current rating [A]	Weight [lbs]	Height [inches]	Width [inches]	Depth [inches]	Frame size
21, 37, 43 and 53	9.25	11.61	5.90	7.20	G1
68	9.92			8.38	
84, 89 and 105	10.8				
131, 141, 195 and 215	32.8	17.24	10.82	9.84	G2
245	52.6	18.11	15.35	10.98	G3
360, 380 and 428	77	27.12	16.92	11.82	G4
595, 619, 790 and 927	100				
1200, 1410 and 1600	264				
		33.70	23.03	14.33	G5

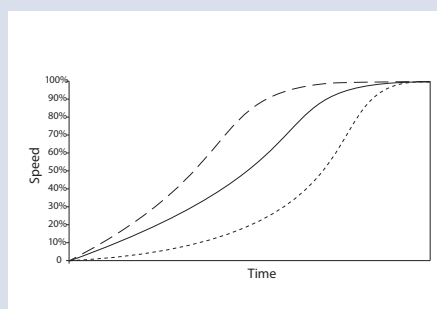
## MCD 500 operation options

### Starting:

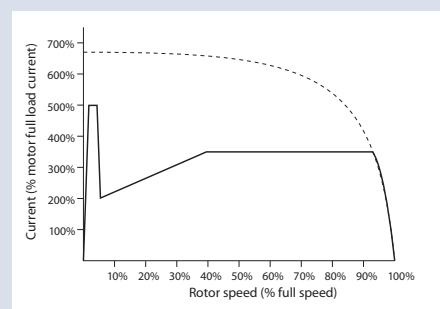
- AAC Adaptive Acceleration
- Control
- Current Ramp
- Constant Current
- Kickstart

### Stopping:

- Coast to stop
- TVR soft Stop
- AAC Adaptive deceleration Control
- Brake



Three Adaptive Acceleration Control (AAC) start profiles; early, constant and late acceleration



Constant current/ current ramp – here shown with kickstart

## Control Panel VLT® LCP 501



With the Control Panel VLT® LCP 501 being a full function interface, everything you can do on the VLT® Soft Starter MCD 500 is possible via the LCP 501.

The screen view set-up is selected from 8 views. Options include 7 standard and 1 user programmable view.

### Language selection:

English, Chinese, German, Spanish, Portuguese, French, Italian, Russian.

The VLT® LCP 501 is connected to the MCD 500 by using a 10 ft cable using 9 pin (D-sub) plug and 10 ft cable provided with the IP 65 (NEMA 12) door-mount kit.

Once connected, the soft starter asks whether you want to copy parameters from LCP to starter or starter to LCP (if different).

### 100% easy connection

- The Modbus, Profibus and Device net modules use another port on the MCD 500 (at the side of the soft starter)
- Separate LCP 501 output at the bottom for 9 pin plug and 10 ft cable
- One ordering number (LCP with door-mount kit and cable)
- Plug & play connection (also if soft starter is powered up)
- One cable for power and communication
- Powered up by soft starter
- Copy of parameter set- up

# VLT® Compact Soft Starter MCD 200

**Danfoss VLT® Compact Soft Starter series MCD 200 includes two families of soft starters in the power range from 10 – 150 HP.**

The series offers easy DIN rail mounting for sizes up to 40 HP, 2-wire or 3-wire start/stop control and excellent starting duty ( $4 \times I_e$  for 6 seconds).

Heavy starting ratings at  $4 \times I_e$  for 20 seconds.

Compatible with grounded delta power systems.

## The perfect match for:

- Pumps
- Fans
- Compressors
- Mixers
- Conveyors
- And many more

## Power range:

- 10 – 150 HP

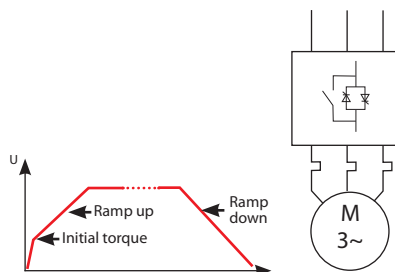


## Remote operation

Remote operation of MCD 201 and MCD 202 is facilitated by the dedicated remote operator kit.

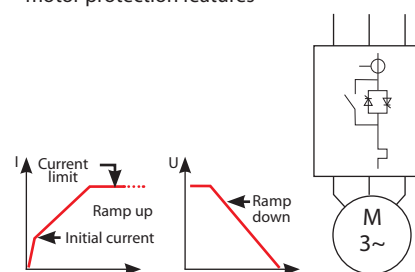
The operator (IP 54/NEMA 12) is mounted on the cabinet front and allows remote control, status indication and motor monitoring of an individual VLT® Soft Starter using RS485 serial communication.

### MCD 201



### MCD 202

MCD 202 provides enhanced soft start functionality and various motor protection features



Features	Benefits
Small footprint and compact size	– Saves panel space
Built-in bypass	– Minimizes installation cost and eliminates power loss – Reduces heat build up. Savings in components, cooling, wiring and labor
Advanced accessories	– Allows enhanced functionality
Advanced SCR control algorithms balance output waveform	– Allowing more starts per hour, accepting higher load
Reliable	Maximum up-time
Essential motor protection (MCD 202)	– Reduces overall project investment
Max. ambient temperature 50°C without derating	– No external cooling or oversizing necessary
User friendly	Save commissioning
Easy to install and use	
Easy DIN rail mounting for sizes up to 40 HP	– Saves time and space



## Dimensions

Power range (575 V)	10 – 40 HP	50 – 75 HP	100 – 150 HP
Height [inches]	7.99	8.46	9.44
Width [inches]	3.85	5.70	7.9
Depth [inches]	6.49	7.59	8.42

# VLT® Soft Starter MCD 100

**Danfoss VLT® Soft Start Controller MCD 100 is a cost effective and extremely compact soft starter for AC motors up to 15 HP, due to a unique semiconductor design.**

MCD 100 is a true “fit and forget” product. Selection can be made on the basis of the motor power – exactly as with traditional contactors.

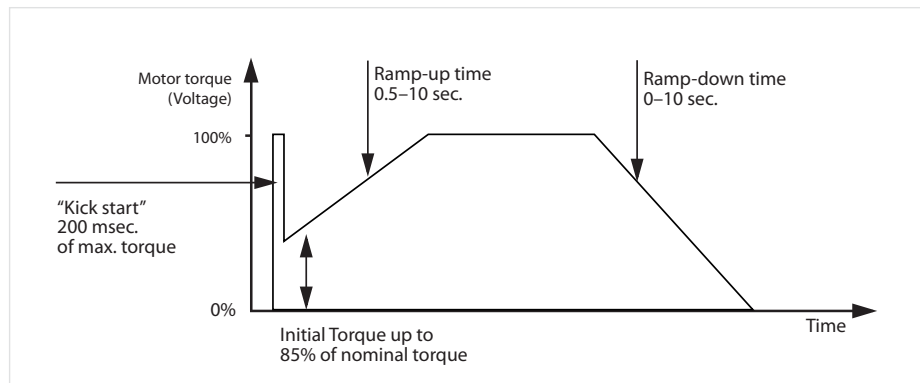
MCD 100 products provide timed voltage ramp up and down. Ramp time can be individually adjusted with rotary switches from 0.4 to 10 seconds.

The start torque can be adjusted from 0 to 85% of the direct on-line torque.

All sizes are rated for line voltage up to 600 V AC.

## The perfect match for:

- Pumps
- Fans
- Compressors
- Mixers
- Conveyors
- and many more



Features	Benefits
Small footprint and compact size	– Saves panel space
Selection can be based on motor power	– Easy selection
Universal control voltage	– Simplifies selection – Keeps stock at a minimum
“Fit and forget” contactor design	– Simplifies installation – Reduces required panel space
Reliable	Maximum up-time
Robust semiconductor design	– Reliable operation
Almost unlimited number of starts per hour without derating	– Prevents unauthorized changes
Max. ambient temperature 50°C without derating	– No external cooling or oversizing necessary
User-friendly	Save commissioning and operating cost
Easy to install and use	– Saves times
Digitally controlled rotary switches	– Secures precise settings and simplifies installation
Easy DIN rail mounting for sizes up to 40 HP	– Saves time and space



## Dimensions

Model	Power size (HP)	Rated current (Amps)	Dimensions (inches) H x W x D	Approvals
MCD 100	2	3 A AC-53b: 4-10: 110	4.01 x 0.88 x 4.88	UL, CSA, CE
	10	15 A AC-53a: 8-3: 100-3000 AC-58a: 6-6: 100-3000	4.33 x 1.77 x 5.03	
	15	25 A AC-53a: 8-3: 100-3000 AC-58a: 6-6: 100-3000	4.33 x 3.54 x 5.03	

# Serial communication

MCD 201, MCD 202 and MCD 500 come with optional plug-in modules for serial communication.

- DeviceNet
- Profibus
- Modbus RTU
- USB

	MCD 100	MCD 201	MCD 202	MCD 500
Start/stop, reset	■	■	■	■
LED for start, run, trip	■	■	■	■
Trip codes	■	■	■	■
Current display			■	■
Motor temp. display			■	■
4 – 20 mA output			■	■
Programming keypad, graphical display				■

## Ordering type codes

### VLT® Compact Starter MCD 200

MCD	2	0	-	-	T	-	C	V
<b>Series</b>								
Soft start/stop	1							
Soft start/stop + protection	2							
<b>Nominal Motor kW, 400 V</b>								
E.g. 55 kW		055						
110 kW		110						
<b>Line Supply Voltage</b>								
200 – 440 V				4				
200 – 575 V				6				
<b>Control Supply Voltage</b>								
24 V AC/DC							1	
110 – 240 V AC and 380 – 440 V AC							3	

### VLT® Soft Starter MCD 500

MCD	5	-	-	-	T	-	G	X	-	-	C	V
<b>MCD5, 500 Series</b>												
<b>FLC, [A]</b>												
0021												
0037												
0043												
0053												
0068												
0084												
0089												
0105												
0131												
0141												
0195												
0215												
0245												
0360												
0380												
0428												
0595												
0619												
0790												
0927												
1200												
1410												
1600												
<b>Bypass indication</b> B: With Internal Bypass Contactor C: Without Internal Bypass Contactor (Continuous)												
<b>Supply Voltage</b> T5, 200 – 525 VAC T7, 380 – 690 VAC												
<b>Enclosure</b> G1, Frame size 1 G2, Frame size 2 G3, Frame size 3 G4, Frame size 4 G5, Frame size 5												
<b>IP Rating</b> 00, IP 00 20, IP 20												
<b>Control Voltage</b> CV1, 24 VAC or 24 VDC CV2, 110 or 220 VAC												

# Size indications

## Size indication for VLT® Compact Starter MCD 200

Model	Power size (HP)	Rated current AC-53b* (Amps)	Dimensions (inches) H x W x D	Approvals
MCD 201/ MCD 202	10	18 A: 4-6: 354	7.99 x 3.85 x 6.49	UL C – UL CE CCC C-tick Lloyds
	20	34 A: 4-6: 354		
	25	42 A: 4-6: 354		
	30	48 A: 4-6: 354		
	40	60 A: 4-6: 354		
	50	75 A: 4-6: 594	8.46 x 5.70 x 7.59	
	60	85 A: 4-6: 594		
	75	100 A: 4-6: 594		
	100	140 A: 4-6: 594	9.44 x 7.95 x 8.42	
	125	170 A: 4-6: 594		
	150	200 A: 4-6: 594		

\* Example: AC 53b: 42 A: 4-6: 354 starting current max. 4 times FLC (42 A) in 6 seconds. 354 seconds minimum between starts.

## Size indication for VLT® Soft Starter MCD 100

Model	Power size (HP)	Rated current (Amps)	Dimensions (inches) H x W x D	Approvals
MCD 100	2	3 A: 5-5:10 (AC 53b)	4.01 x 0.88 x 4.88	UL, CSA, CE
	10	15 A: 8-3: 100-3000 (AC 53a)	4.33 x 1.77 x 5.03	
	15	25 A: 6-5:100-480 (AC 53a)	4.33 x 3.54 x 5.03	

## Size indication for VLT® Soft Starter MCD 500

Motor size (HP) @ 400 V	Frame size code	Starts per hour	Max. FLC	Rated FLC (104 F, 3,280 ft), outside delta motor connection					
				Light 300%, 30s, Internal bypass		Medium 400%, 20s, Internal bypass		Heavy 450%, 30s, Internal bypass	
15	G1 (no fan)	10	23	21		17		15	
25		10	43	37		31		26	
30		10	50	43		37		30	
35		10	53	53		46		37	
40	G1	6	76	68		55		47	
50		6	97	84		69		58	
60		6	100	89		74		61	
75		6	105	105		95		78	
80	G2	6	145	131		106		90	
100		6	170	141		121		97	
125		6	200	195		160		134	
150		6	220	215		178		149	
Motor size (HP) @ 400 V	Frame size code	Starts per hour	Max. FLC	Not bypassed	External bypass	Not bypassed	External bypass	Not bypassed	External bypass
175	G3x	6	255	245	255	195	201	171	176
250	G4x	6	360	360	360	303	310	259	263
275		6	380	380	380	348	359	292	299
300		6	430	428	430	355	368	301	309
400		6	620	595	620	515	540	419	434
500		6	650	619	650	532	561	437	455
600		6	790	790	790	694	714	567	579
700		6	930	927	930	800	829	644	661
800	G5x	6	1200	1200	1200	1135	1200	983	1071
900		6	1410	1410	1410	1187	1319	1023	1114
1000		6	1600	1600	1600	1433	1600	1227	1353

Note: Optimise your selection with WinStart Soft Starter PC tool.

# Specifications

Type	VLT® Soft Starter MCD 500	VLT® Soft Starter MCD 100
	The total motor starter solution. Provides advanced control methods for starting and stopping and protection of motor and application	A true "fit and forget" soft starter for DIN rail mount, MCD 100 provides basic soft start and stop function
Concept	Enhanced soft start and soft stop Motor and system protection 10 – 1100 HP @ 400 V (21-1600A) 200 – 690 V mains voltage 110 – 220 V AC or 24V AC/DC control supply 3-phase SCR control	Soft start Soft stop 1/3 – 15 HP @ 400 V 208 – 600 V mains voltage 24 – 480 V AC/DC control voltage 2-phase SCR control
Start/stop	Adaptive Acceleration Control (AAC) Current limit start Current ramp start Dual parameter function Kick-start Jog	Timed voltage ramp-up Adjustable start torque Selectable kick-start function
	Adaptive Deceleration Control (AAC) TVR soft stop (Timed Voltage Ramp) Coast to stop DC brake function – three phase Soft brake function	Timed voltage ramp-down
Protection	Same as MCD 202 and: Under current Current imbalance Starter overtemperature Restart delay Warning before trips Adjustable phase imbalance sensitivity – Programmable input trip – Individual phase loss trips – Individual shorted SCR trips – Int. bypass relay overload – Int. bypass relay fail Fully adjustable protections Network communication timeout Heatsink overtemperature Battery/clock failure Supply frequency External trip	
Outputs	Three programmable output relays: Programmable analogue output Motor thermistor	
Control	8 language graphical display and keypad Quick menu and application menu Buttons for start, stop, reset and remote control Inputs for two- or three-wire control  <b>Optional:</b> Modules for serial communication Control Panel VLT® LCP 501 PC software	Universal two-wire control Programmable via 3 rotary switches
Other features	Bypass up to 150 HP Configurable bus bars from 360 A and up Operation timers Jog – slow speed operation Auto reset of fault situations Emergency run 99 event log Trip log User programmable metering and monitoring Simulation before connecting line voltage	Extremely robust SCR design for unlimited number of starts per hour, LED indication, IP 20

Type	VLT® Compact Starter MCD 201	VLT® Compact Starter MCD 202
	A physically compact starter providing basic soft start and stop functionality	Physically similar to MCD 201 but providing enhanced soft start functionality and various motor protection functions
Concept	Soft start Soft stop 10 – 150 HP @ 400 V 3 x 200 – 480 VAC (T6 model) CV1 – 24 VAC / VDC CV3 – 110-240 VAC & 380-440 VAC 2-phase SCR control	Current limit start Soft stop Motor protection 10 – 150 HP @ 400 V 3 x 200 – 480 VAC (T6 model) CV1 – 24 VAC / VDC CV3 – 110-240 VAC & 380-440 VAC 2-phase SCR control
Start/stop	Timed voltage ramp-up Adjustable initial torque	Current limit start Initial current ramp-up
	Timed voltage ramp-down	Timed voltage ramp-down
Protection		Motor overload (adjustable trip class) Excess start time Reverse phase rotation Motor thermistor input Shorted SCR – no start Supply fault – no start Instantaneous overload
Outputs	One output relay: Line contactor control	Two output relays: Line contactor control Run contactor or trip function
Control	Two- or three-wire control Programmable via 3 rotary switches Reset push button  <b>Optional:</b> Modules for serial communication Remote operator kit PC software	Two- or three-wire control Programmable via 8 rotary switches Reset push button  <b>Optional:</b> Modules for serial communication Remote operator kit PC software
Other features	Integral SCR bypass for minimum physical size and heat dissipation during nominal operation LED status indication IP 20 (10 – 75 HP @ 400 V) IP 00 (100 – 150 HP @ 400 V) Protection kit available	Integral SCR bypass for minimum physical size and heat dissipation during nominal operation LED status indication IP 20 (10 – 75 HP @ 400 V) IP 00 (100 – 150 HP @ 400 V) Protection kit available



# What VLT® is all about

Danfoss VLT Drives is the world leader among dedicated drives providers – and still gaining market share.

## Environmentally responsible

VLT® products are manufactured with respect for the safety and well-being of people and the environment.

All activities are planned and performed taking into account the individual employee, the work environment and the external environment. Production takes place with a minimum of noise, smoke or other pollution and environmentally safe disposal of the products is pre-prepared.

### UN Global Compact

Danfoss has signed the UN Global Compact on social and environmental responsibility and our companies act responsibly towards local societies.

### EU Directives

All factories are certified according to ISO 14001 standard. All products fulfil the EU Directives for General Product Safety and the Machinery directive. Danfoss VLT Drives is, in all product series, implementing the EU Directive concerning Hazardous Substances in Electrical and Electrical Equipment (RoHS) and is designing all new product series according to the EU Directive on Waste Electrical and Electronic Equipment (WEEE).

### Impact on energy savings

One year's energy savings from our annual production of VLT® drives will save the energy equivalent to the energy production from a major power plant. Better process control at the same time improves product quality and reduces waste and wear on equipment.

## Dedicated to drives

Dedication has been a key word since 1968, when Danfoss introduced the world's first mass produced variable speed drive for AC motors – and named it VLT®.

Twenty five hundred employees develop, manufacture, sell and service drives and soft starters in more than one hundred countries, focused only on drives and soft starters.

## Intelligent and innovative

Developers at Danfoss VLT Drives have fully adopted modular principles in development as well as design, production and configuration.

Tomorrow's features are developed in parallel using dedicated technology platforms. This allows the development of all elements to take place in parallel, at the same time reducing time to market and ensuring that customers always enjoy the benefits of the latest features.

## Rely on the experts

We take responsibility for every element of our products. The fact that we develop and produce our own features, hardware, software, power modules, printed circuit boards, and accessories is your guarantee of reliable products.

## Local backup – globally

VLT® motor controllers are operating in applications all over the world and Danfoss VLT Drives' experts located in more than 100 countries are ready to support our customers with application advice and service wherever they may be.

Danfoss VLT Drives experts don't stop until the customer's drive challenges are solved.



**Danfoss VLT Drives**, 4401 N. Bell School Rd., Loves Park, IL 61111, Tel. +1 (815) 639-8600 (main), Tel. +1 (800) 432-6367 (24 Hour Service for Drives), Fax +1 (815) 639-8000, [www.danfossdrives.com](http://www.danfossdrives.com), Email: [salesinformation@danfoss.com](mailto:salesinformation@danfoss.com)

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without consequential changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.



# Control Panel VLT® LCP 501

The VLT® LCP 501 ensures seamless plug and play communication and control of VLT® Soft Starter MCD 500.



With the Control Panel VLT® LCP 501 being a full function interface, everything you can do on the VLT® Soft Starter MCD 500 is possible via the LCP 501.

## Full control and monitoring

The screen view set-up is selected from 7 standard views and one user programmable.

## Language selection:

English, Chinese, German, Spanish, Portuguese, French, Italian, Russian.

The VLT® LCP 501 is connected to the MCD 500 by using a 3 m cable using 9 pin (D-sub) plug and 3 m cable provided with the IP 65 (NEMA 12) door-mount kit.

Once connected, the soft starter asks whether you want to copy parameters from LCP to starter or starter to LCP (if different).

## Control Panel VLT® LCP 501

- Same user interface as VLT® Soft Starter MCD 500
- Plug & play with MCD 500
- Copy/ paste of parameters
- Multiple monitoring setup
- Door-mount kit – 3m cable
- IP 65 (NEMA 12)

# Perfect

for:

- Quick set-up
- Panel-door mounting

Feature	Benefit
Danfoss "FC" menu structure and button interface concept	– Proven logical access ensuring easy set-up
Parameter upload/ download	– Saves time, simplifies set-up
Same user interface as VLT® Soft Starter MCD 500	– Effective, simple and flexible
Adjustable multiple monitoring views	– You see what you want to see
Door mount IP 65 (NEMA 12)	– Reliable in harsh environment
Speaks your language	– Comfortable set-up
3 metre cable	– Remote Operation
New output on MCD 500	– Simple to connect – Communication port on MCD 500 available also with LCP



### 100% easy connection

- The Modbus, Profibus and Device net modules use another port on the MCD 500 (at the side of the soft starter)
- Separate LCP 501 output at the bottom for 9 pin plug and 3 m cable
- One ordering number (LCP with door-mount kit and cable)
- Plug & play connection (also if soft starter is powered up)
- One cable for power and communication
- Powered up by soft starter
- Copy of parameter set-up

*Modified MCD 500,  
new interface G1*



*Modified MCD 500,  
new interface G2 – G5*



*VLT® Soft Starter MCD 500 range – fully featured soft starters for motors up to 850 kW including total motor starting solution; advanced start, stop and protection features; Adaptive Acceleration Control; Inside Delta connection; 4 line graphical display; multiple programming set-up menus.*

*Power range: 21 – 1600 A, 7.5 – 850 kW (1.2 MW inside delta connection)  
Versions for 200 – 690 VAC.*

Phone: 800.894.0412 - Fax: 888.723.4773 - Web: [www.ctiautomation.net](http://www.ctiautomation.net) - Email: [info@ctiautomation.net](mailto:info@ctiautomation.net)

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequential changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.

## INSTALLATION INSTRUCTIONS



**MODEL NUMBER**  
**DAR 275V**

### 1. PREPARATION



**DANGER:** *Electrical shock or burn hazard. Installation of this device should only be made by qualified personnel. Failure to lockout electrical power during installation or maintenance can result in fatal electrocution or severe burns. Before making any connections be sure that power has been removed from all associated wiring, electrical panels, and other electrical equipment.*



#### CAUTION NOTES:

1. The installation of this device should follow all applicable electrical codes, such as the National Electrical Code.
2. Check to make sure line voltage does not exceed DAR275V voltage ratings.
3. Follow all instructions to ensure correct and safe operation.
4. Do not attempt to open or tamper with the DAR in any way as this may compromise performance and will void warranty. No user serviceable parts are contained.

### 2. INTRODUCTION

Selected DSD, TDS & TDF DINLINE Surge Protection Devices include status monitoring circuits which provide visual status display of device capacity. They may also provide a low voltage opto-coupler alarm output circuit that can be connect to the DAR to provide potential free (Form C) change-over contacts. The DAR alarm contacts may be used to provide output to external alarm systems or remote monitoring circuits.

One DAR can be used per DSD/TDS/TDF opto-coupler alarm or up to 16 DSD opto-coupler alarms can be connected in series to the one DAR to provide a common output. It is recommended that the DAR be powered from the same power circuit that feeds the device(s) being monitored, however the DAR can be powered from other circuits. This allows for example, one DAR unit to be connected to separate SPDs that are protecting a three phase circuit.

Note. Depending upon the usage of the DAR output contacts, failure of power to the DAR may be interpreted as a failure of one or more of the SPDs being monitored. Visual inspection of the DAR and SPDs status displays would determine this.

### 3. MOUNTING

The DAR is designed to clip to 35mm (top hat) DIN rails (standard EN50022). Unless otherwise mechanically restrained, use horizontal DIN rails with the DAR module spring clips to the bottom and the label text the correct way up.

**NOTE:** The DAR must be installed in an enclosure or panel that:

- prevents the DAR temperature from exceeding 131°F (55°C)
- provides adequate electrical and safety protection
- prevents the ingress of moisture and water
- allows DAR status indicators to be inspected

### 4. ELECTRICAL CONNECTION

The interconnecting wiring should:

- be of size #10 to #14 AWG (2.5mm<sup>2</sup> to 6mm<sup>2</sup>) solid or stranded conductor.
- The wire insulation should be stripped back 5/16" (8mm).
- NOTE: Do not use greater than 9inlbs (1Nm) of torque when tightening the terminals.

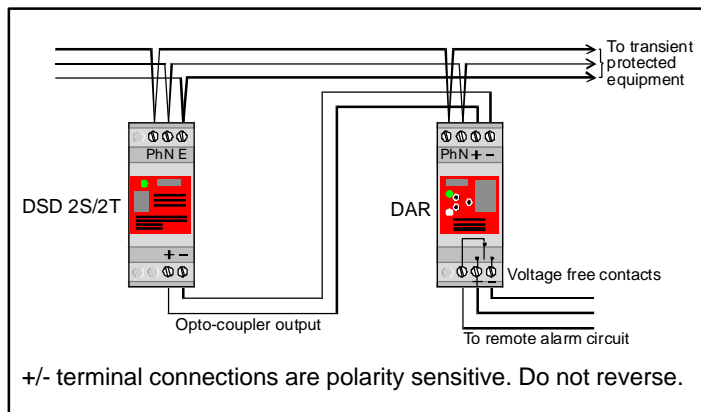
### CONNECTION TO TELECOMMUNICATIONS NETWORKS

The DAR is approved for use in Australia where the alarm contacts may be connected to private lines or building cabling associated with the telecommunications network. NO direct connection to the public switched network should be made.

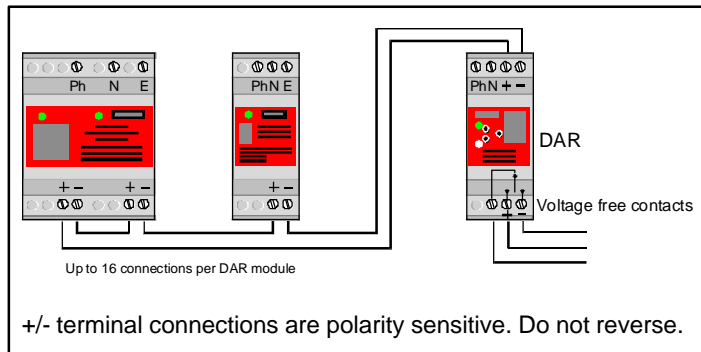
## INSTALLATION INSTRUCTIONS

### 5. INTERCONNECTION

When connecting the DAR to a single opto-coupler output the + terminal of the SPD should connect to the + terminal on the DAR. The – terminal should connect to the – terminal.



When connecting the DAR to multiple opto-couplers the opto-couplers should be connected in series with + terminal of one connected to the – terminal of the next. The DAR + terminal should connect to + SPD terminal at one end of the series connection and the – DAR terminal connect to the – SPD terminal at the other end of the series connection.



### 5. STATUS INDICATION

	✓	!	X
STATUS	Protection Operational	Protection Alarm	Fault Mode
DISPLAY			
EXPLANATION	Normal operation Normal (green) indicator ON Red indicator OFF Relay is energised Power is supplied	DSD in alarm mode or power to DSD has been removed Normal (green) indicator OFF Red indicator ON Relay is de-energised Power is supplied	Power to DAR removed Protection status unknown Normal (green) indicator OFF Red indicator OFF Relay is de-energised Power is OFF

### 6. FUSING AND ISOLATION

Overcurrent protection must be installed in the upstream circuit of the power supply to the DAR to provide protection to the unit itself and the wiring in case of fault conditions.

The fuse rating should be based on the wiring size used to connect to the DAR Ph & N terminals. Australian regulations AS3000-1991, Table B2 specifies the following upstream protection for single phase circuits, unenclosed in air.

Cable Size	HRC Fuse or	CB Rewirable Fuse
1.5mm <sup>2</sup>	16A	12A
2.5mm <sup>2</sup>	20A	16A
4mm <sup>2</sup>	25A	20A
6mm <sup>2</sup>	32A	25A

Where overcurrent protection of the appropriate rating or smaller is already fitted in the upstream circuit, overcurrent protection at the DAR will not be required

### 6. MAINTENANCE & TESTING

Before removing a DAR unit from service, ensure that the power has been removed. Maintenance, testing and replacement should only be undertaken by qualified personnel.

Testing of a DAR unit which is connected to a fully functional DSD unit can be accomplished by removing power to the DSD only. The DAR Status indication and output contacts should alter from the Normal to Fault condition.

Testing of the DAR unit alone may be accomplished by disconnecting the + / - connections to the unit. When power is applied the DAR "Fault" Status Indicator should be illuminated. By connecting the + / - terminals together, the "Normal" Status Indicator should be illuminated. The output contacts should alter to the appropriate state.

### 7. USE OF OTHER INTERFACES

Only DAR units are recommended for the interfacing of equipment to the DSD, TDS & TDF opto-coupler alarm output circuit(s). The direct connection of other equipment to these opto-coupler alarm outputs may not provide sufficient isolation or exceed the opto-coupler specifications. This may damage the SPD and/or the connected equipment. Warranty may be voided under such circumstances.

**NOTE:** In connecting to the SPD opto-coupler alarm output(s), do not reverse the +/- connections as damage may occur.

*Think Automation and beyond...*



# LF1B Series

## LED Illumination Units

**LUMIFA™**

Low heat generation.  
Four lengths & four illumination  
colors available.

Slim, space-  
saving design  
(only 16mm  
thick)

Heat generation  
reduced by  
70%\*



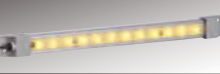
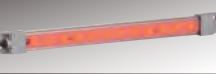


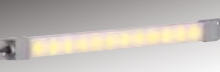
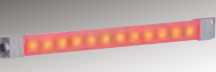
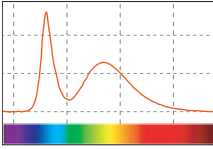
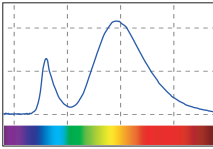
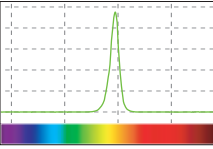
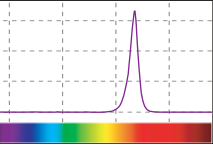




Less power  
consumption &  
71% less CO<sub>2</sub>  
emission\*

5 times  
longer life\*

\*Compared to 20W  
fluorescent lamps.

IDEC CORPORATION

## Illumination Colors & Application Examples

		<div style="display: flex; justify-content: space-around; align-items: center;"> <span style="color: red; font-weight: bold; font-size: 1.2em;">New</span> <span style="color: red; font-weight: bold; font-size: 1.2em;">New</span> <span style="color: red; font-weight: bold; font-size: 1.2em;">New</span> </div>			
Illumination Color		Cool White	Warm White	Yellow	Red
Power Voltage		24V DC			
Appearance	Clear Cover				
	White Cover				
Spectrum					
Features		Suppressing glare, the bright, clear cool white illumination color lights up a target object clearly. This illumination color gives off a color temperature of 5500K.	Warm color similar to that of incandescent lamps. This illumination color gives off a color temperature of 2800K.	Yellow illumination color gives off an emission spectrum with a dominant wavelength of 590 nm.	Red illumination color gives off an emission spectrum with a dominant wavelength of 625 nm.
Applications		<ul style="list-style-type: none"> <li>Control panel</li> <li>Plant equipment</li> <li>Refrigerator/freezer</li> <li>Inspection/test equipment</li> <li>Advertising display/board</li> <li>Machine tool</li> </ul> 	<ul style="list-style-type: none"> <li>Food processing machines</li> <li>Cosmetic plants</li> <li>Chemical plants</li> <li>Showcases</li> <li>Food display cases</li> </ul> 	<ul style="list-style-type: none"> <li>Manufacturing equipment</li> <li>IC foundries</li> </ul> 	<ul style="list-style-type: none"> <li>Photosensitive materials</li> <li>Semiconductor manufacturing equipment</li> </ul> 

### Features

- Brightness: 62.5 Lumens/Watt
- Low heat generation.
- Less energy usage, longer operation life, smaller mounting space, and no electrical noise.
- 71% reduction of power and CO<sub>2</sub> emission when compared to 20W fluorescent lamps (LF1B-C/D)
- Thin and slim style fits into compact spaces.
- Two cover colors: clear and white (diffused light)
- Cool white, warm white, yellow and red illumination colors available.
- UL Listed & IP54 protection against dust and water splash (IEC 60529)



### Part No. Development

## LF1B- C 3 S - 2 THWW4

#### LED Module Arrangement

- A: 3 LEDs x 1 row
- B: 6 LEDs x 1 row
- C: 12 LEDs x 1 row
- D: 24 LEDs x 1 row

#### Rated Voltage

2: 24V DC

#### Degree of Protection

S: IP54

#### Cover

- 3: Clear plastic
- 4: White plastic

#### LED Illumination Color

- THWW4: Cool white
- TLWW4: Warm white
- SHY6: Yellow
- SHR6: Red

### LED Optics Specifications

Illumination Color		Cool White	Warm White	Yellow	Red
Luminous Intensity (typ.) (Single LED module)		5000 mcd	4500 mcd	2300 mcd	1800 mcd
Color Temperature (typ.)/Dominant Wavelength (typ.)		5500K	2800K	590 nm	625 nm
Reference Illuminance (typ.) at 500 mm (clear cover)	3 LEDs x 1 row	90 lx	60 lx	20 lx	20 lx
	6 LEDs x 1 row	170 lx	110 lx	40 lx	40 lx
	12 LEDs x 1 row	330 lx	200 lx	75 lx	75 lx
	24 LEDs x 1 row	560 lx	350 lx	125 lx	125 lx

Note: Illumination colors and illuminance may vary. Specifications shown in the above table are typical values and may vary depending upon actual environment.

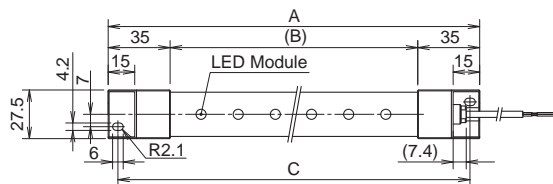
## LF1B Series Illumination Units

### Performance Specifications

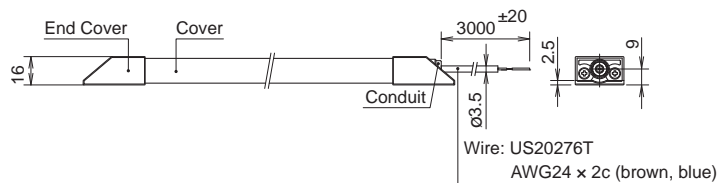
Rated Voltage	24V DC (non-polarized)
Input Current (typ.) (at the rated voltage)	LF1B-A 30mA
	LF1B-B 60mA
	LF1B-C 120mA
	LF1B-D 240mA
Power Consumption (typ.) (at the rated voltage)	LF1B-A 0.8W
	LF1B-B 1.5W
	LF1B-C 2.9W
	LF1B-D 5.8W
Insulation Resistance	100MΩ minimum (500V DC megger)
Dielectric Strength	1000V AC, 1 minute (between live and dead parts)
Vibration Resistance (damage limits)	Frequency: 5 to 55 Hz Amplitude: 0.5 mm
Shock Resistance (damage limits)	1000m/s <sup>2</sup>
Operating Temperature	-30 to +55°C (no freezing)
Operating Humidity	45 to 85% RH (no condensation)
Storage Temperature	-35 to +70°C (no freezing)
Operating Atmosphere	No corrosive gas
Life	40000 hours (The total illumination duration in which the luminance maintains a minimum of 70% of the initial value.)
Degree of Protection	IP54
Material	End cover, conduit: polyamide Cover: polycarbonate Wire: US20276T AWG24 × 2C
Weight (approx.)	LF1B-A 95g
	LF1B-B 125g
	LF1B-C 165g
	LF1B-D 255g

- Do not use the LF1B illumination units in environments subject to corrosive gases, otherwise illuminance may deteriorate.

### Dimensions

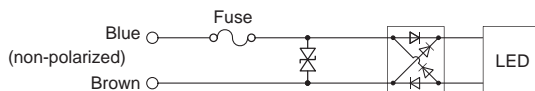


Type No.	A	B	C
LF1B-A	134	64	123
LF1B-B	210	140	199
LF1B-C	330	260	319
LF1B-D	580	510	569



All dimensions in mm.

### Internal Circuit



IDEC Corporation • 1175 Elko Drive • Sunnyvale, CA 94089 • 800-262-IDEC (4332) • Fax: 408-745-5258 • [www.IDEC.com/usa](http://www.IDEC.com/usa)

©2009 IDEC Corporation. All Rights Reserved. PDF only. Updated 07/09



# Relay Selection Guide

Call (800) 262.IDEC

[www.IDEC.com/relay](http://www.IDEC.com/relay)



# RH Series - Compact Power Relays



- Small industrial 10A GP relay
- SPDT, DPDT, 3PDT, 4PDT contacts
- Options: indicator LED, check-button and surge suppression diode
- DIN rail, through panel, and PCB type sockets available
- SPDT and DPDT 500K cycle UL tested for maximum life expectancy



**RH 1 B - U L AC24V**

Contact Configuration

1=SPDT  
2=DPDT  
3=3PDT  
4=4PDT

Terminal Type  
B=Blade (.187")  
V2=PCB

Options

L=Indicator light  
C=Check button  
T=Top mounting\*  
D=Diode (DC only)

Coil Voltage

AC6V DC6V  
AC12V DC12V  
AC24V DC24V  
AC120V DC48V  
AC240V DC110V

\*Diode, Indicator light, and check button not available with top mount option  
1. For RH2B use AC110-120V  
2. For RH2B use AC220-240V  
3. For RH2B use DC100-110V

Specifications		RH1	RH2	RH3	RH4
	Contact Material	Silver cadmium oxide (AgCdO)			
	Contact Rating	10A			
	Minimum Load (reference values)	30mA@24VDC, 100mA@5VDC			
	Dimensions (w x d x h) mm	14x27.5x42	21x27.5x42	31x27.5x42	41x27.5x42

Sockets for Blade Terminal Models	Relays	Standard DIN Rail Mount	Finger-safe DIN Rail Mount	Through Panel Mount	PCB Mount
	RH1B	SH1B-05	SH1B-05C	SH1B-51	SH1B-62
	RH2B	SH2B-05	SH2B-05C	SH2B-51	SH2B-62
	RH3B	SH3B-05	SH3B-05C	SH3B-51	SH3B-62
	RH4B	SH4B-05	SH4B-05C	SH4B-51	SH4B-62

Accessories	Relays / Sockets		Description	For DIN Mount Socket	For Through Panel & PCB Mount Socket
	Hold Down Springs & Clips	RH1B	Pullover Wire Spring	SY2S-02F1	SY4S-51F1
		RH2B		SY4S-02F1	
		RH3B		SH3B-05F1	
		RH4B		SH4B-02F1	
		RH1B, RH2B, RH3B, RH4B	Leaf Spring (side latch)	SFA-202	SFA-302
		RH1B, RH2B, RH3B, RH4B	Leaf Spring (top latch)	SFA-101	SFA-301
	DIN Rail	all DIN mount sockets	Aluminum DIN Rail (1 meter length)	BNDN1000	—
			DIN Rail End Stop	BNL5	—

# DSN

DECONTACTOR™

## The range

<b>Advantages</b>	<b>p. 18</b>
<b>Features</b>	<b>p. 19</b>
<b>Core range</b>	<b>p. 20</b>
<b>DSN1 - 20 A</b>	<b>p. 22</b>
<b>DSN3 - 32 A</b>	<b>p. 24</b>
<b>DSN6 - 63 A</b>	<b>p. 26</b>
<b>Dimensions</b>	<b>p. 28</b>

Spare parts: see page 172



Food processing



Chemical industry



Port facilities

## The universal plug and socket-outlet with an automatic IP66/67

With the DSN range, MARECHAL ELECTRIC provides the only plug and socket-outlet that remains watertight in every situation. Such watertightness is provided just by inserting the

plug and is maintained when you remove the plug from the socket-outlet and close the lid. There is no need to turn any sealing ring!

And water treatment, wood and paper processing plants, construction site equipment ...

**Advantages**

Core range  
 DSN1 - 20 A  
 DSN3 - 32 A  
 DSN6 - 63 A  
 Dimensions

## Electrical features

- From **20 to 63** Amps - Voltage up to 1 000 Volts AC and up to 250 Volts DC
- Integral switching device as defined in clause 2.8 of IEC / EN 60309-1 standard
- Equipped with silver-nickel butt-contacts and metal braid for added reliability and lifetime
- Socket-outlet safety shutter provides **IP4X** protection
- Unique keying system allows discrimination between 24 different power supplies (voltage, frequency, AC and DC current)
- Number of cycles under normal operation and overload conditions from 2 to 8 times (depending on rated current) more than those required by IEC / EN 60309-1 standard
- Versions with 2 auxiliary contacts (32 A) and 4 auxiliary contacts (63 A)

## Mechanical features

- IP66 and IP67 automatic watertightness as standard



Push the plug into the socket-outlet: a "click" indicates that connection has been established and that IP66/67 has been achieved.



Remove the plug from the socket-outlet and close the lid: the same "click" indicates that IP66/67 has been achieved.

- Resistance to high pressure washing
- Casings made of glass fibre reinforced polyester providing excellent resistance:
  - to most chemicals and environmental conditions (including UV and Gamma rays)
  - to shocks (**IK08**) in a broad range of temperatures
- Ambient temperature: -40 °C to +60 °C (for temperatures outside this range, please contact us)
- Spring-assisted terminals unaffected by vibrations and thermal cycling
- Self-opening lid; self-returning lid on request

## Regulatory features

DSN decontactors comply with:

- The **IEC 60309-1** International standard and **EN 60309-1** European standard (plugs and socket-outlets for industrial purposes),
- The European Low Voltage Directive (decree N°95-1081 dated 3<sup>rd</sup> October 1995),
- The French decree **N° 88-1056** dated 14<sup>th</sup> November 1988 relating to workers' protection,
- The decrees relating to workers' protection in Belgium, Spain and Italy,
- The load breaking capacity according to utilisation categories **AC 22** and **AC 23** of **IEC / EN 60947-3** (switch standard).

Also certified by **VERITAS LCIE**, **UL**, **AS** and **CSA** (French, American, Australian and Canadian inspection laboratories).



### SPECIFICATION

IP 66/67 Plug and socket-outlet with integral switching device AC22/23, safety shutter (IP4X socket-outlet), silver-nickel butt contacts with metal braid, comply with BECMA international standard.

Product technical data sheet on e-catalogue - [www.marechal-electric.com](http://www.marechal-electric.com)

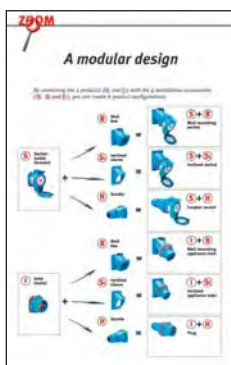
# DSN

DECONTACTOR™

# Quickly find the right items!



## Marechal's modular system



DSN decontactors meet the modularity system described on the front cover flap. Before consulting the 'part number' pages, determine the parts required for the needed configuration.



Example : a **wall mounting socket-outlet** includes an active part, the socket-outlet (female) and an installation accessory,

the **wall box**. Each part has its own part number. Therefore, the order should have **two part numbers**.

## DSN part number system

- **Standard** DSN part numbers are made up of 7 characters. All part numbers start with a '6'.
- The choice of an **option** or a **version with auxiliary contacts** results in adding a suffix (from 1 to 3 characters).

1 <sup>st</sup> character	2 <sup>nd</sup> character	3 <sup>rd</sup> character	4 <sup>th</sup> character	Characters from 5 to 7		
Range	Casing	Rated current	Usage	Supply voltage**	Frequency	Polarity
<b>6 = DSN</b>	1 = Blue poly	1 = <b>DSN1</b> (20 A)	4 = Socket-outlet	<b>08A</b> = 20 - 24 V	50 Hz	2P
	4 = Grey poly	3 = <b>DSN3</b> (32 A)	8 = Inlet	<b>035</b> = 110 - 130 V	50 Hz	1P+N+E
	5 = Black poly	6 = <b>DSN6</b> (63 A)		<b>033</b> = 190 - 230 V	50 Hz	3P+E
				<b>015</b> = 220 - 250 V	50 Hz	1P+N+E
				<b>013</b> = 380 - 440 V	50 Hz	3P+E
				<b>017</b> = 380 - 440 V	50 Hz	3P+N+E
			A = Installation accessory	<b>013</b> = Handle		
				<b>027</b> = Inclined sleeve		
				<b>053</b> = Wall box		

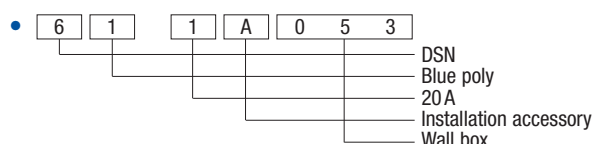
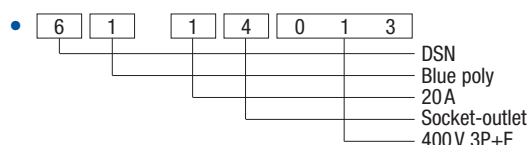
\*\* 24 different power supplies (voltage, frequency) and 12 polarities are available: see international standard and colour-code on page 8

## Check that the DSN part number meets the need ...

Example : the need is for a 20A, 400 V, 3P+E blue poly wall mounting socket.

- The DSN with a 20A rated current is **DSN1** (see pages 22 and 23).
- Order a **20 A socket-outlet (S)** and a **wall box (B)**.
- In the standard socket-outlet part number table, select the part number for a 400 V, 3P+E socket-outlet: **61 14 013**
- In the standard wall box part number table, choose the accessory that suits you e.g. a 30° blue poly wall box with a M20 threaded entry: **61 1A 053**

You can check the two part numbers found:



## The DSN core range

The following table describes the most frequent configurations. Take a look:  
 if the required configuration is there, do not look further in the 'part number' pages.  
 Each configuration includes two part numbers: one for the active part (*socket-outlet or inlet*)  
 and one other for the installation accessory (*wall box, inclined sleeve or handle*).

Wall mounting  
socket



Inclined  
socket



Coupler socket



Plug



Wall mounting  
appliance inlet



Inclined  
appliance inlet



Active part:	Socket-outlet	Socket-outlet	Socket-outlet	Inlet	Inlet	Inlet
+ installation accessory:	<b>B</b> Wall box	<b>Si</b> Inclined sleeve	<b>H</b> Handle	<b>H</b> Handle	<b>B</b> Wall box	<b>Si</b> Inclined sleeve

### DSN<sub>1</sub> 20 A

Voltage	Polarity	Part Number					
230V	1P+N+E	61 14 015	61 14 015	61 14 015	61 18 015	61 18 015	61 18 015
	+ installation accessory:	61 1A 053	61 1A 027	61 1A 013	61 1A 013	61 1A 053	61 1A 027
400V	3P+E	61 14 013	61 14 013	61 14 013	61 18 013	61 18 013	61 18 013
	+ installation accessory:	61 1A 053	61 1A 027	61 1A 013	61 1A 013	61 1A 053	61 1A 027
400V *	3P+N+E	61 14 017 *	61 14 017 *	61 14 017 *	61 18 017	61 18 017	61 18 017
	+ installation accessory:	61 1A 053	61 1A 027	61 1A 013	61 1A 013	61 1A 053	61 1A 027

Example described at bottom of previous page

### DSN<sub>3</sub> 32 A

Voltage	Polarity	Part Number					
230V	1P+N+E	61 34 015	61 34 015	61 34 015	61 38 015	61 38 015	61 38 015
	+ installation accessory:	61 3A 053	61 3A 027	61 3A 013	61 3A 013	61 3A 053	61 3A 027
400V	3P+E	61 34 013	61 34 013	61 34 013	61 38 013	61 38 013	61 38 013
	+ installation accessory:	61 3A 053	61 3A 027	61 3A 013	61 3A 013	61 3A 053	61 3A 027
400V *	3P+N+E	61 34 017 *	61 34 017 *	61 34 017 *	61 38 017	61 38 017	61 38 017
	+ installation accessory:	61 3A 053	61 3A 027	61 3A 013	61 3A 013	61 3A 053	61 3A 027

### DSN<sub>6</sub> 63 A

Voltage	Polarity	Part Number					
230V	1P+N+E	61 64 015	61 64 015	61 64 015	61 68 015	61 68 015	61 68 015
	+ installation accessory:	61 6A 053	61 6A 027	61 6A 013	61 6A 013	61 6A 053	61 6A 027
400V	3P+E	61 64 013	61 64 013	61 64 013	61 68 013	61 68 013	61 68 013
	+ installation accessory:	61 6A 053	61 6A 027	61 6A 013	61 6A 013	61 6A 053	61 6A 027
400V *	3P+N+E	61 64 017 *	61 64 017 *	61 64 017 *	61 68 017	61 68 017	61 68 017
	+ installation accessory:	61 6A 053	61 6A 027	61 6A 013	61 6A 013	61 6A 053	61 6A 027

\* A dual voltage 230/400V socket-outlet with 3P+N+E accepts a 400V plug with 3P+N+E or 3P+E as well as a 230V plug with 1P+N+E (see front cover flap).

**DSN<sub>1</sub>****DECONTACTOR™  
20 A**Certificate no.  
FR 60042266D**Main features:**

• (socket-outlet) IP	66/67	• Wiring (min - max) flexible	1 / 2.5 mm <sup>2</sup>
• (socket-outlet + inlet) IP	66/67	• Wiring (min - max) stranded	1.5 / 4 mm <sup>2</sup>
• IK	08	• Other wiring on request	
• U <sub>max</sub>	500 V AC - 250 V DC	max flexible / stranded	10 / 16 mm <sup>2</sup>
• Rated currents (IEC / EN 60309-1)		20 A / 400 V	20 A / 500 V
• Rated currents and operating voltages (load breaking capacity according to IEC / EN 60947-3)		20 A / 400 V (AC23)	20 A / 500 V (AC22)

**Socket-outlet (female)****Inlet (male)****Main options**

Device for self-ejecting coupler socket\*



Device for self-ejecting plug\*

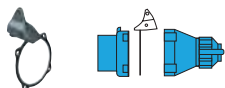
\* See Operating Instruction on page 168

Padlocking shaft  
(Padlock not supplied)

Stop button

**Accessories**

IP67 Inlet cap



Ejecting mechanism (shark fin)



Tension cord

Voltage	Polarity	Material	Part #
20 - 24 V	2P	Polyester	61 14 08A
110 - 130 V	1P+N+E	Polyester	61 14 035
190 - 230 V	3P+E	Polyester	61 14 033
220 - 250 V	1P+N+E	Polyester	61 14 015
380 - 440 V	3P+E	Polyester	61 14 013
Dual voltage*	3P+N+E	Polyester	61 14 017

\* See front cover flap

Other voltages, polarities: see page 8

**Version with self-closing lid (IP54):****Please consult us****Socket-outlet options**

Device for self-ejecting coupler socket	Socket # +	<b>354</b>
Device for self-ejecting plug	Socket # +	<b>352</b>
Self-returning lid	Socket # +	<b>R</b>
180°-opening lid	Socket # +	<b>10</b>
180°-opening and self-returning lid	Socket # +	<b>18</b>
Padlocking shaft for 1 padlock 3 mm Ø	Socket # +	<b>840</b>
Padlocking shaft up to 3 padlocks 3 mm Ø	Socket # +	<b>844</b>
Stop button	Socket # +	<b>453</b>

If you want to equip a socket-outlet with two or more options:  
call us at +33 (0) 1 45 11 60 00.

Voltage	Polarity	Material	Part #
20 - 24 V	2P	Polyester	61 18 08A
110 - 130 V	1P+N+E	Polyester	61 18 035
190 - 230 V	3P+E	Polyester	61 18 033
220 - 250 V	1P+N+E	Polyester	61 18 015
380 - 440 V	3P+E	Polyester	61 18 013
380 - 440 V	3P+N+E	Polyester	61 18 017

**Inlet accessories**

IP67 cap	61 1A 126
Ejecting mechanism (shark fin)	61 1A 338
Tension cord	31 1A 336

**Also see:**

Full range of boxes page 86  
Dimensions page 28  
Technical Manual page 150

**Installation accessories****B Box**

	Wall box poly 30°	Wall box poly 70°
Entry		
M20	61 1A 053	51 AA 058
M25		51 AA 058
M32		51 AA 058

The boxes are supplied without any cable gland.  
The 70° boxes are not drilled (drilled at extra cost).

**Sl Sleeve**

	Inclined poly 30°	Inclined poly 70°
Entry		
M20	61 1A 027	51 AA 757

**H Handle**

	Straight poly	Angled poly
Cable dia.		
8 - 18 mm	61 1A 013	01 NA 313
5 - 21 mm	61 1A 413	

Handle for flat or steel armoured cables on request.



Straight poly with  
poly cable gland



for  
ejection option



Straight poly flowerpot  
with metric threaded entry \*

Cable dia.

6 - 12 mm	61 1A 753	61 1A 463
13 - 18 mm	61 1A 253 25P	61 1A 443 25P
18 - 25 mm	61 1A 253 32P	61 1A 443 32P

Entry

M20	61 1A 253 417
M25	61 1A 253 418
M32	61 1A 253 419

\* Cable gland on request.

**A Industrial – Domestic adapters**

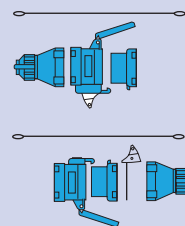
Domestic socket-outlet 10/16A 230V  
+ Marechal industrial inlet 1P+N+E

Type	Material	Part number
UK	Poly	61 18 015 D40 *
FR with safety shutter	Poly	61 18 015 D16

\* All these domestic socket-outlets are available to foreign standards : replace D40 by D11 for France, D30 for Germany, D06 for Italy, D08 for Switzerland, D67 for Australia, D80 for USA etc

**Self-ejection**

Both DSN sockets and plugs can be modified for self-ejection purposes e.g. for use on vehicles, movable vessels, trailers etc.



See page 168 for guidance notes or  
contact us with your application for assistance.

**Supply boxes for emergency vehicles**

with self-ejecting coupler socket



See description on page 137

# DSN<sub>3</sub> DECONTACTOR™

## 32 A



Certificate no.  
FR 60042266E



### Main features:

• (socket-outlet) IP	66/67	• Wiring (min - max) flexible	2.5 / 6 mm <sup>2</sup>
• (socket-outlet + inlet) IP	66/67	• Wiring (min - max) stranded	2.5 / 10 mm <sup>2</sup>
• IK	08	• Other wiring on request	
• U <sub>max</sub>	690 V AC - 250 V DC	max flexible / stranded	10 / 16 mm <sup>2</sup>
• Rated currents (IEC / EN 60309-1)	32 A / 400 V	32 A / 500 V	32 A / 690 V
• Rated currents and operating voltages (load breaking capacity according to IEC / EN 60947-3)	32 A / 400 V (AC23)	32 A / 500 V (AC22)	32 A / 690 V (AC22)



### Socket-outlet (female)



### Inlet (male)



### Main options



Device for self-ejecting coupler socket\*



Device for self-ejecting plug\*

\* See Operating Instruction on page 168



Padlocking shaft  
(Padlock not supplied)



Stop button

### Accessories



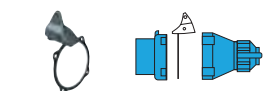
IP67 Inlet cap



Self-closing lid for inlet



Closing mechanism  
(finger draw plates sold per unit)



Ejecting mechanism (shark fin)



Tension cord

Voltage	Polarity	Material	Part #
20 - 24 V	2P	Polyester	61 34 08A
110 - 130 V	1P+N+E	Polyester	61 34 035
190 - 230 V	3P+E	Polyester	61 34 033
220 - 250 V	1P+N+E	Polyester	61 34 015
380 - 440 V	3P+E	Polyester	61 34 013
Dual voltage*	3P+N+E	Polyester	61 34 017

\* See front cover flap

Other voltages, polarities: see page 8

### Socket-outlet (U<sub>max</sub> 400 V) with auxiliary contacts

With 2 auxiliary contacts (30A) Socket # + 972

If you want to add an option to this kind of socket-outlet:  
call us at +33 (0) 1 45 11 60 00.

### Socket-outlet options

Device for self-ejecting coupler socket	Socket # + 354
Device for self-ejecting plug	Socket # + 352
Self-returning lid	Socket # + R
180°-opening lid	Socket # + 10
180°-opening and self-returning lid	Socket # + 18
Padlocking shaft for 1 padlock 3 mm Ø	Socket # + 840
Padlocking shaft up to 3 padlocks 3 mm Ø	Socket # + 844
Stop button	Socket # + 453

If you want to equip a socket-outlet with two or more options:  
call us at +33 (0) 1 45 11 60 00.

### Socket-outlet accessories

Closing mechanism (finger draw plate)	61 3A 346
---------------------------------------	-----------

Voltage	Polarity	Material	Part #
20 - 24 V	2P	Polyester	61 38 08A
110 - 130 V	1P+N+E	Polyester	61 18 035
190 - 230 V	3P+E	Polyester	61 38 033
220 - 250 V	1P+N+E	Polyester	61 38 015
380 - 440 V	3P+E	Polyester	61 38 013
380 - 440 V	3P+N+E	Polyester	61 38 017

### Inlet (U<sub>max</sub> 400 V) with auxiliary contacts

With 2 auxiliary contacts (30A) Inlet # + 972

### Inlet accessories

IP67 cap	61 3A 126
Self-closing lid	31 1A 226
Closing mechanism (finger draw plate)	61 3A 346
Ejecting mechanism (shark fin)	61 3A 338
Tension cord	31 1A 336

**Also see:**

Full range of boxes page 86  
Dimensions page 28  
Technical Manual page 150

**Installation accessories****B****Box****Wall box poly 30°****Wall box poly 70°****Wall box metal 30°****Wall box metal + poly sleeve 30°****Wall box metal + metal sleeve 30°****Wall box metal + straight metal sleeve****Entry**

M20

61 3A **053**51 BA **058**69 3A **053**61 3A **653**69 3A **653**69 3A **095**

M25

61 3A **083**51 BA **058**61 3A 653 **418**69 3A 653 **418**69 3A 095 **418**

M32

51 BA **058**61 3A 653 **419**69 3A 653 **419**69 3A 095 **419**

M40

61 3A 653 **420**69 3A 653 **420**69 3A 095 **420**

The boxes are supplied without any cable gland. The 70° boxes are not drilled (drilled at extra cost).

**Sl****Sleeve****Inclined poly 30°****Inclined poly 70°****Straight metal****Inclined metal 30°**61 3A **027**51 BA **757**69 3A **127**69 3A **027****H****Handle****Straight poly****Straight poly with poly cable gland****for ejection option \*****Straight metal with metal cable gland****Straight poly flowerpot with metric threaded entry \*****Cable dia.**

5 - 21 mm

61 3A **013****Cable dia.**

6 - 12 mm

61 3A **753**61 3A **463**

13 - 18 mm

61 3A 253 **25P**61 3A 443 **25P**

18 - 25 mm

61 3A 253 **32P**61 3A 443 **32P**

22 - 32 mm

61 3A 253 **40P**61 3A 443 **40P****Cable dia.**

6 - 12 mm

61 3A **963**

10 - 18 mm

61 3A 953 **25M****Entry**M20 61 3A 253 **417**M25 61 3A 253 **418**M32 61 3A 253 **419**M40 61 3A 253 **420**

Handle for flat or steel armoured cables on request.

\* Handle with eyelet for tension cord

\* Cable gland on request.

**A****Industrial – Domestic adapters**

Domestic socket-outlet 10/16A 230V + **Marechal** industrial inlet 1P+N+E, 10 A 230 V fuse protection

**Type****Material****Part number**

UK

Poly

61 38 015 **D40 \***

FR with safety shutter

Poly

61 38 015 **D16**

\* All these domestic socket-outlets are available to foreign standards : replace D40 by D11 for France, D30 for Germany, D06 for Italy, D08 for Switzerland, D67 for Australia, D80 for USA etc

**Supply boxes with self-ejecting coupler socket for emergency vehicles**

See description on page 137

**ZOOM****Wall boxes and 70° sleeves**

These wall boxes are designed for:

- easy wiring, recommended for large conductor cross-sections (up to 5 x 35 mm<sup>2</sup>)
- entries and exits either at top, bottom or sides
- stock reduction, as the same wall box is common to several products

The sleeves are angled (70°) to reduce the socket-outlet protrusion and impact risk (fork lifts ...).

**See full range of boxes on page 86**

# DSN6 DECONTACTOR™ 63A



Certificate no.  
FR 60037180-537184N



## Main features:

• (socket-outlet) IP	66/67	• U <sub>max</sub>	1000 V AC - 250 V DC
• (socket-outlet + inlet) IP	66/67	• Wiring (min - max) flexible	6 / 16 mm <sup>2</sup>
• IK	08	• Wiring (min - max) stranded	6 / 25 mm <sup>2</sup>
• Rated currents (IEC / EN 60309-1)	63 A / 400V	63 A / 690V	45 A / 1000V
• Rated currents and operating voltages	63 A / 400V	63 A / 690V	-
(load breaking capacity according to IEC / EN 60947-3)	(AC23)	(AC22)	(-)

## **S** Socket-outlet (female)



Version with  
auxiliary contacts

## **I** Inlet (male)



## Main options



Device for self-ejecting coupler socket\*



Device for self-ejecting plug\*

\* See Operating Instruction on page 168



Padlocking shaft  
(Padlock not supplied)



Stop button

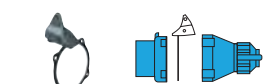
## Accessories



IP67 Inlet cap



Self-closing lid for inlet



Ejecting mechanism (shark fin)



Tension cord

Voltage	Polarity	Material	Part #
20 - 24V	2P	Polyester	61 64 08A
110 - 130V	1P+N+E	Polyester	61 64 035
190 - 230V	3P+E	Polyester	61 64 033
220 - 250V	1P+N+E	Polyester	61 64 015
380 - 440V	3P+E	Polyester	61 64 013
Dual voltage*	3P+N+E	Polyester	61 64 017

\* See front cover flap

Other voltages, polarities: see page 8

## Socket-outlet (U<sub>max</sub> 400V) with auxiliary contacts

With 2 auxiliary contacts (16 A)	Socket # + 972
With 4 auxiliary contacts (16 A)	Socket # + 264

If you want to add an option to this kind of socket-outlet:  
call us at +33 (0) 1 45 11 60 00.

## Socket-outlet options

Device for self-ejecting coupler socket	Socket # + 354
Device for self-ejecting plug	Socket # + 352
Self-returning lid	Socket # + R
180°-opening lid	Socket # + 10
180°-opening and self-returning lid	Socket # + 18
Padlocking shaft for 1 padlock 3 mm Ø	Socket # + 840
Padlocking shaft up to 3 padlocks 3 mm Ø	Socket # + 844
Stop button	Socket # + 453

If you want to equip a socket-outlet with two or more options:  
call us at +33 (0) 1 45 11 60 00.

Voltage	Polarity	Material	Part #
20 - 24V	2P	Polyester	61 68 08A
110 - 130V	1P+N+E	Polyester	61 68 035
190 - 230V	3P+E	Polyester	61 68 033
220 - 250V	1P+N+E	Polyester	61 68 015
380 - 440V	3P+E	Polyester	61 68 013
380 - 440V	3P+N+E	Polyester	61 68 017

## Inlet (U<sub>max</sub> 400V) with auxiliary contacts

With 2 auxiliary contacts (16 A)	Inlet # + 972
With 4 auxiliary contacts (16 A)	Inlet # + 264








## Inlet accessories

IP67 cap	61 6A 126
Self-closing lid	31 3A 226
Ejecting mechanism (shark fin)	61 6A 338
Tension cord	31 1A 336

**Also see:**






Full range of boxes page 86  
Dimensions page 28  
Technical Manual page 150

**Installation accessories****B Box**

							
	Wall box poly 30°	Wall box poly 70°	Wall box metal 30°	Wall box metal + poly sleeve 30°	Wall box metal + metal sleeve 30°	Wall box metal + straight metal sleeve	Wall box metal + metal sleeve 70°
Entry							
M20		51 CA 058		61 6A 653 417	69 6A 653 417	69 6A 095 417	87 3A 053 417
M25	61 6A 053	51 CA 058	69 6A 053	61 6A 653	69 6A 653	69 6A 095	87 3A 053
M32		51 CA 058		61 6A 653 419	69 6A 653 419	69 6A 095 419	87 3A 053 419
M40		51 CA 058		61 6A 653 420	69 6A 653 420	69 6A 095 420	87 3A 053 420

The boxes are supplied without any cable gland. The 70° boxes are not drilled (drilled at extra cost).

**Sl Sleeve**






					
	Inclined poly 30°	Inclined poly 70°	Straight metal	Inclined metal 30°	Inclined metal 70°
	61 6A 027	51 CA 757	69 6A 127	69 6A 027	87 3A 087

**ZOOM**

**Handle with built-in finger draw plate**

This straight handle is recommended for in-line connections.

**H Handle**

					
	Straight poly	Straight poly with poly cable gland	for ejection option *	Straight metal with metal cable gland	Straight poly flowerpot with metric threaded entry *
Cable dia.		Cable dia.		Cable dia.	Entry
10 - 30 mm	61 6A 013	6 - 12 mm 61 6A 253 20P	61 6A 443 20P	6 - 12 mm 61 6A 953 20M	M20 61 6A 253 417
10 - 30 mm	61 6A 473 *	13 - 18 mm 61 6A 753	61 6A 463	10 - 18 mm 61 6A 963	M25 61 6A 253 418
		18 - 25 mm 61 6A 253 32P	61 6A 443 32P	16 - 24 mm 61 6A 953 32M	M32 61 6A 253 419
		22 - 32 mm 61 6A 253 40P	61 6A 443 40P	22 - 32 mm 61 6A 953 40M	M40 61 6A 253 420

\* With built-in finger draw plate (for in-line connections)

Handle for flat or steel armoured cables on request.

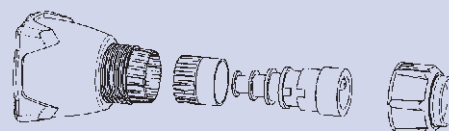
\* Handle with eyelet for tension cord

\* Cable gland on request.



### Perfect cable fit and broad tightening range

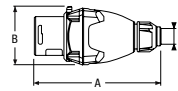
A special anchoring system provides a perfect cable fit and a broad tightening range (multi-layer bush to choose best cable fit).



# DSN range dimensions

## Socket-outlet + plug

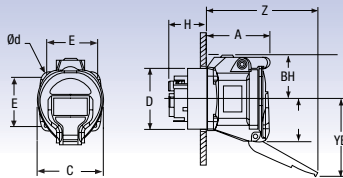
### Plug



	A	B	Ø
DSN1	125	58	8-18
DSN3/DSN24C	145	68	5-21
DSN6/DSN37C	152	83	10-30

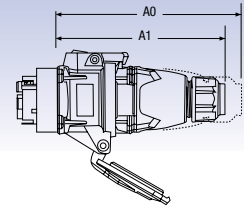
### Socket-outlet

YB8: 180° OPENING LID



	A	BB	BH	C	D	E	H	YB	YB8	Z	Ød
DSN1	53	40	38	57	50.5	42	25	70		98	4.5
DSN3/DSN24C	66	53	50	73	58	48	15	98		113.6	4.5
DSN6/DSN37C	79	59	56	82	68	55	18	118	148	121	5

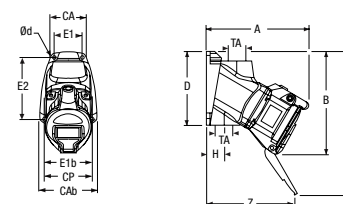
### Plug connected (A1)/ disconnected (Ao) in a socket-outlet



	A1	A0
DSN1	156	169
DSN3/DSN24C	169	186
DSN6/DSN37C	175	204

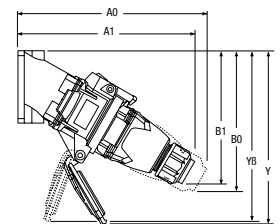
### 30° wall mounting socket

YB: 180° OPENING LID



	A	B	CA	CAb	CP	D	E1	E1b	E2	H	Y	YB	Z	Ød
DSN1	127	131	45	68	57	90	36	56	78	38	180		111	4.5
DSN3/DSN24C	138	132	84	73	107	70	70	70	18	200			105	6
DSN6/DSN37C	165	162	89	89	82	122	77	77	88	24	236	213	114	6.5

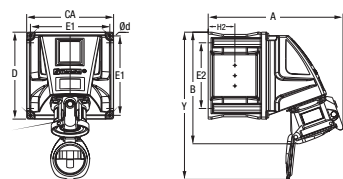
### Plug connected (A1)/ disconnected (Ao) in a 30° wall mounting socket



	A1	A0	B1	B0	Y	YB
DSN1	204	215	162	168	180	
DSN3/DSN24C	214	229	162	171	200	
DSN6/DSN37C	233	259	184	199	236	213

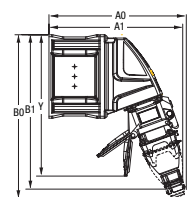
### 70° wall mounting socket

YB: 180° OPENING LID



	A	B	CA	D	E1	E2	H2	Y	Ød
DSN1	197	163	127	127	116	96	39	215	6.5
DSN3/DSN24C	211	182	127	127	116	96	39	242	6.5
DSN6/DSN37C	236	225	170	170	159	139	39	295	6.5

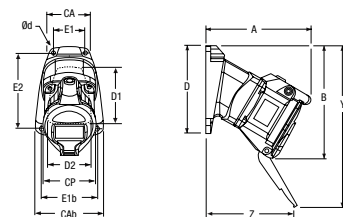
### Plug connected (A1)/ disconnected (Ao) in a 70° wall mounting socket



	A1	A0	B1	B0	Y
DSN1	204	209	235	250	215
DSN3/DSN24C	217	223	263	280	242
DSN6/DSN37C	245	253	331	338	295

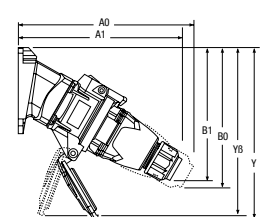
### 30° inclined socket

YB: 180° OPENING LID



	A	B	CA	CAb	CP	D	D1	D2	E1	E1b	E2	Y	YB	Z	Ød
DSN1	108	120	45	68	57	90	75	50	36	56	78	169		92	4.5
DSN3/DSN24C	119	141	76	76	73	107	65	95	63	63	95	209		86	5.5
DSN6/DSN37C	136	156	76	76	82	107	65	95	63	63	95	230	207	85	5.5

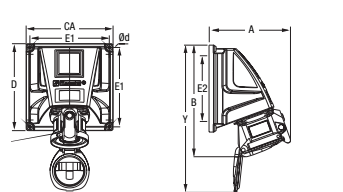
### Plug connected (A1)/ disconnected (Ao) in a 30° inclined socket



	A1	A0	B1	B0	Y	YB
DSN1	185	196	151	157	169	
DSN3/DSN24C	195	210	171	180	209	
DSN6/DSN37C	204	230	178	193	230	207

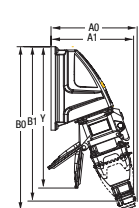
### 70° inclined socket

YB: 180° OPENING LID



	A	B	CA	D	E1	E2	Y	Ød
DSN1	119	163	127	127	116	96	215	4.5
DSN3/DSN24C	133	182	127	127	116	96	242	4.5
DSN6/DSN37C	158	225	170	170	159	139	295	4.5

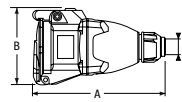
### Plug connected (A1)/ disconnected (Ao) in a 70° inclined socket



	A1	A0	B1	B0	Y
DSN1	126	131	235	250	215
DSN3/DSN24C	139	145	263	280	242
DSN6/DSN37C	167	175	331	338	295

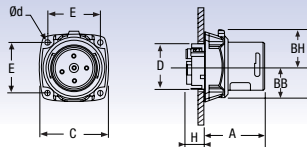
## Coupler socket + inlet

### Coupler socket



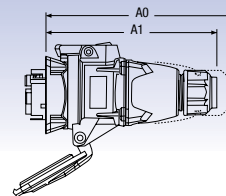
	A	B	Ø
DSN1	131	78	8-18
DSN3/DSN24C	162	103	5-21
DSN6/DSN37C	175	115	10-30

### Inlet



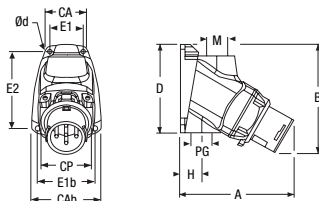
	A	BB	BH	C	D	E	H	Ød
DSN1	50	24	27	57	37	42	14	4.5
DSN3/DSN24C	50	32	36	67	58	48	13	4.5
DSN6/DSN37C	54	39	44	78	68	55	15	5

### Coupler socket connected (A1)/ disconnected (A0) in an inlet



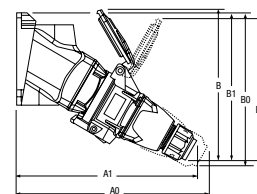
	A1	A0
DSN1	156	169
DSN3/DSN24C	169	186
DSN6/DSN37C	175	204

### 30° wall mounting appliance inlet



	A	B	CA	CAb	CP	D	E1	E1b	E2	H	Ød
DSN1	115	113	45	68	57	90	36	56	78	38	4.5
DSN3/DSN24C	112	105	84	84	67	107	70	70	70	18	6
DSN6/DSN37C	132	128	89	89	78	122	77	77	88	24	6.5

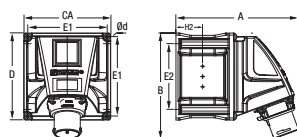
### Coupler socket connected (A1)/ disconnected (A0) in a 30° wall mounting appliance inlet



BB: 180° OPENING LID

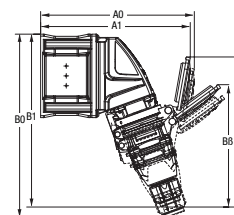
	A1	A0	B	B1	B0	BB
DSN1	204	215	162	162	168	
DSN3/DSN24C	214	229	209	162	171	
DSN6/DSN37C	233	259	235	184	199	213

### 70° wall mounting appliance inlet



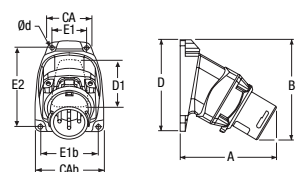
	A	B	CA	D	E1	E2	H2	Ød
DSN1	179	154	127	127	116	96	39	6.5
DSN3/DSN24C	184	160	127	127	116	96	39	6.5
DSN6/DSN37C	209	203	170	170	159	139	39	6.5

### Coupler socket connected (A1)/ disconnected (A0) in a 70° wall mounting appliance inlet



	A1	A0	B	B1	B0	BB
DSN1	195	201	188	235	250	141
DSN3/DSN24C	228	234	228	263	280	164
DSN6/DSN37C	262	269	259	322	341	188

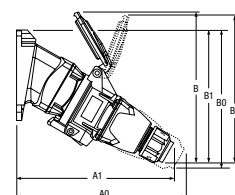
### 30° inclined appliance inlet



D1: drilling Ø

	A	B	CA	CAb	D	D1	E1	E1b	E2	Ød
DSN1	96	102	45	68	90	75	36	56	78	4.5
DSN3/DSN24C	93	114	76	76	107	65	63	63	95	5.5
DSN6/DSN37C	103	122	76	76	107	65	63	63	95	5.5

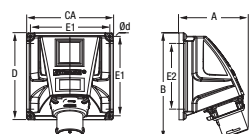
### Coupler socket connected (A1)/ disconnected (A0) in a 30° inclined appliance inlet



BB: 180° OPENING LID

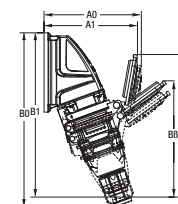
	A1	A0	B	B1	B0	BB
DSN1	185	196	162	151	157	
DSN3/DSN24C	195	210	209	171	180	
DSN6/DSN37C	204	230	235	178	193	213

### 70° inclined appliance inlet



	A	B	CA	D	E1	E2	Ød
DSN1	101	154	127	127	116	96	4.5
DSN3/DSN24C	106	160	127	127	116	96	4.5
DSN6/DSN37C	131	203	170	170	159	139	4.5

### Coupler socket connected (A1)/ disconnected (A0) in a 70° inclined appliance inlet

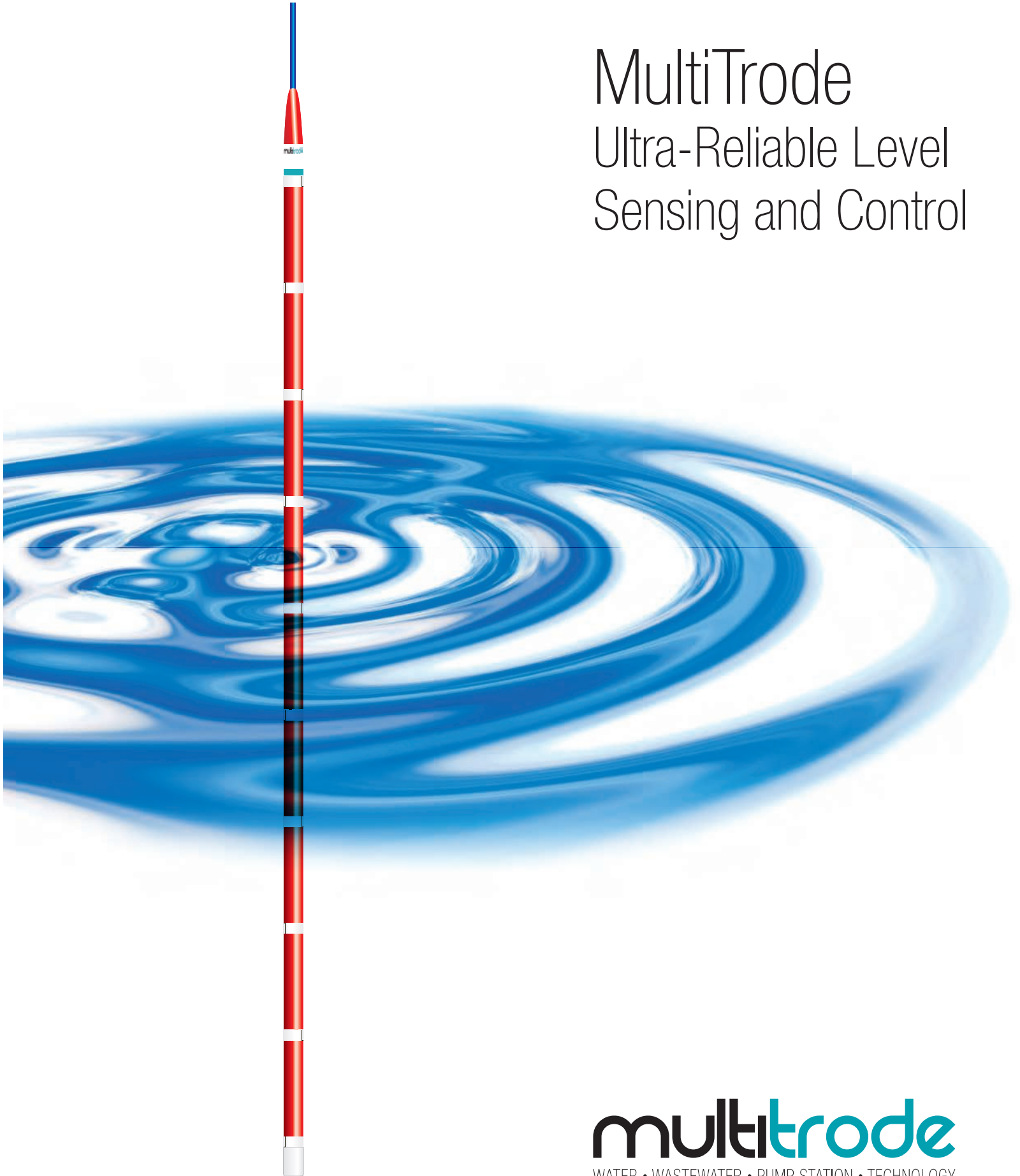


	A1	A0	B	B1	B0	BB
DSN1	117	123	188	235	250	141
DSN3/DSN24C	150	156	228	263	280	164
DSN6/DSN37C	184	191	259	322	341	188



# MultiTrode

## Ultra-Reliable Level Sensing and Control



**multitrode**  
WATER • WASTEWATER • PUMP STATION • TECHNOLOGY

# The Probe... Dip it. Set it. Leave it.



## Why is it easier to install than other level devices?

All you do is hang the Probe on its own cable into your wet well, using the bracket we supply. Installation is simple - any one of your technicians could do it in an hour or so. What's more, you install the Probe relatively low down in the wet well, so compared to ball floats it allows the well to be cleaned out more thoroughly. That means less debris build-up, odors and pump clogs.

## MTISB Intrinsically Safe Barrier

The MTISB is used between MultiTrobe Probes and control equipment. It eliminates the risk of dangerous energy entering the potentially explosive environment where the Probe is located. 5-channel (MTISB5) and 10-channel (MTISB10) barriers available.



MultiTrobe's Probe is the most reliable and cost-effective level sensor available in the water and wastewater industry today.

- 10+ year lifetime
- Cost effective and virtually maintenance free
- Very low and reliable pump cut-out
- Unaffected by build up (fat, grease, sludge and foam)
- Reduces maintenance cost
- Intrinsically safe when installed with MTISB barrier
- Eliminates false readings
- Simple to install and maintain
- Cuts the risk of spills
- UL, ULC, CTick, and CE Approved

## Why is it so Reliable?

There are no electronics and no moving parts - which results in a long lifetime. **That's why it gets a 10-year warranty!**



How would your Ultrasonic hold up to this application?

The MultiTrobe Probe is unaffected by fat, foam, grease and sludge.

## How does it work?

The Probe works by using the conductive properties of the water itself to complete a circuit with a controller. It's mounted near the inflow, allowing the turbulence to keep it clean. Even if a build-up does occur it's usually conductive (in wastewater) and so the Probe keeps right on working.

If cleaning is required the Probe is simply pulled through a squeegee that is part of the mounting bracket.

# The Probe Connects To:

## MultiSmart Pump Station Manager

Full control and monitoring with SCADA connectivity – please see the MultiSmart brochure for details.

SCADA System

MTIC with  
10 Probe InputsMTDPC with  
10 Probe InputsMTR with  
2 Probe InputsMTRA with  
3 Probe InputsSafe-TL or Safe-FS with  
3 Probe Inputs  
Includes thermal/seal motor protection

## Ordering Information and Examples

Model Code	Probe Length	Number of Sensors	Sensor Separation
0.2 / 1-xx	8in / 0.2m	1	N/A
0.5 / 3-xx	16in / 0.5m	3	6in / 150mm
1.0 / 10-xx	40in / 1.0m	10	4in / 100mm
1.5 / 10-xx	60in / 1.5m	10	6in / 150mm
2.0 / 10-xx	80in / 2.0m	10	8in / 200mm
2.5 / 10-xx	96in / 2.5m	10	10in / 250mm
3.0 / 10-xx	115in / 3.0m	10	12in / 300mm
6.0 / 10-xx	224in / 6.0m	10	24in / 600mm
9.0 / 10-xx	368in / 9.0m	10	35in / 900mm

xx = 10 (for 33ft or 10m of cable); or 30 (for 100ft or 30m of cable)

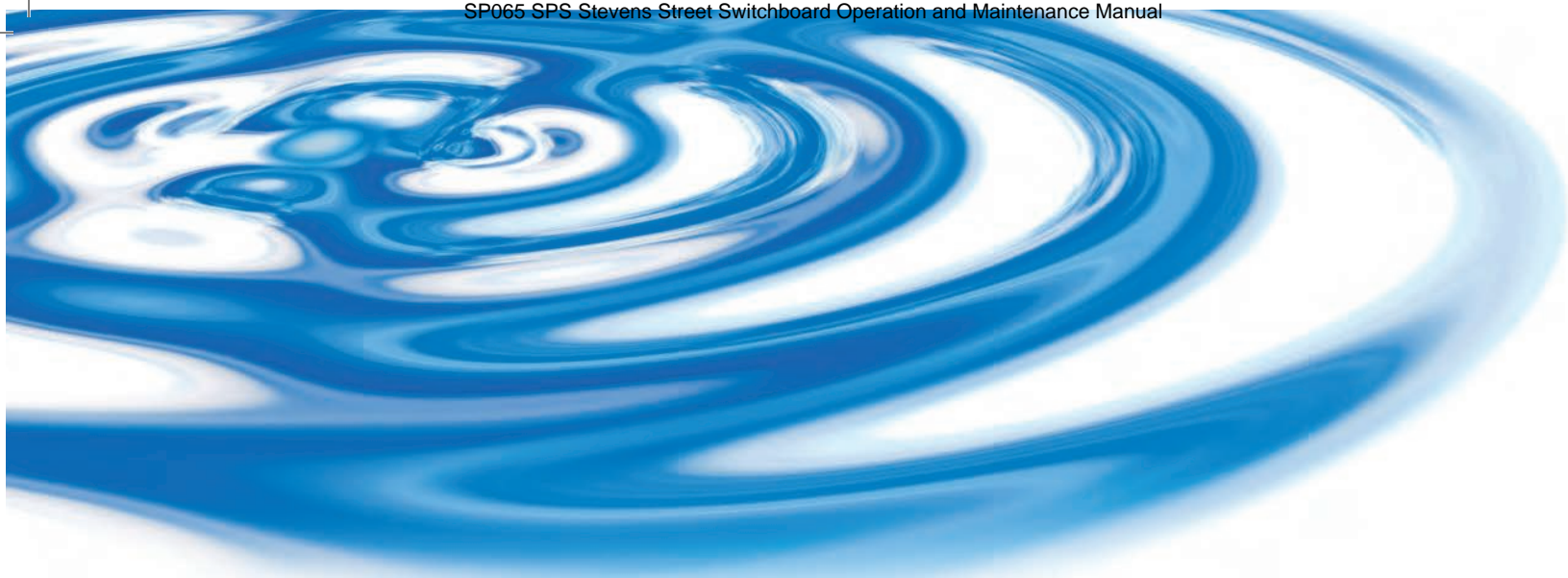
Probes are supplied with a standard length of cable in either 33ft / 10m or in 100ft / 30m lengths. The Probe comes in sizes ranging from 8 inches to 30 feet. It is available with 1-sensor, 3-sensors or 10-sensors.

2.5 / 10 -10

Probe Length (meters)  
2.5

Sensor Points  
10

Cable Length (meters)  
10



In the complicated world of water and wastewater management, there is good reason why MultiTrove stands unrivalled amongst its peers: We are committed to a singular vision of developing the latest technological advancements to provide sophisticated solutions to every day challenges in the water and wastewater industries.

Key to our success is the importance we place on customer satisfaction and solution-based products to save you time and money. From pump station management systems to engineering support, MultiTrove encompasses it all. By investing heavily in R&D, we remain on the cutting edge of technology and always ahead of our competitors.

Our products are proven. Our results are tangible. MultiTrove is unrivalled.

#### **MultiTrove, Inc - USA**

990 South Rogers Circle, Suite 3  
Boca Raton, Florida 33487  
Tel: 561.994.8090 Fax: 561.994.6282  
USsales@multitrove.com

#### **MultiTrove - UK**

Unit 5 Kingswood Court  
Longmeadow  
South Brent  
Devon TQ10 9YS  
Tel: +44 1752 547355 Fax: +44 1752 894615  
UKsales@multitrove.com

#### **MultiTrove Pty Ltd - Australia**

Brisbane Technology Park  
18 Brandl Street  
Eight Mile Plains  
Queensland 4113  
Tel: +61 7 3340 7000 Fax: +61 7 3340 7077  
AUsales@multitrove.com

MULTITRODE® and MULTISMART® are registered trademarks of MultiTrove Pty Ltd in Australia, USA, and Europe. Designs registered for the MultiSmart Pump Controller Remote and Base Modules in Australia, USA, Europe and China. Patents pending in Australia, USA, and Europe.

©2012 MultiTrove, Inc.

This publication is protected by copyright. No part of this publication may be reproduced by any process, electronic or otherwise, without the express written permission of MultiTrove Pty Ltd.



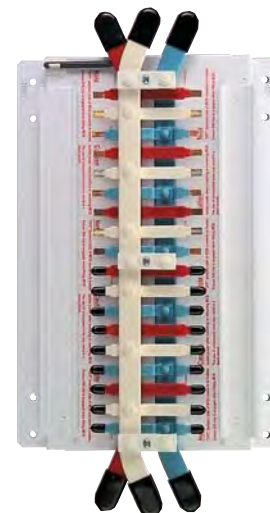
## Panelboards, loadcentres and accessories

### 2 CONCEPT•PLUS and Premier busbar chassis – Din-T

- Standards AS/NZS 3439
- Current rating 250 A
- Withstand rating 250 A/20 kA for 0.2 sec
- Splayed busbar to suit 160 A & 250 A switch
- Top and bottom feed – splayed top & bottom
- Tee-offs stripped and 50% capped
- Top power feed stripped and capped
- Full 35 mm DIN rail, improved MCB mounting security
- Improved insulation coating

#### Concept Din-T – 250 to suit Din-T MCBs (18 mm pole pitch) <sup>3)</sup>

Pole capacity	250 A Cat. No. <sup>1)</sup>
12	CD-2-12/18-3U
18	CD-2-18/18-3U
24	CD-2-24/18-3U
30	CD-2-30/18-3U
36	CD-2-36/18-3U
42	CD-2-42/18-3U
48	CD-2-48/18-3U
54	CD-2-54/18-3U
60	CD-2-60/18-3U
72	CD-2-72/18-3U
78	CD-2-78/18-3U
84	CD-2-84/18-3U
96	CD-2-96/18-3U



3 pole CD chassis to suit Din-T MCBs

- Notes:** <sup>1)</sup> 4 pole and other special configurations available to special order refer NHP.  
 'OFF' (line) side of MCB connects to chassis tee-off.  
 MCB DIN clips may be disengaged or removed when mounting onto "CD" chassis.  
 If applicable use insulated tool provided to disengage DIN clip when removing MCB from chassis.  
<sup>3)</sup> Not suitable for CONCEPT economy Panelboards. Contact NHP for availability.  
 Available on indent only.

#### Accessories

Description	Cat. No.
Split tariff kit 250/355 A (supplied loose)	STKCD
Split tariff kit (fitted)	REFER NHP
Plastic tee-off cap 250 / 355 A	CD250TOPC

#### Technical data – CD/CT busbar chassis

Description	CD-250 A
Busbar rating (Amp)	250
Voltage rating (V)	415
Short circuit rating (kA)	20
Short circuit time (sec)	0.2
Insulation material	Polyolefin PPA-441

#### Catalogue number structure – CD/CT busbar chassis

XX	X	XX	XX	X
Type	Current rating	No. of ways	Pole pitch (mm)	No. of phases
CD Din-T	2 250 A	12	18 Din-T	2 1 P + N (red, black)
CDH Din-T10H	3 355 A	18	27 Din-T10H	3 3 P (red, white, blue)
CT Safe-T	Etc.	24	27/18 Hybrid Din-T10H/Din-T	4 3 P + N (red, white, blue, black)
		30	25 Safe-T	
		36 etc.		
		27 mm/18 mm		
		6/24		
		12/60		

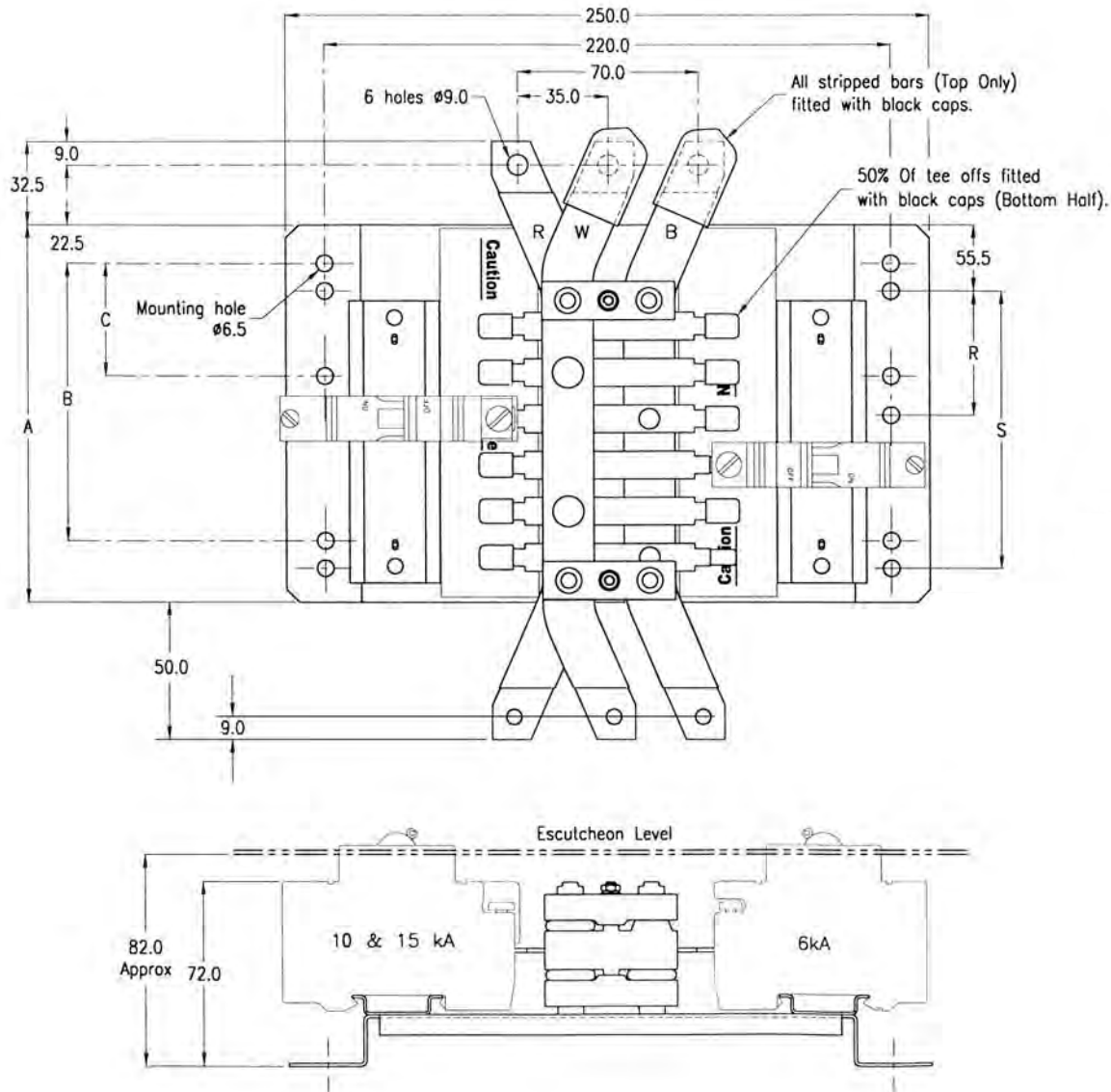


## Panelboards, loadcentres and accessories

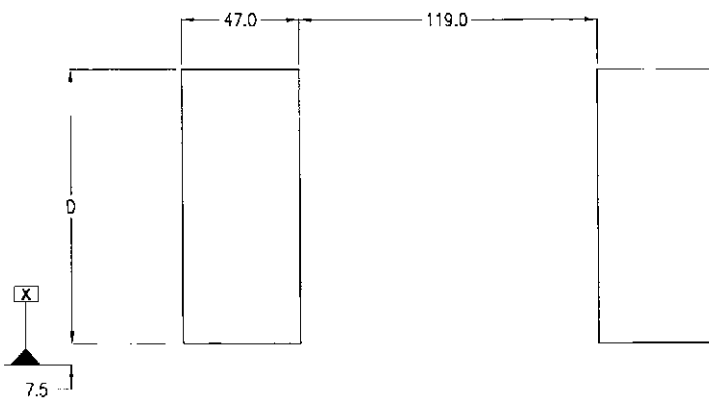
### Dimensions (mm)

2

CD chassis 250 to suit Din-T6, 10 and 15



Escutcheon cut-out details



**Notes:** <sup>1)</sup> "X" insert 2 = 250 A or 3 = 355 A, current rating does not effect above dims.  
 Maximum current rating of tee-off = 100 A.  
 'OFF' (line) side of MCB connects to chassis tee-off.  
 MCB DIN clips may be disengaged or removed when mounting onto "CD" chassis.  
 Use insulated tool provided to disengage DIN clip when removing MCB from chassis.

Dimensions (mm)

Chassis size <sup>1)</sup>	A	B	C	D	R	S
CD-X-12/18-3U	152	100	-	110	-	100
CD-X-18/18-3U	206	100	-	164	-	100
CD-X-24/18-3U	260	100	-	218	-	100
CD-X-30/18-3U	314	200	-	272	-	200
CD-X-36/18-3U	368	300	-	326	-	300
CD-X-42/18-3U	422	300	-	280	-	300
CD-X-48/18-3U	476	400	-	434	-	400
CD-X-54/18-3U	530	400	-	488	-	400
CD-X-60/18-3U	584	500	-	542	-	500
CD-X-72/18-3U	692	600	-	650	-	600
CD-X-78/18-3U	745	700	300	704	300	700
CD-X-84/18-3U	800	700	300	758	300	700
CD-X-96/18-3U	908	800	400	866	400	800

## Miniature circuit breakers

### Din-Safe single pole width residual current circuit breaker (RCB0)

- Standards AS/NZS 61009
- Approval N17482
- 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
- Type "A" residual current device (AC/DC)



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

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

<sup>2)</sup> Will not accept side mounting accessories.

Available on indent only.

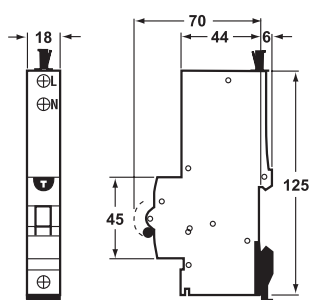
#### Operation

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)

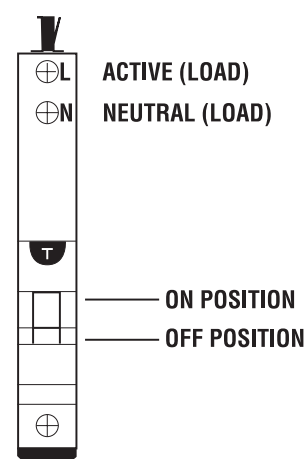
**Note:** A 1.2 m long pigtail lead is included as standard.



#### 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



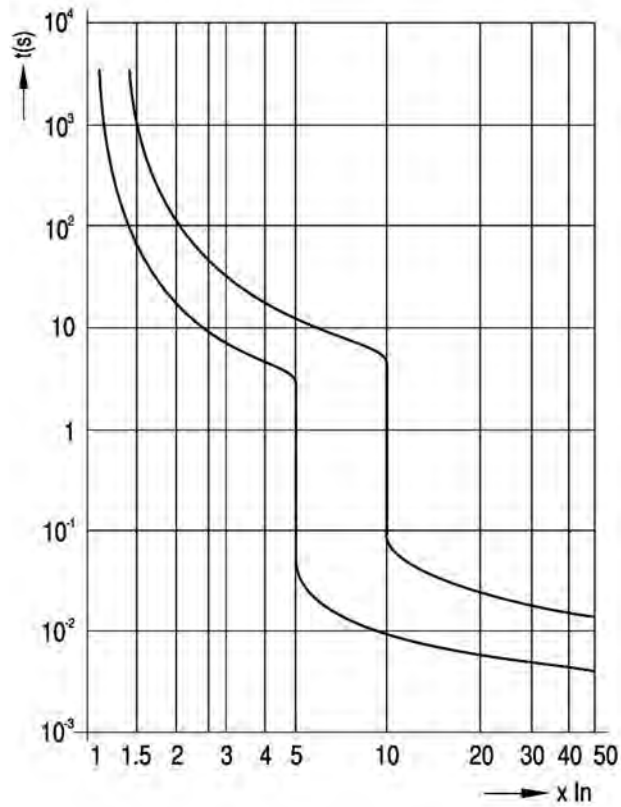
**Note:** Nuisance tripping may be experienced in VFD and motor starting applications refer NHP.

## Din-T MCBs + RCDs Technical data

### Tripping curves according to EN 60898

The following tables show the average tripping curves of the Terasaki Din-T MCBs based on the thermal and magnetic characteristics.

#### Curve C



## Din-T MCBs + RCDs Technical data

### What is an RCD?

3

The RCD (Residual Current Device) is a device intended to protect people against indirect contact, the exposed conductive parts of the installation being connected to an appropriate earth electrode. It may be used to provide protection against fire hazards due to a persistent earth fault current, without operation of the overcurrent protective device.

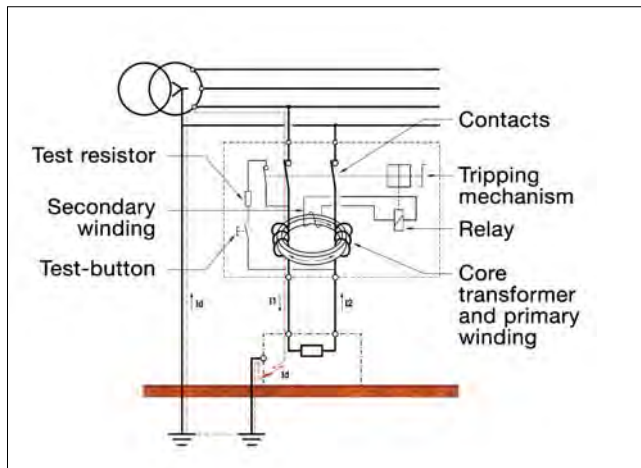
RCDs having a rated residual operating current not exceeding 30 mA are also used as a means for additional protection in case of failure of the protective means against electric shock (direct contact).

#### Working Principle

The main components of an RCD are the following:

- The core transformer: which detects the earth fault current.
- The relay: when an earth fault current is detected, the relay reacts by tripping and opening the contacts.
- The mechanism: element to open and close the contacts either manually or automatically.
- The contacts: to open or close the main circuit.

The RCD constantly monitors the vectorial sum of the current passing through all the conductors. In normal conditions the vectorial sum is zero ( $I_1 + I_2 = 0$ ) but in case of an earth fault, the vectorial sum differs from zero ( $I_1 + I_2 = I_d$ ), this causes the actuation of the relay and therefore the release of the main contacts.



#### Definitions related to RCDs

**RCCB = Residual Current Circuit Breaker without overcurrent protection.**

**RCBO = Residual Current Circuit Breaker with overcurrent protection.**

#### Breaking capacity

A value of AC component of a prospective current that an RCCB is capable of breaking at a stated voltage under prescribed conditions of use and behaviour.

#### Residual making and breaking capacity ( $I_{\Delta m}$ )

A value of the AC component of a residual prospective current which an RCCB can make, carry for its opening time and break under specified conditions of use and behaviour.

#### Conditional residual short-circuit current ( $I_{\Delta c}$ )

A value of the AC component of a prospective current which an RCCB protected by a suitable SCPD (short-circuit protective device) in series, can withstand, under specific conditions of use and behaviour.

#### Conditional short-circuit current ( $I_{nc}$ )

A value of the AC component of a residual prospective current which an RCCB protected by a suitable SCPD in series, can withstand, under specific conditions of use and behaviour.

#### Residual short-circuit withstand current

Maximum value of the residual current for which the operation of the RCCB is ensured under specified conditions, and above which the device can undergo irreversible alterations.

#### Prospective current

The current that would flow in the circuit, if each main current path of the RCCB and the overcurrent protective device (if any) were replaced by a conductor of negligible impedance.

#### Making capacity

A value of AC component of a prospective current that an RCCB is capable to make at a stated voltage under prescribed conditions of use and behaviour.

#### Open position

The position in which the predetermined clearance between open contacts in the main circuit of the RCCB is secured.

#### Closed position

The position in which the predetermined continuity of the main circuit of the RCCB is secured.

#### Tripping time

The time which elapses between the instant when the residual operating current is suddenly attained and the instant of arc extinction in all poles.

#### Residual current ( $I_{\Delta n}$ )

Vector sum of the instantaneous values of the current flowing in the main circuit of the RCCB.

#### Residual operating current

Value of residual current which causes the RCCB to operate under specified conditions.

#### Rated short-circuit capacity ( $I_{cn}$ )

Is the value of the ultimate short-circuit breaking capacity assigned to the circuit breaker. (Only applicable to RCBO)

#### Conventional non-tripping current ( $I_{nt}$ )

A specified value of current which the circuit breaker is capable of carrying for a specified time without tripping. (Only applicable to RCBO)

#### Conventional tripping current ( $I_t$ )

A specified value of current which causes the circuit breaker to trip within a specified time. (Only applicable to RCBO)

## Din-T MCBs + RCDs Technical data

### RCDs classification according to EN 61008/61009

RCDs may be classified according to:

The behaviour in the presence of DC current  
(types for general use).

■ Type AC

■ Type A

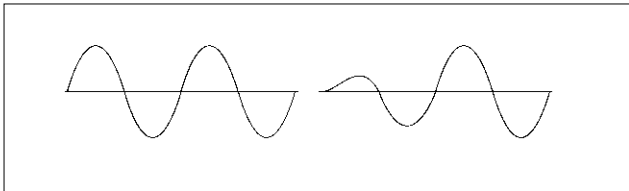
The time-delay (in the presence of residual current)

■ RCDs without time delay: type for general use

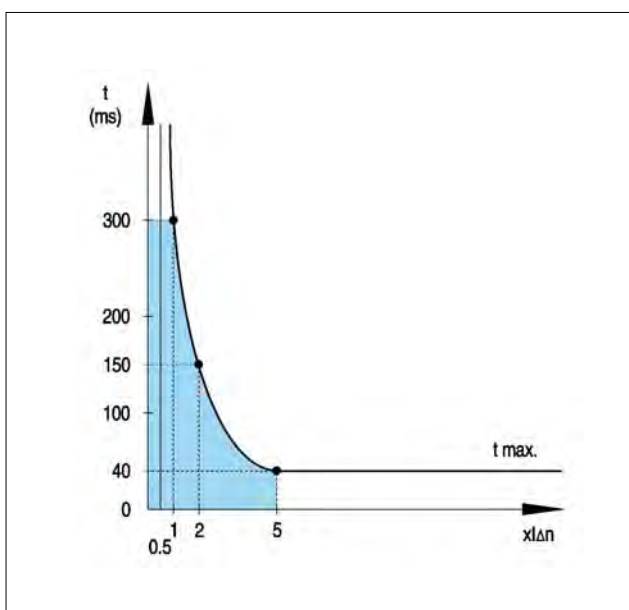
■ RCDs with time delay: type S for selectivity

**Type AC**  <sup>1)</sup> <sup>2)</sup>

The type AC RCDs are designed to release with sinusoidal residual currents which occur suddenly or slowly rise in magnitude.



Residual current	Tripping time
$0.5 \times I_{\Delta n}$	$t = \infty$
$1 \times I_{\Delta n}$	$t = <300 \text{ ms}$
$2 \times I_{\Delta n}$	$t = <150 \text{ ms}$
$5 \times I_{\Delta n}$	$t = \leq 40 \text{ ms}$



Tripping curve type AC


<sup>1)</sup> Standard in Australia

<sup>2)</sup> Type A acceptable in Australia

Tripping curve type A

<sup>3)</sup> Standard in New Zealand

<sup>4)</sup> DSRCBH is type A.

**Type A**  <sup>3)</sup> <sup>4)</sup>

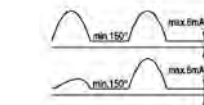
Certain devices during faults can be the source of non-sinusoidal earth leakage currents (DC components) due to the electronic components e.g. diodes, thyristors etc.

Type A RCDs are designed to ensure that under these conditions the residual current devices operate on sinusoidal residual current and also with pulsating direct current(\*) which occur suddenly or slowly rise in magnitude.

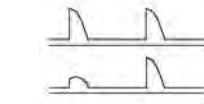
(\*) Pulsating direct current: current of pulsating wave form which assumes, in each period of the rated power frequency, the value 0 or a value not exceeding  $0.006 \text{ A DC}$  during one single interval of time, expressed in angular measure of at least  $150^\circ$ .

Residual current	Tripping time
1. For sinusoidal residual current	
$0.5 \times I_{\Delta n}$	$t = \infty$
$1 \times I_{\Delta n}$	$t = <300 \text{ ms}$
$2 \times I_{\Delta n}$	$t = <150 \text{ ms}$
$5 \times I_{\Delta n}$	$t = \leq 40 \text{ ms}$

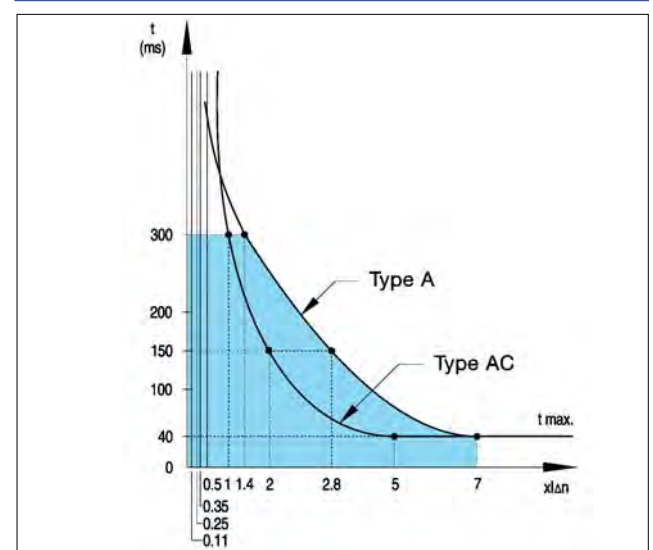
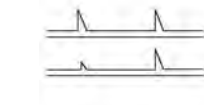
2. For residual pulsating direct current	
At point of wave $0^\circ$	
$0.35 \times I_{\Delta n}$	$t = \infty$
$1.4 \times I_{\Delta n}$	$t = <300 \text{ ms}$
$2.8 \times I_{\Delta n}$	$t = <150 \text{ ms}$
$7 \times I_{\Delta n}$	$t = \leq 40 \text{ ms}$



At point of wave $90^\circ$	
$0.25 \times I_{\Delta n}$	$t = \infty$
$1.4 \times I_{\Delta n}$	$t = <300 \text{ ms}$
$2.8 \times I_{\Delta n}$	$t = <150 \text{ ms}$
$7 \times I_{\Delta n}$	$t = \leq 40 \text{ ms}$



At point of wave $135^\circ$	
$0.11 \times I_{\Delta n}$	$t = \infty$
$1.4 \times I_{\Delta n}$	$t = <300 \text{ ms}$
$2.8 \times I_{\Delta n}$	$t = <150 \text{ ms}$
$7 \times I_{\Delta n}$	$t = \leq 40 \text{ ms}$



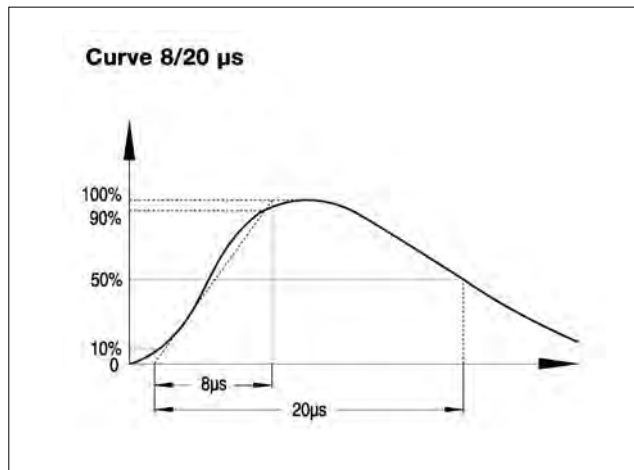
## Din-T MCBs + RCDs Technical data

### Nuisance tripping

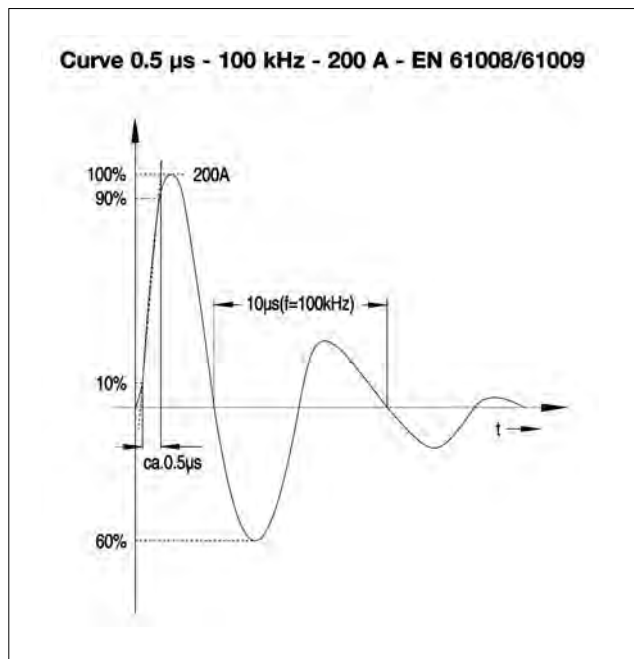
All DinSafe RCDs have a high level of immunity to transient currents, against current impulses of 8/20  $\mu$ s according to EN 61008/61009 and VDE 0664.T1.

Type A, AC.....250 A 8/20  $\mu$ s

Type S.....3000 A 8/20  $\mu$ s

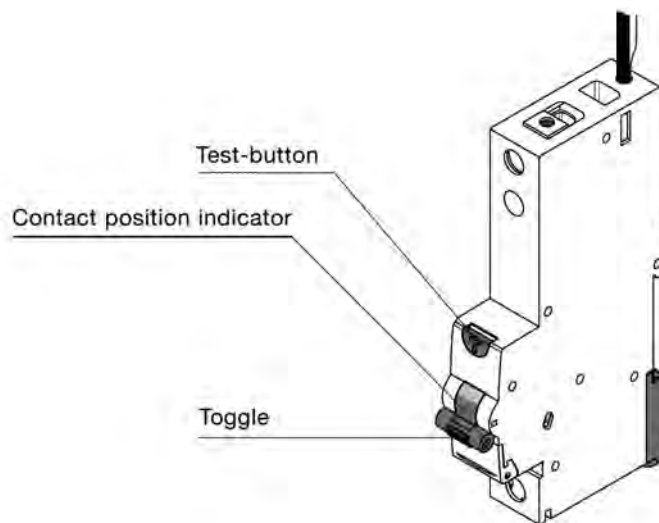


RCDs have a high level of immunity against alternating currents of high frequency according to EN 61008/61009.



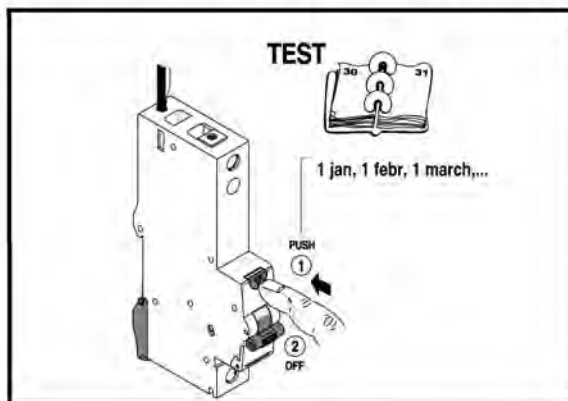
## Din-T MCBs + RCDs Technical data

### Use of an RCBO (DSRCBH)



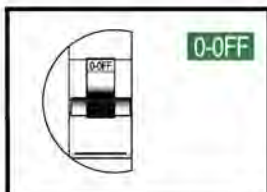
#### TEST-BUTTON

To ensure the correct functioning of the RCBO, the test-button T shall be pressed frequently. The device must trip when the test-button is pressed.



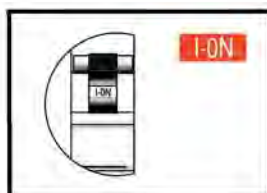
#### CONTACT POSITION INDICATOR

Printing on the toggle to provide information of the real contact position.



#### O-OFF

Contacts in open position. Ensure a distance between contacts > 4 mm.



#### I-ON

Contacts in closed position. Ensure continuity in the main circuit.

#### TOGGLE

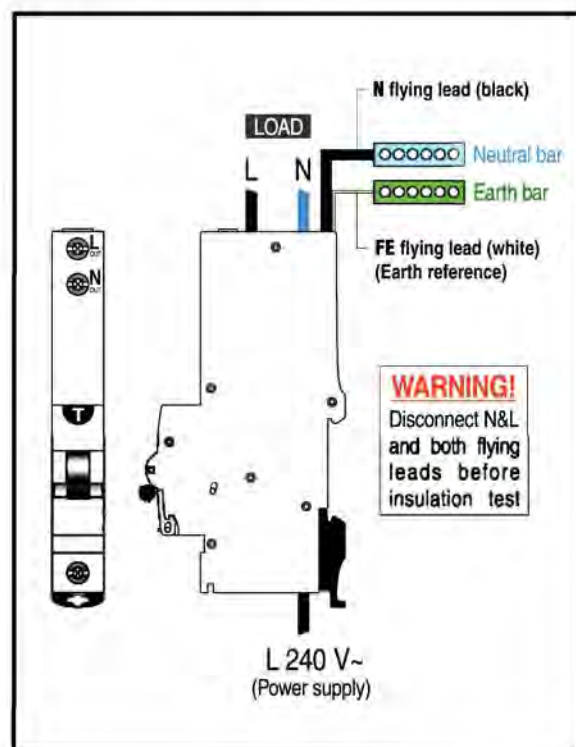
To manually switch the RCBO ON or OFF

#### CABLE CONNECTION

The power supply (L) must be done at the bottom terminal, and the supply neutral flying cable (black) shall be connected to the neutral bar.

Load connection shall be done in both terminals at the top side (L out / N out).

The earth reference cable (FE white) ensures protection against earth leakage in case of loss of supply neutral.



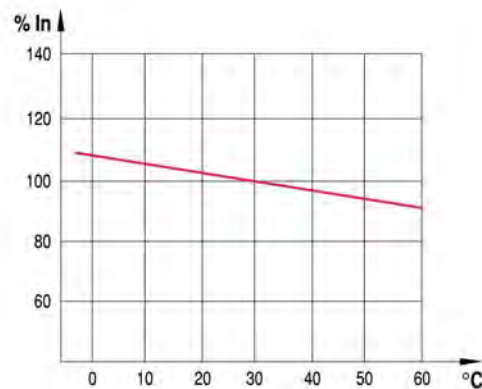
## Din-T MCBs + RCDs Technical data

### Product related information

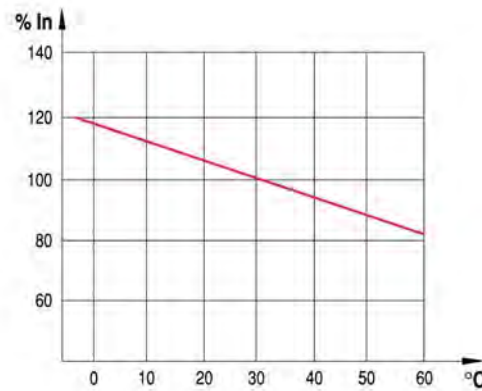
#### Influence of temperature on RCB0s (DinSafe DSRCB)

The thermal calibration of the RCB0 was carried out at an ambient temperature of 30 °C. Ambient temperatures different from 30 °C influence the bimetal and this results in earlier or later thermal tripping.

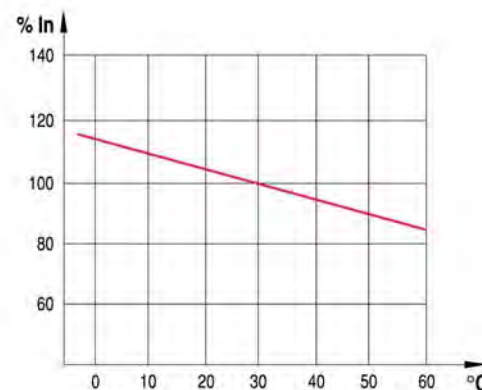
**0.5 - 6 A**



**10 A**



**16 - 40 A**



## Din-T MCBs + RCDs Technical data

### Tripping current as a function of the frequency

All RCDs are designed to work at frequencies of 50-60 Hz, therefore to work at different values, we must consider the variation of the tripping sensitivity according to the tables below. It should be taken into consideration that there is a no tripping risk when pushing the test-button, due to the fact that such action is made by means of an internal resistor with a fixed value.

#### RCBO DSRCBH <sup>3)</sup>

Type AC <sup>1)</sup>	10 Hz	30 Hz	50 Hz	100 Hz	200 Hz	300 Hz	400 Hz
30 mA	0.62	0.65	0.80	0.91	1.24	1.55	1.88
100 mA	0.74	0.71	0.80	0.95	1.16	1.38	1.59
300 mA	0.80	0.74	0.80	0.97	1.19	1.44	1.64
500 mA	1.10	0.81	0.80	0.89	1.18	1.38	1.68
Type A <sup>2)</sup>							
30 mA	8.17	3.13	0.75	1.70	3.10	3.52	3.67
100 mA	6.81	2.71	0.75	1.43	2.35	2.58	2.71
300 mA	6.20	2.16	0.75	0.49	0.87	0.74	0.95
500 mA	4.34	1.53	0.75	0.39	0.59	0.62	0.64

**Notes:** <sup>1)</sup> The standard NHP/Terasaki type is the "type AC" in Australia, Type "A" in New Zealand.

<sup>2)</sup> The standard NHP/Terasaki DSRCBH single pole RCBO is "type A" in Australia and New Zealand.

<sup>3)</sup> The numbers in the table above are multipliers, e.g. A "DSRCD" at 50 hz has an 0.8 multiplier.  
Therefore a 30 mA, "type AC" RCD will trip at (0.8 x 30 mA) 24 mA.

### Power losses

The power losses are calculated by means of measuring the voltage drop between the incoming and the outgoing terminal of the device at rated current. Power loss per pole:

#### RCBO-Single pole DSRCBH

In (A)	6	10	13	16	20	25	32	40	50	63
Z (mOhm)	45.8	16.4	12.5	10.6	7.3	5.4	3.2	2.6	1.9	1.4
Pw (W)	1.65	1.7	2.1	2.7	2.9	3.3	3.4	4.2	4.8	5.6

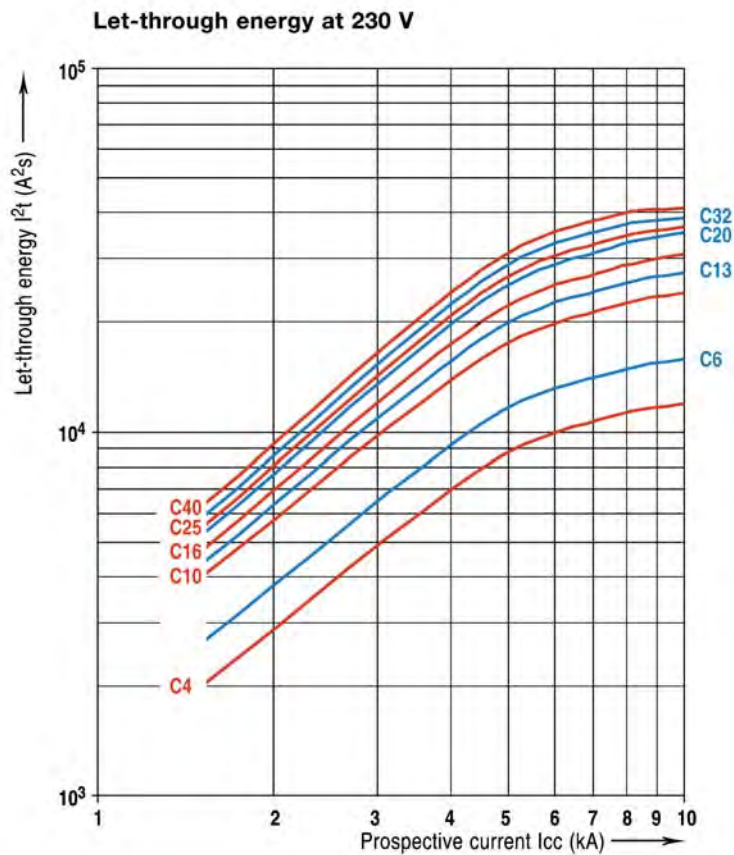
## Din-T MCBs + RCDs Technical data

### RCBO (DSRCB) let-through energy $I^2t$

The benefit of an RCBO in short-circuit conditions, is its ability to reduce the value of the let-through energy that the short-circuit would be generating.

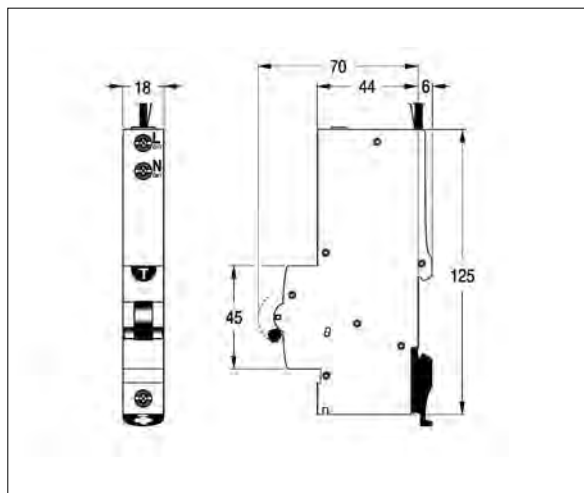
#### Din-T single pole width RCD (DSRCBH)

##### Curve C



#### RCCB - Din-Safe safety switch (DSRCD)

#### RCBO - Din-Safe (DSRCBH)



Dimensions in mm

# Din-T MCBs + RCDs Technical data

## Overview Din-Safe RCDs

### RCBO



## Device type definition

Rating/description		Cat. No.	DSRCBH
Standards			IEC 61009-1
Magnetic tripping characteristics			C
Residual tripping characteristic <sup>1)</sup>			A
Tripping time at I <sub>Δn</sub>	Instantaneous	ms	<300
	Selective	ms	-
Rated current		A	6, 10, 16, 20, 25, 32, 40
Rated residual current I <sub>Δn</sub>		mA	10, 30
Calibration temperature		°C	30
Number of poles versus modules			1
Rated voltage U <sub>n</sub>	2 P AC	V	240 (1 P+N)
	3 P AC	V	-
	4 P AC	V	-
Frequency		Hz	50/60
Maximum service voltage U <sub>bmax</sub>		V	255
Minimum service voltage U <sub>bmin</sub>		V	100
Power supply			Bottom
Selectivity class			3
Rated making and breaking capacity (I <sub>m</sub> )		A	10xI <sub>n</sub>
Residual making and breaking capacity (I <sub>Δm</sub> )		A	10000
Conditional short-circuit capacity (I <sub>nc</sub> )		A	-
Conditional residual short-circuit capacity (I <sub>Δc</sub> )		A	-
Short-circuit capacity (I <sub>cn</sub> )		A	10000
Grid distance (safety distance between two devices)		mm	-
Isolator application			yes
Insulation degree	Insulation voltage	V (DC)	500 <sup>2)</sup>
	Shock voltage (1.2/50 ms)	kV	6 <sup>2)</sup>
	Insulation resistance	(mΩhm)	1000 <sup>2)</sup>
	Dielectric strength	V	2500 <sup>2)</sup>
Shock resistance (in x, y, z direction)(IEC 60077/16.3)			40 g, 18 shocks 5 ms
Vibration resistance (in x, y, z direction; IEC 60068-2-6)			2 g, 30 min, 0...80 Hz
Endurance	electrical at U <sub>n</sub> , I <sub>n</sub>		10000
	mechanical at U <sub>n</sub> , I <sub>n</sub>		20000
Protection degree (outside/inside electrical enclosure)			IP 20 / IP 40
Self extinguish degree (according to UL 94)			V2
Tropicalisation (according to IEC 60068-2, DIN 40046)		°C/RH	+55/95 %
Pollution degree (acc. IEC 60947-1)			3
Operating temperature		°C	-5...+60
Storage temperature		°C	-25...+70
Terminals capacity	Rigid cable min/max (Top)	mm <sup>2</sup>	1/25
	Flexible cable min*/max (Top)	mm <sup>2</sup>	1/16
	Rigid cable min/max (bottom)	mm <sup>2</sup>	1/35
	Flexible cable min*/max (bottom)	mm <sup>2</sup>	1/25
	(*Flexible cable 0.75/1/1.5 mm <sup>2</sup> with cable lug)		
Torque	Top/Bottom	Nm	3
Add-on devices (side add-on)	Auxiliary contacts		-
	UVT		-
	Shunt trip		-
	Motor operator		-
	Panelboard switch		Bottom
Busbars systems	Pin		Bottom
	Fork		yes
<b>Accessories</b>			
Dimensions, weights, packaging	# Poles		1+N
	(HxDxW) 86x68xW	mm	18
	Weight/unit	g	350
	Package/unit		1

**Note:** <sup>1)</sup> Refer catalogue section for types.

<sup>2)</sup> Making sure that N-L and both flying leads are disconnected.

## Miniature circuit breakers

### Din-T6 series 6 kA MCB

- Standards AS/NZS 4898
- 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 5-10 In
2	DTCB6102C
4	DTCB6104C
6	DTCB6106C
10	DTCB6110C
13	DTCB6113C
16	DTCB6116C
20	DTCB6120C
25	DTCB6125C
32	DTCB6132C
40	DTCB6140C
50	DTCB6150C
63	DTCB6163C

#### 2 pole 2 modules

2	DTCB6202C
4	DTCB6204C
6	DTCB6206C
10	DTCB6210C
13	<sup>i</sup> DTCB6213C
16	DTCB6216C
20	DTCB6220C
25	DTCB6225C
32	DTCB6232C
40	DTCB6240C
50	DTCB6250C
63	DTCB6263C

#### 3 pole 3 modules

2	DTCB6302C
4	DTCB6304C
6	DTCB6306C
10	DTCB6310C
13	<sup>i</sup> DTCB6313C
16	DTCB6316C
20	DTCB6320C
25	DTCB6325C
32	DTCB6332C
40	DTCB6340C
50	DTCB6350C
63	DTCB6363C

#### Short circuit capacity 6 kA

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

DC use	1 P	2 P <sup>1)</sup>
Short circuit	20 kA	25 kA
Max.voltage (DC)	48 V	110 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.

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

**The line side is the "OFF" (bottom) side of the MCB, and connects to CD chassis tee-offs.**

<sup>i</sup> Available on indent only.

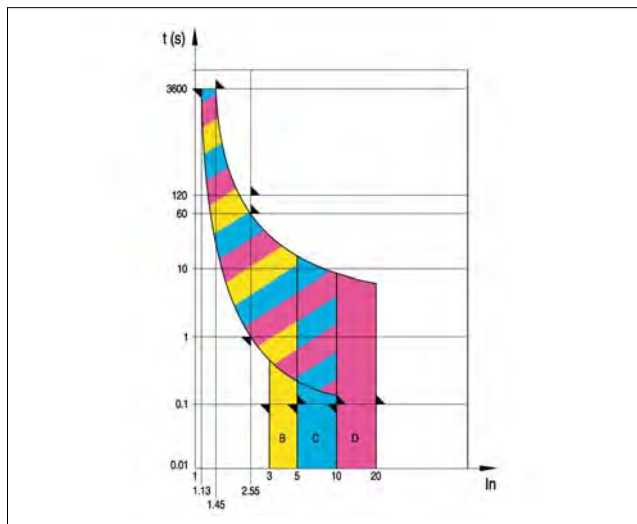
## Din-T MCBs Technical data

### Characteristics according to BS EN 60898

Miniature Circuit Breakers are intended for the protection of wiring installations against both overloads and short-circuits in **domestic** or **commercial** wiring installations where operation is possible by **uninstructed** people

3

#### Tripping characteristic curves



#### Magnetic release

An electromagnet with plunger ensures instantaneous tripping in the event of short-circuit. The NHP Din-T range has 3 different types, following the current for instantaneous release: types B, C and D curve.

ICn (A)	Test current	Tripping time	Applications
B	3 x In 5 x In	0.1 < t < 45 s (In ≤ 32 A) 0.1 < t < 90 s (In > 32 A) t < 0.1 s	Only for resistive loads eg: • electrical heating • water heater • stoves.
C	5 x In 10 x In	0.1 < t < 15 s (In ≤ 32 A) 0.1 < t < 30 s (In > 32 A) t < 0.1 s	Usual loads such as: • lighting • socket outlets • small motors
D	10 x In 20 x In	0.1 < t < 4 s (**) (In ≤ 32 A) 0.1 < t < 8 s (In > 32 A) t < 0.1 s	Control and protection of circuits having important transient inrush currents (large motors)

#### Thermal release

The release is initiated by a bimetal strip in the event of overload. The standard defines the range of releases for specific overload values. Reference ambient temperature is 30 °C.

Test current	Tripping time
1.13 x In	t ≥ 1 h (In ≤ 63 A) t ≥ 2 h (In > 63 A)
1.45 x In	t < 1 h (In ≤ 63 A) t < 2 h (In > 63 A)
2.55 x In	1 s < t < 60 s (In ≤ 32 A) 1 s < t < 120 s (In > 32 A)

#### Rated short-circuit breaking capacity (Icn)

Is the value of the short-circuit that the MCB is capable of withstanding in the following test of sequence of operations: O-t-CO.

After the test the MCB is capable, without maintenance, to withstand a dielectric strength test at a test voltage of 900 V. Moreover, the MCB shall be capable of tripping when loaded with 2.8 In within the time corresponding to 2.55 In but greater than 0.1s.

#### Service short-circuit breaking capacity (Ics)

Is the value of the short-circuit that the MCB is capable of withstanding in the following test of sequence of operations: O-t-CO-t-CO.

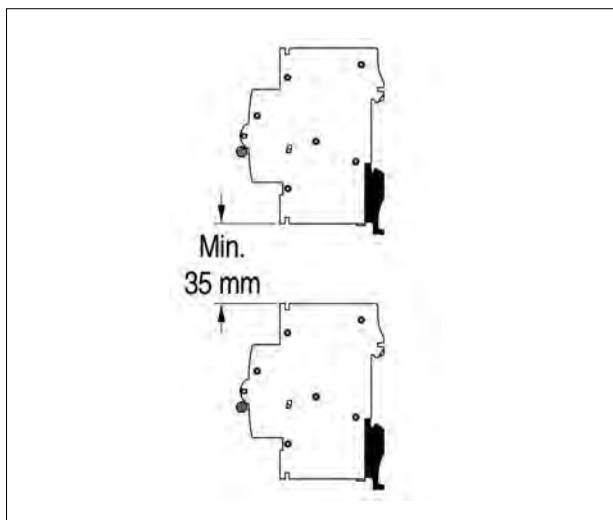
After the test the MCB is capable, without maintenance, to withstand a dielectric strength test at a test voltage of 1500 V. Moreover, the MCB shall not trip at a current of 0.96 In. The MCB shall trip within 1h when current is 1.6 In.

- O - Represents an opening operation
- C - Represents a closing operation followed by an automatic opening.
- t - Represents the time interval between two successive short-circuit operations: 3 minutes.

The relation between the rated short-circuit capacity (Icn) and the rated service short-circuit breaking capacity (Ics) shall be as follows:

ICn (A)	Ics (A)
≤ 6000	6000
> 6000 ≤ 10000	0.75 Icn min. 6000
> 10000	0.75 Icn min. 7500

In both sequences all MCBs are tested for emission of ionized gases during short-circuit (grid distance), in a safety distance between two MCBs of 35 mm when devices are installed in two different rows in the enclosure. This performance allows the use of any NHP/Terasaki enclosure.

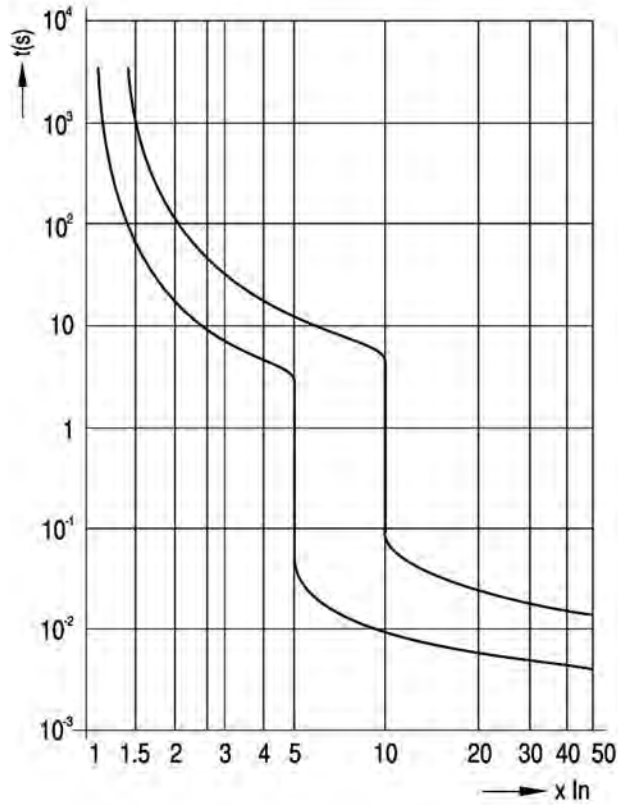


## Din-T MCBs Technical data

### Tripping curves according to EN 60898

The following tables show the average tripping curves of the Terasaki Din-T MCBs based on the thermal and magnetic characteristics.

#### Curve C



## Din-T MCBs Technical data

### Influence of ambient air temperature on the rated current

The maximum value of the current which can flow through an MCB depends on the nominal current of the MCB, the conductor cross-section and the ambient air temperature.

The values shown in the table below are for devices in free air. For devices installed with other modular devices in the same switchboard, a correction factor (K) shall be applied relative to the mounting situation of the MCB, the ambient temperature and the number of main circuits in the installation.

No of devices	K <sup>1)</sup>
2 or 3	0.9
4 or 5	0.8
6 or 9	0.7
> 10	0.6

#### Calculation example

Within a distribution board consisting of eight 2 Pole, 16 A, 'C' curve type MCBs, with an operating ambient temperature of 45 °C, which is the highest temperature the MCB can operate at without unwanted tripping?

#### Calculation

The correction factor  $K = 0.7$ , for use in an eight circuit installation:  $16 \text{ A} \times 0.7 = 11.2 \text{ A}$

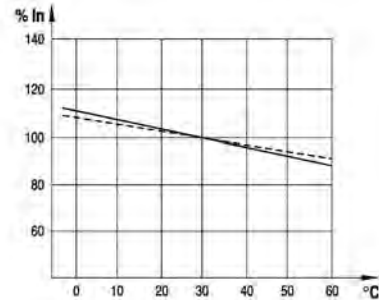
As the MCB is working at 45 °C it shall be given another factor (90 % = 0.9):

In at 45 °C = In at 30 °C  $\times 0.9 = 11.2 \text{ A} \times 0.9 = 10.1 \text{ A}$ .

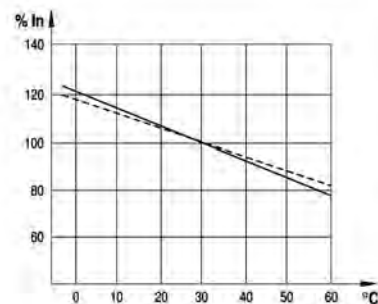
**Note:** <sup>1)</sup> Applicable for MCBs working at maximum rated currents.

The thermal calibration of the MCBs was carried out at an ambient temperature of 30 °C. Ambient temperatures different from 30 °C influence the bimetal and this results in earlier or later thermal tripping.

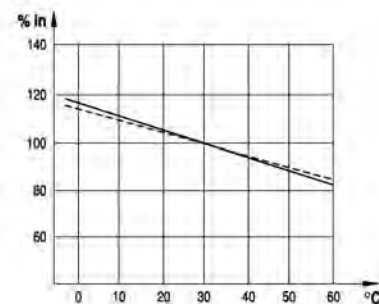
**0.5 - 6 A**



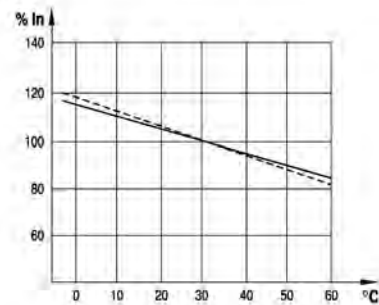
**10 A**



**16 - 40 A**



**50 - 63 A**



———— : 1P (single pole)

----- : mP (multi-pole)

## Din-T MCBs Technical data

### Effects of frequency on the tripping characteristic

All the MCBs are designed to work at frequencies of 50-60 Hz, therefore to work at different values, consideration must be given to the variation of the tripping characteristics. The thermal tripping does not change with variation of the frequency but the magnetic tripping values can be up to 50 % higher than the ones at 50-60 Hz.

#### Tripping current variation

60 Hz	100 Hz	200 Hz	300 Hz	400 Hz
1	1.1	1.2	1.4	1.5

### Power losses

The power losses are calculated by measuring the voltage drop between the incoming and the outgoing terminals of the device at rated current.

#### Power loss per pole

In (A)	Voltage drop (V)	Energy loss (W)	Resistance (mΩ)
0.5	2.230	1.115	4458.00
1	1.270	1.272	1272.00
2	0.620	1.240	310.00
3	0.520	1.557	173.00
4	0.370	1.488	93.00
6	0.260	1.570	43.60
8	0.160	1.242	19.40
10	0.160	1.560	15.60
13	0.155	2.011	11.90
16	0.162	2.586	10.10
20	0.138	2.760	6.90
25	0.128	3.188	5.10
32	0.096	3.072	3.00
40	0.100	4.000	2.50
50	0.090	4.500	1.80
63	0.082	5.160	1.30
80	0.075	6.000	0.90
100	0.075	7.500	0.75
125	0.076	9.500	0.60

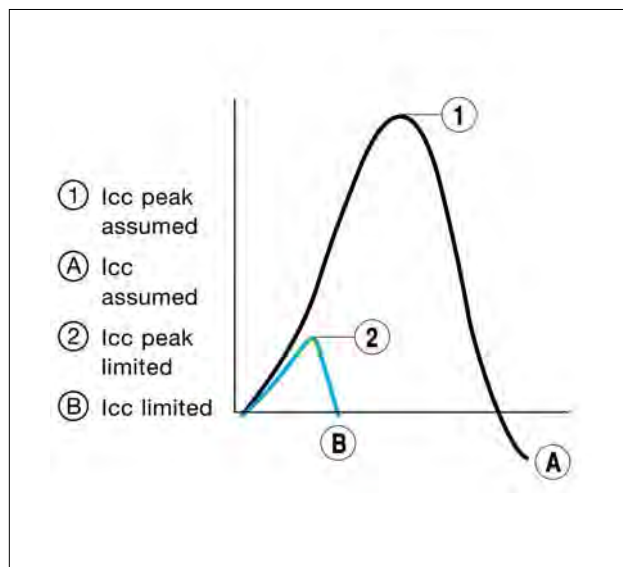
### Limitation curves

#### Let-through energy $I^2t$

The limitation capacity of an MCB in short-circuit conditions, is its capacity to reduce the value of the let-through energy that the short-circuit would be generating.

#### Peak current $I_p$

Is the value of the maximum peak of the short-circuit current limited by the MCB.



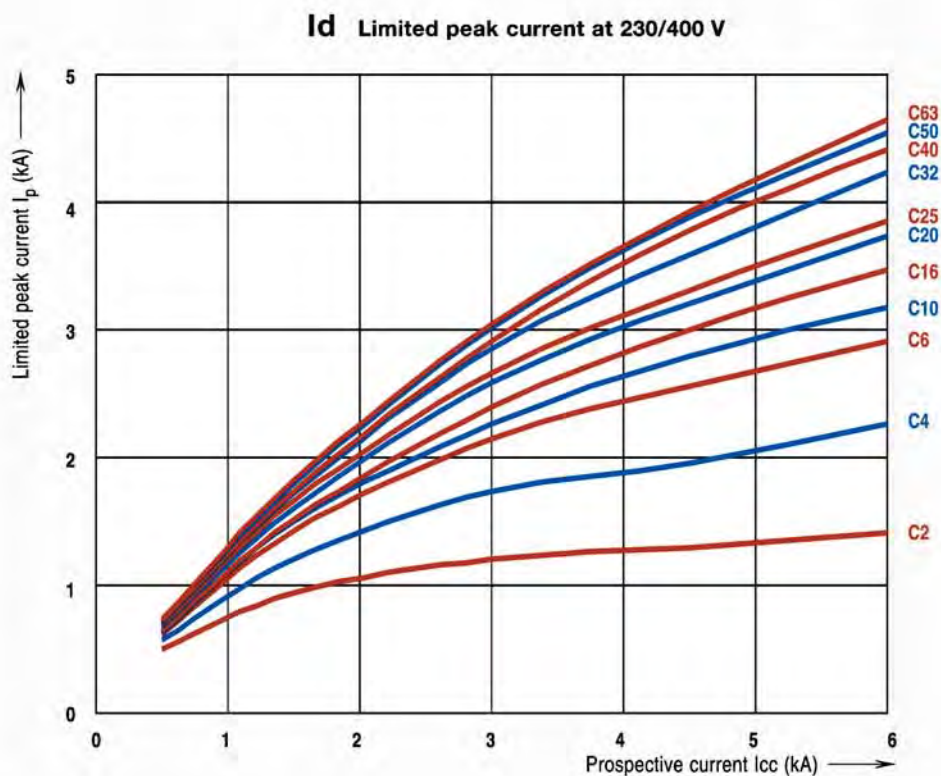
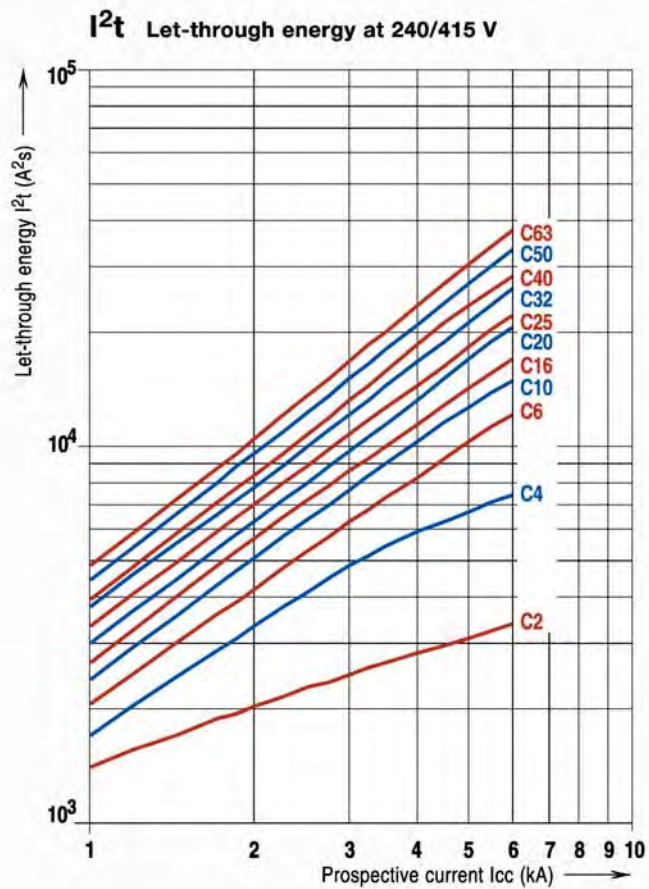
See following pages

## Din-T MCBs Technical data

Din-T 6

6 kA

C curve



## Din-T MCBs Technical data

### Use of standard MCB for DC use

For MCBs designed to be used in alternating current but used in installations in direct current, the following should be taken into consideration:

- For protection against overloads it is necessary to connect the two poles to the MCB. In these conditions the tripping characteristic of the MCB in direct current is similar to alternating current.

- For protection against short-circuits it is necessary to connect the two poles to the MCB. In these conditions the tripping characteristic of the MCB in direct current is 40% higher than the one in alternating current.

### Use in DC selection table

Series	Rated current (A)	48 V 1 pole Icu (kA)	110 V 2 poles in series Icu (kA)	250 V 1 pole Icu (kA)	440 V 2 poles in series Icu (kA)
Din-T 6	0.5....63 A	20	25	-	-

## Din-T MCBs Technical data

### Text for specifiers

#### MCB Series Din-T 6

- According to EN 60898 standard
- For DIN rail mounting according to DIN EN 50022; EN 50022; future EN 60715; IEC 60715 (top hat rail 35 mm)
- Grid distance 35 mm
- Working ambient temperature from -25 °C up to +50 °C
- Approved by CEBEC, VDE, KEMA, IMQ.
- 1 pole is a module of 18 mm wide
- Nominal rated currents are:  
0.5/1/2/3/4/6/10/13/16/20/25/32/40/50/63 A
- Tripping characteristics: B,C,D (B curve Din-T 10 only).
- Number of poles: 1 P, 1 P+N, 2 P, 3 P, 3 P+N, 4 P
- The short-circuit breaking capacity is: 6/10k A, energy limiting class 3
- Terminal capacity from 1 up to 35 mm<sup>2</sup> rigid wire or 1.5 up to 25 mm<sup>2</sup> flexible wire.
- Screw head suitable for flat or Pozidrive screwdriver
- Can be connected by means of both pin or fork busbars
- The toggle can be sealed in the ON or OFF position
- Rapid closing
- Both incoming and outgoing terminals have a protection degree of IP 20 and they are sealable
- Isolator function thanks to Red/Green printing on the toggle.
- Maximum voltage between two phases; 440 V~
- Maximum voltage for utilisation in DC current: 48 V 1 P and 110 V 2 P
- Two position rail clip
- Mechanical shock resistance 40 g (direction x, y, z) minimum 18 shocks 5 ms half-sinusoidal acc. to IEC 60068-2-27
- Vibration resistance: 3 g (direction x, y, z) minimum 30 min. according to IEC 60068-2-6
- Extensions can be added on both left or right hand side
  - ☛ Auxiliary contact
  - ☛ Shunt trip
  - ☛ Undervoltage release
  - ☛ Motor operator
  - ☛ Panelboard switch
- Add-on RCD can be coupled.

## Din-T MCBs Technical data

Series				Din-T6
AS/NZS 4898				
Standards (Aust / NZ / International)				IEC 60898
Tripping characteristics				C, D
Nominal current		A	C/D(0.5-63)	
Calibration temperature		°C	30	
Number of poles (# mod)		1/2/3/4		
Neutral pole protected		yes		
Nominal voltage Un	AC	1 P	V	240/415
		3 P/4 P	V	415
	DC	1 P <sup>1)</sup>	V DC	48
		2 P (in series) <sup>1)</sup>	V DC	110
Frequency		Hz	50/60	
		Hz	DC: magn.trip +40%	
		Hz	400: magn.trip +50%	
Maximum service voltage Ubmax between two wires		V	250/440; 53/120	
Minimum service voltage Ubmin		V	12; 12	
Selectivity class (IEC 60898)		3		
Isolator application		IEC 60947-2		yes
Rated insulation voltage	Pollution degree 2		V	500
	Pollution degree 3		V	440
Impulse withstand test voltage		kV	6	
Insulation resistance		mOhm	10,000	
Dielectric rigidity		kV	2.5	
Vibration resistance (in x, y, z direction) (IEC 77/16.3)		3 g		
Endurance	Electrical at Un, In		10,000	
	mechanical		20,000	
Utilisation category (IEC 60947-2)		A		
Protection degree (outside / inside, in enclosure with door)		IP 20/IP 40		
Self-extinguish degree (according to UL94)		V2		
Tropicalisation (according to IEC 60068-2 / DIN 40046) °C/RH		+55 °C/95 % RH		
Operating temperature		°C	-25/+55	
Storage temperature		°C	-55/+55	
Terminal capacity Rigid cable min/max (top)		mm²	1/35	
	Flexible cable min*/max (top)		mm²	0.75/25
	Rigid cable min/max (bottom)		mm²	1/35
	Flexible cable min*/max (bottom)		mm²	0.75/25
	(* Flexible cable 0.75/1/1.5 mm² with cable lug)			
	Torque		Nm	4.5
Add-on devices (side add-on)	Auxiliary contacts		yes	
	UVT		yes	
	Shunt trip		yes	
	Motor operator		yes	
	Panelboard switch		yes	
Busbar systems	Pin (top/bottom)		yes/yes	
	Fork (top/bottom)		-/yes	
Accessories		yes		
Dimensions, weights, packaging				
	(HxDxW) 86x68xW		mm/mod.	18
	Weight/mod.		g	120
	Package		mod.	12
Short-circuit capacity AC (kA)				AS/NZS 4898
IEC 60898	Icn	1 P	230/400 V	6
		2 P	230/400 V	6
		3 P/4 P	230/400 V	6
	Ics (service)			100 % Icn
IEC 60947-2	Icu (ultimate)	1 P	127 V	20
			240 V	10
			415 V	3
	2 P	127 V	-	
		240 V	15	
		415 V	10	
	3 P, 4 P	240 V	15	
		415 V	10	
		440 V	6	
		Ics (service)		
NEMA AB1 (120/240V)		20		
Short-circuit capacity DC (kA)				
IEC 60947-2	Icu (ultimate)	1 P	≤60 V	20
			≤220 V	-
			2 P	≤125 V
		2 P	≤440 V	-
	Ics (service)			100 % Icu

**Notes** Refer pages 3 - 23, 24 for information on SAFE-T MCBs.

<sup>1)</sup> Preferred values of rated control supply voltage (IEC 60947 - 2): 24 V, 48 V, 110 V, 125 V, 250 V

<sup>2)</sup> 0.5-4 A/6-25 A/32-40 A/50-63 A

<sup>3)</sup> 10 (125 V DC)

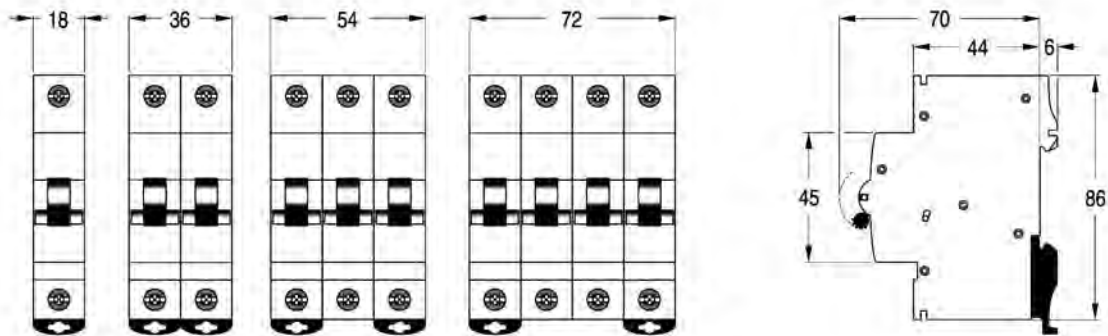
<sup>4)</sup> 10 (250 V DC)

<sup>5)</sup> On request.

## Din-T MCBs Technical data

### Miniature circuit breakers - Din-T 6

Dimensions in mm.



# Solid-state Timer H3CA

CSM\_H3CA\_DS\_E\_3\_1

## DIN-sized (48 x 48, 45 x 75 mm) Timer with Digital Setting and LCD Display

- Dual power supplies for free AC/DC.
- Eight operation modes selectable with one unit.
- Any desired time can be set digitally within a range from 0.1 seconds to 9,990 hrs.
- Four external signal inputs.
- ON/OFF indicator for control output and bar indicator for remaining time.
- Conforms to UL, CSA, and CE marking.



## Ordering Information

Operation/resetting system	Operation mode	Terminal	Time-limit contact	Instantaneous contact	Mounting	
					Surface mounting/ track mounting	Flush mounting
Time-limit operation/self-resetting/external resetting (see note 2)	8 operation modes (selectable) (see note 3)	11-pin round socket	SPDT	---	H3CA-A	H3CA-A
		Front screw			H3CA-FA	---
Time-limit operation/self-resetting	ON-delay operation	8-pin round socket	DPDT	---	H3CA-8	H3CA-8
			SPDT	SPDT	H3CA-8H	H3CA-8H

**Note:** 1. Specify both the model number and supply voltage when ordering for the H3CA-8H and H3CA-8.

2. The operation/resetting system depends on the selected operation mode. For details, see "Timing Chart".

3. The 8 operation modes are as follows:

A: ON-delay operation

B: Repeat cycle operation

C: Signal ON/OFF-delay operation (1)

D: Signal OFF-delay operation (1)

E: Interval operation

F: One-shot and flicker operation

G: Signal ON/OFF-delay operation (2)

H: Signal OFF-delay operation (2)

## Accessories (Order Separately)

Timer	Track mounted socket (See note.)	Back connecting socket	
		Solder terminal	Screw terminal
H3CA-A	P2CF-11	PL11	P3GA-11
H3CA-8H/H3CA-8	P2CF-08	PL08	P3G-08

**Note:** Track mounted socket can be used as a front connecting socket.

## Specifications

### Time Ranges

A desired time can be set within a range of 0.1 s to 9,990 hrs by combining the three thumbwheel switch modules for time setting and one module for time unit selection.

Time unit		0.1 s	1 s	0.1 min	1 min	0.1 hrs	1 hr	10 hrs
Time range	1 to 999 (3 digits)							

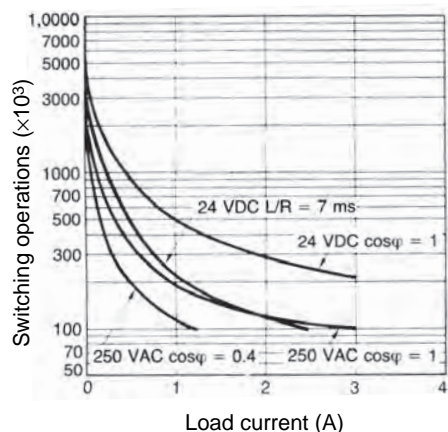
Item	H3CA-A/H3CA-FA	H3CA-8	H3CA-8H
Rated supply voltage (See note 2.)	24 to 240 VAC (50/60 Hz), 12 to 240 VDC (permissible ripple: 20% max.)	100/110/120, 200/220/240 VAC, (50/60 Hz), 24 VDC, 110 VDC (permissible ripple: 20% max.) (See note 1.)	
Operating voltage range	90% to 110% of rated supply voltage	85% to 110% of rated supply voltage	
Power consumption	AC: approx. 4 VA DC: approx. 2 W	AC: approx. 10 VA/1 W DC: approx. 1 W	AC: approx. 10 VA/1.5 W DC: approx. 2 W
Control outputs	3 A at 250 VAC, resistive load ( $\cos\phi = 1$ ) Minimum applicable load      H3CA-8, H3CA-A and H3CA-FA: 10 mA at 5 VDC (failure level: Preference value) H3CA-8H:                                  100mA at 5 VDC (failure level: Preference value)		

2. Refer to *Safety Precautions for All Times* when combining the Timer with an AC 2-wire proximity sensor.

<b>Accuracy of operating time</b>	±0.3% ±0.05 s		
<b>Influence of voltage</b>			
<b>Influence of temperature</b>			
<b>Setting error</b>	±0.5% ±0.05 s max.		
<b>Reset time</b>	H3CA-A/-FA: 0.5 s max. H3CA-8H/-8: 0.1 s max.		
<b>Insulation resistance</b>	100 MΩ min. (at 500 VDC)		
<b>Dielectric strength</b>	2,000 VAC, 50/60 Hz for 1 min (between current-carrying and non-current-carrying parts and between contact and control circuit) 1,000 VAC, 50/60 Hz for 1 min (between non-continuous contacts)		
<b>Impulse withstand voltage</b>	3 kV		
<b>Vibration resistance</b>	Destruction: 10 to 55 Hz with 0.75-mm double amplitude for 1 h each in three directions Malfunction: 10 to 55 Hz with 0.5-mm double amplitude for 10 min each in three directions		
<b>Shock resistance</b>	Destruction: 980 m/s <sup>2</sup> Malfunction: 98 m/s <sup>2</sup>		
<b>Ambient temperature</b>	Operating: -10°C to 55°C		
<b>Ambient humidity</b>	Operating: 35% to 85%		
<b>Life expectancy</b>	Mechanical: 10,000,000 operations min. (under no load at 1,800 operations/h) Electrical: 100,000 operations min. (3 A at 250 VAC, cosφ = 1 at 1,800 operations/h) See <i>Lift-test Curve</i> for more details.		
<b>Approved standards</b>	UL508, CSA C22.2 No. 14, LR, NK Conforms to EN61010-1.		
<b>EMC</b>	(EMI) Emission Enclosure: Emission AC mains: (EMS) Immunity ESD:  Immunity RF-interference:  Immunity Conducted Disturbance: Immunity Burst:  Immunity Surge:  Immunity Voltage Dip/Interruption	EN61326 EN55011 Group 1 class A EN55011 Group 1 class A EN61326 EN61000-4-2: EN61000-4-3:  EN61000-4-6: EN61000-4-4:  EN61000-4-5:  EN61000-4-11:	4 kV contact discharge (level 2) 8 kV air discharge (level 3) 10 V/m (Amplitude-modulated, 80 MHz to 1 GHz) (level 3); 10 V/m (Pulse-modulated, 900 MHz ±5 MHz) (level 3)  10 V (0.15 to 80 MHz) (according to EN61000-6-2) 2 kV power-line (level 3); 1 kV I/O signal-line (level 4) 1 kV line to lines (power and output lines) (level 3); 2 kV line to ground (power and output lines) (level 3) 0.5 cycle, 100% (rated voltage)
<b>Weight</b>	H3CA-A: approx. 110 g H3CA-FA: approx. 190 g		

## Engineering Data

### Life-test Curve

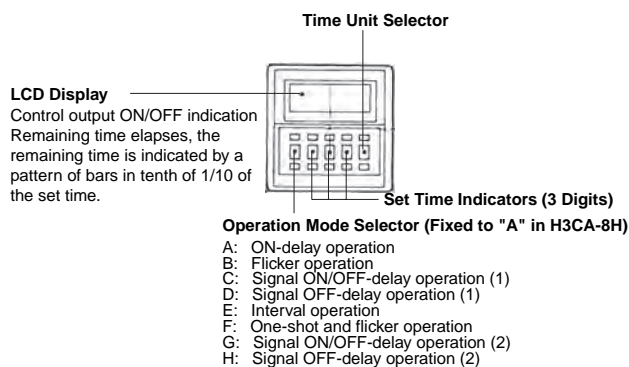


Reference: A maximum current of 0.15 A can be switched at 125 VDC ( $\cos\phi = 1$ ).  
Maximum current of 0.1 A can be switched if L/R is 7 ms. In both cases, a life of 100,000 operations can be expected.

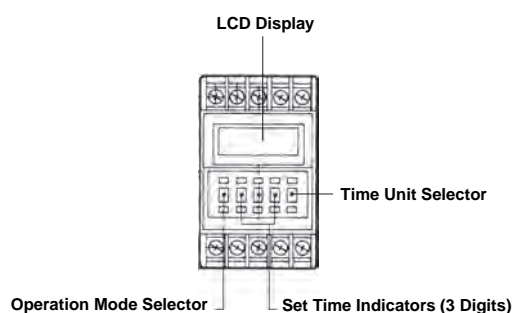
- Note:** 1. The H3CA Series has been tested for the following: impulse voltages, noise (via noise simulator, for L loads, and for relay oscillation), and resistance to static electricity.
2. Minimum applicable load (P reference values):  
H3CA-A(FA), H3CA-8H: 100 mA at 5 VDC  
H3CA-8: 10 mA at 5 VDC

## Nomenclature

### H3CA-A/H3CA-8H



### H3CA-FA



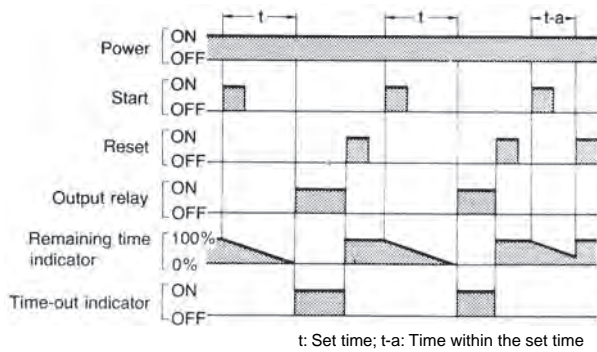
# Operation

## ■ Timing Chart

### H3CA-A (FA)

#### ON-delay Operation (A Mode)

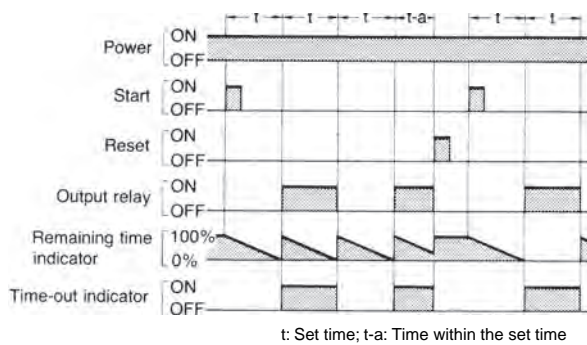
##### Signal Start



**Note:** The minimum signal input time is 0.05 s.

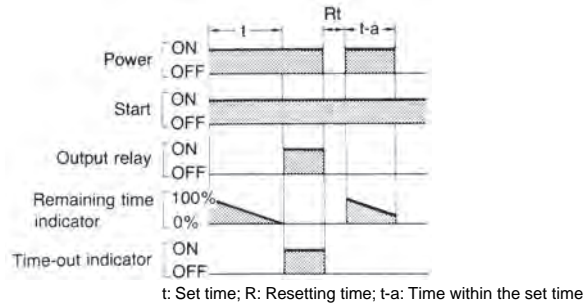
#### Flicker Operation (B Mode)

##### Signal Start

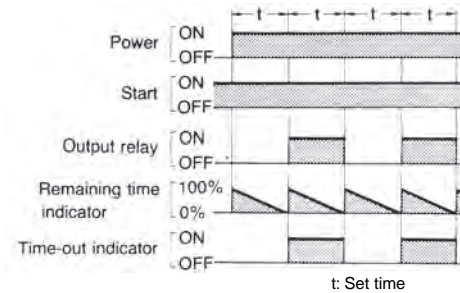


**Note:** The minimum signal input time is 0.05 s.

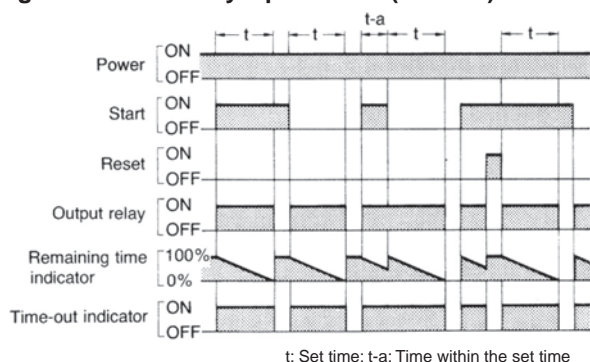
#### Power-ON Start/Power-OFF Reset



#### Power-ON Start/Power-OFF Reset

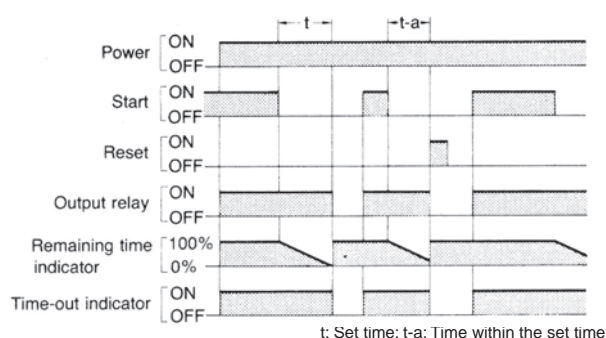


## Signal ON/OFF-delay Operation 1 (C Mode)



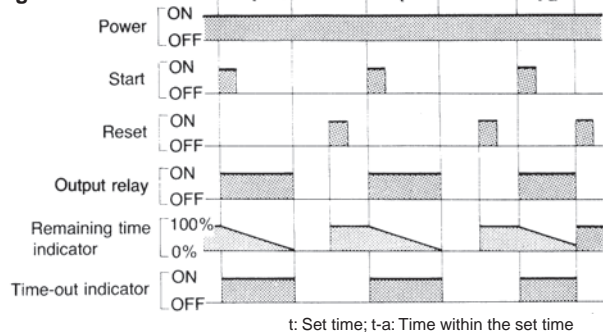
- Note:**
1. The minimum signal input time is 0.05 s.
  2. Operation 1 refers to the version in which the output relay operates when the Start signal is ON.

## Signal OFF-delay Operation 1 (D Mode)

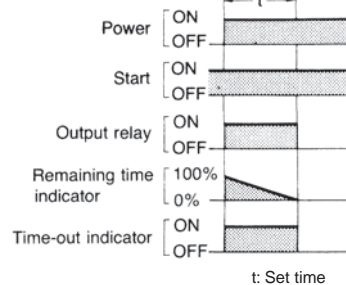


## Interval Operation (E Mode)

## Signal Start

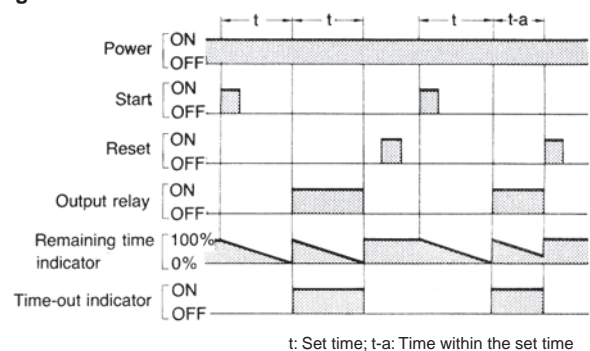


- Note:** The minimum signal input time is 0.05 s.



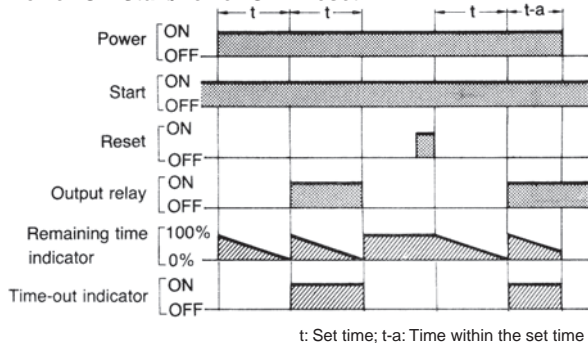
## One-shot and Flicker Operation (F Mode)

## Signal Start



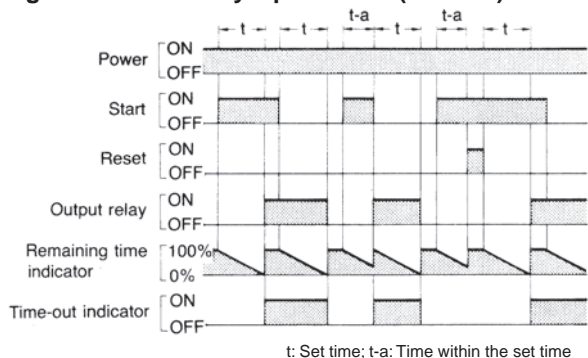
- Note:** The minimum signal input time is 0.05 s.

## Power-ON Start/Power-OFF Reset



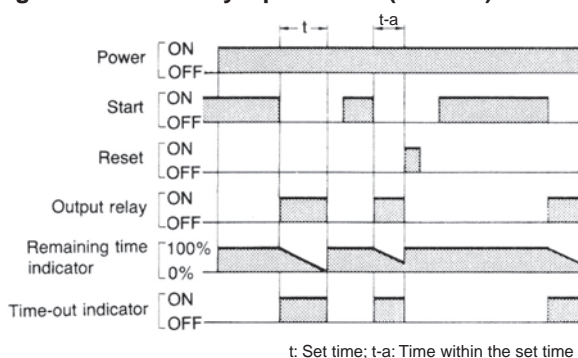
- Note:** The minimum signal input time is 0.05 s.

## Signal ON/OFF-delay Operation 2 (G Mode)

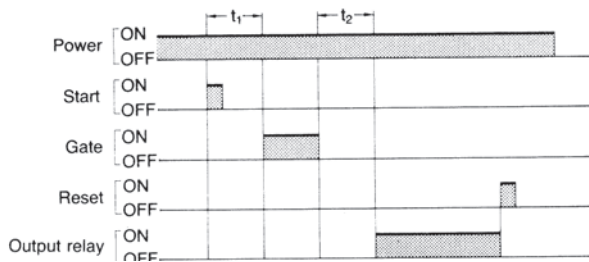


- Note:**
1. The minimum signal input time is 0.05 s.
  2. Operation 2 refers to the version in which the output relay does not operate when the Start signal is ON.

## Signal ON/OFF-delay Operation 2 (H Mode)



## How to Use Gate Signal Input

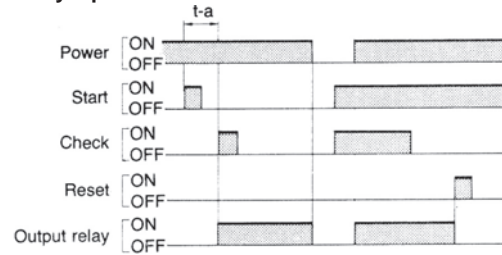


- Note:**
1. This timing chart indicates the gate input in operation mode A (ON-delay operation).
  2. The set time is the sum of  $t_1$  and  $t_2$ .

## How to Use Check Signal Input

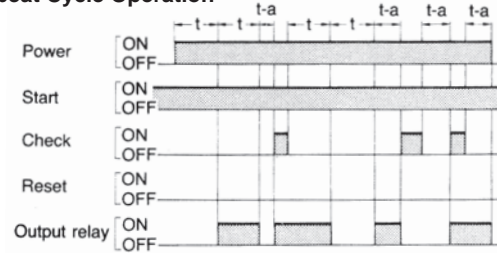
If a check signal is input to the timer during the lapse of a set time, the remaining set time will become 0 and the timer will enter the next control state. Also, while a check signal is being input, the elapsed time measurement of the set time is not performed.

### ON-delay Operation



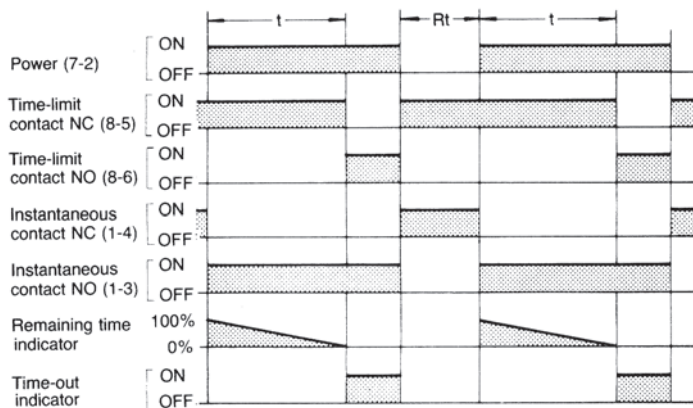
$t$ : Set time;  $t-a$ : Time within the set time

### Repeat Cycle Operation



$t$ : Set time;  $t-a$ : Time within the set time

## H3CA-8H

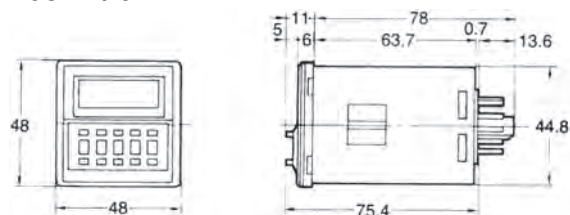


## Dimensions

**Note:** All units are in millimeters unless otherwise indicated.

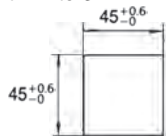
### Timers

#### H3CA-A/-8H



#### Panel Cutouts

When mounting a single unit  
t = 1 to 3.2 mm



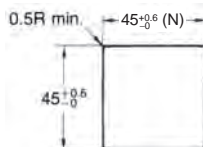
Horizontally connecting n units

No front cover:

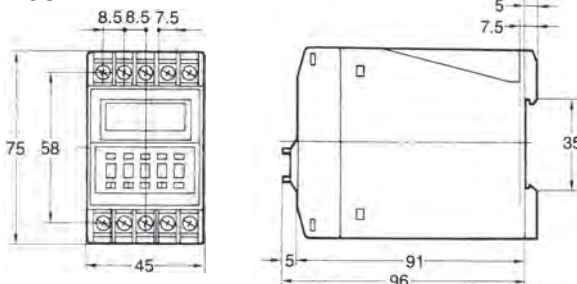
$$N = (48n - 2.5)^{+1}_{-0}$$

With front cover:

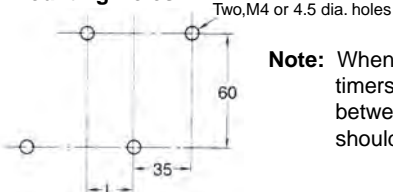
$$N = \{48n - 2.5 + (n - 1) \times 3\}^{+1}_{-0}$$



#### H3CA-FA



#### Mounting Holes

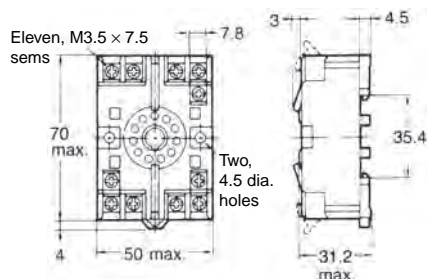


**Note:** When mounting two or more timers in line, dimension L between two adjacent timers should be 10 mm min.

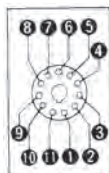
### Accessories (Order Separately)

#### Track Mounted Front Connecting Socket

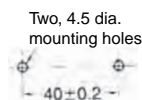
##### P2CF-11



#### Terminal Arrangement (Top View)

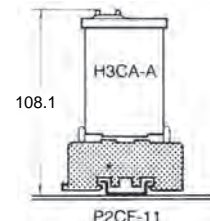


#### Mounting Holes

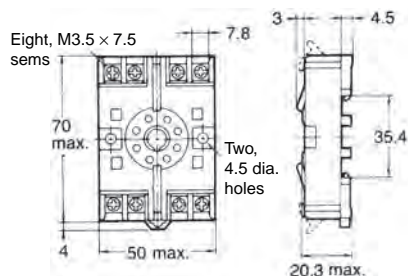


**Note:** P2CF-11 can be used as a front connecting socket.

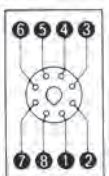
#### Mounting Height of Timer with Socket



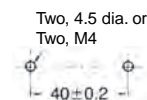
##### P2CF-08



#### Terminal Arrangement (Top View)

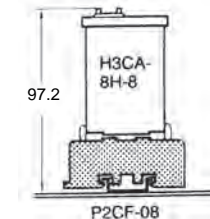


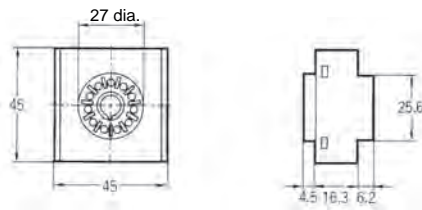
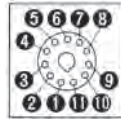
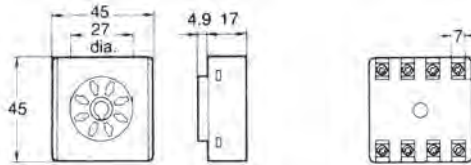
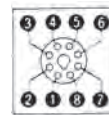
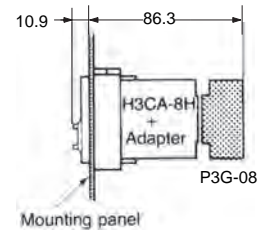
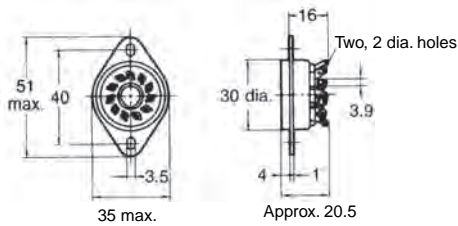
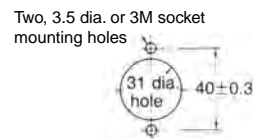
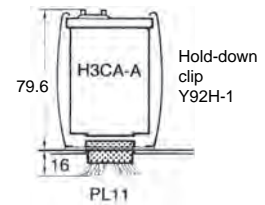
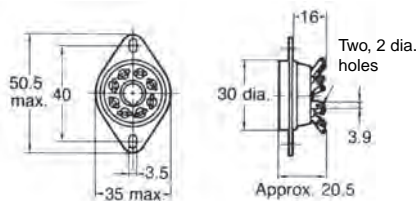
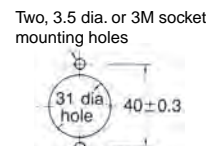
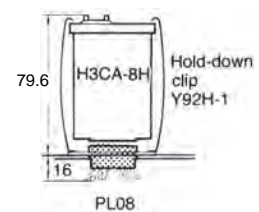
#### Mounting Holes



**Note:** P2CF-08 can be used as a front connecting socket.

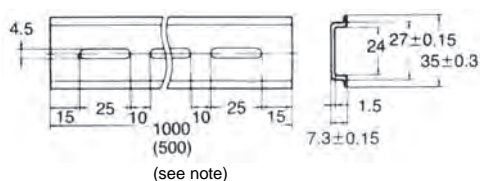
#### Mounting Height of Timer with Socket



**Back Connecting Socket****P3GA-11****Terminal Arrangement  
(Bottom View)****P3G-08****Terminal Arrangement  
(Bottom View)****Mounting Height of  
Timer with Socket****PL11****Terminal Arrangement  
(Bottom View)****Mounting Holes****Mounting Height of  
Timer with Socket****PL08****Terminal Arrangement  
(Bottom View)****Mounting Holes****Mounting Height of  
Timer with Socket**

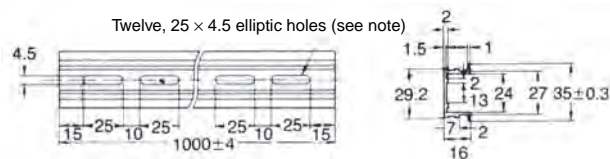
## Mounting Track (Meets DIN EN50022)

### PFP-100N/PFP-50N



**Note:** This dimension applied to PFP-50N.

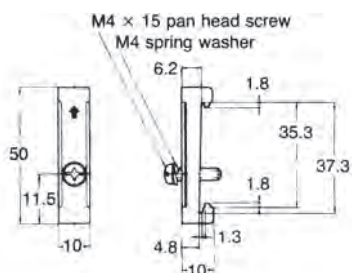
### PFP-100N2



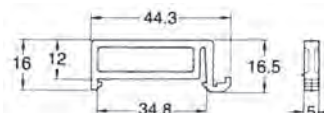
**Note:** A total of 12-25 × 4.5 elliptic holes are provided with 6 holes cut from each rail end at a pitch of 10 mm between holes.

## End Plate

### PFP-M

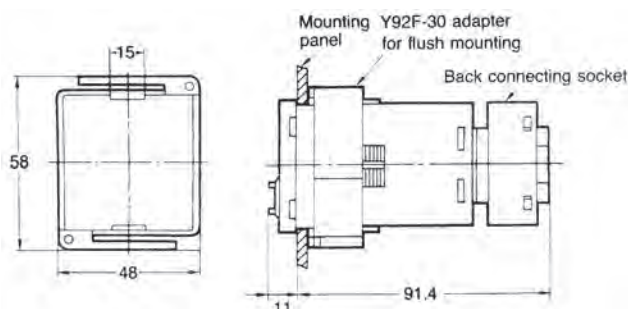


### PFP-S



## Adapter for Flush Mounting

### Y92F-30



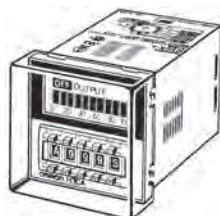
**Note:** Pay attention to the orientation of the adapter when mounting two or more timers in a vertical or horizontal line.

## Protective Cover

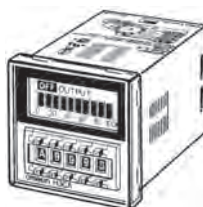
### Y92A-48B/Y92A-48D

The protective cover protects the front panel, particularly the time setting section, against dust, dirt and water drip, as well as prevents the set value from being altered due to accidental contact with the time setting knob.

#### Y92A-48B Hard Plastic Cover



#### Y92A-48D Soft PVC Cover

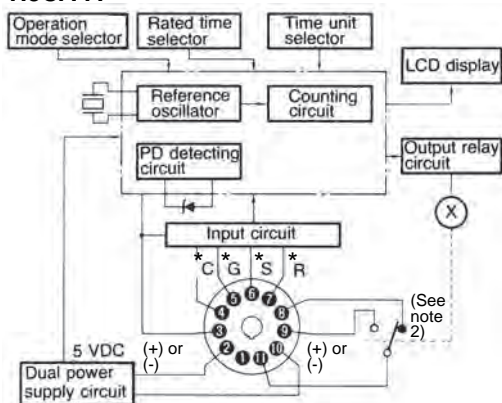


**Note:** The Y92A-48B Protective Cover is made of a hard plastic and therefore, must be removed to change the timer set value. However, since the Y92A-48D Protective Cover is made of PVC, the set value can be altered by pressing on the surface of the cover. It may be, however, difficult to make setting changes of the Timer with the Y92A-48B Protective Cover attached, which must be taken into consideration before using the Y92A-48B Protective Cover. When attaching the Y92A-48A to the Timer to be panel-mounted, use the Y92F-30 Mounting Adapter along with the Timer. The Protective Cover cannot be, however, used for the H3CA-FA Series.

# Installation

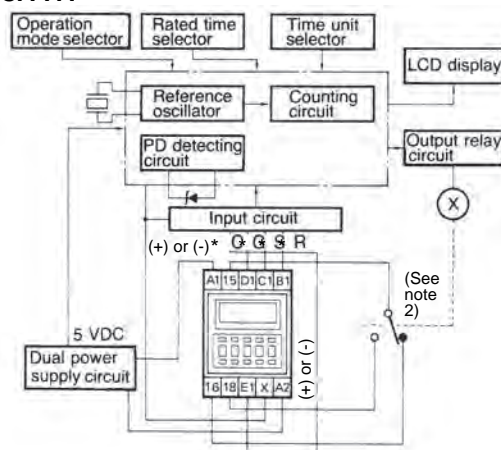
## Terminal Arrangement

H3CA-A



- Note:**
1. \*C: Check: 3-4  
\*G: Gate: 3-5  
\*S: Start: 3-6  
\*R: Reset: 3-7
  2. Conventional time-limit contacts are symbolized as . However, the contacts of H3CA-A are symbolized as because timer has 8 operation modes.

H3CA-FA

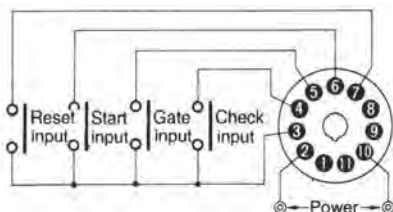


- Note:**
1. \*C: Check: X-E1  
\*G: Gate: X-D1  
\*S: Start: X-C1  
\*R: Reset: X-B1
  2. Conventional time-limit contacts are symbolized as . However, the contacts of H3CA-FA are symbolized as because timer has 8 operation modes.

## Input Connections

### Signal Inputs

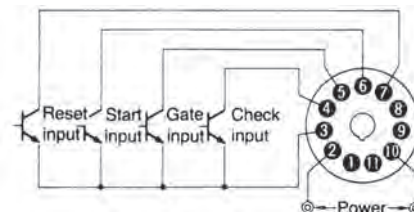
Connect the start input contact between terminals ③ and ⑥, the reset input contact between terminals ③ and ⑦, the gate input contact between terminals ③ and ⑤, and the check input contact between terminals ③ and ④.



For each signal input contact, use a gold-plated contacts with high reliability. Be sure that these input signals satisfy the following requirements: a resistance of 1 k $\Omega$  (max.) and a residual voltage of 1 V (max.) when the contact is made.

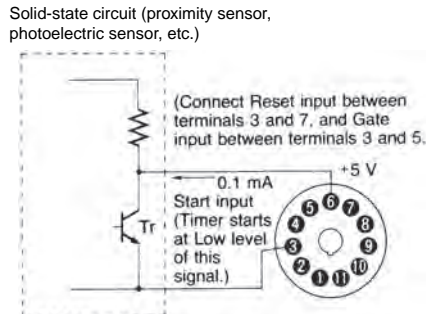
### Solid-state Signal Inputs

Connect the start input transistor between terminals ③ and ⑥, the reset input transistor between terminals ③ and ⑦, the gate input transistor between terminals ③ and ⑤, and the check input transistor between terminals ③ and ④.



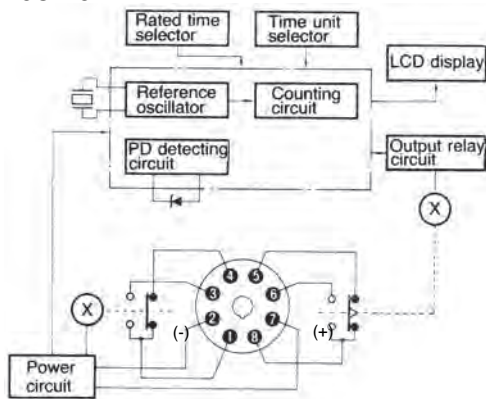
For signal input, use an open collector type transistor with characteristics:  $V_{CE0} = 20$  V min.,  $V_{CE(S)} = 1$  V max.,  $I_C = 50$  mA min. and  $I_{CBO} = 0.5$   $\mu$ A max. In addition, be sure that the input signals satisfy the following requirements: a resistance of 1 k $\Omega$  (max.) and a residual voltage of 1 V (max.) when the transistor is ON, and a resistance of 200 k $\Omega$  (min.) when the transistor is OFF.

From a solid-state circuit (proximity sensor, photoelectric sensor, or the like) with rated power supply voltage ranging from 6 to 30 VDC, input signals can also be applied by other than an open collector type transistor as shown in the following diagram. The input signal from a solid-state circuit is applied when output transistor Tr turns ON. In terms of signal voltage, the signal is input when it goes from a high to low level. Again, the residual voltage should be 1 V (max.) when the transistor is ON. As the current output from the timer to Tr is approximately 0.1 mA, this connection is possible provided the residual voltage is kept to a maximum of 1 V.

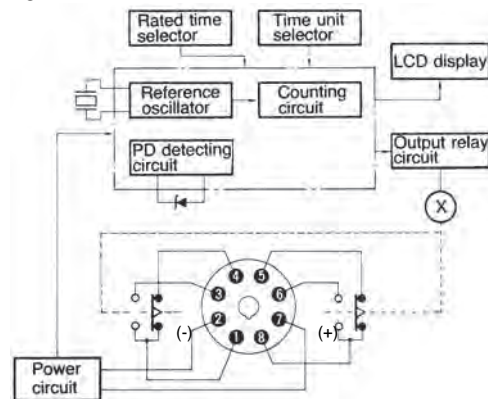


**Note:** Except for the power supply circuitry, avoid the laying of input signal wires in parallel or in the same conduit with high-tension or power lines. It is recommended to use shielded wires or wiring with independent metal conduits for the shortest possible distance.

## H3CA-8H



## H3CA-8

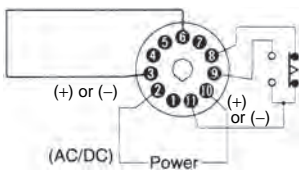
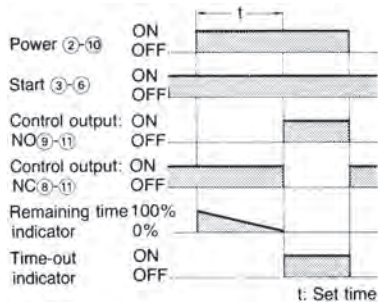


## Application Examples

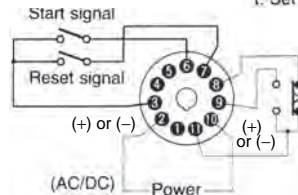
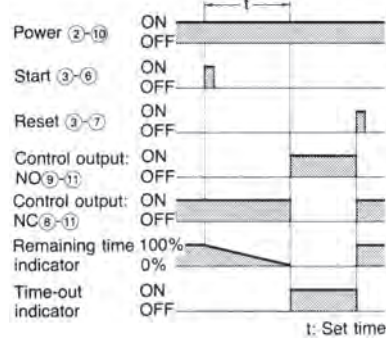
Standard type H3CA is used for the following application examples. In the schematic diagrams, each thick line indicates the wiring necessary for selecting the desired operation mode.

### ON-delay Operation (A Mode)

#### Power-ON Start/Power-OFF Reset

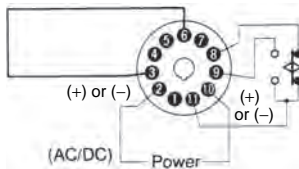
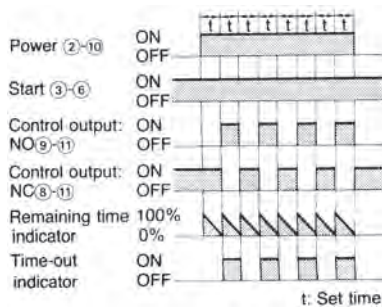


#### Signal Start/Signal Reset

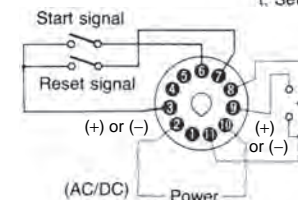
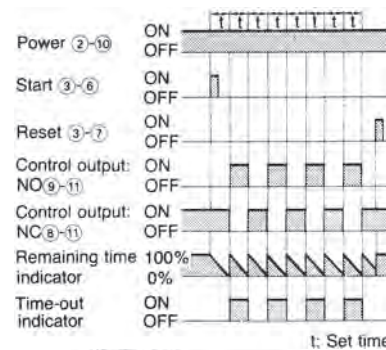


### Flicker Operation (B Mode)

#### Power-ON Start/Power-OFF Reset

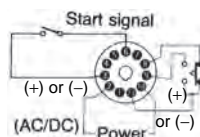
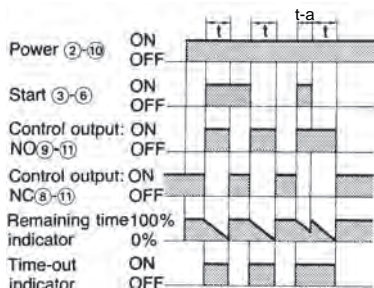


#### Signal Start/Signal Reset



### Signal ON/OFF-delay Operation 1 (C Mode)

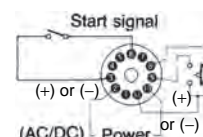
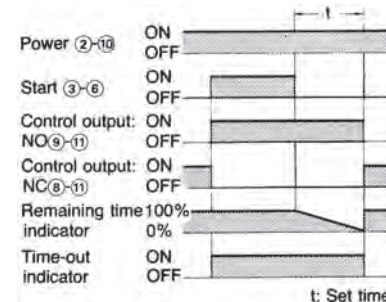
#### Signal ON/OFF-start/Instantaneous Operation/ Time-limit Reset



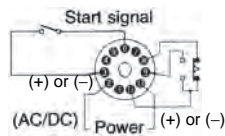
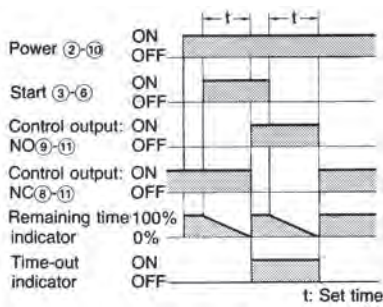
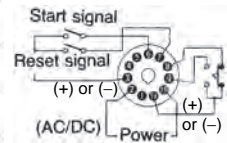
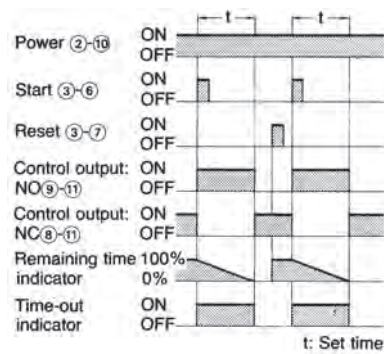
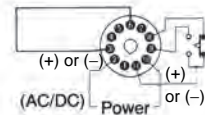
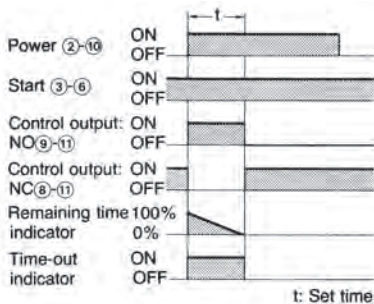
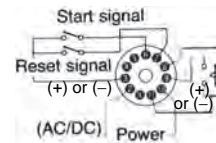
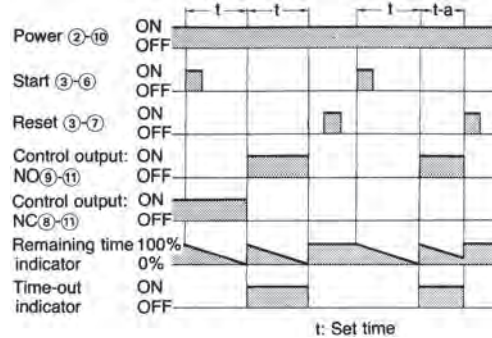
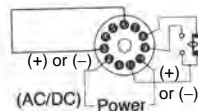
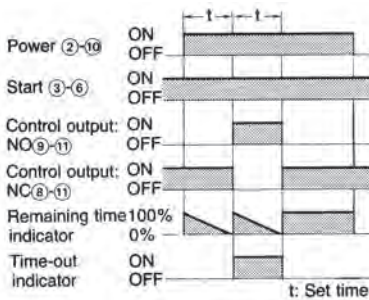
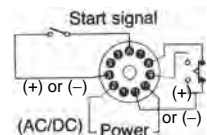
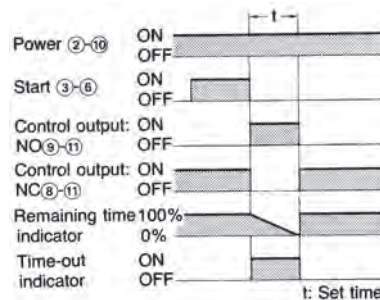
t: Set time, t-a: Time within the set time

### Signal OFF-delay Operation 1 (D Mode)

#### Signal Start/Instantaneous Operation/Time-limit Reset



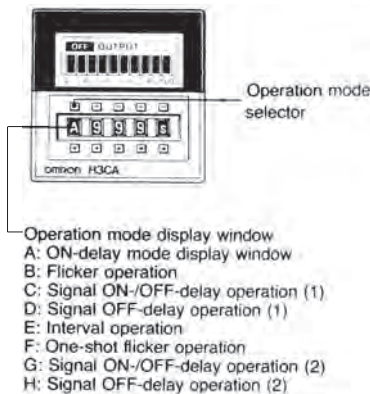
t: Set time

**Signal ON/OFF-delay Operation 2 (G Mode)****Signal ON/OFF-start/Instantaneous Operation/  
Time-limit Reset****Signal Start/Signal Reset****Interval Operation (E Mode)****Power-ON Start/Power-OFF Reset****Signal Start/Signal Reset****One-shot and Flicker Operation (F Mode)****Power-ON Start/Power-OFF Reset****Signal OFF-delay Operation 2 (H Mode)****Signal/Instantaneous Operation/Time-limit Reset**

# Safety Precautions

## How to Change Operation Mode

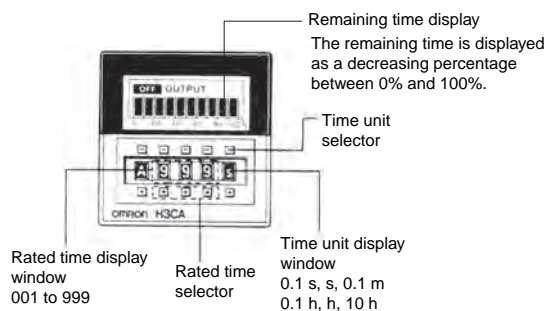
Operate the pushbuttons of the thumbwheel switch, located at the leftmost position on the front panel to set the operation mode. Eight operation modes (A, B, C, D, E, F, G, and H) are selectable and the selected operation mode is displayed in the operation mode display window.



**Note:** The operation mode is fixed to "A" for H3CA-8H. The characters are yellow.

## How to Change Time Unit and Rated Time

Operate the pushbuttons of the rightmost thumbwheel switch to select the desired time unit. Seven time units (0.1 s, s, 0.1 m, m, 0.1 h, h, or 10 h) are selectable and the selected time unit is displayed in the time unit display window. The desired rated time is specified by operating the three thumbwheel switches in the middle of the front panel. The range of rated time is 001 to 999 for each unit.



**Note:** The characters are yellow.

## Time Unit and Rated Time

Time unit	Rated time
0.1 s	0.1 to 99.9 s
s	1 to 999 s
0.1 m	0.1 to 99.9 m
m	1 to 999 m
0.1 h	0.1 to 99.9 h
h	1 to 999 h
10 h	10 to 9,990 h

### CAUTION

- Do not change the time unit, rated time, or operation mode while the timer is in operation. Otherwise, the timer may malfunction or be damaged. Be sure to turn off the power supply to the timer before changing the timer unit, rated time or operation mode.
- Note that output will be generated in C, D, E, G, or H mode even if the rated time is set to 000. No output will be generated in A, B, or F mode.

## Connecting the Operating Power Supply

The H3CA-8□ contains a capacitor-drop power circuit. Use a sinusoidal power supply with a commercial frequency. Do not use power supplies with a high frequency component (such as inverter power supplies) for Timers with 100 to 240-VAC specifications. Using these power supplies can damage internal circuits.

The power supply connections to the H3CA-A and H3CA-FA can be made without regard to polarity for both AC and DC power supplies; just connect to the specified terminals (2 and 10, or A1 and A2). When connecting a DC power supply to the H3CA-8 or H3CA-8H, however, the polarity must be connected as indicated.

Although there is a wide range of power connectable to the H3CA-A and H3CA-FA, be sure that there is no inductive voltage or residual voltage applied to the timer power supply terminals (2 and 10, or A1 and A2) when the power switch is turned OFF. (Inductive voltage can be generated in the power supply line if it is placed in parallel with high-voltage or power lines.)

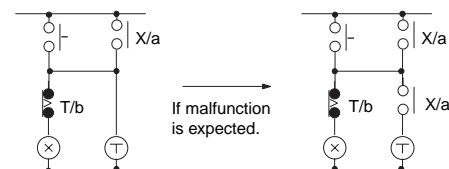
A DC power supply can be connected if its ripple factor is 20% or less and the mean voltage is within the rated operating voltage range of the Timer.

Connect the power supply voltage through a relay or switch in such a way that the voltage reaches a fixed value at once or the Timer may not be reset or a timer error could result.

H3CA-8 and H3CA-8H Timers with AC specifications are equivalent to capacitor loads. When switching the Timer power supply with an SSR, use an SSR with a withstand voltage of twice the power supply voltage.

Since the H3CA-8 and H3CA-8H Timers of AC specifications externally discharges a part of internal energy when the power is turned OFF, it may malfunction if an extremely sensitive relay is used with the following sequence circuit.

If such a malfunction occurs, change the circuit configuration as shown below on the right side.

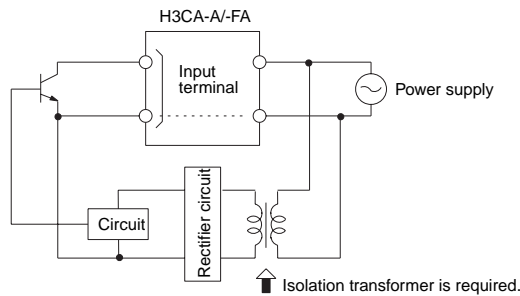


## Input/Output

The operation of the output contacts varies with the operation specifications. Before making connections, check the operation specifications and operating conditions using the application examples provided.

The H3CA-A and H3CA-FA do not use transformers. Simultaneous inputting power from two or more power supplies to separate timers or counters from a single input contact or transistor is not possible.

For the power supply of an input device, use an isolating transformer, of which the primary and secondary windings are mutually isolated and the secondary winding is not grounded.



A transformer is not used in the power supplies for the H3CA-A and H3CA-FA. You can therefore receive an electrical shock by touching the input terminals when the power supply voltage is being applied. Take adequate precautions to protect against electrical shock.

Inputs to input signal terminals are made by shorting the individual input terminals to the common terminal (terminal 3 for the H3CA-A or terminal (X) for the H3CA-FA). Internal circuits may be damaged if connections are made to any other terminals or if voltages are applied.

If contacts are used to short the terminals, they will be switching a low voltage (approximately 5 VDC) and current (approximately 100  $\mu$ A). You must therefore use high-reliability contacts with a contact resistance of 1 k $\Omega$  or less when shorted and residual voltage of 1 V maximum when shorted.

The reset input will take priority if both the set and reset inputs are turned ON simultaneously.

## Others

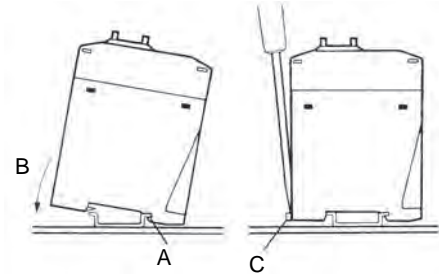
Holding relays are used for outputs on the H3CA-A Series. Dropping the Unit or otherwise subjecting it to shock can cause the relay to reverse or to move to the center position.

## How to Mount the Timer on Mounting Track

When mounting a H3CA-FA Timer on a socket mounting track, observe the following procedures:

### Mounting

First hook portion A of the timer to an edge of the track and then depress the timer in direction B.



### Dismounting

Pull out portion C with a round-blade screwdriver and remove the timer from the mounting track.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.

## Special-purpose Basic Switch

**DZ**

CSM\_DZ\_DS\_E\_2\_3

**DPDT Basic Switch for Two Independent Circuit Control**

- Ideal for switching the circuits operating on two different voltages, and for controlling two independent circuits.
- Interchangeable with OMRON Z Basic Switches, as both switches are identical in mounting hole dimensions, mounting pitch and pin plunger position.



Be sure to read *Safety Precautions* on page 4 and *Safety Precautions for All Basic Switches*.



For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

**Model Number Structure****Model Number Legend**

**DZ-10G□-1□**  
(1) (2)(3) (4)(5)

**(1) Ratings**

10 : 10 A (250 VAC)

**(2) Contact Gap**

G : 0.5 mm

**(3) Actuator**

None : Pin plunger  
V : Hinge lever  
V22 : Short hinge roller lever  
V2 : Hinge roller lever  
W : Hinge lever  
W22 : Short hinge roller lever  
W2 : Hinge roller lever

**(4) Contact Form**

1 : DPDT

**(5) Terminals**

A : Solder terminal  
B : Screw terminal

**Ordering Information**

Actuator	Terminal	Solder terminal (-1A)		Screw terminal (-B)	
		Model		Model	
Pin plunger		DZ-10G-1A		DZ-10G-1B	
Hinge lever	High OT	DZ-10GW-1A		DZ-10GW-1B	
	Low OT	DZ-10GV-1A		DZ-10GV-1B	
Short hinge roller lever	High OT	DZ-10GW22-1A		DZ-10GW22-1B	
	Low OT	DZ-10GV22-1A		DZ-10GV22-1B	
Hinge roller lever	High OT	DZ-10GW2-1A		DZ-10GW2-1B	
	Low OT	DZ-10GV2-1A		DZ-10GV2-1B	

**Specifications****Ratings**

Rated voltage	Non-inductive load (A)				Inductive load (A)			
	Resistive load		Lamp load		Inductive load		Motor load	
	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	10		2	1	6		3	1.5
250 VAC	10		1.5	0.7	4		2	1
8 VDC	10		3	1.5	6		5	2.5
14 VDC	10		3	1.5	6		5	2.5
30 VDC	10		3	1.5	4		3	1.5
125 VAC	0.5		0.5		0.05		0.05	
250 VDC	0.25		0.25		0.03		0.03	

Note: 1. The above values are for steady-state current.

2. Inductive load has a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).

3. Lamp load has an inrush current of 10 times the steady-state current.

4. Motor load has an inrush current of 6 times the steady-state current.

5. The ratings values apply under the following test conditions:

(1) Ambient temperature: 20±2°C

(2) Ambient humidity: 65±5%RH

(3) Operating frequency: 20 operations/min

**Certified Standard Ratings**

Ask your OMRON representative for information on certified models.

**UL/CSA**

Rated voltage	DZ-10G
125 VAC	10 A 1/8 HP
250 VAC	10 A 1/4 HP
480 VAC	2 A
125 VDC	0.5 A
250 VDC	0.25 A

**Accessories (Terminal Covers, Actuators, and Separators): Refer to Z/A/X/DZ Common Accessories and Z/X/DZ Common Accessories.**

## Characteristics

<b>Operating speed</b>		0.1 mm to 1 m/s *1
<b>Operating frequency</b>	<b>Mechanical</b>	240 operations/min
	<b>Electrical</b>	20 operations/min
<b>Insulation resistance</b>		100 MΩ min. (at 500 VDC)
<b>Contact resistance</b>		15 mΩ max. (initial value)
<b>Dielectric strength</b>		1,000 VAC, 50/60 Hz for 1 min between non-continuous terminals 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and non-current-carrying metal part, and between current-carrying metal part and ground and between switches
<b>Vibration resistance</b>	<b>Malfunction</b>	10 to 55 Hz, 1.5-mm double amplitude *2
<b>Shock resistance</b>	<b>Destruction</b>	1,000 m/s <sup>2</sup> max.
	<b>Malfunction</b>	300 m/s <sup>2</sup> max. *1 *2
<b>Durability</b>	<b>Mechanical</b>	1,000,000 operations min.
	<b>Electrical</b>	500,000 operations min.
<b>Degree of protection</b>		IP00
<b>Degree of protection against electric shock</b>		Class I
<b>Proof tracking index (PTI)</b>		175
<b>Ambient operating temperature</b>		-25°C to 80°C (with no icing)
<b>Ambient operating humidity</b>		35% to 85%RH
<b>Weight</b>		Approx. 30 to 50 g

\*1. The values are for pin plunger models. (Contact your OMRON representative for other models.)

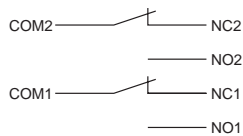
\*2. Malfunction: 1 ms max.

## Contact Specifications

<b>Contacts</b>	<b>Material</b>	Silver alloy
	<b>Gap (standard value)</b>	0.5 mm
<b>Inrush current</b>	<b>NC</b>	30 A max.
	<b>NO</b>	15 A max.

## Structure

### Contact Form (DPDT)

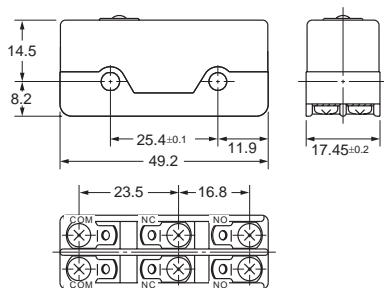


## Dimensions

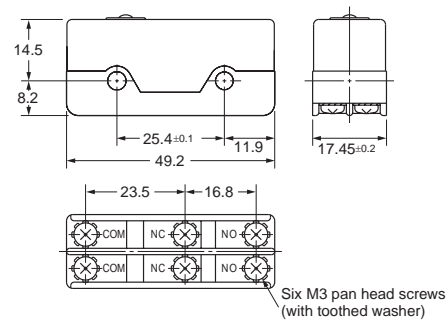
(Unit: mm)

### Terminals

#### Solder Terminals (-1A)



#### Screw Terminals (-1B)

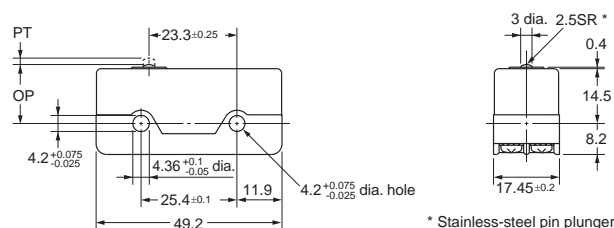


## Dimensions and Operating Characteristics

The solder terminal model has a suffix "-1A" in its model number and its omitted dimensions are the same as the corresponding dimensions of the pin plunger model.

### Pin Plunger

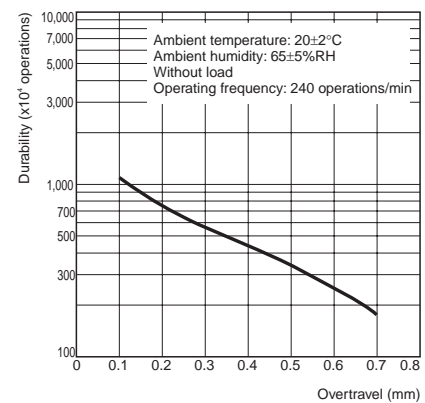
#### DZ-10G-1B



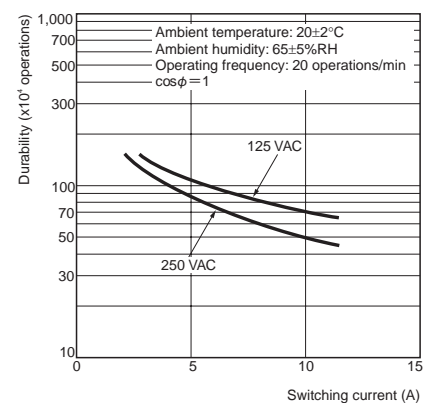
\* Stainless-steel pin plunger

## Engineering Data

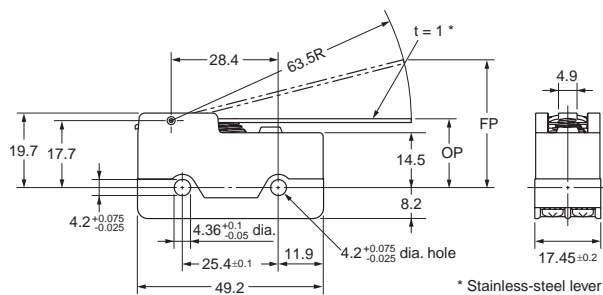
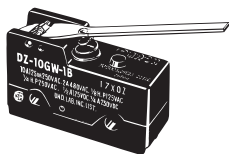
### Mechanical Durability (DZ-10G-1B)



### Electrical Durability (DZ-10G-1B)

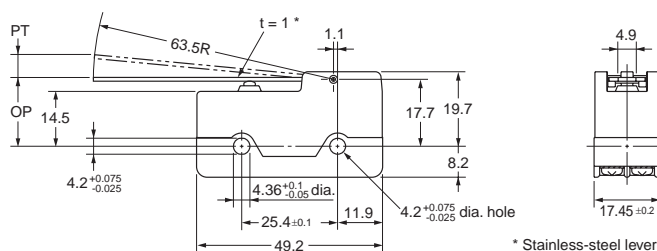
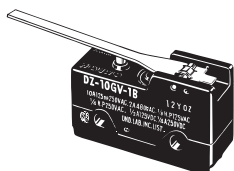


### Hinge Lever DZ-10GW-1B



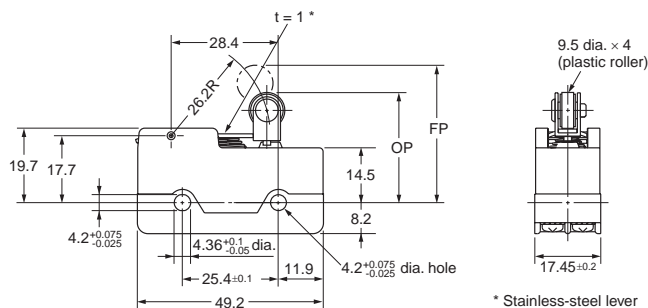
OF	max.	1.67 N
RF	min.	0.27 N
OT	min.	1.6 mm
MD	max.	4 mm
FP	max.	46.3 mm
OP		21.8 $\pm 1$ mm

### DZ-10GV-1B



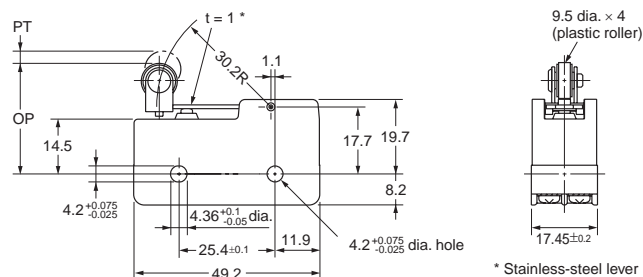
OF	max.	1.96 N
RF	min.	0.13 N
PT	max.	6 mm
OT	min.	0.4 mm
MD	max.	1.7 mm
OP		18.3 $\pm 1$ mm

### Short Hinge Roller Lever DZ-10GW22-1B



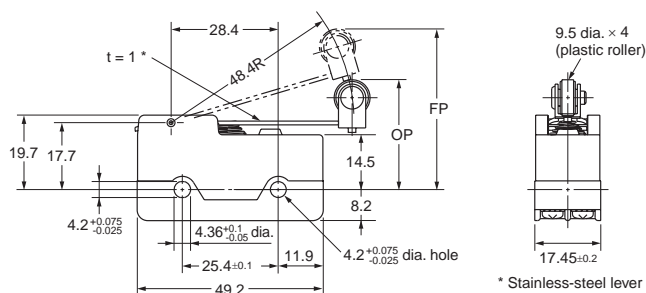
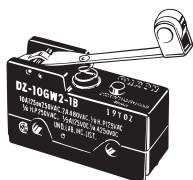
OF	max.	3.92 N
RF	min.	0.83 N
OT	min.	0.9 mm
MD	max.	2.4 mm
FP	max.	39.7 mm
OP		30.2 $\pm 0.8$ mm

### DZ-10GV22-1B



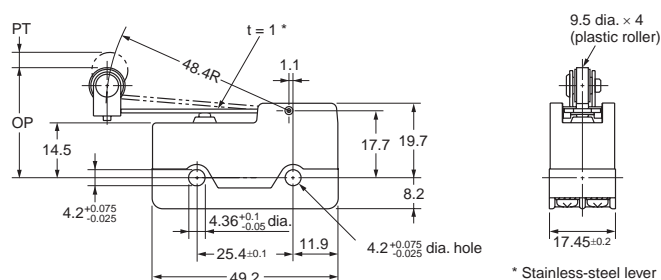
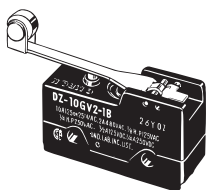
OF	max.	4.22 N
RF	min.	0.41 N
PT	max.	3 mm
OT	min.	0.13 mm
MD	max.	0.6 mm
OP		29.4 $\pm 0.8$ mm

### Hinge Roller Lever DZ-10GW2-1B



OF	max.	2.09 N
RF	min.	0.41 N
OT	min.	1.2 mm
MD	max.	3.3 mm
FP	max.	47.6 mm
OP		31.8 $\pm 0.8$ mm

### DZ-10GV2-1B



OF	max.	2.65 N
RF	min.	0.33 N
PT	max.	4 mm
OT	min.	0.26 mm
MD	max.	1.1 mm
OP		29.4 $\pm 0.8$ mm

Note: Unless otherwise specified, a tolerance of  $\pm 0.4$  mm applies to all dimensions.

## Safety Precautions

Refer to *Safety Precautions for All Basic Switches*.

### Precautions for Safe Use

#### Terminal Connection

When soldering lead wires to the Switch, make sure that the capacity of the soldering iron is 60 W maximum. Do not take more than 5 s to solder any part of the Switch. The characteristics of the Switch will deteriorate if a soldering iron with a capacity of more than 60 W is applied to any part of the Switch for 5 s or more.

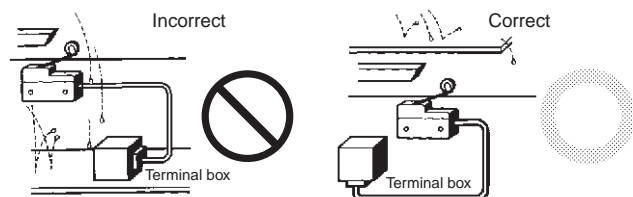
#### Operation

- Make sure that the switching frequency or speed is within the specified range.
  - If the switching speed is extremely slow, the contact may not be switched smoothly, which may result in a contact failure or contact welding.
  - If the switching speed is extremely fast, switching shock may damage the Switch soon. If the switching frequency is too high, the contact may not catch up with the speed.
 The rated permissible switching speed and frequency indicate the switching reliability of the Switch.  
 The life of a Switch is determined at the specified switching speed. The life varies with the switching speed and frequency even when they are within the permissible ranges. In order to determine the life of a Switch model to be applied to a particular use, it is best to conduct an appropriate durability test on some samples of the model under actual conditions.
- Make sure that the actuator travel does not exceed the permissible OT position. The operating stroke must be set to 70% to 100% of the rated OT.

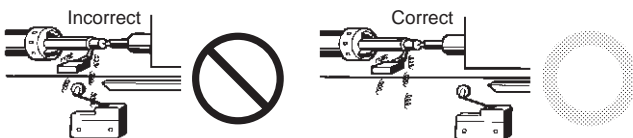
### Precautions for Correct Use

#### Mounting Location

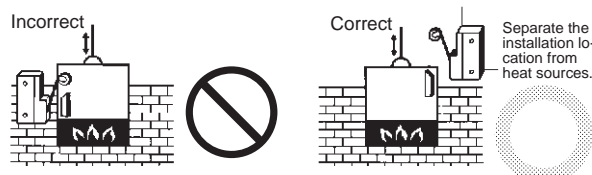
- Do not use the switch alone in atmospheres such as flammable or explosive gases. Arcing and heat generation associated with switching may cause fires or explosions.
- Switches are generally not constructed with resistance against water. Use a protective cover to prevent direct spraying if the switch is used in locations subject to splashing or spurting oil or water, dust adhering.



- Install the switch in a location that is not directly subject to debris and dust from cutting. The actuator and the switch body must be protected from accumulated cutting debris and dirt.



- Do not use the switch in locations subject to hot water (greater than 60°C) or in water vapor.
- Do not use the switch outside the specified temperature and atmospheric conditions.  
 The permissible ambient temperature depends on the model. (Refer to the specifications in this catalog.) Sudden thermal changes may cause thermal shock to distort the switch and result in faults.



- Mount a cover if the switch is to be installed in a location where worker inattention could result in incorrect operation or accidents.

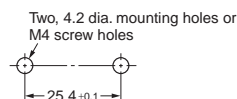


- Subjecting the switch to continuous vibration or shock may result in contact failure or faulty operation due to abrasion powder and in reduced durability. Excessive vibration or shock will cause the contacts to operate malfunction or become damaged. Mount the switch in a location that is not subject to vibration or shock and in a direction that does not subject the switch to resonance.
- If silver contacts are used with relatively low frequency for a long time or are used with microloads, the sulfide coating produced on the contact surface will not be broken down and contact faults will result. Use a microload switch that uses gold contacts.
- Do not use the switch in atmospheres with high humidity or heat or in harmful gases, such as sulfide gas (H<sub>2</sub>S, SO<sub>2</sub>), ammonia gas (NH<sub>3</sub>), nitric acid gas (HNO<sub>3</sub>), or chlorine gas (Cl<sub>2</sub>). Doing so may impair functionality, such as with damage due to contacting faults or corrosion.
- The switch includes contacts. If the switch is used in an atmosphere with silicon gas, arc energy may cause silicon oxide (SiO<sub>2</sub>) to accumulate on the contacts and result in contact failure. If there is silicon oil, silicon filling, silicon wiring, or other silicon products in the vicinity of the switch, use a contact protection circuit to limit arcing and remove the source of the silicon gas.

#### Mounting

Use M4 mounting screws with plane washers or spring washers to securely mount the Switch. Tighten the screws to a torque of 1.18 to 1.47 N·m.

#### Mounting Holes



## Accessories (Order separately)

Refer to *Z/A/X/DZ Common Accessories* for details about Terminal Covers, Separators, and Actuators.

## Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

### LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

## Application Considerations

### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

### PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

## Disclaimers

### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

### PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

### ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

2012.8

In the interest of product improvement, specifications are subject to change without notice.

**OMRON Corporation**  
Industrial Automation Company

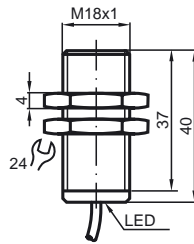
<http://www.ia.omron.com/>

(c)Copyright OMRON Corporation 2012 All Right Reserved.

# Inductive proximity switches

**NCB5-18GM40-Z0**

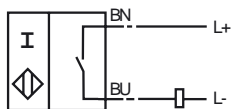
Comfort series  
5 mm embeddable



General specifications	
Switching element function	DC Make function
Rated operating distance $s_n$	5 mm
Installation	embeddable
Assured operating distance $s_a$	0 ... 4.05 mm
Reduction factor $r_{Al}$	0.37
Reduction factor $r_{Cu}$	0.33
Reduction factor $r_{V2A}$	0.7
Nominal ratings	
Operating voltage $U_B$	5 ... 60 V
Switching frequency $f$	0 ... 350 Hz
Hysteresis $H$	1 ... 10 typ. 5 %
Reverse polarity protection	tolerant
Short-circuit protection	pulsing
Voltage drop $U_d$	$\leq 5$ V
Operating current $I_L$	2 ... 100 mA
Off-state current $I_r$	0 ... 0.5 mA typ.
Indication of the switching state	all direction LED, yellow
Standard conformity	
Standards	EN 60947-5-2:2004
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Mechanical specifications	
Connection type	2 m, PUR cable
Cable version	PA
Core cross-section	0.34 mm <sup>2</sup>
Housing material	Stainless steel
Sensing face	PBT
Protection degree	IP67

## Connection type:

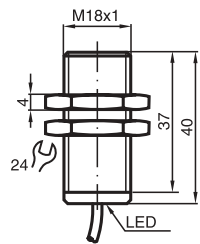
Z0



Inductive proximity switches

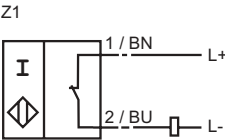
NCB5-18GM40-Z1

Comfort series  
5 mm embeddable



Switching element function	DC	Break function
Rated operating distance $s_n$	5 mm	
Installation	embeddable	
Assured operating distance $s_a$	0 ... 4,05 mm	
Reduction factor $r_{Al}$	0,37	
Reduction factor $r_{Cu}$	0,33	
Reduction factor $r_{V2A}$	0,7	
Operating voltage $U_B$	5 ... 60 V	
Switching frequency $f$	0 ... 350 Hz	
Hysteresis $H$	1 ... 10 typ. 5 %	
Reverse polarity protection	tolerant	
Short circuit protection	pulsing	
Voltage drop $U_d$	Ω5 V	
Operating current $I_L$	2 ... 100 mA	
Off-state current $I_r$	0 ... 0,5 mA typ.	
Indication of the switching state	all direction LED, yellow	
Standards	EN 60947-5-2	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Connection type	2 m, PUR cable	
Cable version	PA	
Core cross-section	0.34 mm²	
Housing material	high grade steel	
Sensing face	PBT	
Protection degree	IP67	

Connection\_type:



089262\_ENG.xml

2003-07-08

## Thermal device circuit breaker - TCP 0.25A - 0712123

Please be informed that the data shown in this PDF Document is generated from our Online Catalog. Please find the complete data in the user's documentation. Our General Terms of Use for Downloads are valid (<http://download.phoenixcontact.com>)



Thermal miniature circuit breaker, pluggable in screw-type fuse terminal block UK 6-FSI/C and spring-cage fuse terminal block ST 4-FSI/C

The illustration shows version  
TCP 2A

### Why buy this product

- ✓ A version with screw or spring-cage connection is used as a basic terminal block
- ✓ The reclosable thermal circuit breaker is available in ten nominal current levels ranging from 0.1 to 10 A
- ✓ Compact design
- ✓ The integrated switching function enables immediate reclosure and therefore ensures the availability of the system



### Key commercial data

Packing unit	1
Minimum order quantity	20
Catalog page	Page 197 (TT-2011)
GTIN	 4 017918 848422
Custom tariff number	85362010
Country of origin	INDONESIA

### Technical data

#### General

Installation instructions	When mounted in rows, the nominal device current can be limited to just 80% or must be oversized accordingly.
Degree of protection	IP40 (Actuation area)
Mounting type	On base element
Color	black
Number of positions	1
Surge voltage category	II
Insulating material	PPS
Inflammability class according to UL 94	V0

#### Dimensions

# Thermal device circuit breaker - TCP 0.25A - 0712123

## Technical data

### Dimensions

Height	24.4 mm
Width	8.2 mm
Depth	44.5 mm
Complete module height	64 mm
Complete module width	8.2 mm
Complete module depth	88.5 mm

### Technical data

Fuse	Slow-blow
Fuse type	Automatic device
Rated surge voltage	2.5 kV
Rated voltage	250 V AC
Rated voltage	65 V DC
Rated voltage	250 V ()
Rated voltage	72 V ()
Rated current $I_n$	0.25 A
Insulation resistance $R_{iso}$ :	> 100 M $\Omega$ (500 V DC)
Rated short-circuit switching capacity $I_{cn}$	1.5 A (250 V AC / 65 V DC)
Rated short-circuit switching capacity $I_{cn}$	6.25 A (30 V DC)
Short-circuit switching capacity $I_k$	2000 A 250 V AC / UL 1077
Short-circuit switching capacity $I_k$	2000 A 72 V DC / UL 1077
Dielectric strength	3000 V AC (Actuation area)
Dielectric strength	1500 V AC (Installation area)
Cycles, max.	6000 (At 1 x $I_n$ , low-induction)
Cycles, max.	3000 (At 1 x $I_n$ , inductive)
Cycles, max.	500 (At 2 x $I_n$ , inductive)
Pollution degree	2
Surge voltage category	II
Insulating material group	IIIb
Ambient temperature (operation)	-20 °C ... 60 °C

### Standards

Standard - Electrical safety	EN 60934
------------------------------	----------

## Classifications

### ETIM

ETIM 2.0	EC000899
ETIM 3.0	EC000899
ETIM 4.0	EC000899
ETIM 5.0	EC000899

# Thermal device circuit breaker - TCP 0.25A - 0712123

## Classifications

### UNSPSC

UNSPSC 11	39121411
UNSPSC 12.01	39121411
UNSPSC 13.2	39121411
UNSPSC 6.01	30211812
UNSPSC 7.0901	39121411

### eCl@ss

eCl@ss 4.0	27141116
eCl@ss 4.1	27141116
eCl@ss 5.0	27141116
eCl@ss 5.1	27141116
eCl@ss 6.0	27141116
eCl@ss 7.0	27141116

## Approvals

### Approvals


#### Approvals

CSA / UL Recognized / VDE Zeichengenehmigung / cUL Recognized / GOST / cULus Recognized

#### Ex Approvals

#### Approvals submitted


### Approval details

CSA 	
Nominal current I <sub>N</sub>	0.25 A
Nominal voltage U <sub>N</sub>	250 V

UL Recognized 
---

## Thermal device circuit breaker - TCP 0.25A - 0712123

### Approvals

VDE Zeichengenehmigung 

cUL Recognized 

GOST 

cULus Recognized 

### Accessories

#### Accessories

#### Marking

Flat zack marker sheet - ZBFM 5/WH:UNBEDRUCKT - 0803595



Flat zack marker sheet, Sheet, white, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into flat marker groove, For terminal block width: 5.2 mm, Lettering field: 5 x 4.5 mm

Flat zack marker sheet - ZBFM 5/OG:UNBEDRUCKT - 0807180



Flat zack marker sheet, Sheet, orange, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into flat marker groove, For terminal block width: 5.2 mm, Lettering field: 5 x 4.5 mm

### Additional products

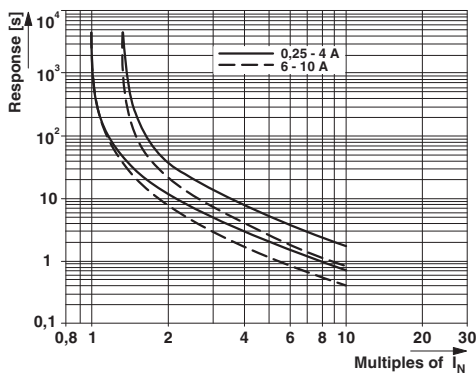
Fuse modular terminal block - UK 6-FSI/C - 3118203



Flat-type fuse terminal block, cross section: 0.2 - 6 mm², AWG: 26 - 8, width: 8.2 mm, color: black

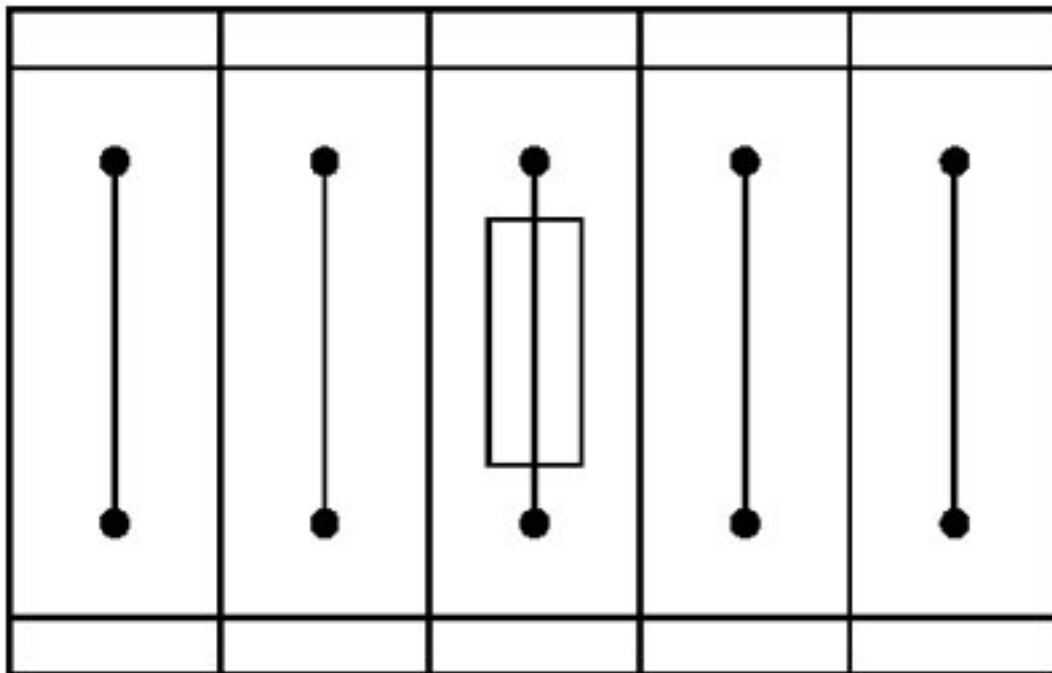
## Thermal device circuit breaker - TCP 0.25A - 0712123

Diagram



Trigger characteristic

Application drawing



Fuse terminal block in single arrangement,  
block consisting of one fuse terminal block and 4 feed-through terminal  
blocks



IS-50NX-C2

## dc blocked protector

Flange mounted, dc block, single transmitter coaxial lightning protection for 125 MHz to 1 GHz with N female connectors

Specifications for PolyPhaser IS-50NX-C2

### Mount Type

Flange

### Frequency Range

125 MHz to 1 GHz

### Protected Side Connector

N Female

### Surge Side Connector

N Female

### Turn On Voltage

600 Vdc  $\pm$  20 %

### VSWR

$\leq 1.1:1$  125 MHz to 1 GHz

### Insertion Loss

$\leq 0.1$  dB

### RF Power

125 to 220 MHz @ 375 W, 220 to 700 MHz @ 125 W, 700 to 1000 MHz @ 50 W

# PB251-CM Series

220-330 WATTS DC UPS

## FEATURES

- Chassis Mount
- Ultra-low noise output
- Independent battery charging output
- DC output OK & battery OK alarms & LEDs
- Battery-LVD and alarm
- Over-temperature protection
- Battery fuse fail LED



## SPECIFICATIONS

INPUT	
Voltage:	190 to 264 vac, or 225 to 400Vdc
Line regulation:	0.2%typical
Current:	1.4A maximum
Inrush current:	10A maximum
Frequency:	45 to 65 Hz

OUTPUT	
Voltage	See table
Current	See table
Load regulation	0.5%typical
Current limit type - load cct	Constant current
Current limit type - batt. cct	Constant current
Short circuit protection	Indefinite, auto-resetting
Over-voltage protection	17.5 to 20V latching (13.8Vdc output)
Ripple & noise	28mVp-p (13.8Vdc output)
100 MHz bandwidth	55mVp-p (27.6Vdc output)

ENVIRONMENTAL	
Operating temperature	0 to 70°C ambient with derating, 5 to 90% relative humidity (non-condensing)
Over-temperature protection	Automatic & auto-resetting
Cooling requirement	Natural convection
Efficiency	80% minimum

## STANDARDS & APPROVALS

Safety	Complies with AS/NZS 60950, class 1, NSW Office of Fair Trading Approval N20602
EMC	Emissions comply with AS/NZS CISPR11, Group 1, Class B. Complies with ACA EMC Scheme, Safety & EMC Regulatory Compliance Marked
Isolation i/p-o/p i/p-ground o/p-ground	4242VDC for 1 minute 2121VDC for 1 minute 707VDC for 1 minute

## ALARMS & BATTERY FUNCTIONS

Converter ON/OK alarm	Indicated by voltage-free changeover relay contacts & green LED: ON=OK
green LED	ON=PSU OK
Battery low (& fuse) alarm	Alarm voltage 11V. Adjustable 10.2-12.6V contact Sales Office. Indicated by voltage-free changeover relay contacts & green LED: ON=BATT OK
Low voltage disconnect	9.6 to 12V adjustable Contact Sales office.
Charger over-load protection	Auto-resetting electronic circuit breaker
Reverse polarity protection	Internal battery fuse
Battery to load voltage drop	0.2 to 0.25V typical

## MECHANICAL

Case size	264 L x 172 W x 67 H mm
Case size with heatsink	264 L x 186 W x 67 H mm
Rack mount option	Refer to PB251-RM Series

## SELECTION TABLE

MODEL NUMBER	VDC	ILOAD	IBATT	OUTPUT POWER
PB251-12CM	13.8V	16A*	2A	220W
PB251-12CM-H	13.8V	20A*	4A	275W

**NOTE:** Non standard battery charging current available on request. ie PB251-12CM-H-10 for 10A.

\* Sum of load + battery charging current.



# PBIH Series

## 15-150 WATTS DC/DC SINGLE OUTPUT

### DC-DC CONVERTERS

#### FEATURES

- Wide selection of models
- 4 input voltage ranges
- High efficiency
- Low output ripple
- Proven reliability
- Good thermal margins

#### SPECIFICATIONS

INPUT	
Input voltage	12VDC (9.2–16) 24VDC (19–32) 48VDC (38–63) 110VDC (85–140)
Inrush current	20A max. for 110V only
OUTPUT	
Output voltage	See table
Voltage adjustment	±10%, ±5% for PBIH-F
Output current	See table
Ripple & noise	Output Volts x 1% + 50mV to -100mV pk-pk
Line regulation	0.8% over input range
Load regulation	0.9%, 0%–100% load
Temperature coefficient	0°C to 50°C, 0.03% per °C
Overvoltage protection	O.V. clamp, PBIH-F Output shutdown, PBIH-G, J, M, R – input must be switched off for at least 30S to reactivate
Overcurrent protection	Fold back – PBIH-F Current limiting, PBIH-G, J, M, R (PBIH-R series is adjustable); PBIH110xxR models are not adjustable
Drift	Output V x 0.5% + 15(mV) per 8 hrs after 1 hr warm-up
Rise Time	200ms max. – PBIH-F, M, R 100ms max. – PBIH-G, J (at 25°C)
Holdup time	10ms (only 110V input)
Remote sense	PBIH-R Series only



OPERATING	
Efficiency	70%–89%
Safety isolation (1 minute)	Type – 12, 24, 48V input Input – Output: 1500VAC Input– Case: 1500VAC Output– Case: 500VAC Type– 110V input Input– Output: 2000VAC Input– Case: 2000VAC Output– Case: 500VAC
Insulation resistance	50M $\Omega$ (500VDC) Input – Case
Parallel operation	Consult sales office for details
Remote control	PBIH-R Series: Open link: output normal Short link: output off
ENVIRONMENTAL	
Operating temperature	0°C to 70°C.
Temperature derating	Derate 100% load from 50°C - 70°C at 1.5% per °C to 30% load.
Cooling	Convection cooled
Storage temperature	-20°C to +85°C
Humidity	85%
Shock	30G, PBIH-F, G and J
Vibration	(5Hz–10Hz, 10mm), (10Hz–50Hz) 2G, PBIH-F, G and J
STANDARDS AND APPROVALS	
Safety	Designed to UL1950
C-Tick	AS/NZS CISPR11 Group 1, Class A
MECHANICAL	
Weight	PBIH-F : 250g PBIH-G : 380g PBIH-J : 410g PBIH-M : 800g PBIH-R : 1.4kg

# PBIH Series

15-150 WATTS DC/DC SINGLE OUTPUT

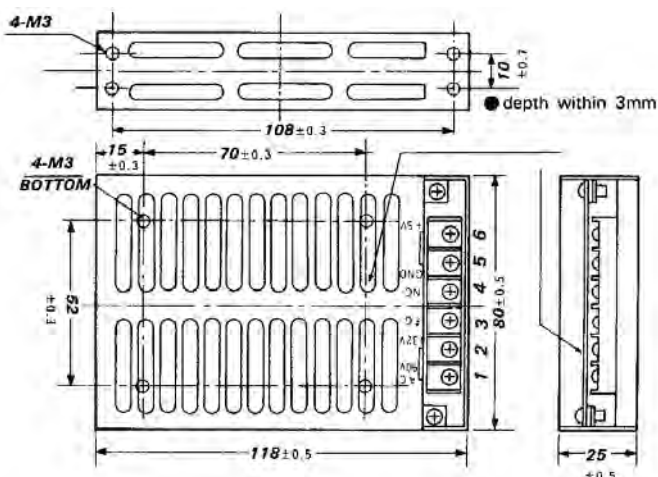
## SELECTION TABLE

MODEL NUMBER	INPUT	OUTPUT	OUTPUT POWER
PBIH-1205F	9.2-16V	5V 3A	15W
PBIH-1212F	9.2-16V	12V 1.2A	15W
PBIH-1215F	9.2-16V	15V 1A	15W
PBIH-1224F	9.2-16V	24V 0.62A	15W
PBIH-2405F	19-32V	5V 3A	15W
PBIH-2412F	19-32V	12V 1.2A	15W
PBIH-2415F	19-32V	15V 1A	15W
PBIH-2424F	19-32V	24V 0.62A	15W
PBIH-4805F	38-63V	5V 3A	15W
PBIH-4812F	38-63V	12V 1.2A	15W
PBIH-4815F	38-63V	15V 1A	15W
PBIH-4824F	38-63V	24V 0.62A	15W
PBIH-11005F	85-140V	5V 3A	15W
PBIH-11012F	85-140V	12V 1.2A	15W
PBIH-11015F	85-140V	15V 1A	15W
PBIH-11024F	85-140V	24V 0.62A	15W
PBIH-1205G	9.2-16V	5V 5A	25W
PBIH-1212G	9.2-16V	12V 2.1A	25W
PBIH-1215G	9.2-16V	15V 1.7A	25W
PBIH-1224G	9.2-16V	24V 1.1A	25W
PBIH-1248G	9.2-16V	48V 0.5A	25W
PBIH-2405G	19-32V	5V 5A	25W
PBIH-2412G	19-32V	12V 2.1A	25W
PBIH-2415G	19-32V	15V 1.7A	25W
PBIH-2424G	19-32V	24V 1.1A	25W
PBIH-2448G	19-32V	48V 0.5A	25W
PBIH-4805G	38-63V	5V 5A	25W
PBIH-4812G	38-63V	12V 2.1A	25W
PBIH-4815G	38-63V	15V 1.7A	25W
PBIH-4824G	38-63V	24V 1.1A	25W
PBIH-4848G	38-63V	48V 0.5A	25W
PBIH-11005G	85-140V	5V 5A	25W

MODEL NUMBER	INPUT	OUTPUT	OUTPUT POWER
PBIH-11012G	85-140V	12V 2.1A	25W
PBIH-11015G	85-140V	15V 1.7A	25W
PBIH-11024G	85-140V	24V 1.1A	25W
PBIH-11048G	85-140V	48V 0.5A	25W
PBIH-1205J	9.2-16V	5V 8A	40W
PBIH-1212J	9.2-16V	12V 3.3A	40W
PBIH-1215J	9.2-16V	15V 2.7A	40W
PBIH-1224J	9.2-16V	24V 1.7A	40W
PBIH-1248J	9.2-16V	48V 0.8A	40W
PBIH-2405J	19-32V	5V 10A	50W
PBIH-2412J	19-32V	12V 4.3A	50W
PBIH-2415J	19-32V	15V 3.4A	50W
PBIH-2424J	19-32V	24V 2.5A	50W
PBIH-2448J	19-32V	48V 1A	50W
PBIH-4805J	38-63V	5V 10A	50W
PBIH-4812J	38-63V	12V 4.3A	50W
PBIH-4815J	38-63V	15V 3.4A	50W
PBIH-4824J	38-63V	24V 2.5A	50W
PBIH-4848J	38-63V	48V 1A	50W
PBIH-11005J	85-140V	5V 10A	50W
PBIH-11012J	85-140V	12V 4.3A	50W
PBIH-11015J	85-140V	15V 3.4A	50W
PBIH-11024J	85-140V	24V 2.5A	50W
PBIH-11048J	85-140V	48V 1A	50W
PBIH-1205M	9.2-16V	5V 18A	100W
PBIH-1212M	9.2-16V	12V 9A	100W
PBIH-1215M	9.2-16V	15V 7A	100W
PBIH-1224M	9.2-16V	24V 4.5A	100W
PBIH-1248M	9.2-16V	48V 2A	100W
PBIH-2405M	19-32V	5V 20A	100W
PBIH-2412M	19-32V	12V 9A	100W
PBIH-2415M	19-32V	15V 7A	100W

MODEL NUMBER	INPUT	OUTPUT	OUTPUT POWER
PBIH-2424M	19-32V	24V 5A	100W
PBIH-2448M	19-32V	48V 2A	100W
PBIH-4805M	38-63V	5V 20A	100W
PBIH-4812M	38-63V	12V 9A	100W
PBIH-4815M	38-63V	15V 7A	100W
PBIH-4824M	38-63V	24V 5A	100W
PBIH-4848M	38-63V	48V 2A	100W
PBIH-11005M	85-140V	5V 20A	100W
PBIH-11012M	85-140V	12V 9A	100W
PBIH-11015M	85-140V	15V 7A	100W
PBIH-11024M	85-140V	24V 5A	100W
PBIH-11048M	85-140V	48V 2A	100W
PBIH-1205R	9.2-16V	5V 27A	150W
PBIH-1212R	9.2-16V	12V 13A	150W
PBIH-1215R	9.2-16V	15V 10A	150W
PBIH-1224R	9.2-16V	24V 6.5A	150W
PBIH-1248R	9.2-16V	48V 3.3A	150W
PBIH-2405R	19-32V	5V 30A	150W
PBIH-2412R	19-32V	12V 14A	150W
PBIH-2415R	19-32V	15V 11A	150W
PBIH-2424R	19-32V	24V 7A	150W
PBIH-2448R	19-32V	48V 3.5A	150W
PBIH-4805R	38-63V	5V 30A	150W
PBIH-4812R	38-63V	12V 14A	150W
PBIH-4815R	38-63V	15V 11A	150W
PBIH-4824R	38-63V	24V 7A	150W
PBIH-4848R	38-63V	48V 3.5A	150W
PBIH-11005R	85-140V	5V 30A	150W
PBIH-11012R	85-140V	12V 14A	150W
PBIH-11015R	85-140V	15V 11A	150W
PBIH-11024R	85-140V	24V 7A	150W
PBIH-11048R	85-140V	48V 3.5A	150W

## PBIH-F



• Dimensions in mm

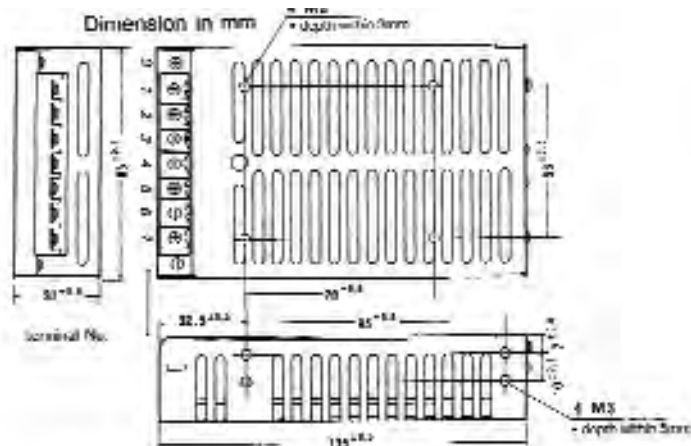
terminal No.	
1	0 V (DC in)
2	+ V (DC in)
3	FG
4	NO Connection
5	- V out
6	+ V out

# PBIH Series

15-150 WATTS SINGLE OUTPUT

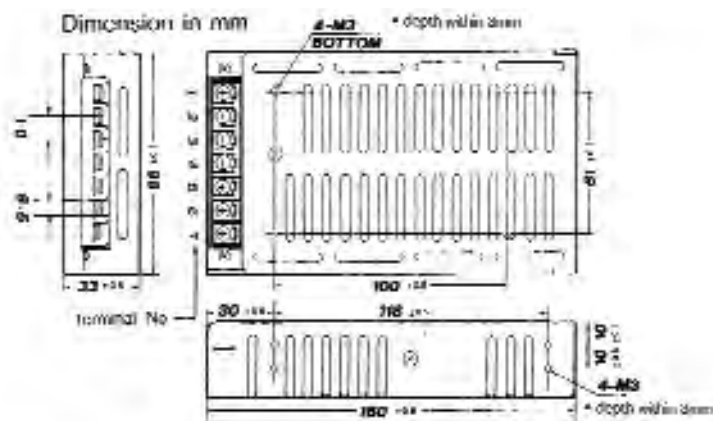
DC-DC CONVERTERS

## PBIH-G



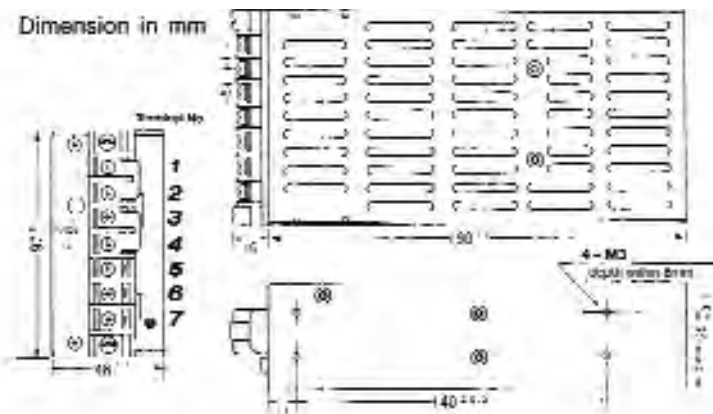
Terminal	Connection
0	FG
1	DC +V in
2	0V in
3	LFC
4	NO
5	NO
6	-V out
7	+V out

## PBIH-J



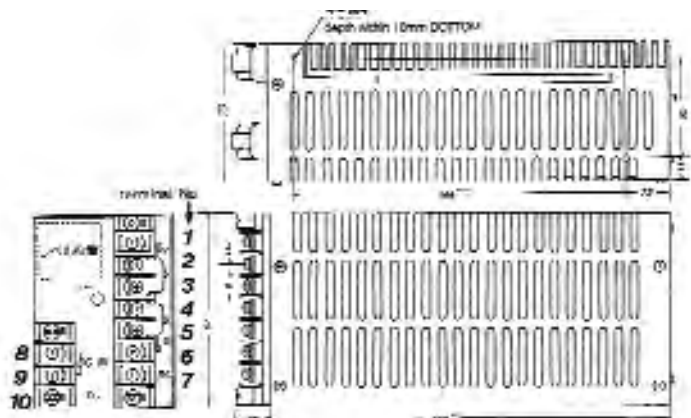
Terminal	Connection
1	FG
2	DC +V in
3	0V in
4	LFC
5	-V out
6	+V out
7	NC

## PBIH-M



Terminal	Connection
1	+V out
2	+V out
3	-V out
4	-V out
5	FG
6	-V in
7	+V in

## PBIH-R



Terminal	Connection
1, 2	+V out
3	+S
4	-S
5, 6	V out
7	Remote Control
8	DC +V in
9	DC 0V in
10	FG



## DATA SHEET

### Coax Cable Connector

**N-203HS**  
**N-201**



### Description

Straight Cable Plug Crimp

Suits Cables: LMR400 CNT400 BELDEN 9913

### Technical Data

#### Electrical

Impedance 50 Ohm  
Max Frequency 11 GHz

### Mechanical & Environmental Data

Centre contact	Crimp
Outer Contact	Crimp
Mating	5/8" - 24 threaded coupling
Durability	500 matings
Coupling nut retention	100lbs Max
Cable Retention	40 lbs min
Temperature Range	-65° to 165° C
Vibration	MIL-STD-202 Test Cond B
Salt Spray	MIL-STD-101 Test Cond B
Thermal Shock	MIL-STD-107 Test Cond B

### Material Data

Parts	Material	Plating	
		N-203HS	N-201
Connector Body	Brass	Silver	White Bronze
Centre contact	Brass	Gold	Gold
Insulation	Teflon	-	-
Gasket	Silicone Rubber	-	-
Crimp Ferrule	Annealed Copper	Silver	White Bronze

PC-40591-16

## MODEL G306A - GRAPHIC COLOR LCD OPERATOR INTERFACE TERMINAL WITH TFT QVGA DISPLAY AND TOUCHSCREEN



FOR USE IN HAZARDOUS LOCATIONS:  
 Class I, Division 2, Groups A, B, C, and D

- CONFIGURED USING CRIMSON® SOFTWARE (BUILD 424 OR NEWER)
- UP TO 5 RS-232/422/485 COMMUNICATIONS PORTS (2 RS-232 AND 1 RS-422/485 ON BOARD, 1 RS-232 AND 1 RS-422/485 ON OPTIONAL COMMUNICATIONS CARD)
- 10 BASE T/100 BASE-TX ETHERNET PORT TO NETWORK UNITS AND HOST WEB PAGES
- USB PORT TO DOWNLOAD THE UNIT'S CONFIGURATION FROM A PC OR FOR DATA TRANSFERS TO A PC
- UNIT'S CONFIGURATION IS STORED IN NON-VOLATILE MEMORY (8 MBYTE FLASH)
- COMPACTFLASH® SOCKET TO INCREASE MEMORY CAPACITY
- 5.7-INCH TFT ACTIVE MATRIX 256 COLOR QVGA 320 X 240 PIXEL LCD W/LED BACKLIGHT
- 5-BUTTON KEYPAD FOR ON-SCREEN MENUS
- THREE FRONT PANEL LED INDICATORS
- POWER UNIT FROM 24 VDC  $\pm 20\%$  SUPPLY
- RESISTIVE ANALOG TOUCHSCREEN

### GENERAL DESCRIPTION

The G306A Operator Interface Terminal combines unique capabilities normally expected from high-end units with a very affordable price. It is built around a high performance core with integrated functionality. This core allows the G306A to perform many of the normal features of the Paradigm range of Operator Interfaces while improving and adding new features.

The G306A is able to communicate with many different types of hardware using high-speed RS232/422/485 communications ports and Ethernet 10 Base T/100 Base-TX communications. In addition, the G306A features USB for fast downloads of configuration files and access to trending and data logging. A CompactFlash socket is provided so that Flash cards can be used to collect your trending and data logging information as well as to store larger configuration files.

In addition to accessing and controlling of external resources, the G306A allows a user to easily view and enter information. Users can enter data through the touchscreen and/or front panel 5-button keypad.

### SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the controller to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the controller.



The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.



**WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2**



**CAUTION: Risk Of Danger.**  
 Read complete instructions prior to installation and operation of the unit.



**CAUTION: Risk of electric shock.**

### CONTENTS OF PACKAGE

- G306A Operator Interface.
- Panel gasket.
- Template for panel cutout.
- Hardware packet for mounting unit into panel.
- Terminal block for connecting power.

### ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
<b>G306A</b>	Operator Interface for indoor applications, textured finish with embossed keys	G306A000
G3CF	CompactFlash Card <sup>5</sup>	G3CFxxxx
G3RS	RS232/485 Optional Communication Card	G3RS0000
G3CN	CANopen Optional Communication Card	G3CN0000
G3DN	DeviceNet option card for G3 operator interfaces with isolated high speed communications ports	G3DN0000
G3PBDP	Profibus DP Optional Communication Card	G3PBDP00
PSDR7	DIN Rail Power Supply	PSDR7000
SFCRM2	Crimson 2.0 <sup>2</sup>	SFCRM200
CBL	RS-232 Programming Cable	CBLPROG0
	USB Cable	CBLUSB00
	Communications Cables <sup>1</sup>	CBLxxxxx
DR	DIN Rail Mountable Adapter Products <sup>3</sup>	DRxxxxxx
	Replacement Battery <sup>4</sup>	BNL20000
G3FILM	Protective Films	G3FILM06

<sup>1</sup> Contact your Red Lion distributor or visit our website for complete selection.

<sup>2</sup> Use this part number to purchase the Crimson® software on CD with a printed manual, USB cable, and RS-232 cable. Otherwise, download for free from www.redlion.net.

<sup>3</sup> Red Lion offers RJ modular jack adapters. Refer to the DR literature for complete details.

<sup>4</sup> Battery type is lithium coin type CR2025.

<sup>5</sup> Industrial grade two million write cycles.

CompactFlash is a registered trademark of CompactFlash Association.

# SPECIFICATIONS

## 1. POWER REQUIREMENTS:

Must use a Class 2 circuit according to National Electrical Code (NEC), NFPA-70 or Canadian Electrical Code (CEC), Part I, C22.1 or a Limited Power Supply (LPS) according to IEC 60950-1 or Limited-energy circuit according to IEC 61010-1.

Power connection via removable three position terminal block.

Supply Voltage: +24 VDC  $\pm 20\%$

Typical Power<sup>1</sup>: 8 W

Maximum Power<sup>2</sup>: 10 W

Notes:

1. Typical power with +24 VDC, RS232/485 communications, Ethernet communications, CompactFlash card installed, and display at full brightness.
2. Maximum power indicates the most power that can be drawn from the G306A. Refer to "Power Supply Requirements" under "Installing and Powering the G306A."
3. The G306A's circuit common is not connected to the enclosure of the unit. See "Connecting to Earth Ground" in the section "Installing and Powering the G306A."
4. Read "Power Supply Requirements" in the section "Installing and Powering the G306A" for additional power supply information.

## 2. BATTERY: Lithium coin cell. Typical lifetime of 10 years.

## 3. LCD DISPLAY:

SIZE	5.7-inch
TYPE	TFT
COLORS	256
PIXELS	320 X 240
BRIGHTNESS	380 cd/m <sup>2</sup>
BACKLIGHT*	50,000 HR TYP.

\*Lifetime at room temperature. Refer to "Display" in "Software/Unit Operation"

## 4. 5-KEY KEYPAD: for on-screen menus.

## 5. TOUCHSCREEN: Resistive analog

## 6. MEMORY:

**On Board User Memory:** 8 Mbyte of non-volatile Flash memory.

**Memory Card:** CompactFlash Type II slot for Type I and Type II CompactFlash cards.

## 7. COMMUNICATIONS:

**USB Port:** Adheres to USB specification 1.1. Device only using Type B connection.



**WARNING - DO NOT CONNECT OR DISCONNECT CABLES WHILE POWER IS APPLIED UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS. USB PORT IS FOR SYSTEM SET-UP AND DIAGNOSTICS AND IS NOT INTENDED FOR PERMANENT CONNECTION.**

**Serial Ports:** Format and Baud Rates for each port are individually software programmable up to 115,200 baud.

PGM Port: RS232 port via RJ12.

COMMS Ports: RS422/485 port via RJ45, and RS232 port via RJ12.

DH485 TXEN: Transmit enable; open collector,  $V_{OH} = 15$  VDC,

$V_{OL} = 0.5$  V @ 25 mA max.

Note: For additional information on the communications or signal common and connections to earth ground please see the "Connecting to Earth Ground" in the section "Installing and Powering the G306A."

**Ethernet Port:** 10 BASE-T / 100 BASE-TX

RJ45 jack is wired as a NIC (Network Interface Card).

Isolation from Ethernet network to G3 operator interface: 1500 Vrms

## 8. ENVIRONMENTAL CONDITIONS:

**Operating Temperature Range:** 0 to 50°C

**Storage Temperature Range:** -20 to 70°C

**Operating and Storage Humidity:** 80% maximum relative humidity (non-condensing) from 0 to 50°C.

**Vibration according to IEC 68-2-6:** Operational 5 to 8 Hz, 0.8" (p-p), 8 to 500 Hz, in X, Y, Z direction, duration: 1 hour, 3 g.

**Shock according to IEC 68-2-27:** Operational 40 g, 9 msec in 3 directions.

**Altitude:** Up to 2000 meters.

## 9. CERTIFICATIONS AND COMPLIANCES:

### SAFETY

UL Listed, File #E245515, UL61010-1, ANSI/ISA 12.12.01-2007, CAN/CSA 22.2 No. 61010.1, CSA 22.2 No. 213-M1987 and File #E179259, UL61010-1, CAN/CSA 22.2 No.61010-1

LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards

Type 4X Indoor Enclosure rating (Face only), UL50

IECEE CB Scheme Test Report #E179259-A1-CB-3

Issued by Underwriters Laboratories Inc.

IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.

IP66 Enclosure rating (Face only), IEC 529

### ELECTROMAGNETIC COMPATIBILITY

Emissions and Immunity to EN 61326: 2006: Electrical Equipment for Measurement, Control and Laboratory use.

### Immunity to Industrial Locations:

Electrostatic discharge	EN61000-4-2	Criterion A 4kV contact discharge 8kV air discharge
Electromagnetic RF fields	EN61000-4-3	Criterion A 10V/m (80 MHz to 1 GHz) 3 V/m (1.4 GHz to 2 GHz) 1 V/m (2 GHz to 2.7 GHz)
Fast transients (burst)	EN61000-4-4	Criterion A 2kV power 1kV I/O signal
Surge	EN61000-4-5	Criterion A 1kV L to L 2kV L to G power 1 kV signal
RF conducted interference	EN61000-4-6	Criterion A 3Vrms
Power frequency magnetic fields	EN61000-4-8	Criterion A 30A/m

### Emissions:

Emissions	EN55011	Class A
-----------	---------	---------

Note:

1. Criterion A: Normal operation within specified limits.

## 10. CONNECTIONS: Compression cage-clamp terminal block.

Wire Gauge: 12-30 AWG copper wire

Torque: 5-7 inch-pounds (56-79 N-cm)

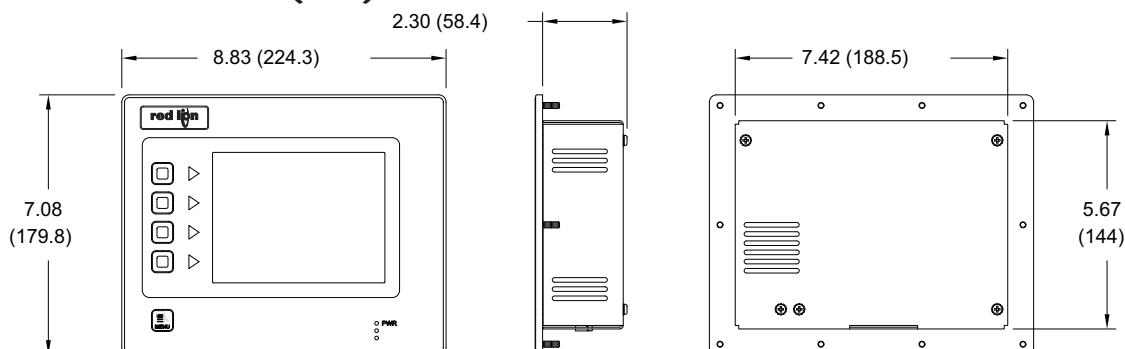
## 11. CONSTRUCTION: Steel rear metal enclosure with NEMA 4X/IP66 aluminum front plate for indoor use only when correctly fitted with the gasket provided. Installation Category II, Pollution Degree 2.

## 12. MOUNTING REQUIREMENTS: Maximum panel thickness is 0.25" (6.3 mm). For NEMA 4X/IP66 sealing, a steel panel with a minimum thickness of 0.125" (3.17 mm) is recommended.

**Maximum Mounting Stud Torque:** 17 inch-pounds (1.92 N-m)

## 13. WEIGHT: 3.0 lbs (1.36 Kg)

## DIMENSIONS In inches (mm)

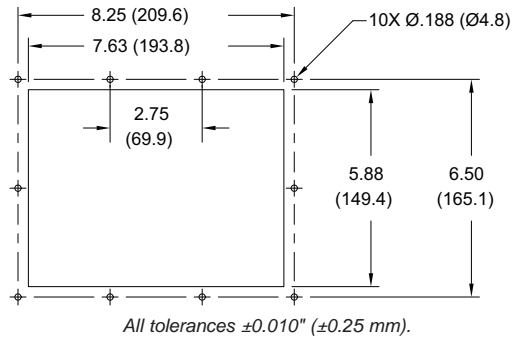


# INSTALLING AND POWERING THE G306A

## MOUNTING INSTRUCTIONS

This operator interface is designed for through-panel mounting. A panel cut-out diagram and a template are provided. Care should be taken to remove any loose material from the mounting cut-out to prevent that material from falling into the operator interface during installation. A gasket is provided to enable sealing to NEMA 4X/IP66 specification. Install the ten kee nuts provided and tighten evenly for uniform gasket compression.

*Note: Tightening the kee nuts beyond a maximum of 17 inch-pounds (1.92 N-m) may cause damage to the front panel.*



ALL NONINCENDIVE CIRCUITS MUST BE WIRED USING DIVISION 2 WIRING METHODS AS SPECIFIED IN ARTICLE 501-4 (b), 502-4 (b), AND 503-3 (b) OF THE NATIONAL ELECTRICAL CODE, NFPA 70 FOR INSTALLATION WITHIN THE UNITED STATES, OR AS SPECIFIED IN SECTION 19-152 OF CANADIAN ELECTRICAL CODE FOR INSTALLATION IN CANADA.

## CONNECTING TO EARTH GROUND



The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

Each G306A has a chassis ground terminal on the back of the unit. Your unit should be connected to earth ground (protective earth).

The chassis ground is not connected to signal common of the unit. Maintaining isolation between earth ground and signal common is not required to operate your unit. But, other equipment connected to this unit may require isolation between signal common and earth ground. *To maintain isolation between signal common and earth ground care must be taken when connections are made to the unit.* For example, a power supply with isolation between its signal common and earth ground must be used. Also, plugging in a USB cable may connect signal common and earth ground.<sup>1</sup>

<sup>1</sup> USB's shield may be connected to earth ground at the host. USB's shield in turn may also be connected to signal common.

## POWER SUPPLY REQUIREMENTS

The G306A requires a 24 VDC power supply. Your unit may draw considerably less than the maximum rated power depending upon the options being used. As additional features are used your unit will draw increasing amounts of power. Items that could cause increases in current are additional communications, optional communications card, CompactFlash card, and other features programmed through Crimson.

In any case, it is very important that the power supply is mounted correctly if the unit is to operate reliably. Please take care to observe the following points:

- The power supply must be mounted close to the unit, with usually not more than 6 feet (1.8 m) of cable between the supply and the operator interface. Ideally, the shortest length possible should be used.
- The wire used to connect the operator interface's power supply should be at least 22-gage wire. If a longer cable run is used, a heavier gage wire should be used. The routing of the cable should be kept away from large contactors, inverters, and other devices which may generate significant electrical noise.
- A power supply with an NEC Class 2 or Limited Power Source (LPS) and SELV rating is to be used. This type of power supply provides isolation to accessible circuits from hazardous voltage levels generated by a mains power supply due to single faults. SELV is an acronym for "safety extra-low voltage." Safety extra-low voltage circuits shall exhibit voltages safe to touch both under normal operating conditions and after a single fault, such as a breakdown of a layer of basic insulation or after the failure of a single component has occurred.

# INSTALLING AN OPTION CARD



**WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN DISCONNECTED AND THE AREA IS KNOWN TO BE NON-HAZARDOUS.**

Each option card comes with a cable for communications and three screws for attaching the option card to the G306's rear cover. To install the option card, remove all power and I/O communications cables from the unit. Use the three screws provided to mount the option card to the rear cover of the G306 as shown in Figure 1.

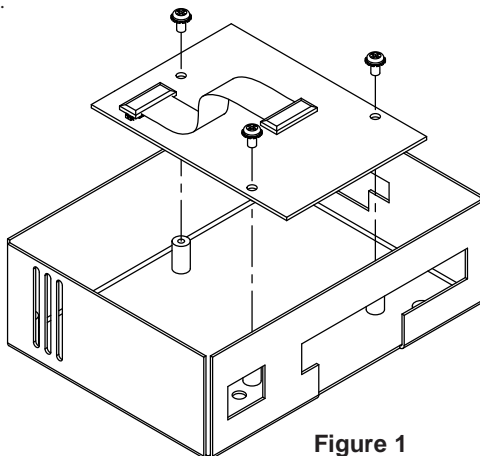


Figure 1

Connect the cable from the option card to CN11 on the main board of the G306 as shown in Figure 2. Be sure both ends of the cable are firmly seated into their appropriate connector housing. Carefully replace the rear cover by reversing the instructions for removing the rear cover.

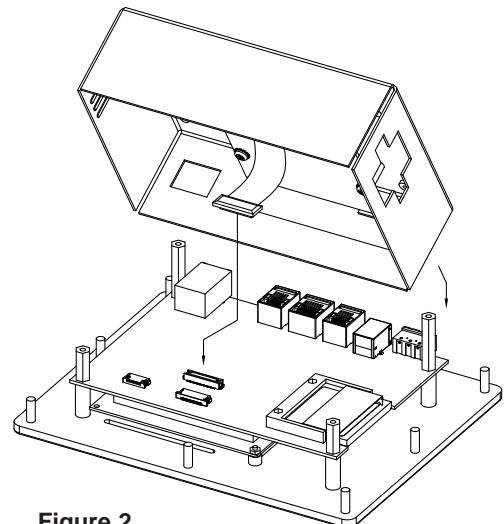


Figure 2

# COMMUNICATING WITH THE G306A

## CONFIGURING A G306A

The G306A is configured using Crimson® software. Crimson is available as a free download from Red Lion's website, or it can be purchased on CD. Updates to Crimson for new features and drivers are posted on the website as they become available. By configuring the G306A using the latest version of Crimson, you are assured that your unit has the most up to date feature set. Crimson® software can configure the G306A through the RS232 PGM port, USB port, or CompactFlash.

The USB port is connected using a standard USB cable with a Type B connector. The driver needed to use the USB port will be installed with Crimson.

The RS232 PGM port uses a programming cable made by Red Lion to connect to the DB9 COM port of your computer. If you choose to make your own cable, use the "G306A Port Pin Out Diagram" for wiring information.

The CompactFlash can be used to program a G3 by placing a configuration file and firmware on the CompactFlash card. The card is then inserted into the target G3 and powered. Refer to the Crimson literature for more information on the proper names and locations of the files.

## USB, DATA TRANSFERS FROM THE COMPACTFLASH CARD



**WARNING - DO NOT CONNECT OR DISCONNECT CABLES WHILE POWER IS APPLIED UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS. USB PORT IS FOR SYSTEM SET-UP AND DIAGNOSTICS AND IS NOT INTENDED FOR PERMANENT CONNECTION.**

In order to transfer data from the CompactFlash card via the USB port, a driver must be installed on your computer. This driver is installed with Crimson and is located in the folder C:\Program Files\Red Lion Controls\Crimson 2.0\Device\ after Crimson is installed. This may have already been accomplished if your G306A was configured using the USB port.

Once the driver is installed, connect the G306A to your PC with a USB cable, and follow "Mounting the CompactFlash" instructions in the Crimson 2 user manual.

## CABLES AND DRIVERS

Red Lion has a wide range of cables and drivers for use with many different communication types. A list of these drivers and cables along with pin outs is available from Red Lion's website. New cables and drivers are added on a regular basis. If making your own cable, refer to the "G306A Port Pin Outs" for wiring information.

## ETHERNET COMMUNICATIONS

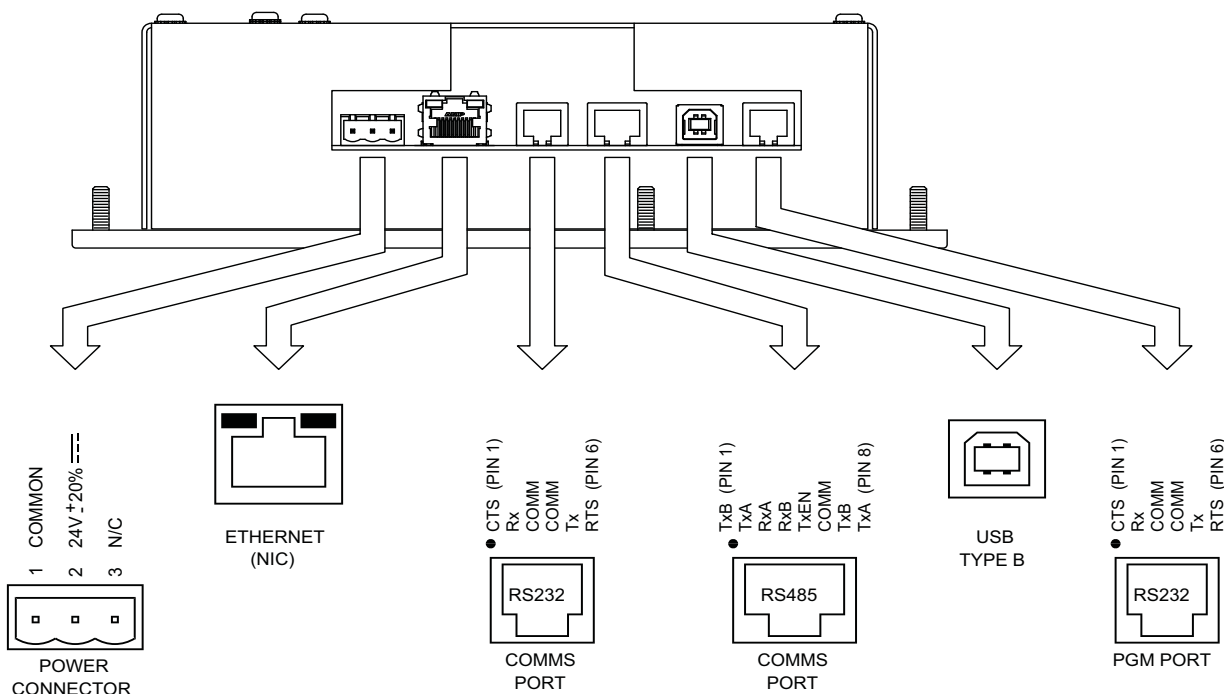
Ethernet communications can be established at either 10 BASE-T or 100 BASE-TX. The G306A unit's RJ45 jack is wired as a NIC (Network Interface Card). For example, when wiring to a hub or switch use a straight-through cable, but when connecting to another NIC use a crossover cable.

The Ethernet connector contains two LEDs. A yellow LED in the upper right, and a bi-color green/amber LED in the upper left. The LEDs represent the following statuses:

LED COLOR	DESCRIPTION
YELLOW solid	Link established.
YELLOW flashing	Data being transferred.
GREEN	10 BASE-T Communications
AMBER	100 BASE-TX Communications

On the rear of each unit is a unique 12-digit MAC address and a block for marking the unit with an IP address. Refer to the Crimson manual and Red Lion's website for additional information on Ethernet communications.

**G306A PORT PIN OUTS**



## RS232 PORTS

The G306A has two RS232 ports. There is the PGM port and the COMMS port. Although only one of these ports can be used for programming, both ports can be used for communications with a PLC.

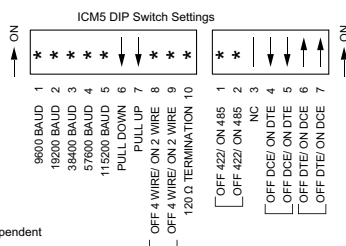
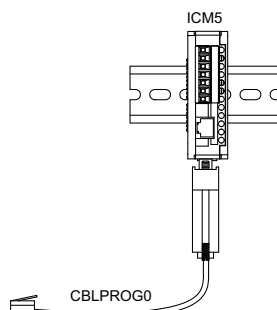
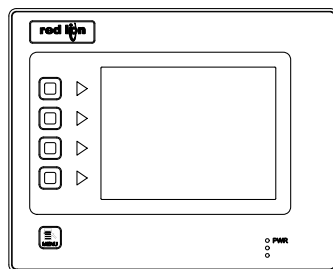
The RS232 ports can be used for either master or slave protocols with any G306A configuration.

Examples of RS232 communications could involve another Red Lion product or a PC. By using a cable with RJ12 ends on it, and a twist in the cable, RS232 communications with another G3 product or the Modular Controller can be established. Red Lion part numbers for cables with a twist in them are CBLPROG0<sup>1</sup>, CBLRLC01<sup>2</sup>, or CBLRC02<sup>3</sup>.

### G3 RS232 to a PC

Connections			
G3: RJ12	Name	PC: DB9	Name
4	COMM	1	DCD
5	Tx	2	Rx
2	Rx	3	Tx
	N/C	4	DTR
3	COM	5	GND
	N/C	6	DSR
1	CTS	7	RTS
6	RTS	8	CTS
	N/C	9	RI

CONNECTING A G306A OPERATOR INTERFACE TO AN ICM5



<sup>1</sup> CBLPROG0 can also be used to communicate with either a PC or an ICM5.

<sup>2</sup> DB9 adapter not included, 1 foot long.

<sup>3</sup> DB9 adapter not included, 10 feet long.

## Examples of RS485 2-Wire Connections

### G3 to Red Lion RJ11 (CBLRLC00) DLC, IAMS, ITMS, PAXCDC4C

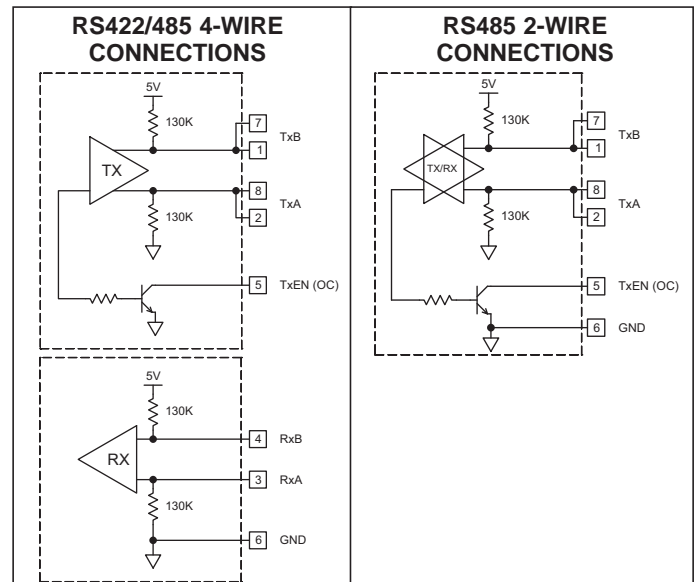
Connections			
G3: RJ45	Name	RLC: RJ11	Name
5	TxEN	2	TxEN
6	COM	3	COM
1	TxB	5	B-
2	TxA	4	A+

### G3 to Modular Controller (CBLRLC05)

Connections			
G3	Name	Modular Controller	Name
1,4	TxB	1,4	TxB
4,1	RxB	4,1	RxB
2,3	TxA	2,3	TxA
3,2	RxA	3,2	RxA
5	TxEN	5	TxEN
6	COM	6	COM
7	TxB	7	TxB
8	TxA	8	TxA

## RS422/485 COMMS PORT

The G306A has one RS422/485 port. This port can be configured to act as either RS422 or RS485.



**Note:** All Red Lion devices connect A to A and B to B, except for Paradigm devices. Refer to [www.redlion.net](http://www.redlion.net) for additional information.

## DH485 COMMUNICATIONS

The G306A's RS422/485 COMMS port can also be used for Allen Bradley DH485 communications.

**WARNING: DO NOT** use a standard DH485 cable to connect this port to Allen Bradley equipment. A cable and wiring diagram are available from Red Lion.

### G3 to AB SLC 500 (CBLAB003)

Connections			
RJ45: RLC	Name	RJ45: A-B	Name
1	TxB	1	A
2	TxA	2	B
3, 8	RxA	-	24V
4, 7	RxB	-	COMM
5	TxEN	5	TxEN
6	COMM	4	SHIELD
4, 7	TxB	-	COMM
3, 8	TxA	-	24V

# SOFTWARE/UNIT OPERATION

## CRIMSON® SOFTWARE

Crimson® software is available as a free download from Red Lion's website or it can be purchased on a CD, see "Ordering Information" for part number. The latest version of the software is always available from the website, and updating your copy is free.

## DISPLAY

This operator interface uses a liquid crystal display (LCD) for displaying text and graphics. The display utilizes an LED backlight for lighting the display. The backlight can be dimmed for low light conditions.

The LED backlight has a limited lifetime. Backlight lifetime is based upon the amount of time the display is turned on at full intensity. Turning the backlight off when the display is not in use can extend the lifetime of your backlight. This can be accomplished through the Crimson® software when configuring your unit.

## FRONT PANEL LEDs

There are three front panel LEDs. Shown below is the default status of the LEDs.

LED	INDICATION
<b>RED (TOP, LABELED "PWR")</b>	
FLASHING	Unit is in the boot loader, no valid configuration is loaded. <sup>1</sup>
STEADY	Unit is powered and running an application.
<b>YELLOW (MIDDLE)</b>	
OFF	No CompactFlash card is present.
STEADY	Valid CompactFlash card present.
FLASHING RAPIDLY	CompactFlash card being checked.
FLICKERING	Unit is writing to the CompactFlash, either because it is storing data, or because the PC connected via the USB port has locked the drive. <sup>2</sup>
FLASHING SLOWLY	Incorrectly formatted CompactFlash card present.
<b>GREEN (BOTTOM)</b>	
FLASHING	A tag is in an alarm state.
STEADY	Valid configuration is loaded and there are no alarms present.

<sup>1</sup> The operator interface is shipped without a configuration. After downloading a configuration, if the light remains in the flashing state continuously, try cycling power. If the LED still continues to flash, try downloading a configuration again.

<sup>2</sup> Do not turn off power to the unit while this light is flickering. The unit writes data in two minute intervals. Later Microsoft operating systems will not lock the drive unless they need to write data; Windows 98 may lock the drive any time it is mounted, thereby interfering with logging. Refer to "Mounting the CompactFlash" in the Crimson 2 User Manual.

## TOUCHSCREEN

This operator interface utilizes a resistive analog touchscreen for user input. The unit will only produce an audible tone (beep) when a touch on an active touchscreen cell is sensed. The touchscreen is fully functional as soon as the operator interface is initialized, and can be operated with gloved hands.

## KEYPAD

The G306A keypad consists of five keys that can be used for on-screen menus.

## TROUBLESHOOTING YOUR G306A

If for any reason you have trouble operating, connecting, or simply have questions concerning your new G306A, contact Red Lion's technical support. For contact information, refer to the back page of this bulletin for phone and fax numbers.

EMAIL: [techsupport@redlion.net](mailto:techsupport@redlion.net)

Web Site: <http://www.redlion.net>

## BATTERY & TIME KEEPING



**WARNING - EXPLOSION HAZARD - THE AREA MUST BE KNOWN TO BE NON-HAZARDOUS BEFORE SERVICING/REPLACING THE UNIT AND BEFORE INSTALLING OR REMOVING I/O WIRING AND BATTERY.**



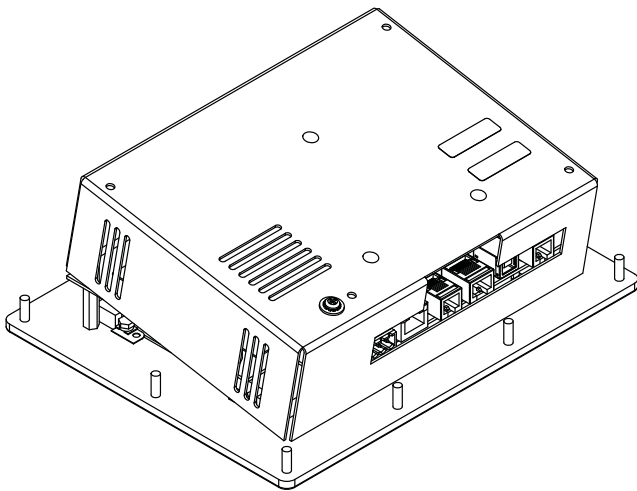
**WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN DISCONNECTED AND THE AREA IS KNOWN TO BE NON-HAZARDOUS.**

A battery is used to keep time when the unit is without power. Typical accuracy of the G306A time keeping is less than one minute per month drift. The battery of a G306A unit does not affect the unit's memory, all configurations and data is stored in non-volatile memory.



**CAUTION:** The circuit board contains static sensitive components. Before handling the operator interface without the rear cover attached, discharge static charges from your body by touching a grounded bare metal object. Ideally, handle the operator interface at a static controlled clean workstation. Also, do not touch the surface areas of the circuit board. Dirt, oil, or other contaminants may adversely affect circuit operation.

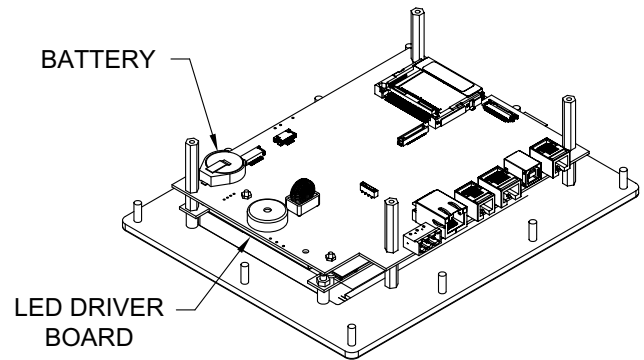
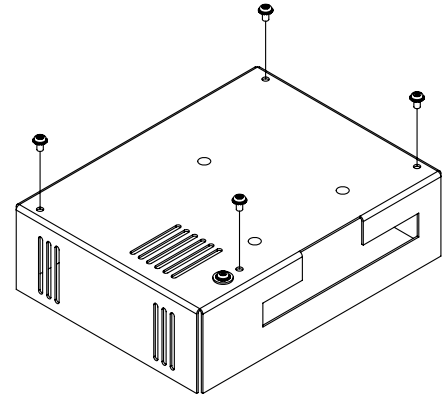
To change the battery of a G306A, remove power, cabling, and then the rear cover of the unit. To remove the cover, remove the four screws designated by the arrows on the rear of the unit. Then, by lifting the top side, hinge the cover, thus providing clearance for the connectors on the bottom side of the PCB as shown in the illustration below. Install in the reverse manner.



Remove the old battery\* from the holder and replace with the new battery. Replace the rear cover, cables, and re-apply power. Using Crimson or the unit's keypad, enter the correct time and date.

*\* Please note that the old battery must be disposed of in a manner that complies with your local waste regulations. Also, the battery must not be disposed of in fire, or in a manner whereby it may be damaged and its contents come into contact with human skin.*

*The battery used by the G306A is a lithium type CR2025.*



# OPTIONAL FEATURES AND ACCESSORIES

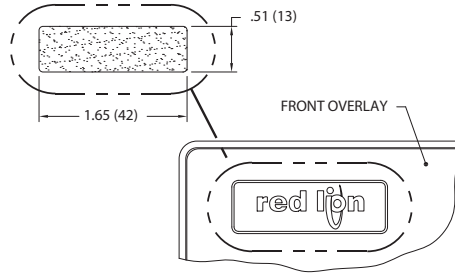
## OPTIONAL COMMUNICATION CARD

Red Lion offers optional communication cards for fieldbus communications. These communication cards will allow your G306A to communicate with many of the popular fieldbus protocols.

Red Lion is also offering a communications card for additional RS232 and RS422/485 communications. Visit Red Lion's website for information and availability of these cards.

## CUSTOM LOGO

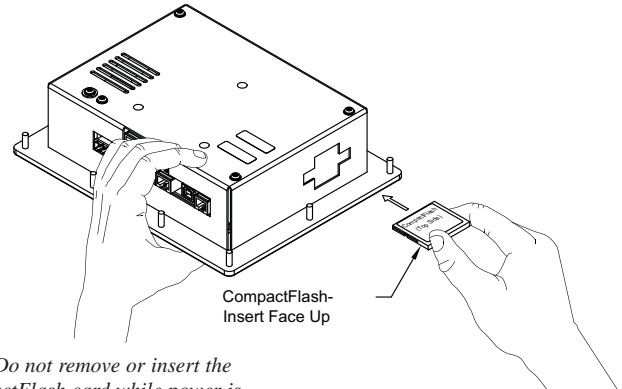
Each G3 operator interface has an embossed area containing the Red Lion logo. Red Lion can provide custom logos to apply to this area. Contact your distributor for additional information and pricing.



## COMPACTFLASH SOCKET

CompactFlash socket is a Type II socket that can accept either Type I or II cards. Use cards with a minimum of 4 Mbytes and formatted to a maximum of 2 Gbytes (See Note box below) with the G306A's CompactFlash socket. Cards are available at most computer and office supply retailers.

CompactFlash can be used for configuration transfers, larger configurations, data logging, and trending.



*Note: Do not remove or insert the CompactFlash card while power is applied. Refer to "Front Panel LEDs."*

Information stored on a CompactFlash card by a G306A can be read by a card reader attached to a PC. This information is stored in IBM (Windows®) PC compatible FAT16 file format.

## NOTE

For reliable operation of this and other Red Lion products, one of the following brands of CompactFlash card must be used...

SimpleTech	SMART® Modular
SanDisk®	Silicon Systems

*Not all of the above manufacturers offer CompactFlash cards recognized to UL standards, which may be required for your application.*

*Although RLC products limit use of CompactFlash card memory to 2 GB, cards with a larger capacity can be used. They MUST be formatted to 2 GB and use the FAT 16 file system. It is recommended to format the CF card using the format utility from within Crimson.*

## LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

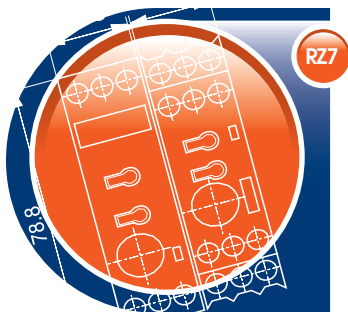
No warranties expressed or implied are created with respect to The Company's products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.

Red Lion Controls  
Headquarters  
20 Willow Springs Circle  
York PA 17406  
Tel +1 (717) 767-6511  
Fax +1 (717) 764-0839

Red Lion Controls  
Europe  
Printerweg 10  
NL - 3821 AD Amersfoort  
Tel +31 (0) 334 723 225  
Fax +31 (0) 334 893 793

Red Lion Controls  
India  
54, Vishvas Tenement  
GST Road, New Ranip,  
Ahmedabad-382480 Gujarat, India  
Tel +91 987 954 0503  
Fax +91 79 275 31 350

Red Lion Controls  
China  
Unit 101, XinAn Plaza  
Building 13, No.99 Tianzhou Road  
Shanghai, P.R. China 200223  
Tel +86 21 6113-3688  
Fax +86 21 6113-3683



# Electronic Timing Relays with Adjustable Modes

## RZ7 Standard, Economy and EX

**Full Featured  
Functionality**

**Easy to Use  
& Install**

**DIN Rail or Panel  
Mountable**

**Hazardous  
Location  
Models**

### RZ7-FS High-Performance Model

#### Multiple Voltage Ranges

Standard supply voltage ranges from 24...48V DC & 24...240V AC.

#### Functional Choices

Single, Multi- or Special Function models address most industrial timing needs.

#### Adjustable Timing Ranges from 0.5s up to 60 hours

Adjustment dial for 0 to 100% of timing adjustment range on both models means less inventory to stock.

#### LED Output indicator

Both FS and FE models have LED indicators for output status conditions.

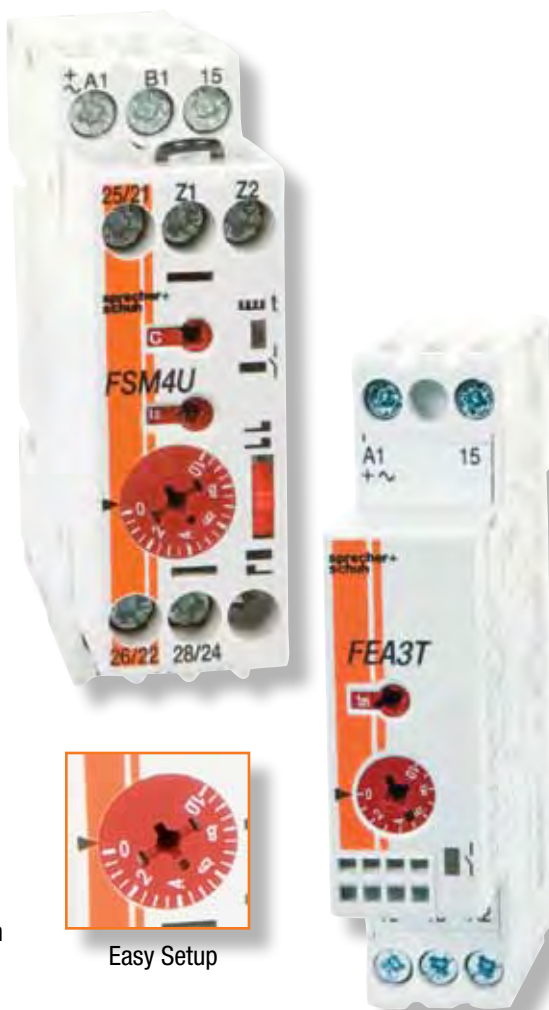
#### Multiple Mounting Options

The RZ7 are surface or DIN-Rail mountable for easy installation.

#### Special Hazardous Location Models Available

The RZ7-FS\_EX models are approved for use in hazardous location areas such as in the oil & gas industries.

- UL Class 1, Div. 2, Groups A,B,C,D  
UL Class 1, Zn 2, Group IIC
- Ex II 3 G, EEx nL IIC T4  
2A 32VDC max. Ta 70°C
- cULus E317176



### RZ7-FE Economy Model

#### Solid State Accuracy & Reliability

Solid state electronics and microprocessor control means accuracy within 0.2% for FS, and 0.1% for FE models.

#### One Tool Installation

Same size screw driver installs and adjusts functions and timing ranges. No need for multiple tools.

#### Safety & Convenience Features

- IP40 finger & hand protection
- Open, captive terminals for fast connections
- All functions accessible from front of unit
- Open screw terminals with dual chamber system for control wires

#### Standard Model Approvals

- cULus E14840
- CE Marked



RZ7\_EX model only

**sprecher+schuh**

RZ7

# RZ7 Adjustable Electronic Timing Relays



## QUICK SELECTION GUIDE

		RZ7-FS													RZ7-FE									
		RZ7-FSA	RZ7-FSB	RZ7-FSC	RZ7-FSD	RZ7-FSE	RZ7-FSF	RZ7-FSG	RZ7-FSI	RZ7-FSJ	RZ7-FSK	RZ7-FSL	RZ7-FSQ	RZ7-FSM	RZ7-FSH	RZ7-FSY	RZ7-FEA	RZ7-FEB	RZ7-FED	RZ7-FEE	RZ7-FEF	RZ7-FEL	RZ7-FEM	RZ7-FEY
<b>Dims/Mounting</b>	78.8x22.5x101 mm DIN or Panel	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•								
	80x17.5x70 mm DIN or Panel																•	•	•	•	•	•	•	•
<b>Outputs</b>	1 normally open contact																•	•	•	•				
	2 normally open contacts (1 side common)														•	•								•
	1 single pole double contacts	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	2 single pole double contacts	•	•	•	•	•	•	•	•	•	•	•	•	•										
<b>Functions</b>	ON-DELAY	•															•							
	OFF-DELAY		•															•						
	ON and OFF Delay			•																				
	ONE-SHOT/WATCHDOG				•														•					
	Fleeting OFF-DELAY					•														•				
	Symmetric flasher starting with a pulse						•														•			
	Symmetric flasher starting with a pause							•																
	Repeat cycle timer (flasher)														•									
	ON-DELAY pulse generator								•															
	ON-DELAY (pulse controlled)									•														
	ONE-SHOT/WATCHDOG (pulse controlled)										•													
	Impulse converter											•										•		
	Multi-function (A, B, C, D, E, F)													•									①	
	OFF-DELAY without supply voltage												•											
	Wye-Delta timing relay															•								•
<b>Time Ranges</b>	4 time ranges, 0.15 s to 10 min												•											•
	5 time ranges, 0.05 s to 10 hr															•	•	•	•	•	•	•	•	
	10 time ranges, 0.05 s to 60 hr													•	•									
	12 time ranges, 0.05 s to 60 hr	•	•	•	•	•	•	•	•	•	•	•												
<b>Supply Voltage</b>	24...48 VDC and 24...240 VAC	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•
	24 VAC/DC OR 110...240 VAC																•	•	•	•			•	
	24...240 VAC/DC												•											
<b>Hazardous Location Certified (suffix -EX only)</b>											•			•										

## Functional, Reliable Timing Relays

Sprecher + Schuh's RZ7 Series of electronic timing relays offer a multitude popular output functions in a versatile, compact package. This series is especially designed for applications where a high quality timing relay is required. Timing formats include ON-delay, OFF-delay, Wye-Delta and many other choices. All models are easily installed and adjusted for set and forget it usability.

Contact your local Sprecher + Schuh representative for more details.

**Sprecher + Schuh US Division Headquarters**  
 15910 International Plaza Dr., Houston, TX 77032  
 Tel: (281) 442-9000; Fax: (800) 739-7370  
[www.sprecherschuh.com](http://www.sprecherschuh.com)

① Multi-function (A, B, C, D, E, F)

**sprecher+**  
**schuh**

## Electrical Data

		CA7-9	CA7-12	CA7-16	CA7-23	CA7-30	CA7-37	CA7-43	CA7-60	CA7-72	CA7-85
<b>Rated Insulation Voltage <math>U_i</math></b>											
IEC, AS,BS,SEV, VDE 0660	[V]								690V		
UL; CSA	[V]								600V		
<b>Rated Impulse Voltage <math>U_{imp}</math></b>											
	[kV]								8kV		
<b>Rated Voltage <math>U_e</math>-Main Contacts</b>											
AC 50/60Hz	[V]				115, 200, 208, 230, 240, 380, 400, 415, 460, 500, 575, 690V						
DC	[V]				24, 48, 110, 115, 220, 230, 300, 440V						
<b>Operating Frequency for AC Loads</b>											
	[Hz]					50...60Hz					

## Switching Motor Loads

## Standard IEC Ratings

<b>AC-2, AC-3, AC-4</b>		230V	[A]	12	15	20	26.5	35	38	44	62	72	85
DOL Reversing 50Hz/60° C		240V	[A]	12	15	20	26.5	35	38	44	62	72	85
		400V	[A]	9	12	16	23	30	37	43	60	72	85
		415V	[A]	9	12	16	23	30	37	43	60	72	85
		500V	[A]	7	10	14	20	25	30	38	55	67	80
		690V	[A]	5	7	9	12	18	21	25	34	42	49
		230V	[kW]	3	4	5.5	7.5	10	11	13	18.5	22	25
		240V	[kW]	3	4	5.5	7.5	10	11	13	18.5	22	25
		400V	[kW]	4	5.5	7.5	11	15	18.5	22	32	40	45
		415V	[kW]	4	5.5	7.5	11	15	20	22	32	40	45
		500V	[kW]	4	5.5	7.5	13	15	20	25	37	45	55
		690V	[kW]	4	5.5	7.5	10	15	18.5	22	32	40	45

## UL/CSA/IEC

DOL Reversing 60Hz/60° C ①	10	115V	[A]	9.8	9.8	16	24	24	34	34	56	56	80
		230V	[A]	10	12	17	17	28	28	40	50	68	68
		115V	[HP]	1/2	1/2	1	2	2	3	3	5	5	7-1/2
		230V	[HP]	1 1/2	2	3	3	5	5	7-1/2	10	15	15
		200V	[A]	7.8	11	17.5	17.5	25.3	32.2	32.2	48.3	62.1	78.2
		230V	[A]	6.8	9.6	15.2	22	28	28	42	54	68	80
	30	460V	[A]	7.6	11	14	21	27	34	40	52	65	77
		575V	[A]	9	11	17	17	27	32	32	52	62	62
		200V	[HP]	2	3	5	5	7-1/2	10	10	15	20	25
		230V	[HP]	2	3	5	7-1/2	10	10	15	20	25	30
		460V	[HP]	5	7-1/2	10	15	20	25	30	40	50	60
		575V	[HP]	7-1/2	10	15	15	25	30	30	50	60	60
	Maximum Operating Rate (at max. amps)	AC2	[ops/hr]	450	450	450	400	400	400	400	300	250	200
		AC3	[ops/hr]	700	700	700	600	600	600	600	500	500	500
		AC4	[ops/hr]	200	150	120	80	80	70	70	70	60	50

① Approved by Lloyd's register of shipping.

## Electrical Data

Contactors

CA7

CA7-9 CA7-12 CA7-16 CA7-23 CA7-30 CA7-37 CA7-43 CA7-60 CA7-72 CA7-85

## Switching Motor Loads (continued)

AC-4	200,000 Op. Cycles 50Hz	230V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38	
		240V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38	
		400V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38	
		415V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38	
		500V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38	
		690V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38	
	60Hz	1Ø	230V	[kW]	0.75	1.5	2.2	2.2	3	3.7	4	6.3	7.5	11
			240V	[kW]	0.75	1.5	2.2	2.2	3	4	4	7.5	7.5	11
			400V	[kW]	1.8	3	4	4	5.5	6.3	7.5	13	15	20
			415V	[kW]	1.8	3	4	4	5.5	6.3	7.5	13	17	20
			500V	[kW]	2.2	3.7	5.5	5.5	7.5	7.5	10	15	20	25
			690V	[kW]	3	5.5	7.5	7.5	10	11	15	22	25	32
		3Ø	115V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38
			230V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38
			115V	[HP]	1/8	1/4	1/3	1/2	1/2	3/4	1	2	2	3
			230V	[HP]	1/3	1/2	1	1-1/2	2	2	2	3	5	5
			200V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38
			230V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38
	460V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38		
	575V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38		
	200V	[HP]	3/4	1	2	2	3	3	3	7-1/2	7-1/2	10		
	230V	[HP]	1	1-1/2	2	3	3	3	5	7-1/2	10	10		
	460V	[HP]	2	3	5	5	7-1/2	10	10	15	20	25		
575V	[HP]	3	5	7-1/2	7-1/2	10	10	10	20	25	30			
Maximum Operating Rate		[	250	250	220	200	200	200	200	120	120	120		
Wye-Delta (Star Delta)														
50 Hz	230V	[kW]	5.5	7.5	10	13	17	20	22	32	37	45		
	240V	[kW]	5.5	7.5	10	13	18.5	20	22	32	40	50		
	400V	[kW]	7.5	10	13	20	25	32	40	55	63	80		
	415V	[kW]	7.5	11	15	22	25	37	40	55	63	80		
	500V	[kW]	7.5	11	15	22	25	32	45	63	80	90		
	690V	[kW]	7.5	10	13	18.5	25	32	40	55	63	80		
60 Hz	200V	[HP]	5	5	7-1/2	7-1/2	10	15	20	30	40	50		
	230V	[HP]	5	7-1/2	10	10	15	20	25	40	50	60		
	460V	[HP]	10	15	20	25	30	40	50	75	100	125		
	575V	[HP]	10	15	20	25	30	40	50	75	100	125		
AC Elevator Control Ratings														
UL / CSA	Max FLC	[A]	8.0	11.0	16.0	21.0	27.0	31.0	37.0	43.0	54.0	62.0		
500,000 operations	200V	[A]	7.8	11.0	11.0	17.5	25.3	25.3	32.2	32.2	48.3	62.1		
	230V	[A]	6.8	9.6	15.2	15.2	22.0	28.0	28.0	42.0	54.0	68.0		
	460V	[A]	7.6	11.0	14.0	21.0	27.0	27.0	34.0	40.0	52.0	65.0		
	575V	[A]	6.1	9.0	11.0	17.0	22.0	27.0	32.0	41.0	52.0	62.0		
	200V	[HP]	2	3	3	5	7-1/2	7-1/2	10	10	15	20		
	230V	[HP]	2	3	5	5	7-1/2	10	10	15	20	25		
	460V	[HP]	5	7-1/2	10	15	20	20	25	30	40	50		
	575V	[HP]	5	7-1/2	10	15	20	25	30	40	50	60		

## Electrical Data

			CA7-9	CA7-12	CA7-16	CA7-23	CA7-30	CA7-37	CA7-43	CA7-60	CA7-72	CA7-85
AC-1 Load, 30 Switching Ambient Temperature 40° C	$I_m$	[A]	32	32	32	32	65	65	85	100	100	100
	230V	[kW]	13	13	13	13	26	26	34	40	40	40
	240V	[kW]	13	13	13	13	27	27	35	42	42	42
	400V	[kW]	22	22	22	22	45	45	59	69	69	69
	415V	[kW]	23	23	23	23	47	47	61	72	72	72
	500V	[kW]	28	28	28	28	56	56	74	87	87	87
	690V	[kW]	38	38	38	38	78	78	102	120	120	120
Ambient Temperature 60° C	$I_m$	[A]	32	32	32	32	65	65	80	100	100	100
	230V	[kW]	13	13	13	13	26	26	32	40	40	40
	240V	[kW]	13	13	13	13	27	27	33	42	42	42
	400V	[kW]	22	22	22	22	45	45	55	69	69	69
	415V	[kW]	23	23	23	23	47	47	57	72	72	72
	500V	[kW]	28	28	28	28	56	56	69	87	87	87
	690V	[kW]	38	38	38	38	78	78	95	120	120	120
Maximum Operating Rate		[	1,000	1,000	1,000	1,000	1,000	1,000	300	600	600	600
Continuous Current (UL/CSA)												
General Purpose Rating (40°)	Open	[A]	25	25	30	30	45	55	60	90	90	100
	Enclosed	[A]	25	25	30	30	55	60	75	90	90	100
Maximum Operating Rate		[	1,400	1,400	1,200	1,200	1,200	1,000	1000	700	700	600
Lighting Loads ①												
Elec.Dischrg.Lamps-AC-5a, single compensated	Open	[A]	22.5	25	28	29	40.5	45	77	81	85	90
	Enclosed	[A]	22.5	25	28	29	37	41	57	57	81	90
Max. capacitance at prospective short circuit current available at the contactor	10kA	[μf]	1,000	1,000	1,000	1,000	2,700	2,700	3,200	4,000	4,000	4,700
	20kA	[μf]	500	500	500	500	1,350	1,350	1,600	2,000	2,000	2,350
	50kA	[μf]	200	200	200	200	540	540	640	800	800	940
Incandescent Lamps - AC -5b												
Electrical endurance ~ 100,000 operations		[A]	12	16	18	22	30	37	43	60	70	76
Switching power transformers AC-6a												
50Hz												
Inrush		= n										
Rated transformer current												
n=30		[A]	10.9	10.9	10.9	10.9	20	20	23	40.8	40.8	40.8
	230 VAC	[kVA]	4.3	4.3	4.3	4.3	8	8	9.2	16	16	16
	240 VAC	[kVA]	4.5	4.5	4.5	4.5	8.3	8.3	10	17	17	17
	400 VAC	[kVA]	7.5	7.5	7.5	7.5	14	14	16	28	28	28
	415 VAC	[kVA]	7.8	7.8	7.8	7.8	14	14	17	29	29	29
	500 VAC	[kVA]	9.4	9.4	9.4	9.4	17	17	20	35	35	35
	690 VAC	[kVA]	13	13	13	13	24	24	27	49	49	49
n=20		[A]	16.3	16.3	16.3	16.3	30	30	34.5	61.3	61.3	61.3
	230 VAC	[kVA]	6.5	6.5	6.5	6.5	12	12	13.7	24.4	24.4	24.4
	240 VAC	[kVA]	6.8	6.8	6.8	6.8	12.5	12.5	14.3	25.5	25.5	25.5
	400 VAC	[kVA]	11.3	11.3	11.3	11.3	20.8	20.8	23.9	42.5	42.5	42.5
	415 VAC	[kVA]	11.7	11.7	11.7	11.7	21.6	21.6	24.8	44.1	44.1	44.1
	500 VAC	[kVA]	14.1	14.1	14.1	14.1	26	26	29.9	53.1	53.1	53.1
	690 VAC	[kVA]	19.5	19.5	19.5	19.5	35.9	35.9	41.2	73.3	73.3	73.3
n=15		[A]	22	22	22	22	40	40	46	82	82	82
	230 VAC	[kVA]	2.3	2.3	2.3	2.3	4.3	4.3	5.0	8.8	8.8	8.8
	240 VAC	[kVA]	2.4	2.4	2.4	2.4	4.5	4.5	5.2	9.2	9.2	9.2
	400 VAC	[kVA]	4.1	4.1	4.1	4.1	7.5	7.5	8.6	15.3	15.3	15.3
	415 VAC	[kVA]	4.2	4.2	4.2	4.2	7.8	7.8	8.9	15.9	15.9	15.9
	500 VAC	[kVA]	5.1	5.1	5.1	5.1	9.4	9.4	10.8	19.1	19.1	19.1
	690 VAC	[kVA]	7.0	7.0	7.0	7.0	12.9	12.9	14.9	26.4	26.4	26.4

① CA7 ratings for lighting loads are provided for technical reference. For cUL rated and labeled devices, see CAL7 contactors listed in this section.

## Electrical Data

Contactors

CA7

CA7-9 CA7-12 CA7-16 CA7-23 CA7-30 CA7-37 CA7-43 CA7-60 CA7-72 CA7-85												
Switching power transformers AC-6a												
60Hz												
Inrush = n												
Rated transformer current												
n=30		[A]	10.9	10.9	10.9	10.9	20	20	23	40.8	40.8	40.8
	200 VAC	[kVA]	3.8	3.8	3.8	3.8	6.9	6.9	8.0	14.1	14.1	14.1
	208 VAC	[kVA]	3.9	3.9	3.9	3.9	7.2	7.2	8.3	14.7	14.7	14.7
	240 VAC	[kVA]	4.5	4.5	4.5	4.5	8.3	8.3	9.6	17	17	17
	480 VAC	[kVA]	9.1	9.1	9.1	9.1	16.6	16.6	19.1	33.9	33.9	33.9
	600 VAC	[kVA]	11.3	11.3	11.3	11.3	20.8	20.8	23.9	42.4	42.4	42.4
	660 VAC	[kVA]	12.5	12.5	12.5	12.5	22.9	22.9	26.3	46.6	46.6	46.6
n=20		[A]	16.3	16.3	16.3	16.3	30	30	34.5	61.3	61.3	61.3
	200 VAC	[kVA]	5.6	5.6	5.6	5.6	10.4	10.4	12	21.2	21.2	21.2
	208 VAC	[kVA]	5.9	5.9	5.9	5.9	10.8	10.8	12.4	22.1	22.1	22.1
	240 VAC	[kVA]	6.8	6.8	6.8	6.8	12.5	12.5	14.3	25.5	25.5	25.5
	480 VAC	[kVA]	13.6	13.6	13.6	13.6	24.9	24.9	28.7	51	51	51
	600 VAC	[kVA]	16.9	16.9	16.9	16.9	31.2	31.2	35.9	63.7	63.7	63.7
	660 VAC	[kVA]	18.6	18.6	18.6	18.6	34.3	34.3	39.4	70.1	70.1	70.1
n=15		[A]	22	22	22	22	40	40	46	82	82	82
	200 VAC	[kVA]	7.5	7.5	7.5	7.5	13.9	13.9	15.9	28.4	28.4	28.4
	208 VAC	[kVA]	7.8	7.8	7.8	7.8	14.4	14.4	16.6	29.5	29.5	29.5
	240 VAC	[kVA]	9	9	9	9	16.6	16.6	19.1	34.1	34.1	34.1
	480 VAC	[kVA]	18.1	18.1	18.1	18.1	33.3	33.3	38.2	68.2	68.2	68.2
	600 VAC	[kVA]	22.6	22.6	22.6	22.6	41.6	41.6	47.8	85.2	85.2	85.2
	660 VAC	[kVA]	24.9	24.9	24.9	24.9	45.7	45.7	52.6	93.7	93.7	93.7
DC-1 Switching - 60°C												
1 Pole	24VDC	[A]	25	25	32	32	45	45	50	70	80	80
	48VDC	[A]	20	20	20	20	25	25	30	40	40	40
	60VDC	[A]	20	20	20	20	25	25	30	40	40	40
	110VDC	[A]	6	6	6	6	8	8	9	11	11	11
	220VDC	[A]	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2
	440VDC	[A]	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5
2 Poles in Series	24VDC	[A]	25	25	32	32	45	45	50	70	80	80
	48VDC	[A]	25	25	32	32	45	45	50	70	80	80
	60VDC	[A]	25	25	32	32	45	45	50	70	80	80
	110VDC	[A]	25	25	32	32	45	45	50	70	80	80
	220VDC	[A]	8	8	8	8	10	10	10	15	15	15
	440VDC	[A]	1	1	1	1	1	1	1	1.5	1.5	1.5
3 Poles in Series	24VDC	[A]	25	25	32	32	45	45	63	90	90	100
	48VDC	[A]	25	25	32	32	45	45	63	90	90	100
	60VDC	[A]	25	25	32	32	45	45	63	90	90	100
	110VDC	[A]	25	25	32	32	45	45	63	90	90	100
	220VDC	[A]	25	25	32	32	45	45	50	70	80	80
	440VDC	[A]	3	3	3	3	3.5	3.5	4	5	5	5
DC-2, 3, 5 Switching - 60°C												
Starting, reverse current braking, reversing, DC-5, 60°C	24VDC	[A]	25	25	32	32	45	45	63	90	90	100
	48VDC	[A]	25	25	32	32	45	45	50	70	70	80
	60VDC	[A]	25	25	32	32	45	45	50	70	70	80
	110VDC	[A]	20	20	25	25	30	30	35	70	70	80
Shunt Wound 3 Poles in Series	220VDC	[A]	6	6	6	10	15	15	20	25	25	30
	440VDC	[A]	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Series-wound Motors												
3 Poles in Series	24VDC	[A]	25	25	32	32	45	45	63	90	90	100
	48VDC	[A]	25	25	32	32	45	45	50	70	70	80
	60VDC	[A]	25	25	32	32	45	45	50	70	70	80
	110VDC	[A]	20	20	25	25	30	30	35	70	70	80
	220VDC	[A]	6	6	6	10	15	15	20	25	25	30
	440VDC	[A]	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6

## Electrical Data

			CA7-9	CA7-12	CA7-16	CA7-23	CA7-30	CA7-37	CA7-43	CA7-60	CA7-72	CA7-85
<b>Capacitor Ratings ①</b>												
<b>Capacitor Switching AC-6b-50 Hz</b>												
Single Capacitor - 40°C	230 V	[kVar]	8	8	8.5	9	14	14	24	28	28	28
	240 V	[kVar]	8	8	8.5	9	14	14	25	29	29	29
	400 V	[kVar]	8	8	10	12.5	20	24	35	48	48	48
	415 V	[kVar]	8	8	10	12.5	20	25	35	50	50	50
	500 V	[kVar]	8	8	10	12.5	20	25	35	50	55	60
	690 V	[kVar]	8	8	10	12.5	20	25	35	50	55	60
Single Capacitor - 60°C	230 V	[kVar]	8	8	8.5	9	12.5	12.5	18	28	28	28
	240 V	[kVar]	8	8	8.5	9	12.5	12.5	18	29	29	29
	400 V	[kVar]	8	8	10	12.5	20	21.5	30	42	48	48
	415 V	[kVar]	8	8	10	12.5	20	22	30	42	50	50
	500 V	[kVar]	8	8	10	12.5	20	25	30	42	50	55
	690 V	[kVar]	8	8	10	12.5	20	25	30	42	50	55
Capacitor Bank - 40°C ②	230 V	[kVar]	5	5	8	9	12.5	14	20	28	28	28
	240 V	[kVar]	5	5	8	9	12.5	14	20	29	29	29
	400 V	[kVar]	5	5	8	10	15	20	25	40	48	48
	415 V	[kVar]	5	5	8	10	15	20	25	40	50	50
	500 V	[kVar]	5	5	8	10	15	20	25	40	50	50
	690 V	[kVar]	5	5	8	10	15	20	25	40	50	50
Capacitor Bank - 60°C ②	230 V	[kVar]	5	5	8	9	12.5	12.5	18	28	28	28
	240 V	[kVar]	5	5	8	9	12.5	12.5	18	29	29	29
	400 V	[kVar]	5	5	8	10	15	20	25	40	48	48
	415 V	[kVar]	5	5	8	10	15	20	25	40	50	50
	500 V	[kVar]	5	5	8	10	15	20	25	40	50	50
	690 V	[kVar]	5	5	8	10	15	20	25	40	50	50
<b>Capacitor Switching - 60Hz</b>												
Single Capacitor - 40°C	200 V	[kVar]	5	5	8	9	12.5	14	20	28	28	28
	230 V	[kVar]	5	5	8	9	12.5	14	20	29	29	29
	460 V	[kVar]	5	5	8	10	15	20	25	40	50	50
	600 V	[kVar]	5	5	8	10	15	20	25	40	50	60
Capacitor Bank - 40°C ②	200 V	[kVar]	5	5	8	9	12.5	12.5	18	28	28	28
	230 V	[kVar]	5	5	8	9	12.5	12.5	18	29	29	29
	460 V	[kVar]	5	5	8	10	15	20	25	40	50	50
	600 V	[kVar]	5	5	8	10	15	20	25	40	50	50

① CA7 capacitor ratings are provided for technical reference. For cUL rated and labeled devices, see CAQ7 contactors listed in this section.

② CA7-9...CA7-30 = L min. 30  $\mu$ H; CA7-37...CA7-85 = L min. 6  $\mu$ H

## Electrical Data

		CA7-9	CA7-12	CA7-16	CA7-23	CA7-30	CA7-37	CA7-43	CA7-60	CA7-72	CA7-85
<b>Resistance and Watt Loss / <math>I_g</math> AC3</b>											
Resistance per power pole	[mΩ]	2.7	2.7	2.7	2.0	2.0	2.0	1.5	0.9	0.9	0.9
Watt Loss - 3 power poles	[W]	0.66	1.2	2.1	3.2	5.4	8.2	8.3	9.7	14.0	19.5
Coil and 3 power poles	AC	[W]	3.3	3.8	4.7	6.2	8.4	11.2	11.5	11	13.8
	DC	[W]	6.7	7.2	8.1	12.4	14.6	17.4	18.4	11	13.8
Coil only	AC	[W]	2.6	2.6	2.6	3.0	3.0	3.0	3.2	4.5	4.5
	DC	[W]	6.0	6.0	6.0	9.2	9.2	9.2	10.0	4.9	4.9
<b>Short-Circuit Coordination</b>											
<b>Max. Fuse or circuit breaker ratings</b>											
<b>DIN Fuses -gG, gL</b>											
Available Fault Current	[A]	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA
Type "1" (690V) ①	[A]	50	50	50	80	125	125	160	250	250	250
Type "2" (690V) ②	[A]	25	35	35	40	80	80	100	160	160	160
<b>BS 88 Fuses</b>											
Available Fault Current	[A]	80 KA	80 KA	80 KA	80 KA	80 KA	80 KA	80 KA	80 KA	80 KA	80 KA
Type "1" (690V) ①	[A]	25	32	35	50	63	80	100	100	125	160
Type "2" (690V) ②	[A]	25	32	35	50	63	80	100	100	125	160
<b>Class K1, RK1 Fuses</b>											
Available Fault Current	[A]	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA
Type "2" (600V) ③	[A]	15	20	20	30	40	50	50	80	100	100
<b>cUL Short-Circuit Ratings</b>											
<b>Class K1, RK1, K5, and RK5 Fuses</b>											
Available Fault Current	[A]	5 KA	5 KA	5 KA	5 KA	5 KA	5 KA	5 KA	5 KA	5 KA	5 KA
cUL Max. Rating (600V) ② Type 1	[A]	35	40	70	90	110	125	150	200	250	300
<b>Class CC &amp; CSA HRCI Fuses</b>											
Available Fault Current	[A]	100 KA	100 KA	100 KA	100 KA	~	~	~	~	~	~
cUL Max. Rating (600V) ② Type 2	[A]	15	20	30	30	~	~	~	~	~	~
<b>Class J CSA &amp; HRCI-J Fuses</b>											
Available Fault Current	[A]	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA
cUL Max. Rating (600V) ② Type 2	[A]	15	20	30	30	50	50	70	80	100	150
<b>Inverse-Time Circuit Breaker ①</b>											
Available Fault Current	[A]	5 KA	5 KA	5 KA	5 KA	5 KA	5 KA	5 KA	5 KA	10 KA	10 KA
cUL Max. Rating 480V ② Type 1	[A]	30	30	50	50	125	125	125	250	250	250
cUL Max. Rating 600V ② Type 1	[A]	~	~	~	~	125	125	125	250	250	250
<b>Short Time Current Withstand Ratings</b>											
$I_{cw}$ 60° C	10 s	[A]	170	170	170	215	300	304	375	700	700
Off Time Between Operations		[Min.]	20	20	20	20	20	20	20	20	20

- ① When used as a Branch Circuit Protection device, NEC 430-152 defines the maximum rating of an Inverse-time circuit breaker to be sized at 250% of the motor nameplate FLA for most applications.
- ② UL Listed Combination. (UL File E41850) Per UL508A, NEC409 abd CSA 22.2 No.14 for contactor and fuses or circuit breaker only.
- ③ Per IEC 60947-1 for contactor and fuses only.

## Electrical Data

### Short Circuit Coordination / AC3

**Type 2 Coordination Combinations** (contactor, overload and fuses) — Per UL 508 and IEC 60947-4-1

Contactor	Overload Relay	Withstand Rating	Maximum Voltage	Max. Amp Rating (UL Class CC or J Fuses)
CA7-9	CEP7-M/A/B32-0.32...	100kA	600V	1
	CEP7-M/A/B32-1.0...	100kA	600V	2
	CEP7-M/A/B32-2.9...	100kA	600V	6
	CEP7-M/A/B32-5...	100kA	600V	10
	CEP7-M/A/B32-12...	100kA	600V	15
CA7-12...	CEP7-M/A/B32-12...	100kA	600V	20
CA7-16...	CEP7-M/A/B32-32...	100kA	600V	20
CA7-23...	CEP7-M/A/B32-32...	100kA	600V	30
CA7-30...	CEP7-M/A/B37-37...	100kA	600V	40
CA7-37...	CEP7-M/A/B37-37...	100kA	600V	50
CA7-43...	CEP7-M/A/B45-45...	100kA	600V	50
CA7-60...	CEP7-M/A/B85-85...	100kA	600V	80
CA7-72...	CEP7-M/A/B85-85...	100kA	600V	100
CA7-85...	CEP7-M/A/B85-85...	100kA	600V	100

**CEP7 First Generation  
Scheduled for  
Obsolescence 2006**

**UL Listed Combinations** (contactor, overload and circuit breaker) — Per UL 508

Contactor	Overload Relay	Withstand Rating	Maximum Voltage	Max. Amp Rating (UL Listed Circuit Breaker)
CA7-9...12	CEP7-M/A32-2.9...12	5kA	480V	30
CA7-12	CT7-24-0.16...10			
	CT7-24-16	5kA	480V	50
CA7-16...23	CEP7-M/A32-2.9...32			
	CT7-24-0.16...16			
CA7-23	CT7-24-24	5kA	600V	125
CA7-30...37	CEP7-M/A37-12...37			
	CT7-24-16...CT7-45-30			
CA7-37	CT7-45-45	5kA	600V	125
CA7-43	CEP7-M/A45...45			
	CT7-45-30...45	5kA	600V	250
CA7-60	CEP7-M/A85...85			
	CT7-75-30...60	10kA	600V	250
CA7-72	CEP7-M/A85...85			
	CT7-75-30...75	10kA	600V	250
CA7-85	CEP7-M/A85...85			
	CT7-75-30...CT7-100-90			

## Short Circuit Ratings

## Standard Fault Short Circuit Ratings per UL508 and CSA 22.2 No.14

CEP7 Second Generation Cat. No.		Max. available fault current (kA)	Conditional S.C. current, I <sub>q</sub> (kA)	S.C.P.D.
CEP7	ED1AB, EEAB ED1BB, EEGB	1	600	Suitable for use with fuses only
	ED1CB, ED1DB, ED1EB, EECB, EEDB, EEGB, EEED, EEFD, EEPB, EERB, EESB, EETD	5		Not restricted to
	EEEE, EEFE, EEGE, EEUE	10		

## IEC Short Circuit Ratings per EN60947-4-1

CEP7 Second Generation Cat. No.		Prospective S.C. current, I <sub>r</sub> (kA)	Conditional S.C. current, I <sub>q</sub> (kA)	Max. voltage (V)	S.C.P.D.
CEP7	ED1AB, EEAB ED1BB, EEGB	1	100	690	Suitable for use with fuses only
	ED1CB, ED1DB, EECB, EEDB, EEPB, EERB	1			Not restricted to
	ED1EB, EEGB, EEED, EEFD, EEEE, EEFE, EESB, EETD	3			
	EEGE, EEUE	5			












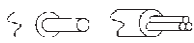
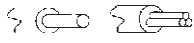










## High Fault Short Circuit Ratings per UL508 and CSA 22.2 No.14

CEP7 Second Generation Cat. No.		Contactor Cat. No.	Max. starter FLC (A)	Max. available fault current (kA)	Max. voltage (V)	UL Class J and CSA HRCI-J fuse (A)
CEP7	ED1AB, EEAB ED1BB, EEGB	CA7-09	0.5	100	600	3
			1			6
	ED1CB, ED1DB, ED1EB, EEGB, EECB, EEDB	CA7-09	09			20
		CA7-12	12			20
		CA7-16	16			30
		CA7-23	23			30
		CA7-30	30			50
	EEED, EEFD	CA7-37	37			50
		CA7-43	43			70
		CA7-60	60			80
	EEEE, EEFE EEGE	CA7-72	72			100
		CA7-85	85			150

## IEC Type 1 and Type II Fuse Coordination with CA7 Series contactors per EN60947-4-1

CEP7 Second Generation Cat. No.		Contactor Cat. No.	Max. starter FLC (A)	Prospective S.C. current, I <sub>r</sub> (kA)	Conditional S.C. current, I <sub>q</sub> (kA)	Max. voltage (V)	Type I with Class J fuse (A)	Type II with Class J fuse (A)
CEP7	ED1AB, EEAB	CA7-09	0.5	1	100	600	3	3
	ED1BB, EEGB		1				6	6
	ED1CB, ED1DB, EECB, EEDB	CA7-09	09	1			20	15
		CA7-12	12				20	20
		CA7-16	16				30	30
		CA7-23	23				30	30
		CA7-09	09				3	20
	ED1EB, EEEB	CA7-12	12	20				20
		CA7-16	16	30				30
		CA7-23	23	30				30
		CA7-30	30	50				50
	EEED, EEFD	CA7-37	37	3			50	50
		CA7-43	43				70	70
		CA7-60	60				80	80
	EEEE, EEFE	CA7-72	72	3			100	100
		CA7-85	85				150	150
		CA7-60	60				5	80
	EEGE	CA7-72	72	100				100
		CA7-85	85	150				150










## Electro-Mechanical Data

			CA7-9	CA7-12	CA7-16	CA7-23	CA7-30	CA7-37	CA7-43	CA7-60	CA7-72	CA7-85
<b>Service Life</b>												
Mechanical	AC	[Mil.]	13	13	13	13	13	13	12	10	10	10
	DC	[Mil.]	13	13	13	13	13	13	13	10	10	10
Electrical AC-3 (400V)	AC	[Mil.]	1.3	1.3	1.3	1.3	1.3	1.3	1.0	1.0	1.0	1.0
<b>Shipping Weights</b>												
AC - CA7		[kg]	0.39	0.39	0.39	0.39	0.48	0.49	0.51	1.45	1.45	1.45
		[Lbs.]	0.86	0.86	0.86	0.86	1.06	1.08	1.12	3.20	3.20	3.20
AC - CAU7		[kg]	0.85	0.85	0.85	0.85	1.08	1.08	1.15	3.14	3.14	3.14
		[Lbs.]	1.89	1.89	1.89	1.89	2.39	2.39	2.54	6.92	6.92	6.92
DC - CA7		[kg]	0.60	0.60	0.60	0.73	0.85	0.85	1.00	1.47	1.47	1.47
		[Lbs.]	1.32	1.32	1.32	1.61	1.87	1.87	2.20	3.24	3.24	3.24
DC - CAU7		[kg]	1.27	1.27	1.27	1.53	1.81	1.81	2.13	3.22	3.22	3.22
		[Lbs.]	2.81	2.81	2.81	3.39	4.00	4.00	4.70	7.10	7.10	7.10
<b>Terminations - Power</b>												
Description			   				  			  		
			One saddleclamp per pole: cross, slotted or Pozidrive No. 2/blade No. 3 screw				Dual connection; one saddleclamp and one box lug per pole; cross, slotted or Pozidrive No. 2/blade No. 4 screw			Dual connection; two box lugs per pole Allen Head: 4mm, 5/32		
	1 Wire	[mm <sup>2</sup> ]	1...4	1...4	1...4	1...4	2.5...10	2.5...10	2.5...16	2.5...35	2.5...35	2.5...35
	2 Wires	[mm <sup>2</sup> ]	1...4	1...4	1...4	1...4	2.5...10	2.5...10	2.5...10	2.5...25	2.5...25	2.5...25
	1 Wire	[mm <sup>2</sup> ]	1.5...6	1.5...6	1.5...6	1.5...6	2.5...16	2.5...16	2.5...25	2.5...50	2.5...50	2.5...50
	2 Wires	[mm <sup>2</sup> ]	1.5...6	1.5...6	1.5...6	1.5...6	2.5...16	2.5...16	2.5...16	2.5...35	2.5...35	2.5...35
	1 Wire	[AWG]	16...10	16...10	16...10	16...10	14...4	14...4	14...4	14...1	14...1	14...1
	2 Wires	[AWG]	16...10	16...10	16...10	16...10	14...4	14...4	14...4	14...1	14...1	14...1
Torque Requirement			[Nm]	1.0...2.5	1.0...2.5	1.0...2.5	2.5...3.5	2.5...4	2.5...4	3.5...6	3.5...6	3.5...6
			[Lb-in]	9...22	9...22	9...22	22...31	22...35	22...35	31...53	31...53	31...53
<b>Terminations - Control</b>												
Description			         									
			Combination Screw Head: Cross, Slotted, Pozidrive									
Coils	1 or 2	[mm <sup>2</sup> ]	1.5...6									
Wires		[AWG]	16...12									
Control Modules	1 or 2	[mm <sup>2</sup> ]	1.5...6									
Wires		[AWG]	16...12									
Torque Requirement		[Nm]	1...2.5									
		[Lb-in]	9...13									
<b>Degree of Protection - contactor</b>			IP 2LX per IEC 529 and DIN 40 050 (with wires installed)									
<b>Protection Against Accidental Contact</b>			Safe from touch by fingers and back-of-hand per VDE 0106; Part 100									

## Environmental and General Specifications

<b>Ambient Temperature</b>		
Storage	-55...+80° C (-67...176° F) - [CRI7E Electronic Interface -50...+80° C (-58...176° F)]	
Operation	-25...+60° C (-13...140° F)	
Conditioned 15% current reduction after AC-1 at >60° C	-25...+70° C (-13...158° F)	
<b>Altitude at installed site</b>		2000 meters above sea level per IEC 947-4
<b>Resistance to Corrosion/Humidity</b>		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.
<b>Shock Resistance</b>		IEC 68-2: Half sinusoidal shock 11ms, 30g (in all three directions)
<b>Vibration Resistance</b>		IEC 68-2: Static > 2g, in normal position no malfunction <5g
<b>Pollution Degree</b>		3
<b>Operating Position</b>		Refer to Dimension Pages
<b>Standards</b>		IEC947-1/4, EN 60947; UL 508; CSA 22.2, No. 14
<b>Approvals</b>		CE, UL, CSA

## Lug Kit and Paralleling Link Specifications

			CA7-P-KN23 / KL23	CA7-P-K37	CA7-P-K43	CA7-P-K85	CA7-P-B23	CA7-P-B37
Approvals			UL Listed; CSA Certified; C					
Conformity to Standards			UL508; CSA 22.2 No. 14; IEC 60947-4					
Protection Against Accidental Contact Terminations			IP2LX Finger Protection					
								
Description			Cross, slotted or Pozidrive screw		Allen Head; 5mm, 3/16	Allen Head; 7 mm, 15/32		
Wire Size								
	1 Wire	[mm <sup>2</sup> ]	4...16	4...16	6...35	10...70	35...70	35...70
	1 Wire	[mm <sup>2</sup> ]	4...25	4...25	6...50	10...95	35...95	35...95
	1 Wire	[AWG]	10...4	10...4	8...2	8...2/0	0...2/0	0...2/0
Torque Requirement								
			[Nm]	2...3	3...6	8...12	6...12	6...12
			[Lb-in]	18...27	27...54	72...108	54...108	54...108

## Coil Data

			CA7-9	CA7-12	CA7-16	CA7-23	CA7-30	CA7-37	CA7-43	CA7-60	CA7-72	CA7-85
<b>Voltage Range</b>												
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[xU <sub>N</sub> ]	0.85...1.1									
	Dropout	[xU <sub>N</sub> ]	0.3...0.6									
DC	Pickup	[xU <sub>N</sub> ]	0.8...1.1 (9V coils = 0.65...1.3; 24V coils = 0.7...1.25)									
	Dropout	[xU <sub>N</sub> ]	0.1...0.6									
<b>Coil Consumption</b>												
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[VA/W]	70/50	70/50	70/50	70/50	80/60	80/60	130/90	200/110	200/110	200/110
	Hold-in	[VA/W]	8/2.6	8/2.6	8/2.6	9/3	9/3	9/3	10/3.2	16/4.5	16/4.5	16/4.5
True DC Coils (CA7C)	Pickup	[W]	6.5	6.5	6.5	9.2	9.2	9.2	10.1	~	~	~
	Hold-in	[W]	6.5	6.5	6.5	9.2	9.2	9.2	10.1	~	~	~
Two Winding DC Coils CA7Y & CA7D	Pickup	[W]	120	120	120	200	200	200	200	200	200	200
	Hold-in	[W]	1.1	1.1	1.1	1.2	1.2	1.2	1.3	4.5	4.5	4.5
<b>Operating Times</b>												
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[ms]	15...30	15...30	15...30	15...30	15...30	15...30	15...30	20...40	20...40	20...40
	Dropout	[ms]	10...60	10...60	10...60	10...60	10...60	10...60	10...60	10...60	10...60	10...60
	with RC Suppressor	Dropout	[ms]	10...60	10...60	10...60	10...60	10...60	10...60	10...60	10...60	10...60
True DC Coils (CA7C)	Pickup	[ms]	40...70	40...70	40...70	40...70	50...80	50...80	50...80	~	~	~
	Dropout	[ms]	7...15	7...15	7...15	7...15	7...15	7...15	7...15	~	~	~
	with Integrated Suppression	Dropout	[ms]	14...20	14...20	14...20	17...23	17...23	17...23	~	~	~
with External Suppression	Dropout	[ms]	70...95	70...95	70...95	80...125	80...125	80...125	80...125	~	~	~
	Dropout	[ms]	70...95	70...95	70...95	80...125	80...125	80...125	80...125	~	~	~
Two Winding DC Coils (CA7Y/D)	Pickup	[ms]	17...26	17...26	15...27	15...27	15...27	15...27	15...27	20...40	20...40	20...40
	Dropout	[ms]	9...20	9...20	14...24	14...24	14...24	14...24	14...24	20...35 ①	20...35 ①	20...35 ①

① ≤ 220V.

## Electrical Data

			CA7-9- M40(31; 22)	CA7-12- M40(31; 22)	CA7-16- M40(31; 22)	CA7-23- M40(31; 22)	CA7-40-M22	CA7-40-M40	CA7-90-M22	CA7-90-M40		
<b>Rated Insulation Voltage <math>U</math></b>												
IEC, AS, BS, SEV, VDE 0660							690V					
UL; CSA							600V					
<b>Rated Impulse Voltage <math>U_{imp}</math></b>							8 kV					
<b>Rated Voltage <math>U_e</math> - Main Contacts</b>												
AC 50/60Hz					115, 200, 208, 230, 240, 380, 400, 415, 460, 500, 575, 690V							
DC					24, 48, 110, 115, 220, 230, 300, 440V							
<b>Operating Frequency for AC Loads</b>							50...60Hz					
<b>Switching Motor Loads</b>												
<b>Standard IEC Ratings</b>												
<b>AC-2, AC-3, AC-4</b>			230V	[A]	12	15	20	26.5	38	38	85	85
DOL & Reversing			240v	[A]	12	15	20	26.5	38	38	85	85
50Hz/60°C			400V	[A]	9	12	16	23.	37	37	85	85
			415V	[A]	9	12	16	23	37	37	85	85
			500V	[A]	7	10	14	20	29	30	80	80
			690V	[A]	5	7	9	12	9	21	22	49
			230V	[kW]	3	4	5.5	7.5	11	11	25	25
			240V	[kW]	3	4	5.5	7.5	11	11	25	25
			400V	[kW]	4	5.5	7.5	11	18.5	18.5	45	45
			415V	[kW]	4	5.5	7.5	11	18.5	18.5	45	45
			500V	[kW]	4	5.5	7.5	13	18.5	20	55	55
			690V	[kW]	4	5.5	7.5	10	7.5	18.5	18.5	45
<b>UL/CSA/IEC</b>												
DOL & Reversing			115V	[A]	7.2	9.8	16	24	34	34	80	80
60Hz/60°C			230V	[A]	18	12	17	17	28	28	68	68
			115V	[HP]	1/2	1/2	1	2	3	3	7-1/2	7-1/2
			230V	[HP]	1-1/2	2	3	3	5	5	15	15
			200V	[A]	7.8	11	17.5	17.5	32.2	32.2	78.2	78.2
			230V	[A]	6.8	9.6	15.2	22	28	28	80	80
			460V	[A]	7.6	11	14	21	34	34	65	77
			575V	[A]	9	11	17	17	17	32	22	52
			200V	[HP]	2	3	5	5	10	10	25	25
			230V	[HP]	2	3	5	7-1/2	10	10	30	30
			460V	[HP]	5	7-1/2	10	15	25	25	50	60
			575V	[HP]	7-1/2	10	15	15	15	30	20	50
Maximum Operating Rate			AC2	[ops/hr]	450	450	450	400	400	400	200	200
(at max. amps)			AC3	[ops/hr]	700	700	700	600	600	600	500	500
			AC4	[ops/hr]	200	150	120	80	70	70	50	50



## Electrical Data

			CA7-9- M40(31; 22)	CA7-12- M40(31; 22)	CA7-16- M40(31; 22)	CA7-23- M40(31; 22)	CA7-40-M22	CA7-40-M40	CA7-90-M22	CA7-90-M40
<b>AC-1 Load, 3Ø Switching</b>										
Ambient Temperature 40°C	$I_n$	[A]								
		[kW]	32	32	32	32	75	75	130	130
	230V	[kW]	13	13	13	13	30	30	52	52
	240V	[kW]	13	13	13	13	31	31	54	54
	400V	[kW]	22	22	22	22	52	52	90	90
	415V	[kW]	23	23	23	23	54	54	93	93
	500V	[kW]	28	28	28	28	65	65	113	113
	690V	[kW]	38	38	38	38	90	90	155	155
	$I_n$	[kW]	32	32	32	32	60	60	110	110
		[kW]	13	13	13	13	24	24	44	44
	240V	[kW]	13	13	13	13	25	25	46	46
	400V	[kW]	22	22	22	22	42	42	76	76
	415V	[kW]	23	23	23	23	43	43	79	79
	500V	[kW]	28	28	28	28	52	52	95	95
	690V	[kW]	38	38	38	38	72	72	131	131
Max Operating Rate			[ops/hour]	1,000	1,000	1,000	1,000	300	300	600
<b>Continuous Current (UL/CSA)</b>										
General Purpose Rating (40°)	Open	[A]	25	25	30	30	60	60	125	130
	Enclosed	[A]	25	25	30	30	60	60	125	130
Max. Operating Rate			[ops/hour]	1,400	1,400	1,200	1,200	1,000	1,000	600
<b>Lighting Loads ①</b>										
Elec. Dischrg. Lamps-AC-5a, single compensated	Open	[A]	22.5	25	28	29	65	65	115	115
	Enclosed	[A]	22.5	25	28	29	54	54	95	95
Incandescent Lamps AC-5b, Electrical endurance~100,000 operations										
			12	16	18	22	18	25	60	75
<b>DC-1 Switching - 60°C</b>										
1 Pole	24VDC	[A]	25	25	32	32	45	45	80	80
	48VDC	[A]	20	20	20	20	25	25	40	40
	60VDC	[A]	20	20	20	20	25	30	40	40
	110VDC	[A]	6	6	6	6	10	10	11	11
	220VDC	[A]	1.5	1.5	1.5	1.5	1.5	1.5	1.8	1.8
	440VDC	[A]	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5
2 Pole in Series	24VDC	[A]	25	25	32	32	45	45	80	80
	48VDC	[A]	25	25	32	32	45	45	80	80
	60VDC	[A]	25	25	32	32	45	45	80	80
	110VDC	[A]	25	25	32	32	45	45	80	80
	220VDC	[A]	8	8	8	8	10	10	15	15
	440VDC	[A]	1	1	1	1	1	1	1.5	1.5
3 Poles in Series	24VDC	[A]	25	25	32	32	~	48	~	100
	48VDC	[A]	25	25	32	32	~	48	~	100
	60VDC	[A]	25	25	32	32	~	48	~	100
	110VDC	[A]	25	25	32	32	~	48	~	100
	220VDC	[A]	25	25	32	32	~	48	~	80
	440VDC	[A]	3	3	3	3	~	3.5	~	5
4 Poles in Series	24VDC	[A]	25	25	32	32	~	60	~	110
	48VDC	[A]	25	25	32	32	~	60	~	110
	60VDC	[A]	25	25	32	32	~	60	~	110
	110VDC	[A]	25	25	32	32	~	60	~	110
	220VDC	[A]	25	25	32	32	~	60	~	100
	440VDC	[A]	8	8	8	8	~	10	~	15










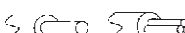









① CA7 ratings for lighting loads are provided for technical reference. For cUL rated and labeled devices, see CAL7 contactors listed in this section.

## Electrical Data

		CA7-9- M40(31; 22)	CA7-12- M40(31; 22)	CA7-16- M40(31; 22)	CA7-23- M40(31; 22)	CA7-40-M22	CA7-40-M40	CA7-90-M22	CA7-90-M40
<b>Resistance and Watt Loss <math>\frac{1}{6}</math> AC3</b>									
Resistance per power pole	[mΩ]	2.7	2.7	2.7	2.0	2.0	1.5	0.8	0.7
Watt Loss - 4 power poles	[W]	2.8	2.8	2.8	2.0	11.3	8.4	13.5	11.8
Coil and 4 power poles	AC	[W]	13.7	13.7	10.8	26.1	37.4	36.0	56.3
	DC (true)	[W]	17.6	17.6	17.4	32.6	43.9	~	~
	DC (2 winding)	[W]	~	~	~	~	~	32.5	52.8
<b>Short Circuit Coordination</b>									
<b>DIN Fuses -gG, gL</b>									
Available Fault Current	[A]	100 KA	100 KA	100 KA	100 KA	50 KA	50 KA	50 KA	50 KA
Type "1" (690V) ③	[A]	50	50	50	80	160	160	250	250
Type "2" (690V) ③	[A]	25	35	35	40	100	100	160	160
<b>BS 88 Fuses</b>									
Available Fault Current	[A]	80 KA	80 KA	80 KA	80 KA	~	~	~	~
Type "1" (690V) ③	[A]	25	32	35	50	~	~	~	~
Type "2" (690V) ③	[A]	25	32	35	50	~	~	~	~
<b>Class K1, RK1 Fuses</b>									
Available Fault Current	[A]	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA
Type "2" (600V) ③	[A]	15	20	20	30	70	70	100	100
<b>cUL Short-Circuit Ratings</b>									
<b>Class K1, RK1, K5, and RK5 Fuses</b>									
Available Fault Current	[A]	5 KA	5 KA	5 KA	5 KA	5 KA	5 KA	10 KA	10 KA
cUL Max. Rating (600V) ② Type 1	[A]	35	40	70	90	125	125	300	300
<b>Class CC &amp; CSA HRCI Fuses</b>									
Available Fault Current	[A]	100 KA	100 KA	100 KA	100 KA	~	~	~	~
cUL Max. Rating (600V) ② Type 2	[A]	15	20	30	30	~	~	~	~
<b>Class J CSA &amp; HRCI-J Fuses</b>									
Available Fault Current	[A]	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA	100 KA
cUL Max. Rating (600V) ② Type 2	[A]	15	20	30	30	70 ④	70 ④	150 ④	150 ④
<b>Inverse-Time Circuit Breaker ①</b>									
Available Fault Current	[A]	5 KA	5 KA	5 KA	5 KA	5 KA	5 KA	10 KA	10 KA
cUL Max. Rating 480V ② Type 1	[A]	30	30	50	50	125	125	250	250
cUL Max. Rating 600V ② Type 1	[A]	~	~	~	~	125	125	250	250
<b>Short Time Current Withstand Ratings</b>									
/ 60° C	[A]	170	170	170	215	304	304	700	700
Off Time Between Operations	[Min.]	20	20	20	20	5	5	5	5

- ① When used as a Branch Circuit Protection device, NEC 430-152 defines the maximum rating of an Inverse-time circuit breaker to be sized at 250% of the motor nameplate FLA for most applications.
- ② UL Listed Combination. (UL File E41850) Per UL508A, NEC409 abd CSA 22.2 No.14 for contactor and fuses or circuit breaker only.
- ③ Per IEC 60947-1 for contactor and fuses only.
- ④ UL Testing not complete at the time of printing this catalog.

## Mechanical Data

			CA7-9- M40(31; 22)	CA7-12- M40(31; 22)	CA7-16- M40(31; 22)	CA7-23- M40(31; 22)	CA7-40-M22	CA7-40-M40	CA7-90- M22	CA7-90- M40
<b>Service Life</b>										
Mechanical	AC	[Mil.]	13	13	13	13	10	10	10	10
	DC	[Mil.]	13	13	13	13	10	10	10	10
<b>Shipping Weights</b>										
AC - CA7		[kg]	0.39	0.39	0.39	0.39	0.51	0.51	1.45	1.45
		[Lbs.]	0.86	0.86	0.86	0.86	1.12	1.12	3.20	3.20
DC - CA7		[kg]	0.60	0.60	0.60	0.73	1.00	1.00	1.47	1.47
		[Lbs.]	1.32	1.32	1.32	1.61	2.20	2.20	3.24	3.24
<b>Terminations - Power</b>										
Description										
			One saddleclamp per pole: cross, slotted or Pozidrive No. 2/blade No. 3 screw				Dual connection; one saddleclamp and one box lug per pole; cross, slotted or Pozidrive No. 2/blade No. 4 screw		Dual connection; two box lugs per pole Allen Head: 4mm, 5/32	
	1 Wire	[mm <sup>2</sup> ]	1...4	1...4	1...4	1...4	2.5...10	2.5...10	2.5...16	2.5...35
	2 Wires	[mm <sup>2</sup> ]	1...4	1...4	1...4	1...4	2.5...10	2.5...10	2.5...10	2.5...25
	1 Wire	[mm <sup>2</sup> ]	1.5...6	1.5...6	1.5...6	1.5...6	2.5...16	2.5...16	2.5...25	2.5...50
	2 Wires	[mm <sup>2</sup> ]	1.5...6	1.5...6	1.5...6	1.5...6	2.5...16	2.5...16	2.5...16	2.5...35
	1 Wire	[AWG]	16...10	16...10	16...10	16...10	14...6	14...6	14...4	14...1
	2 Wires	[AWG]	16...10	16...10	16...10	16...10	14...6	14...6	14...4	14...1
Torque Requirement		[Nm]	1.0...2.5	1.0...2.5	1.0...2.5	1.0...2.5	2.5...4	2.5...4	2.5...4	3.5...6
		[Lb-in]	9...22	9...22	9...22	9...22	22...35	22...35	22...35	31...53
<b>Terminations - Control</b>										
Description										
			Combination Screw Head: Cross, Slotted, Pozidrive							
Coils	1 or 2	[mm <sup>2</sup> ]	1.5...6							
Wires		[AWG]	16...12							
Control Modules	1 or 2	[mm <sup>2</sup> ]	1.5...6							
Wires		[AWG]	16...12							
Torque Requirement		[Nm]	1...2.5							
		[Lb-in]	9...13							
<b>Degree of Protection - contactor</b>			IP 2LX per IEC 529 and DIN 40 050 (with wires installed)							
<b>Protection Against Accidental Contact</b>			Safe from touch by fingers and back-of-hand per VDE 0106; Part 100							

## Environmental and General Specifications

<b>Ambient Temperature</b>		
Storage		-55...+80° C (-67...176° F) - [CRI7E Electronic Interface -50...+80° C (-58...176° F)]
Operation		-25...+60° C (-13...140° F)
Conditioned 15% current reduction after AC-1 at >60° C		-25...+70° C (-13...158° F)
<b>Altitude at installed site</b>		2000 meters above sea level per IEC 947-4
<b>Resistance to Corrosion/Humidity</b>		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.
<b>Shock Resistance</b>		IEC 68-2: Half sinusoidal shock 11ms, 30g (in all three directions)
<b>Vibration Resistance</b>		IEC 68-2: Static > 2g, in normal position no malfunction <5g
<b>Pollution Degree</b>		3
<b>Operating Position</b>		Refer to Dimension Pages
<b>Standards</b>		IEC947-1/4, EN 60947; UL 508; CSA 22.2, No. 14
<b>Approvals</b>		CE, UL, CSA







## Coil Data (CA7 4-Pole)

			CA7-9- M40(31; 22)	CA7-12- M40(31; 22)	CA7-16- M40(31; 22)	CA7-23- M40(31; 22)	CA7-40- M22	CA7-40- M40	CA7-90- M22	CA7-90- M40
<b>Voltage Range</b>										
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[xU <sub>N</sub> ]	0.85...1.1							
	Dropout	[xU <sub>N</sub> ]	0.3...0.6							
DC	Pickup	[xU <sub>N</sub> ]	0.8...1.1 (9V coils = 0.65...1.3; 24V coils = 0.7...1.25)							
	Dropout	[xU <sub>N</sub> ]	0.1...0.6							
<b>Coil Consumption</b>										
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[VA/W]	70/50	70/50	70/50	70/50	130/90	130/90	400/240	400/240
	Hold-in	[VA/W]	8/2.6	8/2.6	8/2.6	9/3	12/3.6	12/3.6	24/9	24/9
True DC Coils (CA7C)	Pickup	[W]	6.5	6.5	6.5	9.2	10.1	10.1	~	~
	Hold-in	[W]	6.5	6.5	6.5	9.2	10.1	10.1	~	~
Two Winding DC Coils CA7Y & CA7D	Pickup	[W]	~	~	~	~	~	~	325	325
	Hold-in	[W]	~	~	~	~	~	~	5.5	5.5
<b>Operating Times</b>										
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[ms]	15...30	15...30	15...30	15...30	15...30	15...30	20...30	20...30
	Dropout	[ms]	10...60	10...60	10...60	10...60	10...60	10...60	20...40	20...40
	with RC Suppressor	[ms]	10...60	10...60	10...60	10...60	10...60	10...60	20...40	20...40
True DC Coils (CA7C)	Pickup	[ms]	40...70	40...70	40...70	40...70	50...80	50...80	~	~
	Dropout	[ms]	7...15	7...15	7...15	7...15	7...15	7...15	~	~
without Suppression	Pickup	[ms]	7...15	7...15	7...15	7...15	7...15	7...15	~	~
	Dropout	[ms]	7...15	7...15	7...15	7...15	7...15	7...15	~	~
with Integrated Suppression	Pickup	[ms]	14...20	14...20	14...20	17...23	~	~	~	~
	Dropout	[ms]	14...20	14...20	14...20	17...23	~	~	~	~
with External Suppression	Pickup	[ms]	70...95	70...95	70...95	80...125	~	~	~	~
	Dropout	[ms]	70...95	70...95	70...95	80...125	~	~	~	~
Two Winding DC Coils	Pickup	[ms]	~	~	~	~	~	~	15...20	20...25
	Dropout	[ms]	~	~	~	~	~	~	20...25	20...25
with Internal Suppression	Pickup	[ms]	~	~	~	~	~	~	~	~
	Dropout	[ms]	~	~	~	~	~	~	~	~

## Technical Information – Auxiliary Contact Data

		Mounted Standard Auxiliary	Built-in Auxiliary Contacts in Contac- tor CA7-9...CA7-23	Front Mounted Auxiliary Contacts CA7-PV, CS7-PV, CZE/A7, CV7	Front Mounted Bifurcated Auxiliary Contacts	Side Mounted Auxiliary Contacts CA-PA, CM7
Electrical Contact Ratings - NEMA			A600, P600	A600, Q600		A600, Q600
Min. Contact Rating			17V, 10 mA	17V, 5 mA	5V, 3 mA	17V, 10 mA
Contact Ratings - IEC AC-15 (solenoids, contactors) rated voltage IEC 60947-5-1		24V	10 A	6 A	3 A	6 A
		48V	10 A	6 A	3 A	6 A
		120V	10 A	6 A	3 A	6 A
		240V	10 A	5 A	3 A	5 A
		400V	6 A	3 A	2 A	3 A
		480V/500V	2.5 A	1.6 A	1.2 A	1.6 A
		600V	1 A	1 A	0.7 A	1 A
		690V	1 A	1 A	0.7 A	1 A
AC-12 (Control of resistive loads) IEC 60947-5-1	40 °C	I <sub>th</sub>	20 A	10 A	10 A	10 A
		230V	8 kW			
		400V	14 kW			
		690V	24 kW			
	60 °C	I <sub>th</sub>	20 A	6 A	6 A	6 A
		230V	8 kW			
DC-12 Switching DC Loads t <sub>cr</sub> < 1 ms, Resistive Loads IEC 60947-5-1		24V	12 A	12 A	6 A	6 A
		48V	9 A	9 A	3.2 A	3.2 A
		110V	3.5 A	3.5 A	0.45 A	0.45 A
		220V	0.55 A	0.55 A	0.18 A	0.18 A
		440V	0.2 A	0.2 A	0.1 A	0.1 A
DC-13 IEC 60947-5-1, Solenoids and contactors		24V	5 A	5 A	2.5 A	5 A
		48V	3 A	3 A	1.5 A	3 A
		110V	1.2 A	1.2 A	0.6 A	1.2 A
		220V	0.6 A	0.6 A	0.3 A	0.6 A
		440V	0.3 A	0.15 A	0.15 A	0.15 A

## Auxiliary Contacts

			Built-in Auxiliary Contacts in Contactor CA7-9...CA7-23	Front Mounted Auxiliary Contacts CA7-PV, CS7-PV, CZE/A7, CV7	Side Mounted Auxiliary Contacts CA-PA, CM7
<b>Continuous Current Rating per UL/CSA</b>					
Rated Voltage	AC	[V]	600 max.	600 max.	600 max.
Continuous Rating	40°C	[A]	10 A general purpose Heavy pilot duty (A600)	10 A general purpose Heavy pilot duty (A600)	10 A general purpose Heavy pilot duty (A600)
Continuous Rating	DC	[A]	5A, 600 max. Standard pilot duty (P600)	2.5A, 600 max. Standard pilot duty (Q600)	2.5A, 600 max. Standard pilot duty (Q600)
<b>Short-Circuit Protection -gGFuse</b>					
Type 2 Coordination		[A]	20	10	10
<b>Rated Impulse Voltage <math>U_{imp}</math></b>					
		[kV]	8	8	6
Insulation Voltage (between control and load circuit) per DIN< VDE 0103, Part 101 (NAMUR recommendation)					
		[V]	380	440	440
<b>Mechanically Linked Contacts</b> (per IEC60947-5-1 Annex L (SUVA Third-party certified))					
			Mutually unrestricted between all NO and NC contacts	Mutually unrestricted between all NO & NC contacts. CZE & CV7 not mechanically linked with contactor main contacts	Mutually unrestricted between all NO and NC contacts
<b>Terminals</b>					
Terminal Type					
Maximum Wire Size per IEC 947-1			2xA4	2xA4	2xA4
 Flexible with Wire-End	1 conductor	[mm <sup>2</sup> ]	1...4	0.5...2.5	0.5...2.5
 Fenule	2 conductor	[mm <sup>2</sup> ]	1...4	0.75...2.6	0.75...2.6
 Solid/Stranded-Conductor	1 conductor	[mm <sup>2</sup> ]	1.5...6	0.5...2.5	0.5...2.5
	2 conductor	[mm <sup>2</sup> ]	1.5...6	0.75...2.6	0.75...2.6
Recommended Tightening Torque		[Nm]	1...2.5	1...15	1...15
Max. Wire Size per UL/CSA		[AWG]	16...10	18...14	18...14
Recommended Tightening Torque		[lb-in]	9...22	9...13	9...13

## Accessories

<b>Latch Attachment Release, CV7-11</b>		
Coil Consumption	[VA/W]	AC 45/40
	[W]	DC 25W
<b>Contact Signal Duration</b>	[min/max]	0.03...15s
<b>Time Attachment</b>		
Reset Time		
at min. time setting	[ms]	10
at max. time setting	[ms]	70
Repeat Accuracy		±10%

## Contact Ratings (Per NEMA/UL A600 &amp; Q600)

Standard	Circuit Voltage	Make (Amps/VA)	Break (Amps/VA)	Continuous Amps
A600	120AC	60A/7200VA	6A/720VA	10
	240AC	30A/7200VA	3A/720VA	
	480AC	15A/7200VA	1.5A/720VA	
	600AC	12A/7200VA	1.2A/720VA	
Q600	125DC	0.55A/69VA	0.55A/69VA	25
	250DC	0.27A/69VA	0.27A/69VA	
	301-600DC	0.1A/69VA	0.1A/69VA	

**Positively-Guided Contacts (Mechanically-linked)**  
*SUVA Certified*

- Restricted guidance guarantees without restrictions from contactor to auxiliary contact and auxiliary contact to contactor.❶

❶ See Section G for additional details.

### Determining Contact Life

To determine the contactor's estimated electrical life, follow these guidelines:

1. Identify the appropriate Utilization Category from Table A.
2. On the following pages, choose the graph for the Utilization Category selected.

3. Locate the Rated Operational Current ( $I_e$ ) along the bottom of the chart and follow the graph lines up to the intersection of the appropriate contactor's life-load curve.
4. Read the estimated contact life along the vertical axis.

**Table A – IEC Special Utilization Categories, AC Ratings ❶**

	Category	Typical Applications	Rated Current	Conditions for testing electrical life						Ops.	Conditions for testing making and breaking capacity						Ops.
				Make			Break				Make			Break			
				I/Ie	U/ue	cos	Ic/Ie	Ur/Ue	cos		I/Ie	U/ue	cos	I/Ie	U/ue	cos	
CONTACTORS	AC-1	Non-inductive or slightly inductive loads; resistance furnaces	All values	1	1	0.95	1	1	0.95	6000	1.5	1.05	0.8	1.5	1.05	0.8	50
	AC-2	Slip-ring motors: Starting, plugging	All values	2	1.05	0.65	2	1.05	0.65	6000	4	1.05	0.65	4	1.05	0.65	50
	AC-3	Slip-ring motors: Starting, switching off motors during running	Ie 17Amp	6	1	0.65	1	0.17	0.65	6000	10	1.1	0.65	8	1.1	0.65	50
			17Amp <Ie 100Amp	6	1	0.35	1	0.17	0.35		10	1.1	0.35	8	1.1	0.35	
			Ie> 100Amp	6	1	0.35	1	0.17	0.35		8 ❷	1.1	0.35	6 ❸	1.1	0.35	
	AC-4	Squirrel-cage motors: Starting, plugging, inching ❺	Ie 17Amp	6	1	0.65	6	1	0.65	6000	12	1.1	0.65	10	1.1	0.65	50
			17Amp <Ie 100Amp	6	1	0.35	6	1	0.35		12	1.1	0.35	10	1.1	0.35	
			Ie> 100Amp	6	1	0.35	6	1	0.35		10 ❹	1.1	0.35	8 ❷	1.1	0.35	
AC-5a	Switching of electric discharge lamp control		2	1.05	0.45	2	1.05	0.45	6000	3	1.05	0.45	3	1.05	0.45	50	
AC-5b	Switching of incandescent lamps		1	1.05		1	1.05		6000	1.5	1.05		1.5	1.05		50	
AC-6a	Switching of transformers									Rating derived from AC-3 rating (x 0.45)							
AC-6b	Switching of capacity banks									Depends on circuit conditions of application							
CONTROL DEVICES	AC-12	Control of resistive loads and solid state loads with isolation by opto couplers	All values	1	1	0.9	1	1	0.9	6050							
	AC-13	Control of solid state loads with transformer isolation		2	1	0.65	1	1	0.65	6050	10	1.1	0.65	1.1	1.1	0.65	10
	AC-14	Control of small electromagnetic loads	72 VA	6	1	0.3	1	1	0.3	6050	6	1.1	0.7	6	1.1	0.7	10
	AC-15	Control of electromagnetic loads	72 VA	10	1	0.3	1	1	0.3	6050	10	1.1	0.3	10	1.1	0.3	10
	AC-20	Connecting and disconnecting under no load conditions		No testing required													
	AC-21	Switching or resistive loads, including moderate overloads	All values	1	1	0.95	1	1	0.95	10000	1.5	1.05	0.95	1.5	1.05	0.95	5
	AC-22	Switching of mixed resistive & inductive loads, including moderate overloads	All values	1	1	0.8	1	1	0.8	10000	3	1.05	0.65	3	1.05	0.65	5
	AC-23	Switching of motor loads or other highly inductive loads	All values	1	1	0.65	1	1	0.65	10000	10	1.05	0.45	8	1.05	0.45	5

#### Legend

$U_e$  Rated operational voltage  
 $U$  Voltage before make  
 $U_r$  Recovery voltage  
 $I_e$  Rated operational current  
 $I$  Making current  
 $I_c$  Breaking current  
 $L$  Inductance of test circuit  
 $R$  Resistance of test circuit

- ❶ Utilization categories and test conditions for AC & DC. For contactors according to IEC 158-1, starters according to IEC 292-1 ... 4 and control switches according to IEC 337-1 and IEC 337-1A.
- ❷ With a minimum value of 1000A for  $I$  or  $I_c$ .
- ❸ With a minimum value of 800A for  $I_c$ .
- ❹ With a minimum value of 1200A for  $I$ .
- ❺ Plugging is understood as stopping or reversing the motor rapidly by reversing the motor primary connections while the motor is running. Inching [or jogging] is understood as energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.

## Determining Contact Life

To determine the contactor's estimated electrical life, follow these guidelines:

1. Identify the appropriate Utilization Category from Table A.
2. On the following pages, choose the graph for the Utilization Category selected.

3. Locate the Rated Operational Current ( $I_e$ ) along the bottom of the chart and follow the graph lines up to the intersection of the appropriate contactor's life-load curve.
4. Read the estimated contact life along the vertical axis.

**Table A – IEC Special Utilization Categories, DC Ratings ❶**

Category	Typical Applications	Rated Current	Conditions for testing electrical life						Ops.	Conditions for testing making and breaking capacity						Ops.
			Make			Break				Make			Break			
			I/I <sub>e</sub>	U/U <sub>e</sub>	cos	I <sub>c</sub> /I <sub>e</sub>	U <sub>r</sub> /U <sub>e</sub>	cos		I/I <sub>e</sub>	U/U <sub>e</sub>	cos	I/I <sub>e</sub>	U/U <sub>e</sub>	cos	
DC-1	Non-inductive or slightly inductive loads, resistance furnaces	All Values	1	1	1	1	1	1		1.5 ❷	1.1 ❷	1 ❷	1.5 ❷	1.1 ❷	1 ❷	
DC-2	Shunt-motors: Starting, switching off motors during running	All Values	2.5	1	2	1	0.1	7.5		4	1.1	2.5	4	1.1	2.5	
DC-3	Shunt motors: Starting, plugging, inching	All Values	2.5	1	2	2.5	1	2		4	1.1	2.5	4	1.1	2.5	
DC-4	Series-motors: Starting , switching off motors during running	All Values	2.5	1	7.5	1	0.3	10		4	1.1	15	4	1.1	15	
DC-5	Series-motors: Starting, plugging, inching	All Values	2.5	1	7.5	2.5	1	7.5		4	1.1	15	4	1.1	15	
DC-15	Electromagnets for contactors, valves, solenoid actuators	All Values	1	1	6 x P ❸	1	1	6 x P ❸		1.1	1.1	6 x P ❸	1.1	1.1	6 x P ❸	

### Legend

- $U_e$  Rated operational voltage
- $U$  Voltage before make
- $U_r$  Recovery voltage
- $I_e$  Rated operational current
- $I$  Making current
- $I_c$  Breaking current
- $L$  Inductance of test circuit
- $R$  Resistance of test circuit

❶ Utilization categories and test conditions for AC & DC. For contactors according to IEC 158-1, starters according to IEC 292-1 ... 4 and control switches according to IEC 337-1 and IEC 337-1A.

❷ Only according to VDE.

❸  $P = U_e \times I_e$  rated power [W]. The value "6 x P" has been derived from an empiric relationship which covers most magnetic loads for DC up to an upper limit of  $P = 50W$ .

### Predicting Electrical Life

Sprecher + Schuh contactors are designed for superior performance in a wide variety of applications, by giving consideration to the specific load, utilization category and required electrical life, you can purchase exactly the type

and size of contactor required. This assures reliable operation and high value the ability to very closely match the contactor to the application.

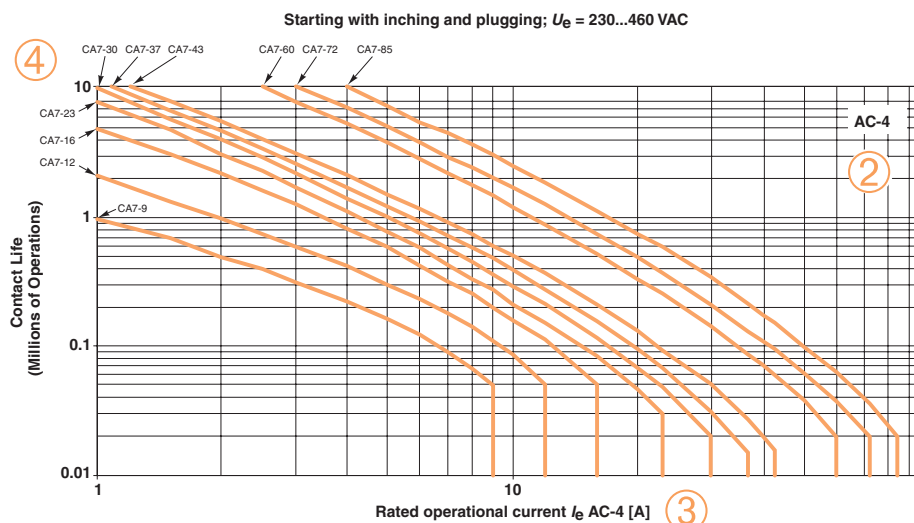
- ① Identify the appropriate utilization category. For this example, we will determine CA7 contact life for inching and plugging squirrel-cage motors. ①

Utilization Category	Definition	
<b>AC-1</b>	Resistance Furnaces	Non inductive or slightly inductive loads, Resistive Furnaces
<b>AC-2</b>	Slip-ring motors	Starting and stopping of running motors
<b>AC-3</b>	Squirrel-cage motors	Starting and stopping of running motors
<b>AC-4</b> ①	Squirrel-cage motors	Starting, plugging, and inching (Plugging is understood as stopping or reversing the motor rapidly by reversing the motor primary connections while the motor is running. Inching [or jogging] is understood as energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.)
<b>AC-15</b>	Electromagnets	Electromagnets for contactors, valves, solenoid actuators

- ② Choose the graph for the utilization category selected. (a graph pertaining to most Utilization Categories can be found in each contactor section.)

- ③ Locate the Rated Operational Current ( $I_e$ ) along the bottom of the chart and follow the graph lines up to the intersection of the appropriate contactor's life-load curve.

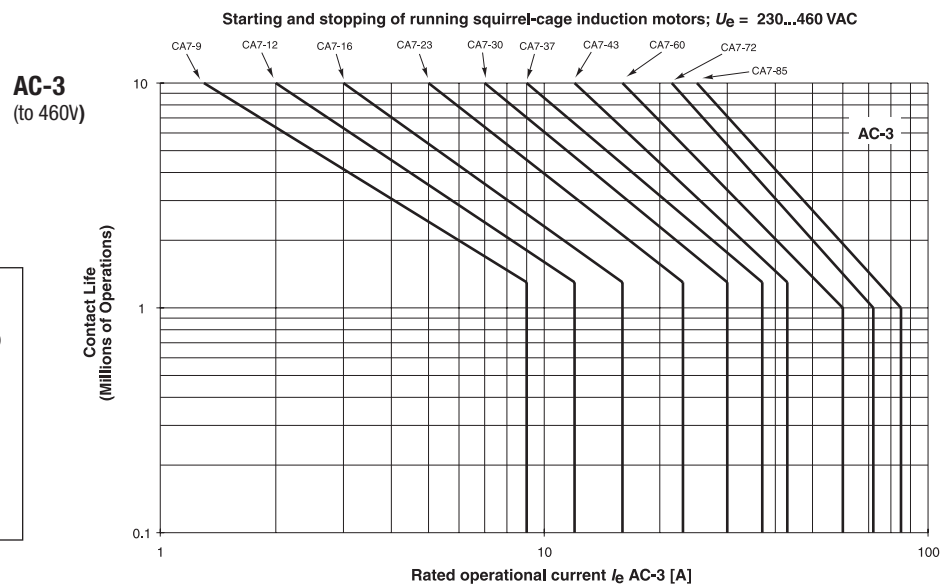
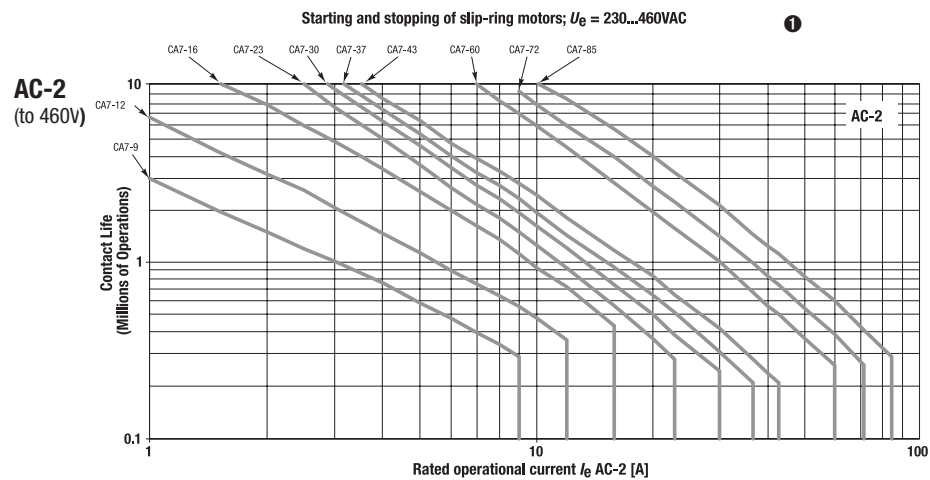
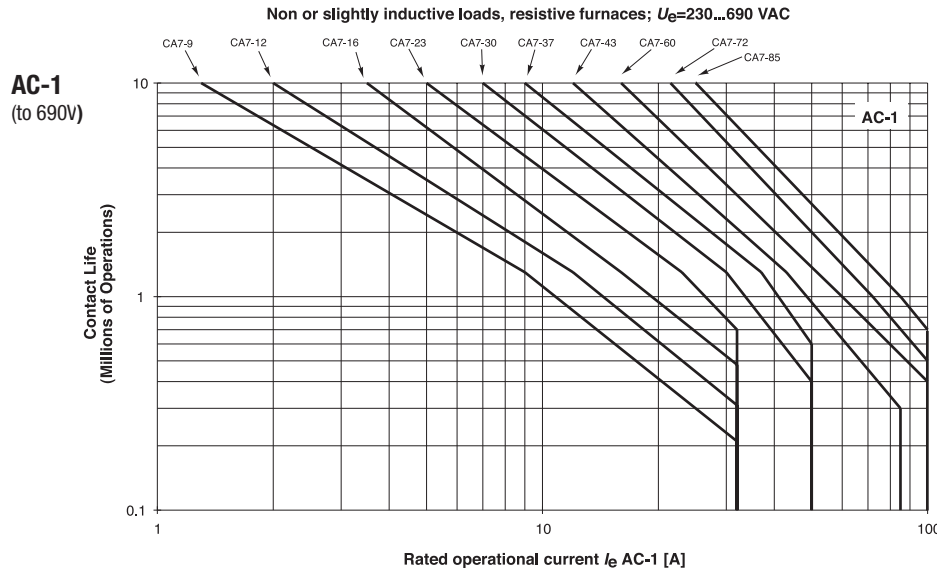
- ④ Read the estimated contact life along the vertical axis. ②



- ① A comprehensive list of Utilization Categories can be found in each contactor section, however, these are the primary categories used in most industrial motor applications.
- ② The life-load curves shown here are based on Sprecher+Schuh tests according to the requirements defined in IEC 60947-4-1. Since contact life in a given application is dependent on environmental conditions and duty cycle, actual application contact life may vary from that indicated by the curves shown here.

## Life-Load Curves

- Locate the Rated Operational Current ( $I_e$ ) along the bottom of the chart and follow the graph lines up to the intersection of the appropriate contactor's life-load curve.
- Read the estimated contact life along the vertical axis.



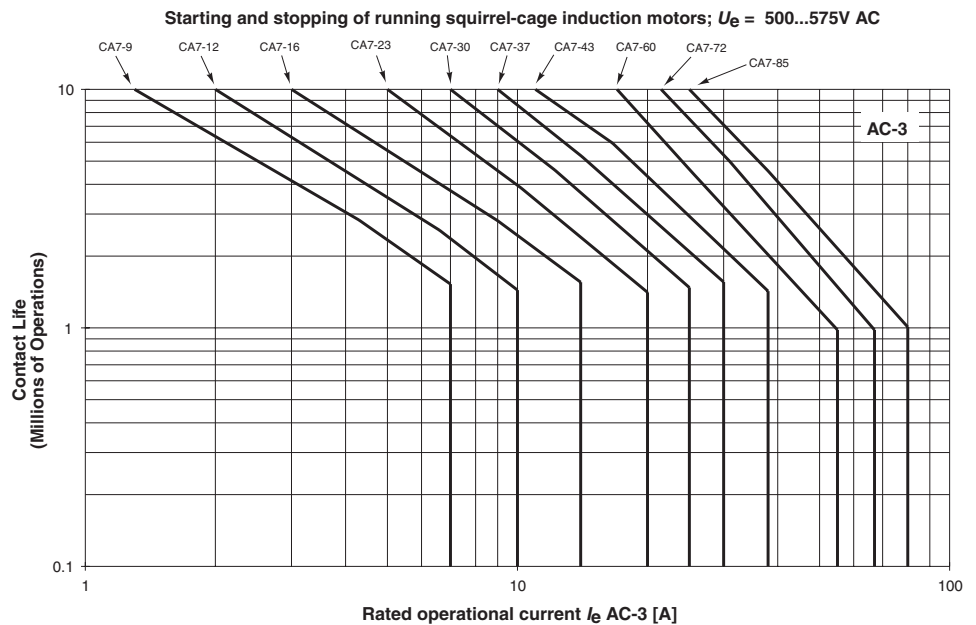
**NOTE:** The life-load curves shown here are based on Sprecher+Schuh tests according to the requirements defined in IEC 60947-4-1. Since contact life in any given application is dependent on environmental conditions and duty cycle, actual application contact life may vary from that indicated by the curves shown here.

① 575V applications use 90% of curve value.

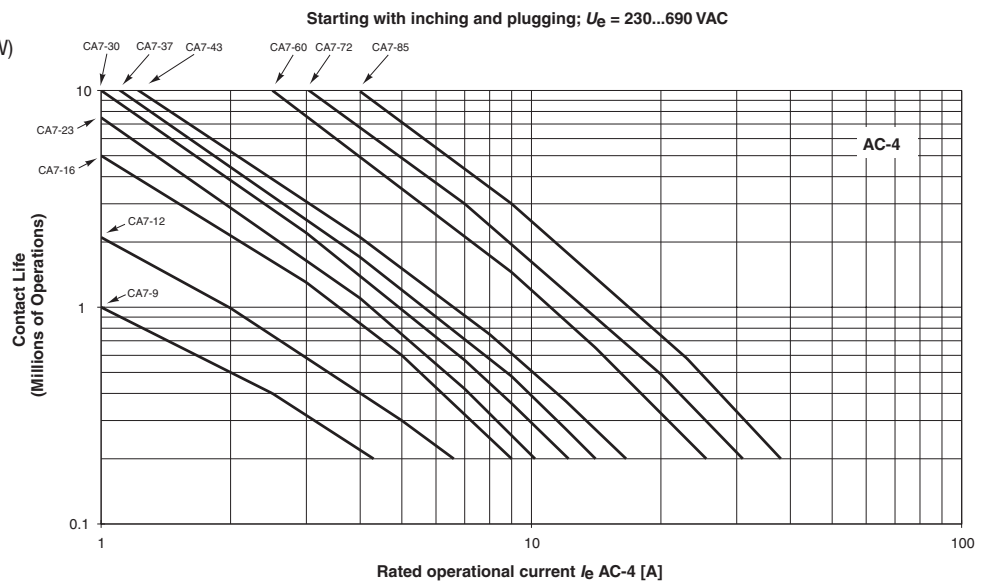
## Life-Load Curves

- Locate the Rated Operational Current ( $I_e$ ) along the bottom of the chart and follow the graph lines up to the intersection of the appropriate contactor's life-load curve.
- Read the estimated contact life along the vertical axis.

### AC-3 (to 575)

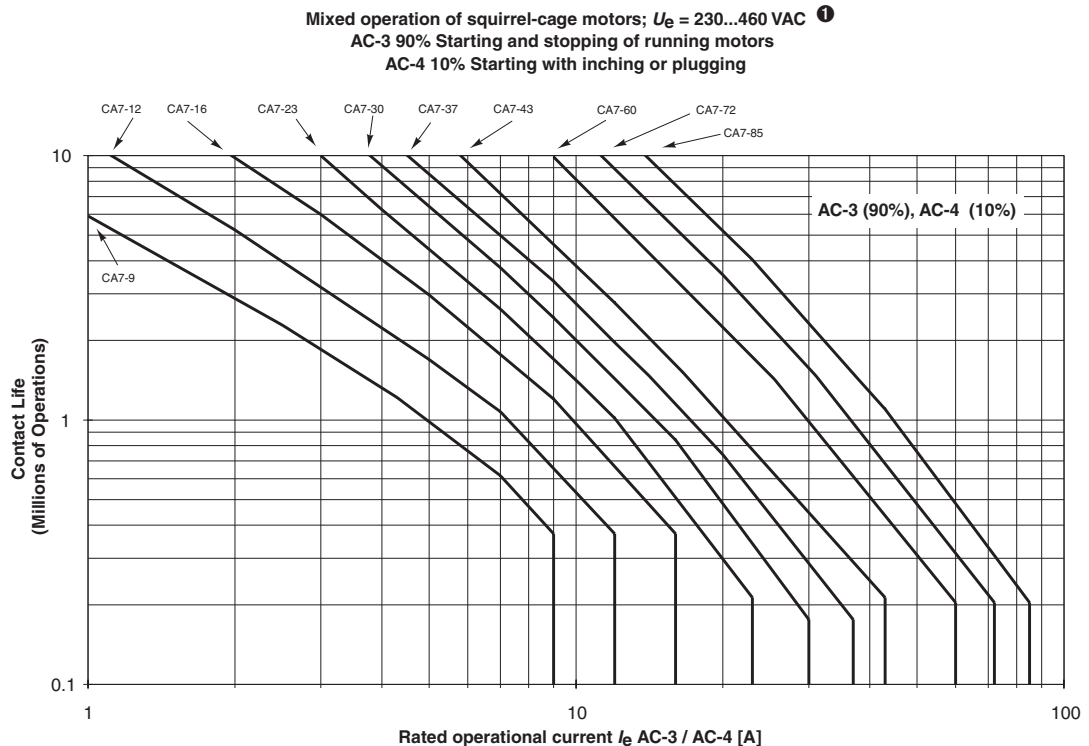


### AC-4 (to 690V)



**NOTE:** The life-load curves shown here are based on Sprecher+Schuh tests according to the requirements defined in IEC 60947-4-1. Since contact life in any given application is dependent on environmental conditions and duty cycle, actual application contact life may vary from that indicated by the curves shown here.

## Life-Load Curves

AC-3 (90%),  
AC-4 (10%)

## Contact Life for Mixed Utilization Categories

## AC-3 and AC-4

In many applications, the utilization category cannot be defined as either purely AC-3 or AC-4. In those applications, the electrical life of the contactor can be estimated with the following equation:

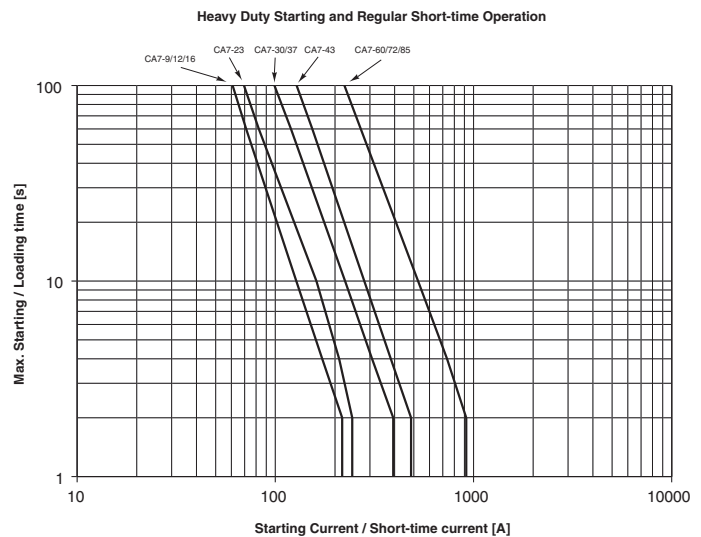
$$L_{\text{mixed}} = L_{\text{ac3}} / [1 + P_{\text{ac4}} \times (L_{\text{ac3}} / L_{\text{ac4}} - 1)], \text{ where:}$$

$L_{\text{mixed}}$  Approximate contact life in operations for a mixed AC-3/AC-4 utilization category application.

$L_{\text{ac3}}$  Approximate contact life in operations for a pure AC-3 utilization category (from the AC-3 life-load curve).

$L_{\text{ac4}}$  Approximate contact life in operations for a pure AC-4 utilization category (from the AC-4 life-load curve).

$P_{\text{ac4}}$  Percentage of AC-4 operations



**NOTE:** The life-load curves shown here are based on Sprecher+Schuh tests according to the requirements defined in IEC 60947-4-1. Since contact life in any given application is dependent on environmental conditions and duty cycle, actual application contact life may vary from that indicated by the curves shown here.

① 575V applications use 85% of curve value.

## Operating Rates

The estimated contact life shown in the life-load curves is based on the standard operating rates shown in Table B below. For applications requiring a higher operating frequency, the maximum operating power (Pn in kW or HP) for a given contactor must be reduced to maintain the same contact life.

To find a contactor's maximum operating power, for an operating rate greater than shown in Table B, follow these guidelines:

1. Identify the appropriate curve for the contactor and utilization category from Table B.
2. Locate the appropriate Maximum Operating Rate curve on the following pages.
3. Locate the intersection of the curve with the application's operating rate (ops/hr.) found on the vertical axis.

4. Read the percent of maximum operating power (Pn) of the contactor from the horizontal axis.

5. Multiply the % maximum power by the standard power rating.

Example: The contactor selected for an AC-4 utilization category application is a CA7-16 (10HP at 460V), however, the application requires an operating rate of 200 ops/hr., compared to the standard operating rate of 120 ops/hr. as shown in Table B.

1. Locate the AC-4 Maximum Operating Rate curve on the following pages.
2. Locate the intersection of 200 ops/hr on the CA7-16 curve. The data shows that the maximum operating power of the CA7-16 contactor in this application is 60%.
3. Therefore, the maximum horsepower that can be switched by the CA7-16 contactor in this application is 6 HP (0.60 x 10HP).

**Table B – Standard Operating Rates by Contactor and Utilization Category**

Contactor	AC-1 Max. ops/hr.	AC-2 Max. ops/hr.	AC-3 Max. ops/hr.	AC-4 Max. ops/hr.	AC-4 @ I <sub>e</sub> for 200K ops. Max. ops/hr.
	Operating Parameters and Start Time				
			40% Duty Cycle 250ms ❶	250ms	250ms
CA-9	1000	500	700	200	400
CA-12	1000	500	700	150	300
CA-16	1000	500	700	120	240
CA-23	1000	400	600	80	160
CA-30	1000	400	600	80	160
CA-37	1000	400	600	70	140
CA-43	1000	400	600	70	140
CA-60	800	300	500	70	140
CA-72	800	250	500	60	120
CA-85	600	200	500	50	140

❶ **Duty Cycle or Load Factor** – Defined as the “on” time for a given operating cycle per hour including the “start time.” A 40% Duty Cycle is calculated in the following manner:

*Contactor switches six (6) times per minute (tpm), 250ms start time; 40% duty cycle.*

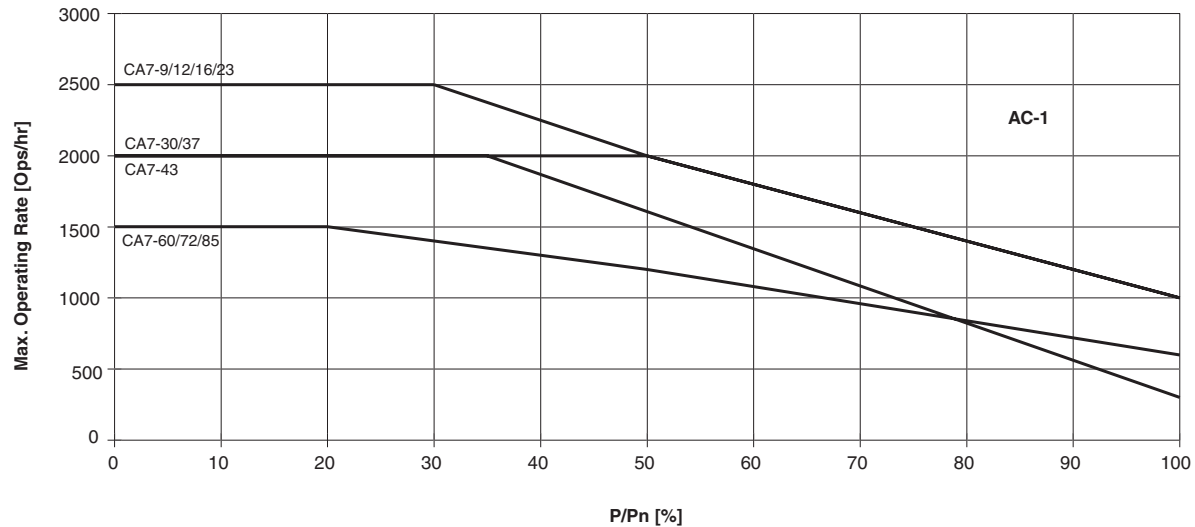
To determine the “on” time and “off” time:

- Operations per hour = 360; [60 min x 6 tpm = 360]
- One operating cycle = 10 sec; [60 min ÷ 6 tpm = 10 sec]
- “On” time at 40% duty cycle = 4 sec; [10 sec x 0.4 (40%) = 4 sec]
- 4 sec “on” time includes the start time of 250ms
- “Off” time at 40% duty cycle = 6 sec; [10 sec – 4 sec = 6 sec]

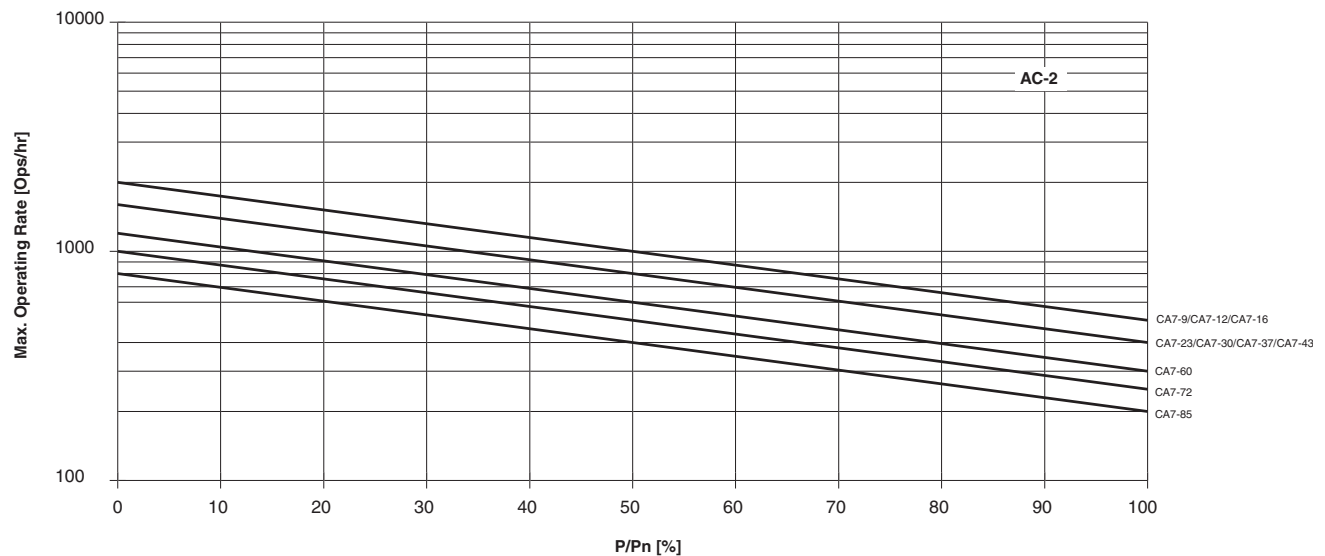
## Contractors

## CA7

**Non or slightly inductive loads, resistance furnaces;  $U_e = 230...690$  VAC**



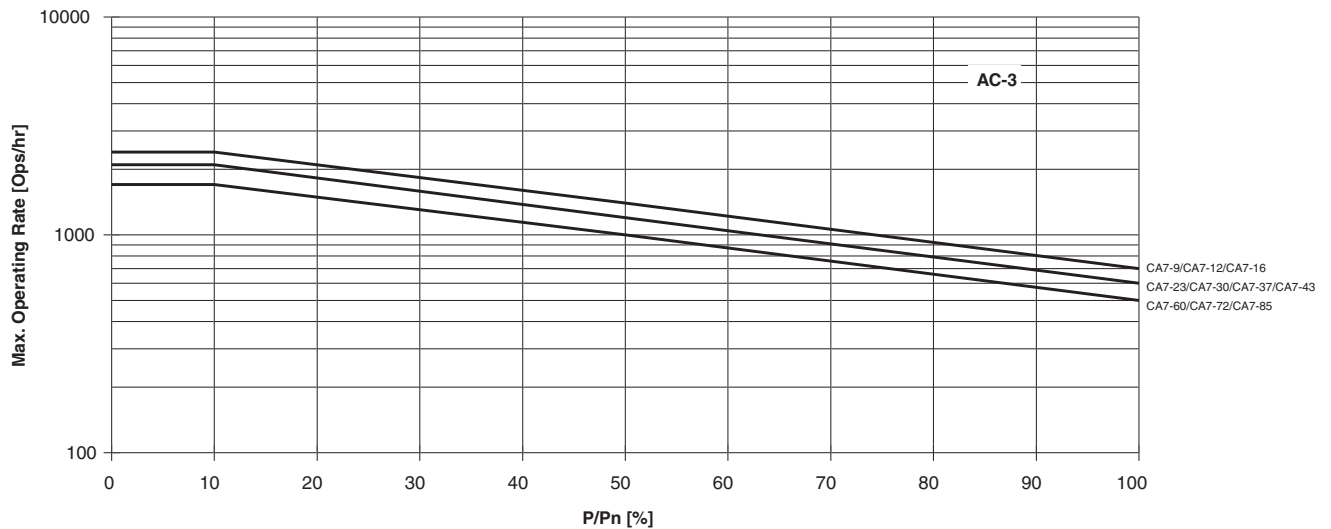
**Slip-ring motors: starting, switching off;  $U_e = 230...460$  VAC**



## Operating Rate Curves

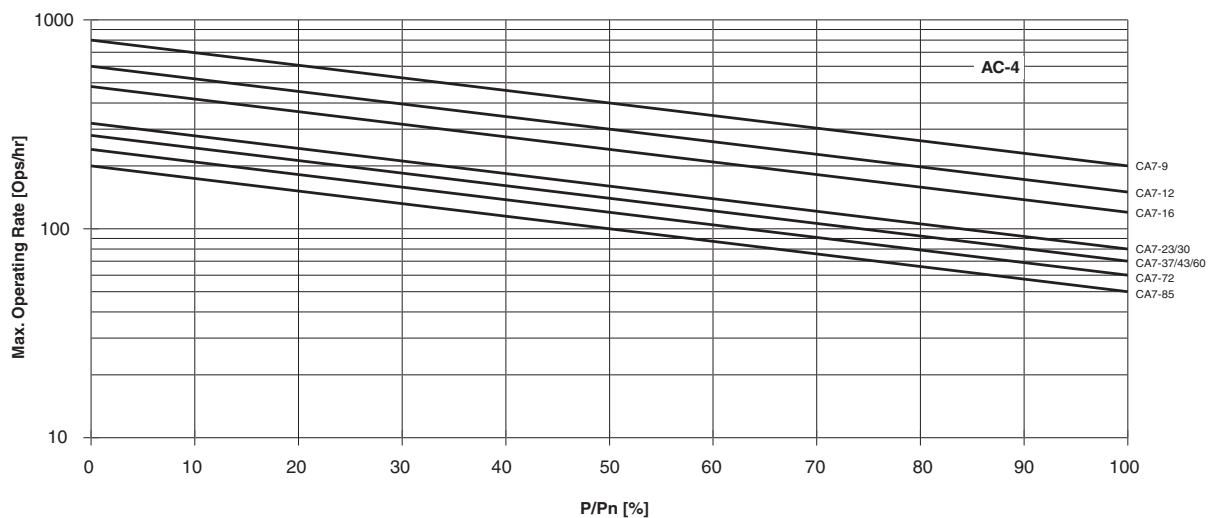
## AC-3

Squirrel-cage motors: starting, switching off motors during running;  $U_e = 230...460$  VAC  
Relative operating time 40%, Starting time  $t_A = 0.25$  s

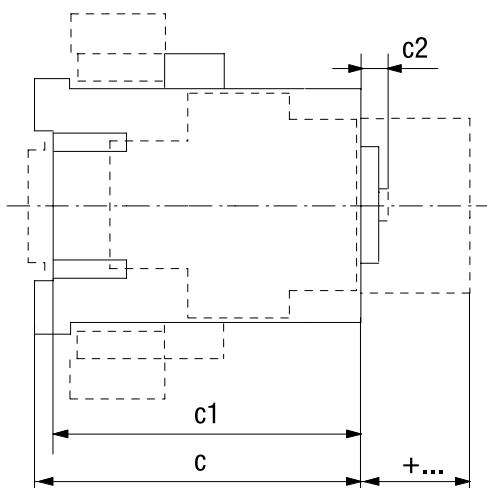
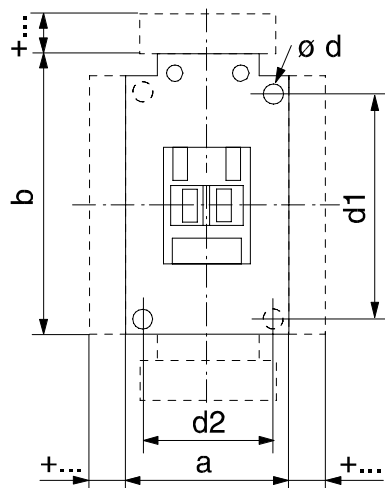


## AC-4

Squirrel-cage motors: starting, plugging, inching;  $U_e = 230...460$  VAC  
Starting Time  $t_A = 0.25$  s



## Series CA7, CAU7, CAQ7, CNX, CAN7 and CAL7 (Contactors, Reversing Contactors &amp; Special Use Contactors)



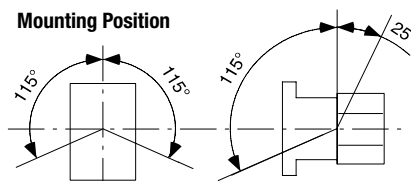
- Dimensions are in millimeters (inches)
- Dimensions not intended for manufacturing purposes

	Catalog Number	a	b	c	c1	c2	ød	d1	d2
AC Contactors	CA7-9...CA7-23; CAQ7-16; CAN7-12, CNX-205...208; CAN7-12, CA(V)L7-20	45 (1-25/32)	80 (3-3/16)	80.5 (3-11/64)	75.5 (3-3/32)	6 (1/4)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-25/64)
	CA7-30...CA7-37; CNX-209; CAN7-30...CAN7-37	45 (1-25/32)	81 (3-3/16)	97.5 (4)	92.6 (3-49/64)	6.5 (17/64)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-25/64)
	CA7-40	59 (2-21/64)	81 (3-3/16)	100.5 (4-7/64)	95.5 (3-49/64)	6.5 (17/64)	2-4.5 (2-3/16)	60 (2-23/64)	45 (1-25/32)
	CA7-43, CNX-212	54 (2-1/8)	81 (3-3/16)	100.5 (4-7/64)	95.5 (3-49/64)	6.5 (17/64)	2-4.5 (2-3/16)	60 (2-23/64)	45 (1-25/32)
	CA7-60...CA7-85 CNX-218	72 (2-53/64)	122 (4-51/64)	117 (4-49/64)	111.5 (4-35/64)	8.5 (21/64)	4-5.4 (4-7/32)	100 (3-15/16)	55 (2-11/64)
	CA7-90	95 (3-3/4)	81 (3-3/16)	117 (4-49/64)	111.5 (4-35/64)	8.5 (21/64)	4-5.4 (4-7/32)	100 (3-15/16)	55 (2-11/64)
True DC Contactors	CA7-9C...CA7-16C, CAQ7-16C CNX-205C...206C; CAN7-12C	45 (1-25/32)	81 (3-3/16)	106.5 (4-3/16)	101.5 (4)	6 (1/4)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-25/64)
	CA7-23C CNX-207C...208C	45 (1-25/32)	81 (3-3/16)	123.5 (4-55/64)	119 (4-43/64)	6 (1/4)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-25/64)
	CA7-30C...CA7-37C; CAQ7-37C; CNX-209C; CAN7-30C...CAN7-37C	45 (1-25/32)	81 (3-3/16)	141.5 (5-37/64)	136.5 (5-3/8)	6.5 (17/64)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-25/64)
	CA7-40C	59 (2-21/64)	81 (3-3/16)	144.5 (5-11/16)	139.5 (5-1/2)	6.5 (17/64)	2-4.5 (2-3/16)	60 (2-23/64)	45 (1-25/32)
	CA7-43C, CNX-212C	54 (2-1/8)	81 (3-3/16)	144.5 (5-11/16)	140 (5-33/64)	6.5 (17/64)	2-4.5 (2-3/16)	60 (2-23/64)	45 (1-25/32)

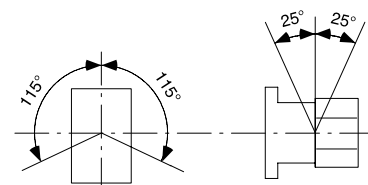
## Reversing Contactors, Capacitor Contactors &amp; Accessories (+...)

Contactors with...		Dim. [mm]	Dim. [inches]
auxiliary contact block-front mounting	2-, or 4-pole	c/c1 + 39	c/c1 + 1-37/64
(CAQ7) capacitor switching deck -front mounting		c/c1 + 39	c/c1 + 1-37/64
auxiliary contact block-side mounting	1-, or 2 pole	a + 9	a + 23/64
pneumatic timing module		c/c1 + 58	c/c1 + 2-23/64
electronic timing module	on coil terminal side	b + 24	b + 15/16
reversing contactor w-mech.interlock	on side of contactor	a+9+a	a+ 23/64+a
mechanical latch		c/c1 + 61	c/c1 + 2-31/64
interface module	on coil terminal side	b + 9	b + 23/64
surge suppressor	on coil terminal side	b + 3	b + 1/8
Labeling with...	label sheet	+0	+0
	marking tag sheet with clear cover	+0	+0
	marking tag adapter for V7 Terminals	+5.5	+7/32

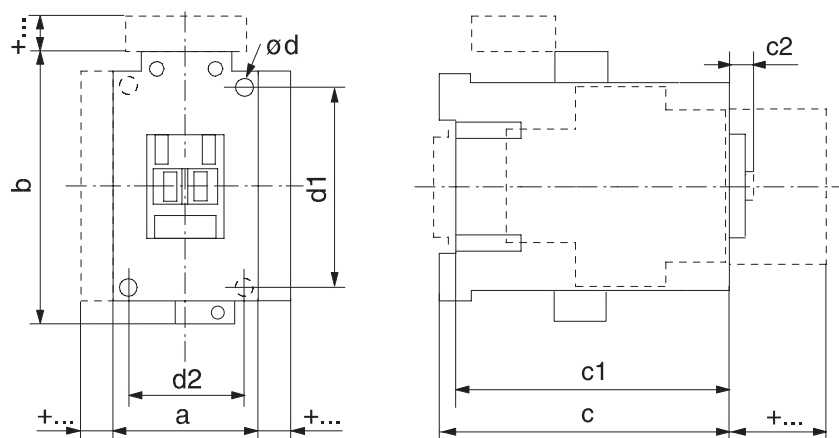
## Mounting Position



AC contactors



True DC contactors

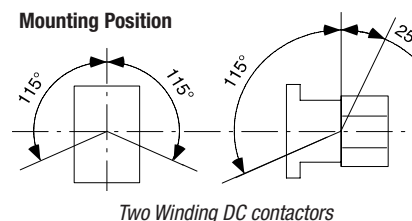
**Series CA7 with Two Winding DC Coil**


- Dimensions are in millimeters (inches)
- Dimensions not intended for manufacturing purposes

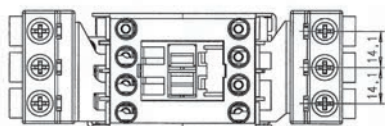
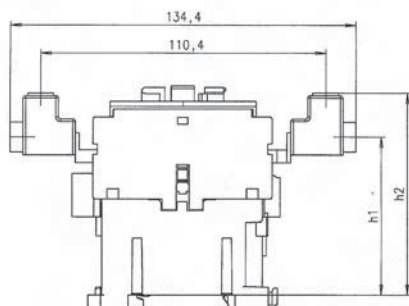
Catalog Number	a	b	c	c1	c2	ød	d1	d2
CA7-9Y...CA7-23Y	54 (2-9/64)	90 (3-35/64)	80.5 (3-11/64)	75.5 (3-3/32)	6 (1/4)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-25/64)
CA7-30Y, CA7-37Y	54 (2-9/64)	90 (3-35/64)	97.5 (4)	92.6 (3-49/64)	6.5 (17/64)	2-4.5 (2-3/16)	60 (2-23/64)	35 (1-25/64)
CA7-43Y	63 (2-31/64)	90 (3-35/64)	100.5 (4-7/64)	95.6 (3-7/8)	6.5 (17/64)	2-4.5 (2-3/16)	60 (2-23/64)	45 (1-25/32)
CA7-60D...CA7-85D	81 (3-3/16)	131 (5-5/32)	117 (4-49/64)	111.5 (4-35/64)	8.5 (21/64)	4-5.4 (4-7/32)	100 (3-15/16)	55 (2-11/64)
CAN7-72D, CNX-218D	95 (3-3/4)	122 (4-51/64)	117 (4-49/64)	111.5 (4-35/64)	8.5 (21/64)	4-5.4 (4-7/32)	100 (3-15/16)	55 (2-11/64)

**Reversing Contactors, Capacitor Contactors & Accessories (+...)**

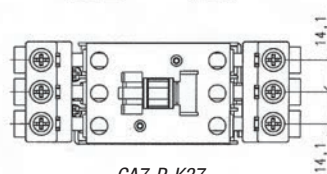
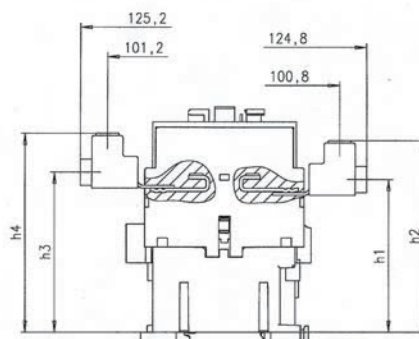
	Contactors with...	Dim. [mm]	Dim. [inches]
auxiliary contact block-front mounting	2-, or 4-pole	c/c1 + 39	c/c1 + 1-37/64
auxiliary contact block- left side mounting	1-, or 2 pole	a + 9	a + 23/64
pneumatic timing module		c/c1 + 58	c/c1 + 2-23/64
electronic timing module	on coil terminal side	b + 24	b + 15/16
mechanical latch		c/c1 + 61	c/c1 + 61
interface module	on coil terminal side	b + 9	c/c1 + 2-31/64
Labeling with...	label sheet	+0	+0
	marking tag sheet with clear cover	+0	+0
	marking tag adapter for V7 Terminals	+5.5	+7/32



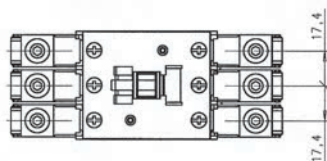
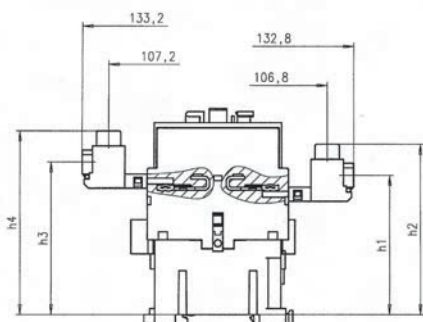
- Dimensions are in millimeters (inches)
- Dimensions not intended for manufacturing purposes



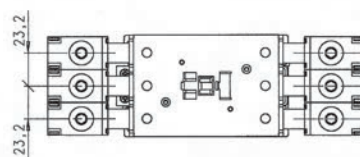
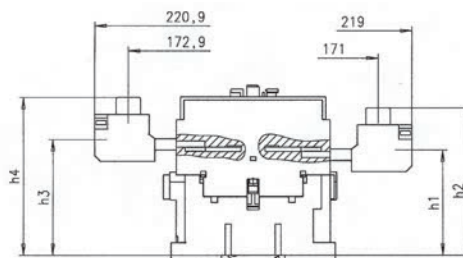
CA7-P-KN23 / KL23



CA7-P-K37



CA7-P-K43

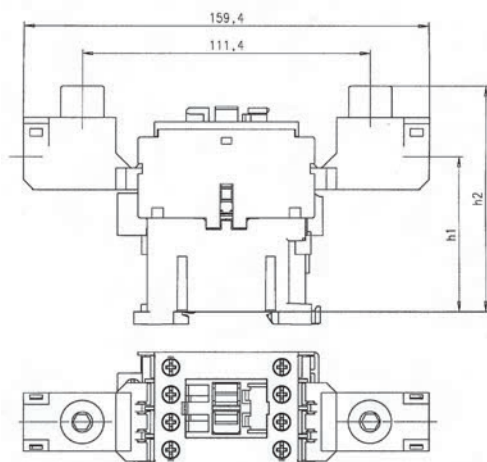


CA7-P-K85

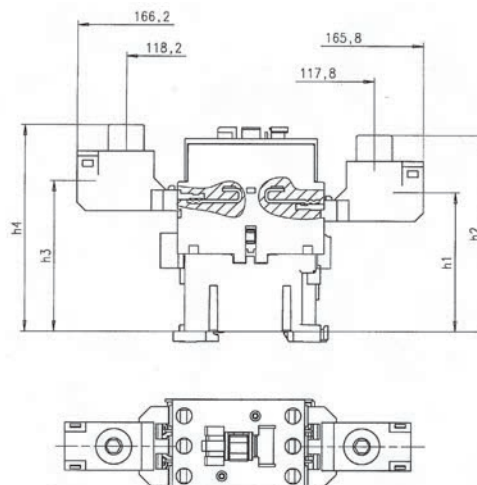
Catalog Number	With Contactor	AC Operated Contactor				DC Operated Contactor			
		h1	h2	h3	h4	h1	h2	h3	h4
CA7-P-KN23 / KL23	CA7-9...16	61.6 (2-27/64)	78.6 (3-3/32)	~	~	87.2 (3-7/16)	104.2 (4-3/32)	~	~
	CA7-23	61.6 (2-27/64)	78.6 (3-3/32)	~	~	105.2 (4-9/64)	122.2 (4-13/16)	~	~
CA7-P-K37	CA7-30 & 37	67.6 (2-21/32)	84.6 (3-21/64)	71.5 (2-13/16)	88.5 (3-31/64)	111.2 (4-3/8)	128.2 (5-3/64)	115.1 (4-17/32)	132.1 (5-13/64)
CA7-P-K43	CA7-43	69.0 (2-23/32)	85.0 (3-11/32)	74.5 (2-15/16)	90.5 (3-9/16)	112.6 (4-7/16)	128.6 (5-1/16)	118.1 (4-21/32)	134.1 (5-9/32)
CA7-P-K85	CA7-60...85	79.7 (3-1/8)	104.7 (4-1/8)	86.7 (3-13/64)	111.7 (4-3/8)	79.7 (3-1/8)	104.7 (4-1/8)	86.7 (3-13/64)	111.7 (4-3/8)

**CA7 Contactors with Paralleling Links**

- Dimensions are in millimeters (inches)
- Dimensions not intended for manufacturing purposes



CA7-P-B23



CA7-P-B37

Catalog Number	With Contactor	AC Operated Contactor				DC Operated Contactor			
		h1	h2	h3	h4	h1	h2	h3	h4
<b>CA7-P-B23</b>	CA7-9...16	65.1 (2-9/16)	90.1 (3-9/16)	~	~	90.7 (1/4)	104.2 (2-3/16)	~	~
	CA7-23	65.1 (2-9/16)	90.1 (3-9/16)	~	~	108.7 (4-9/32)	133.7 (5-17/64)	~	~
<b>CA7-P-K37</b>	CA7-30 & 37	69.0 (2-23/32)	94.0 (3-45/64)	74.5 (2-15/16)	99.5 (3-29/32)	112.6 (4-7/16)	137.6 (5-13/32)	118.1 (4-21/32)	143.1 (5-5/8)



# Economical Devices for High Performance Switching & Control Solutions

## Series D7 Pilot Devices

**22mm Design  
Saves Panel Space**

**Heavy Duty  
Ratings**

**Modular Design  
Reduces Inventory**

**Order Assembled  
or by Component**

### Features

#### TWO OPERATOR TYPES

- Plastic operator with captive front bezel
- Metal operator with die-cast zinc housing and captive shiny metal bezel

#### LESS INVENTORY, MORE CHOICES

- Wide range of style choices
- Modular design for mix and match flexibility
- Endless configurations from core components

#### QUICK, EASY INSTALLATION

- Tool-less mounting latch for quick assembly
- Anti-rotation tab for one person installation
- Snap-on back panel components

#### LONG ELECTRICAL & MECHANICAL LIFE

- 10 million mechanical operations
- 10 million electrical cycles

#### ENVIRONMENTAL RATINGS

- UL Type 4/4X/13, IP66 Sealing
- Chemical resistant industrial grade thermoplastic body
- Corrosion and UV resistant

Sprecher + Schuh's rugged D7 pilot devices offer maximum flexibility and a wide choice for all applications. This 22mm line is aesthetically appealing and modularly designed to make assembly and interchangeability easy. The D7 operators are available in two different body styles to meet every industrial application need. Both operators exhibit a new lower profile stylish appearance while maintaining the rugged performance necessary for demanding environments.



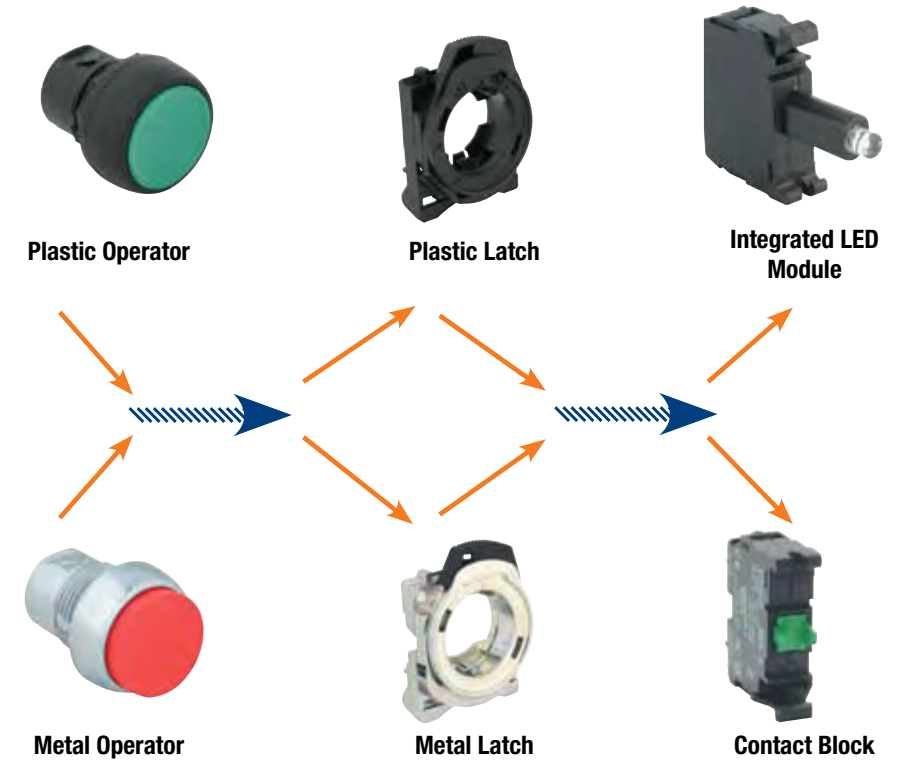
# Fast Mounting

Tool-less, snap-in design for fast assembly



# Flexibility

**D7P**



**D7M**

# Complete Accessories



# Superior Design



# Push Buttons



Extended



Flush Guarded\*

## Illuminated

### Momentary, Extended Plastic Metal

- D7P-LE0 D7M-LE0
- D7P-LE3 D7M-LE3
- D7P-LE4 D7M-LE4
- D7P-LE5 D7M-LE5
- D7P-LE6 D7M-LE6
- D7P-LE7 D7M-LE7
- D7P-LE9 D7M-LE9

### Momentary, Flush\* Plastic Metal

- D7P-LF0 D7M-LF0
- D7P-LF3 D7M-LF3
- D7P-LF4 D7M-LF4
- D7P-LF5 D7M-LF5
- D7P-LF6 D7M-LF6
- D7P-LF7 D7M-LF7
- D7P-LF9 D7M-LF9

### Maintained, Flush Plastic Metal

- D7P-LFA0 D7M-LFA0
- D7P-LFA3 D7M-LFA3
- D7P-LFA4 D7M-LFA4
- D7P-LFA5 D7M-LFA5
- D7P-LFA6 D7M-LFA6
- D7P-LFA7 D7M-LFA7
- D7P-LFA9 D7M-LFA9

\* Guarded available on Momentary Flush only

## Non-Illuminated

### Momentary, Extended Plastic Metal

- D7P-E0 D7M-E0
- D7P-E1 D7M-E1
- D7P-E2 D7M-E2
- D7P-E3 D7M-E3
- D7P-E4 D7M-E4
- D7P-E5 D7M-E5
- D7P-E6 D7M-E6
- D7P-E9 D7M-E9

### Momentary, Flush\* Plastic Metal

- D7P-F0 D7M-F0
- D7P-F1 D7M-F1
- D7P-F2 D7M-F2
- D7P-F3 D7M-F3
- D7P-F4 D7M-F4
- D7P-F5 D7M-F5
- D7P-F6 D7M-F6
- D7P-F9 D7M-F9

### Maintained, Flush Plastic Metal

- D7P-FA0 D7M-FA0
- D7P-FA1 D7M-FA1
- D7P-FA2 D7M-FA2
- D7P-FA3 D7M-FA3
- D7P-FA4 D7M-FA4
- D7P-FA5 D7M-FA5
- D7P-FA6 D7M-FA6
- D7P-FA9 D7M-FA9

\* Guarded available on Momentary Flush only

## Illuminated 40mm Mushroom, Momentary

### Plastic Metal

- D7P-LMM3 D7M-LMM3
- D7P-LMM4 D7M-LMM4
- D7P-LMM5 D7M-LMM5
- D7P-LMM6 D7M-LMM6
- D7P-LMM7 D7M-LMM7



Also available in 60mm Mushroom

## Non-Illuminated 40mm Mushroom, Momentary

### Plastic Metal

- D7P-MM42 D7M-MM42
- D7P-MM43 D7M-MM43
- D7P-MM44 D7M-MM44
- D7P-MM45 D7M-MM45
- D7P-MM46 D7M-MM46

# Push-Pull Operators



## 2 Position Illuminated

### Push-Pull, 40mm Mushroom Plastic Metal

- D7P-LMP43 D7M-LMP43
- D7P-LMP44 D7M-LMP44
- D7P-LMP45 D7M-LMP45

### Complete Unit

- 1NC: D7P-LMP44PX01 D7M-LMP44PX01
- 1 Guardian: D7P-LMP44PX01S D7M-LMP44PX01S



## 2 Position Non-Illuminated

### Push-Pull, 40mm Mushroom Plastic Metal

- D7P-MP42 D7M-MP42
- D7P-MP44 D7M-MP44

### Complete Unit

- 1NC: D7P-MP44PX01 D7M-MP44PX01
- 1 Guardian: D7P-MP44PX01S D7M-MP44PX01S



## 3 Position Illuminated

### Push-Pull, 40mm Mushroom Momentary Maintained

- D7M-LMM40-E3 D7M-LMP40-E3
- D7M-LMM43-E3 D7M-LMP43-E3
- D7M-LMM44-E3 D7M-LMP44-E3
- D7M-LMM46-E3 D7M-LMP46-E3
- D7M-LMM47-E3 D7M-LMP47-E3



## 3 Position Non-Illuminated

### Push-Pull, 40mm Mushroom Momentary Maintained

- D7M-MM42-E3 D7M-MP42-E3
- D7M-MM43-E3 D7M-MP43-E3
- D7M-MM44-E3 D7M-MP44-E3

# Emergency Stops



## Illuminated

### Twist-to-release, 40mm Mushroom

### Plastic Metal

D7P-LMT44 D7M-LMT44

### Complete Unit

- 1NC: D7P-LMT44PX01 D7M-LMT44PX01
- 1 Guardian: D7P-LMT44PX01S D7M-LMT44PX01S



## Non-Illuminated

### Twist-to-release, 30mm Mushroom

### Plastic Metal

D7P-MT34 D7M-MT34

### Complete Unit

- 1NC: D7P-MT34PX01 D7M-MT34PX01
- 1 Guardian: D7P-MT34PX01S D7M-MT34PX01S



## Keyed

### Twist-to-release, 40mm Mushroom

### Plastic Metal

D7P-MK44 D7M-MK44

### Complete Unit

- 1NC: D7P-MK44PX01 D7M-MK44PX01
- 1 Guardian: D7P-MK44PX01S D7M-MK44PX01S



## Twist-to-release, 40mm Mushroom

### Plastic Metal

D7P-MT44 D7M-MT44

### Complete Unit

- 1NC: D7P-MT44PX01 D7M-MT44PX01
- 1 Guardian: D7P-MT44PX01S D7M-MT44PX01S



## Twist-to-release, 60mm Mushroom

### Plastic Metal

D7P-MT64 D7M-MT64

### Complete Unit

- 1NC: D7P-MT64PX01 D7M-MT64PX01
- 1 Guardian: D7P-MT64PX01S D7M-MT64PX01S

# Pilot Lights



## Plastic

- D7P-P0
- D7P-P3
- D7P-P4
- D7P-P5
- D7P-P6
- D7P-P7
- D7P-P9

## Metal

- D7M-P0
- D7M-P3
- D7M-P4
- D7M-P5
- D7M-P6
- D7M-P7
- D7M-P9

○ Pilot light without lens or diffuser

# Reset Operators



## Mechanical and/or Electrical Reset

### Plastic

- D7P-R1
- D7P-R2
- D7P-R6

### Metal

- D7M-R1
- D7M-R2
- D7M-R6

PUSH buttons

MONOLITHIC

emergency STOP

SELECTOR switches

MULTIfunction push buttons

COMPONENTS

PILOT lights

PUSH-PULL operators

RESET operators

OTHER switches

## Monolithic



### Indicator Light

LED	Incandescent
• D7D-P0N♣	D7D-P0D♣
• D7D-P3N♣	D7D-P3D♣
• D7D-P4N♣	D7D-P4D♣
• D7D-P5N♣	D7D-P5D♣
• D7D-P6N♣	D7D-P6D♣
○ D7D-P7N♣	D7D-P7D♣

♣ Select lamp voltage and terminal type

### Push Button

Non-Illuminated, Plastic, Momentary

Flush Cap	Extended Cap
○ D7D-F1♣	D7D-E1♣
• D7D-F2♣	D7D-E2♣
• D7D-F3♣	D7D-E3♣
• D7D-F4♣	D7D-E4♣
• D7D-F5♣	D7D-E5♣
• D7D-F6♣	D7D-E6♣

♣ Select cap text and contact configuration



### E-STOP Push Button

Push-Pull and Twist-to-release, 40mm Mushroom, Plastic

D7D-MT44X01	1NC
D7D-MT44X11	1NO 1NC
D7D-MT44X02	2NC



### Selector Switch

Non-Illuminated, Plastic

2 Position, Maintained	
• D7D-SM22X10	1NO
• D7D-SM22X01	1NC
• D7D-SM22X20	2NO
• D7D-SM22X02	2NC
• D7D-SM22X11	1NO, 1NC
3 Position, Maintained	
• D7D-SM32X20	2NO
• D7D-SM32X02	2NC
• D7D-SM32X11	1NO, 1NC

Also available with spring return

## Selector Switches



### Non-Illuminated

#### 2 Position, Maintained

Plastic	Metal
• D7P-SM22	D7M-SM22

Also available with spring return



#### 3 Position, Maintained

Plastic	Metal
• D7P-SM32	D7M-SM32



### Illuminated

#### 2 Position, Maintained

Plastic	Metal
• D7P-LSM20	D7M-LSM20
• D7P-LSM23	D7M-LSM23
• D7P-LSM24	D7M-LSM24
• D7P-LSM25	D7M-LSM25
• D7P-LSM26	D7M-LSM26
○ D7P-LSM27	D7M-LSM27



#### 3 Position, Maintained

Plastic	Metal
• D7P-LSM30	D7M-LSM30
• D7P-LSM33	D7M-LSM33
• D7P-LSM34	D7M-LSM34
• D7P-LSM35	D7M-LSM35
• D7P-LSM36	D7M-LSM36
○ D7P-LSM37	D7M-LSM37

## Multi-function



### Illuminated

#### 2 Function

Plastic	Metal
D7P-LU2X	D7M-LU2X



### Non-Illuminated

#### 2 Function

Plastic	Metal
D7P-U2X	D7M-U2X



#### 3 Functions

Plastic	Metal
D7P-U3X	D7M-U3X

## Other Switches



### Toggle Switch

Metal

#### 2 Position

D7M-JR2	Momentary
D7M-JM2	Maintained

#### 4 Position

D7M-JR4	Momentary
D7M-JM4	Maintained



### Key Selector Switches

2 Position, Maintained	
Plastic	Metal
D7P-KM21	D7M-KM21
D7P-KM22	D7M-KM22
D7P-KM23	D7M-KM23

3 Position, Maintained	
Plastic	Metal
D7P-KM31	D7M-KM31
D7P-KM33	D7M-KM33
D7P-KM34	D7M-KM34
D7P-KM35	D7M-KM35

Also available with spring return



### Potentiometer

Single Turn, Assembled

Plastic	Resistive Element
D7P-P0T	None (Operator Only)
D7P-P0T1	150 Ω
D7P-P0T2	500 Ω
D7P-P0T3	1000 Ω
D7P-P0T4	2500 Ω
D7P-P0T5	5000 Ω
D7P-P0T6	10000 Ω



### Selector/Jog Operators

2 Position	
Plastic	Metal
• D7P-SJ22	D7M-SJ22
• D7P-SJ23	D7M-SJ23

3 Position	
Plastic	Metal
• D7P-SJ32	D7M-SJ32
• D7P-SJ33	D7M-SJ33

## Components



### Contact Blocks

(latch not included)

D7-X10	1NO
D7-X01	1NC
D7-X01B	1NC Early Break
D7-X10E	1NO Early Make
D7-X01L	1NC Late Break
D7-X10V(1mA)	1NO Low Voltage
D7-X01V(1mA)	1NC Low Voltage
D7-X01S	Guardian Block
D7-Q10	1NO Screwless
D7-Q01	1NC Screwless



### Integrated LED Module

(latch not included)

#### Screw Type

D7-N3*	24V AC/DC
D7-N5*	120V AC
D7-N7*	240V AC

#### Spring-Clamp

D7-Q3*	24V AC/DC
D7-Q5*	120V AC
D7-Q7*	240V AC

\* Add LED Color, R=red, G=green, Y=yellow, B=blue, W=white



Plastic Latch  
D7-ALP



Metal Latch  
D7-ALM



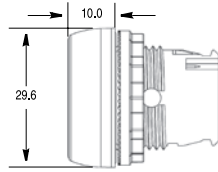
### Incandescent Power Module

(bulb not included)

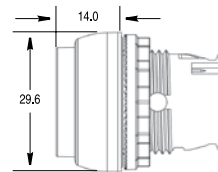
D7-D0C	6-240V AC/DC
--------	--------------

## Dimensions\* (Approximately in millimeters)

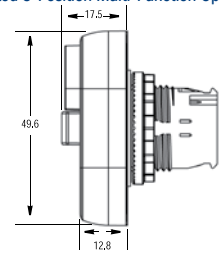
Non-Illuminated and Illuminated  
Flush Push Button Operators (D7x-F)



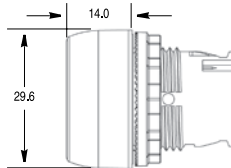
Illuminated and Non-Illuminated  
Extended Push Button Operators



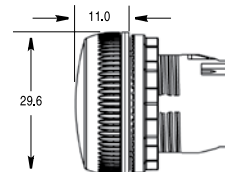
Non-Illuminated 3-Position Multi-Function Operators (D7x-U3)



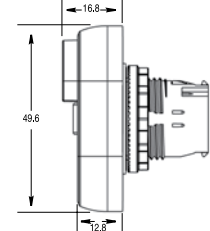
Non-Illuminated Guarded and Non-Illuminated  
Maintained Push Button Operators (D7x-G and D7x-FA)



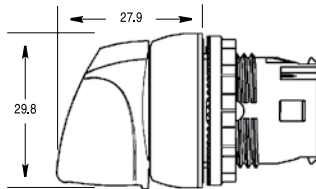
Pilot Light Operators (D7x-P)



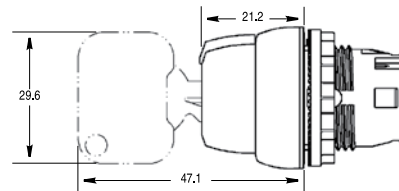
Illuminated and Non-Illuminated 2-Position Multi-Function  
Operators (D7x-LU2 & D7x-U2)



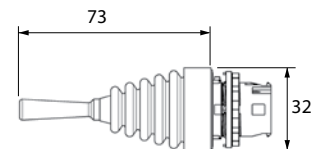
Illuminated and Non-Illuminated Knob Selector Switch  
Operators (D7x-LS & D7x-S)



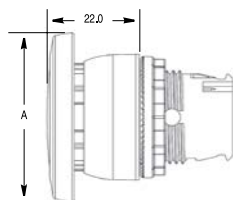
Key Selector Switch Operators (D7x-K)



Toggle Switch Operators (D7M-JM)

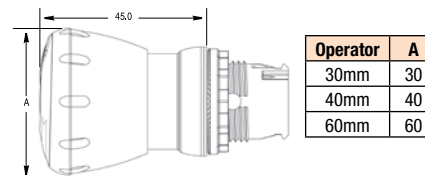


Illuminated and Non-Illuminated  
Momentary Mushroom Operators  
40mm and 60mm (D7x-LMM & D7x-MM)



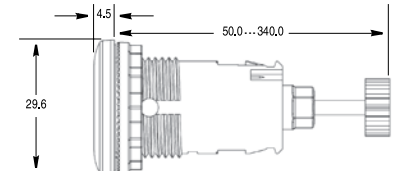
Operator	A
40mm	39.8
60mm	59.8

Illuminated and Non-Illuminated Twist-to-Release  
Operators 30mm, 40mm, and 60mm (D7x-MT)

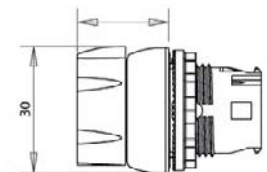


Operator	A
30mm	30
40mm	40
60mm	60

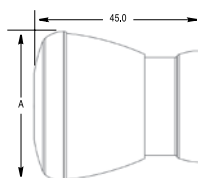
Reset Operators (D7x-R)



Selector Jog Operators (D7x-SJ)

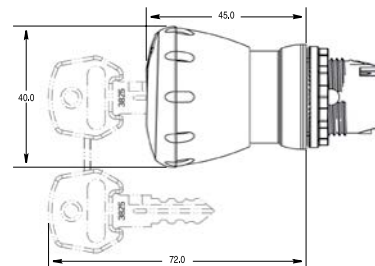


Illuminated and Non-Illuminated  
Push-Pull Mushroom Operators 30mm, 40mm, and 60mm  
(D7x-MP)

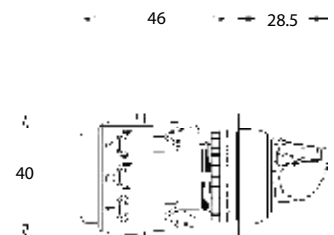


Operator	A
30mm	30
40mm	40
60mm	60

Mushroom Key Release Operator 40mm (D7x-MK)



Potentiometer with Resistive Element (D7P- POT)



\* For Monolithic Devices see the D7D Monolithic Flyer



[CATALOGUE TB2-CAT]

# TEMBREAK 2 MOULDED CASE CIRCUIT BREAKERS

INDUSTRIAL SWITCHGEAR &amp; AUTOMATION SPECIALISTS



*TemBreak*

# NHP



Beyond the Standard™

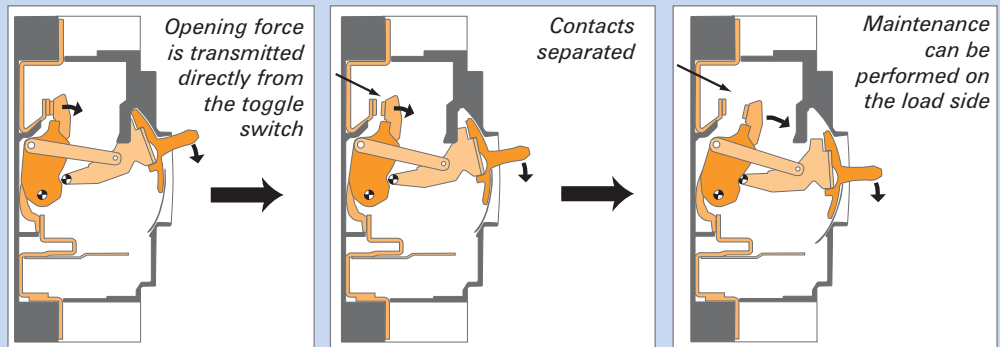
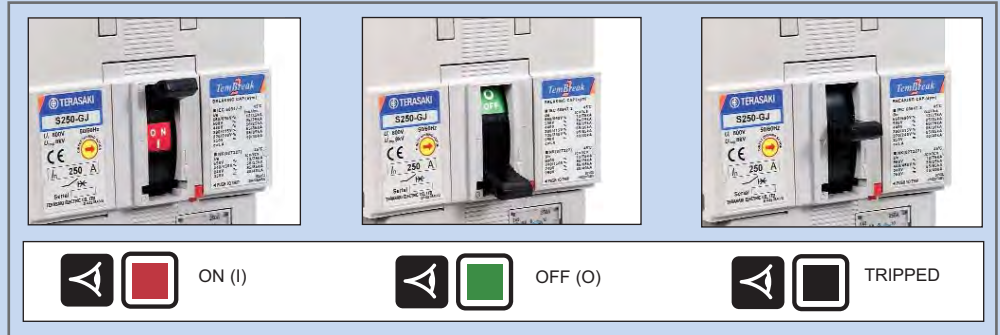
**TemBreak**

Simply.....

**Beyond the Standard™**

- Easy accessory fitting
- Double insulated MCCB
- 125 / 250 A adjustment flexibility
- Clear contact status
- Symmetrical design
- Elec / Mech endurance
- Low temperature rise
- Higher harmonic immunity
- High insulation voltage

## MAIN CONTACT / TOGGLE STATUS VISIBILITY



TemBreak 2 MCCBs are marked with the IEC symbol indicating Direct Opening Action. The robust mechanism ensures that the force applied to the toggle is transmitted directly to the contacts.

## Isolation and Machine Safety

Complies with direct action contact status requirements.



## TEMBREAK 2

*Simply flexible*

### Positive OFF/ON operation.

The toggle mechanism is directly driven by the MCCB main contacts. The label logo below indicates this fact.

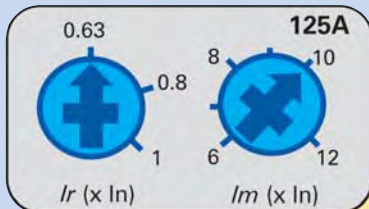


Thermal Magnetic or  
Electronic Trip units



Common internal  
accessories 125 - 630 A

All internal and external  
accessories are field  
installable



### Thermal Magnetic 125 A, 250 A and 400 A MCCBs

- MCCBs are fitted with adjustable thermal AND adjustable magnetic current adjustment dials

### Electronic MCCB range

- From 50 A to 630 A
- 2 frame sizes: 250 A and 400/630 A



## ELECTRICAL CHARACTERISTICS

According to IEC 60947-2, EN 60947-2, JIS C 8201-2, AS/NZS 3947-2, NEMA

Quantity Units Condition														
Maximum rated current	In	A	45/50 °C	125						160				
Model				E125	S125			H125	L125	S160			H160	L160
Number of poles				3, 4	1	3, 4		3, 4	3, 4	1	3, 4		3, 4	3, 4
Type				NJ	NF	NJ	GJ	NJ	NJ	NF	NJ	GJ	NJ	NJ
Rated Breaking Capacity	Icu	kA	690 V AC	-	-	6	6	20	25	-	7.5	7.5	20	25
			440 V AC	15	-	25	50	85	125	-	25	50	85	125
			380/415 V AC	25	25*	36	65	125	200	25*	36	65	125	200
			220/240 V AC	35	25	50	85	150	200	25	65	85	150	200
			250 V DC	25	-	25	40	40	40	-	40	40	40	40
	Ics	kA	690 V AC	-	-	6	6	15	20	-	7.5	7.5	15	20
			440 V AC	12	-	25	25	65	100	-	25	25	65	100
			380/415 V AC	19	13*	30	33	85	150	19*	36	36	85	150
			220/240 V AC	27	13	50	85	150	150	19	65	85	150	150
			250 V DC	19	-	19	40	40	40	-	40	40	40	40
Rated Breaking Capacity, NEMA	kA	480 V AC	8	-	22	25	45	65	-	22	25	45	65	
		240 V AC	35	25*	50	85	150	200	25	65	85	150	200	
Outline Dimensions	h	mm		155				165		165		165	165	
	w	mm	3 pole, (1 pole)	90, (30)				105		(35)		105	105	
	w	mm	4 pole	120				140		140		140	140	
	d	mm		68				103		68		103	103	
Utilisation Category				A	A	A	A	A	A	A	A	A	A	A
Available Protection Units	Adjustable thermal, adjustable magnetic													
	Fixed thermal, fixed magnetic													
	Microprocessor													

These characteristics are the same for all products on this page.

Rated AC and DC insulation voltage	Ui	V	800
Rated impulse withstand voltage	Uimp	kV	8
Rated operational voltage	Ue	V	AC 690
Suitable for isolation	Yes		
Direct opening action	Yes		



12 A to 125 A application

12 A to 250 A application

\* Breaking capacity shown is at 1/√3 times the standard voltage.

TemBreak 2 switch-disconnectors are available with the same frame dimensions as the MCCBs.

MOULDED CASE CIRCUIT BREAKERS

NHP

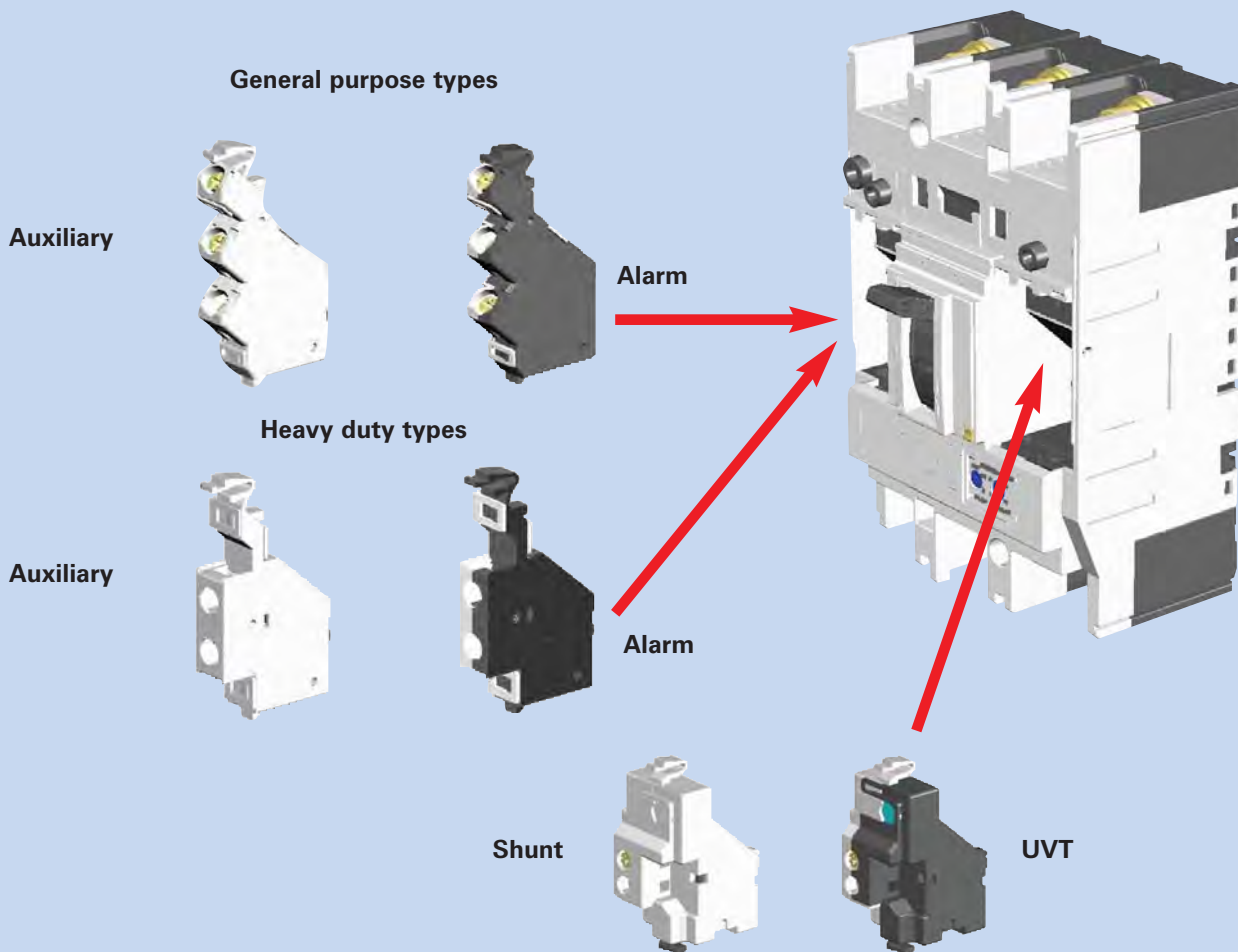
250						400										630		
E250	S250			H250	L250	E400	S400					H400		L400		E630	S630	
3, 4	3, 4			3, 4	3, 4	3, 4	3, 4					3, 4		3, 4		3, 4	3, 4	
NJ	NJ	GJ	PE	NJ	NJ	NJ	CJ	NJ	NE	GJ	GE	NJ	NE	NJ	NE	NE	CE	GE
-	7.5	7.5	20	20	25	-	15	20	20	20	20	35	35	50	50	10	20	20
15	25	50	50	85	125	22	30	45	30	50	50	85	85	125	125	25	45	50
25	36	65	70	125	200	25	36	50	50	70	70	125	125	200	200	36	50	70
35	65	85	125	150	200	35	50	85	85	100	100	150	150	200	200	50	85	100
25	40	40	-	40	40	25	40	40	-	40	-	40	-	40	-	-	-	-
-	7.5	7.5	15	15	20	-	15	15	15	15	15	35	35	50	50	10	15	15
12	25	25	50	65	100	22	30	45	45	45	45	65	65	100	100	25	45	45
19	36	36	70	85	150	25	36	50	50	50	50	85	85	150	150	36	50	50
27	65	85	125	150	150	35	50	85	85	85	85	150	150	150	150	50	85	85
19	40	40	-	40	40	19	40	40	-	40	-	40	-	40	-	-	-	-
10	22	25	35	45	65	15	22	25	25	30	30	45	45	65	65	15	25	30
35	65	85	125	150	200	35	50	85	85	100	100	150	150	200	200	50	85	100
165				165		260										260		
105				105		140										140		
140				140		185										185		
68				103		103										103		
A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A



125 A to 630 A application

## INTERNAL ACCESSORIES

*One size fits all!*



## SMART ACCESSORIES



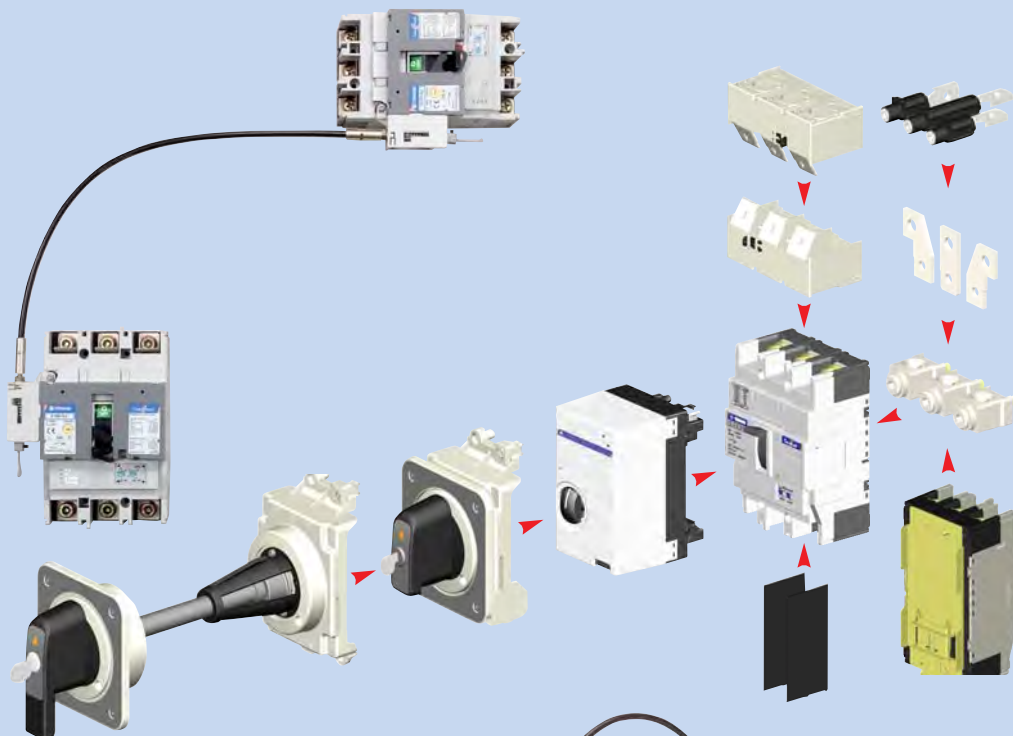
## SIMPLY SAFE

- Common accessory range from 125AF to 630AF
- Double insulated MCCB allowing accessory fitting while "live"
- TemBreak 2 accessory types reduce part numbers, stock, make supply more customer friendly, reduce lead times
- All accessories meet IEC 60 947-5, AS/NZS 3947-5
- Endurance tested accessories - not normally done by many manufacturers

## MOULDED CASE CIRCUIT BREAKERS

**NHP**

### EXTERNAL ACCESSORIES



*Simple to fit*



#### TemPlug

A simple plug in method for MCCBs 125 A to 630 A



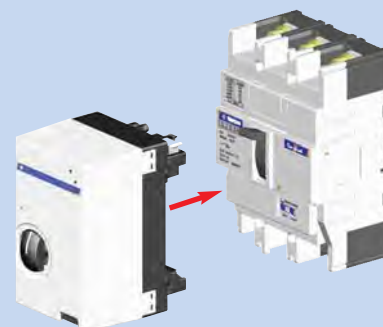
#### Transfer switch Link interlock

Allows for handles and motors to be mounted



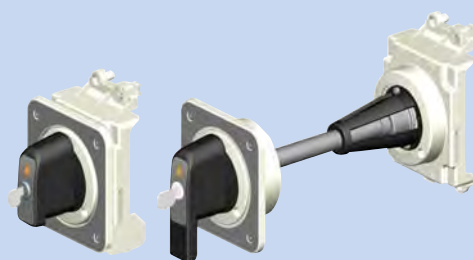
#### Transfer switch Wire interlock

Horizontal, vertical or diagonal MCCB mounting allows for handles and motors to be mounted



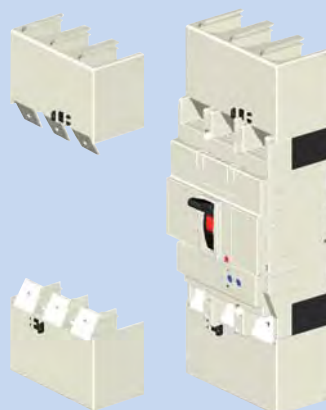
#### Motor fitting

Simple, quick installation in seconds requiring no tools on 125 A / 250 A MCCBs. Larger MCCBs only require a screwdriver



#### Variable and fixed depth handles

Simple, quick installation in seconds requiring no tools on 125 A / 250 A MCCBs. Larger MCCBs only require a screwdriver. IP 54 or IP 65 handles



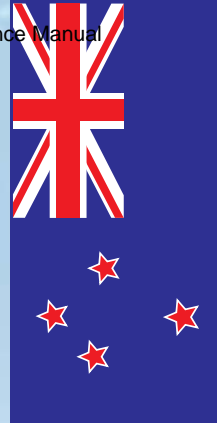
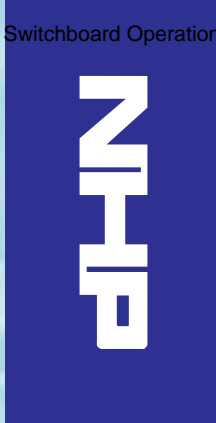
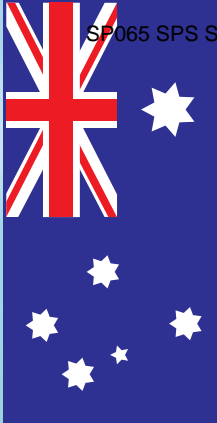
#### Terminal covers

Slide-on and click into place, no tools required



#### Plug in MCCB

Safety interlock standard to maximise safety



## AUSTRALIA [www.nhp.com.au](http://www.nhp.com.au)

**VICTORIA**  
**MELBOURNE HEADQUARTERS**  
43-67 River Street  
Richmond Victoria 3121  
**Telephone +61 3 9429 2999**  
**Fax +61 3 9429 1075**  
Email [mel-sales@nhp.com.au](mailto:mel-sales@nhp.com.au)

**NATIONAL DISTRIBUTION AND  
MANUFACTURING CENTRE**  
104-106 William Angliss Drive  
Laverton North Victoria 3026  
**Telephone +61 3 9429 2999**  
**Fax +61 3 9368 2997**  
Email [mel-sales@nhp.com.au](mailto:mel-sales@nhp.com.au)

**TASMANIA**  
**HOBART**  
2/65 Albert Road  
Moonah Tasmania 7009  
**Telephone +61 3 6228 9575**  
**Fax +61 3 6228 9757**  
Email [tas-sales@nhp.com.au](mailto:tas-sales@nhp.com.au)

**QUEENSLAND**  
**BRISBANE**  
16 Riverview Place  
Murarrie Queensland 4172  
**Telephone +61 7 3909 4999**  
**Fax +61 7 3399 9712**  
Email [bris-branch@nhp.com.au](mailto:bris-branch@nhp.com.au)

**TOWNSVILLE**  
62 Leyland Street  
Garbutt Queensland 4814  
**Telephone +61 7 4779 0700**  
**Fax +61 7 4775 1457**  
Email [tsv-branch@nhp.com.au](mailto:tsv-branch@nhp.com.au)

**ROCKHAMPTON**  
14 Robison Street  
Rockhampton Queensland 4701  
**Telephone +61 7 4927 2277**  
**Fax +61 7 4922 2947**  
Email [rkh-branch@nhp.com.au](mailto:rkh-branch@nhp.com.au)

**TOOWOOMBA**  
Cnr Carroll St & Struan Crt  
Toowoomba Queensland 4350  
**Telephone +61 7 4634 4799**  
**Fax +61 7 4633 1796**  
Email [too-branch@nhp.com.au](mailto:too-branch@nhp.com.au)

**CAIRNS**  
2/1 Bramp Close  
Portsmith Queensland 4870  
**Telephone +61 7 4035 6888**  
**Fax +61 7 4035 6999**  
Email [cns-branch@nhp.com.au](mailto:cns-branch@nhp.com.au)

**NEW SOUTH WALES**  
**SYDNEY**  
30-34 Day Street North  
Silverwater New South Wales 2128  
**Telephone +61 2 9748 3444**  
**Fax +61 2 9648 4353**  
Email [syd-branch@nhp.com.au](mailto:syd-branch@nhp.com.au)

**NEWCASTLE**  
575 Maitland Road  
Mayfield West New South Wales 230  
**Telephone +61 2 4960 2220**  
**Fax +61 2 4960 2203**  
Email [ncl-branch@nhp.com.au](mailto:ncl-branch@nhp.com.au)

**SOUTH AUSTRALIA**  
**ADELAIDE**  
36-38 Croydon Road  
Keswick South Australia 5035  
**Telephone +61 8 8297 9055**  
**Fax +61 8 8371 0962**  
Email [adl-branch@nhp.com.au](mailto:adl-branch@nhp.com.au)

**WESTERN AUSTRALIA**  
**PERTH**  
38 Belmont Ave  
Rivervale Western Australia 6103  
**Telephone +61 8 9277 1777**  
**Fax +61 8 9277 1700**  
Email [per-branch@nhp.com.au](mailto:per-branch@nhp.com.au)

**NORTHERN TERRITORY**  
**DARWIN**  
3 Steele Street  
Winnellie Northern Territory 0820  
**Telephone +61 8 8947 2666**  
**Fax +61 8 8947 2049**  
Email [dar-branch@nhp.com.au](mailto:dar-branch@nhp.com.au)

## NEW ZEALAND [www.nhp-nz.com](http://www.nhp-nz.com)

**AUCKLAND**  
7 Lockhart Place  
Mt Wellington Auckland  
**Telephone +64 9 276 1967**  
**Fax +64 9 276 1992**  
Email [sales@nhp-nz.com](mailto:sales@nhp-nz.com)

**CHRISTCHURCH**  
85 Gasson Street  
Sydenham Christchurch  
**Telephone +64 3 377 4407**  
**Fax +64 3 377 4405**  
Email [sales@nhp-nz.com](mailto:sales@nhp-nz.com)



# D Series

## Data Radio Modem

### DR900 - Digital Radios

Trio DataCom's **D Series** are high performance cost effective data radio modems designed as an alternative to hard wired data transport. Transmit your data over radio with a fully integrated data radio modem designed for fixed point-to-point and point-to-multipoint applications.

The **D Series** is available as either a half duplex or a full duplex\* 853-929 MHz +/- 5MHz radio, including a fully integrated 4800 / 9600 bps data modem. These units operate equally well in either a stand-alone configuration, or as part of a large communication system.

This complete package forms an attractively priced product for the transmission of data over radio in fixed applications thus providing a viable alternative to costly networks of buried media.



#### Features:

- ❖ Fully integrated half and full duplex\* radio and modem
- ❖ Transparent and non-intrusive remote diagnostic facilities (Optional)
- ❖ Inbuilt data routing and multiplexing capabilities, multi-port operation
- ❖ Simultaneous delivery of multiple protocols using Trio DataCom's unique MultiStream™ technology
- ❖ Digital Signal Processing (DSP) modem
- ❖ Selectable 300-19,200 bps asynchronous RS232 user interface
- ❖ Built-in antenna diplexer\*
- ❖ Integrated supervisory data channel
- ❖ Unique collision avoidance facility, for unsolicited report-by-exception
- ❖ Software selectable configuration parameters
- ❖ Internal repeater operation
- ❖ Housed in an attractive yet robust metal enclosure
- ❖ Range of ancillary equipment - full duplex base / repeater stations and hot-standby base station

#### Radio

The **D Series** radio has been designed to meet worldwide regulatory guidelines, including FCC, and has adjustable power output up to 5 Watts. This fully synthesised radio is programmable in 6.25/7.5 kHz increments to accommodate various worldwide channel spacings. The receiver section has a wide tuning range with an excellent signal-to-noise ratio. Exceptional frequency stability is achieved by intelligent microprocessor controlled temperature compensation. An extended operating temperature range of -30 to 60°C makes the unit ideal for commercial and industrial applications.

#### Modem

The in-built modem includes a custom DSP developed for data communications over narrow band radio systems.

This system offers minimum occupied bandwidth and optimal data integrity (using the standard HDLC protocol with CCITT CRC error detection) inhibiting the transfer of any rogue unwanted data caused by interference or squelch headers / tails.

The Trio DataCom DSP provides:

- the interface between the asynchronous RS232 user communication and the synchronous radio link layer.
- an inbuilt multiplexer / router which allows for simultaneous transportation of multiple protocols over the one radio network.

#### Applications

The **D Series** is ideal for use in a variety of sophisticated and critical SCADA and Distributed Information Systems, where complex routing of multiple data protocols and remote diagnostics and wireless network management are important factors.

Remote units and a number of full duplex base station / repeater models, suitable for a variety of requirements, make up the **D Series**. At the top of the range, the DH model is a genuine, duplicated hot standby base for systems where nothing short of ultra reliability is acceptable.

**Telemetry Systems** - Utilities (Gas, Water, Electricity), Railways, Mining, Telecommunications, Industry. Where network status, system control, data collection and fault conditions are required.

**Transaction Processing** - Point of Sale Credit Terminals, Stock Control, Direct Order, Banks, Building Societies, Stock Brokers, Gambling Organizations, etc, where Point of Sale, inventory, credit, or transaction data requires collection and distribution.

**Common Carrier Data Services** - The high speed, low cost and spectrum efficiency of this device make it well suited to all forms of common carrier data networking.

**Alarm Monitoring** - Fire, Power, Intrusion & Essential Services Alarm Reporting.

## D Series - Data Radio Modem

### DR900 - Digital Radios

#### Configuration

Configuration using Trio's **D Series** programming software (DRProg) is completely Windows® based for all parameters, such as; frequency, transmitter power, digital mute level, PTT timer, system configurations, port settings.

#### Network Management & Diagnostic (Optional)

A large distributed network, or even a simple point-to-point link, requires comprehensive fault reporting and diagnostics to ensure a high level of availability. Trio **D Series** data radio modem products offer sophisticated in-built diagnostics using the optional **TView™** software. This capability allows the customer to remotely monitor and maintain their system, minimising the likelihood of failures, by pointing out component degradation and decreasing the time to diagnose and repair. There is no necessity to visit the master station or interfere with the host data integrity, other than additional data transfer. For further details, consult the **TView** data sheet.

#### Specifications:

RADIO	
Frequency Range**	853-929 MHz +/- 5MHz
Channel Selection	Fully programmable
Frequency Splits	76 MHz Tx/Rx frequency split available including simplex
Frequency Stability	±1ppm (-10 to 60°C ambient, opt. -30 to 70°C) Higher frequency stability options are available due to intelligent processor controlled temperature compensation
Aging	≤ 1ppm/annum
Half / Full Duplex	half duplex or full duplex*
Data Rate (rf)	4800 / 9600 bps
Configuration	All configuration via Windows software
TRANSMITTER	
Tx Power	5 W (+37 dBm) or 1 W* (+30 dBm) (software programmable)
Modulation	Narrow band digital filtering binary GMSK
Occupied Bandwidth	Meets various international regulatory guidelines for point-to-point and point-to-multipoint
Tx Attach Time	< 1 mSecond
Timeout Timer	Programmable 1-255 seconds
Tx Spurious	≤ -65 dBm
RECEIVER	
Sensitivity	-115 dBm for 12 dB SINAB
Blocking	> 75 dB (EIA)
Intermodulation	≤ 70 dB (EIA)
Spurious Response	≤ 70 dB (EIA)
Select. and Desense	70 dB (EIA)
AFC Tracking	±3 kHz tracking @ -90 dBm/attack time <10 mS
Mute	Programmable digital mute

#### Collision Avoidance

A unique fully integrated, yet independent, low speed supervisory data channel embedded within the primary bit-stream provides collision avoidance facilities which are transparent to the user. The use of this feature makes this product ideally suited for reliable, error free data transmissions between stations in high density point-to-multipoint data networks.

The benefits include:

- Multiple asynchronous applications operating on the one radio channel.
- Enhanced performance of report-by-exception networks.

#### Related Products

- ❖ Base Stations (DB900)
- ❖ Hot Standby Base Station (DH900)
- ❖ 9 Port Stream Router Multiplexer (MSR)
- ❖ Network Management and Diagnostic Software (TView™)
- ❖ D Series Programming Software (DRProg™)

CONNECTIONS	
User Data Port	2 x DB9 RS232 female ports
Antenna	SMA female bulkhead (optional N)
Power	2 pin locking. Mating connector supplied
MODEM	
Data Serial Port #1	Full duplex, DB9 RS232, DCE (modem), 300-19,200 bps asynchronous, hardware/software handshaking
Data Serial Port #2	Full duplex, DB9 RS232, 300-9600 bps asynchronous, software handshaking
Data Storage	On-board RAM
Channel Data Rate	4800 / 9600 bps, full duplex
Bit Error Rate	< 1x10 <sup>-6</sup> @ -108 dBm (4800 bps) < 1x10 <sup>-6</sup> @ -105 dBm (9600 bps)
Collision Avoidance	Trio DataCom's unique supervisory channel C/DSMA collision avoidance system
MultiStream™	Trio DataCom's unique simultaneous delivery of multiple data streams (protocols)
GENERAL	
Power Supply	13.8 Vdc nominal (11-16 Vdc)
Transmit Current	600 mA max. @ 1 W 1700 mA max. @ 5 W
Receive Current	175 mA
Dimensions	260 x 161 x 65 mm (robust metal enclosure)
Weight	1.3 kg

\* Available for DR900 full duplex 1 W version (853 ± 5 MHz / 929 ± 5 MHz)

\*\* Various sub-frequency bands available.

Note: Model codes previously known as xxxDR are now depicted as DRxxx.

designs products & solutions

Local regulatory conditions may determine the suitability of individual versions in different countries. It is the responsibility of the buyer to confirm these regulatory conditions.

Performance data indicates typical values related to the described unit.  
Information subject to change without notice.

© Copyright 2004 Trio DataCom Pty Ltd. All rights reserved. Issue 11/04

**TRIO DATACOM**  
41 Aster Avenue  
Carrum Downs VIC  
Australia 3201

T +613 9775 0505  
F +613 9775 0606  
E [frontdesk@trio.com.au](mailto:frontdesk@trio.com.au)  
[www.trio.com.au](http://www.trio.com.au)



# VEGABAR 52

## Profibus PA

### Pressure transmitter with CERTEC® measuring cell



#### Area of application

The VEGABAR 52 pressure transmitter can be used universally for measurement of gases, vapours and liquids. Also substances such as sand are not problem for the abrasion-resistant ceramic measuring cell. The VEGABAR 52 is an economical solution for a multitude of applications in all areas of industry.

#### Advantages

- High plant availability through maximum overload and vacuum resistance of the ceramic measuring cell
- Measurement down to the last drop through extremely small measuring ranges with high accuracy.
- Low costs for maintenance thanks to wear-free ceramic measuring cell

#### Function

The heart of the pressure transmitter is the pressure measuring cell that transforms pressure into an electrical signal. This pressure-dependent signal is converted into a standard output signal by the integrated electronics.

The sensor element is the CERTEC® measuring cell with excellent long-term stability and high overload resistance. The CERTEC® measuring cell is also equipped with a temperature sensor. The temperature value can be displayed via the indicating and adjustment module or processed via the signal output.

#### Technical data

Measuring ranges	-1 ... +72 bar/-100 kPa ... +7200 kPa (-14.5 ... +1044 psig)
Smallest measuring range	+0.1 bar/+10 kPa (+1.45 psig)
Deviation	< 0.075 %, optionally up to < 0.05 %
Process fitting	Thread G $\frac{1}{2}$ (EN 837), thread from G1 $\frac{1}{2}$ (DIN 3852-A), flanges from DN 25 or ANSI 1", fittings for the food processing and paper industry
Process temperature	-40 ... +150 °C (-40 ... +302 °F)
Ambient, storage and transport temperature	-40 ... +80 °C (-40 ... +176 °F)
Betriebsspannung	9 ... 32 V DC

#### Materials

The wetted parts of the instrument are made of 316L, PVDF, Hastelloy, C4-plated or Sapphire-ceramic®. The process seal is available in FKM, FFKM as well as EPDM.

You will find a complete overview of the available materials and seals in the "configurator" on our homepage under [www.vega.com/configurator](http://www.vega.com/configurator).

#### Housing versions

The housings are available as single chamber or double chamber version in plastic, stainless steel or aluminium.

They are available in protection ratings up to IP 68 (25 bar) with external electronics.

#### Electronics versions

The instruments are available in different electronics versions. Apart from the two-wire electronics with 4 ... 20 mA or 4 ... 20 mA/HART, two purely digital versions with Profibus PA and Foundation Fieldbus are available.

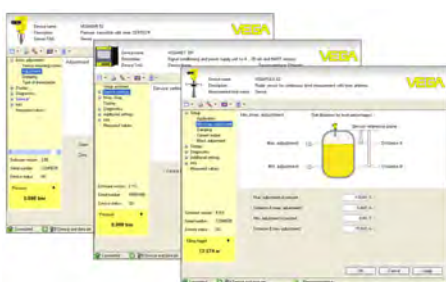
#### Approvals

The instruments are suitable for use in hazardous areas and are approved e.g. according to ATEX and IEC. The instruments have also different ship approvals such as e.g. GL, LRS or ABS.

You can find detailed information on the existing approvals in the "configurator" on our homepage under [www.vega.com/configurator](http://www.vega.com/configurator).

## Bedienung

Die Bedienung des Gerätes erfolgt über das optional einsetzbare Anzeige- und Bedienmodul PLICSCOM oder über einen PC mit der Bediensoftware PACTware und entsprechendem DTM. Eine alternative Bedienmöglichkeit ist das herstellerspezifische Bedienprogramm PDM.



- 2 Threaded version G1½ A
- 3 Flange version DN 50

## Information

You can find further information about the VEGA product line on our homepage [www.vega.com](http://www.vega.com).

In the download section under [www.vega.com/downloads](http://www.vega.com/downloads) you'll find free operating instructions, product information, brochures, approval documents, instrument drawings and much, much more.

There, you will also find GSD and EDD files for Profibus PA systems as well as DD and CFF files for Foundation Fieldbus systems.

## Instrument selection

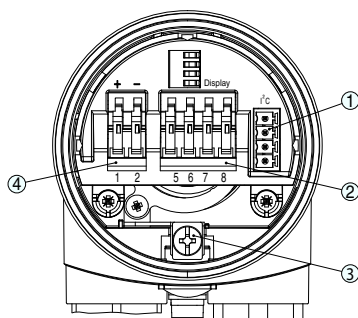
With the "finder" you can select the most suitable measuring principle for your application: [www.vega.com/finder](http://www.vega.com/finder).

You can find detailed information on the instrument versions in the "configurator" on our homepage under [www.vega.com/configurator](http://www.vega.com/configurator).

## Contact

You can find the VEGA agency serving your area on our homepage [www.vega.com](http://www.vega.com).

## Elektrischer Anschluss

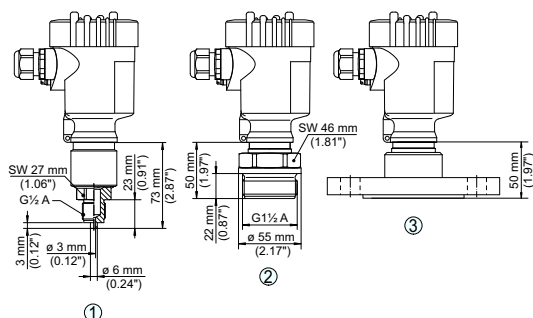


Elektronik- und Anschlussraum Einkammergehäuse

- 1 Steckverbinder für VEGACONNECT (I<sup>2</sup>C-Schnittstelle)
- 2 Federkraftklemmen zum Anschluss der externen Anzeige VEGADIS 61
- 3 Erdungsklemme zum Anschluss des Kabelschirms
- 4 Federkraftklemmen für Spannungsversorgung und Signalausgang

Details zum elektrischen Anschluss finden Sie in der Betriebsanleitung des Gerätes auf unserer Homepage unter [www.vega.com/downloads](http://www.vega.com/downloads).

## Dimensions



Dimensions VEGABAR 52

- 1 Threaded version G1½ A (manometer connection EN 837)

# VEGADIS 62

## External indicating and adjustment unit without additional external energy



### Application area

VEGADIS 62 is suitable for measured value indication and adjustment of standard sensors with HART protocol. The instrument is looped directly into the 4 ... 20 mA signal line at any location. A separate external power supply is not required. VEGADIS 62 also operates exclusively as an indicating instrument in a 4 ... 20 mA current loop.

### Your benefit

- Minimum time and cost expenditure for on-site parameter adjustment via clearly arranged display with simple 4-key adjustment
- Reliable and easy adjustment of the HART sensors through clear text indication with graphic support

### Function

VEGADIS 62 measures the current in the current loop and indicates the measured value in digital and quasianalogue format. The instrument operates in different modes. In basic mode at 4 ... 20 mA, the instrument can be scaled individually via the adjustment keys. In HART standard and HART multidrop mode, the instrument listens continuously to the HART communication between control system and sensor. It adapts itself automatically to modifications of unit and/or measuring range.

### Technical data

#### General data

##### Materials

- Housing plastic PBT, Alu die-casting, 316L
- Inspection window in housing cover for indicating and adjustment module Polycarbonate (UL-746-C listed)
- Ground terminal 316Ti/316L

Weight approx. 0.35 kg (0.772 lbs)

#### Supply circuit

Voltage supply and data transmission via the signal circuit

Current range 3.5 ... 22.5 mA

#### Indicating and adjustment module

##### Display

- Principle LCD
- Measured value presentation 7 segments, 5-digit, height of digits 9 mm (0.354 in), indication range -99999 ... 99999
- Bar graph 20 segments
- Info line 14 segments, 6-digit, height of digits 5.5 mm (0.217 in)

Adjustment elements 4 keys

##### Materials

- Housing ABS
- Inspection window Polyester foil

#### Ambient conditions

Ambient temperature -20 ... +70 °C (-4 ... +158 °F)

Storage and transport temperature -40 ... +80 °C (-40 ... +176 °F)

#### Electromechanical data

Cable gland 2 x cable entry M20 x 1.5 (cable: ø 5 ... 9 mm)

Spring-loaded terminals for wire cross-section

- Massive wire, cord 0.2 ... 2.5 mm<sup>2</sup> (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm<sup>2</sup> (AWG 24 ... 16)

#### Electrical protective measures

##### Protection rating

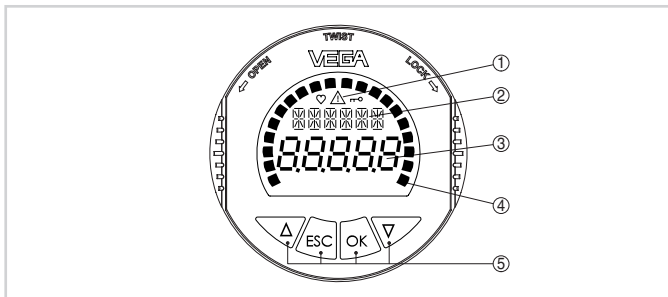
- Housing plastic IP 66/IP 67
- Housing Aluminium, stainless steel IP 66/IP 68 (0.2 bar)

### Approvals

You can find detailed information on the existing approvals in the "configurator" on our homepage under [www.vega.com/configurator](http://www.vega.com/configurator).

## Adjustment

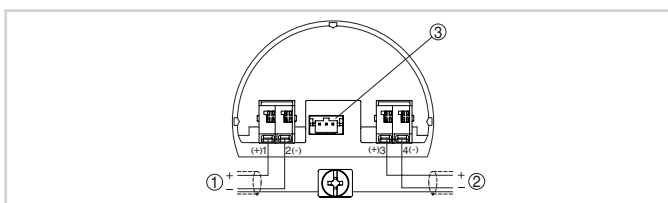
The adjustment of VEGADIS 62 is menu-controlled via four keys on the front and one LC display.



Indicating and adjustment elements

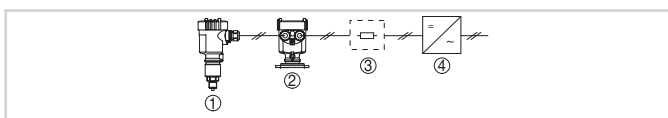
- 1 Status information (HART mode, unit lock, warning or error information)
- 2 Unit and information line
- 3 Digital measured value indication
- 3 Bar graph for quasianalogue measured value indication
- 3 Adjustment keys

## Electrical connection



Wiring plan VEGADIS 62

- 1 To the sensor
- 2 For power supply
- 3 For connection cable to indicating and adjustment module

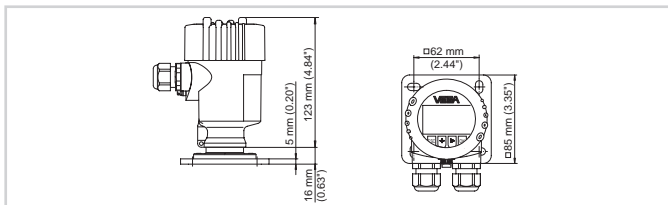


Installation example VEGADIS 62 in conjunction with an individual sensor

- 1 Sensor
- 2 VEGADIS 62
- 3 HART resistance > 150  $\Omega$  (necessary with low impedance power supply)
- 4 Voltage supply/Processing

You can find details of the electrical connection in the operating instruction of the instrument on [www.vega.com/downloads](http://www.vega.com/downloads).

## Dimensions



## Info

You can find further information about the VEGA product line on our homepage [www.vega.com](http://www.vega.com).  
In the download section under [www.vega.com/downloads](http://www.vega.com/downloads) you'll find

free operating instructions, product information, brochures, approval documents, instrument drawings and much, much more.

## Contact

You can find the VEGA agency serving your area on our homepage [www.vega.com](http://www.vega.com).

Process pressure/Hydrostatic

## VEGAWELL 52



## Product Information



# VEGA

## Contents

<b>1</b>	<b>Description of the measuring principle</b>	<b>3</b>
<b>2</b>	<b>Type overview</b>	<b>4</b>
<b>3</b>	<b>Mounting instructions.</b>	<b>5</b>
<b>4</b>	<b>Electrical connection</b>	
4.1	General requirements	7
4.2	Power supply	7
4.3	Connection cable.	7
4.4	Cable screening and grounding	7
4.5	Wiring plan VEGAWELL 52 - 4 ... 20 mA	7
4.6	Wiring plan VEGAWELL 52 - 4 ... 20 mA/HART - Pt 100	8
<b>5</b>	<b>Operation</b>	
5.1	Overview.	9
5.2	Adjustment with PACTware	9
<b>6</b>	<b>Technical data</b>	<b>10</b>
<b>7</b>	<b>Dimensions.</b>	<b>14</b>
<b>8</b>	<b>Product code</b>	<b>15</b>

### Take note of safety instructions for Ex applications



Please note the Ex specific safety information which you can find on our homepage [www.vega.com/services/downloads](http://www.vega.com/services/downloads) and which comes with every instrument. In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units. The sensors must only be operated on intrinsically safe circuits. The permissible electrical values are stated in the certificate.

# 1 Description of the measuring principle

## Measuring principle

VEGAWELL 52 pressure transmitters work according to the hydrostatic measuring principle, which functions independently of the dielectric properties of the product and is not influenced by foam generation.

The sensor element of VEGAWELL 52 is the dry ceramic-capacitive CERTEC<sup>®</sup> measuring cell in two sizes. Base element and diaphragm consist of high purity sapphire-ceramic<sup>®</sup>.

The hydrostatic pressure of the product causes via the diaphragm a capacitance change in the measuring cell. This capacitance change is converted into an appropriate output signal.

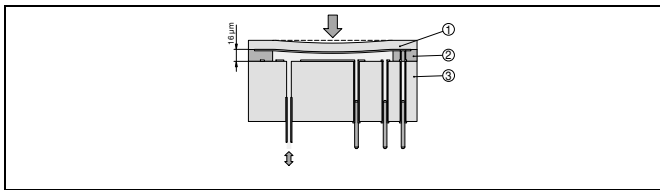


Fig. 1: Configuration of the CERTEC<sup>®</sup> measuring cell with VEGAWELL 52

- 1 Diaphragm
- 2 Soldered glass bond
- 3 Base element

The advantages of the CERTEC<sup>®</sup> measuring cell are:

- Very high overload resistance
- No hysteresis
- Excellent long-term stability
- Completely front flush installation
- Good corrosion resistance
- Very high abrasion resistance

## Wide application range

VEGAWELL 52 is suitable for level measurement in deep wells and ballast tanks as well as for gauge measurement in open flumes. Typical media are drinking water and waste water as well as water containing abrasive substances. All signal outputs are available in 4 ... 20 mA and 4 ... 20 mA/HART - Pt 100.

In the 4 ... 20 mA/HART - Pt 100 version, a temperature sensor Pt 100 in four-wire technology is integrated in the transducer. Power supply or processing are carried out via an external temperature transducer.

## 2 Type overview

### VEGAWELL 52



Measuring cell:	CERTEC®
Media:	drinking water and waste water
Process fitting:	Straining clamp, screw connection, thread
Material process fitting:	316L
Material, suspension cable:	PE, PUR, FEP
Material transmitter:	316L, 1.4462 (Duplex), each also with PE coating, PVDF, Titanium
Diameter transmitter:	depending on material and version at least 22 mm
Measuring range:	0 ... 0.1 bar up to 0 ... 25 bar
Process temperature:	-20 ... +80 °C (-4 ... +176 °F)
Deviation:	< 0.2 %, < 0.1 %
Signal output:	4 ... 20 mA, 4 ... 20 mA/HART
Operation:	depending on the version via PACTware/PC

### 3 Mounting instructions

#### Mounting position

The following illustration shows a mounting example for VEGA-WELL 52. The VEGA price list contains suitable mounting brackets under the section Accessories. With these parts, standard mounting arrangements can be realised quickly and reliably.



Fig. 3: VEGAWELL 52 in a pump shaft with VEGABOX 02

VEGAWELL 52 must be mounted in a calm area or in a suitable protective tube. This avoids lateral movements of the transmitter and the resulting corruption of measurement data.



#### Note:

As an alternative to fixing the transmitter, the use of a measuring instrument holder from VEGA's line of mounting accessories is recommended.

Beside the connection and suspension cables, the suspension cable also contains a capillary for atmospheric pressure compensation. All versions can be shortened on site.

With VEGAWELL 52, the electronics is completely integrated in the transmitter. The cable end can be lead directly to a dry connection compartment. Pressure compensation is then carried out via the filter element of the capillaries.



#### Note:

The pressure compensation housing VEGABOX 02 is recommended for connecting VEGAWELL 52.

It contains a high-quality ventilation filter and terminals. A protective cover is optionally available for use outdoors.

#### Mounting versions

The following illustrations show the different mounting versions depending on the instrument type.

#### Mounting with straining clamp

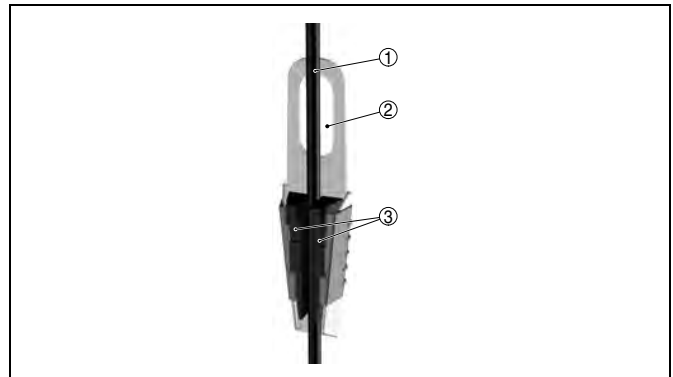


Fig. 5: Straining clamp

- 1 Suspension cable
- 2 Suspension opening
- 3 Clamping jaws

#### Mounting with screw connection

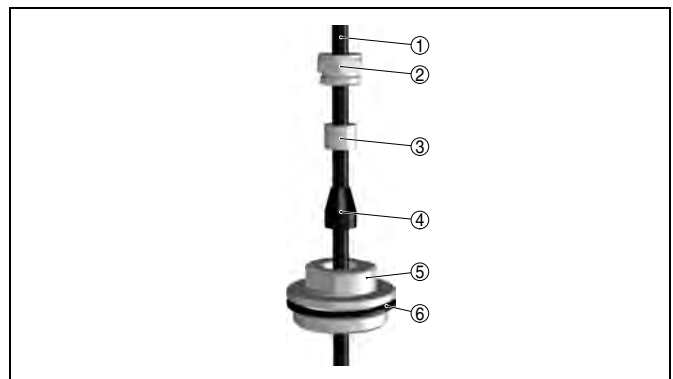


Fig. 6: Screw connection

- 1 Suspension cable
- 2 Seal screw
- 3 Cone bushing
- 4 Seal cone
- 5 Screw connection
- 6 Seal

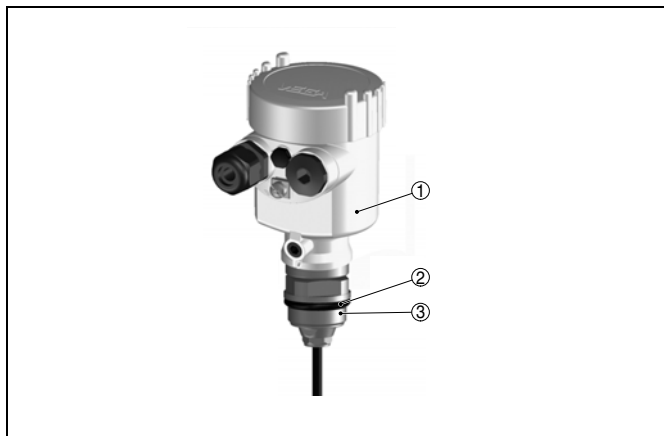
**Mounting with housing and thread**

Fig. 7: Housing with thread G1½ A

- 1 Housing
- 2 Seal
- 3 Thread

## 4 Electrical connection

### 4.1 General requirements

The supply voltage range can differ depending on the instrument version. You can find exact specifications in chapter "Technical data".

The national installation standards as well as the valid safety regulations and accident prevention rules must be observed.



In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units.

### 4.2 Power supply

Supply voltage and current signal are carried on the same two-wire cable. The requirements on the power supply are specified in chapter "Technical data".

The VEGA power supply units VEGATRENN 149AEx, VEGAS-TAB 690, VEGADIS 371 as well as VEGAMET signal conditioning instruments are suitable for power supply. When one of these instruments is used, a reliable separation of the supply circuits from the mains circuits according to DIN VDE 0106 part 101 is ensured.

### 4.3 Connection cable

#### In general

An outer diameter of 5 ... 9 mm ensures the seal effect of the cable entry. If electromagnetic interference is expected, screened cable should be used for the signal lines.

The sensors are connected with standard two-wire cable without screen.



In Ex applications, the corresponding installation regulations must be noted for the connection cable.

### 4.4 Cable screening and grounding

If screened cable is necessary, the cable screen must be connected on both ends to ground potential. If potential equalisation currents are expected, the connection on the evaluation side must be made via a ceramic capacitor (e.g. 1 nF, 1500 V).

### 4.5 Wiring plan VEGAWELL 52 - 4 ... 20 mA

#### Direct connection

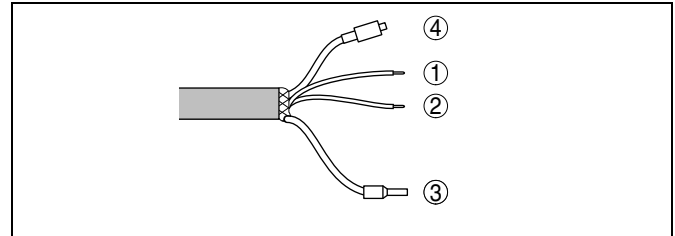


Fig. 8: Wire assignment, suspension cable

- 1 blue (-): to power supply or to the processing system
- 2 brown (+): to power supply or to the processing system
- 3 Shielding
- 4 Breather capillaries with filter element

#### Connection via VEGABOX 02

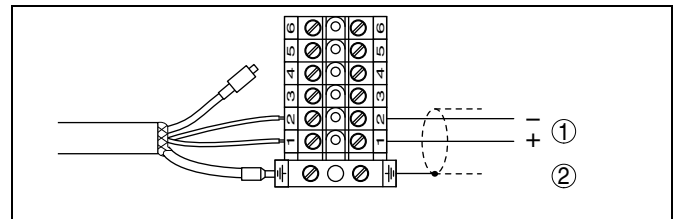


Fig. 9: Terminal assignment VEGABOX 02

- 1 To power supply or the processing system
- 2 Shielding<sup>1)</sup>

#### Connection via housing

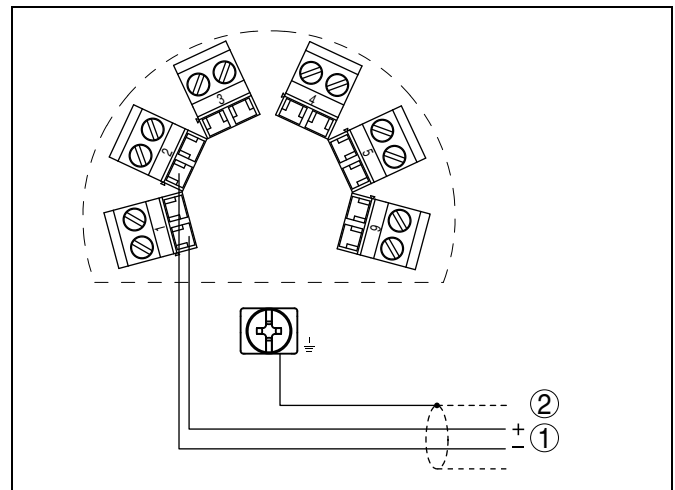


Fig. 10: Terminal assignment of the housing

- 1 To power supply or the processing system
- 2 Shielding<sup>2)</sup>

<sup>1)</sup> Connect screen to ground terminal. Connect ground terminal on the outside of the housing as prescribed. The two terminals are galvanically connected.

<sup>2)</sup> Connect screen to ground terminal. Connect ground terminal on the outside of the housing as prescribed. The two terminals are galvanically connected.

## 4.6 Wiring plan VEGAWELL 52 - 4 ... 20 mA/ HART - Pt 100

### Direct connection

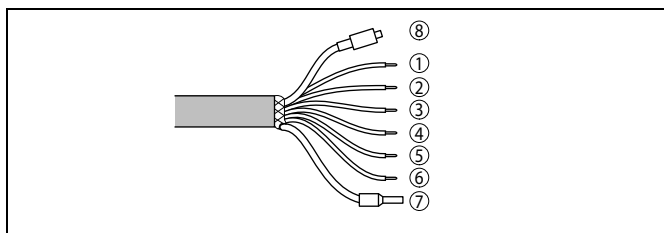


Fig. 11: Wire assignment, connection cable

- 1 blue (-): to power supply or to the processing system
- 2 Brown (+): to power supply or to the processing system
- 3 White: for processing of the integrated Pt 100 (power supply)
- 4 Yellow: for processing of the integrated Pt 100 (measurement)
- 5 Red: for processing of the integrated Pt 100 (measurement)
- 6 Black: for processing of the integrated Pt 100 (power supply)
- 7 Shielding
- 8 Breather capillaries with filter element

### Connection via VEGABOX 02

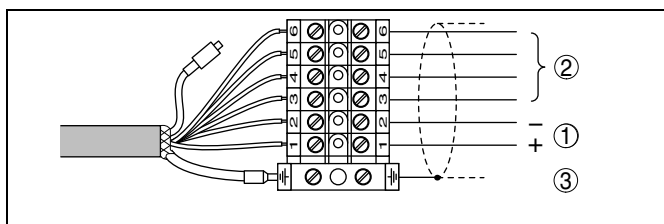


Fig. 12: Terminal assignment VEGABOX 02

- 1 To power supply or the processing system (signal pressure transmitter)
- 2 To power supply or the processing system (connection cables resistance thermometer Pt 100)
- 3 Shielding<sup>3)</sup>

### Connection via VEGABOX 02 with integrated temperature sensor

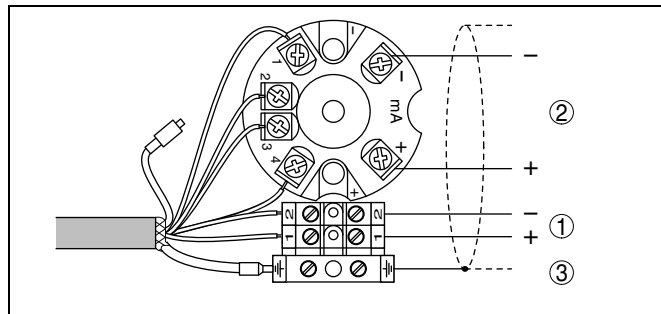


Fig. 13: Terminal assignment VEGABOX 02

- 1 To power supply or the processing system (signal pressure transmitter)
- 2 For voltage supply or to processing system (resistance thermometer Pt 100)
- 3 Shielding<sup>4)</sup>

### Connection via housing

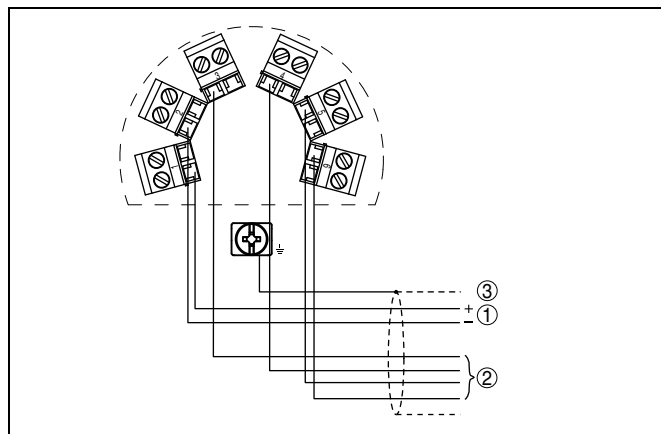


Fig. 14: Terminal assignment of the housing

- 1 To power supply or the processing system (signal pressure transmitter)
- 2 For voltage supply or to processing system (resistance thermometer Pt 100)
- 3 Shielding<sup>5)</sup>

<sup>3)</sup> Connect screen to ground terminal. Connect ground terminal on the outside of the housing as prescribed. The two terminals are galvanically connected.

<sup>4)</sup> Connect screen to ground terminal. Connect ground terminal on the outside of the housing as prescribed. The two terminals are galvanically connected.

<sup>5)</sup> Connect screen to ground terminal. Connect ground terminal on the outside of the housing as prescribed. The two terminals are galvanically connected.

## 5 Operation

### 5.1 Overview

#### VEGAWELL 52 4 ... 20 mA

VEGAWELL 52 - 4 ... 20 mA has no adjustment options.

#### VEGAWELL 52 4 ... 20 mA/HART - Pt 100

- Adjustment software according to FDT/DTM standard, e.g. PACTware and PC
- HART handheld

### 5.2 Adjustment with PACTware

#### Connecting the PC to the signal cable

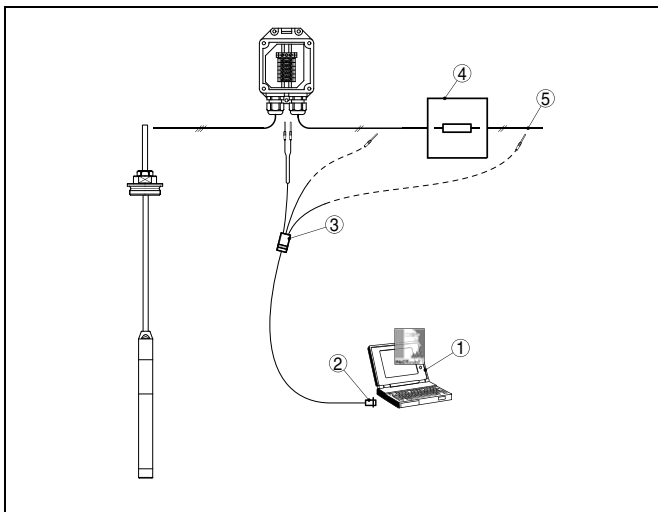


Fig. 15: Connection of the PC to VEGABOX 02 or communication resistor

- 1 PC with PACTware
- 2 RS232 interface (with VEGACONNECT 3), USB interface (with VEGA-CONNECT 4)
- 3 VEGACONNECT 3 or 4
- 4 Communication resistor 250  $\Omega$
- 5 Power supply unit

#### Necessary components:

- VEGAWELL 52
- PC with PACTware and suitable VEGA DTM
- VEGACONNECT with HART adapter cable
- HART resistor approx. 250  $\Omega$
- Power supply unit



#### Note:

With power supply units with integrated HART resistance (internal resistance approx. 250  $\Omega$ ), an additional external resistance is not necessary (e. g. VEGATRENN 149A, VEGAMET 381/624/625, VEGASCAN 693). In such cases, VEGACONNECT can be connected parallel to the 4 ... 20 mA cable.

## 6 Technical data

### Materials and weights

Materials, wetted parts	
– Transmitter	316L, 316L with PE coating, 1.4462 (Duplex), 1.4462 with PE coating, PVDF, Titanium
– Diaphragm	sapphire ceramic® (99.9 % oxide ceramic)
– Measuring cell seal	FKM (VP2/A) - FDA and KTW approved, FFKM (Perlast G75S), EPDM (A+P 75.5/KW75F)
– Suspension cable	PE (FDA and KTW-approved), FEP, PUR
– Cable gland on the transmitter	316L
– Process fitting	316L
– Straining clamp	1.4301
– Unassembled screw connection	316L, PVDF
– Threaded connection on the housing	316L
Materials, non-wetted parts	
– Housing	plastic PBT (Polyester), 316L
Weight approx.	
– Basic weight	0.8 kg (1.764 lbs)
– Suspension cable	0.1 kg/m (0.07 lbs/ft)
– Straining clamp	0.2 kg (0.441 lbs)
– Screw connection	0.4 kg (0.882 lbs)
– Plastic housing	0.8 kg (1.764 lbs)
– Stainless steel housing	1.6 kg (3.528 lbs)

### Input variable

Measured value	Level
Measuring range	see product code
Recommended max. turn down	10 : 1

### Output variable

<b>4 ... 20 mA</b>	
Output signal	4 ... 20 mA
Signal resolution	2 µA
Failure signal	< 3.6 mA
Max. output current	22 mA
Run-up time	2 s
Step response time	100 ms (ti: 0 s, 0 ... 63 %)
Fulfilled NAMUR recommendations	NE 43
<b>4 ... 20 mA/HART - Pt 100</b>	
Output signal	4 ... 20 mA/HART
Signal resolution	2 µA
Failure signal	< 3.6 mA; 20.5 mA; 22 mA; unchanged (adjustable via PACTware)
Max. output current	22 mA
Run-up time	15 s
Step response time	200 ms (ti: 0 s, 0 ... 63 %)
Fulfilled NAMUR recommendations	NE 43

### Additional output parameter - temperature

integrated resistance thermometer	Pt 100 according to DIN EN 60751
Range	-50 ... +100 °C (-58 ... +212 °F)
Resolution	1 °K

### Deviation for 4 ... 20 mA version<sup>6)</sup>

Specifications refer to the set span. Turn down (TD) = nominal measuring range/set span.

Deviation with version < 0.2 %	
– Turn down 1 : 1 up to 5 : 1	< 0.2 %
– Turn down > 10 : 1	< 0.04 % x TD

<sup>6)</sup> Determined according to the limit point method according to IEC 60770, incl. non-linearity, hysteresis and non-repeatability.

Deviation with version < 0.1 %

- Turn down 1 : 1 up to 5 : 1 < 0.1 %
- Turn down > 10 : 1 < 0.02 % x TD

#### Deviation for version 4 ... 20 mA/HART - Pt 100<sup>7)</sup>

Applies to **digital** HART interface as well as to **analogue** current output 4 ... 20 mA. Specifications refer to the set span. Turn down (TD) is the relation nominal measuring range/set span.

Deviation with version < 0.2 %

- Turn down 1 : 1 up to 5 : 1 < 0.2 %
- Turn down > 10 : 1 < 0.04 % x TD

Deviation with version < 0.1 %

- Turn down 1 : 1 up to 5 : 1 < 0.1 %
- Turn down > 10 : 1 < 0.02 % x TD

#### Influence of the product or ambient temperature

Applies to **digital** HART interface as well as to **analogue** current output 4 ... 20 mA. Specifications refer to the set span. Turn down (TD) is the relation nominal measuring range/set span.

##### Average temperature coefficient of the zero signal

In the compensated temperature range of 0 ... +80 °C (+32 ... +176 °F), reference temperature 20 °C (68 °F).

Average temperature coefficient of the zero signal

- Turn down 1 : 1 < 0.05 %/10 K
- Turn down 1 : 1 up to 5 : 1 < 0.1 %/10 K
- Turn down > 10 : 1 < 0.15 %/10 K

Outside the compensated temperature range

Average temperature coefficient of the zero signal

- Turn down 1 : 1 typ. < 0.05 %/10 K

#### Long-term stability (similar to DIN 16086, DINV 19259-1 and IEC 60770-1)

Applies to **digital** HART interface as well as to **analogue** current output 4 ... 20 mA. Specifications refer to the set span. Turn down (TD) is the relation nominal measuring range/set span.

Long-term drift of the zero signal < (0.1 % x TD)/year

#### Ambient conditions

Ambient temperature

- Connection cable PE -40 ... +60 °C (-40 ... +140 °F)
- Connection cable PUR, FEP -40 ... +85 °C (-40 ... +185 °F)
- Storage and transport temperature -20 ... +80 °C (-4 ... +176 °F)

#### Process conditions

##### Process pressure

Max. process pressure, transmitter<sup>8)</sup>

- Measuring range 0.1 bar (1.45 psig) 15 bar (218 psig)
- Measuring range 0.2 bar (2.9 psig) 20 bar (290 psig)
- Measuring range ≤ 0.4 bar (5.8 psig) 25 bar (363 psig)

Pressure stage, process fitting

- Unassembled screw connection 316L: PN 3, PVDF: unpressurized
- Thread on the housing PN 3

Product temperature, depending on the version

<sup>7)</sup> Determined according to the limit point method according to IEC 60770, incl. non-linearity, hysteresis and non-repeatability.

<sup>8)</sup> Limited by the overpressure resistance of the measuring cell.

Suspension cable	Transmitter	Product temperature
PE	All	-20 ... +60 °C (-4 ... +140 °F)
PUR	All	-20 ... +80 °C (-4 ... +176 °F)
PUR	PE coating	-20 ... +60 °C (-4 ... +140 °F)
FEP	All	-20 ... +80 °C (-4 ... +176 °F)
FEP	PE coating	-20 ... +60 °C (-4 ... +140 °F)

Vibration resistance

mechanical vibrations with 4 g and 5 ... 100 Hz<sup>9)</sup>**Electromechanical data**

Suspension cable

– Configuration

six wires, one suspension cable, one breather capillary, screen braiding, foil, mantle

– Tensile strength

≥ 1200 N (270 pound force)

– Max. length

1000 m (3280 ft)

– Min. bending radius

25 mm (with 25 °C/77 °F)

– Diameter approx.

8 mm (0.315 in)

– colour (non-Ex/Ex) - PE

black/blue

– colour (non-Ex/Ex) - PUR, FEP

blue/blue

Cable entry housing or VEGABOX 02

1 x cable gland M20 x 1.5 (cable: ø 5 ... 9 mm), 1 x blind stopper M20 x 1.5 for wire cross section 1.5 mm<sup>2</sup> (AWG 16), screen up to 4 mm<sup>2</sup> (AWG 12)

Screw terminals

**Supply voltage - 4 ... 20 mA**

Operating voltage

8 ... 36 V DC

Permissible residual ripple

– &lt; 100 Hz

 $U_{ss} < 1 \text{ V}$ 

– 100 Hz ... 10 kHz

 $U_{ss} < 10 \text{ mV}$ 

Load

see diagram

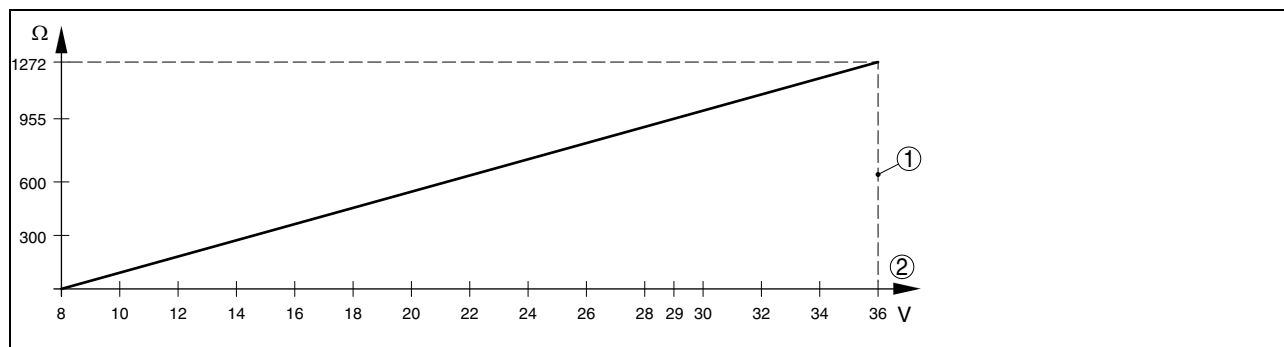


Fig. 16: Voltage diagram

1 Voltage limit

2 Operating voltage

**Supply voltage - 4 ... 20 mA/HART - Pt 100**

Operating voltage

9.6 ... 36 V DC

Permissible residual ripple

– &lt; 100 Hz

 $U_{ss} < 1 \text{ V}$ 

– 100 Hz ... 10 kHz

 $U_{ss} < 10 \text{ mV}$ 

Load

see diagram

<sup>9)</sup> Tested according to the regulations of German Lloyd, GL directive 2.

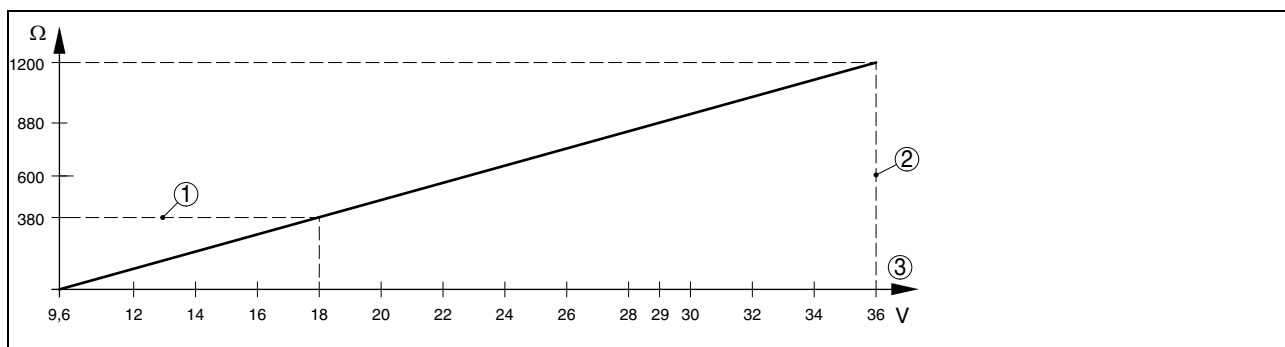


Fig. 17: Voltage diagram

- 1 HART load
- 2 Voltage limit
- 3 Operating voltage

### Electrical protective measures

Protection	
– Transmitter	IP 68 (30 bar)
– Housing	IP 66/IP 67
– VEGABOX 02	IP 65
Overvoltage category	III
Protection class	III

### Existing approvals or approvals applied for

Gas explosion protection	e.g. according to ATEX and IEC
Fire-damp protection	e.g. according to ATEX
Overfill protection	e.g. according to WHG
Ship approval	e.g. according to GL, LRS, ABS, RINA

The available approvals can be selected via the configurator on [www.vega.com](http://www.vega.com).

Depending on the version, instruments with approvals can have different technical data. For these instruments, please note the corresponding approval documents. They can be downloaded in the download section on [www.vega.com](http://www.vega.com).

### CE conformity

EMC (2004/108/EG)	EN 61326-1: 2006
LVD (2006/95/EG)	EN 61010-1: 2001

### Environmental instructions

VEGA environment management system	certified according to DIN EN ISO 14001
You can find detailed information under <a href="http://www.vega.com">www.vega.com</a> .	

## 7 Dimensions

## VEGAWELL 52 - suspension cable 1

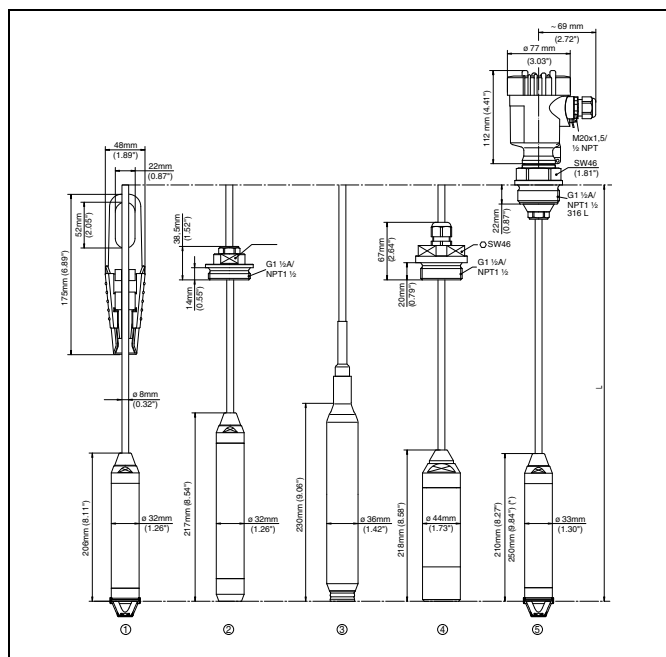
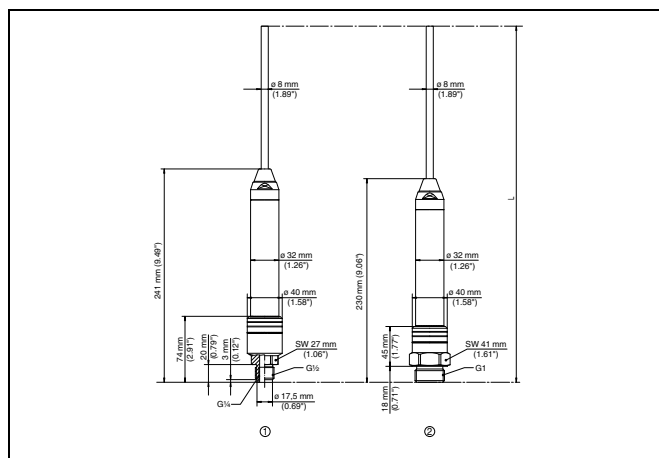


Fig. 18: VEGAWELL 52 - suspension cable

- 1 Transmitter Duplex, with straining clamp
- 2 Transmitter Duplex for deep wells, with unassembled screw connection G1½ A (1½ NPT) and closing cap
- 3 Transmitter Duplex, with PE coating
- 4 Transmitter with screwed connection of PVDF
- 5 Transmitter Titanium/Titanium with glass leadthrough, with thread G1 A (1 NPT) and plastic housing

## VEGAWELL 52 - threaded fitting



**Fig. 22: VEGAWELL 52 - thread**

- 1 Threaded fitting G $\frac{1}{2}$  inner G $\frac{1}{4}$
- 2 Threaded fitting G1

## VEGAWELL 52 - suspension cable 2

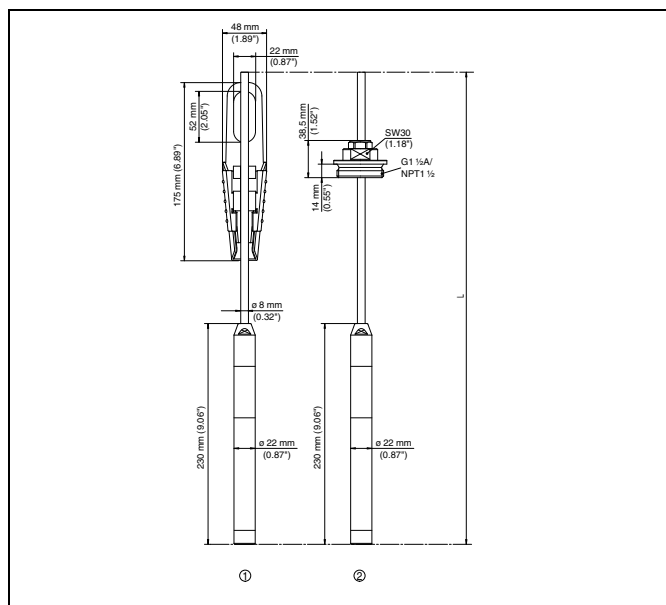


Fig. 20: VEGAWELL 52 - suspension cable

- 1 Transmitter 316L, with straining clamp
- 2 Transmitter Titanium, with unassembled screw connection G1 A (1 NPT)





# VEGA

VEGA Grieshaber KG  
Am Hohenstein 113  
77761 Schiltach  
Germany  
Phone +49 7836 50-0  
Fax +49 7836 50-201  
E-Mail: [info@de.vega.com](mailto:info@de.vega.com)  
[www.vega.com](http://www.vega.com)



You can find at **[www.vega.com](http://www.vega.com)** downloads of the following

- operating instructions manuals
- menu schematics
- software
- certificates
- approvals
- and much, much more

*Subject to change without prior notice*

35400-EN-090130

# Datasheet

## CP M SNT 120W 24V 5A

**Weidmüller Interface GmbH & Co. KG**

Klingenbergstraße 16

D-32758 Detmold

Germany

Fon: +49 5231 14-0

Fax: +49 5231 14-2083

www.weidmueller.com



PRO-M = Power-Reliable-Optimized

The optimal and reliable power supply in automation technology. The solid, very narrow metal housing of the 10 different versions of the 24 V DC supply enable installation without lateral spacing, thereby saving space on the DIN rail. AC and DC wide-range inputs and a broad temperature range allow universal use. Thanks to its high efficiency, overload resistance and high performance reserves, the PRO-M is the reliable power supply in all applications. The 3-phase PRO-M power supply modules continue to work reliable even if one phase fail, i.e. in two-phase operation.

### General ordering data

Order No.	<a href="#">8951340000</a>
Part designation	CP M SNT 120W 24V 5A
Version	Power supply, switch-mode power supply unit
GTIN (EAN)	4032248742554
Qty.	1 pc(s).

Creation date September 3, 2010 10:26:49 PM CEST

Last update 28.06.2010 / We reserve the right to make technical changes.  
Q-Pulse Id: TMS209

Active: 25/11/2015

Page 230 of 370

1

# Datasheet

## CP M SNT 120W 24V 5A

Weidmüller Interface GmbH &amp; Co. KG

Klingenbergstraße 16

D-32758 Detmold

Germany

Fon: +49 5231 14-0

Fax: +49 5231 14-2083

www.weidmueller.com

## Technical data

### Dimensions (1)

Weight	0.7 kg	Length	125 mm
Width	40 mm	Height	130 mm

### temperature

Ambient temperature (operational)	-25 °C...+70 °C	Storage temperature	-40 °C...+85 °C
-----------------------------------	-----------------	---------------------	-----------------

### Input

AC current consumption	1.1 A @ 230 V AC / 2.0 A @ 115 V AC	Conductor connection system	Screw connection
DC current consumption	0.4 A @ 370 V DC / 1.2 A @ 120 V DC	DC input voltage range	80...370 V DC (Derating @ 120 V DC)
Frequency range AC	47...63 Hz	Input fuse	Yes
Input fuse (internal)	Yes	Input voltage AC, max.	264 V
Input voltage AC, min.	85 V	Input voltage DC, max.	370 V
Input voltage DC, min.	80 V	Input voltage range AC	85...264 V AC (Derating @ 100 V AC)
Recommended back-up fuse	4 A / DI, safety fuse 6 A, Char. B, circuit breaker 3...5 A, Char. C, circuit breaker	making current	max. 40 A
rated input voltage	100...240 V AC (wide-range input)		

### output

Conductor connection system	Screw connection	Output current	5 A
Output voltage	(adjustable via potentiometer on front)	Output voltage type	DC
Output voltage, max.	29.5 V	Output voltage, min.	22.5 V
Parallel connection option	yes, max. 5	Powerboost @ 24 V DC, 60 °C	6 A for 1 min, ED = 5 %
Rated (nominal) output current @ U <sub>Nom</sub>	5 A @ 60 °C	continuous output current @ 24 V DC	6.0 A @ 45 °C 5.3 A @ 55 °C 3.8 A @ 70 °C
rated output voltage	24 V DC ± 1 %	residual ripple, breaking spikes	< 50 mV <sub>PP</sub> @ 24 V DC, I <sub>N</sub>

### General data

AC failure bridging time @ I <sub>Nom</sub>	> 100 ms @ 230 V AC / > 20 ms @ 115 V AC	Ambient temperature (operational)	-25 °C...+70 °C
Current limiting	> 120 % I <sub>N</sub>	DIN Rail compatibility	TS 35
Degree of efficiency	90 % @ 230 V AC / 88 % @ 115 V AC	Housing version	Metal, corrosion resistant
Indication	Operation, green LED	MTBF	> 500,000 h acc. to IEC 1709 (SN29500)
Mounting position, installation notice	Horizontal on TS35 mounting rail, with 50 mm of clearance at top and bottom for air circulation. Can be mounted side by side with no space in between.	Power factor (approx.)	> 0.5 @ 230 V AC / > 0.6 @ 115 V AC
Protection against reverse voltages from the load	30...35 V DC		

Creation date September 3, 2010 10:26:49 PM CEST

Last update 28.06.2010 / We reserve the right to make technical changes.

Q-Pulse Id: TMS209

Active: 25/11/2015

Page 231 of 370

2

# Datasheet

## CP M SNT 120W 24V 5A

**Weidmüller Interface GmbH & Co. KG**

Klingenbergstraße 16

D-32758 Detmold

Germany

Fon: +49 5231 14-0

Fax: +49 5231 14-2083

www.weidmueller.com

## Technical data

### Insulation coordination

Class of protection	I, with PE connection	Insulation voltage	3 kV input/output; 2 kV input/earth; 0.5 kV output/earth
Pollution severity	2	Protection class	IP 20
electrical isolation, input-earth	2 kV	electrical isolation, input-output	3 kV
electrical isolation, output-earth	0.5 kV		

### Approvals

Approvals institutes	CE; CURUS; CULUS; C-Tick
----------------------	--------------------------

### Classifications

eClass 5.1	27-04-90-02	eClass 6.0	27-04-90-04
------------	-------------	------------	-------------

### Notes

Note, technical data	*) Recommendation applies only for AC operation; the max. permissible operating voltage must be observed in all cases! The internal varistor found in a switch-mode power supply does not replace the need for surge protection within a system.
----------------------	--

## Datasheet

### CP M SNT 120W 24V 5A

Weidmüller Interface GmbH & Co. KG

Klingenbergstraße 16

D-32758 Detmold

Germany

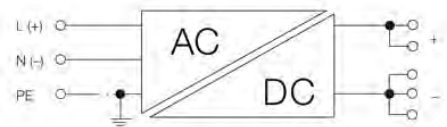
Fon: +49 5231 14-0

Fax: +49 5231 14-2083

[www.weidmueller.com](http://www.weidmueller.com)

## Drawings

### Electric symbol



With DC connection, note polarity



# Product Specification UXH50-12

Product No.  
14956

## Yuasa UXH Series VRLA Battery, 10 Years Design Life

Yuasa UXH batteries are constructed to yield even greater capacity than comparable batteries. The UXH uses AGM technology which ensures that there is no 'free acid' in the battery. This allows the battery to be mounted either vertically or horizontally. An additional feature of this product is Yuasa's heavy duty lead calcium-tin alloy, providing the UXH battery the ability to remain in float service for 10 years.

- 10 Year Design Life
- High Energy Density
- Gas Pressure Venting System
- No Equalising Charge Required

### General Performance

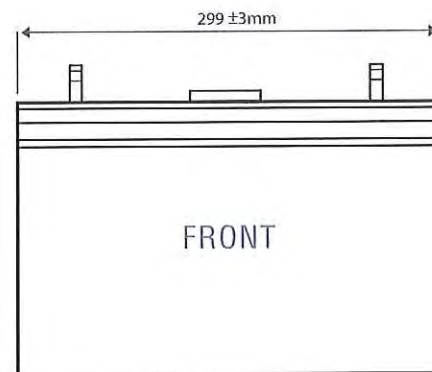
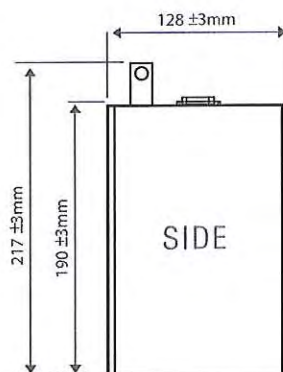
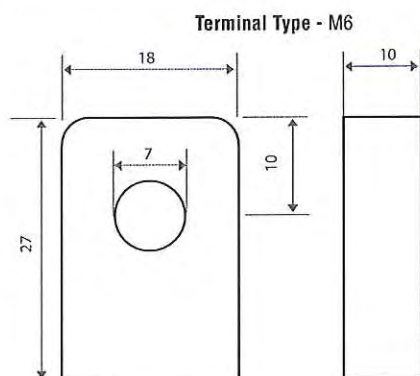
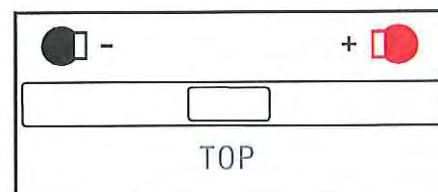
Battery	UXH50-12	
Application	Floating	
Design Life	10 Years	
Nominal Capacity	50Ah	
Actual Capacity at 25°C	1 hour rate to 1.70 Vpc	29.0Ah
	3 hour rate to 1.70 Vpc	39.0Ah
	10 hour rate to 1.80 Vpc	46.0Ah

### Electrolyte

Fully charge density at 20°C	1.300
Density Range	1.290-1.310
Gelled/Absorbed	Absorbed
Mounting Orientation	Vertical/Horizontal

### Plates

<b>Positive Plates:</b>	
Number/cell	4
Type	Flat Pasted
Material of grid	Lead-Calcium-Tin Alloy
Thickness	4.0mm
<b>Negative Plates:</b>	
Number/cell	5
Type	Flat Pasted
Material of grid	Lead-Calcium-Tin Alloy
Thickness	2.3mm



Century Yuasa believes that the data presented is generally accurate for the purpose for which it is presented, however expressly disclaims any representation of warranty expressed or implied, concerning the data or recommendations and in no event shall be liable for any loss or damage claimed to have arisen as a result of the use of this brochure.



# Product Specification UXH50-12

 Product No.  
14956

**Yuasa UXH Series VRLA Battery, 10 Years Design Life**

## Physical Properties

Separators	
Type	Glass Mat
Is glass fibre included?	Yes
Thickness	1.5mm
Lid & Container Materials	
Lid Material, Colour	Acrylonitrile Butadiene Styrene ABS/Dark Grey
Container Material, Colour	Acrylonitrile Butadiene Styrene ABS/Dark Grey
Flame Retardant	No
Safety Vent Operational Pressure	20kPA
Flame Arrestor Filter Fitted	Yes
Dimensions:	
Overall Width	299mm ± 3
Depth	128mm ± 3
Height	190mm ± 3
Overall Height	217mm ± 3
Battery Weight (kg) Total (wet)	21kg

## Electrical Properties

Self Discharge Rate @ 25°C	<3% per month		
Internal Resistance (mOHMS)	6.0mΩ		
Normal Charge (Amperes)	5A		
Max. Charge (Amperes)	10A		
Max. Sustained Current without damage (discharging 5 sec)	230A		
Volts End of Charge	2.275 Vpc		
	20°C	25°C	30°C
Float Voltage (Vpc) pure floating applications	2.290 Vpc	2.275 Vpc	2.260 Vpc
Float Current (mA)	~50mA	~50mA	~50mA
Initial Short circuit current (A)	~2275A		
Efficiency at 10 hour rate (%):			
Ampere-Hour	>90%		
Watt-Hour	>78%		

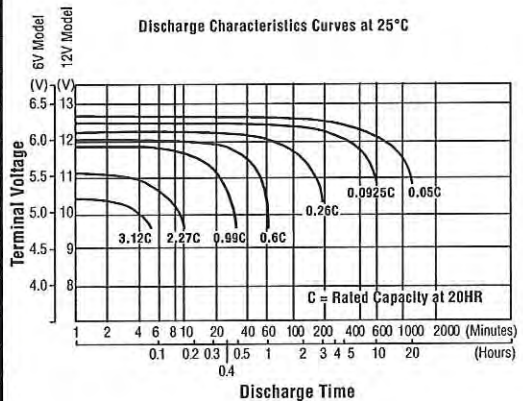
## Torque Setting Technology

Terminal Torque Setting	3.9 - 5.4 N.m.
-------------------------	----------------

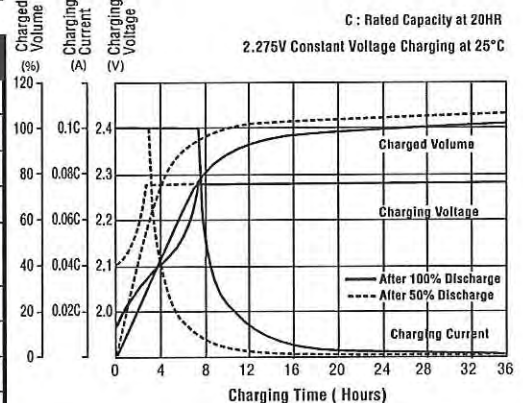
## Compliant Standard Plate Technology

Battery Standard	JIS C8704-2: 1999
------------------	-------------------

## Discharge Characteristics



## Charging Characteristics



An affiliated business of the GS Yuasa Corporation, Century Yuasa has an 80-year history of supplying a range of stored energy solutions to the Australian market. An established network of sales and distributions offices throughout Australia and New Zealand has seen the business gain the trust and respect from its customers by focusing on quality products and exceptional customer service. CenturyYuasa is Australia's enduring manufacturer of stored energy products.

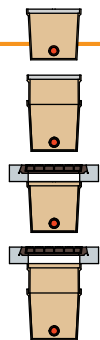
Mkt No. YU309-590

## 2.6 SITE WIDE EQUIPMENT TECHNICAL DATA

The following pages contain technical data for the material used outside of the switchboard. The list below has been added to assist in navigation of the supplied technical data.

### SITE WIDE TECHNICAL DATA LIST – STEVENS STREET

TYPE 96 ELECTRICAL PIT - CABLEMATE .....	236
CHEMSET BOLT ANCHOR – RAMSET .....	238
DUCTILE IRON PIT LID – ACO ACCESS .....	240
EARTH ROD CONNECTION BOX – DULMISON .....	244
HYDROTITE PIT SEALANT – PARCHEM .....	248
NITOBOND EP – PARCHEM .....	252
RENDEROC HB40 – PARCHEM .....	256
RENDEROC HB70 – PARCHEM .....	261
VEGA EXTERNAL HOUSING - VEGA .....	265



## Type 96 Pit

Length	995mm	L	W	Up to
Width	695mm		D	920mm (1 riser)
Depth	620mm			1,220mm (2 risers)

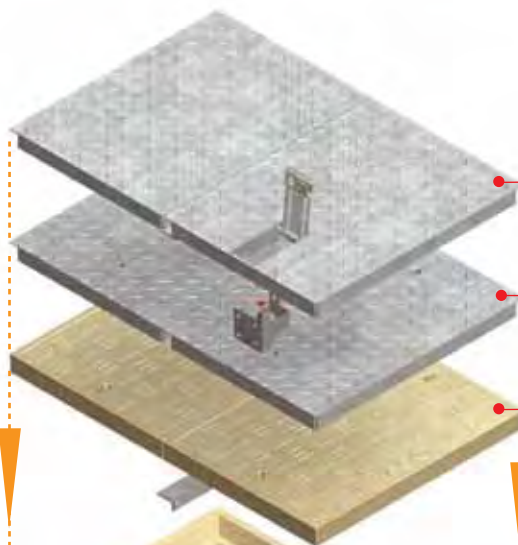


### Product Selection Steps

Once pit type is determined:

1. Determine if riser(s) is required.
2. Select lid or access cover (adds additional depth) to suit project application.

### Lids

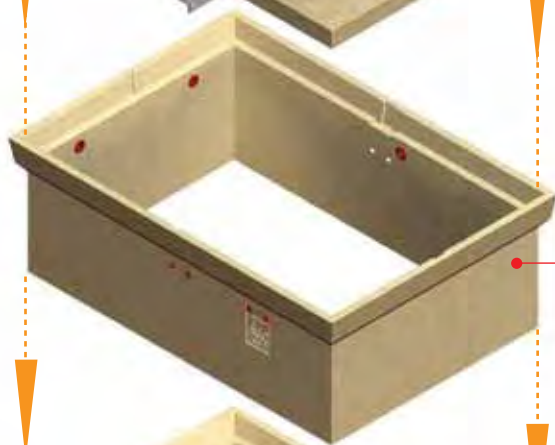


Steel **PowerLok**® 2-part lid (AS 3996 Class B)  
AS/NZS 4586 Slip Resistance Rating R10.  
IP2XD (AS 60529) protection against ingress of foreign objects when hatch is closed.

Steel 2-part lid (AS 3996 Class B)  
AS/NZS 4586 Slip Resistance Rating R10.  
IP4X (AS 60529) protection against ingress of foreign objects if fitted with universal plug.

Polymer concrete 2-part lid (AS 3996 Class A)  
AS/NZS 4586 Slip Resistance Rating R10.  
IP4X (AS 60529) protection against ingress of foreign objects if fitted with universal plug.

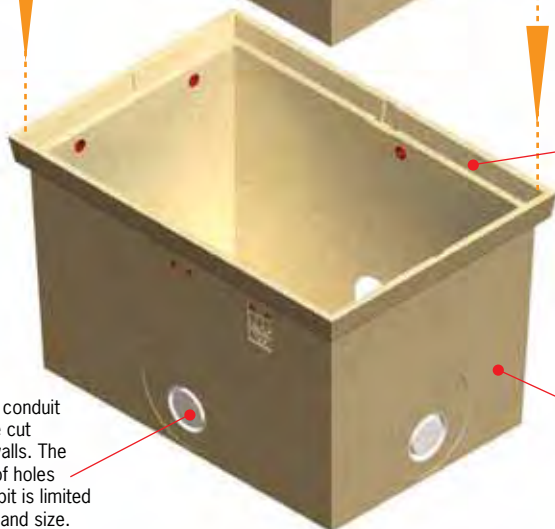
### Riser



Note: Access covers fit above pit/riser, refer to pg 80 for installation guidelines.

Optional riser to increase pit depth, riser rebate is identical to pit rebate and with lid, offers the same IP protection. Can be cut to required height. ACO recommends no more than 2 risers. Each riser adds 300mm depth.

### Pit



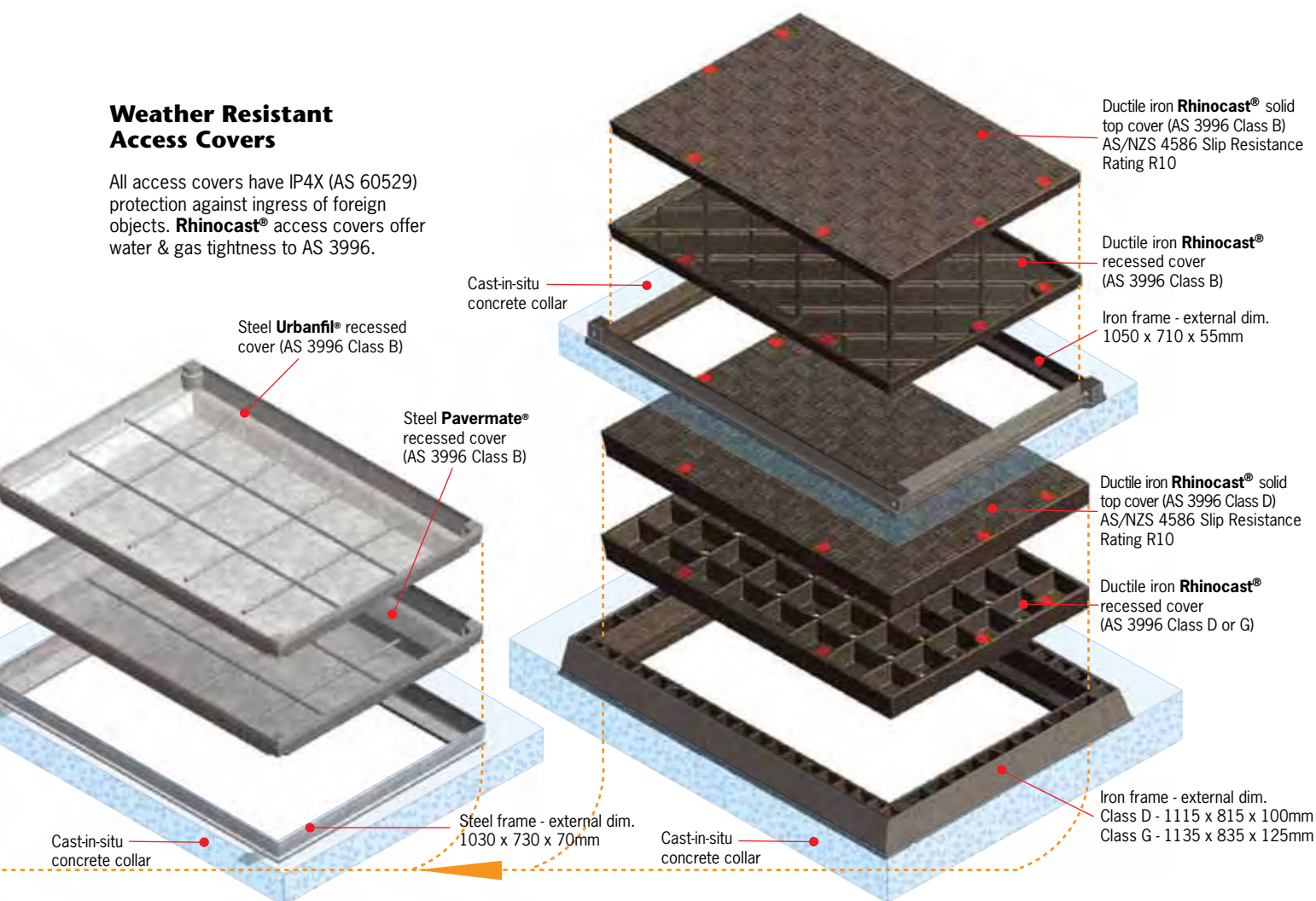
Holesaw guides for conduit entry - holes can be cut anywhere on side walls. The maximum number of holes recommended per pit is limited by conduit quantity and size. Contact ACO for guidance.

Lids fit into rebate at top of pit, whilst access covers must be installed in a cast in situ concrete collar.

Polymer concrete pit construction offers excellent strength to weight ratio, excellent electrical resistivity, low porosity, and high resistance to chemicals, weathering, biological attack.

## Weather Resistant Access Covers

All access covers have IP4X (AS 60529) protection against ingress of foreign objects. **Rhinocast®** access covers offer water & gas tightness to AS 3996.

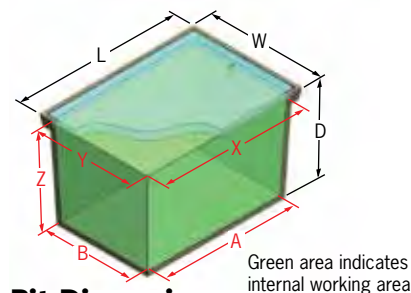


## Type 96 Pit Parts List<sup>6</sup>

Description	Part No.	Weight (kg)
Type 96 polymer concrete pit	74429	95
Type 96 polymer concrete riser (adds 300mm to pit depth)	74463	55
Lids & Covers		Cover <sup>1</sup> Total
Polymer concrete 2-part lid (AS 3996 Class A) - Blank <sup>2</sup>	74560	22 46
Polymer concrete 2-part lid (AS 3996 Class A) - Communications <sup>2</sup>	74555	22 46
Polymer concrete 2-part lid (AS 3996 Class A) - Electricity <sup>2</sup>	74550	22 46
Steel 2-part lid (AS 3996 Class B)	79620	15 30
Steel <b>PowerLok®</b> 2-part lid (AS 3996 Class B) <sup>2,3</sup>	79630	20 39
Steel <b>Urbanfil®</b> recessed cover (AS 3996 Class B) <sup>4</sup>	82018	21 30
Steel <b>Pavermate®</b> recessed cover (AS 3996 Class B) <sup>4</sup>	81364	22 30
Ductile iron <b>Rhinocast®</b> recessed cover (AS 3996 Class B) <sup>5</sup>	85078	57 83
Ductile iron <b>Rhinocast®</b> solid top cover (AS 3996 Class B) <sup>5</sup>	85253	57 87
Ductile iron <b>Rhinocast®</b> recessed cover (AS 3996 Class D) <sup>5</sup>	89072	88 149
Ductile iron <b>Rhinocast®</b> solid top cover (AS 3996 Class D) <sup>5</sup>	89276	102 165
Ductile iron <b>Rhinocast®</b> recessed cover (AS 3996 Class G) <sup>5</sup>	87075	180 266

### Notes:

- Lid & access cover weights are provided as lifting weight (individual cover parts) and total weight. Recessed cover weights do not include pavement infill; for approx. lifting weight - **Urbanfil®**/**Pavermate®** covers - multiply weight by '7'; **Rhinocast®** covers multiply weight by '1.5'.
- All lids are supplied with brackets and support bars where applicable.
- PowerLok®** lids supplied with locking bolt (padlock not supplied).
- Optional brass edging (Specify 'BE' after part number).
- Optional locking, brass or stainless steel edging in 12mm or 40mm heights (Specify 'BE' or 'SS' and height after part number).
- For Accessories (e.g. identification plates, divider brackets, cable hanger brackets see pg 43).



## Pit Dimensions

Internal working area (mm)	
A	850
B	555
X	900
Y	600
Z	550
Overall dimensions (mm)	
L	995
W	695
D	620

### Notes:

- Using risers will increase pit depth (Z & D) by depth of riser.
- Access covers will increase depth of pit by height of concrete collar - allowance should be made for concrete collar during pit installation. See pg 82 for excavation details.

# Ramset™ | Chemset™ Maxima Spin Capsules

## Solid Concrete Anchoring



### Function

Chemset Maxima Spin Capsules are a chemical anchor system based on epoxy acrylate. The capsule is placed into the hole and the mortar is mixed during the anchor installation.

### Features and Benefits

#### No measuring, no mess, no waste

- Adhesive is contained in pre-measured capsules.

#### Versatile

- Use in damp holes.

#### Fast installation

- Cures in minutes and can be loaded in 20 min (at 20°C).

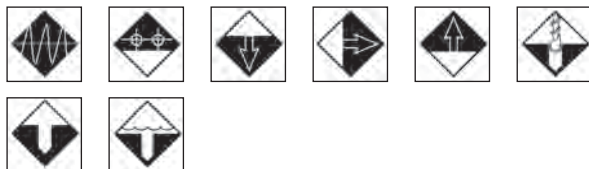
#### High bond strength

- Acrylic adhesive.

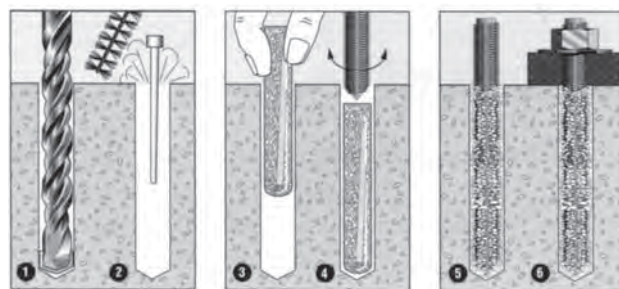
#### High corrosion resistance

#### Principal Applications

- Structural beams and columns
- Batten fixing
- Installing signs, handrails, balustrades and gates
- Racking
- Safety barriers
- Stadium seating
- Machinery hold down



### Installation



- Drill recommended diameter and depth hole.
- Clean hole with hole cleaning brush. Remove all debris using hole blower.
- Insert correct size Spin capsule into the hole.
- Using appropriate driver accessories, drive the Chemset Anchor Stud into the hole using a hammer drill (on rotation).
- Cure as per setting times.
- Attach fixture and tighten nut in accordance with recommended tightening torque.

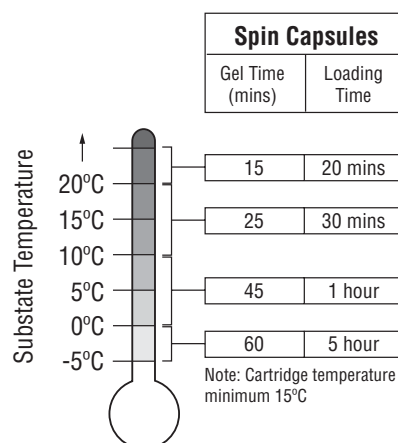
#### Installation temperature limits:

Substrate: -5°C to 35°C. Load should not be applied to anchor until the chemical has sufficiently cured as specified.

#### Service temperature limits:

-23°C to 60°C

### Setting Times



## Solid Concrete Anchoring

### Installation and Performance Details: Using Chemset Anchor Studs (p20)

	Installation details				Minimum dimension*			Reduced Characteristic Capacity			
Anchor size, d <sub>a</sub> (mm)	Drilled hole Ø, d <sub>h</sub> (mm)	Fixture hole Ø, d <sub>f</sub> (mm)	Anchor effective depth, h (mm)	Tightening torque, T <sub>r</sub> (Nm)	Edge distance, e <sub>c</sub> (mm)	Anchor spacing, a <sub>c</sub> (mm)	Substrate thickness, b <sub>m</sub> (mm)	Shear V <sub>a</sub> (kN)	Tension N <sub>a</sub> (kN)		
									Concrete strength MPa		
								20 MPa	20 MPa	32 MPa	40 MPa
M10	12	12	90	20	40	60	120	14.1	16.7	19.2	20.6
M12	14	15	110	40	50	70	140	21.0	23.8	27.4	29.3
M16	18	19	125	95	65	100	160	39.7	34.8	40.1	42.9
M20	24	24	150	180	80	120	190	59.9	55.7	64.1	68.6
			170**				220	59.9	63.1	72.7	77.7
M24	26	28	160	315	95	145	200	86.8	64.4	74.1	79.3
			210**				270	86.8	84.5	97.3	104.0
* For shear loads acting towards an edge or where these minimum dimensions are not achievable, please use the								Reduced Characteristic			

\* For shear loads acting towards an edge or where these minimum dimensions are not achievable, please use the simplified strength limit state design process to verify capacity.

\* For details on Reduced Characteristic capacities refer page 3.

\*\*Note: To achieve these non standard effective depths, use an additional CHEM10 Maxima spin capsule per hole.

### Description and Part Numbers - Chemset Maxima Spin Capsules

Capsule dimensions		To suit Chemset Anchor Stud	Capsule Part No.
Nominal $\varnothing$ , $d$ (mm)	Capsule Length, $L$ (mm)	Anchor size, $d_a$	
11	80	M10	CHEM10
13	95	M12	CHEM12
17	95	M16	CHEM16
21.5	115	M20	CHEM2024
21.5	115	M24	CHEM2024

### Description and Part Numbers - Accessories

Cleaning Brush	10-14mm Hole	HCBT13
Cleaning Brush	18-22mm Hole	HCBT20
Cleaning Brush	22-26mm Hole	HCBT26
Hole Cleaning Pump / Blower	-	S065990

## Rhinocast - Ductile Iron Access Covers and Frames

### Typical Applications

- Internal areas
- Streetscapes
- Prestige/Aesthetic projects
- Commercial areas
- Industrial applications
- Docks and ports
- Airports
- Ducting trenches
- Roads and carriageways
- Electrical and communications
- Trade waste, sewer and storm water



Ductile iron strengthening ribs cast into the cover.

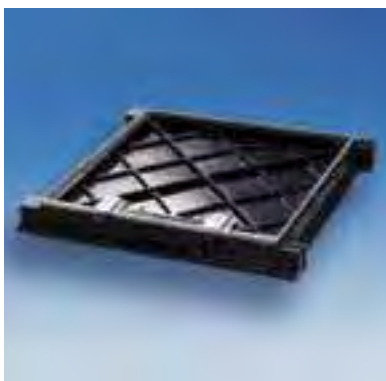


Decorative edge can be attached to the cover and frame for aesthetic areas. This adds 12mm or 40mm to overall height to accommodate tiles or pavers

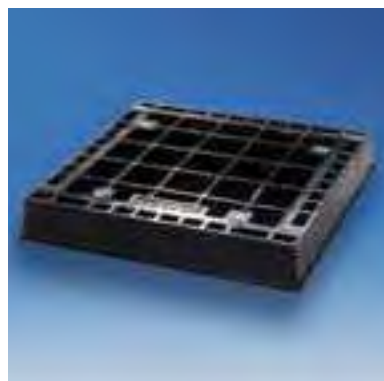


Circular, square and rectangular covers are available as recessed or solid top

### Class B Cover with 'T' frame



### Class D & G covers with cellular frame



### Circular covers



### Product Features

- All covers are designed to meet Australian Standard AS 3996 Class B, D or G loading
- 600/3 ductile iron cover to AS 1831 and grey iron frame
- All covers are sealed to 1.5kPa to AS 3996 requirements
- 'T' or cellular frame provides excellent anchorage of the frame into the concrete bed
- Drawcut/undercut profile of cover and frame allows the cover to slide out, in one direction only
- Reinforcing ribs cast into the cover provide required strength
- Plastic dust caps prevent lifting boss' filling with dirt and debris
- Optional brass or stainless steel decorative edging adds 12mm or 40mm to overall height to accommodate tiles or brick pavers

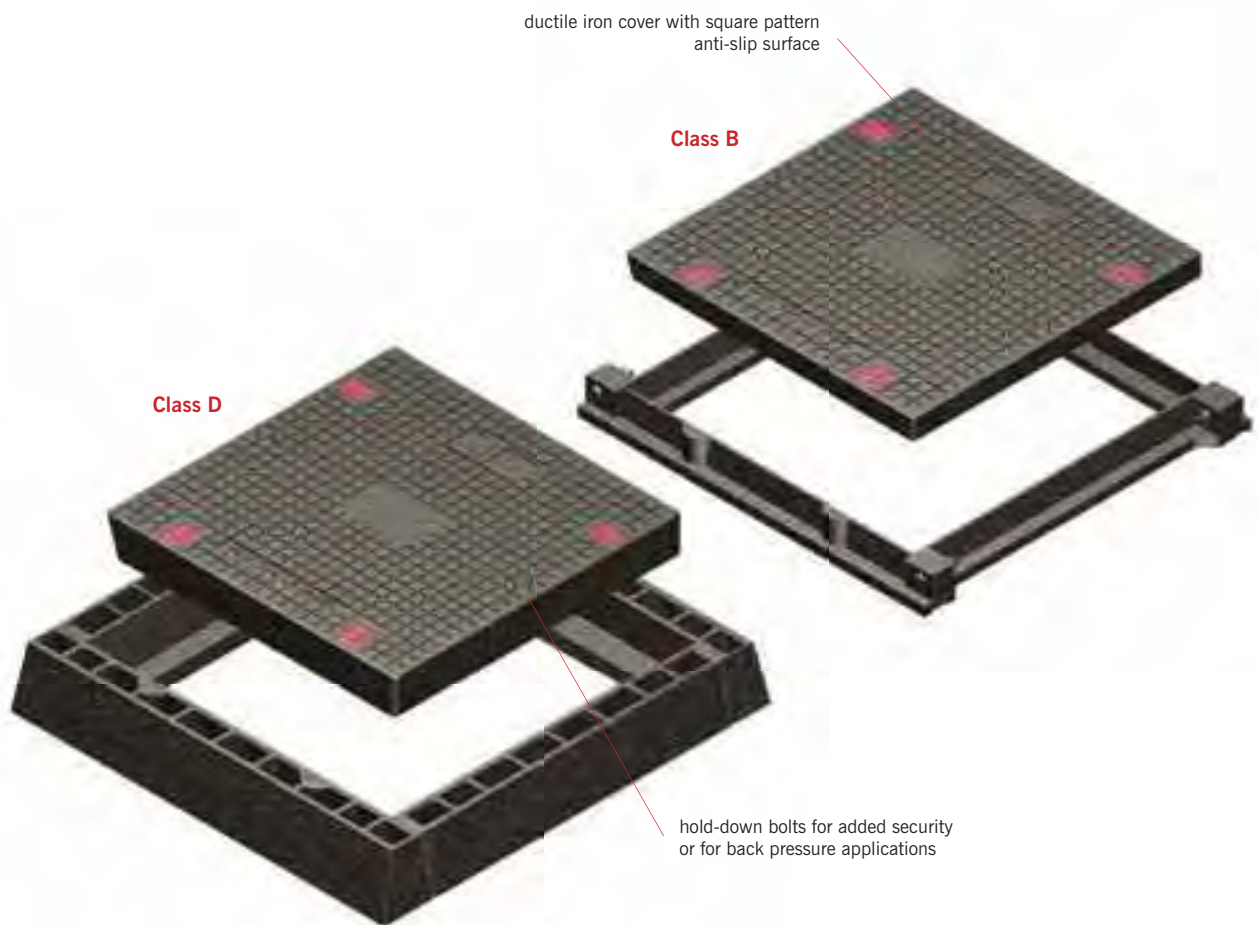


**Australian Standard**  
AS 3996 Lic 2646  
Standards Australia



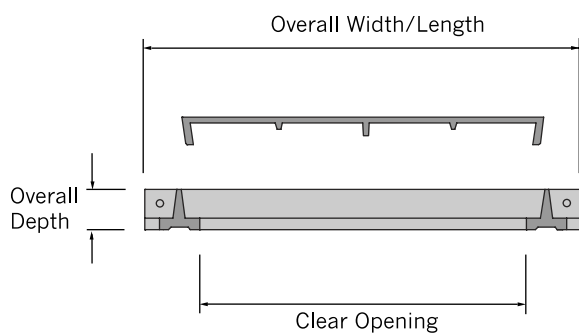
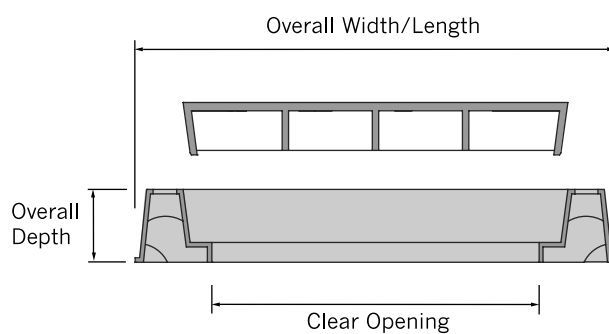
## Rhinocast - Solid Top Ductile Iron Access Cover and Frame



Single part square units can be used to provide access to underground stormwater/sewer systems, electricity and communication enclosures, greasetraps, valves and junction boxes.



Also available as 2 part, 3 part, trench and multipart systems



**Class B - 'T' Frame****Class D - Cellular Frame**

Type	Part No.	Clear Opening W x L (mm)	Overall W x L (mm)	Overall Depth (mm)	Cover Wgt (kg)	Overall Wgt (kg)	Decorative Edging*	Locking Option**
 <b>Class B - AS 3996 - 80kN</b>								
DIS44B	<b>85249</b>	450 x 450	600 x 560	55	22.0	44.0	BE/SS – 12/40	STD/BB
DIS46B	<b>85261</b>	450 x 600	600 x 710	55	31.0	54.0	BE/SS – 12/40	STD/BB
DIS64B	<b>85236</b>	600 x 450	750 x 560	55	31.0	54.0	BE/SS – 12/40	STD/BB
DIS66B	<b>85222</b>	600 x 600	750 x 710	55	36.0	62.0	BE/SS – 12/40	STD/BB
DIS74B	<b>85298</b>	750 x 450	900 x 560	55	39.0	66.0	BE/SS – 12/40	STD/BB
DIS76B	<b>85287</b>	750 x 600	900 x 710	55	54.0	82.0	BE/SS – 12/40	STD/BB
DIS77B	<b>85274</b>	750 x 750	900 x 860	55	60.0	94.0	BE/SS – 12/40	STD/BB
DIS67B	<b>85215</b>	600 x 750	750 x 860	55	44.0	82.0	BE/SS – 12/40	STD/BB
DIS94B	<b>85208</b>	900 x 450	1050 x 560	55	50.0	79.0	BE/SS – 12/40	STD/BB
DIS96B	<b>85253</b>	900 x 600	1050 x 710	55	57.0	89.0	BE/SS – 12/40	STD/BB
 <b>Class D - AS 3996 - 210kN</b>								
DIS44D	<b>89268</b>	450 x 450	660 x 660	105	42.0	87.0	BE/SS – 12/40	STD/BB
DIS46D	<b>89283</b>	450 x 600	660 x 810	105	51.0	101.0	BE/SS – 12/40	STD/BB
DIS64D	<b>89251</b>	600 x 450	810 x 660	105	51.0	101.0	BE/SS – 12/40	STD/BB
DIS66D	<b>89235</b>	600 x 600	810 x 810	105	65.0	122.0	BE/SS – 12/40	STD/BB
DIS67D	<b>89227</b>	600 x 750	810 x 960	105	80.0	142.0	BE/SS – 12/40	STD/BB
DIS74D	<b>89294</b>	750 x 450	962 x 660	105	66.0	120.0	BE/SS – 12/40	STD/BB
DIS76D	<b>89309</b>	750 x 600	962 x 810	105	84.0	140.0	BE/SS – 12/40	STD/BB
DIS77D	<b>89315</b>	750 x 750	962 x 960	105	104.0	161.0	BE/SS – 12/40	STD/BB
DIS94D	<b>89215</b>	900 x 450	1110 x 660	105	80.0	142.0	BE/SS – 12/40	STD/BB
DIS96D	<b>89276</b>	900 x 600	1110 x 810	105	102.0	162.0	BE/SS – 12/40	STD/BB

\* Decorative Brass (BE) or Stainless Steel (SS) edging can be added - just specify BE or SS and height (12mm or 40mm) after part no.

\*\* Optional locking bolts are available for security or back pressure applications - specify standard bolts (LD) or Barri bolts (BB) after part no.



## **EARTHING RODS & ACCESSORIES**

- ♦ **Extendable Earth Rods - Tapered**
- ♦ **Extendable Earth Rods - Flush**
- ♦ **Non Extendable Rods**
- ♦ **Airport Earthing Terminals**
- ♦ **Survey and Mapping Data Marks**
- ♦ **Earthing Bond**
- ♦ **Earthing Connectors**
- ♦ **Earth Rods Clamps**
- ♦ **Earthing Enhancement Compounds**
- ♦ **Connection Boxes**
- ♦ **Exothermic Welded Connections**
- ♦ **Pole Earthing Terminals**
- ♦ **Earth Mats**

## DULMISON EARTHING RODS & ACCESSORIES

### Non-Extendable Rods - Heavy Duty Series Earth Rod Clamps

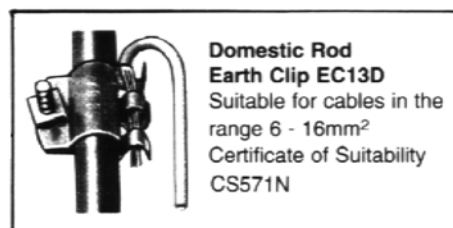
Type LGR - Copper Clad

Recommended Clamps: Clamp Types EP, ET, GB and FSC provide a copper to copper connection, either in parallel or right angle mode, accommodating single, two and three conductors.

LGR 19mm Rods	
Length (metres)	Catalogue No.
1.8	LGR1918
2.4	LGR1924
3.0	LGR1930

### Non-Extendable Rods - Domestic CNE1314T 1400mm x 13mm diameter

Dulmison Manufacture a broad range of non-extenable earth rods. Each rod incorporates an integral driving point, machined (not ground) to preserve the strength and rigidity of cold drawn steel. The flat tip was developed for penetrating all types of soil.



### Extendable Earth Rods - Taperlock Coupled Types CTE and STE



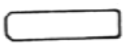

Types CTE and STE earth rods are among the simplest to use. They have identical taper ends and are joined by a one-piece tapered coupling which locks upon driving. These rods may be driven by hand or machine.

Taper lock rods available with driving point (add suffix 'P').

Copper Clad Rods			Stainless Steel Clad Rods		
Diameter	13mm	15mm	19mm	13mm	14mm
Length	Standard Taperlock	Standard Taperlock	Standard Taperlock	Standard Taperlock	Standard Taperlock
1200	CTE1312	CTE1512	-	STE1312	STE1412
1440	CTE1314	CTE1514	-	STE1314	STE1415
1800	CTE1318	CTE1518	-	STE1318	STE1418
2000	-	-	CTE1920	-	-
2400	CTE1324	CTE1524	-	STE1324	STE1424
3000	CTE1330	CTE1530	-	STE1330	STE1430



## DULMISON EARTHING RODS & ACCESSORIES

Tapered Couplings, Driving Points, Tools		Copper		Stainless Steel	
		CTE13	CTE15	STE13	STE14
	<b>Couplings</b>	CCT13	CCT15	SCT13	SCT15
	Driving Points				
	Average Driving	DPT13	DPT15	DPT12	DPT15
Hard Driving - Points and Tools available					
	<b>Hand Driving Tools</b>				
	Average Driving	DHT15	DHT15	DHT15	DHT15
	<b>Machine Driving Tools</b>				
	Kango 900/950	MDH15K	MDH15K	MDH15K	MDH15K

Tools available for Atlas Copco / Stanley Cbrromwade

### Earthing Enhancement Compound - Earthrite

Composition: Bentonite, Gypsum, Sodium Sulphate

Features: Earthrite provides long term low ground resistance, high expansion and low shrink characteristics. Non toxic, Non corrosive.

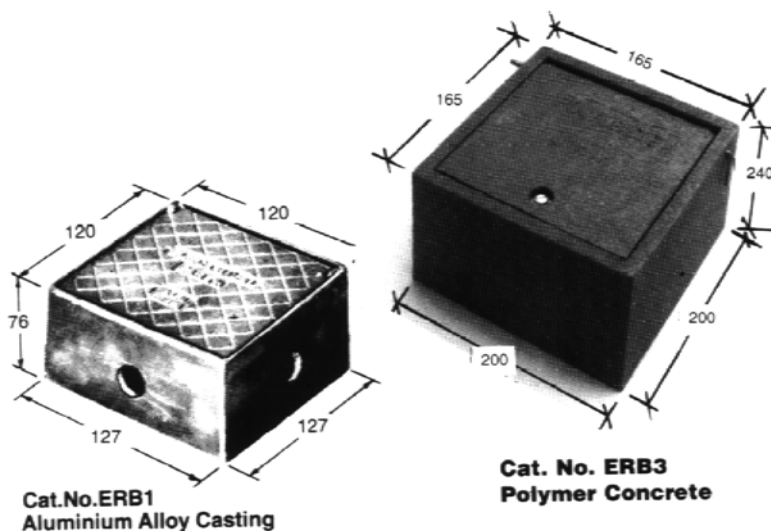
20kg Bag yields 0.03m<sup>3</sup>

Application: As a dry mix or as pourable slurry.



### Earth Rod Connection Boxes

Boxes ERB1 and ERB3 feature hinged inspection lids and cable entry holes on the sides.



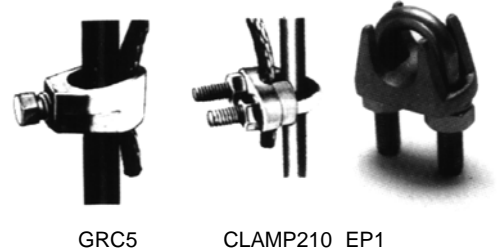
## DULMISON EARTHING RODS & ACCESSORIES

### EARTH ROD CLAMPS

Single Conductor - Parallel

Materials - Body: High copper content alloy casting  
Hardware: Stainless Steel

Part No.	Rod Size	Conductor	Size
		csa mm <sup>2</sup>	diameter mm
GRC5	13-15	10-35	4.05-7.65
CLAMP210	13-15	16-120	5.10-14.21
EP1	17-19	16-120	5.10-14.21

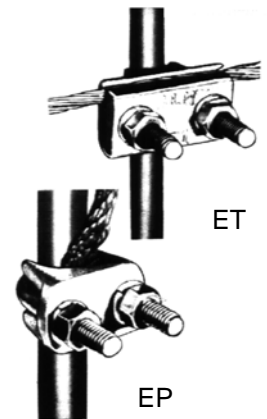


### Multi-Conductor Earthing

For two earth conductors parallel to rod, or two or three earth conductors at right angles to rod.

Materials - Body: High copper content alloy casting  
Hardware: Stainless Steel

Multiple Conductor Intsallations				
Part No.	Rod Size	csa mm <sup>2</sup>	diameter mm	No. of Conductors
EP3	13-19	16-35	5.1-7.7	2
EP4	13-19	50-120	8.9-14.2	2
ET1	13-19	16-35	5.1-7.7	2
ET2	13-19	50-120	8.9-14.2	2
ET4	13-19	50-120	8.9-14.2	3

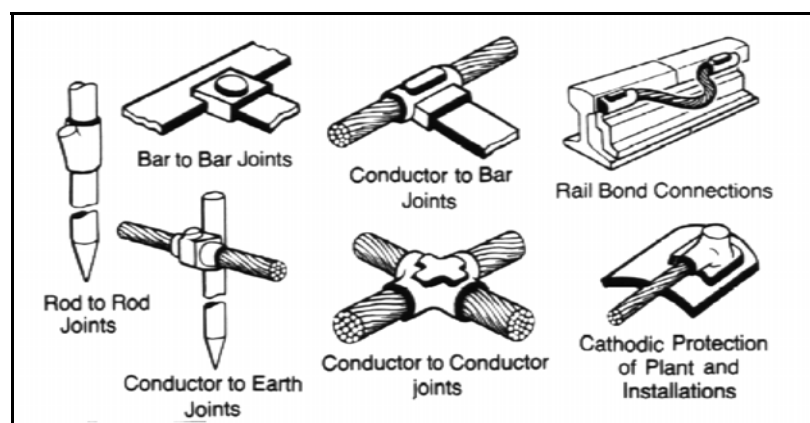


### The CADWELD Connection

Simple - Fast - No Gas or Arc Welding. Cadweld is ideal for on-site welding of connections to a wide range of metals as follows:

Copper to: Mild Steel Copper      Stainless Steel Copper Clad Steel  
Brass      Bronze      Monel Metal      Galvanised Steel

Some typical exothermic welded connections applicable to earthing



# Technical Data Sheet

## Hydrotite

**Premium grade, water swellable, waterstop range for use in cast in-situ concrete**

### DESCRIPTION

Hydrotite is a hydrophilic waterstop which exhibits excellent durability and water sealing capacity. It expands as it absorbs water and fills up concrete joint gaps conforming to the gap variation, ensuring excellent sealing. Hydrotite is based on the technology of hydrophilics, a material which expands in a controlled fashion by approximately eight times by volume in the presence of moisture to create a pressure seal within the joint.

When properly installed Hydrotite is capable of sealing heads of water up to 50 m and is used throughout the construction industry to seal horizontal and vertical construction joints for poured in-situ concrete.

Hydrotite offers various profiles for in-situ concrete construction joints such as DSS0220, CJ0725-3K, CJ1020-2K, CJ1030-4M. It consists of a unique combination of expanding hydrophilic materials and non-expanding chloroprene rubber co-extruded together to form a single strip. The expanding section is blue with the non-expanding section being black. The co-extruded design means that the expansion is directed across the joint for maximum sealing performance.

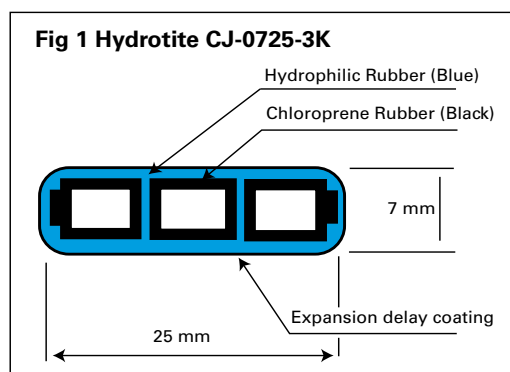
This expansion creates an effective compression seal within joints which shuts out the water path. Upon expansion Hydrotite turns from a dark blue colour to a light blue colour so that a visual inspection of the Hydrotite can be made and the contractor can check if the Hydrotite has pre-expanded.

Hydrotite is treated with a delay coating to prevent it from absorbing water from the moist green concrete, to help stop any premature expansion should the joint become ponded with water prior to the second pour and to stop any premature expansion taking place before curing of the concrete. For areas where ponding or running water may be a problem, please contact Parchem or your local distributor for advice.

Some Hydrotite profiles are available with a self-adhesive backing which makes installation easier and lowers construction time and costs. The self-adhesive backing means that the purchase of other construction adhesives is not required and also saves the contractor the installation costs of applying the adhesive to the concrete.

Hydrotite, as with any hydrophilic waterstop will return to its original size if there is no more water or moisture present. Hydrotite will then re-expand when water or moisture is again introduced to the joint. Some leakage may occur before Hydrotite re-expands fully. Repeated wet and dry cycling of this nature does not effect the functioning of Hydrotite.

The standard dimension and shape of CJ-0725-3K is as per Fig. 1.



Before expansion

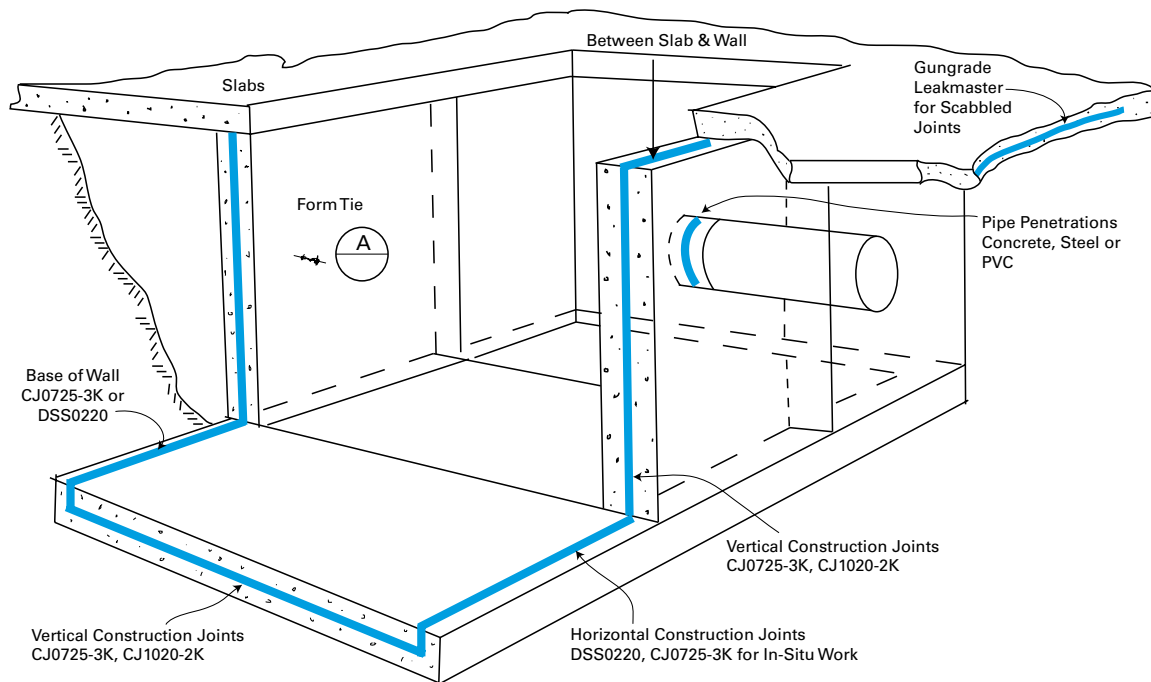


After expansion

an **alesco** company

**Corkjoint**

<b>PARCHEM</b>	CONCRETE REPAIR	FLOORING	<b>JOINTING SYSTEMS</b>	WATERPROOFING
<b>TECHNICAL DATA SHEET</b>	<b>MARCH 08</b>			
<a href="http://www.parchem.com.au">www.parchem.com.au</a>	7 Lucca Road, Wyong NSW 2259	Sales 1800 624 322	Technical 1800 812 864	ABN 80 069 961 968



## AREAS OF APPLICATION

Hydrotite is to be used where watertight integrity is the prime issue. Typical applications where there is a need to achieve a water seal include:-

- Sewerage treatment plants
- Pipe penetrations
- Subway stations
- Water treatment plants
- Swimming pools
- Basements
- Reservoirs
- Tunnels
- Pits

Vertical Construction Joints:	CJ0725-3K, CJ1020-2K, CJ1030-4M, CJ2020-M
-------------------------------	---

Horizontal Construction Joints:	DSS0220, CJ0725-3K, CJ1020-2K, Leakmaster
---------------------------------	---

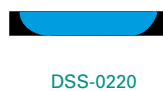
Joint and Leak Repairs:	RSS rods various sizes
-------------------------	------------------------

Pipe Penetrations:	DSS0220, CJ0725-3K, Leakmaster
--------------------	--------------------------------

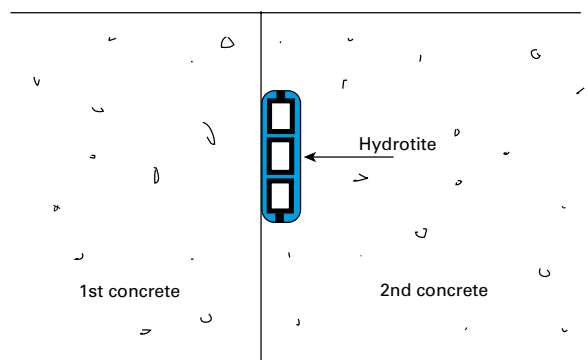
Thru Tie Holes:	RSS rods, RSS2519D, RSS2014D
-----------------	------------------------------

## GUIDE TO PROFILE SELECTION

Shown below is a guideline of where Hydrotite profiles have been specified and used in construction joints in various projects. Joint details should be verified by the Consulting Engineer who should determine the suitability of the products for its intended use.



### Typical Application of Hydrotite



## ADVANTAGES

- Self-adhesive properties makes installation much easier and reduces construction costs
- Co-extruded design means expansion is directed across the joint for maximum seal
- Unaffected by repeated wet and dry cycles
- No site welding as is required for traditional PVC waterstops
- Has a delay coating to help prevent premature expansion
- Extra cans of delay coating are available if required
- Changes colour as a visual alert to let you know it has expanded
- No need for special intersections, joining is by simple butt joints
- Can be applied to rough surfaces using Leakmaster gun grade waterstop
- Easy to handle and install
- Can be joined to traditional PVC waterstop
- No compaction or displacement problems
- Non toxic and non hazardous
- No need for split forming

## DESIGN CRITERIA

Hydrotite should be used to prevent the passage of water through low movement joints in both new in-situ concrete and between new and existing concrete. Hydrotite can also be used around penetrating pipe entries prior to concrete placement. Hydrotite increases in volume in the range of up to 800% and gives a resistance to hydraulic heads of up to 50 metres.

Hydrotite waterstops should be positioned to ensure that a minimum of 50 mm cover of concrete is present to accommodate pressure developed during the swelling process.

Hydrotite is suitable for applications between existing and newly placed concrete where there is little or no steel continuity and therefore some small movement may occur.

Hydrotite is generally not suitable for use in expansion joints

**TABLE 1: BASIC PHYSICAL PROPERTIES OF HYDROTITE**

Item	Unit	Hydrophilic Rubber		Chloroprene Rubber	
		Standard	Typical	Standard	Typical
Specific Gravity		1.40 ± 0.10	1.35	1.40 ± 0.10	1.41
Hardness	(JIS-A)	50 ± 5	52	50 ± 5	51
Tensile Strength	N/mm <sup>2</sup>	min. 2.94	3.63	min. 8.82	12.25
Elongation	%	min.600	760	min. 400	435

## CHEMICAL RESISTANCE

The influence of pH values of concrete, grouting material and ground water upon the expansion of Hydrotite was tested using hydrophilic rubber as follows.

The specimen was immersed in each solution for seven days and the retention value of tensile strength and elongation were measured. Then, the specimen was removed from each solution and placed in tap water for seven days. The specimen was then compared with specimens that had been expanded in tap water only.

The retention value of both physical properties and expansion was compared with that of specimens tested in tap water.

**TABLE 2: BEHAVIOUR IN CHEMICAL SOLUTION**

Hydrotite exhibited retention values 90% or more in the following solutions:

- pH 3 aqueous solution
- pH 5 aqueous solution
- pH 7 (tap water)
- pH 9 aqueous solution
- pH 11 aqueous solution
- Ferrous aqueous solution
- Bentonite aqueous solution
- Grout aqueous solution

**PACKAGING**

PROFILE	DIMENSIONS	METRES PER ROLL	METRES PER CARTON
DSS0220 *	20 MM X 2 MM	25	100
CJ0725-3K *	25 MM X 7 MM	10	40
CJ1020-2K *	20 MM X 10 MM	10	50
CJ1030-4M	30 MM X 10 MM	10	40
CJ2020-M	20 MM X 20 MM	10	30
RSS 1208D	12 MM DIAMETER	20	40
RSS1610D	16 MM DIAMETER	10	20
RSS2014D	20 MM DIAMETER	10	20
RSS2519D	25 MM DIAMETER	5	10

\* these profiles available with self adhesive backing

**LIMITATIONS**

- Not recommended for use in suspended slabs or expansion joints
- Minimum of 50 mm cover of concrete over Hydrotite for reinforced concrete and 100 mm cover of concrete or unreinforced concrete based on concrete strength of 22.5N mm<sup>2</sup>
- Expansion rate can vary in salt or contaminated water
- Not for use where excessive shrinkage may occur

**SPECIFICATION CLAUSE**

Hydrophilic expanding waterstops shall be placed at the joints in the concrete at the locations shown on the drawings in accordance with the requirement of this specification.

Waterstops where shown on drawings shall be Hydrotite (fill in profile number) Hydrophilic Waterstops as supplied by Parchem.

The waterstop shall consist of a non-expansive chloroprene rubber, co-extruded with a blue hydrophilic rubber which is capable of swelling by approx. eight times by volume.

The waterstop shall be treated with a delay coating to prevent premature expansion and be able to change colour upon expansion which acts as a visual alert that the waterstop has started to expand.

The waterstop is to be installed strictly in accordance with the manufacturers recommendations.

**ADDITIONAL INFORMATION**

Parchem provides a wide range of complementary products which include:

- concrete repair – cementitious and epoxy
- grouts and anchors – cementitious and epoxy
- waterproofing membranes – liquid applied, cementitious and bituminous sheet membranes
- waterstops – pvc and swellable
- joint sealants – building, civil and chemical resistant
- industrial flooring systems – cementitious and epoxy
- architectural coatings
- filler boards – swellable cork, bituminous and backing rod
- ancillary products

For further information on any of the above, please consult with your local distributor or Parchem sales office.

**IMPORTANT NOTICE**

A Material Safety Data Sheet (MSDS) and Technical Data Sheet (TDS) are available from the Parchem website or upon request from the nearest Parchem sales office. Read the MSDS and TDS carefully prior to use as application or performance data may change from time to time. In emergency, contact the Poisons Information Centre (phone 13 11 26 within Australia or 0800 764 766 in New Zealand) or see a doctor for advice.

**PRODUCT DISCLAIMER**

This Technical Data Sheet (TDS) summarises our best knowledge of the product, including how to use and apply the product based on the information available at the time. You should read this TDS carefully and consider the information in the context of how the product will be used, including in conjunction with any other product and the type of surfaces to, and the manner in which, the product will be applied. Our responsibility for products sold is subject to our standard terms and conditions of sale. Parchem does not accept any liability either directly or indirectly for any losses suffered in connection with the use or application of the product whether or not in accordance with any advice, specification, recommendation or information given by it.

<b>PARCHEM</b>	CONCRETE REPAIR	FLOORING	<b>JOINTING SYSTEMS</b>	WATERPROOFING
<b>TECHNICAL DATA SHEET</b>	<b>MARCH 08</b>			
<a href="http://www.parchem.com.au">www.parchem.com.au</a>	<b>7 Lucca Road, Wyong NSW 2259</b>	<b>Sales 1800 624 322</b>	<b>Technical 1800 812 864</b>	ABN 80 069 961 968 <b>4</b>

Waterproofing Warehouse  
4/12 Strathaird Road, Bundall, 4217  
www.wpw.com.au  
admin@wpw.com.au  
Phone: +61 07 55921329  
Fax: +61 07 55921227



## Technical Data Sheet

# Nitobond EP

**Epoxy resin primer, high strength bonding agent to bond concrete substrate to repair mortars**

### USES

For bonding fresh wet cementitious materials to existing cementitious surfaces. For use on horizontal or vertical surfaces where mortar or concrete can be supported by formwork. The long 'open' life makes it suitable for use with formwork or where additional steel reinforcement has to be fitted. The product is ideal for roads, bridges, pavements, loading bays and factories, and for bonded or granolithic floor toppings. Nitobond EP is equally suited to internal and external applications.

Nitobond EP may also be used as part of a repair system where a substrate/repair barrier is required or where the substrate is likely to remain permanently damp or wet.

### ADVANTAGES

- Positive adhesion - exceeds that of the tensile strength of the host concrete
- Exhibits high mechanical strength
- Can be applied on to dry or damp substrates
- Solvent-free - can be used in enclosed locations

### DESCRIPTION

Nitobond EP is based on solvent-free epoxy resins containing pigments and fine fillers. It is supplied as a two-component material in pre-weighed quantities ready for on-site mixing and use. The 'base' component is white and the 'hardener' component is black, providing visual evidence (uniform grey colour) that adequate mixing has been achieved.

### TECHNICAL SUPPORT

Parchem offers a comprehensive range of high performance, high quality concrete repair and construction products. In addition, Parchem offers a technical support package to specifiers, end-users and contractors, as well as on-site technical assistance.

### DESIGN CRITERIA

Nitobond EP is designed to have an overlay time of 90 minutes at 20°C. The minimum application temperature for Nitobond EP is 5°C. Consult your local Parchem sales office for further information.

### PROPERTIES

Test method	Typical result
Compressive strength:	50 MPa
Tensile strength:	20 MPa
Flexural strength:	35 MPa
Shear strength:	25 MPa
Adhesive bond to concrete:	In general, the bond will always exceed the tensile strength of the host concrete

### THE FOLLOWING PROPERTIES WERE MEASURED AT 20°C:

Pot life:	35 - 45 minutes
Initial hardness:	24 hours
Full cure:	7 days
Max. overlay time:	90 minutes

Note: at temperatures below 20°C, the cure rate will be slower. Conversely, at temperatures above 20°C, the cure rate will be faster.

### SPECIFICATION CLAUSES

#### EPOXY BONDING AGENT

The bonding agent shall be Nitobond EP, a two-component solvent-free epoxy resin. The 2 components shall be differentially pigmented in order to ensure visually that correct mixing has taken place prior to the application. The product shall achieve 50 MPa compressive strength, 20 MPa tensile strength, 35 MPa flexural strength and 25 MPa shear strength. The adhesive bond to the concrete substrate shall exceed the tensile strength of the host concrete.

an  alesco company



PARCHEM	CONCRETE REPAIR	FLOORING	JOINTING SYSTEMS	WATERPROOFING
TECHNICAL DATA SHEET	FEBRUARY 09			
www.parchem.com.au	7 Lucca Road, Wyong NSW 2259	Sales 1800 624 322	Technical 1800 812 864	ABN 80 069 961 968
				1

# Nitobond EP



## APPLICATION INSTRUCTIONS

### PREPARATION

Clean the surface and remove any dust, unsound material, plaster, oil, paint, grease, corrosion deposits or algae. Roughen the surface and remove any laitance and expose aggregate by light scabbling or grit-blasting.

Oil and grease deposits should be removed by steam cleaning, detergent scrubbing or the use of a proprietary degreaser. The effectiveness of decontamination and soundness of the substrate should then be assessed by a pull-off test.

### MIXING

Any steel reinforcement and formwork should be prepared, cut to size and shape, and made ready for assembly before mixing commences.

Care should be taken to ensure that Nitobond EP is thoroughly mixed. The 'hardener' and 'base' components should be stirred separately before mixing to disperse any settlement. The entire contents of the 'hardener' tin should then be poured into the 'base' tin and the two materials thoroughly mixed using a suitable slow-speed drill and mixing paddle for 2 minutes until a fully uniform colour is obtained. The sides of the tin should then be scraped and mixing should continue for a further 2 minutes.

To facilitate mixing and application at temperatures below 20°C, the separate components should be warmed in hot water up to a maximum temperature of 25°C before beginning to mix. If heated to 25°C, the subsequently mixed material will need to be used more speedily as the pot-life will be reduced to 20 minutes. Alternatively, the material should be stored in an environment heated to 20°C and only removed immediately before use.

### APPLICATION

Nitobond EP should be applied as soon as the mixing process has been completed. It should be brush or spray-applied to the prepared surfaces.

The new concrete or screed should be applied to the coated substrate after the Nitobond EP has become tacky and within 90 minutes at 20°C, ie. while the Nitobond EP is still tacky. If the Nitobond EP is allowed to become tack-free, a second coat will be required.

Where Nitobond EP is to be used as part of a repair system to form a substrate/repair barrier, care should be taken to achieve an unbroken coating. One coat should be applied and allowed to become tack-free. A second coat should be applied and used as the bonding coat.

As soon as the Nitobond EP has been applied, any required steel reinforcement and/or formwork should be erected and fixed securely in place.

### LOW TEMPERATURE WORKING

The minimum application temperature is 5°C. In temperatures below 15°C, the separate components should be heated in warm water (up to 25°C) or stored in a heated environment for 12 hours before use. These measures will facilitate mixing and application. Normal precautions for winter working with cementitious materials should then be adopted.

### HIGH TEMPERATURE WORKING

At ambient temperatures above 30°C, the material should be stored in the shade or in an air-conditioned environment for 12 hours before use.

### CLEANING

Nitobond EP should be removed from tools, equipment and mixers with Parchem Solvent immediately after use. Hardened material can only be removed mechanically.

### LIMITATIONS

Nitobond EP should not be applied when the temperature is below 5°C or is 5°C and falling. If any doubts arise concerning temperature or substrate conditions, consult your local Parchem sales office. Before the application of any repair material or topping, Nitobond EP should be allowed to become tacky after its application to the host substrate. Due to the relatively slow setting time of Nitobond EP, care should be taken when the product is used in cold conditions and or when the material being subsequently applied to the Nitobond EP is rapid setting. In cold conditions (<15°C) the Nitobond may not set quick enough to bond to a rapidly setting topping which may then "curl" due to shrinkage tension. This would result in delamination of the topping away from the host substrate. If there is a possibility of these conditions on site, users are advised to contact Parchem Technical Helpline for specific guidance.

# Nitobond EP



## ESTIMATING

### SUPPLY

<b>Nitobond EP:</b>	1.5 and 6.0 litre packs
---------------------	-------------------------

<b>Parchem Solvent:</b>	4 and 20 litre cans
-------------------------	---------------------

### COVERAGE

<b>Nitobond EP:</b>	4 - 5 m <sup>2</sup> /litre
---------------------	-----------------------------

Note: the coverage figures for Nitobond EP is theoretical – due to wastage factors and the variety and nature of possible substrates, practical coverage figures will be reduced.

## STORAGE

### SHELF LIFE

Nitobond EP has a shelf life of 12 months if kept in a dry store in the original unopened packs.

### STORAGE CONDITIONS

Store in dry conditions in the original unopened packs. If stored at high temperatures, the shelf life may be reduced.

# Nitobond EP



## ADDITIONAL INFORMATION

Parchem provides a wide range of complementary products which include:

- concrete repair – cementitious and epoxy
- grouts and anchors – cementitious and epoxy
- waterproofing membranes – liquid applied, cementitious and bituminous sheet membranes
- waterstops – pvc and swellable
- joint sealants – building, civil and chemical resistant
- industrial flooring systems – cementitious and epoxy
- architectural coatings
- filler boards – swellable cork, bituminous and backing rod
- ancillary products

For further information on any of the above, please consult with your local Parchem sales office.

## IMPORTANT NOTICE

A Material Safety Data Sheet (MSDS) and Technical Data Sheet (TDS) are available from the Parchem website or upon request from the nearest Parchem sales office. Read the MSDS and TDS carefully prior to use as application or performance data may change from time to time. In emergency, contact any Poisons Information Centre (phone 13 11 26 within Australia) or a doctor for advice.

## PRODUCT DISCLAIMER

This Technical Data Sheet (TDS) summarises our best knowledge of the product, including how to use and apply the product based on the information available at the time. You should read this TDS carefully and consider the information in the context of how the product will be used, including in conjunction with any other product and the type of surfaces to, and the manner in which, the product will be applied. Our responsibility for products sold is subject to our standard terms and conditions of sale. Parchem does not accept any liability either directly or indirectly for any losses suffered in connection with the use or application of the product whether or not in accordance with any advice, specification, recommendation or information given by it.

\*Manufactured and sold under license from Fosroc International Limited. Fosroc and the Fosroc logo are trade marks of Fosroc International Limited, used under license. \*Denotes a trade mark of Fosroc International Limited.

an alesco company



PARCHEM	CONCRETE REPAIR	FLOORING	JOINTING SYSTEMS	WATERPROOFING
TECHNICAL DATA SHEET	FEBRUARY 09			
www.parchem.com.au	7 Lucca Road, Wyong NSW 2259	Sales 1800 624 322	Technical 1800 812 864	ABN 80 069 961 968
				4

# Method Statement



## Renderoc HB40

**High performance, medium weight, very low shrinkage, patch repair mortar, compatible with concrete 30-45 MPa**

### SECTION A: GENERAL COMMENTS

#### HIGH AND LOW TEMPERATURE WORKING

It is suggested that, for temperatures above 35°C or below 5°C, the following guidelines are adopted as good working practise:

- I. Store unmixed materials in cool, dry conditions, in original unopened bags, avoiding exposure to direct sunlight.
- II. In high temperature environments, keep equipment cool, arranging shade protection if necessary. It is especially important to keep cool those surfaces of the equipment that come into direct contact with the material itself.
- III. Try to avoid application during the hottest times of the day, arrange temporary shading as necessary.
- IV. At lower temperatures, *Renderoc HB40* should be applied only when the substrate temperature and the ambient temperature is above 5°C or 5°C and rising.
- V. Make sufficient material, plant and labour available to ensure that application is a continuous process.

#### EQUIPMENT

It is suggested that the following list of equipment is adopted as a minimum requirement for the correct application of this material:

- |                         |  |
|-------------------------|--|
| Protective clothing :   | - Protective overalls, safety helmet and safety shoes                                      |
|                         | - Good quality gloves, goggles and face-mask   |
| Preparation equipment : | - Marker chalk or pen  |
|                         | - Disc saw   |
|                         | - Electric or pneumatic concrete breaker   |
|                         | - Wire brush   |
|                         | - Proprietary grit blasting equipment or high pressure washer                              |
| Mixing equipment :      | - Measuring jug  |
|                         | - Festo slow speed drill, 400-500 rpm  |
|                         | + Parchem mortar mixing paddle   |
|                         | + Parchem 20 litre mixing pail, or proprietary forced-action mixer for multiple bag mixing |
| Application equipment : | - Hand application trowel  |
|                         | - Wooden float   |
|                         | - Steel or plastic finishing float   |
|                         | - Finishing sponge   |

an  alesco company



PARCHEM	CONCRETE REPAIR	FLOORING	JOINTING SYSTEMS	WATERPROOFING
METHOD STATEMENT	APRIL 09			
www.parchem.com.au	7 Lucca Road, Wyong NSW 2259	Sales 1800 624 322	Technical 1800 812 864	ABN 80 069 961 968
				1

# Renderoc HB40



## APPLICATION – POINTS OF NOTE

Parchem operates a policy to encourage the use, where possible, of experienced applicators, since the long-term performance of the materials is dependant upon proper application. For contractors who wish to apply the materials themselves, Parchem is also able to offer technical assistance.

## SECTION B: APPLICATION METHOD

### 1.0 REPAIR AREAS

- 1.1 The areas to be repaired are to be as shown on the drawings or as indicated by the Contract Administrator. The areas are to be clearly marked out on site and agreed with the Contract Administrator before proceeding.
- 1.2 As the work proceeds, repair areas may be adjusted by the Contract Administrator, according to the conditions found.
- 1.3 Propping shall be provided as noted on the drawings or as agreed by the Contract Administrator.
- 1.4 The surfaces adjacent to and of areas for repair shall be cleaned to remove any dust, unsound material, plaster, oil, paint, grease, corrosion deposits, organic growth, etc.
- 1.5 Within the repair area, the concrete cover to reinforcement links or main bars shall be determined using a cover meter. A small area shall be chiselled out and the concrete cover and the depth of deteriorated concrete confirmed by measurement.

### 2.0 CONCRETE PREPARATION

Attention to full and proper preparation of the substrate is essential for complete repair adhesion.

- 2.1 Break out unsound concrete as defined within the repair zone. Using a saw, disc cutter, or other suitable tool, the perimeter of the area to be repaired shall be incised to a depth of at least 10 mm causing good arises to be formed at the outer edges all to preclude feather edging of the repair mortar.
- 2.2 Where the depth of breaking out corresponds to the depth of concrete cover and thereby exposes reinforcement, breaking out shall continue to expose the full circumference of the steel and to a further depth of 25 mm or as directed by the Contract Administrator. Breaking out shall continue along the reinforcement until non-corroded steel is reached and shall continue 50 mm beyond this point or as directed by the Contract Administrator. Special care shall be exercised to ensure that any reinforcement exposed is not cut or damaged.
- 2.3 All concrete surfaces to receive repair mortar shall be of a rough scabbled nature. Saw/disc cut edges shall be grit blasted to lightly roughen.
- 2.4 This preparation shall be such as to leave a sound exposed concrete substrate free from dust, loose particles and any deleterious matter.

*Additional considerations where concrete is affected by carbonation*

- 2.5 After breaking out as specified the exposed surface of concrete shall be tested for carbonation by the use of a semi-aqueous solution of phenolphthalein. The test shall be carried out on the freshly exposed concrete or at least within 30 minutes of being exposed. The test shall be carried out on sound, dry and clean air-blown dust free surfaces. If the concrete substrate still exhibits carbonation in the vicinity of the steel reinforcement, breaking out to remove a further 20 mm shall be carried out and the test repeated. If carbonation is still present the Contract Administrator shall be notified before proceeding further.
- 2.6 It is essential that no carbonated concrete substrate shall be in contact with, or within 5 mm of, the reinforcing bars. In cases where carbonation has reached within 5 mm of the reinforcing bars, the concrete shall be broken out to expose the full circumference of the steel and a further depth of 20-30 mm or as directed by the Contract Administrator.

# Renderoc HB40



## *Additional considerations where concrete is affected by chlorides*

- 2.7 Where it is determined that chlorides are present in the concrete the agreed area(s) shall be broken out to remove all contaminated concrete, or, having regard to the steel reinforcement, to a depth as directed by the Contract Administrator.

NOTE: Chloride values are generally expressed in percentage terms of weight of chlorides by weight of concrete: 0.05% - 0.15% medium risk; above 0.15% high risk, though where chloride penetration from external sources is involved, the risk of corrosion in the medium risk range is much greater, and corrosion has been found to occur at levels below 0.05%.

## *Reinforcing steel / concrete not affected by carbonation or chlorides*

- 2.8 Where exposed reinforcement is sound and there are no signs of corrosion other than typical of its original condition it shall be mechanically cleaned of rust and loose mill scale. Where there are signs of corrosion deterioration it shall be cleaned of corrosion products by wet grit blasting or other approved means to achieve a surface finish to comply with a standard of steel cleanliness such as SA 2<sup>1/2</sup> (BS7079: Part A1 / ISO8501) or as directed by the Contract Administrator.
- 2.9 Reinforcement damaged during the removal of concrete or the preparation process shall be brought to the attention of the Contract Administrator and if required, shall be repaired or replaced.

## *Concrete affected by carbonation and / or chlorides*

- 2.10 All exposed reinforcement shall be cleaned of corrosion products by wet grit blasting or other approved means to achieve a surface finish to comply with a standard of steel cleanliness such as SA 2<sup>1/2</sup> (BS7079: Part A1 / ISO8501) or as directed by the Contract Administrator. Special care shall be taken to clean out properly any pitting that may have occurred in the steel bar.

## **3.0 REINFORCEMENT PREPARATION**

- 3.1 When the corrosion products have been removed and if directed by the Contract Administrator, the diameter of the reinforcing bar(s) shall be measured. If considered necessary by the Contract Administrator the existing reinforcement shall be cut out and replaced and/or additional bars added in accordance with instructions. Any deep pitting of the reinforcing bars shall be brought to the attention of the Contract Administrator.
- 3.2 Reinforcement damaged during the removal of concrete or the preparation process shall be brought to the attention of the Contract Administrator and if required, shall be repaired or replaced.

## **4.0 ANODE INSTALLATION**

- 4.1 Where required by specification, *Galvashield XP* anodes shall be installed in accordance with the current Technical Data Sheet and Method Statement. *Renderoc HB40* is suitable for the installation of *Galvashield XP* as it has a Resistivity < 15,000 ohm cm @ 28 days.

## **5.0 REINFORCEMENT PRIMER**

- 5.1 Immediately following preparation and cleaning, the reinforcing steel shall be primed with *Nitoprime Zincrich*, a single component epoxy primer complying with the relevant parts of BS4652, 1971 (1979) Specification For Metallic Zinc Rich Priming Paint Type 2.
- 5.2 The *Nitoprime Zincrich* shall be brush applied to the cleaned reinforcement ensuring that all exposed steel is fully coated. Special attention shall be paid to the backs of the steel bars and where steel bars are tied together. It is essential that this coat is continuous with that of any adjacent repaired area where zinc-rich primer has been used. Avoid excessive over-painting onto the concrete and allow to dry.

# Renderoc HB40



## 6.0 SUBSTRATE PRIMING

6.1 For two hours prior to application of the repair mortar the prepared substrate shall be thoroughly wetted with clean water to totally satisfy absorption. Any standing or excess water shall be removed.

6.2 The concrete primer shall be *Nitobond HAR* acrylic emulsion that shall be worked firmly into the damp substrate with a short-bristle brush to achieve a film intimate with the contact area for immediate repair.

6.3 Single repair areas larger than 0.5m<sup>2</sup> shall be part primed to commence and thereafter progressively in maximum 0.5m<sup>2</sup> adjacent bays as application of the repair mortar proceeds.

6.4 The repair mortar shall be applied whilst the *Nitobond HAR* is tacky. If the primer dries before the mortar is applied, the area shall be re-primed once again.

Note: Where *Renderoc HB40* is spray applied, no concrete primer shall be used. However thorough wetting of the surface must take place prior to spraying.

## 7.0 MIXING REPAIR MORTAR

7.1 Before mixing the repair mortar the contractor shall ensure that sufficient and correct areas for reinstatement are prepared and ready to receive repair mortar.

7.2 Only mixes using complete bags of *Renderoc HB40* shall be allowed and part bag mixes not permitted.

7.3 The mixing shall be carried out strictly in accordance with current product instructions for use and only with appropriate mixing equipment.

7.4 The mixing water shall be potable quality and the carefully measured quantity of water 3.0 - 3.2 litres for the required mix shall be placed into the mixing container before the *Renderoc HB40*. The quantity of water used when wet spraying *Renderoc HB40* may be increased to a maximum of 3.4 litres. Consult the local Parchem representative.

7.5 The *Renderoc HB40* shall be added to the mixing water and in no circumstances shall more water be added than the maximum volume stated for each bag when using the hand application method.

The mixing time shall be minimum 3 - 5 minutes to allow for full integration of component parts.

## 8.0 APPLICATION OF REPAIR MORTAR

8.1 Only fully integrated mixes of *Renderoc HB40* at the required consistency and workability shall be used.

8.2 Trowel the mixed mortar to the prepared and primed surface of the substrate paying particular attention to packing behind and between the reinforcement, and thorough compaction overall.

8.3 *Renderoc HB40* shall be applied in accordance with current instructions for use. It may be applied in one operation by building up to the required profile in wet-on-wet layers between 10-40 mm vertically and 10-30 mm overhead. Thicker sections may be achieved by building up in wet-on-dry layers, where each layer shall be wavy-line scratch keyed with a comb, cured with *Nitobond AR*, allowed to dry throughout and reprimed at the time of application of subsequent layers.

8.4 Sagging of the repair mortar is not acceptable and if occurring all the material of the affected repair shall be completely removed prior to repriming and refilling in two or more applications of mortar supported by formwork if required.

8.5 If formwork is used it shall be pre-treated with a varnish to prevent moisture absorption from the repair mortar. Special care shall be taken to ensure that the positioning of the formwork allows for compaction of and does not result in voids within the repair mortar.

8.6 After applying sufficient mortar to achieve a level flush with or slightly proud of the surrounding surface the *Renderoc HB40* shall be finished by striking off with a straight edge and trowelled/floated depending upon circumstances.

8.7 *Renderoc HB40* can also be applied by a dry spray, and a wet spray process. In spray applications where the *Galvashield XP* is to be incorporated into the patch repairs, allow to protect the installed *Galvashield XP* with a hand applied, set encasement mortar of *Renderoc HB40* prior to commencing the spray application.

8.8 The repair mortar shall not be applied when the ambient or substrate temperature is below 5°C or above 35°C nor at an ambient temperature of 5°C on a falling thermometer. The applied repair mortar shall always be protected from freezing whilst drying.

# Renderoc HB40



## 9.0 CURING

- 9.1 Details of the methods of curing shall be submitted to the Contract Administrator for approval.
- 9.2 Curing techniques shall be instigated immediately following application of repair mortar to any given area. Large areas (0.5m<sup>2</sup> at a time) shall be cured as trowelling progresses without waiting for completion of the whole area.
- 9.3 *Nitobond AR* may be low-pressure, spray applied as a curing membrane. In fast drying conditions it will be necessary to supplement this with polyethylene sheet taped around its edges. Where a *Dekguard* or *Emer-Clad* protective coating is to be applied over the repair area then *Nitobond AR* shall be used as the curing membrane.
- 9.4 During application and curing, all work shall be protected against direct strong sunlight.

## 10.0 CLEANING

- 10.1 All equipment should be washed with clean water immediately after use. Cured material can only be removed by mechanical means.

## SECTION C: IMPORTANT NOTE

This method statement is offered by Parchem as a 'standard proposal' for the application of *Renderoc HB40*. It remains the responsibility of the Engineer to determine the correct method for any given application.

Parchem does not accept any liability either directly or indirectly for any losses suffered in connection with the use or application of the product whether or not in accordance with any advice, specification, recommendation or information given by it.

<b>PARCHEM</b>	<b>CONCRETE REPAIR</b>	FLOORING	JOINTING SYSTEMS	WATERPROOFING
<b>METHOD STATEMENT</b>	<b>APRIL 09</b>			
<b>www.parchem.com.au</b>	<b>7 Lucca Road, Wyong NSW 2259</b>	<b>Sales 1800 624 322</b>	<b>Technical 1800 812 864</b>	<b>ABN 80 069 961 968</b>
				<b>5</b>

Waterproofing Warehouse  
4/12 Strathaird Road, Bundall, 4217  
www.wpw.com.au  
admin@wpw.com.au  
Phone: +61 07 55921329  
Fax: +61 07 55921227



## Technical Data Sheet

# Renderoc HB70

**High build, high strength, very low shrinkage, patch repair mortar, compatible with concrete >45 MPa**

### USES

For the reinstatement of localised patch repairs and larger areas where suitable reinforcement is incorporated. Renderoc HB70 is alkaline in nature and will protect embedded steel reinforcement. It is specifically designed for locations where high build and high compressive strengths are required or in locations where good abrasion resistance is necessary. The mortar is suitable where resistance is required to chlorides and carbon dioxide.



**Important Note 1:** When Renderoc HB70 is used in conjunction with Impressed Current Cathodic Protection or Norcure Realkalisation and Desalination methods, the substrate bonding primer should be an OPC: Water slurry mixed at a 2:1 ratio.

Polymer bonding agents should not be used. No steel primer should be applied. Please refer to Parchem for further advice.

**Important note 2:** Renderoc HB70 is suitable for use with the Fosroc Galvashield XP incipient anode protection, with a resistivity <15,000  $\Omega$  cm @ 28 days.



### ADVANTAGES

- High strength and high abrasion resistance
- High build repairs
- Exceptional system of shrinkage compensation, provides long-term dimensional stability
- Low permeability provides sound protection against carbon dioxide and chlorides
- Can be applied by the wet or dry spray process for fast, exceptionally high build repairs with enhanced characteristics
- Suitable for internal and external use
- Pre-bagged to overcome site-batched variations - only the site-addition of clean water required
- Contains no chloride admixtures

### DESCRIPTION

Renderoc HB70 is supplied as a ready to use blend of dry powders which requires only the site addition of clean water to produce a highly consistent, high strength repair mortar. The material is based on Portland cement, graded aggregates, special fillers and chemical additives and is polymer modified to provide a mortar with good handling characteristics, while minimising water demand. The hardened product exhibits excellent thermal compatibility with concrete and outstanding water repellent properties. The low water requirement ensures fast strength gain and long-term durability.

### DESIGN CRITERIA

Renderoc HB70 is designed for vertical or horizontal use. It can be applied up to 40 mm thickness in vertical sections. Greater thickness can be achieved in small pockets or by the use of formwork. In horizontal locations, Renderoc HB70 can be applied up to 150 mm thickness. Thicker sections can be built up in layers. The material should not be applied at less than 5 mm thickness. Thicknesses greater than those nominated in large areas can be achieved by spray application.

### SPECIFICATION CLAUSE

#### STEEL REINFORCEMENT PRIMER

The steel reinforcement primer should be Nitoprime Zincrich, a single component zinc epoxy primer. The primer is capable of providing a protective barrier to further corrosive elements attacking the steel. It shall be fully compatible with the Renderoc concrete

repair system.

#### REPAIR MORTAR

The polymer modified shrinkage-compensated reinstatement mortar shall be Renderoc HB70 a single-component cement-based blend of powders to which only the site-addition of clean water shall be permitted. The cured mortar shall achieve 70 MPa compressive strength and 10 MPa flexural strength at 28 days.

an **alesco** company



PARCHEM	CONCRETE REPAIR	FLOORING	JOINTING SYSTEMS	WATERPROOFING
TECHNICAL DATA SHEET	AUGUST 09			
www.parchem.com.au	7 Lucca Road, Wyong NSW 2259	Sales 1800 624 322	Technical 1800 812 864	ABN 80 069 961 968
				1

# Renderoc HB70



## PROPERTIES

The following results were obtained at a water:powder ratio of 0.14 and temperature of 20°C.

Test method	Typical result
<b>Compressive strength</b>	
(AS 1478.2 - 2005 - cured in a sealed plastic bag)	20 MPa @ 1 day
- dry cure):	70 MPa @ 28 days
<b>Modulus of Rupture (Flexural Strength)</b>	
(AS 1012.11 - 2000):	5.2 MPa @ 1 day
	6.3 MPa @ 7 days
	6.4 MPa @ 28 days
<b>Indirect Tensile Strength</b>	
(AS 1012.10 - 2000):	2.9 MPa @ 1 day
	4.3 MPa @ 7 days
	4.7 MPa @ 28 days
<b>Chloride Diffusion Nordtest NT Build 443</b>	
(BS 1881: Part 124: 1998)	(2.4 x 10 <sup>-12</sup> m <sup>2</sup> /sec)
<b>Coefficient of thermal expansion:</b>	
	7 - 12 x 10 <sup>-6</sup> /°C
<b>Setting time (AS 1012.10 - 2005):</b>	
Initial set:	3 hours, 15 minutes
Final set:	4 hours, 30 minutes
<b>Fresh wet density:</b>	
	Approx. 2200 kg/m <sup>3</sup> dependent on actual consistency used

## TECHNICAL SUPPORT

Parchem offers a technical support service to specifiers, end-users and contractors, as well as on-site technical assistance.

## APPLICATION INSTRUCTIONS

### PREPARATION

Saw cut or cut back the extremities of the repair locations to a minimum depth of at least 5 mm to avoid feather-edges and to provide a square edge. Break out the repair area to a minimum depth of 5 mm up to the sawn edge.

Clean the surface and remove any dust, unsound or contaminated material, plaster, oil, paint, grease, corrosion deposits or algae. Where breaking out is not required, roughen the surface and remove any laitance by light scabbling or grit-blasting.

Oil and grease deposits should be removed by steam cleaning, detergent scrubbing or the use of a proprietary degreaser. The effectiveness of decontamination should then be assessed by a pull-off test.

Expose fully any corroded steel in the repair area and remove all loose scale and corrosion deposits. Steel

should be cleaned to a bright condition paying particular attention to the back of exposed steel bars. Grit-blasting is recommended for this process.

Where corrosion has occurred due to the presence of chlorides, the steel should be high-pressure washed with clean water immediately after grit-blasting to remove corrosion products from pits and imperfections within its surface.

### REINFORCING STEEL PRIMING

Apply one full coat of Nitoprime Zincrich and allow to dry before continuing. If any doubt exists about having achieved an unbroken coating, a second application should be made and, again, allowed to dry before continuing.

(If Galvashield XP are to be embedded into the Renderoc HB70 patch repair, refer to the current Galvashield XP Technical Data Sheet for priming instructions).

### SUBSTRATE PRIMING

The substrate should be thoroughly soaked with clean water and any excess removed prior to applying one coat of Nitobond HAR primer and scrubbing it well into the surface. Renderoc HB70 is to be applied as soon as the primer becomes tacky. If the Nitobond HAR dries prior to the application of the Renderoc HB70, then the Nitobond HAR is to be reprimed and the repair mortar applied when primer is tacky. If the Nitobond HAR is too wet, vertical build up of the Renderoc HB70 mortar may be difficult.

In exceptional circumstances, e.g. where a substrate/repair barrier is required or where the substrate is wet or likely to remain permanently damp, Nitobond EP bonding aid should be used. Contact your local Parchem sales office for further information.

### MIXING

Care should be taken to ensure that Renderoc HB70 is thoroughly mixed. A forced-action mixer is essential. Mixing in a suitably sized drum using an approved spiral paddle in a slow speed (400/500 rpm) heavy-duty drill is acceptable for the occasional one-bag mix. Free-fall mixers must not be used. Mixing of part bags should never be attempted.

For normal applications, place 2.8 - 3.0 litres of drinking quality water into the mixer and, with the machine in operation, add 1 full 20 kg bag of Renderoc HB70 and mix for 3 - 5 minutes until fully homogeneous. Note that powder must always be added to water. Dependent on the ambient temperature and the desired consistency, the amount of water required may vary slightly but should not exceed 3.0 litres / 20 kg bag of Renderoc HB70.

# Renderoc HB70



## APPLICATION

Exposed steel reinforcing bars should be firmly secured to avoid movement during the application process as this will affect mortar compaction, build and bond.

Apply the mixed Renderoc HB70 to the prepared substrate by gloved hand or trowel. Thoroughly compact the mortar on to the primed substrate and around the exposed reinforcement. Renderoc HB70 can be applied up to 40 mm thickness in vertical sections but greater thickness in smaller pockets or with the use of formwork. If formwork is used, it should have properly sealed faces to ensure that no water is absorbed from the repair material. In horizontal locations, Renderoc HB70 can be applied up to 150 mm thickness.

If sagging occurs during application to vertical surfaces, the Renderoc HB70 should be completely removed and reapplied at a reduced thickness on to the correctly reprimed substrate.

Note: the minimum applied thickness of Renderoc HB70 is 5 mm.

## SPRAY APPLICATION

Renderoc HB70 can be applied by the wet spray technique. In circumstances where large areas of repair are required, the rapid placement and higher build attainable by these methods offer economic advantages over hand-trowelling. The resultant repair also offers a generally more dense compound with greatly enhanced mortar/substrate bond characteristics. For further details on the wet and dry spray techniques, including selection of spraying machines and nozzles, consult Wet or Dry Spray Application Guides or your local Parchem sales office.

## FINISHING

Renderoc HB70 is finished by striking off with a straight edge and closing with a steel float. Wooden or plastic floats, or damp sponges may be used to achieve the desired surface texture. The completed surface should not be overworked.

## LOW TEMPERATURE WORKING

In cold conditions down to 5°C, the use of warm water (up to 30°C) is advisable to accelerate strength development. Normal precautions for winter working with cementitious materials should then be adopted. The material should not be applied when the substrate and/or air temperature is 5°C and falling. At 5°C static temperature or at 5°C and rising, the application may proceed.

## HIGH TEMPERATURE WORKING

At ambient temperatures above 35°C, the material should not be used as this will cause premature setting.

## CURING

Renderoc HB70 is a cement-based repair mortar. In common with all cementitious materials, Renderoc HB70 must be cured immediately after finishing in accordance with good concrete practice. The use of Nitobond AR, sprayed on to the surface of the finished Renderoc in a continuous film, is recommended. Large areas should be cured as trowelling progresses (0.5 m<sup>2</sup> at a time) without waiting for completion of the entire area. In fast drying conditions, supplementary curing with polythene sheeting taped down at the edges must be used. In cold conditions, the finished repair must be protected from freezing.

## OVERCOATING WITH PROTECTIVE DECORATIVE FINISHES

Renderoc HB70 is extremely durable and will provide excellent protection to the embedded steel reinforcement within the repaired locations. The surrounding parts of the structure will generally benefit from the application of a protective barrier/decorative coating to limit the advance of chlorides and carbon dioxide, thus bringing them up to the same protective standard as the repair itself. Parchem recommend the use of the Dekguard or Emer-Clad range of protective, anti-carbonation coatings. These products provide a decorative and uniform appearance as well as protecting areas of the structure which might otherwise be at risk from the environment. Dekguard or Emer-Clad products may be applied over the repair area without prior removal of the Nitobond AR curing membrane. Other curing membranes must be removed prior to the application of Dekguard or Emer-Clad products.

## CLEANING

Nitobond AR and Renderoc HB70 should be removed from tools, equipment and mixers with clean water immediately after use. Cured material can only be removed mechanically.

Equipment used with Nitoprime Zincrich and Nitobond EP should be cleaned with Parchem Solvent.

## LIMITATIONS

Renderoc HB70 should not be used when the temperature is below 5°C and falling. Do not mix part bags. The product should not be exposed to moving water during application. Exposure to heavy rainfall prior to the final set may result in surface scour. If any doubts arise concerning temperature or substrate conditions, consult your local Parchem office.

# Renderoc HB70



## ESTIMATING

### SUPPLY

<b>Renderoc HB70:</b>	20 kg bag
<b>Nitoprime Zincrich:</b>	1 litre can
<b>Nitobond AR:</b>	1, 5 and 20 litre container
<b>Nitobond HAR:</b>	1, 5 and 20 litre container
<b>Nitobond EP:</b>	1.5 and 6 litre pack
<b>Parhem Solvent:</b>	4 and 20 litre can

### COVERAGE AND YIELD

<b>Renderoc HB70:</b>	Approx. 10.2 litres / 20 kg bag (1.0 m <sup>2</sup> @ 10 mm thickness)
<b>Nitoprime Zincrich:</b>	7 m <sup>2</sup> / litre (approx.)
<b>Nitobond AR:</b>	6 - 8 m <sup>2</sup> /litre
<b>Nitobond EP:</b>	4 - 5 m <sup>2</sup> /litre

Notes: the actual yield per bag of Renderoc HB70 will depend on the consistency used. The yield will be reduced if the material is applied by a spray technique. The coverage figures for liquid products are theoretical - due to wastage factors and the variety and nature of possible substrates, practical coverage figures will be reduced.

## STORAGE

### SHELF LIFE

All products have a shelf life of 12 months if kept in a dry store in the original, unopened bags or packs.

### STORAGE CONDITIONS

Store in dry conditions in the original, unopened bags or packs. If stored at high temperatures and/or high humidity conditions the shelf life may be reduced to 4 - 6 months. Nitobond AR should be protected from frost.

## ADDITIONAL INFORMATION

Parchem provides a wide range of complementary products which include:

- concrete repair – cementitious and epoxy
- grouts and anchors – cementitious and epoxy
- waterproofing membranes – liquid applied, cementitious and bituminous sheet membranes
- waterstops – pvc and swellable
- joint sealants – building, civil and chemical resistant
- industrial flooring systems – cementitious and epoxy
- architectural coatings
- filler boards – swellable cork, bituminous and backing rod
- ancillary products

For further information on any of the above, please consult with your local Parchem sales office.

## IMPORTANT NOTICE

A Material Safety Data Sheet (MSDS) and Technical Data Sheet (TDS) are available from the Parchem website or upon request from the nearest Parchem sales office. Read the MSDS and TDS carefully prior to use as application or performance data may change from time to time. In emergency, contact any Poisons Information Centre (phone 13 11 26 within Australia) or a doctor for advice.

## PRODUCT DISCLAIMER

This Technical Data Sheet (TDS) summarises our best knowledge of the product, including how to use and apply the product based on the information available at the time. You should read this TDS carefully and consider the information in the context of how the product will be used, including in conjunction with any other product and the type of surfaces to, and the manner in which, the product will be applied. Our responsibility for products sold is subject to our standard terms and conditions of sale. Parchem does not accept any liability either directly or indirectly for any losses suffered in connection with the use or application of the product whether or not in accordance with any advice, specification, recommendation or information given by it.

\*Manufactured and sold under license from Fosroc International Limited. Fosroc and the Fosroc logo are trade marks of Fosroc International Limited, used under license. \*Denotes a trade mark of Fosroc International Limited.

an alesco company



<b>PARCHEM</b>	<b>CONCRETE REPAIR</b>	<b>FLOORING</b>	<b>JOINTING SYSTEMS</b>	<b>WATERPROOFING</b>
<b>TECHNICAL DATA SHEET</b>	<b>AUGUST 09</b>			
www.parchem.com.au	7 Lucca Road, Wyong NSW 2259	Sales 1800 624 322	Technical 1800 812 864	ABN 80 069 961 968
				4



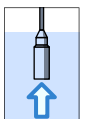
## Supplementary instructions

### VEGABAR - External housing



Document ID:  
31087

Process pressure/  
Hydrostatic



## Contents

<b>1</b>	<b>About this document</b>	
1.1	Function . . . . .	3
1.2	Target group . . . . .	3
1.3	Symbolism used . . . . .	3
<b>2</b>	<b>For your safety</b>	
2.1	Authorised personnel . . . . .	4
2.2	Appropriate use . . . . .	4
2.3	Safety instructions for Ex areas . . . . .	4
2.4	Environmental instructions . . . . .	4
<b>3</b>	<b>Product description</b>	
3.1	Structure . . . . .	5
3.2	Principle of operation . . . . .	5
3.3	Storage and transport . . . . .	6
<b>4</b>	<b>Mounting</b>	
4.1	General instructions . . . . .	7
4.2	Mounting preparations . . . . .	7
4.3	Exchange of the electronics module . . . . .	7
4.4	Mounting steps, external housing . . . . .	9
<b>5</b>	<b>Connect the sensor to the external housing</b>	
5.1	Preparing the connection . . . . .	10
5.2	Connection procedure . . . . .	10
5.3	Wiring plan . . . . .	11
<b>6</b>	<b>Setup</b>	
6.1	Setup . . . . .	15
<b>7</b>	<b>Maintenance</b>	
7.1	Instrument repair . . . . .	16
<b>8</b>	<b>Dismounting</b>	
8.1	Dismounting steps . . . . .	17
8.2	Disposal . . . . .	17
<b>9</b>	<b>Supplement</b>	
9.1	Technical data . . . . .	18
9.2	Dimensions . . . . .	20

## 1 About this document

### 1.1 Function

This supplementary manual, together with the attached operating instructions manual, has all the information you need for quick setup and safe operation. Please read this manual before you start setup.

### 1.2 Target group

This operating instructions manual is directed to trained qualified personnel. The contents of this manual should be made available to these personnel and put into practice by them.

### 1.3 Symbolism used



#### Information, tip, note

This symbol indicates helpful additional information.



**Caution:** If this warning is ignored, faults or malfunctions can result.

**Warning:** If this warning is ignored, injury to persons and/or serious damage to the instrument can result.

**Danger:** If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.



#### Ex applications

This symbol indicates special instructions for Ex applications.



#### List

The dot set in front indicates a list with no implied sequence.



#### Action

This arrow indicates a single action.



#### Sequence

Numbers set in front indicate successive steps in a procedure.

## **2 For your safety**

### **2.1 Authorised personnel**

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the plant operator.

During work on and with the device the required personal protective equipment must always be worn.

### **2.2 Appropriate use**

The external housing is a replacement part for a VEGABAR series 50 or 60 pressure transmitter.

### **2.3 Safety instructions for Ex areas**

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

Use in dust-Ex applications is not permitted.

### **2.4 Environmental instructions**

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified according to DIN EN ISO 14001.

Please help us fulfil this obligation by observing the environmental instructions in this manual:

- Chapter "*Storage and transport*"
- Chapter "*Disposal*"

### 3 Product description

#### 3.1 Structure

##### Scope of delivery

The scope of delivery encompasses:

- External housing
- Line bridge
- Documentation
  - this operating instructions manual

##### Constituent parts

The external housing consists of the following components:

- Housing
- Screwed cover for electronics or connection compartment
- Socket

Depending on the order, the screwed cover is available with or without inspection window for the indicating and adjustment module.

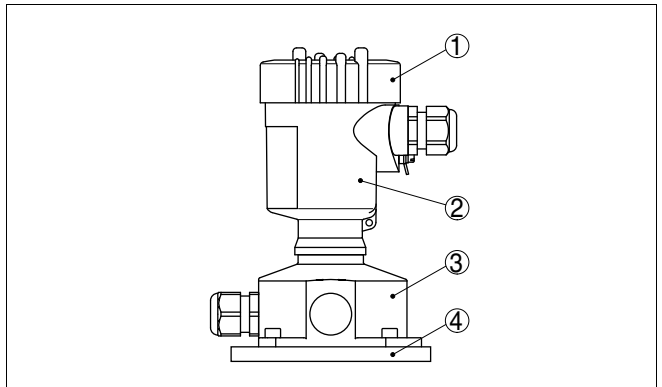


Fig. 1: Components of the external housing for VEGABAR

- 1 Screwed cover
- 2 Housing
- 3 Socket
- 4 Wall mounting plate

#### 3.2 Principle of operation

##### Application area

The external housing is suitable for the following pressure transmitters in IP 68 (25 bar) version:

- VEGABAR 51, 52, 53, 54, 55, 66, 67

### 3.3 Storage and transport

#### Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test according to DIN EN 24180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

#### Storage and transport temperature

- Storage and transport temperature see chapter "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 ... 85 %

## 4 Mounting

### 4.1 General instructions



In Ex applications, only a housing with appropriate Ex approval must be used.

### 4.2 Mounting preparations

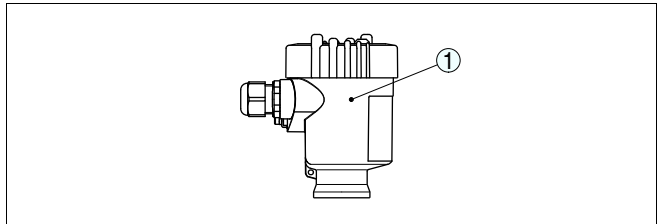
#### Tools

The following tools are required for mounting:

- Allen key, size 4
- Fork wrench, wrench size 19

### 4.3 Exchange of the electronics module

The electronics module is located in the electronics compartment. The below illustration shows the position of the electronics compartment in an external housing.



*Fig. 2: Single chamber housing*

1 Position of the electronics compartment

#### Remove the electronics module from the existing housing

Proceed as follows:

- 1 Switch off power supply
- 2 Unscrew housing cover of the electronics compartment
- 3 Disconnect the connection cables according to the operating instructions manual of the respective sensor
- 4 Loosen the two holding screws of the electronics module with a Phillips screwdriver

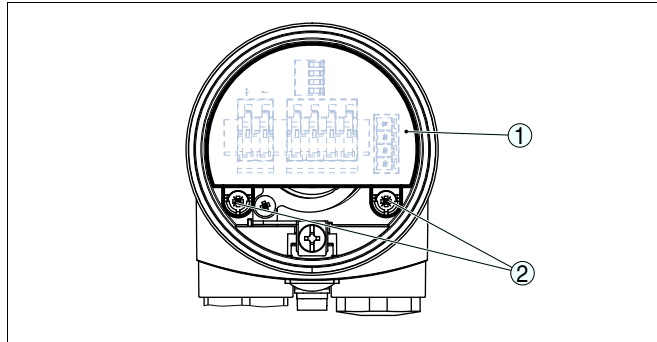


Fig. 3: Loosening the holding screws

- 1 Electronics module
- 2 Screws (2 pcs.)

5 Pull the electronics out by holding the opening levers.

### Mount the electronics module into the new housing

Proceed as follows:

- 1 Insert the electronics module carefully into the new housing.



#### Information:

The electronics module is connected via a plug. Make sure that the plug is in the correct position. The notch must be in position "18.00 h".

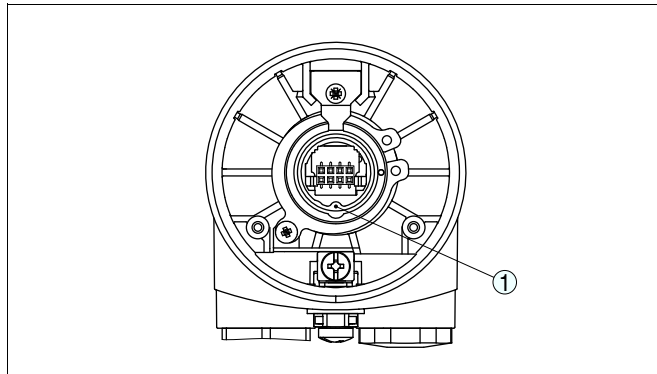


Fig. 4: Plug position

- 1 Notch
- 2 Screw in and tighten the two screws with a Phillips screwdriver.
- 3 Screw the housing cover on

The exchange of the electronics module is finished.



As a rule, an exchange of electronics must be documented internally when Ex applications are involved.

#### 4.4 Mounting steps, external housing

##### Wall mounting

- 1 Mark the holes according to the following drilling template
- 2 Depending on the mounting surface, fasten the wall mounting plate with 4 screws

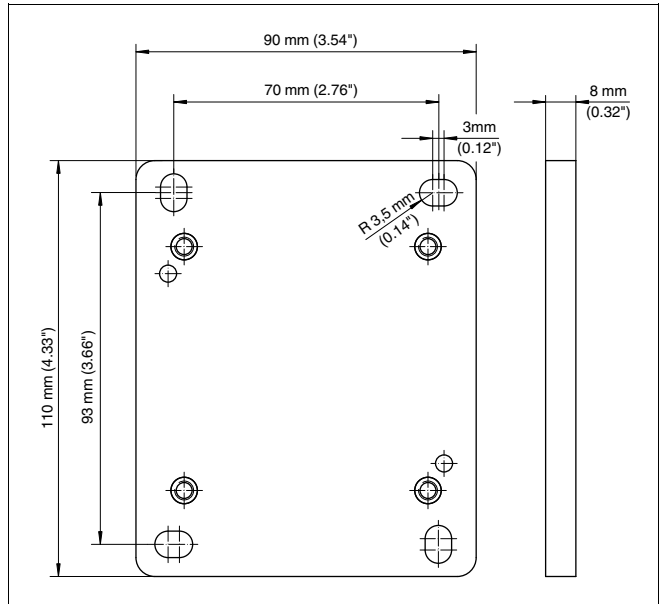


Fig. 5: Drilling template - wall mounting plate



##### Tip:

Mount the wall mounting plate so that the cable entry of the socket housing points downward. Rain and condensation water can thus drain off. The socket housing can be displaced by 180° to the wall mounting plate.

Turn the cable gland of the instrument housing downward. The basic body of the instrument housing can be turned by 330° without any tools.



##### Warning:

The four screws of the socket housing must only be hand-screwed. A torque > 5 Nm (3.688 lbf ft) can damage the wall mounting plate.

## 5 Connect the sensor to the external housing

### 5.1 Preparing the connection

Follow the instructions in the operating instructions manual of the sensor.

### 5.2 Connection procedure

Proceed as follows:

- 1 Loosen the four screws on the housing socket with an Allen key
- 2 Remove the housing socket from the mounting plate

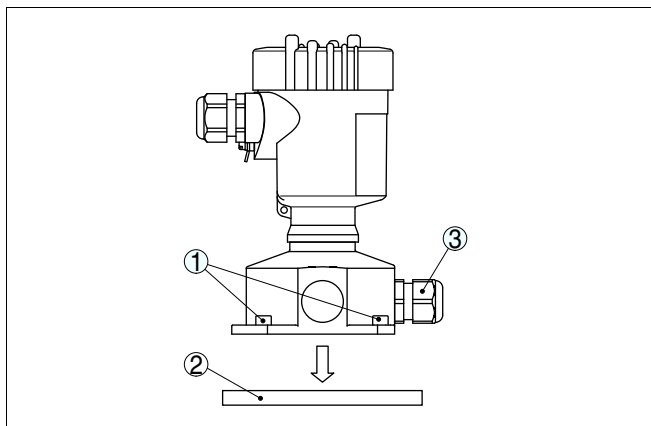


Fig. 6: Remove the mounting plate from the housing socket

- 1 Screws
- 2 Wall mounting plate
- 3 Cable gland

- 3 Lead the connection cable through the cable gland on the housing socket<sup>1)</sup>



#### Tip:

The cable gland can be mounted in three positions each displaced by 90°. Simply exchange the cable gland against the blind plug in the suitable thread opening.

- 4 With four-wire sensor, remove the bridge between terminal 4 and the ground terminal, see "Wiring plan".

<sup>1)</sup> The connection cable is already preconfected. If necessary, shorten it to the requested length, cut the breather capillaries clean. Remove approx. 5 cm of the cable mantle, strip approx. 1 cm insulation from the ends of the individual wires. After shortening the cable, fasten the type plate with support back onto the cable.

- 5 Connect the wire ends as described in chapter "*Connection plan*". Take note of the numbering.



Depending on the delivery date of the sensor, the connection cable is equipped with three or four wires. Take note of the different terminal assignment in the housing socket under "*Wiring plan*".

- 6 Connect the screen to the internal ground terminal and the external ground terminal on top of the housing to potential equalisation
  - 7 Tighten the compression nut of the cable entry. The seal ring must completely encircle the cable
  - 8 Attach the mounting plate again and tighten the screws
- The electrical connection of the sensor to the external housing is finished.

You find the electrical connection of the electronics module in chapter "*Wiring plan*" or in the operating instructions manual of the respective sensor.

### 5.3 Wiring plan

#### Overview VEGABAR 51, 52, 53, 54, 55

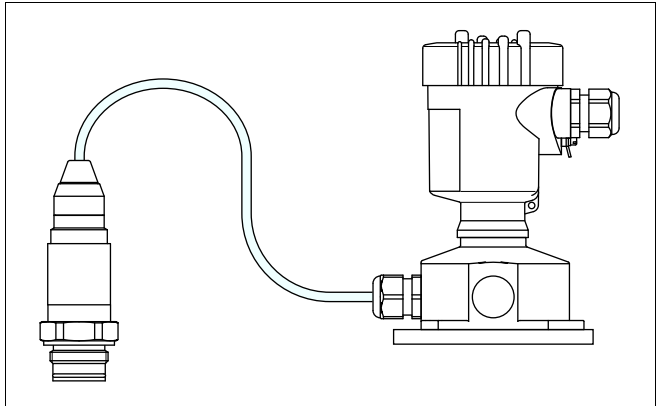
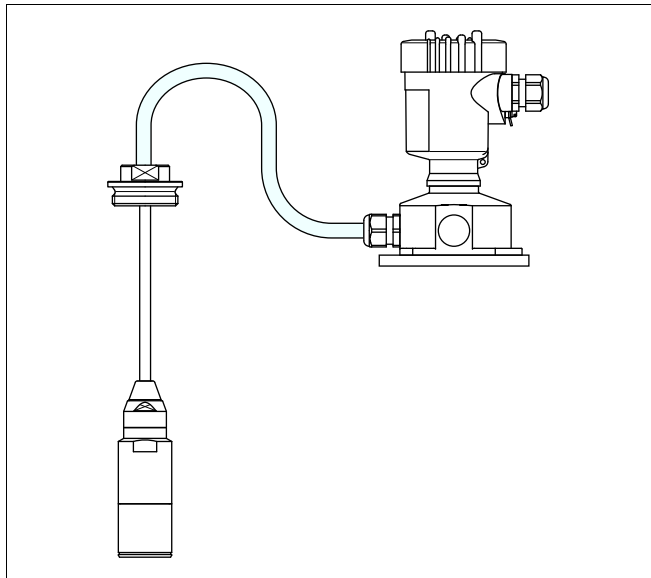


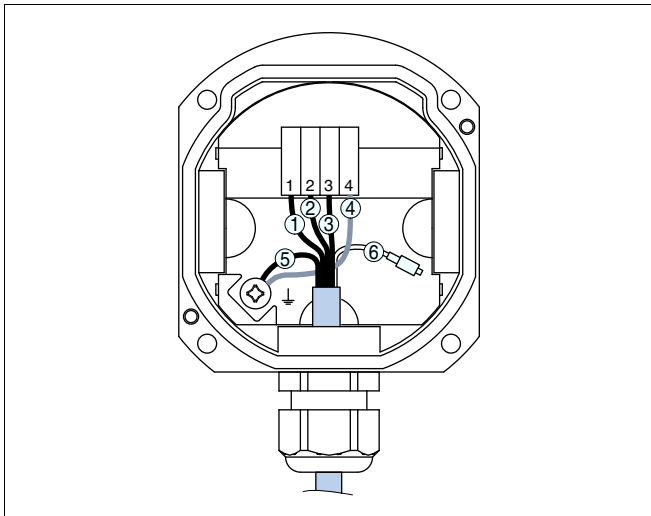
Fig. 7: External housing in conjunction with VEGABAR 51, 52, 53, 54, 55

## 5 Connect the sensor to the external housing

VEGA

**Overview VEGABAR 66,  
67***Fig. 8: External housing in conjunction with VEGABAR 66, 67*

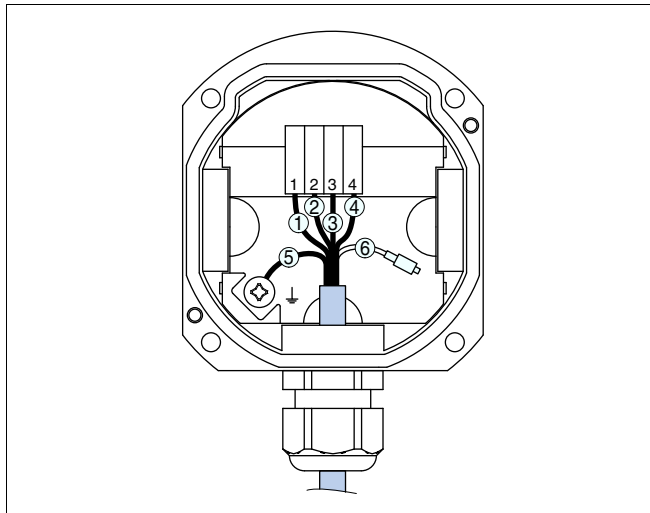
**Terminal compartment,  
housing socket three-  
wire**



*Fig. 9: Connection of the sensor in the housing socket, three-wire*

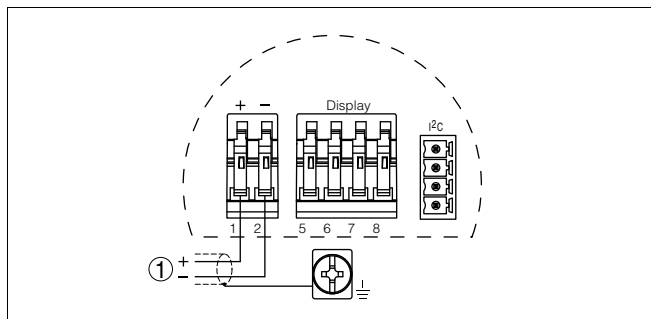
- 1 Brown
- 2 Blue
- 3 Yellow
- 4 Green/yellow (line bridge from supply)
- 5 Shielding
- 6 Breather capillaries

**Terminal compartment,  
housing socket four-  
wire**



- 1 *Brown*
- 2 *Blue*
- 3 *Yellow*
- 4 *White*
- 5 *Shielding*
- 6 *Breather capillaries*

## Wiring plan external electronics



1 Voltage supply

## **6 Setup**

### **6.1 Setup**

Setup is carried out according to the operating instructions manual of the respective sensor.

## 7 Maintenance

### 7.1 Instrument repair

If a repair of the instrument is necessary, please proceed as follows:

You can download a return form (23 KB) from our Internet homepage [www.vega.com](http://www.vega.com) under: "*Downloads - Forms and certificates - Repair form*".

By doing this you help us carry out the repair quickly and without having to call back for needed information.

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and probably a safety data sheet to the instrument
- Send the instrument to the address of the agency serving you. In Germany, send it to the company headquarters in Schiltach.

## 8 Dismounting

### 8.1 Dismounting steps

Take note of chapters "*Mounting*" and "*Connect sensor to the external housing*" and carry out the listed steps in reverse order.

### 8.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We have purposely designed the electronic modules to be easily separable. Mark the instrument as scrap and dispose of it according to national government regulations (e.g. in Germany according to electronic scrap ordinance).

Materials: see chapter "*Technical data*"

If you have no way to dispose of the old instrument properly, please contact us concerning return and disposal.

## 9 Supplement

### 9.1 Technical data

#### Technical data

Following you find all data deviating from the standard instrument. All other technical data are specified in the operating instruction of the respective sensor.

#### General data

Material 316L corresponds to 1.4404 or 1.4435

Materials, non-wetted parts

– Housing	Plastic PBT (polyester), Alu die-casting powder-coated, 316L
– Housing socket	plastic PBT (Polyester)
– Wall mounting plate	plastic PBT (Polyester)
– Seal between housing socket and wall mounting plate	TPE (fixed connected)
– Seal between housing and housing cover	NBR (stainless steel housing), silicone (Alu/plastic housing)
– Ground terminal	316L

Weight	0.7 ... 1.5 kg (1.543 ... 3.307 lbs), depending on housing material
--------	---

#### Process conditions

Ambient, storage and transport temperature

– without indicating and adjustment module	-40 ... +80 °C (-40 ... +176 °F)
– With indicating and adjustment module	-20 ... +70 °C (-4 ... +158 °F)

#### Electromechanical data

Cable entry/plug<sup>2)</sup>

– Socket	<ul style="list-style-type: none"> <li>1 x cable entry M20 x 1.5 (cable: ø 6 ... 12 mm)</li> </ul>
– Housing	<ul style="list-style-type: none"> <li>1 x cable gland M20 x 1.5 (cable: ø 5 ... 9 mm), 1 x blind stopper M20 x 1.5</li> </ul> <p>or:</p> <ul style="list-style-type: none"> <li>1 x closing cap ½ NPT, 1 x blind plug ½ NPT</li> </ul> <p>or:</p> <ul style="list-style-type: none"> <li>1 x plug (depending on the version), 1 x blind stopper M20 x 1.5</li> </ul>

<sup>2)</sup> Depending on the version M12 x 1, according to ISO 4400, Harting, 7/8" FF.

Spring-loaded terminals for wire cross-section up to 2.5 mm<sup>2</sup> (AWG 14)

**Electrical protective measures**

Protection rating

- |           |               |
|-----------|---------------|
| – Housing | IP 65         |
| – Socket  | IP 68 (1 bar) |

## 9.2 Dimensions

### Basic body external housing

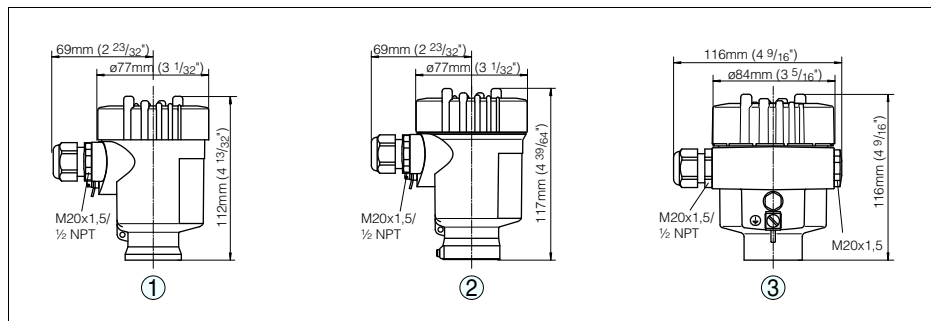


Fig. 12: Basic element, external housing (with integrated PLICSCOM, the height of the housing increases by 9 mm/ 0.35 in)

- 1 Plastic housing
- 2 Stainless steel housing
- 3 Aluminium housing

### Sensor housing and external housing

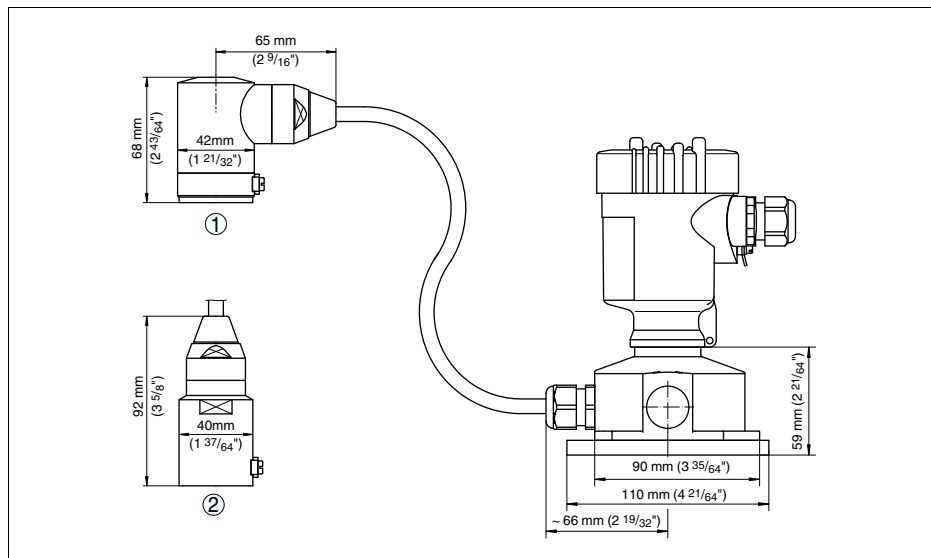


Fig. 13: External housing and sensor housing

- 1 Lateral cable outlet
- 2 Axial cable outlet



31087-EN-101028





31087-EN-101028



Printing date:

VEGA Grieshaber KG  
Am Hohenstein 113  
77761 Schiltach  
Germany  
Phone +49 7836 50-0  
Fax +49 7836 50-201  
E-mail: [info@de.vega.com](mailto:info@de.vega.com)  
**[www.vega.com](http://www.vega.com)**



All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

© VEGA Grieshaber KG, Schiltach/Germany 2010

**SECTION 3: AS CONSTRUCTED DRAWINGS – CONTENTS PAGE**

3.1	DRAWING REGISTER.....	290
3.2	AS CONSTRUCTED DRAWINGS .....	292
3.3	UNDERGROUND CABLE ROUTING DETAILS .....	321

### **3 AS CONSTRUCTED DRAWINGS**

#### **3.1 DRAWING REGISTER**

The following page contains the drawing register for the switchboard and civil works that make up the switchboard upgrade for the sewerage pump station reliability improvement project at Stevens St.

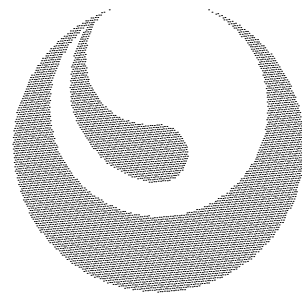
## Job #: 32887

Job Name: SP065 - Stevens St Submersible Sewerage Pump Station Upgrade  
Tel: (07) 3899 8866  
Fax: (07) 3899 8766 Head Contractor/Client: Queensland Urban Utilities

Key: AC - As Constructed, FC - For Construction, IO - Information Only, AB - As Built, Date is of latest revision  
Q-Pulse Id: TMS209 Active: 25/11/2015 Page 292 of 370

### 3.2 AS CONSTRUCTED DRAWINGS

The following pages contain the as constructed drawings listed in the drawing register. For CAD and associated files please refer to the CD containing the soft copy that accompanies this manual.



QUEENSLAND

UrbanUtilities

# SP065 STEVENS STREET SEWAGE PUMPING STATION SITE COVER SHEET

ELECTRICAL DRAWINGS INDEX						STANDARD VARIABLES		STANDARD DESIGN OPTIONS		
DWGN <sup>o</sup> .	TITLE	SHEET	REVISIONS			DESCRIPTION	VALUES	OPTION	DESCRIPTION	FITTED
486/5/7-0271-001	SITE COVER SHEET	1	0	A	B	CT METERING ISOLATOR	NOT APPLICABLE	A	INDIVIDUAL PUMP MOISTURE IN OIL (MIO) SENSOR AND FAULT RELAY	YES NO
486/5/7-0271-002	POWER DISTRIBUTION SCHEMATIC DIAGRAM	2	0	A	B	NORMAL SUPPLY MAIN SWITCH	125A S250PE/125	B	INDIVIDUAL PUMP MOTOR AUX PROTECTION SENSORS AND FAULT RELAYS	YES NO
486/5/7-0271-003	PUMP 01 SCHEMATIC DIAGRAM	3	0	A	B	GENERATOR SUPPLY MAIN SWITCH	125A S250PE/125	C	INDIVIDUAL PUMP REFLEX VALVE MICROSWITCH	YES NO
486/5/7-0271-004	PUMP 02 SCHEMATIC DIAGRAM	4	0	A	B	PUMP1 CIRCUIT BREAKER	20A S125GJ/20	D	STATION MANHOLE SURCHARGE IMMINENT	YES NO
486/5/7-0271-005	RESERVED (SUMP PUMP)	5				PUMP2 CIRCUIT BREAKER	20A S125GJ/20	E	STATION DRY WELL SUMP PUMP AND LEVEL INDICATION SENSORS AND RELAYS	YES NO
486/5/7-0271-006	RESERVED (GENERATOR CONTROL)	6				DRY WELL SUMP PUMP CIRCUIT BREAKER	NOT APPLICABLE	F	STATION PERMANENT GENERATOR - ATS AND CONTROL CONNECTIONS	YES NO
486/5/7-0271-007	COMMON CONTROLS SCHEMATIC DIAGRAM	7	0	A	B	PUMP SOFT STARTER SIZE	MCD500-21 21A	G	STATION EMERGENCY STORAGE LEVEL SENSOR	YES NO
486/5/7-0271-008	COMMON RTU I/O SCHEMATIC DIAGRAM	8	0	A	B	PUMP RATING	7.5kW 15A	H	STATION DELIVERY FLOWMETER	YES NO
486/5/7-0271-009	RTU POWER DISTRIBUTION SCHEMATIC DIAGRAM	9	0	A	B	PUMP LINE CONTACTOR	CA7-30	I	BACKUP COMMUNICATION	YES NO
486/5/7-0271-010	RTU DIGITAL INPUTS TERMINATION DIAGRAM	10	0	A	B	SUMP PUMP RATING	NOT APPLICABLE	J	PUMP CONNECTION (Via De-contactors)	YES NO
486/5/7-0271-011	RTU DIGITAL INPUTS TERMINATION DIAGRAM	11	0	A	B	SUMP PUMP CONTACTOR & TOL	NOT APPLICABLE	K	CATHODIC PROTECTION	YES NO
486/5/7-0271-012	RTU DIGITAL OUTPUTS TERMINATION DIAGRAM	12	0	A	B	PUMP SOCKET OUTLET + INCLINE SLEEVE	DS13114013972 + 51BA058	L	MOTOR THERMISTORS (Via De-contactors)	YES NO
486/5/7-0271-013	RTU ANALOGS & MISCELLANEOUS TERMINATION DIAGRAM	13	0	A	B	PUMP INLET PLUG + HANDLE	DS13118013972 + 311A013	M	ODOUR CONTROL	YES NO
486/5/7-0271-014	COMMON CONTROLS TERMINATION DIAGRAM	14	0	A	B	WET WELL LEVEL TRANSMITTER	WL52XXA4AMD1DD1X 4m	N	CURRENT TRANSFORMER (CT) METERING	YES NO
486/5/7-0271-015	EQUIPMENT LIST	15	0	A	B	EMERGENCY STORAGE WELL LEVEL TRANSMITTER	NOT APPLICABLE	O	PUMPS ELECTRICAL INTERLOCK	YES NO
486/5/7-0271-016	CABLE SCHEDULE	16	0	A	B	DELIVERY PRESSURE TRANSMITTER	BR52XXCA1EHPMAS L.?? 25m	P	WET WELL WASHER	YES NO
486/5/7-0271-017	SWITCHBOARD LABEL SCHEDULE	17	0	A	B	WET WELL ULTRASONIC LEVEL SENSOR	NOT APPLICABLE	Q	AUX PIT SUMP PUMP AND LEVEL PROBE	YES NO
486/5/7-0271-018	SWITCHBOARD CONSTRUCTION DETAILS	18	0	A	B	FLOWMETER RANGE	NOT APPLICABLE	R	TELEMETRY RADIO	YES NO
486/5/7-0271-019	SWITCHBOARD CONSTRUCTION DETAILS	19	0	A	B	RADIO	<<4R900-0?A02-D0>>	S	WET WELL ULTRASONIC LEVEL SENSOR	YES NO
486/5/7-0271-020	LEVEL PROBES AND PRESSURE TRANSMITTER INSTALLATION DETAILS	20	0	A	B	EMERGENCY PUMPING TIME	240sec	T	DOHUBLE SIDED SWITCHBOARD BREEZEWAY FITTED	YES NO
486/5/7-0271-021	RESERVED (CATHODIC PROTECTION UNIT)	21				No of SINGLE POINT PROBES	2	U	DELIVERY PRESSURE TRANSMITTER	YES NO
486/5/7-0271-022	RESERVED (FIELD DISCONNECTION BOX)	22				INCOMING MAINS SUPPLY CABLE	TBA	V	CHEMICAL DOSING	YES NO
486/5/7-0271-023	SWITCHBOARD GENERAL ARRANGEMENT ELEVATIONS - SINGLE SIDED	23	0	A	B	MAIN EARTHING CABLE	TBA			
486/5/7-0271-024	SWITCHBOARD GENERAL ARRANGEMENT SECTIONS - SINGLE SIDED	24	0	A	B	INCOMING GENERATOR SUPPLY CABLE	NOT APPLICABLE			
486/5/7-0271-025	RESERVED (GENERATOR EXTERNAL CONNECTION BOX)	25				SOFT STARTER 3 PHASE SUPPLY	6mm2			
NIL-QUU-SP065-E25	SLAB & CONDUIT DETAILS - SHEET 1 of 3	26	0							
NIL-QUU-SP065-E26	SLAB & CONDUIT DETAILS - SHEET 2 of 3	27	0							
NIL-QUU-SP065-E27	SLAB & CONDUIT DETAILS - SHEET 3 of 3	28	0							

## AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_  
NAME of SIGNATORY: L.FERRIS  
RPEQ No. or LICENCE: 5938  
COMPANY NAME: BUILDING SERVICES DESIGN  
START DATE: 15.05.12 FINISH DATE: 08.11.12

## ELECTRICAL CONTRACTOR



ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226  
379 THYNE ROAD, PHONE 07 3899 8866  
MORNINGSIDES QLD 4170 FAX 07 3899 8766  
Nilsen QLD Pty Ltd ABN 50 115 075 048  
Contracting | Engineering Services | Switchboards

## SWITCHBOARD MANUFACTURER



NAME \_\_\_\_\_ SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_  
QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



SHEET No. 1 OF 28  
QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/7-0271-001  
AMEND. B

Sheet 01

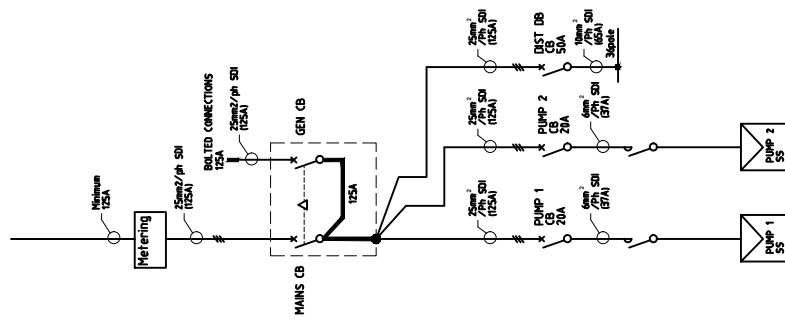
AS CONSTRUCTED

B	8.11.12	AS CONSTRUCTED	P.C.	Q.U.U.	5938	L.F.	ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.		BOB PRITCHARD	14.01.13	ASSET/PROJECT		DRAWING TITLE	
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE	SP065	SITE COVER SHEET
0	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E	NEIL O'BRIEN	N.O.B	14.01.13	CONSTRUCTION MANAGER	SIGNATURE	DATE	STEVENS STREET	
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY		Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE				SEWAGE PUMP STATION	

## NOTES

1. INCOMING GENSET, MAIN PUMP & DIST. BOARD CIRCUIT BREAKERS LINE SIDE SHROUDED.
2. CIRCUIT BREAKER RATINGS SUIT FAULT LEVEL & LOAD. MIN TYPE 2 CO-ORDINATION WITH CONTACTORS & OVERLOADS TO IEC 947-4-1.
3. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST SIZE2000 COMPATIBLE LABELLING.
4. POINT OF SUPPLY ADDED, DISCRIMINATION BETWEEN ENERGEX FUSES AND PUMP CIRCUIT BREAKERS TO AS3000
5. CABLING TO GENERATOR CONNECTION SOCKET AND AUXILIARY SUPPLY SOCKET DOUBLE INSULATED. CABLING FULLY SEALED TO OTHER COMPARTMENTS

## POWER CABLING ARRANGEMENT

ENERGEX SUPPLY 3 PHASE  
415VAC  
FEED FROM PILLAR (NOTE 4)  
16mm²

N R W B

FAULT LEVEL AT  
SWITCHBOARD 15.7kASUPPLY AUTHORITY  
DIRECT  
METERING

SD1,2,3

F1

610

611

612

63A

80KA

N1

E

MEN  
LINKENERGEX MAINS  
POWER FAILURE RELAY  
REF 07A2

601

602

603

N2

PFR

GENERATOR  
CONNECTION SOCKET  
(in Switchboard) (NOTE 5)

R

W

B

N

E

BOLTED  
CONNECTIONS  
(SHROUDED)SWITCHBOARD RATING 125A  
MAX DEMAND 60AGEN SUPPLY  
MAIN SWITCH  
125A (NOTE1,2)  
I<sub>r</sub>=0.5(62.5A)  
Char= 6

Q3

Q2

Q1

Q4

Q5

Q6

Q7

Q8

Q9

Q10

Q11

Q12

Q13

Q14

Q15

Q16

Q17

Q18

Q19

Q20

Q21

Q22

Q23

Q24

Q25

Q26

Q27

Q28

Q29

Q30

Q31

Q32

Q33

Q34

Q35

Q36

Q37

Q38

Q39

Q40

Q41

Q42

Q43

Q44

Q45

Q46

Q47

Q48

Q49

Q50

Q51

Q52

Q53

Q54

Q55

Q56

Q57

Q58

Q59

Q60

Q61

Q62

Q63

Q64

Q65

Q66

Q67

Q68

Q69

Q70

Q71

Q72

Q73

Q74

Q75

Q76

Q77

Q78

Q79

Q80

Q81

Q82

Q83

Q84

Q85

Q86

Q87

Q88

Q89

Q90

Q91

Q92

Q93

Q94

Q95

Q96

Q97

Q98

Q99

Q100

Q101

Q102

Q103

Q104

Q105

Q106

Q107

Q108

Q109

Q110

Q111

Q112

Q113

Q114

Q115

Q116

Q117

Q118

Q119

Q120

Q121

Q122

Q123

Q124

Q125

Q126

Q127

Q128

Q129

Q130

Q131

Q132

Q133

Q134

Q135

Q136

Q137

Q138

Q139

Q140

Q141

Q142

Q143

Q144

Q145

Q146

Q147

Q148

Q149

Q150

Q151

Q152

Q153

Q154

Q155

Q156

Q157

Q158

Q159

Q160

Q161

Q162

Q163

Q164

Q165

Q166

Q167

Q168

Q169

Q170

Q171

Q172

Q173

Q174

Q175

Q176

Q177

Q178

Q179

Q180

Q181

Q182

Q183

Q184

Q185

Q186

Q187

Q188

Q189

Q190

Q191

Q192

Q193

Q194

Q195

Q196

Q197

Q198

Q199

Q200

Q201

Q202

Q203

Q204

Q205

Q206

Q207

Q208

Q209

Q210

Q211

Q212

Q213

Q214

Q215

Q216

Q217

Q218

Q219

Q220

Q221

Q222

Q223

Q224

Q225

Q226

Q227

Q228

Q229

Q230

Q231

Q232

Q233

Q234

Q235

Q236

Q237

Q238

Q239

Q240

Q241

Q242

Q243

Q244

Q245

Q246

Q247

Q248

Q249

Q250

Q251

Q252

Q253

Q254

Q255

Q256

Q257

Q258

Q259

Q260

Q261

Q262

Q263

Q264

Q265

Q266

Q267

Q268

Q269

Q270

Q271

Q272

Q273

Q274

Q275

Q276

Q277

Q278

Q279

Q280

Q281

Q282

Q283

Q284

Q285

Q286

Q287

Q288

Q289

Q290

Q291

Q292

Q293

Q294

Q295

Q296

Q297

Q298

Q299

Q300

Q301

Q302

Q303

Q304

Q305

Q306

Q307

Q308

Q309

Q310

Q311

Q312

Q313

Q314

Q315

Q316

Q317

Q318

Q319

Q320

Q321

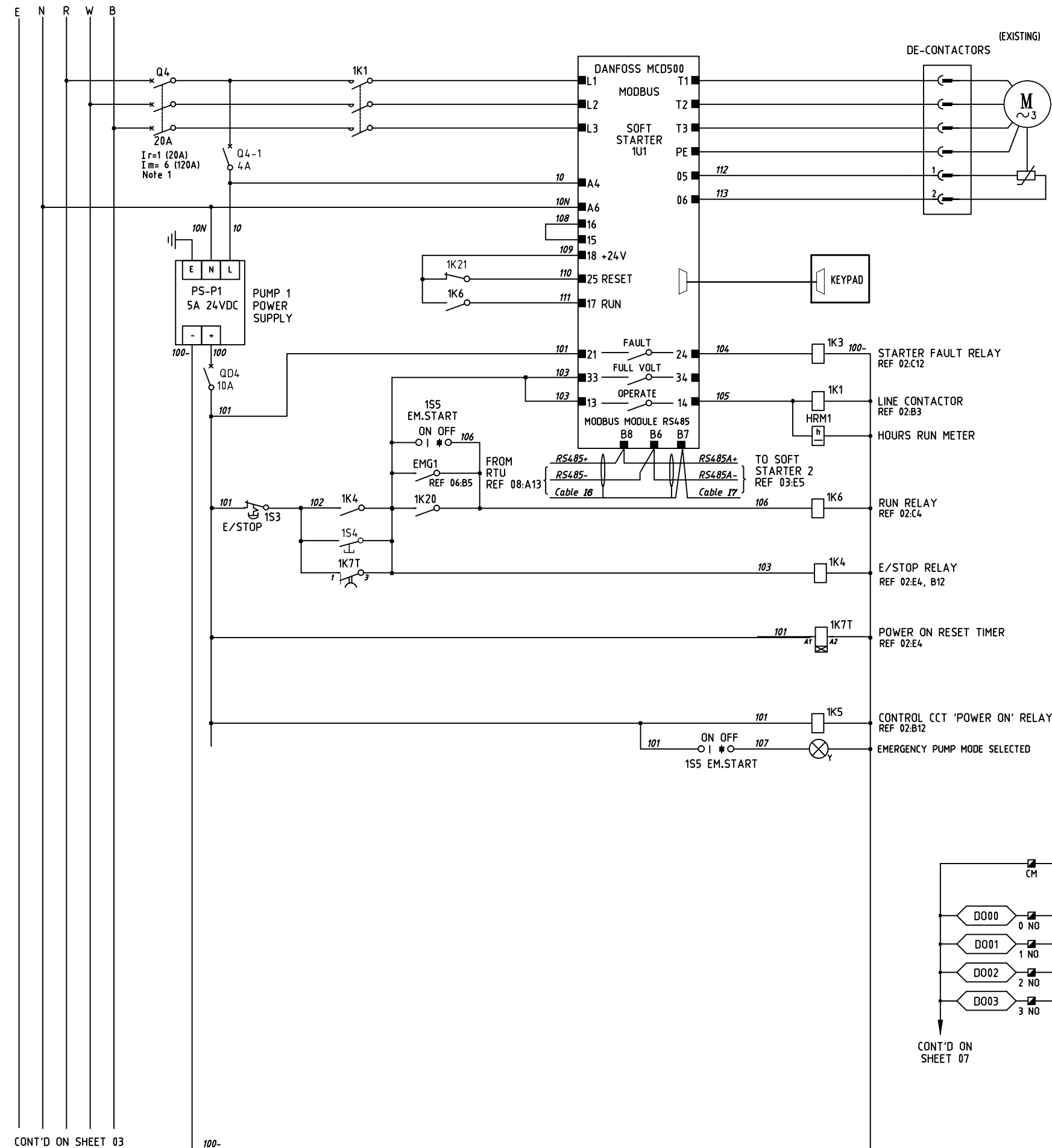
Q322

Q323

Q324

Q325

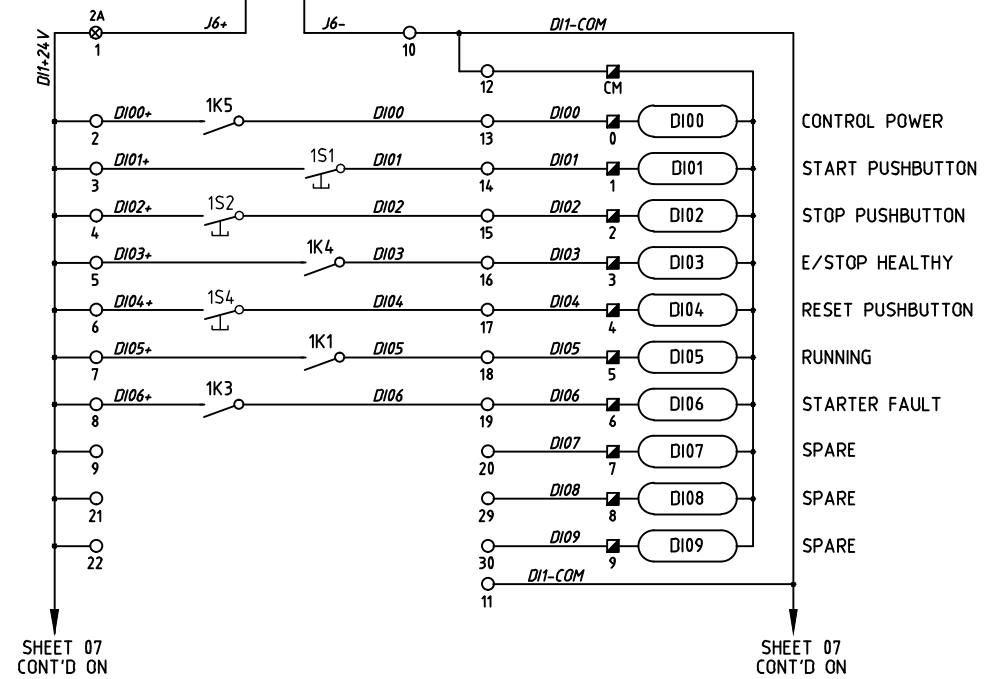
CONT'D FROM SHEET 01



CONT'D ON SHEET 03

## RTU DIGITAL INPUTS

+ 24VDC POWER SUPPLY - REFER SHEET 08:C7



## NOTES

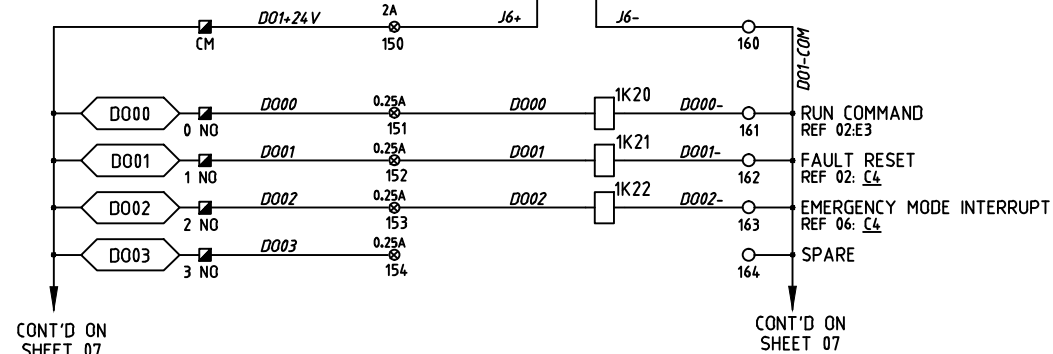
1. INCOMING GENSET, MAIN, PUMP & DIST. BOARD CIRCUIT BREAKERS LINE SIDE SHROUDED.
2. CIRCUIT BREAKER RATINGS SUIT FAULT LEVEL & LOAD, TYPE 2 CO-ORDINATION WITH CONTACTORS & OVERLOADS TO IEC 947-4-1.
3. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST SI2000 COMPATIBLE LABELLING.
4. FAULT LEVEL OF 20kA AT 415V FOR 0.2sec.

## LEGEND:

●	RTU MARSH FUSE TERMINAL
⊗	RTU MARSH. CCT BREAKER TERM
○	RTU MARSH. LINK TERMINAL
⊘	SWITCHBOARD CONTROL TERM.
⊠	SWITCHBOARD GENERATOR TERM.
⊞	FIELD TERMINAL
⊞	RTU TERMINAL
■	SS TERMINAL
DI01	DIGITAL INPUT
DO01	DIGITAL OUTPUT
AI01	ANALOG INPUT
AO01	ANALOG OUTPUT

## RTU DIGITAL OUTPUTS

+ 24VDC POWER SUPPLY - REFER SHEET 08:C7



Sheet 03  
AS CONSTRUCTED

## AS CONSTRUCTED DETAILS

I CERTIFY THAT THE 'AS CONSTRUCTED' DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_  
NAME of SIGNATORY: L.FERRIS  
RPEQ No. or LICENCE: 5938  
COMPANY NAME: BUILDING SERVICES DESIGN  
START DATE: 15.05.12 FINISH DATE: 08.11.12

## ELECTRICAL CONTRACTOR

**NILSEN**

ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226  
379 THYNE ROAD, PHONE 07 3899 8866  
MORNINGSIDE QLD 4170 FAX 07 3899 8766  
Nilsen QLD Pty Ltd ABN 50 115 075 048  
Contracting | Engineering Services | Switchboards

## SWITCHBOARD MANUFACTURER

ENERGY DISTRIBUTION **SUNLINE SWITCHBOARDS PTY.LTD.**  
7 DUNWOOD ST. BENDALUE, 4501, QUEENSLAND, AUSTRALIA.  
Phone : (07) 3881-3431  
FAX : (07) 3881-3511  
EMAIL : admin@sunline.net.au  
WEB SITE : http://www.sunline.net.au

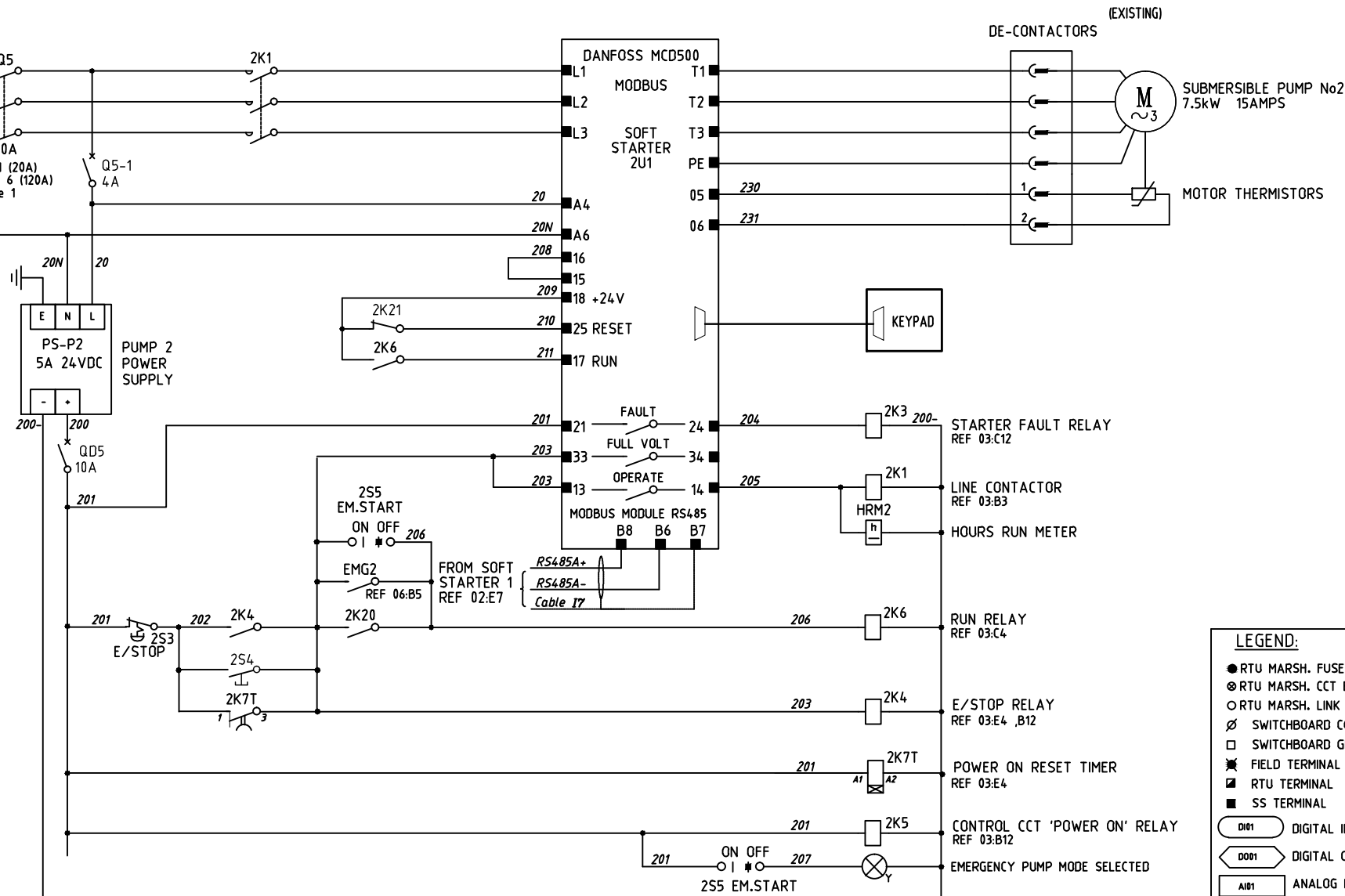
NAME \_\_\_\_\_ SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_  
QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

**QUEENSLAND UrbanUtilities**

SHEET No. 3 OF 28  
QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/7-0271-003  
AMEND. B

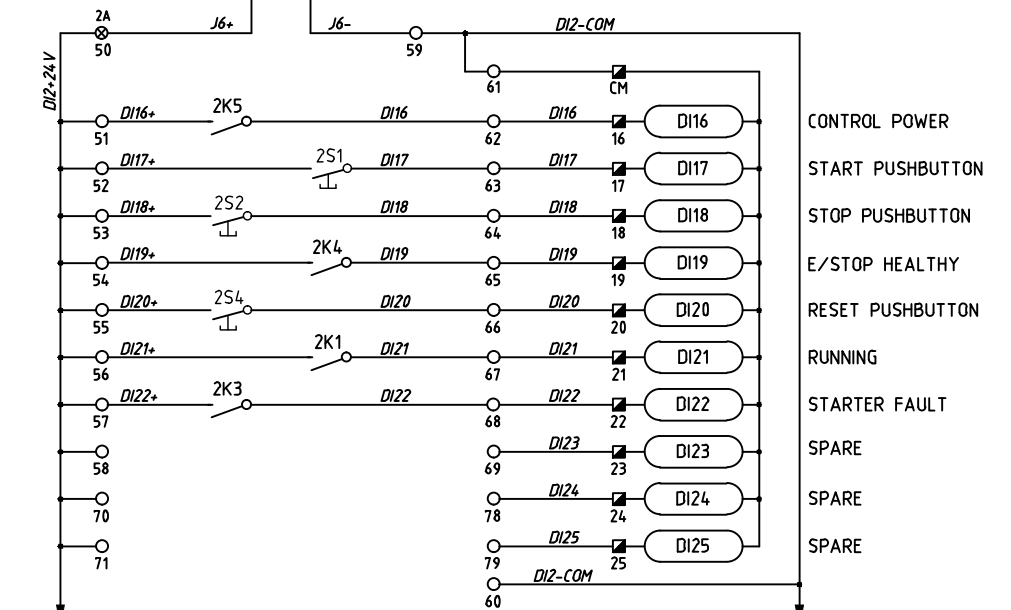
B	8.11.12	AS CONSTRUCTED	P.C.	Q.U.U.	5938	LF	ELECTRICIANS DETAILS	DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.	BOB PRITCHARD	14.01.13	ASSET/PROJECT	DRAWING TITLE	SHEET No. 3 OF 28
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	DRAFTING CHECK	N.O'BRIEN	DESIGN	APPROVED BY	14.01.13	SP065	PUMP No1	
O	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	CAD FILE	Q12B4E	R.P.E.Q. No.	SIGNATURE	DATE	STEVENS STREET	SCHEMATIC DIAGRAM	
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY	Q.U.U. FILE No.	TBA	DESIGN CHECK	SIGNATURE	DATE	SEWAGE PUMP STATION		

CONT'D FROM SHEET 02



## RTU DIGITAL INPUTS

+ 24VDC POWER SUPPLY - REFER SHEET 08:C7



CONT'D ON SHEET 07

CONT'D ON SHEET 07

## NOTES

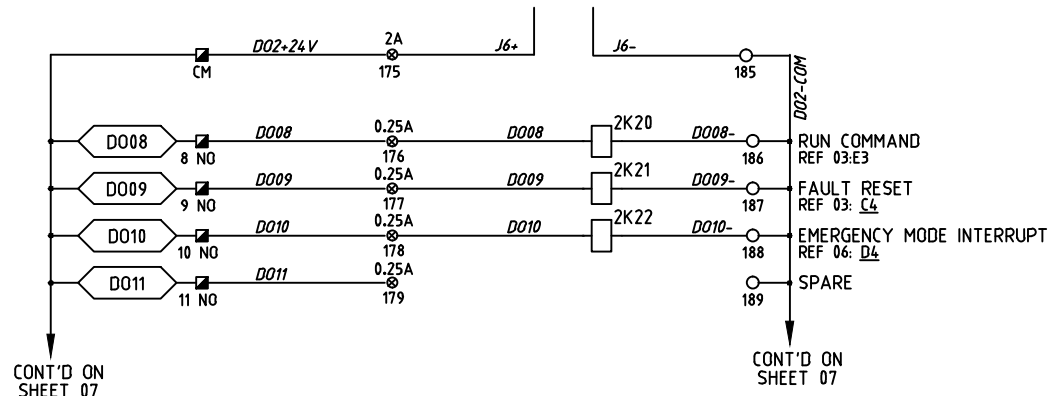
1. INCOMING GENSET, MAIN, PUMP & DIST. BOARD CIRCUIT BREAKERS LINE SIDE SHROUDED.
2. CIRCUIT BREAKER RATINGS SUIT FAULT LEVEL & LOAD, TYPE 2 CO-ORDINATION WITH CONTACTORS & OVERLOADS TO IEC 947-4-1.
3. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST SI2000 COMPATIBLE LABELLING.
4. FAULT LEVEL OF 20kA AT 415V FOR 0.2sec.

## LEGEND:

●	RTU MARSH. FUSE TERMINAL
⊗	RTU MARSH. CCT BREAKER TERM
○	RTU MARSH. LINK TERMINAL
⊘	SWITCHBOARD CONTROL TERM.
□	SWITCHBOARD GENERATOR TERM.
✱	FIELD TERMINAL
■	RTU TERMINAL
■	SS TERMINAL
DI01	DIGITAL INPUT
DO01	DIGITAL OUTPUT
AI01	ANALOG INPUT
AO01	ANALOG OUTPUT

## RTU DIGITAL OUTPUTS

+ 24VDC POWER SUPPLY - REFER SHEET 08:C7



CONT'D ON SHEET 07

CONT'D ON SHEET 07

Sheet 04

AS CONSTRUCTED

B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.	5938	LF	ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.		BOB PRITCHARD	14.01.13	ASSET/PROJECT		DRAWING TITLE		SHEET No. 4 OF 28	
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE	SP065	PUMP No2	QUEENSLAND URBAN UTILITIES DRAWING No.	AMEND.
Q	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E	DESIGN CHECK	R.P.E.Q. No.	DATE	NEIL O'BRIEN	N.O.B	14.01.13	STEVENS STREET	SCHEMATIC DIAGRAM	486/5/7-0271-004	B
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY		Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE	STEWENS STREET SEWAGE PUMP STATION			

RESERVED FOR DRY WELL SUMP PUMP

ELECTRICAL CONTRACTOR



ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226

379 THYNE ROAD,  
MORNINGSIDE QLD 4170  
Nilsen QLD Pty Ltd ABN 50 115 075 048  
Contracting | Engineering Services | Switchboards

PHONE 07 3899 8866  
FAX 07 3899 8766

SWITCHBOARD MANUFACTURER

ENERGY DISTRIBUTION



BY SUNLINE.


**SUNLINE SWITCHBOARDS PTY LTD.**

7 DUNTRIDY ST. BRENDALE, 4500, QUEENSLAND, AUSTRALIA

Phone : (07) 3881-3433  
FAX : (07) 3881-3611  
EMAIL : admin@sunline.net.au  
WEB SITE : <http://www.sunline.net.au>

NAMESIGNATUREDATE

QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



Sheet 05

AS CONSTRUCTED

B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.			ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.			BOB PRITCHARD		14.01.13	ASSET/PROJECT		DRAWING TITLE		SHEET No. 5 OF 28	
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE	SP065	SCHEMATIC DIAGRAM		QUEENSLAND URBAN UTILITIES DRAWING No.		AMEND.
O	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E				NEIL O'BRIEN	N.O.B	14.01.13	STEVENS STREET	DRY WELL SUMP PUMP		486/5/7-0271-005		B
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY			Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE					

RESERVED FOR GENERATOR ATS

ELECTRICAL CONTRACTOR



ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226

379 THYNE ROAD,  
MORNINGSIDE QLD 4170


PHONE 07 3899 8866  
FAX 07 3899 8766

Nilsen QLD Pty Ltd ABN 50 115 075 048

Contracting | Engineering Services | Switchboards

SWITCHBOARD MANUFACTURER

ENERGY DISTRIBUTION



BY SUNLINE.

**SUNLINE SWITCHBOARDS PTY LTD.**

7 DUNTHOON ST. BRENDALE, 4300, QUEENSLAND, AUSTRALIA

Phone : (07) 3881-3433  
FAX : (07) 3881-3611  
EMAIL : [ast@nilsonline.net.au](mailto:ast@nilsonline.net.au)  
WEB SITE : <http://www.sunline.net.au>

NAME

SIGNATURE


DATE

QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



Sheet 06

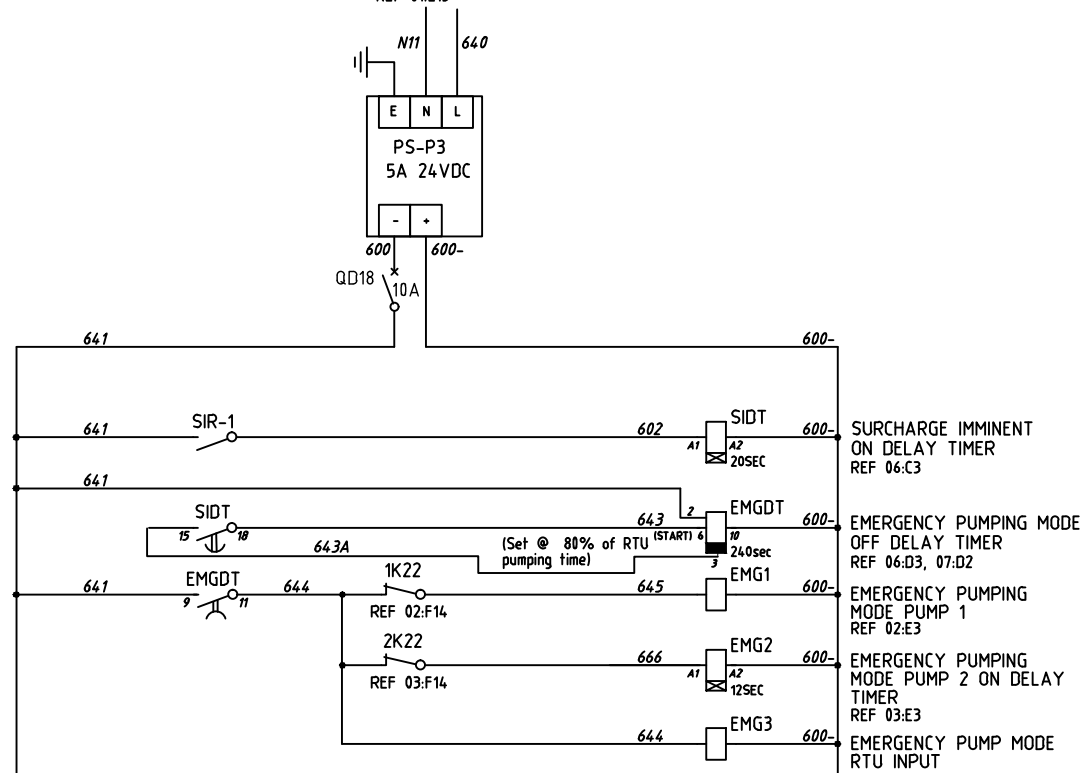
AS CONSTRUCTED

B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.			ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.			BOB PRITCHARD		14.01.13	ASSET/PROJECT SP065 STEVENS STREET SEWAGE PUMP STATION	DRAWING TITLE GENERATOR CONTROL SCHEMATIC DIAGRAM	SHEET No. 6 OF 28  QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/7-0271-006 AMEND. B	
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE				
O	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E				NEIL O'BRIEN	N.O.B	14.01.13				
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY			Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE			

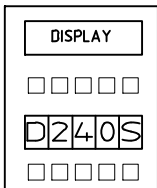
# COMMON CONTROL SECTION EMERGENCY PUMPING MODE (240VAC)

240VAC POWER SUPPLY

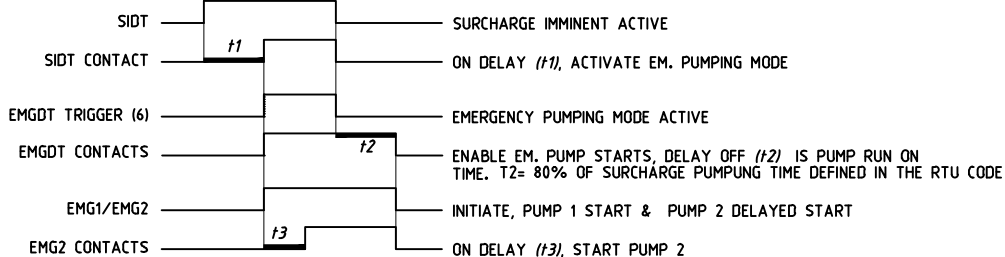
REF 01:E13



EMGDT - SETTINGS



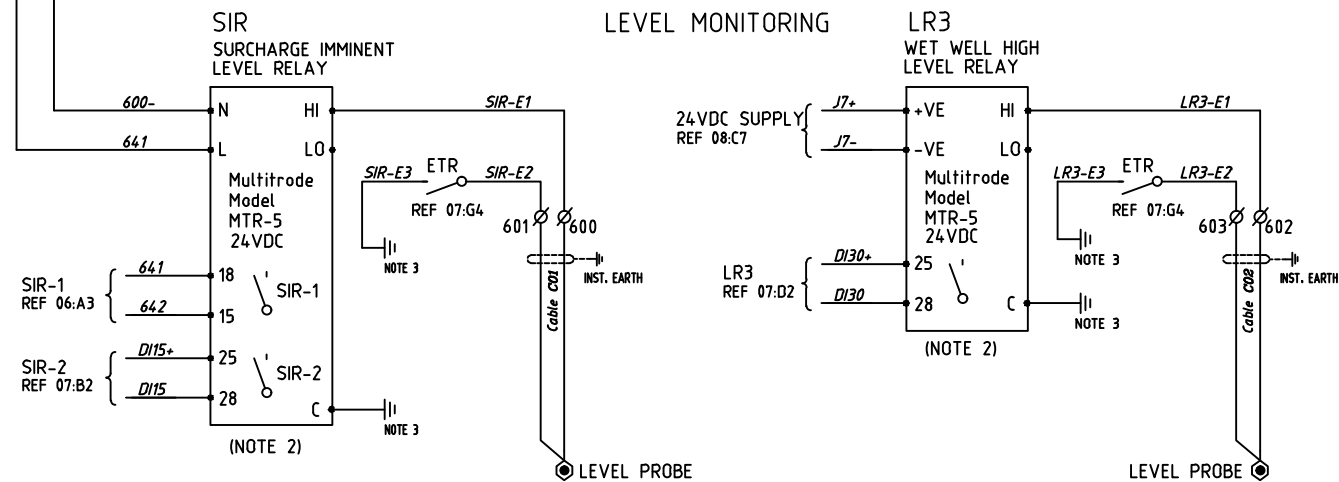
## TIMING DIAGRAM



## COMMON CONTROL SECTION

## LEVEL MONITORING

## LR3 WET WELL HIGH LEVEL RELAY



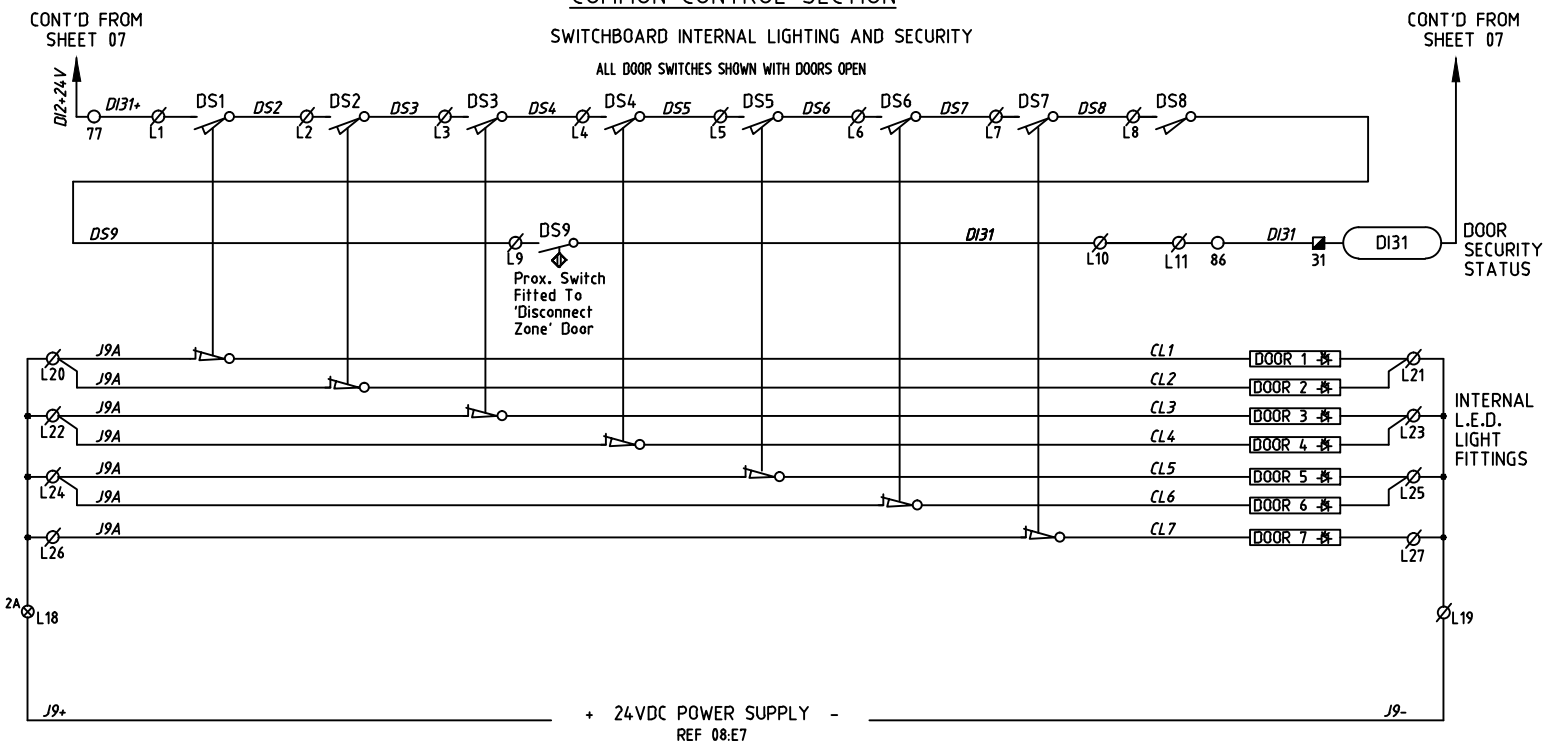
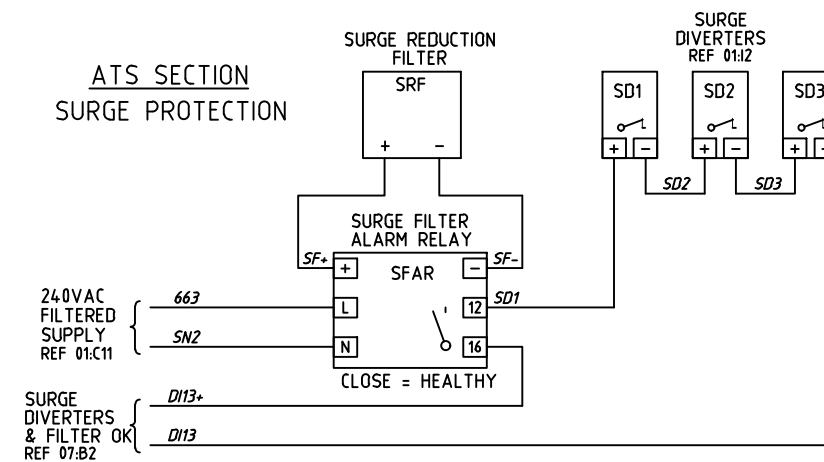
## NOTES

1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELLING.
2. DIPSWITCH SET TO 'DISCHARGE' MODE.
3. SEPARATE DEDICATED EARTH CONDUCTOR RAN TO EARTH BAR.

## COMMON CONTROL SECTION

## SWITCHBOARD INTERNAL LIGHTING AND SECURITY

ALL DOOR SWITCHES SHOWN WITH DOORS OPEN

ATS SECTION  
SURGE PROTECTION

## LEGEND:

- RTU MARSH. FUSE TERMINAL
- ⊙ RTU MARSH. CCT BREAKER TERM
- RTU MARSH. LINK TERMINAL
- ⊘ SWITCHBOARD GENERATOR TERM.
- ⊠ FIELD TERMINAL
- ⊡ RTU TERMINAL
- SS TERMINAL
- DI01 DIGITAL INPUT
- DO01 DIGITAL OUTPUT
- AI01 ANALOG INPUT
- AO01 ANALOG OUTPUT

## Sheet 07

AS CONSTRUCTED

## AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_  
 NAME of SIGNATORY: L.FERRIS  
 RPEQ No. or LICENCE: 5938  
 COMPANY NAME: BUILDING SERVICES DESIGN  
 START DATE: 15.05.12 FINISH DATE: 08.11.12

## ELECTRICAL CONTRACTOR

**NILSEN**

ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226  
 379 THYNE ROAD, MORNINGSIDE QLD 4170 PHONE 07 3899 8866  
 Nilsen QLD Pty Ltd ABN 50 115 075 048 FAX 07 3899 8766  
 Contracting | Engineering Services | Switchboards

## SWITCHBOARD MANUFACTURER

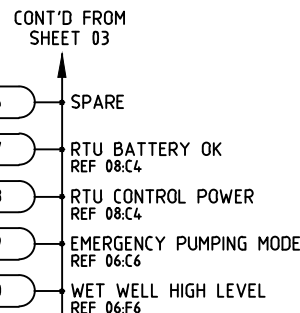
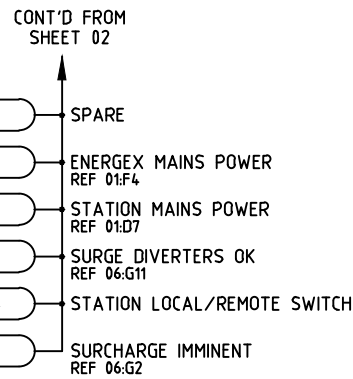
ENERGY DISTRIBUTION  
**SUNLINE SWITCHBOARDS PTY LTD.**  
 7 DUNROBIN ST. BRENDALE, 4500, QUEENSLAND, AUSTRALIA  
 Phone : (07) 3801-3433  
 FAX : (07) 3801-3011  
 EMAIL : admin@sunline.net.au  
 WEB SITE : http://www.sunline.net.au

NAME SIGNATURE DATE  
 QUEENSLAND URBAN UTILITIES DELEGATE  
 (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

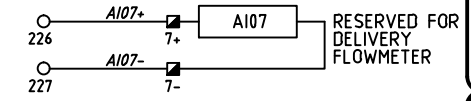
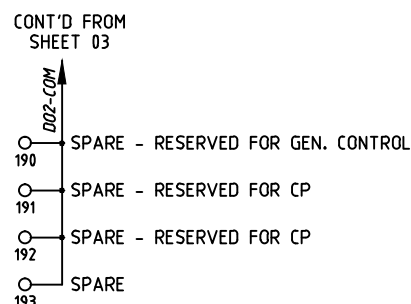
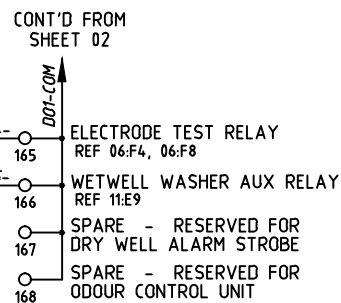
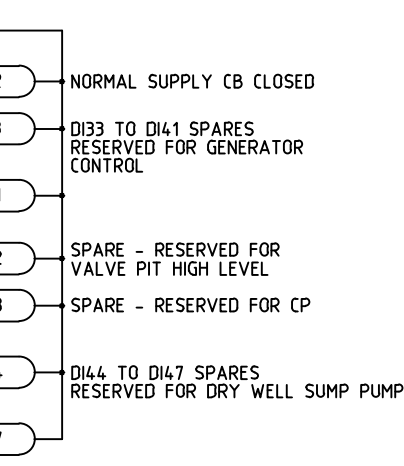
**QUEENSLAND UrbanUtilities**

SHEET No. 7 OF 28  
 QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/7-0271-007  
 AMEND. B





B	8.11.12	AS CONSTRUCTED	P.C.	Q.U.U.	5938	L.F.	ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.	BOB PRITCHARD	14.01.13	ASSET/PROJECT	SP065	DRAWING TITLE	COMMON CONTROLS
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE	SCHEMATIC DIAGRAM
O	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E	DESIGN CHECK	R.P.E.Q. No.	DATE	NEIL O'BRIEN	N.O.B.	14.01.13	
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY		Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE	

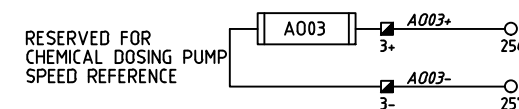


CONT'D ON  
SHEET 06



1. ALL WIRES & CABLE CORES ARE FERRULED  
WITH GRAFOPLAST SIZ2000 COMPATIBLE LABELLING.

- LEGEND:**
- RTU MARSH. FUSE TERMINAL
  - ⊗ RTU MARSH. CCT BREAKER TERM
  - RTU MARSH. LINK TERMINAL
  - ∅ SWITCHBOARD CONTROL TERM.
  - SWITCHBOARD GENERATOR TERM.
  - FIELD TERMINAL
  - ⚡ RTU TERMINAL
  - SS TERMINAL
- 
- |   |                |
|---|----------------|
|  | DIGITAL INPUT  |
|  | DIGITAL OUTPUT |
|  | ANALOG INPUT   |
|  | ANALOG OUTPUT  |

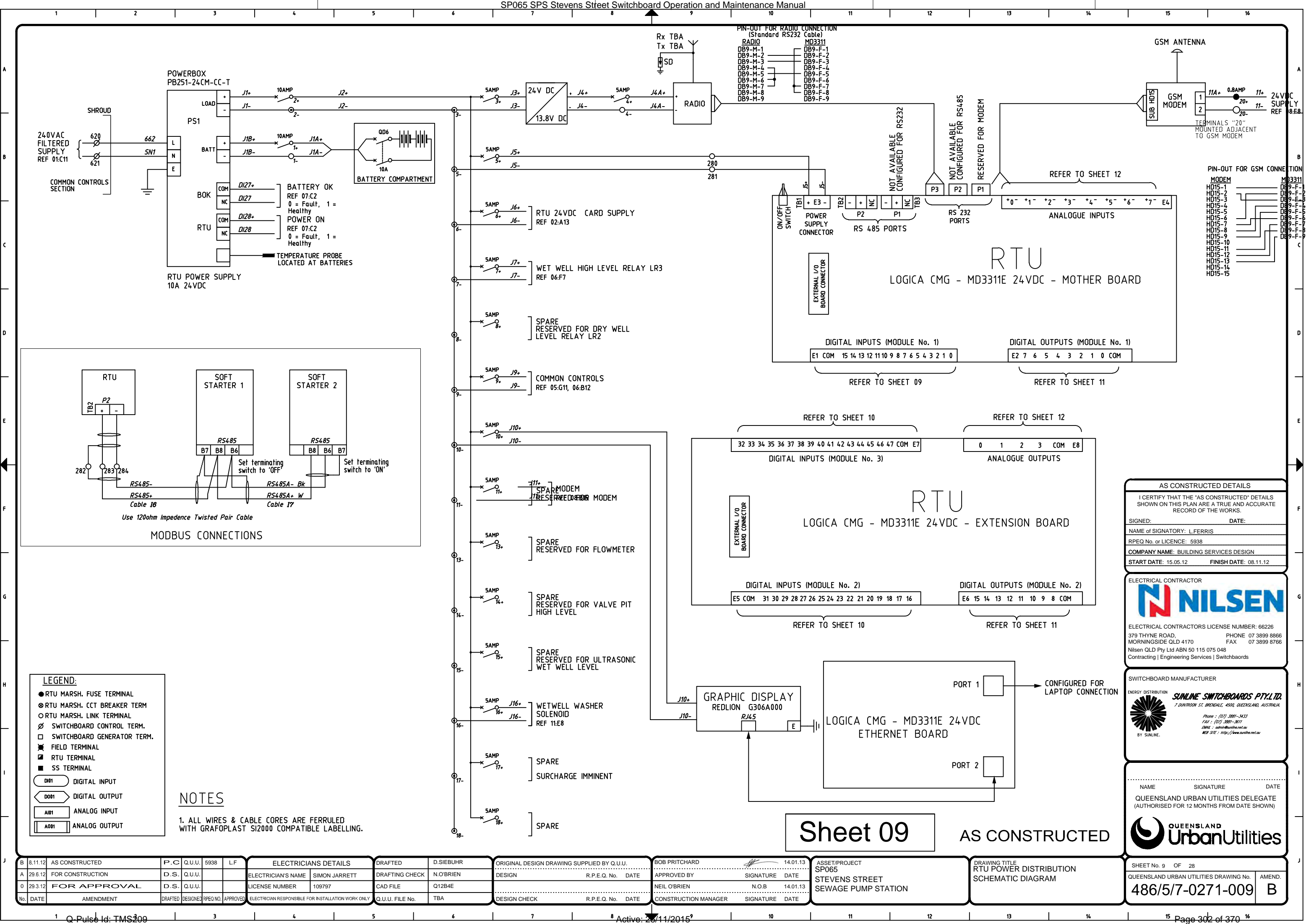


## RTU ANALOG OUTPUTS



QUEENSLAND  
UrbanUtilities

SHEET No. 8 OF 28	
QUEENSLAND URBAN UTILITIES DRAWING No. <b>486/5/7-0271-008</b>	AMEND. <b>B</b>

A  
B  
C  
D  
E  
F  
G  
H  
I  
J

## RTU COMPARTMENT

MITS RTU  
MD3311 EA

## 24VDC POWER DISTRIBUTION

REFER  
SHEET 08REFER  
SHEET 08

## SWITCHBOARD

## FIELD

## STARTER COMPARTMENT

## PUMP 1

REFER SHEET 02

**DI00+** 1K5 CONTROL POWER  
**DI00**  
**DI01+** 1S1 START PUSHBUTTON  
**DI01**  
**DI02+** 1S2 STOP PUSHBUTTON  
**DI02**  
**DI03+** 1K4 E/STOP HEALTHY  
**DI03**  
**DI04+** 1S4 RESET PUSHBUTTON  
**DI04**  
**DI05+** 1K1 PUMP RUNNING  
**DI05**  
**DI06+** 1K3 STARTER FAULT  
**DI06**

## COMMON COMPARTMENT

**DI11+** PFRE ENERGEX MAINS POWER  
**DI11** REF 01:G4  
**DI12+** PFRS STATION MAINS POWER  
**DI12** REF 01:E9

**DI13+** SFAR SURGE DIVERTERS OK  
**DI13** REF 06:F13  
**SD** 3 Off

## STARTER COMPARTMENT

**DI14+** LOC REM STATION LOCAL/REMOTE SWITCH  
**DI14**

## COMMON COMPARTMENT

**DI15+** SIR-2 SURCHARGE IMMINENT  
**DI15** REF 06:G2

16 CHANNEL  
DIGITAL INPUT  
MODULE 1

DI00	00	DI00
DI01	01	DI01
DI02	02	DI02
DI03	03	DI03
DI04	04	DI04
DI05	05	DI05
DI06	06	DI06
DI07	07	DI07
DI08	08	DI08
DI09	09	DI09
DI10	10	DI10
DI11	11	DI11
DI12	12	DI12
DI13	13	DI13
DI14	14	DI14
DI15	15	DI15
COM		DI1-COM V
E1		E

## DI1

2A

x 1

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

95

96

97

98

99

100

101

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

174

175

176

177

178

179

180

181

182

183

184

185

186

187

188

189

190

191

192

193

194

195

196

197

198

199

200

201

202

203

204

205

206

207

208

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

226

227

228

229

230

231

232

233

234

235

236

237

238

239

240

241

242

243

244

245

246

247

248

249

250

251

252

253

254

255

256

257

258

259

260

261

262

263

264

265

266

267

268

269

270

271

272

273

274

275

276

277

278

279

280

281

282

283

284

285

286

287

288

289

290

291

292

293

294

295

296

297

298

299

300

301

302

303

304

305

306

307

308

309

310

311

312

313

314

315

316

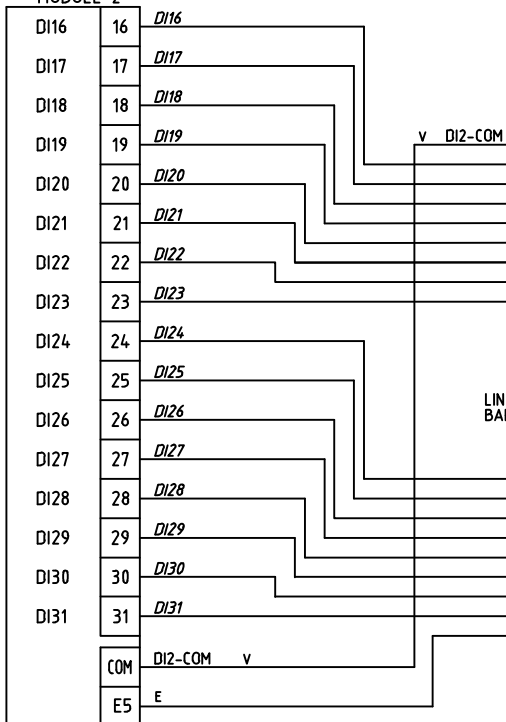
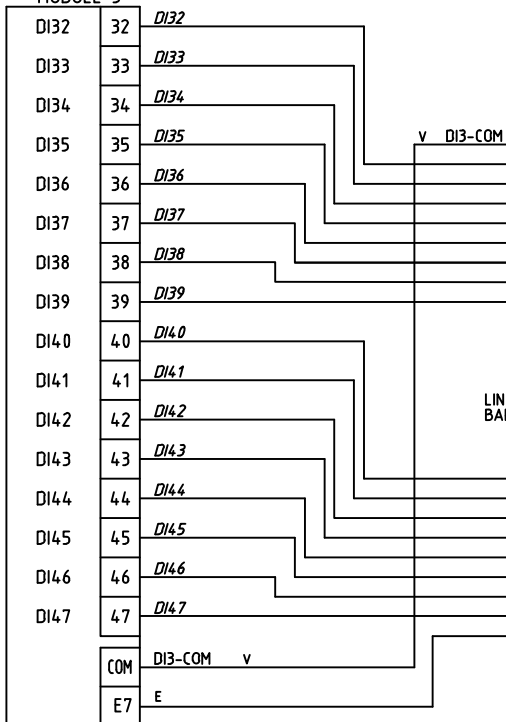
317

318

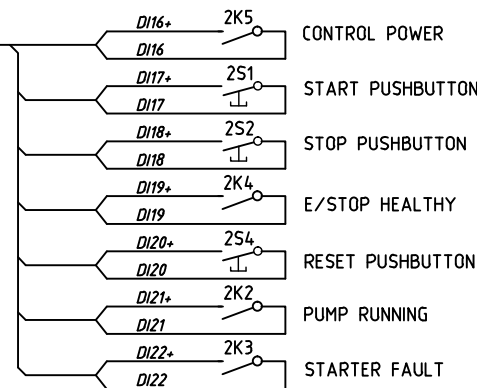
319

320

## RTU COMPARTMENT

MITS RTU  
MD3311 EA16 CHANNEL  
DIGITAL INPUT  
MODULE 216 CHANNEL  
DIGITAL INPUT  
MODULE 3CONT ON  
SHEET 09

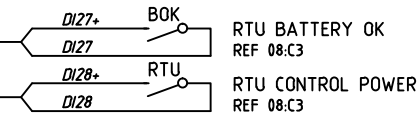
## STARTER COMPARTMENT

PUMP 2  
REFER SHEET 03

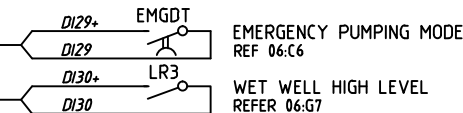
## SWITCHBOARD

## FIELD

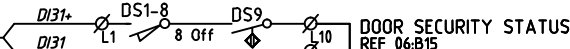
## RTU COMPARTMENT



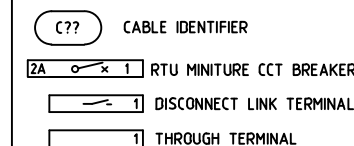
## COMMON COMPARTMENT



## DOOR SECURITY MONITORING

DOOR SECURITY STATUS  
REF 06:B15

## LEGEND:



## NOTES

1. ALL WIRES & CABLE CORES ARE FERRULED  
WITH GRAFOPLAST SI2000 COMPATIBLE LABELLING.

Sheet 11

AS CONSTRUCTED

## AS CONSTRUCTED DETAILS

I CERTIFY THAT THE 'AS CONSTRUCTED' DETAILS  
SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE  
RECORD OF THE WORKS.

SIGNED: DATE:

NAME of SIGNATORY: L.FERRIS

RPEQ No. or LICENCE: 5938

COMPANY NAME: BUILDING SERVICES DESIGN

START DATE: 15.05.12 FINISH DATE: 08.11.12

## ELECTRICAL CONTRACTOR



ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226

379 THYNE ROAD, PHONE 07 3899 8866

MORNINGSIDE QLD 4170 FAX 07 3899 8766

Nilsen QLD Pty Ltd ABN 50 115 075 048

Contracting | Engineering Services | Switchboards

## SWITCHBOARD MANUFACTURER



7 DUNTHORN ST. BRENDALE, 4500, QUEENSLAND, AUSTRALIA

Phone : (07) 3891-3433

FAX : (07) 3891-3071

EMAIL : admin@sunline.net.au

WEB SITE : http://www.sunline.net.au

NAME SIGNATURE DATE

QUEENSLAND URBAN UTILITIES DELEGATE

(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



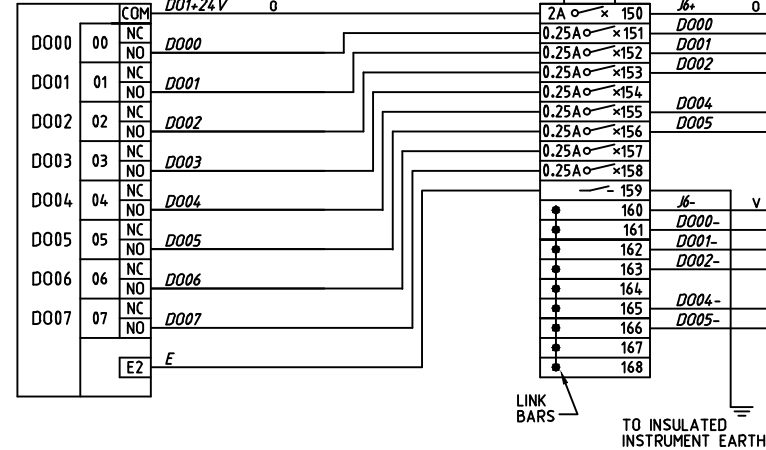
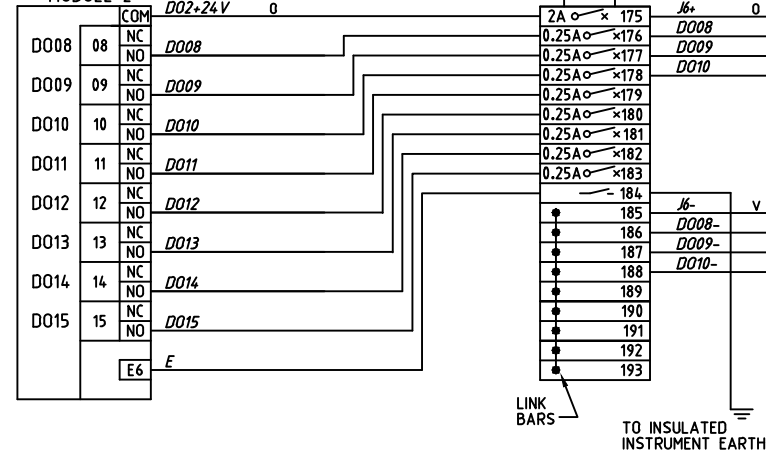
SHEET No. 11 OF 28

QUEENSLAND URBAN UTILITIES DRAWING No.

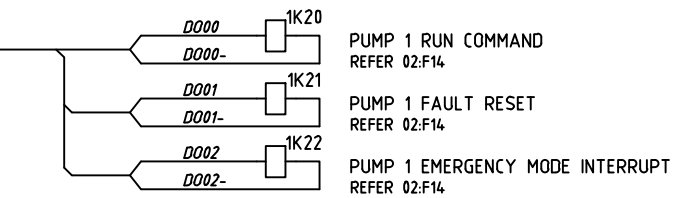
486/5/7-0271-011

AMEND. B

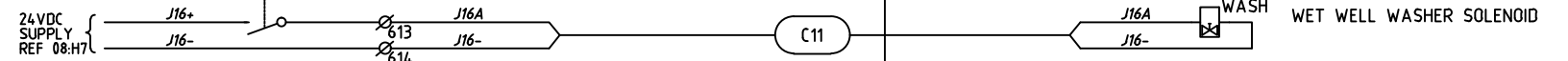
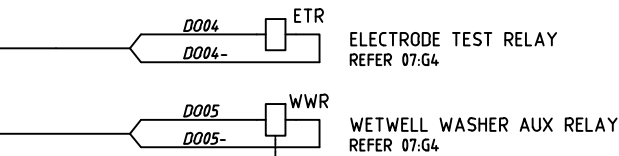
## RTU COMPARTMENT

MITS RTU  
MD3311 EA8 CHANNEL  
DIGITAL OUTPUT  
MODULE 18 CHANNEL  
DIGITAL OUTPUT  
MODULE 2

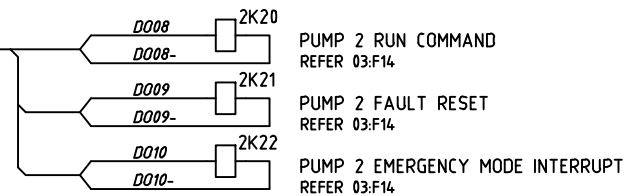
## STARTER COMPARTMENT



## COMMON COMPARTMENT



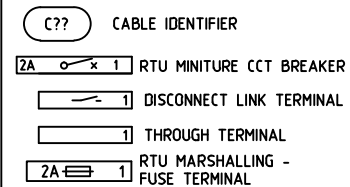
## STARTER COMPARTMENT



## NOTES

1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST SIZ000 COMPATIBLE LABELLING.

## LEGEND:



Sheet 12

AS CONSTRUCTED

## AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: DATE:  
NAME of SIGNATORY: L.FERRIS  
RPEQ No. or LICENCE: 5938  
COMPANY NAME: BUILDING SERVICES DESIGN  
START DATE: 15.05.12 FINISH DATE: 08.11.12

## ELECTRICAL CONTRACTOR




ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226  
379 THYNE ROAD, MORNINGSIDE QLD 4170 PHONE 07 3899 8866  
Nilsen QLD Pty Ltd ABN 50 115 075 048 FAX 07 3899 8766  
Contracting | Engineering Services | Switchboards

## SWITCHBOARD MANUFACTURER

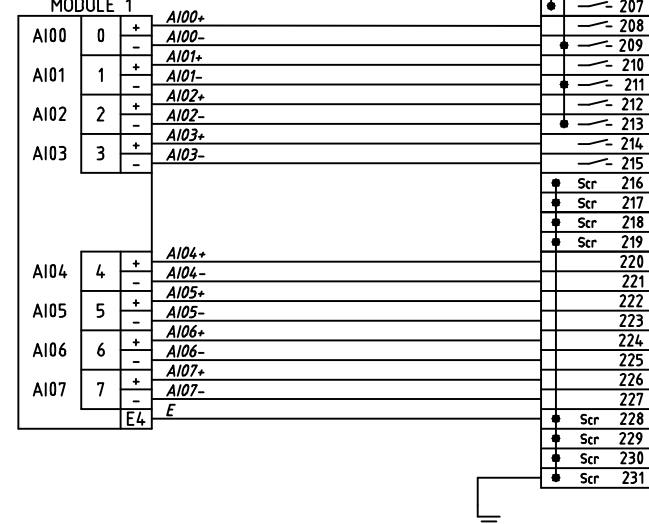
ENERGY DISTRIBUTION **SUNLINE SWITCHBOARDS PTY.LTD.**  
7 DUNTRON ST. BRENDALE, 4500, QUEENSLAND, AUSTRALIA  
Phone : (07) 3881-3433  
FAX : (07) 3881-3611  
EMAIL : admin@sunline.net.au  
WEB SITE : http://www.sunline.net.au

NAME SIGNATURE DATE  
QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



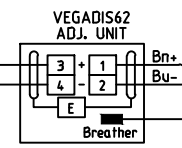
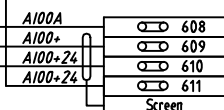
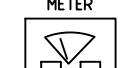
B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.	5938	LF	ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.			BOB PRITCHARD		14.01.13	ASSET/PROJECT SP065		DRAWING TITLE RTU DIGITAL OUTPUTS		SHEET No. 12 OF 28	
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE	STEVENS STREET		TERMINATION DIAGRAM		QUEENSLAND URBAN UTILITIES DRAWING No.	AMEND.
O	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E				NEIL O'BRIEN	N.O.B	14.01.13	SEWAGE PUMP STATION				486/5/7-0271-012	B
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY			Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE					

## RTU COMPARTMENT

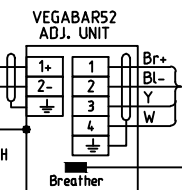
MITS RTU  
MD3311 EA8 CHANNEL  
ANALOG INPUT  
MODULE 1CONT ON  
SHEET 11

## SWITCHBOARD

## RTU COMPARTMENT

ANALOG LEVEL  
METERPRIMARY  
WET WELL LEVEL  
TRANSMITTER

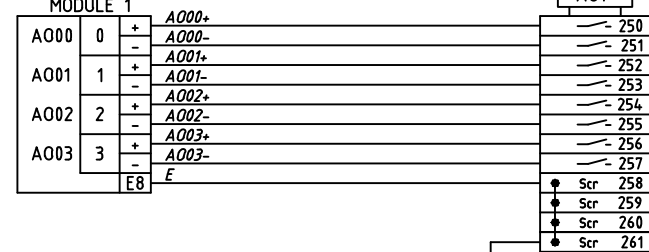
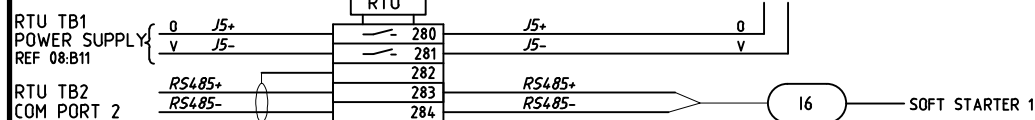
I1

DELIVERY PRESSURE  
TRANSMITTER

I2

## NOTES

1. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST S12000 COMPATIBLE LABELLING.
2. ALL FUSES ARE 500mA EXCEPT WHERE NOTED OTHERWISE.

4 CHANNEL  
ANALOG OUTPUT  
MODULE 1REFER  
SHEET 08.87

## LEGEND:

- C?? CABLE IDENTIFIER
- 2A x 1 RTU MINITURE CCT BREAKER
- 1 DISCONNECT LINK TERMINAL
- 1 THROUGH TERMINAL
- 1 SLIDING LINK TERMINAL

Sheet 13

AS CONSTRUCTED

## AS CONSTRUCTED DETAILS

I CERTIFY THAT THE 'AS CONSTRUCTED' DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

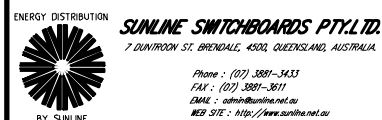
SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_  
NAME OF SIGNATORY: L.FERRIS  
RPEQ No. or LICENCE: 5938  
COMPANY NAME: BUILDING SERVICES DESIGN  
START DATE: 15.05.12 FINISH DATE: 08.11.12

## ELECTRICAL CONTRACTOR



ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226  
379 THYNE ROAD, PHONE 07 3899 8866  
MORNINGSIDE QLD 4170 FAX 07 3899 8766  
Nilsen QLD Pty Ltd ABN 50 115 075 048  
Contracting | Engineering Services | Switchboards

## SWITCHBOARD MANUFACTURER

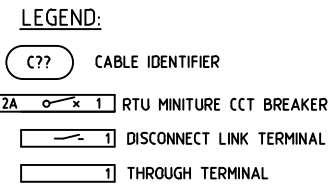
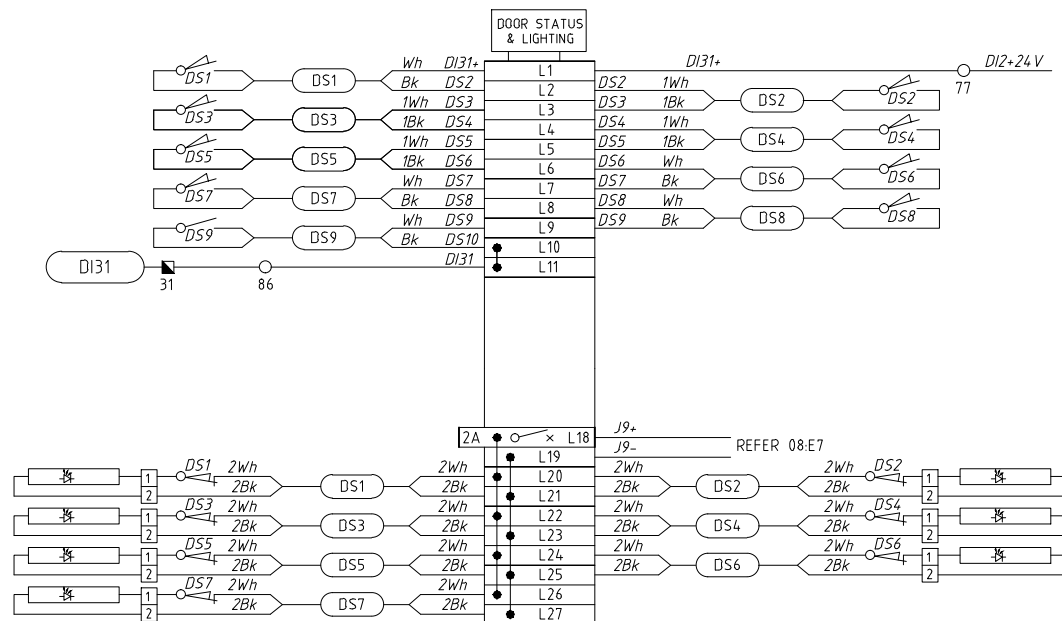


NAME \_\_\_\_\_ SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_  
QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY	Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE	ASSET/PROJECT	DRAWING TITLE	SHEET No. 13 OF 28	AMEND.
B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.	5938	L.F											RTU ANALOGS & MESCELLANEOUS TERMINATION DIAGRAM		
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.															
O	29.3.12	FOR APPROVAL	D.S.	Q.U.U.															

## SWITCHBOARD INTERNAL LIGHTING AND SECURITY



Sheet 14

AS CONSTRUCTED

## AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: DATE:

NAME of SIGNATORY: L.FERRIS

RPEQ No. or LICENCE: 5938

COMPANY NAME: BUILDING SERVICES DESIGN

START DATE: 15.05.12 FINISH DATE: 08.11.12

## ELECTRICAL CONTRACTOR



ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226

379 THYNE ROAD, PHONE 07 3899 8866

MORNINGSIDE QLD 4170 FAX 07 3899 8766

Nilsen QLD Pty Ltd ABN 50 115 075 048

Contracting | Engineering Services | Switchboards

## SWITCHBOARD MANUFACTURER



NAME SIGNATURE DATE

QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



SHEET No. 14 OF 28

QUEENSLAND URBAN UTILITIES DRAWING No. AMEND.

486/5/7-0271-014 B

B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.	5938	L.F	ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.		BOB PRITCHARD	14.01.13	ASSET/PROJECT		DRAWING TITLE		SHEET No. 14 OF 28	
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE	COMMON CONTROLS		QUEENSLAND URBAN UTILITIES DRAWING No.	
0	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E	DESIGN CHECK	R.P.E.Q. No.	DATE	NEIL O'BRIEN	N.O.B	14.01.13	TERMINATION DIAGRAM		486/5/7-0271-014	
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY		Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE			B	

ITEM	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	OPT	REMARKS	ITEM	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	OPT	REMARKS	ITEM	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	OPT	REMARKS
1					N		65	2	PUMP FAULT RELAY - K5	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05	129						K
2	1	MANUAL TRANSFER SWITCH	TERASAKI	MTS52PE12533	F	Set Ir:0.5 (62.5A) Ch=6	66	1	PUMP1 RUN RELAY - 1N6	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05	130						K
3		- TO SUIT MAIN SWITCHES 02 & 03 523PE/125	TERASAKI	Q2 FITTED WITH IN/O ALX CONTACT	F		67	1	PUMP2 RUN RELAY - 2N6	IDEC	RH2B-ULD-DC24V	0	+ SH2B-05	131		NOT USED				
4	1	Q4 PUMP1 CIRCUIT BREAKER + T2H5 Handle	TERASAKI	5125GJ/20 + T2H5 12R5GM	-	Set Ir = 1 (20A) Im= 6 (120A)	68	2	PUMP CONTROL CCT POWER ON RELAY - K5	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05	132						H
5	1	Q5 PUMP2 CIRCUIT BREAKER + T2H5 Handle	TERASAKI	5125GJ/20 + T2H5 12R5GM	-	Set Ir = 1 (20A) Im= 6 (120A)	69	2	PUMP1 E/ STOP RELAY - 1K4/ 2K4	IDEC	RH2B-ULD-DC24V	-	+ SH2B-06	133	1	WET WELL LEVEL PROBE - FREE ISSUE	VEGA - VEGAWELLS2	WL520XA4AM10D1X	-	SET RANGE TO = 4m
6					E		70	2	POWER ON RESET TIMER - 1K7/ 2K7	SPRECHER & SCHUH	RZ7-PSA 3E U23	-	ON DELAY	134	1	WET WELL LEVEL ADJUSTMENT UNIT - FREE ISSUE -	VEGA - VEGADIS62	DIS620001A00X	-	
7	1	Q7 BIERBEX PHASE FAILURE CIRCUIT BREAKER	TERASAKI	DTCB15306C	-		71					B		135						G
8							72					B		136	1	DELIVERY PRESSURE ADJUSTMENT UNIT	TBA	TBA	-	
9	1	Q9 SUB-DISTRIBUTION BOARD CIRCUIT BREAKER	TERASAKI	E12510/50	-	Set Ir:0.8 (40A) Im= 6 (300A)	73	2	PUMP RUN COMMAND RELAY - K20	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05	137	1	DELIVERY PRESSURE TRANSMITTER	VEGA VEGABARS2	BR520X(CALEPH)MAS L=??	U	RANGE = 25m
10	1	Q10 STATION MAINS PHASE FAILURE CIRCUIT BREAKER	TERASAKI	DTCB6306C	-		74	2	PUMP FAULT RESET RELAY - K21	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05	138	1	TRICLOVE FITTING FOR VEGABARS2	VEGA	ADAPTOR 4	U	
11	1	Q11 5A GPO CIRCUIT BREAKER	TERASAKI	DSRCBH-16-30A	-		75	2	PUMP EMERGENCY MODE INTERRUPT RELAY - K22	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05	139	1	RTU POWER SUPPLY 24VDC	POWERBOOK	PB251-24CH-CC-T	-	
12	1	Q12 RTU LAPTOP GPO CIRCUIT BREAKER	TERASAKI	DSRCBH-10-30A	-		76	2	PUMP START PUSHBUTTON - S1	SPRECHER & SCHUH	D7P-F3-PX10	-		140	1	RADIO 24V/13.8VDC CONVERTER	POWERBOOK	PB1H-24123-CC	R	
13	1	Q13 SPARE	TERASAKI	DTCB6106C	E		77	2	PUMP STOP PUSHBUTTON - S2	SPRECHER & SCHUH	D7P-F4-PX10	-		141						I
14	1	Q14 SPARE	TERASAKI	DTCB6110C	E		78	2	PUMP BH/ STOP PUSHBUTTON - S3	SPRECHER & SCHUH	D7P-MT34-PX01S	-	c/w D7-15/E112 + PX01S	142	2	BATTERIES - INCLUDING SPILL TRAYS	YUASA	UD650-12	-	
15	1	Q15 GENERATOR AUXILIARY SUPPLY CIRCUIT BREAKER	TERASAKI	DSRCBH-10-30A	-		79	2	PUMP RESET PUSHBUTTON - S4	SPRECHER & SCHUH	D7P-F6-PX10	-	+ D7P-PX10	143	1	RADIO - FREE ISSUE -	TRIO	<< DR900-07A02- D>>	R	FREE ISSUE
16	1	Q16 SPARE CIRCUIT BREAKER	TERASAKI	DSRCBH-6-30A	-		80	2	PUMP HOUR RUN METER - HRM	NHP	RQ4801080VDC	-	24VDC	144	1	RADIO ANTENNA - NILSEN SUPPLY-	TRIO	VAGL ANT13AL	R	15 ELEMENT 13dB ALUM
17	1	Q17 SURGE FILTER CIRCUIT BREAKER	TERASAKI	DTCB6110C	-		81	2	PUMP POWER SOCKET OUTLET + INCLINE SLEEVE	MARECHAL	DS1 3114013972 + 51B04058	J		145	1	RADIO COAX SURGE PROTECTION UNIT	POLYPHASE CORPORATION	IS-500K-C2	R	Mounted on Din Rail
18	1	Q18 BH PUMP CTRL & SURCHARGE IMMEDIATE CB	TERASAKI	DTCB6106C	-		82	2	PUMP POWER INLET PLUG + HANDLE	MARECHAL	DS1 3118013972 + 311A013	J	-NILSEN SUPPLY-	146	1	TELEMETRY UNIT - FREE ISSUE	LOGICA CMG	MD3311EAL/ 271D-0-7	-	FREE ISSUE
19	1	Q19 SPARE CIRCUIT BREAKER	TERASAKI	DTCB6106C	K		83							147						I
20	1	Q20 3 PHASE OUTLET CIRCUIT BREAKER	TERASAKI	DTCB6310C	-	PLUS DSRCB-32-30- 3PH	84							148						I
21	1	Q21 SPARE	TERASAKI	DTCB6106C	Q		85					E								
22					M		86					E		153						
23					V		87					E		156	1	ANTENNA MAST c/w 20mm NYLON CABLE GLAND	CT SHEETMETAL	SHEET 22	R	LENGTH = 6 METRS
24		NOT USED					88					E		157	1	INTERNAL COAX CABLE (Radio to Lightning Arrester)	TRIO	TRIO - SHMM/1M/ TL23	R	Cable No X01
25		NOT USED					89					E		158	1	EXTERNAL COAX CABLE (Lightning Arrester to Aerial)	R.F. INDUSTRIES	ANDREW - COT400	R	Cable No X02 - NILSEN SUPPLY- Straight cable plug crimp
26	1	Q30 RTU POWER SUPPLY CIRCUIT BREAKER	TERASAKI	DTCB6104C	-		90	1	PUMP 240VAC 24VDC POWER SUPPLY	WEIDMULLER	8951340000	-	120W 5A/ 24VDC	159	2	COAX PLUG (for COT400 cable)	PULSE	N-203HS	R	
27	1	Q31 SURGE FILTER ALARM RELAY CIRCUIT BREAKER	TERASAKI	DTCB6104C	-		91	1	EMERGENCY PUMP MODE 24VDC CIRCUIT BREAKER	TERASAKI	DTCB6110C	-	QD18	160	1	U CLAMPS	R.F. INDUSTRIES	UIM	R	
28	1	Q32 SPARE	TERASAKI	DTCB6104C	H		92	1	LR3- WET WELL HIGH LEVEL RELAY	MULTITRODE	HTR-5	-	24VDC			SWITCHBOARD TERMINALS				
29	1	Q33 SPARE	TERASAKI	DTCB6104C	-		93	1	WWR - WET WELL WASHER RELAY	IDEC	RH2B-ULD-DC24V			164.0	Lot	MISCELLANEOUS	PHOENIX CONTACT	TOP x/A + UK651/ C	-	"x" = Current Rating
30		NOT USED					94					0		164.1	Lot	THROUGH TERMINALS (Grey & Blue as Required)	PHOENIX CONTACT	PIT 2.5	-	PIT 2.5 BU (for -VE)
31	2	PUMP 240VAC CONTROL CIRCUIT BREAKER	TERASAKI	DTCB6104C	-	04-1 05-1	95	1	SIR - SURCHARGE IMMEDIATE LEVEL RELAY	MULTITRODE	HTR-5	-	24VDC	164.2	Lot	DISCONNECT TERMINALS (Grey & Blue as Required)	PHOENIX CONTACT	PIT 2.5-MT	-	PIT 2.5-MT-BU (for - VE)
32	2	PUMP 24VDC CONTROL CIRCUIT BREAKER	TERASAKI	DTCB6110C	-	QD4, 005	96	2	SINGLE POINT PROBES	MULTITRODE	2 off - Q20130FSP- Shield	-	-NILSEN SUPPLY-	164.3	Lot	COMB PLUG TERMINALS (Grey & Blue as Required)	PHOENIX CONTACT	PIT 2.5/ 1P	-	PIT 2.5/ 1P-BU (for - VE)
33	1	BATTERY SHORT CCT PROTECTION CIRCUIT BREAKER	TERASAKI	DTCB6210C	-	QD6	97	1	EMERGENCY PUMPING MODE RELAY PUMP1 - ENG1	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05	164.4	Lot	COMBINATION PLUG/ RUSE	PHOENIX CONTACT	ST 2.5-TWIN-TG/ 1P	-	+ RUSE P-RU 5x20 led24
34	2	PUMP 240VAC 24VDC POWER SUPPLY	WEIDMULLER	8951340000	-	120W 5A/ 24VDC	98	1	SURCHARGE IMMEDIATE DELAY TIMER - S10T	SPRECHER & SCHUH	RZ7-PSA 3E U23	-	ON DELAY	164.5	Lot	COMBINATION PLUG/ LINK TERMINALS	PHOENIX CONTACT	ST 2.5-TWIN-MT/ 1P	-	
35							99	1	EMERGENCY PUMPING MODE TIMER - EMD1T	OMRON	HSCA-A	-	DIGITAL MULTI- FUNCTION TIMER	164.6	Lot	COMB PLUGS (Grey, Blue & Green as Required)	PHOENIX CONTACT	PP-H 2.5/ 1 (R,M & L)	-	Combinations to Suit
36	1	DISTRIBUTION BOARD CHASSIS	TERASAKI	CD-2-24/18-3U	-		100	1	EMERGENCY PUMPING MODE TIMER PUMP2 - ENG2	SPRECHER & SCHUH	RZ7-PSA 3E U23	-	ON DELAY	164.7	Lot	COMB PLUGS Housing & Sleeve)	PHOENIX CONTACT	Housing = PH 25/x	-	Sleeve = QPH x
37	3	F1 - SURGE DIVERTER CIRCUIT FUSES	NHP	63AMP 63MS	-	FUSES & HOLDERS	101	2	EMERGENCY PUMPING MODE SWITCH - S5	SPRECHER & SCHUH	D7P-LSH25 + D7PX10	-	+ D7PREY + D7PX10	164.8	Lot	GROUP MARKER CARRIER	PHOENIX CONTACT	UBE	-	
38	3	SURE DIVERTER	CRITEC	TDS1100-2SR-277	-		102	1	BH PUMP RTU RELAY - ENG3	IDEC	RH2B-ULD-DC24V	-	+ SH2B-05	164.9	Lot	PLUG-IN BRIDGE	PHOENIX CONTACT	FBS	-	AS REQUIRED
39	1	SURE FILTER ALARM RELAY - SFAR	CRITEC	DAR-275V	-		103					F		164.10	2	TEST PLUG	PHOENIX CONTACT	PS-5	-	
40	1	SURE REDUCTION FUSER - SRF	CRITEC	TDF-10A-240V	-		104					F		164.11	Lot	COVER PROFILE (SHROUDDING) + CARRIER PLATE	PHOENIX CONTACT	AP-2 + AP2-TU	-	AS REQUIRED
41	1	ENEREX MAINS PHASE FAILURE RELAY - IFRS	CARLO GAVAZZI	DPB01CH8W4	-		105					F		165						
42							106					F		166						
43	1	STATION MAINS PHASE FAILURE RELAY - IFRS	CARLO GAVAZZI	DPB01CH8W4	-		107					F				MISCELLANEOUS				
44		NOT USED					108					F		167						
45	1	MAIN NEUTRAL LINK	TBA	TBA	-	INSULATED	109					F		168	1	ENEREX PADLOCK - 45mm brass pin tumbler	H.A. REED LOOKSMITHS	KEY No 325 & S/ S Shackle	-	c/w 2 KEYS
46	1	MAIN EARTH LINK	TBA	TBA	-		110					F		169	Lot	WET WELL CONDUIT SEALING BUNGS	RUBBER	TO SUIT CONDUITS	-	Detail "W"
47	1	DIST. BD NEUTRAL LINK - 24 WAY	TBA	TBA	-	INSULATED	111					F		170	Lot	S/ STEEL FITTINGS AS DETAILED FOR PRESSURE TX	FITTINGS	STAINLESS STEEL	U	Sheet 19
48	1	DIST. BD EARTH LINK - 24 WAY	TBA	TBA	-		112					F		171	1	EARTH ROD CONNECTION BOX	NESCO	PIT-03	-	
49	1	SURGE DIVERTER NEUTRAL LINK	CLIPSAL	LSA	-	INSULATED	113					F		172	1	LINE TAP - BONDING TO EARTHING ROD	CLIPSAL	BP26	-	
50	1	INSTRUMENT EARTH LINK	TBA	TBA	-	INSULATED	114					F		173	1	EARTHING ROD	COPPER ROD	13mm Diameter	-	
51	1	FILTERED SUPPLY NEUTRAL LINK	CLIPSAL	L7	-	INSULATED	115	1	GRAPHIC DISPLAY - FREE ISSUE	REDLION	G306A000	-	FREE ISSUE	174						E
52	1	3 PHASE SWITCHED OUTLET	CLIPSAL	56C410	-	USE ENCLOSURE AS SHROUD	116		NOT USED					175						a
53	1	1 PHASE OUTLET 15A	CLIPSAL	15/15-908 (SHROUD)	-		117							176						E
54	1	LAPTOP GPO - TWIN 10A	CLIPSAL	25+ 4BA+ 449AP	-		118	1	STATION LOCAL/REMOTE SWITCH - S10	KRAUS & NAIMER	CAD11-A720-600-FI2- F75B	-	ENGRAVE LOCAL REMOTE	177						E
55	1	1 PHASE OUTLET - GENERATOR AUXILIARY POWER	CLIPSAL	5690310	F	IP56	119	1	ELECTRODES TEST RELAY - ETR	IDEC	RH2B-ULD-24VDC	-	+ SH2B-05	178						E
56	1	3 PHASE N/AE APPLIANCE INLET - GENERATOR POWER	MEMBERGES	MEB061	F	c/w PROTECTIVE CAP 40787	120					P		179						E
57		NOT USED					121	1	WET WELL LEVEL INDICATOR	CRAMPTON INSTRUMENTS	244-01KG-HG-TP-SR 4- 20mA	-	0-100% ADJ RED POINTER	180						E
58							122					J		181	2	CORROSION INHIBITOR	CORTEC	VPCI-110 OR 111	-	FROM AP CONTROLS
59	2	PUMP SOFT STARTER	DANFOSS MCD 500	MCD5-0021B = MODBUS COMMS	-		123	6	SW/ BD DOOR MICRO SWITCHES	OMRON	DZ-10QW2-1B	-	8 OFF/N/O	182						E
60	2	EXTERNAL KEYPAD KIT	DANFOSS LCP50L	17500096	-		124	1	SW/ BD DISCONNECT COMPART DOOR PROXIMITY SWITCH	PEPPERL & FUCHS	NKBS-18GM40-20	-	LOCATION TBA							
61							125	4	SW/ BD INTERNAL LED LIGHTS	LUMIFA	LF1B-C3S-2THWW4	-								
62	2	PUMP LINE CONTACTOR - K1 (24VDC COIL)	SPRECHER & SCHUH	CA7-30		24VDC COIL	126					E								
63							127					S								
64					C		128					S								

Sheet 15  
AS CONSTRUCTED

AS CONSTRUCTED DETAILS

I CERTIFY THAT THE 'AS CONSTRUCTED' DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_

NAME of SIGNATORY: L.FERRIS

RPEQ No. or LICENCE: 5938

COMPANY NAME: BUILDING SERVICES DESIGN

START DATE: 15.05.12 FINISH DATE: 08.11.12

ELECTRICAL CONTRACTOR

**NILSEN**

ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226

379 THYNES ROAD, PHONE 07 3899 8866  
MORNINGSIDE QLD 4170 FAX 07 3899 8766

Nilsen QLD Pty Ltd ABN 50 115 075 048  
Contracting | Engineering Services | Switchboards

SWITCHBOARD MANUFACTURER

ENERGY DISTRIBUTION

**SUNLINE SWITCHBOARDS PTY.LTD.**

7 DUNTHORN ST. BENDALL, 4502, QUEENSLAND, AUSTRALIA


Phone : (07) 3881-3433  
Fax : (07) 3881-3611  
Email : admin@sunline.net.au  
WEB SITE : <http://www.sunline.net.au>

BY SUNLINE.

NAME SIGNATURE DATE

QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

**QUEENSLAND UrbanUtilities**

B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.	5938	L.F	ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.			BOB PRITCHARD		14.01.13	ASSET/PROJECT SP065 STEVENS STREET SEWAGE PUMP STATION	DRAWING TITLE EQUIPMENT LIST	SHEET No. 15 OF 28	
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE			QUEENSLAND URBAN UTILITIES DRAWING No.	AMEND.
O	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E				NEIL O'BRIEN	N.O.B	14.01.13			486/5/7-0271-015	B
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY			Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE			DATE	

A vertical scale from 0 to 10. The scale is represented by a vertical line with horizontal tick marks at each integer. The labels A through J are placed to the right of the line, corresponding to the values 0 through 9 respectively. A black arrow points to the tick mark between F and G, which is at the 5 position.

2. SUFFICIENT LENGTH OF CABLE ALLOWED  
FOR REMOVAL OF PROBE AND CONDUIT.  
EXCESS LENGTH STORED IN ELECTRODE BOX

SHEET No. 16 OF 28	
QUEENSLAND URBAN UTILITIES DRAWING No. <b>486/5/7-0271-016</b>	AMEND. <b>B</b>

AS CONSTRUCTED

DRAWING TITLE  
CABLE SCHEDULE

ITEM#	OPT.	DESCRIPTION - INTERNAL LABEL	LABEL 1	LABEL 2 IF(NECESSARY)	TXT HEIGHT	MATERIAL / COLOUR
73		PUMP RUN COMMAND RELAY	1XG0	2XG0	4mm	ABS PLASTIC W/B
74		PUMP FAULT RESET RELAY	1XG1	2XG1	4mm	ABS PLASTIC W/B
75		PUMP EMERGENCY MODE INTERRUPT RELAY	1XG2	2XG2	4mm	ABS PLASTIC W/B
76		PUMP START PUSHBUTTON	START	START	4mm	ABS PLASTIC W/B
77		PUMP STOP PUSHBUTTON	STOP	STOP	4mm	ABS PLASTIC W/B
78		PUMP EN-STOP PUSHBUTTON	(use label supplied with P/Button)	(use label supplied with P/Button)		V/B
79		PUMP RESET PUSHBUTTON	FAULT RESET	FAULT RESET	4mm	ABS PLASTIC W/B
80		PUMP HOURS RUN METER	HOURS RUN	HOURS RUN	4mm	ABS PLASTIC W/B
81/ 82	J	PUMP DE-CONTACTOR	PUMPHo1	PUMPHo2	6mm	ABS PLASTIC
83/ 84	J	PUMP AUX CONTROL PLUG & SOCKET	PUMPHo1	PUMPHo2	6mm	ABS PLASTIC
92		WET WELL HIGH LEVEL RELAY	WET WELL HIGH LEVEL - LRS		4mm	ABS PLASTIC W/B
93		WELL WASHER RELAY	WWR		4mm	ABS PLASTIC W/B
95		SURCHARGE IM-MEDIATE LEVEL RELAY	WET WELL SURCHARGE IM-MEDIATE - SIR		4mm	ABS PLASTIC W/B
97		EMERGENCY PUMPING MODE PUMP 1 RELAY	B-XG1		4mm	ABS PLASTIC W/B
98		SURCHARGE IM-MEDIATE ON DELAY TIMER	SIDT		4mm	ABS PLASTIC W/B
99		EMERGENCY PUMPING MODE OFF DELAY TIMER	E-HODT		4mm	ABS PLASTIC W/B
100		EMERGENCY PUMPING MODE PUMP 2 TIMER	B-XG2		4mm	ABS PLASTIC W/B
101		EMERGENCY PUMPING MODE START SWITCH	EMERGENCY PUMPING MODE	EMERGENCY PUMPING MODE	4mm	ABS PLASTIC W/B
102		EMERGENCY PUMP MODE RTU RELAY	B-XG3		4mm	ABS PLASTIC W/B
118		STATION LOCAL/RB-NOTE SELECTOR SWITCH	STATION CONTROL MODE		4mm	ABS PLASTIC W/B
119		ELECTRODES TEST RELAY	ETR		4mm	ABS PLASTIC W/B
121		WET WELL LEVEL INDICATOR	WET WELL LEVEL		4mm	ABS PLASTIC W/B
136	U	DELIVERY PRESSURE A01 UNIT	DELIVERY PRESSURE		4mm	ABS PLASTIC W/B
139		RTU 24VAC/ 24VDC POWER SUPPLY	RTU 24VDC POWER SUPPLY		4mm	ABS PLASTIC W/B
140	R	RADIO 24H/ 13.8VDC CONVERTER	24/ 12 VDC CONVERTER - RADIO		4mm	ABS PLASTIC W/B
143	R	RADIO	RADIO		4mm	ABS PLASTIC W/B
145	R	RADIO CORK SURGE PROTECTION	RADIO SURGE PROTECTION		4mm	ABS PLASTIC W/B
146		TELEMETRY UNIT	RTU		4mm	ABS PLASTIC W/B

## EXTERNAL DOOR LABELS

FIELD LABEL LIST

Sheet 17

AS CONSTRUCTED

NAME		SIGNATURE		DATE	
QUEENSLAND URBAN UTILITIES DELEGATE (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)					
		<b>QUEENSLAND</b> <b>UrbanUtilities</b>			
SHEET No. 17 OF 28					
QUEENSLAND URBAN UTILITIES DRAWING No. <b>486/5/7-0271-017</b>				AMEND. <b>B</b>	

CONSTRUCTION - EXTERNAL SWITCHBOARD

Cubicle construction 3mm Marine grade Aluminium (5251).  
Plinth construction 200x60 channel 6061 T6 Grade Aluminium.  
Folded, "Pulse MIG" & "TIG welded with all visible seams and joints fully welded, free from splatter and ground smooth where needed.  
External doors and covers fitted with Emka 1011-207 self grip seal.  
Stainless Steel "D" Handles fitted where indicated on the drawings.  
M6 Earth studs fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces. Dedicated earth stud adjacent main earth bar for switchboard earth.  
Door stiffeners, door stays, cable straps, and document holders etc fitted where shown on the drawings.  
Door stay arms are S/Steel and of sufficient strength to prevent being deformed when subjected to reasonable loads. Minimum 3mm S/Steel.  
Lift-off covers and mounting panels fixed with M8 studs & stainless steel dome nuts.  
Gland plates manufactured from 3mm aluminium, unless otherwise shown.  
Inspection/Access plates manufactured from 3mm aluminium.  
Gland/Inspect/Access plate openings fitted with M6x1.0 flat head closed end rivet nuts. (Detail F)  
Cable glands fitted with compression side installed within cubicle. (Detail G)  
Gland/Inspection/Access plates fitted with seals attached to cubicle.  
Gland/Inspection/Access plate fixings at 100mm with 'Phillips' head screws.  
Gland/Inspection/Access plates maintain a 50mm clearance from section dividers.  
Gland/Inspection/Access plates are NOT split.  
Inspection/Access plates are NOT earthed.  
Shrouding provided to all live parts to IP20 where required.  
Hinges (external) Selectrix HIB650ss-316. Stainless steel.  
Star washers fitted under all hinge screws.  
Hinged escutcheons fixed with Emka 1/4 turn 1000-U142  
All equipment removable via front access.  
Switchboard installed with non-hydroscopic material between plinth and concrete slab. (Detail E1)  
All escutcheons open a minimum of 90°  
All sheet metal edging de-burred.

Locks Doors 1- 6 & 8

DORE ELECTRICS - Swing Handle SHKSS Universal Locking - 92268  
DORE ELECTRICS - 3 point lock rod set - TLR24  
Half Profile Cylinder  
Key Codes RC496A, RC496AB, RC496ABC refer to each door for clarification.

Locks Door 9

DORE ELECTRICS - Swing Handle SHKSS Universal Locking - 92268  
DORE ELECTRICS - 3 point lock rod set - TLR22SS (all S/Steel)  
Lockwood Barrel Lock, Key Code RC496AB

Locks Door 7

DORE ELECTRICS - Swing Handle SHPSS Padlockable - 316  
DORE ELECTRICS - 3 point lock rod set - TLR24  
ENERGEX padlock, S/Steel Shackle, 45mm brass pin tumbler.  
Energen Key No325. c/w 2 keys.

OPERATING PARAMETERS

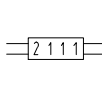
Standard	AS 3439.1
Current & Frequency	AC 50Hz
Rated Operational Voltage Ue	415 VAC
Rated Insulation Voltage Ui	660 V
Rated Auxiliary Voltage	240 VAC / 24 VDC
Rated Current (Main Chassis Bus)	300 AMPS
Short Circuit Current Isc	20 kA
Duration of Isc	.2 sec
Degree of Protection	IP 56 to AS 1939
Measure of Protection by barriers and enclosures.	
Service Conditions	Outdoors
Mass	Not exceeding 2000kg
Forms of Segregation	Form 3Bih

PAINTING

Aluminium Surface Preparation.  
All exposed welds finished clean, descale, and degrease all surfaces.  
Surfaces pretreatment in accordance with AS 1580 & AS 3715 using Novox LF acid etch cleaner, Novacoat 12 conversion coating, & clean water rinses.  
DULUX ALPHATECH 3000 powder coat applied to manufacturer's recommendations.  
CUBICLE & EXTERNAL COMPONENTS :- DULUX Mist Green (36648) matt finish.  
INTERIOR ITEMS (mounting panels, escutcheons, etc.) :- DULUX Bright White (32166)  
Minimum Dry Film Thickness all surfaces 50 microns.

WIRING

All wiring PVC V90 HT 0.6/1Kv Grade with tinned conductor.  
Control and instrumentation wiring has flexible copper conductors, and is colour coded as detailed below, each individual wire is numbered each end, and terminated by the use of appropriate pre-insulated crimp lugs or pins.  
Separate lugs or pins used for each conductor. Proprietary double pin lug used to terminate two conductors.  
Proprietary bridging links used when required to common up terminals.  
Not more than two wires have been connected to any terminal.  
Not more than one wire has been connected on one side of any tunnel type terminal. Where multiple connections are required on tunnel terminals, proprietary terminal link bars have been used.  
Power wiring a minimum 2.5sqmm stranded copper conductors, phase colour coded as detailed below.  
Control wiring a minimum 1.0sqmm flexible copper conductors, colour coded as detailed below.  
Low level control signals a minimum 0.5sqmm flexible copper conductors. colour coded as detailed below.  
Wiring between RTU terminals & RTU disconnect plugs multicore cable with 0.5sqmm flexible copper conductors.  
4-20mA analog signals (internal & external) wired in shielded pair minimum size 0.5sqmm, and earthed at one end only. (Switchboard end for external signals)  
All 240VAC wiring in the RTU or PLC sections is double insulated and all terminals shrouded and labelled- 'Danger 240VAC'  
Earth cables minimum 2.5sqmm flexible.  
Doors and hinged escutcheons bonded with flexible tinned copper braiding.  
Disconnection zone door bonded with flexible copper B/Wire. Heat shrink at lugs.  
Switchboard has dedicated earthing cable bonding directly to main earth bar.  
A minimum clearance of 100mm is maintained between cable ducting & gland plates.  
Wire numbering equal to Grafoplast SI2000 system.  
Terminal strips mounted 30mm off equipment panel to aid termination.  
Wire numbers are readable left to right, bottom to top as shown.



Refer to sheet 17 for coding details for RTU disconnection plugs.  
Coding pins fitted to both the disconnect plug and terminal block.

COLOUR CODE

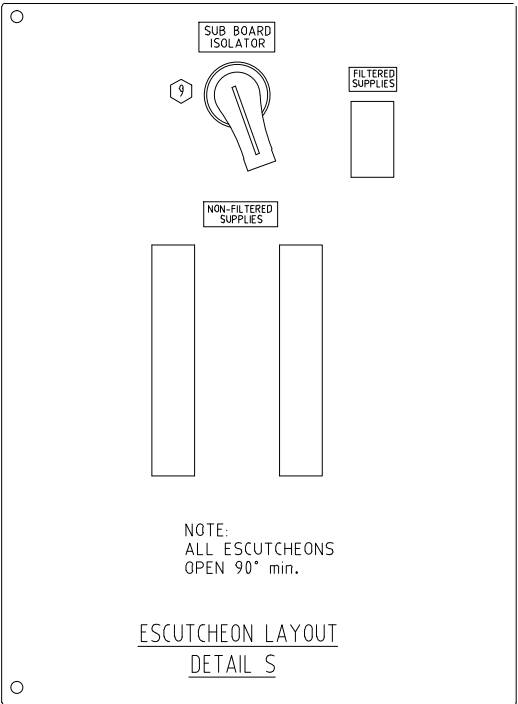
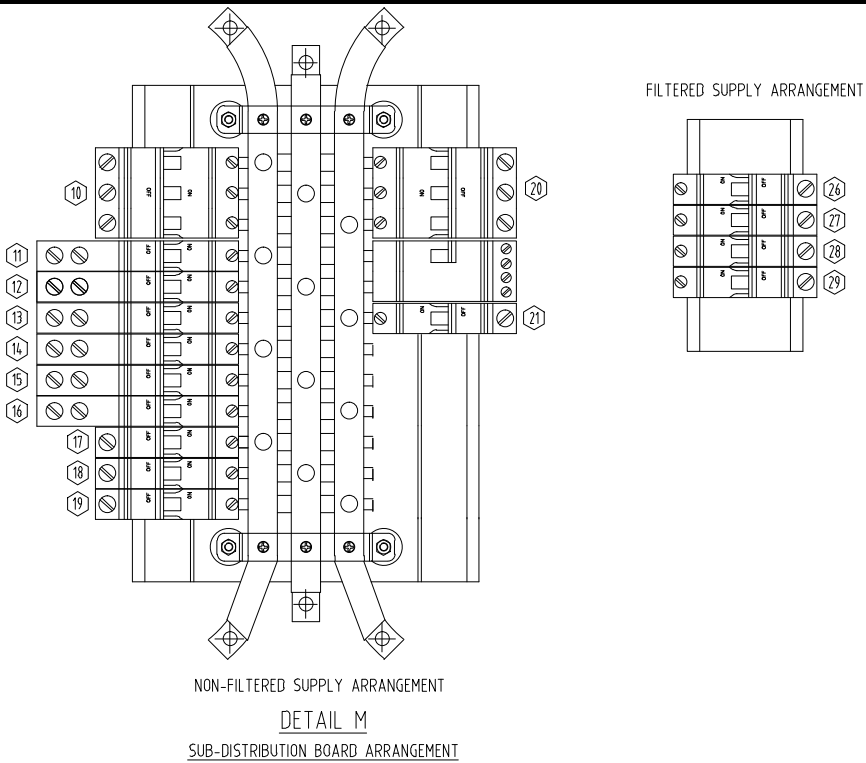
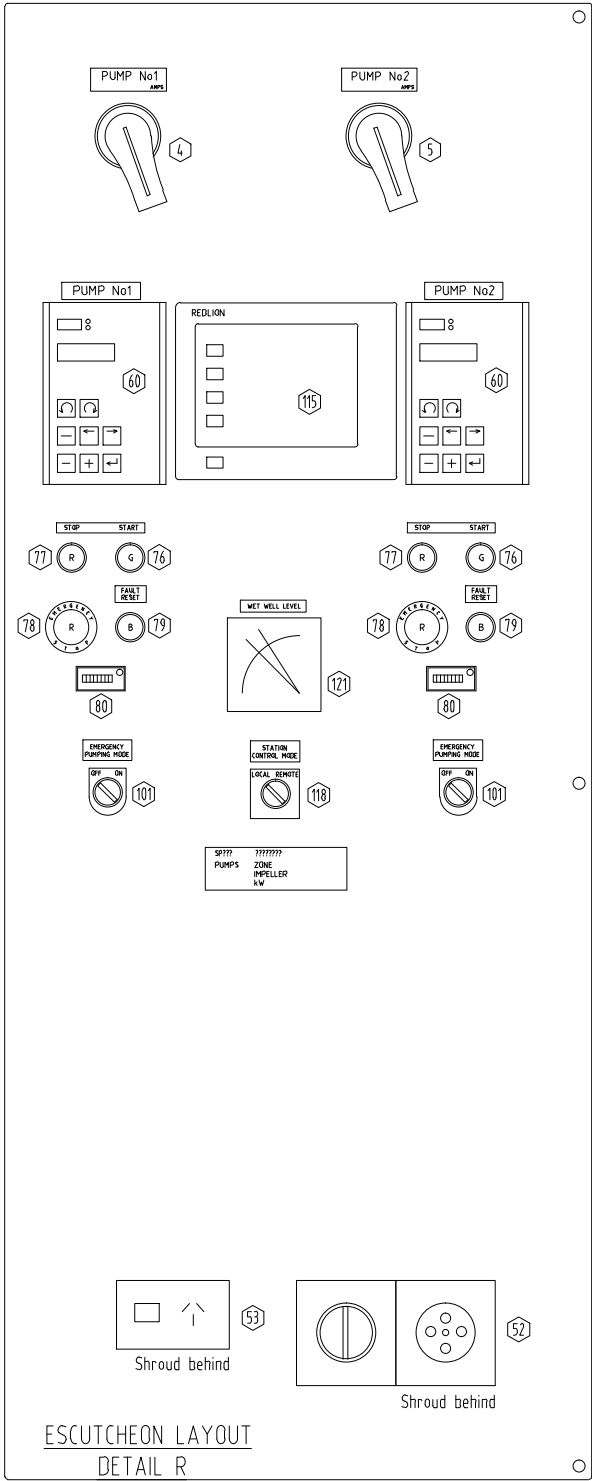
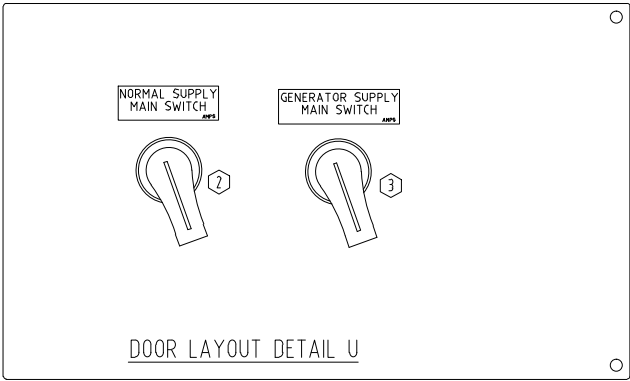
Phase wiring (A,B &C)	Red, White, Blue	2.5sqmm (min)
Potential Metering (240/415 VAC)	Red, White, Blue, Black	1.5sqmm
Current Metering (Secondary)	Red, White, Blue, Grey	2.5sqmm
240 VAC Control Active	Red	1.0sqmm
240 VAC Neutral	Black	1.0sqmm
Extra Low VDC Positive supplies	Orange	1.0sqmm
Extra Low VDC Negative supplies	Violet	1.0sqmm
General Extra Low VDC Wiring	Grey	1.0sqmm
RTU & PLC Wiring	Grey	0.5sqmm
Electrode Wiring	Salmon	1.0sqmm
Intrinsically safe wiring	Light Blue	1.5sqmm
Earth	Green/Yellow	2.5sqmm (min)
Door & Escutcheon Earth Bonds	Green/Yellow	4 sqmm

LABELS

Internal labels W/B engraved ABS PLASTIC to label schedule.  
Warning labels R/W engraved ABS PLASTIC to label schedule.  
E/Stop labels Y/B engraved ABS PLASTIC to label schedule.  
First letter = Background colour, Second letter = Lettering colour.


Main switch label	MAIN SWITCH 400A	10mm 4mm	Material ABS PLASTIC Colour B/W
Pump CB labels	PUMP No1 250A	6mm 4mm	Material ABS PLASTIC Colour W/B
Compartment labels	RTU	10mm	Material Stainless Steel
E/Stop labels	EMERGENCY STOP	4mm	Material ABS PLASTIC Colour Y/B
Warning labels	DANGER 415V ISOLATE ELSE WHERE	7mm 5mm	Material ABS PLASTIC Colour R/W

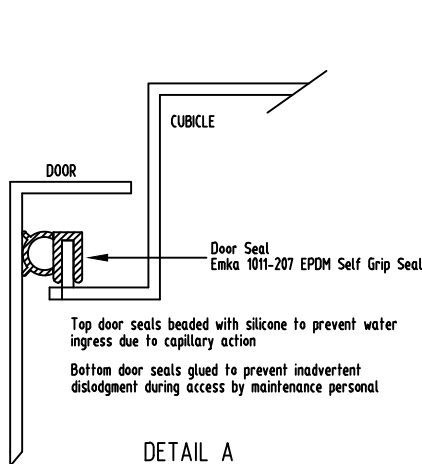
Internal labels secured by M3 chrome plated metal threads.  
CB's identified with individual labels as per label schedule.  
Labels obstructed by switchboard wiring are relocated to adjacent duct lid and secured by M3 nylon threads. Lid secured by a single cable tie at one corner.  
External labels 1mm thick 316 grade s/steel secured by M3 316 s/steel metal threads.  
All internal and external labels have bevelled edges.



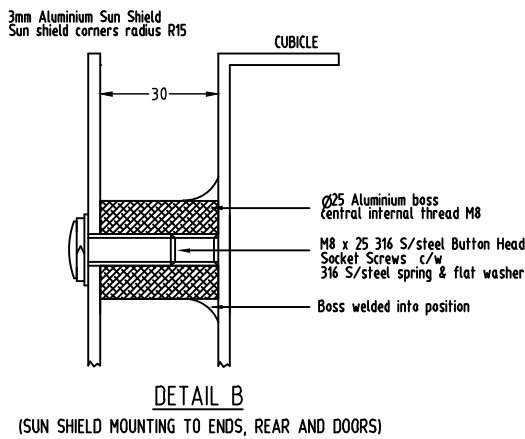
Sheet 18

AS CONSTRUCTED

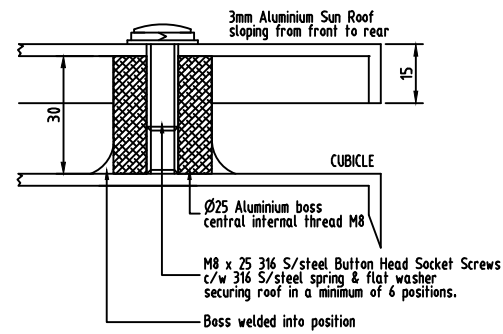
B	08.11.12	AS CONSTRUCTED	P.C	Q.U.U.	5938	L.F	ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.			BOB PRITCHARD		14.01.13	ASSET/PROJECT SP065 STEVENS STREET SEWAGE PUMP STATION	DRAWING TITLE SWITCHBOARD CONSTRUCTION DETAILS	SHEET No. 18 OF 28  QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/7-0271-018	AMEND.  B
A	13.4.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE				
1	15.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4A				NEIL O'BRIEN	N.O.B	14.01.13				
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY			Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE			



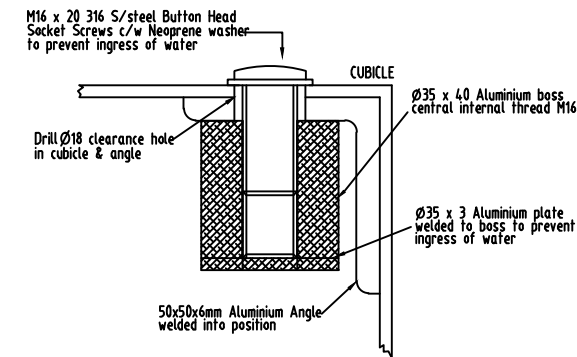
**DETAIL A**  
DOOR SEAL  
EXTERNAL SWITCHBOARD



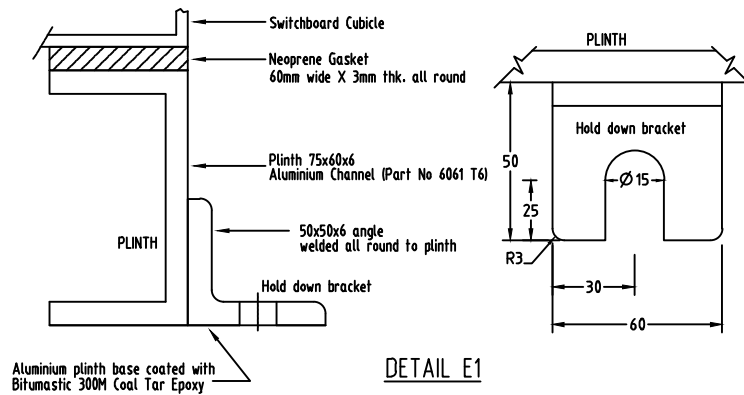
**DETAIL B**  
(SUN SHIELD MOUNTING TO ENDS, REAR AND DOORS)



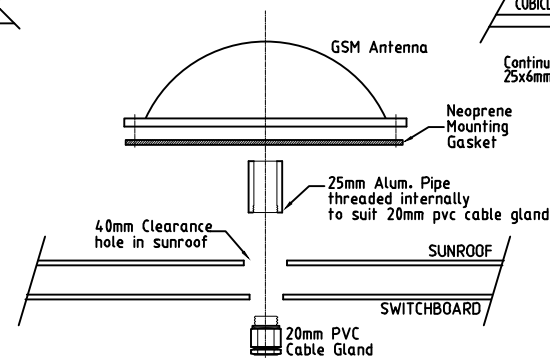
**DETAIL C**  
(SUN ROOF FIXING DETAIL)



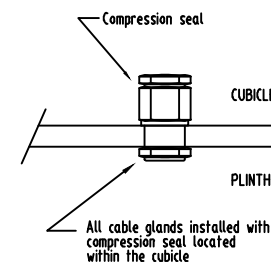
**DETAIL D**  
(EYE BOLT FIXING DETAIL)



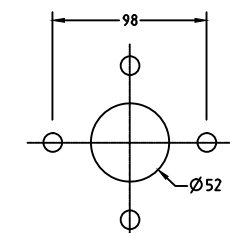
**DETAIL E1**  
(BOLTING DOWN FACILITIES DETAIL)  
(EXTERNAL BRACKET)



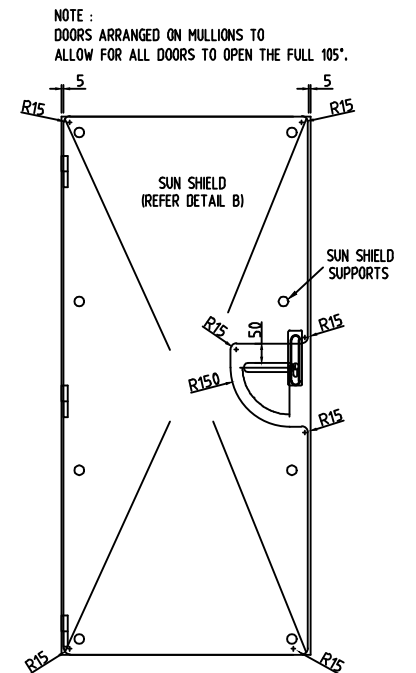
**DETAIL F**  
(GLAND/INSPECTION PLATE FIXING DETAIL)



**DETAIL G**  
(CABLE GLAND INSTALLATION DETAIL)

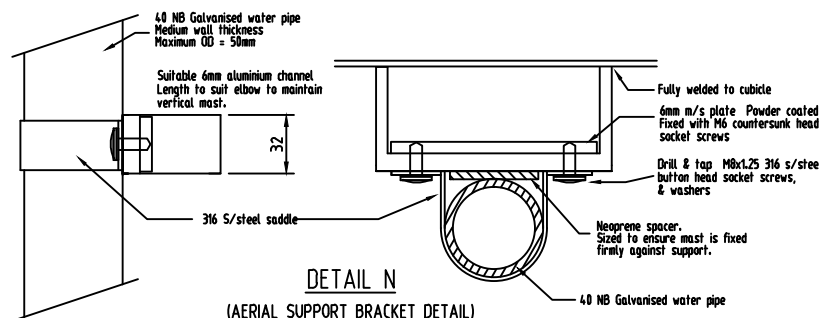


**DETAIL P**  
(AERIAL FLANGE MOUNTING DETAIL)

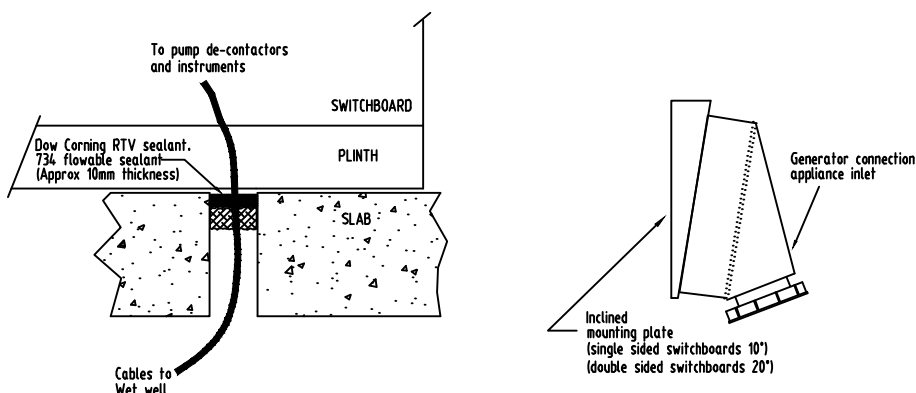


**DETAIL K**  
(DOOR SUN SHIELD DETAIL)  
Adequate clearances to allow doors to be opened while adjacent door is fully open.

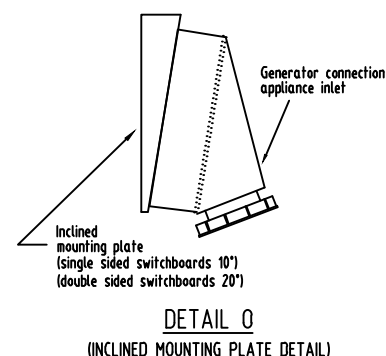
DOOR CLEARANCES



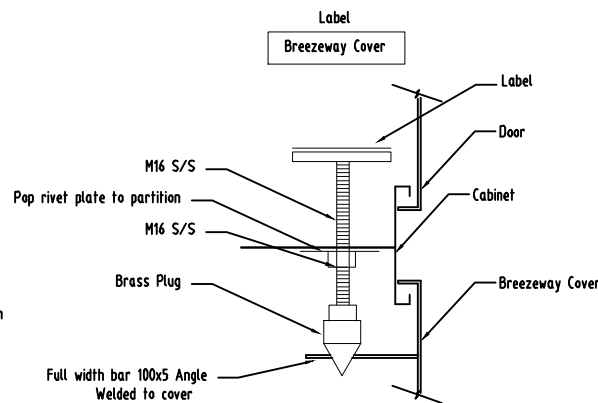
**DETAIL N**  
(AERIAL SUPPORT BRACKET DETAIL)



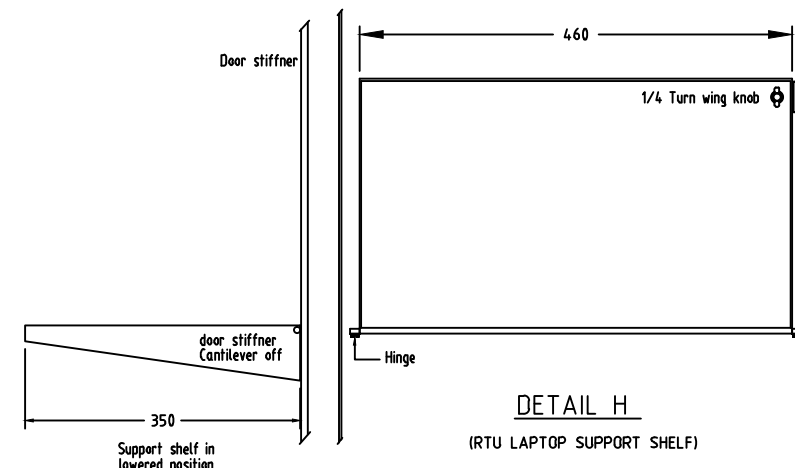
**DETAIL W**  
(WET WELL CONDUIT SEALING DETAIL)



**DETAIL Q**  
(INCLINED MOUNTING PLATE DETAIL)



**DETAIL Z**  
(BREEZEWAY LATCH INSTALLATION DETAIL)



**DETAIL H**  
(RTU LAPTOP SUPPORT SHELF)

AS CONSTRUCTED DETAILS	
I CERTIFY THAT THE 'AS CONSTRUCTED' DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.	
SIGNED:	DATE:
NAME OF SIGNATORY: L.FERRIS	
RPEQ No. or LICENCE: 5938	
COMPANY NAME: BUILDING SERVICES DESIGN	
START DATE: 15.05.12	FINISH DATE: 08.11.12

ELECTRICAL CONTRACTOR	
<b>NILSEN</b>	
ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226	
379 THYNE ROAD,	PHONE 07 3899 8866
MORNINGSIDES QLD 4170	FAX 07 3899 8766
Nilsen QLD Pty Ltd ABN 50 115 075 048	
Contracting   Engineering Services   Switchboards	

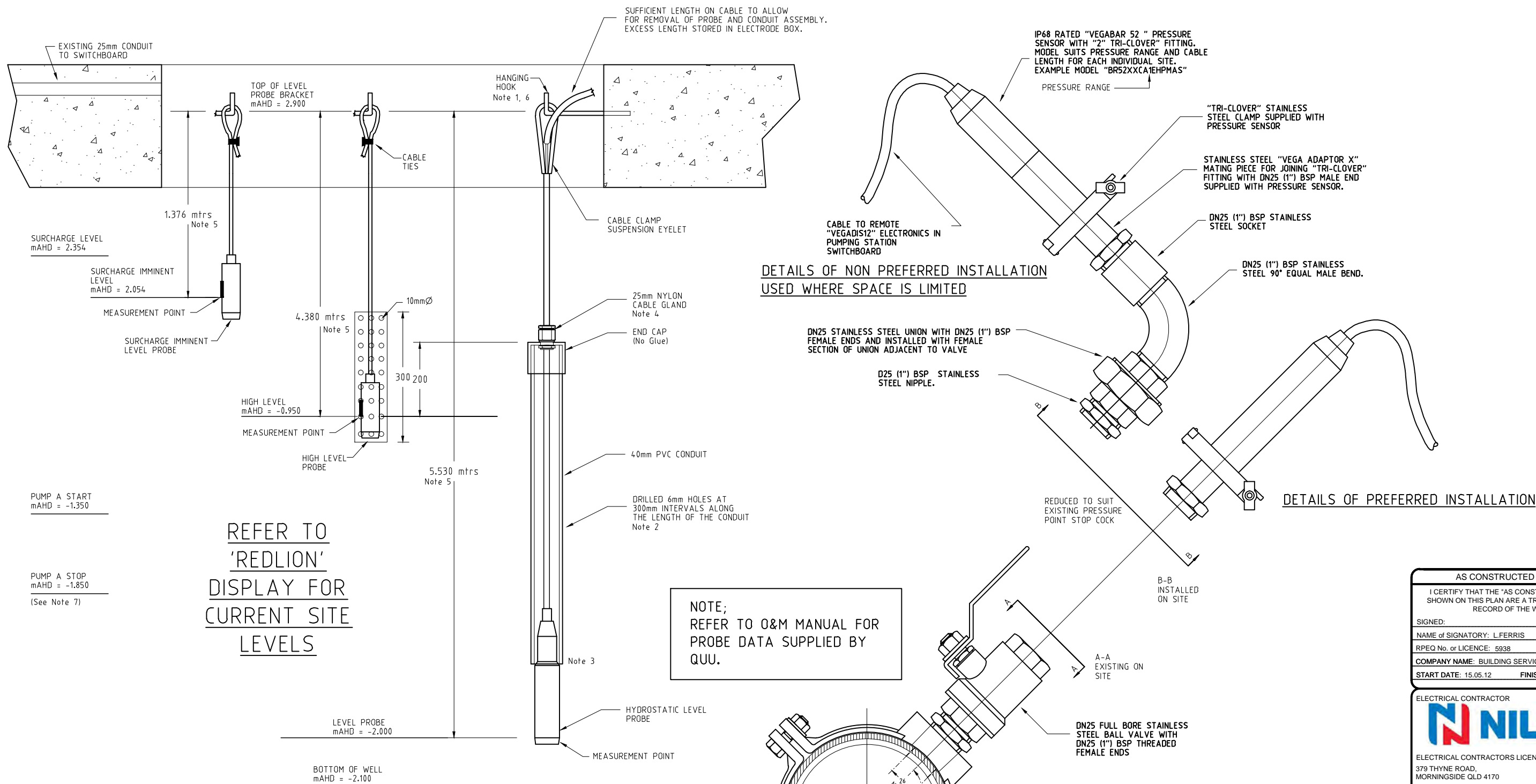
SWITCHBOARD MANUFACTURER	
ENERGY DISTRIBUTION <b>SUNLINE SWITCHBOARDS PTY.LTD.</b>	
7 DUNVIRTON ST. BRENDALE, 4001 QUEENSLAND, AUSTRALIA	
Phone : (07) 3881-3433	
Fax : (07) 3881-3611	
Email : admin@sunline.net.au	
WEB SITE : http://www.sunline.net.au	

NAME	SIGNATURE	DATE
QUEENSLAND URBAN UTILITIES DELEGATE (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)		



**Sheet 19**  
**AS CONSTRUCTED**

B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.	5938	L.F	ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.		BOB PRITCHARD	14.01.13	ASSET/PROJECT SP065		DRAWING TITLE SWITCHBOARD		SHEET No. 19 OF 28	
A	28.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE	CONSTRUCTION DETAILS		QUEENSLAND URBAN UTILITIES DRAWING No.	
O	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E	DESIGN CHECK	R.P.E.Q. No.	DATE	NEIL O'BRIEN	N.O.B	14.01.13	SEWAGE PUMP STATION		486/5/7-0271-019	
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY		Q.U.U. FILE No.	TBA	CONSTRUCTION MANAGER		SIGNATURE	DATE			AMEND.		B	



## LEVEL PROBE INSTALLATION NOTES

1. Stainless steel hanging hooks installed for the suspension of the hydrostatic probe, high level & surcharge probes.
2. 4 x 6mm holes, 150mm from each end and every 300mm of the cut length, prior to installation.
3. Installed so that the conduit rests on the shoulder of the probe. conduit not glued to the end cap.
4. 25mm nylon cable gland. No compression to cable.
5. Measurements taken from top of the Level Probe box to 'measurement points' on probes
6. Hanging hooks installed to ensure the greatest separation between probes is achieved.
7. Pump stop level shown on this drawing is 100mm above actual IDTS value.
7. This allows for ramp down of soft starter

QTY	MATERIALS LIST
1	LENGTH OF HEAVY DUTY ORANGE PVC CONDUIT 40mm
1	CONDUIT END CAP
1	25mm NYLON CABLE GLAND
1	CABLE CLAMP SUSPENSION EYELET

## PRESSURE TRANSMITTER INSTALLATION NOTES

1. Material: All stainless steel fittings grade 316.
2. Galling: All stainless steel threads lubricated with approved anti galling grease and thread tape where applicable.

Sheet 20  
AS CONSTRUCTED

AS CONSTRUCTED DETAILS	
I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.	
SIGNED:	DATE:
NAME of SIGNATORY: L.FERRIS	
RPEQ No. or LICENCE: 5938	
COMPANY NAME: BUILDING SERVICES DESIGN	
START DATE: 15.05.12	FINISH DATE: 08.11.12

ELECTRICAL CONTRACTOR	
<b>NILSEN</b>	
ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226	
379 THYNE ROAD, MORNINGSIDE QLD 4170	PHONE 07 3899 8866 FAX 07 3899 8766
Nilsen QLD Pty Ltd ABN 50 115 075 048	
Contracting   Engineering Services   Switchboards	

SWITCHBOARD MANUFACTURER	
ENERGY DISTRIBUTION	
<b>SUNLINE SWITCHBOARDS PTY LTD.</b>	
7 DUNSTON ST. BRENDALE, 4500, QUEENSLAND, AUSTRALIA	
Phone : (07) 3881-3433 FAX : (07) 3881-3811 EMAIL : <a href="mailto:admin@sunline.net.au">admin@sunline.net.au</a> WEB SITE : <a href="http://www.sunline.net.au">http://www.sunline.net.au</a>	
BY SUNLINE.	

NAME	SIGNATURE	DATE
QUEENSLAND URBAN UTILITIES DELEGATE (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)		



SHEET No. 20 OF 28	AMEND.
QUEENSLAND URBAN UTILITIES DRAWING No.	486/5/7-0271-020
B	

RESERVED FOR CATHODIC PROTECTION

ELECTRICAL CONTRACTOR



ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226

379 THYNE ROAD,  
MORNINGSIDE QLD 4170


Nilsen QLD Pty Ltd ABN 50 115 075 048

PHONE 07 3899 8866  
FAX 07 3899 8766

Contracting | Engineering Services | Switchboards

SWITCHBOARD MANUFACTURER

ENERGY DISTRIBUTION



BY SUNLINE.

**SUNLINE SWITCHBOARDS PTY.LTD.**

7 DUNTHORN ST. BRENDALE, 4500, QUEENSLAND, AUSTRALIA.

Phone : (07) 3891-3433  
FAX : (07) 3891-3611  
EMAIL : [admin@sunline.net.au](mailto:admin@sunline.net.au)  
WEB SITE : <http://www.sunline.net.au>

Sheet 21


AS CONSTRUCTED

NAME

SIGNATURE

DATE

QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)




SHEET No. 21 OF 28

QUEENSLAND URBAN UTILITIES DRAWING No.

486/5/7-0271-021

AMEND.

B

B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.			ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.			BOB PRITCHARD			14.01.13
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE	
0	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E				NEIL O'BRIEN	N.O.B	14.01.13	
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY			Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE

ELECTRICAL CONTRACTOR



ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226


379 THYNE ROAD,  
MORNINGSIDE QLD 4170

PHONE 07 3899 8866  
FAX 07 3899 8766

Nilsen QLD Pty Ltd ABN 50 115 075 048  
Contracting | Engineering Services | Switchboards

SWITCHBOARD MANUFACTURER

ENERGY DISTRIBUTION



**SUNLINE SWITCHBOARDS PTY LTD.**  
7 DUNTHOON ST. BRENDALG, 4503, QUEENSLAND, AUSTRALIA  
Phone : (07) 3881-3433  
FAX : (07) 3881-3611  
EMAIL : [admin@sunline.net.au](mailto:admin@sunline.net.au)  
WEB SITE : <http://www.sunline.net.au>

BY SUNLINE.

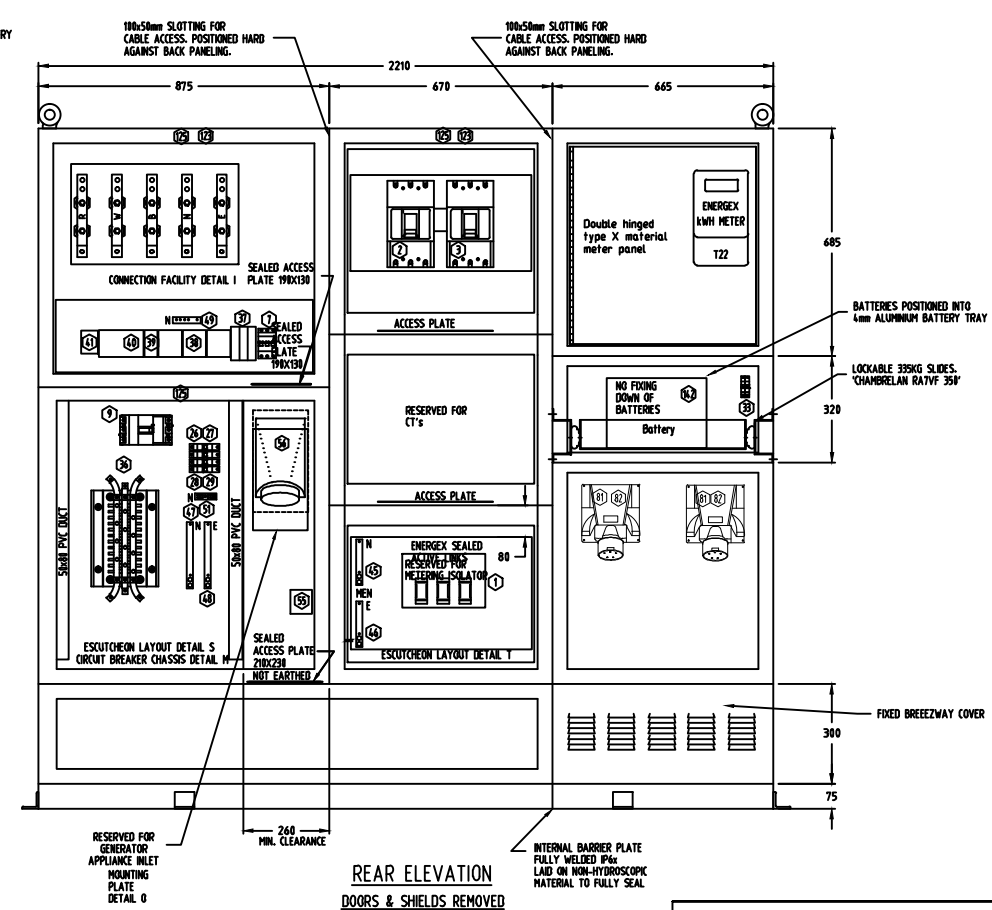
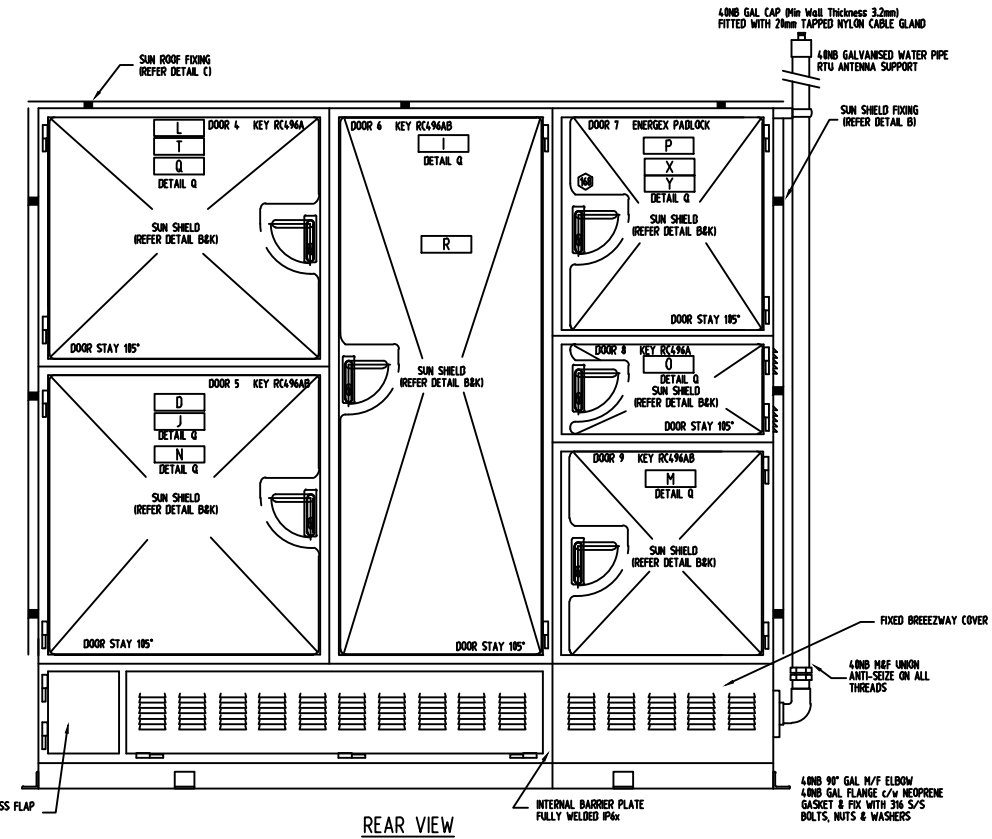
NAME

SIGNATURE

DATE

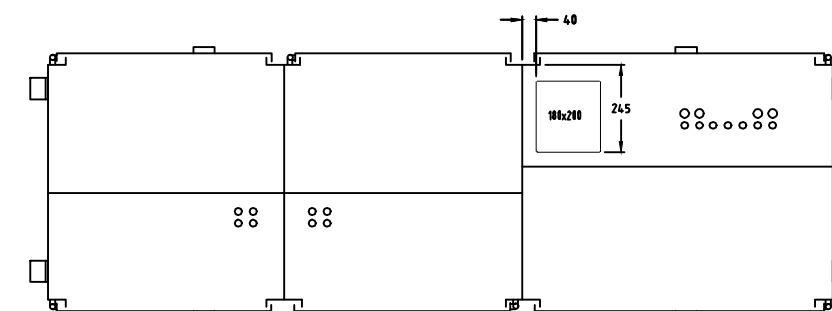
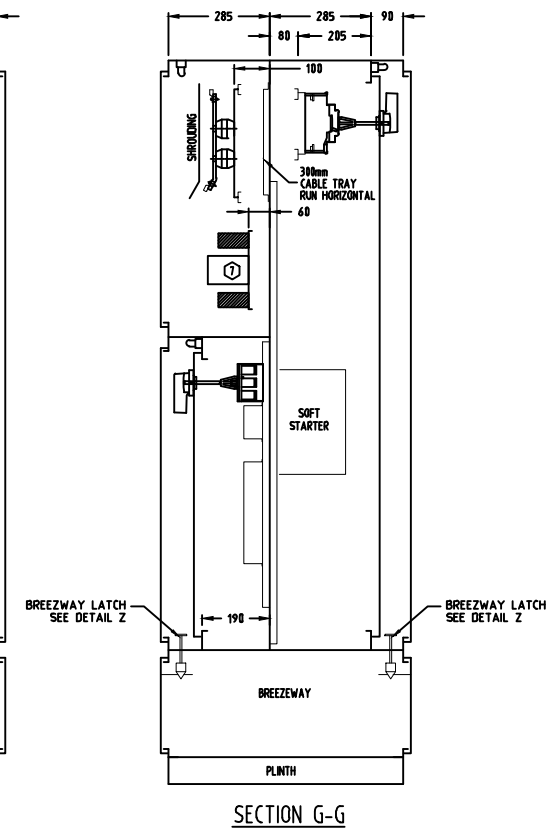
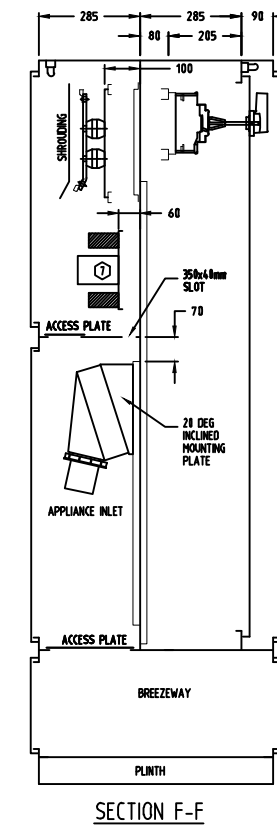
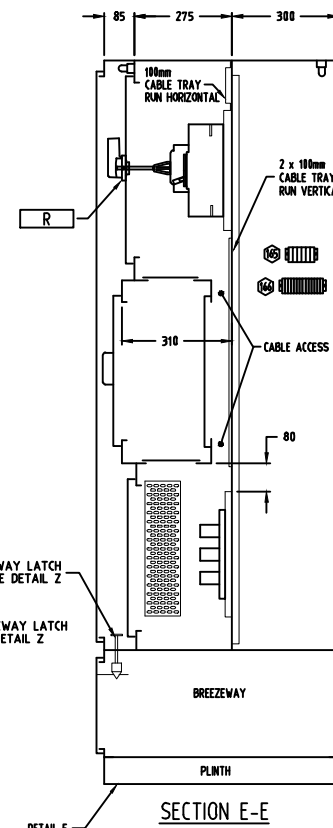
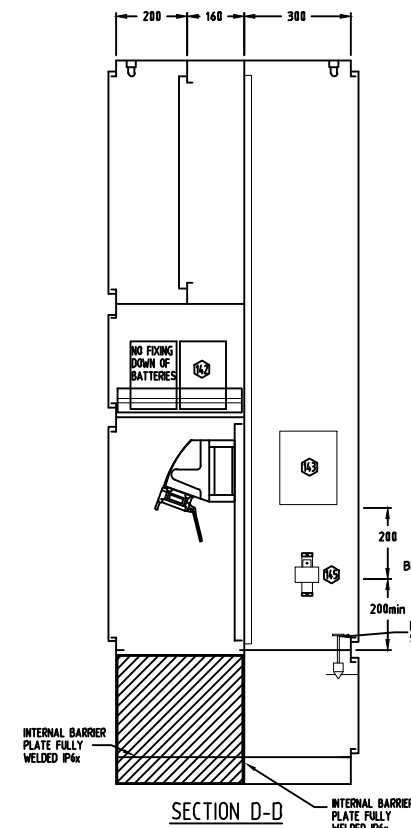
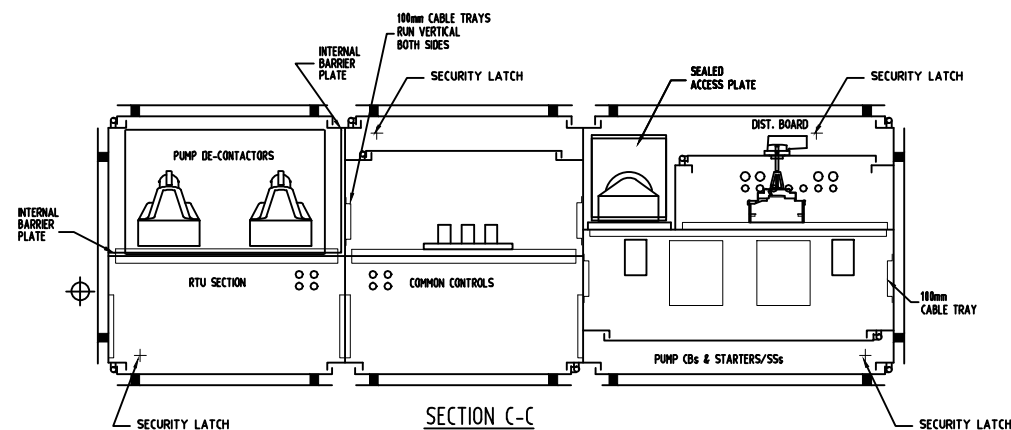
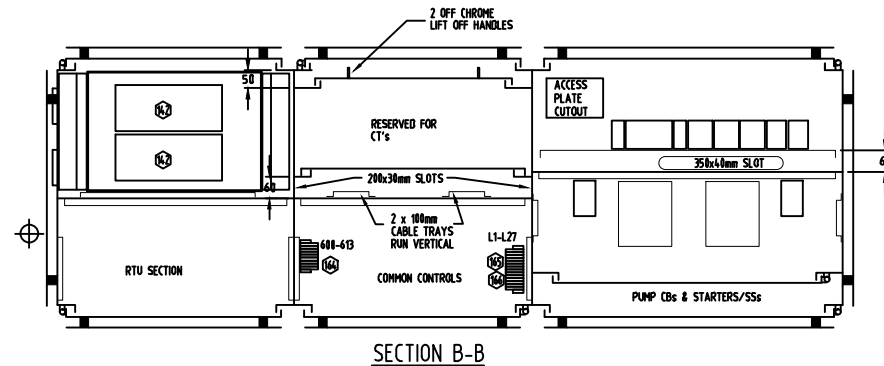
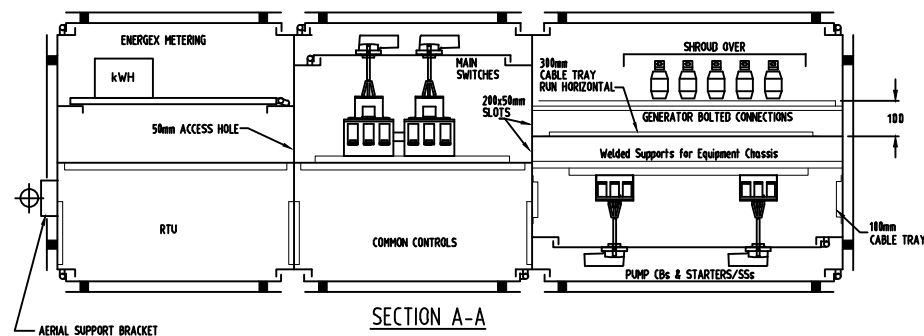
QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)





Page 316 of 370

~~Page 316 of 370~~



## AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_  
NAME of SIGNATORY: L.FERRIS  
RPEQ No. or LICENCE: 5938  
COMPANY NAME: BUILDING SERVICES DESIGN  
START DATE: 15.05.12 FINISH DATE: 21.11.12

## ELECTRICAL CONTRACTOR



ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226  
379 THYNE ROAD, MORNINGSIDE QLD 4170 PHONE 07 3899 8866  
Nilsen QLD Pty Ltd ABN 50 115 075 048 FAX 07 3899 8766  
Contracting | Engineering Services | Switchboards

## SWITCHBOARD MANUFACTURER

ENERGY DISTRIBUTION

**SUNLINE SWITCHBOARDS PTY LTD.**

7 DUNTRON ST. BRENDALE, 4500, QUEENSLAND, AUSTRALIA

Phone : (07) 3881-3433

FAX : (07) 3881-3011

EMAIL : admin@sunline.net.au

WEB SITE : http://www.sunline.net.au

BY SUNLINE.

Sheet 24

AS CONSTRUCTED

B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.	5938	L.F	ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.		BOB PRITCHARD	14.01.13	ASSET/PROJECT		DRAWING TITLE	
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE	SP065	SWITCHBOARD
O	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E	NEIL O'BRIEN	N.O.B	14.01.13	CONSTRUCTION MANAGER	SIGNATURE	DATE	STEVENS STREET	GENERAL ARRANGEMENT
No	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY		Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE				SEWAGE PUMP STATION	SECTIONS

DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE
DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE

ASSET/PROJECT  
SP065  
STEVENS STREET  
SEWAGE PUMP STATION

DRAWING TITLE  
SWITCHBOARD  
GENERAL ARRANGEMENT  
SECTIONS

NAME SIGNATURE DATE  
QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



SHEET No. 24 OF 28  
QUEENSLAND URBAN UTILITIES DRAWING No. AMEND.  
486/5/7-0271-024 B

RESERVED FOR  
GENERATOR CONNECTION CUBICLE

ELECTRICAL CONTRACTOR



ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226


379 THYNE ROAD,  
MORNINGSIDE QLD 4170

Nilsen QLD Pty Ltd ABN 50 115 075 048  
Contracting | Engineering Services | Switchboards

PHONE 07 3899 8866  
FAX 07 3899 8766

SWITCHBOARD MANUFACTURER

ENERGY DISTRIBUTION



BY SUNLINE.

**SUNLINE SWITCHBOARDS PTY LTD.**

7 DUNTHORN ST. BRENDALE, 4302, QUEENSLAND, AUSTRALIA

Phone : (07) 3881-3433  
FAX : (07) 3881-3611  
EMAIL : [sales@sunline.net.au](mailto:sales@sunline.net.au)  
WEB SITE : <http://www.sunline.net.au>


NAMESIGNATUREDATE

QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



Sheet 25

AS CONSTRUCTED

B	8.11.12	AS CONSTRUCTED	P.C	Q.U.U.			ELECTRICIANS DETAILS		DRAFTED	D.SIEBUHR	ORIGINAL DESIGN DRAWING SUPPLIED BY Q.U.U.			BOB PRITCHARD		14.01.13	ASSET/PROJECT SP065 STEVENS STREET SEWAGE PUMP STATION	DRAWING TITLE GENERATOR CONNECTION CUBICLE GENERAL ARRANGEMENT	SHEET No. 25 OF 28		AMEND.
A	29.6.12	FOR CONSTRUCTION	D.S.	Q.U.U.			ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	N.O'BRIEN	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE			QUEENSLAND URBAN UTILITIES DRAWING No.	486/5/7-0271-025	
O	29.3.12	FOR APPROVAL	D.S.	Q.U.U.			LICENSE NUMBER	109797	CAD FILE	Q12B4E				NEIL O'BRIEN	N.O.B	14.01.13					
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIAN RESPONSIBLE FOR INSTALLATION WORK ONLY			Q.U.U. FILE No.	TBA	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE			DATE		



**DISCLAIMER**  
WHILE ALL CARE HAS BEEN TAKEN IN THE PREPARATION OF THIS PLAN, GELEON CONSULTING ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY OF THE INFORMATION. THE CONTRACTOR SHALL RELY ON FIELD INVESTIGATIONS IN ORDER TO VALIDATE INFORMATION SHOWN ON THIS PLAN

**CONDUIT NOTE**  
LOCATION OF CONDUITS ARE INDICATIVE ONLY. EXACT LOCATION TO BE CONFIRMED ON-SITE

**AS CONSTRUCTED**  
14 NOVEMBER 2012

**AS CONSTRUCTED DETAILS**  
I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_  
NAME of SIGNATORY: G.LERCH  
RPEQ No. or LICENCE: 7382  
COMPANY NAME: GELEON CONSULTING  
START DATE: 15.05.12 FINISH DATE: 14.11.12

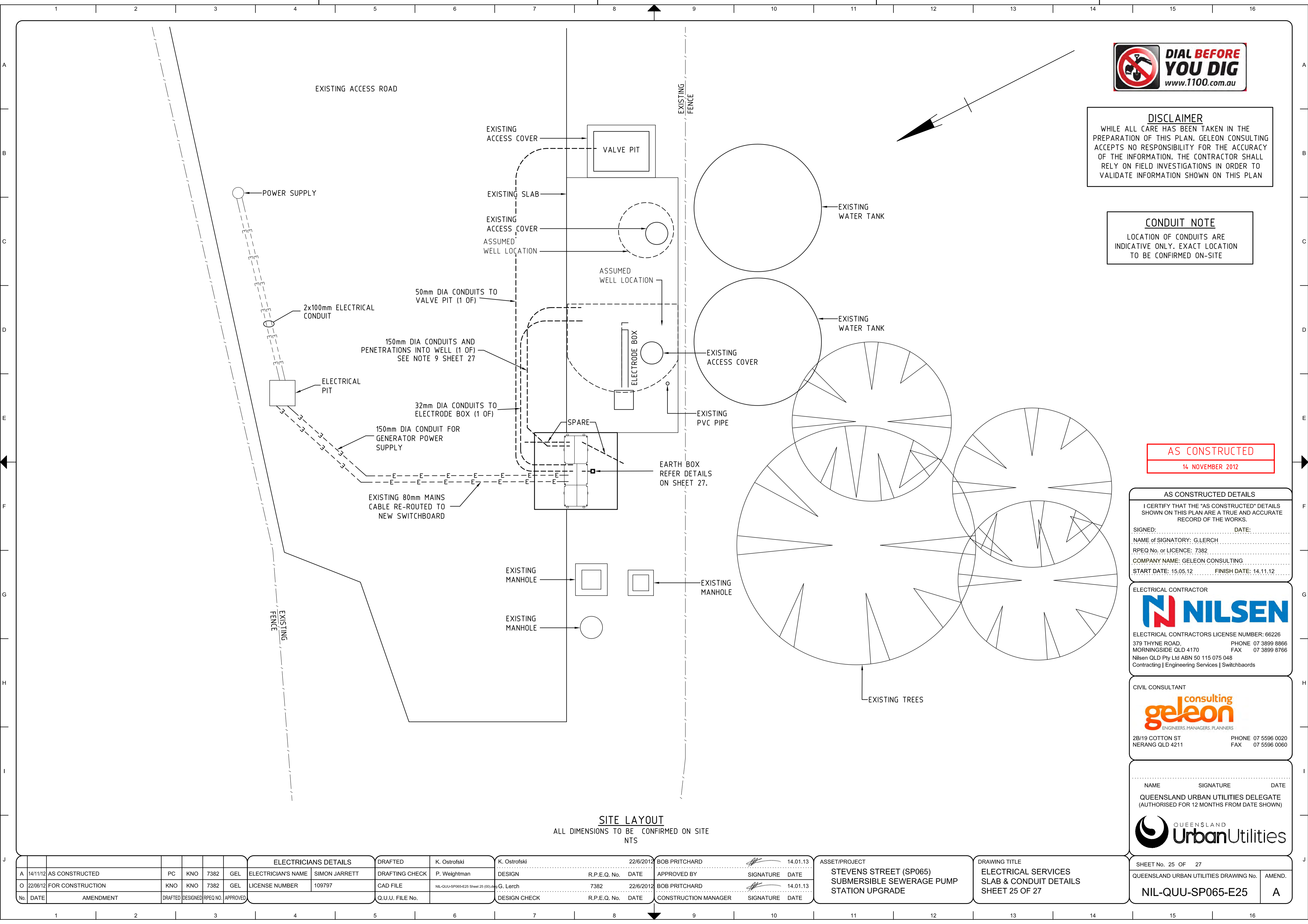
**ELECTRICAL CONTRACTOR**  
**NILSEN**  
ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226  
379 THYNE ROAD, PHONE 07 3899 8866  
MORNINGSIDE QLD 4170 FAX 07 3899 8766  
Nilsen QLD Pty Ltd ABN 50 115 075 048  
Contracting | Engineering Services | Switchboards

**CIVIL CONSULTANT**  
**geleon consulting**  
ENGINEERS. MANAGERS. PLANNERS  
28/19 COTTON ST PHONE 07 5596 0020  
NERANG QLD 4211 FAX 07 5596 0060



NAME \_\_\_\_\_ SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_  
QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

**QUEENSLAND UrbanUtilities**

SHEET No. 25 OF 27  
QUEENSLAND URBAN UTILITIES DRAWING No. \_\_\_\_\_ AMEND. \_\_\_\_\_  
**NIL-QUU-SP065-E25** **A**



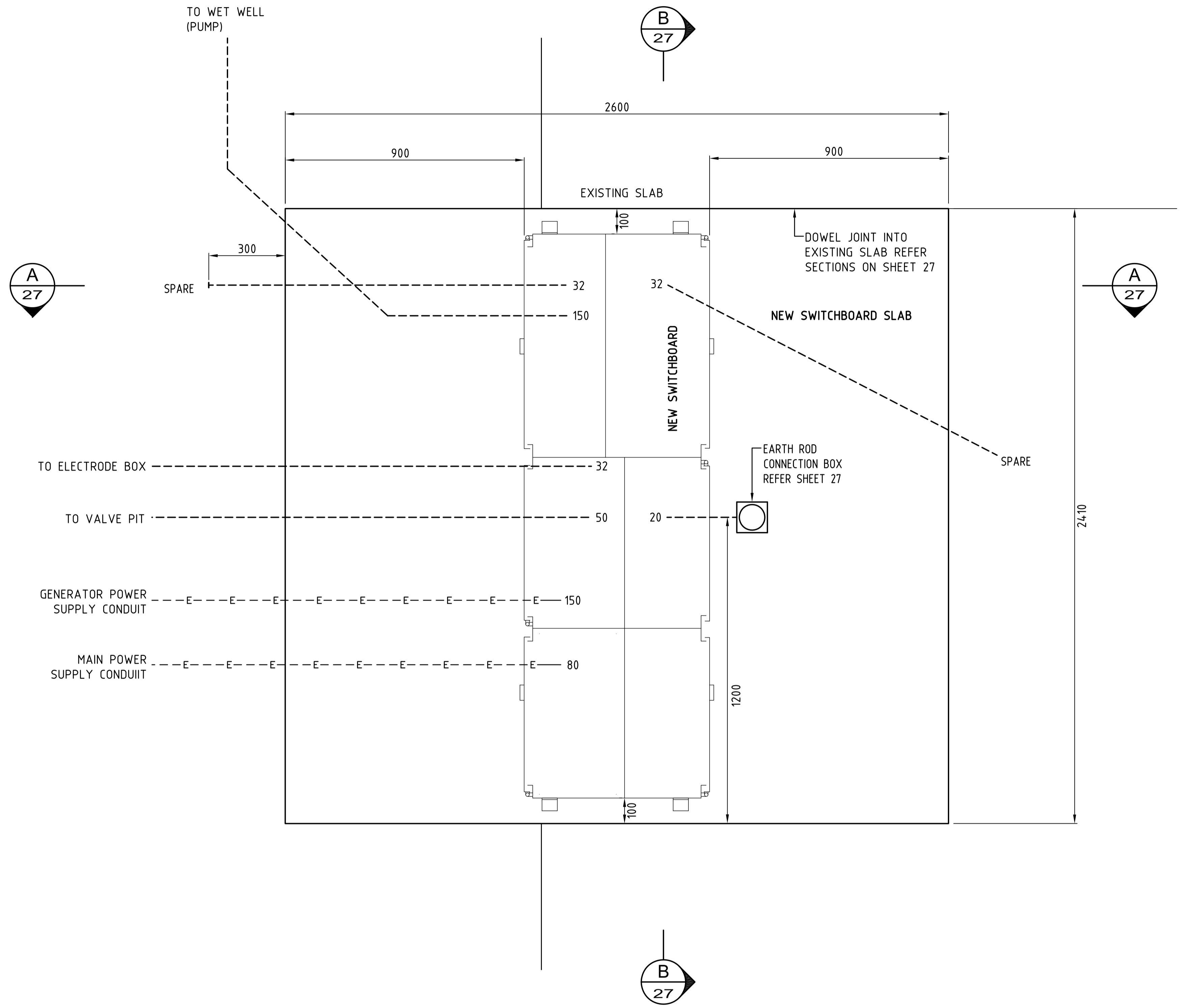
**SITE LAYOUT**  
ALL DIMENSIONS TO BE CONFIRMED ON SITE  
NTS

						ELECTRICIANS DETAILS		DRAFTED	K. Ostrofski	K. Ostrofski	22/6/2012	BOB PRITCHARD		14.01.13	ASSET/PROJECT  STEVENS STREET (SP065) SUBMERSIBLE SEWERAGE PUMP STATION UPGRADE	DRAWING TITLE  ELECTRICAL SERVICES SLAB & CONDUIT DETAILS SHEET 25 OF 27	SHEET No. 25 OF 27			
A	14/11/12	AS CONSTRUCTED	PC	KNO	7382	GEL	ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	P. Weightman	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY			SIGNATURE	DATE	QUEENSLAND URBAN UTILITIES DRAWING No.	
O	22/06/12	FOR CONSTRUCTION	KNO	KNO	7382	GEL	LICENSE NUMBER	109797	CAD FILE	NIL-QUU-SP065-E25 Sheet 25 (001).dwg	G. Lerch	7382	22/6/2012	BOB PRITCHARD				14.01.13	AMEND.	
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ No.	APPROVED			Q.U.U. FILE No.		DESIGN CHECK		R.P.E.Q. No.	DATE			CONSTRUCTION MANAGER	SIGNATURE	DATE	NIL-QUU-SP065-E25



**DISCLAIMER**  
WHILE ALL CARE HAS BEEN TAKEN IN THE PREPARATION OF THIS PLAN, GELEON CONSULTING ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY OF THE INFORMATION. THE CONTRACTOR SHALL RELY ON FIELD INVESTIGATIONS IN ORDER TO VALIDATE INFORMATION SHOWN ON THIS PLAN

- NOTES**
1. REFER TO SHEET 25 FOR SLAB LOCATION
  2. REFER TO SHEET 27 FOR NOTES AND DETAILS



**AS CONSTRUCTED**  
14 NOVEMBER 2012

**AS CONSTRUCTED DETAILS**

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_

NAME of SIGNATORY: G.LERCH

RPEQ No. or LICENCE: 7382

COMPANY NAME: GELEON CONSULTING

START DATE: 15.05.12 FINISH DATE: 14.11.12

ELECTRICAL CONTRACTOR

**NILSEN**

ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226

379 THYNE ROAD, PHONE 07 3899 8866  
MORNINGSIDE QLD 4170 FAX 07 3899 8766

Nilsen QLD Pty Ltd ABN 50 115 075 048  
Contracting | Engineering Services | Switchboards

CIVIL CONSULTANT

**geleon consulting**  
ENGINEERS, MANAGERS, PLANNERS

28/19 COTTON ST PHONE 07 5596 0020  
NERANG QLD 4211 FAX 07 5596 0060

NAME \_\_\_\_\_ SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



**UrbanUtilities**  
QUEENSLAND

SHEET No. 26 OF 27

QUEENSLAND URBAN UTILITIES DRAWING No. \_\_\_\_\_ AMEND. \_\_\_\_\_

**NIL-QUU-SP065-E26** **A**

**CONCRETE SLAB & CONDUITS**  
ALL DIMENSIONS TO BE CONFIRMED ON SITE  
NTS

						ELECTRICIANS DETAILS		DRAFTED	K. Ostrofski	K. Ostrofski		22/6/2012	BOB PRITCHARD		14.01.13	ASSET/PROJECT  STEVENS STREET (SP065) SUBMERSIBLE SEWERAGE PUMP STATION UPGRADE	DRAWING TITLE  ELECTRICAL SERVICES SLAB & CONDUIT DETAILS SHEET 26 OF 27	SHEET No. 26 OF 27			
A	14/11/12	AS CONSTRUCTED		PC	KNO	7382	GEL	ELECTRICIAN'S NAME	SIMON JARRETT	DRAFTING CHECK	P. Weightman	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY			SIGNATURE	DATE	QUEENSLAND URBAN UTILITIES DRAWING No.	AMEND.
O	22/06/12	FOR CONSTRUCTION		KNO	KNO	7382	GEL	LICENSE NUMBER	109797	CAD FILE	NIL-QUU-SP065-E26 Sheet 26 (001).dwg	G. Lerch	7382	22/6/2012	BOB PRITCHARD				14.01.13	NIL-QUU-SP065-E26	A
No.	DATE	AMENDMENT		DRAFTED	DESIGNED	RPEQ NO.	APPROVED			Q.U.U. FILE No.		DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER			SIGNATURE	DATE		

## CONCRETING NOTES

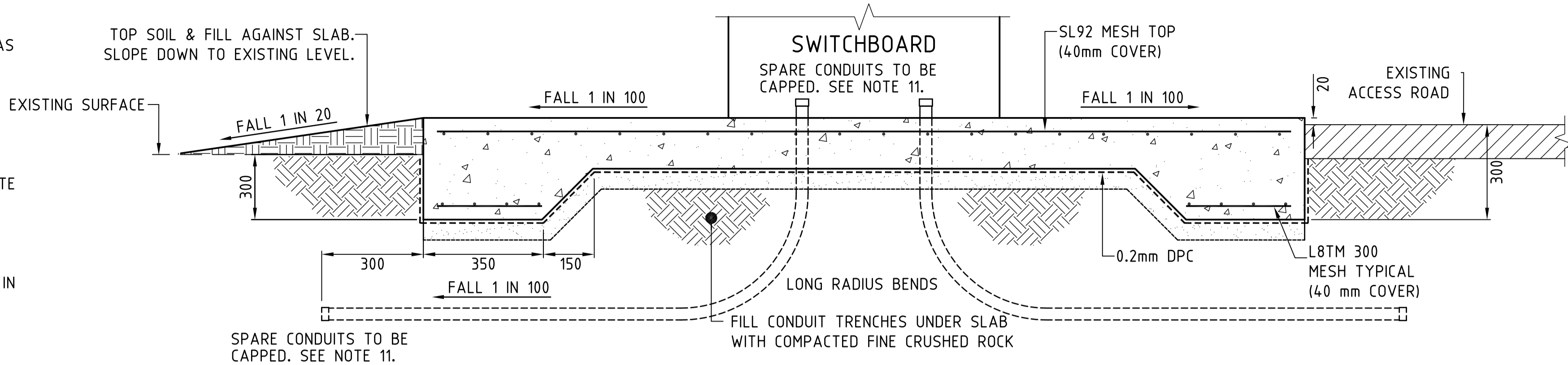
- A NEW BASE SLAB SHALL BE POURED TO PROVIDE A STABLE, LEVEL PLATFORM FOR THE NEW SWITCHBOARD. THE NEW SLAB SHALL BE SIZED AS DETAILED ON SHEET 26.
- ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH CURRENT AUSTRALIAN STANDARDS, CODES AND RELEVANT BUILDING AUTHORITY BY-LAWS.
- ALL CONCRETE SHALL COMPLY WITH THE AUSTRALIAN STANDARDS CONCRETE STRUCTURES CODE AS3600-2001 AND THE BRISBANE CITY COUNCIL, "URBAN MANAGEMENT DIVISION, REFERENCE SPECIFICATIONS FOR CIVIL ENGINEERING WORK, S200 CONCRETE WORK"
- ALL CONCRETE SHALL BE GRADE N32 . THE MAXIMUM SIZE OF AGGREGATE IN THE CONCRETE SHALL BE 20mm.
- EXPOSED EXTERNAL EDGING SHALL FINISHED WITH AN ARRIS.
- PENETRATIONS FOR CONDUIT STUBS SHALL BE ALLOWED FOR IN ACCORDANCE WITH THE CONDUIT LAYOUT SHOWN ON SHEET 26.
- THE CONTRACTOR SHALL IDENTIFY ALL THE SERVICES WITHIN THE IMMEDIATE AREA THAT MAY BE AFFECTED BY THE INSTALLATION OF THE NEW SLAB, CABLE PIT AND CONDUITS. THESE SERVICES SHALL BE PROTECTED AND MAINTAINED.
- SURROUNDS OF SLAB TO BE CONTOURED DOWN TO NATURAL GROUND LEVEL WITH COMPACTED FILL.
- HOLES TO BE CORED THROUGH THE WELL WALL. JOINT TO BE SEALED WITH APPROVED HYDROPHILIC SEAL AROUND CONDUITS
- THE CONTRACTOR SHALL MAKE GOOD EXISTING SWITCHBOARD SLAB AREA BY REMOVING OLD SWITCHBOARD AND BY FILLING ALL EXISTING CORED HOLES EXTENDING FROM UNDER THE EXISTING SWITCHBOARD POSITION INTO THE WELL AND BY CUTTING OFF AND FILLING EXISTING DISUSED CONDUITS BACK TO SLAB LEVEL. USE NON-SHRINK GROUT AND PIN INTO EXISTING SLAB TO PROVIDE SECURE PLACEMENT AND FINISH TO MATCH LEVEL OF THE WELL.

## CONDUIT NOTES

- ALL CONDUITS TO BE PVC HEAVY DUTY ELECTRICAL CONDUITS (ORANGE) CASTED INTO NEW CONCRETE SWITCHBOARD SLAB. ALL CONDUITS FITTED WITH LONG RADIUS BENDS, MINIMUM DEPTH 500mm. ALL CONDUIT STUBS FITTED WITH END CAPS TO PREVENT THE INGRESS OF MOISTURE AND SOIL. 'SPARE/FUTURE' CONDUITS TO EXTEND 300mm BEYOND SLAB EDGE AND FITTED WITH END CAPS.
- REFER TO ENERGEX 'UNDERGROUND DISTRIBUTION CONSTRUCTION MANUAL FOR CONDUIT TRENCH AND INSTALLATION DETAILS.
- NESCO 'ERB1' EARTH ROD CONNECTION BOX TO BE CAST IN AND FLUSH WITH SLAB. ALLOW A MIN. OF 50mm CLEARANCE FROM CONNECTION BOX LID TO THE BASE OF SWITCHBOARD. 100mm CONDUIT CAST VERTICALLY IN SLAB TO EXTEND FROM INSIDE CONNECTION BOX, DOWN TO GROUND LEVEL. THIS CONDUIT ALLOWS FOR THE INSTALLATION OF AN EARTHING ROD. 20mm CONDUIT FOR EARTH IS TO BE MARRIED INTO THIS CONNECTION BOX PRIOR TO POURING ANY CONCRETE WORKS. REFER TO EARTH ROD CONNECTION BOX DETAIL.
- 50mm COMMUNICATIONS CONDUIT (WHITE CONDUIT MUST BE USED).
- CONTRACTOR TO PROVIDE A MINIMUM OF 500mm COVER TO CONDUITS AND ENSURE CONDUITS ARE ABOVE THE HIGH WATER LEVEL IN THE WET WELL

## CONSTRUCTION NOTES

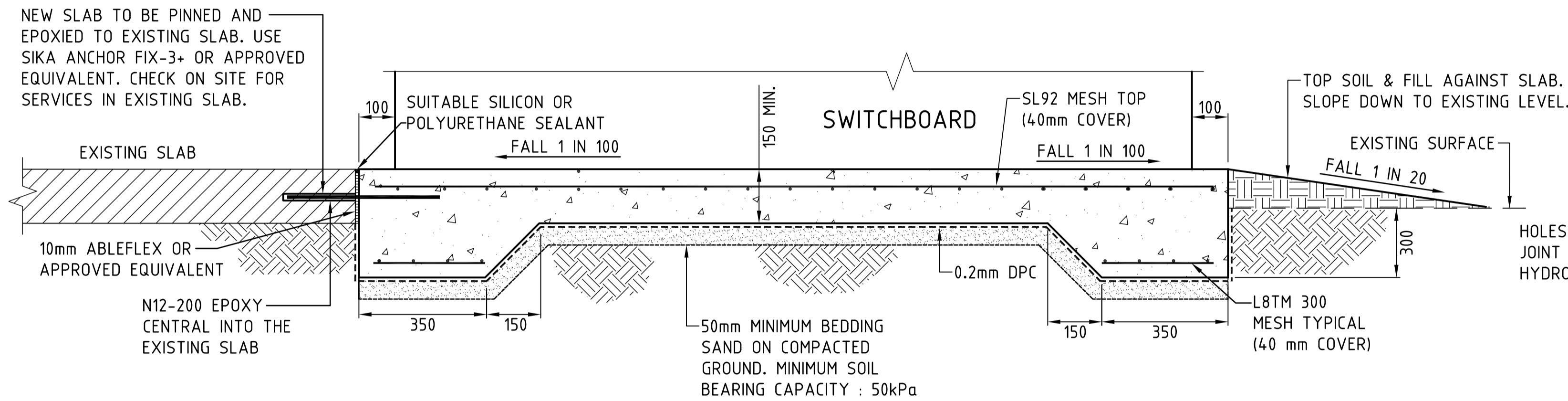
- EXISTING SWITCHBOARD TO BE REMOVED AND ALL PENETRATIONS INTO WET WELL TO BE SEALED AND MADE GOOD.
- TRIM & REMOVE TREES AND PLANTS AS NECESSARY. QUU APPROVAL IS REQUIRED BEFORE COMMENCING WORKS.
- CONTRACTOR TO ENSURE NEW CONCRETE SLAB FALLS AWAY FROM NEW SWITCHBOARD AT 1:100 MINIMUM.
- ALL SERVICES MAY NOT BE SHOWN ON THESE DRAWINGS. A REPRESENTATIVE FOR EACH SERVICE SHALL BE PRESENT ON-SITE WHEN WORKING WITHIN 3.0m OF EACH SERVICE.



SECTION A  
N.T.S

## SLAB & SPARE CONDUIT INSTALLATION

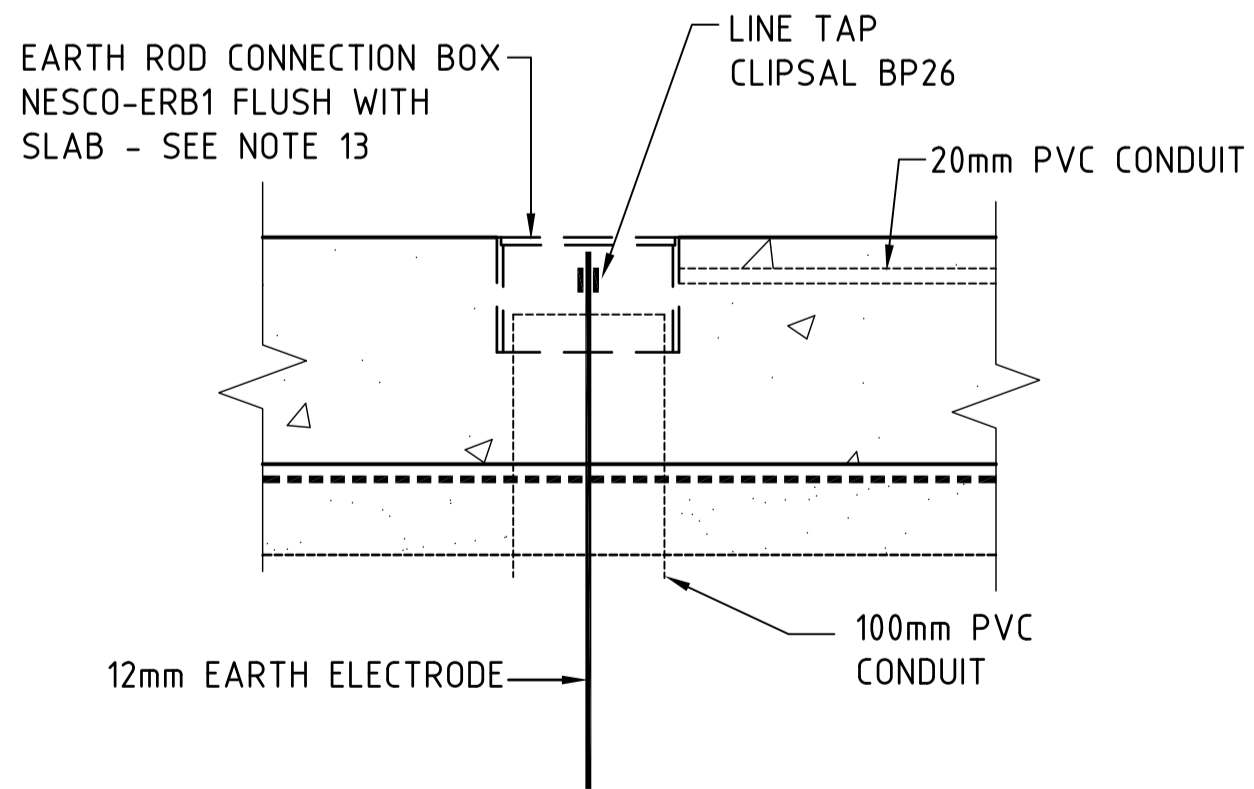
NTS



SECTION B  
N.T.S

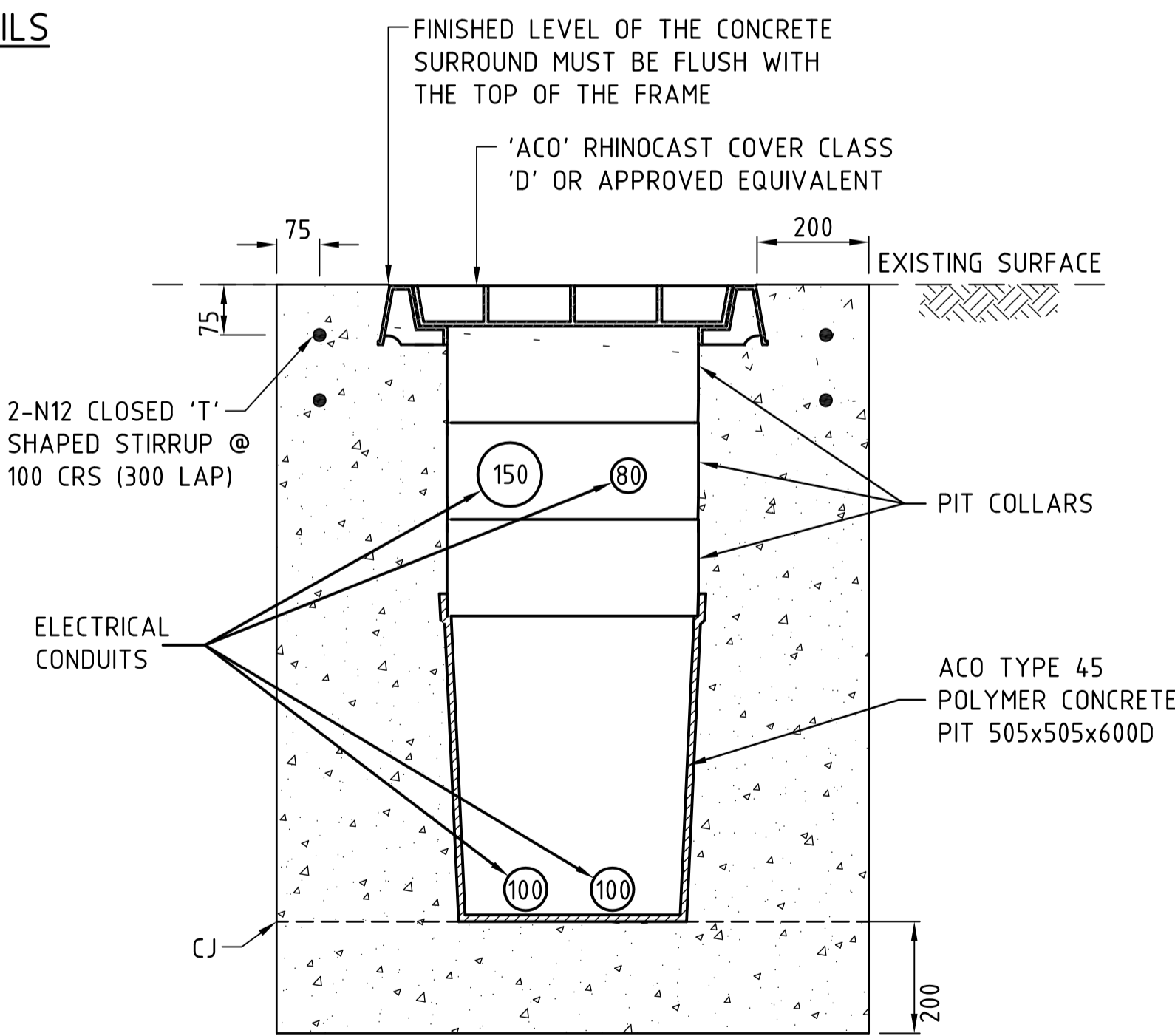
## CONCRETE SLAB DETAILS

NTS



## EARTH ROD CONNECTION BOX DETAIL

NTS



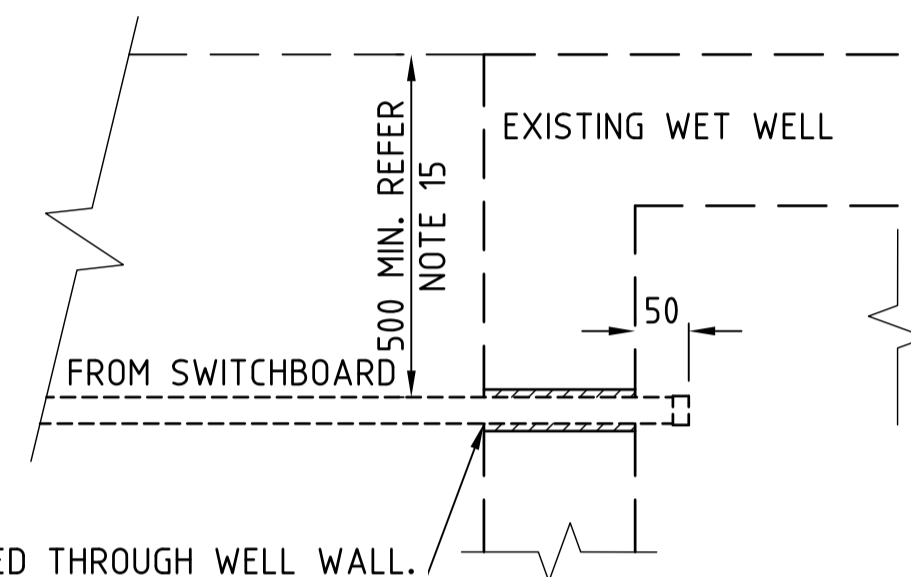
## ELECTRICAL PIT INSTALLATION DETAIL

NTS



## DISCLAIMER

WHILE ALL CARE HAS BEEN TAKEN IN THE PREPARATION OF THIS PLAN, GELEON CONSULTING ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY OF THE INFORMATION. THE CONTRACTOR SHALL RELY ON FIELD INVESTIGATIONS IN ORDER TO VALIDATE INFORMATION SHOWN ON THIS PLAN



## WET WELL PENETRATION DETAIL

NTS

AS CONSTRUCTED

14 NOVEMBER 2012

## AS CONSTRUCTED DETAILS

I CERTIFY THAT THE 'AS CONSTRUCTED' DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_  
NAME of SIGNATORY: G.LERCH  
RPEQ No. or LICENCE: 7382  
COMPANY NAME: GELEON CONSULTING  
START DATE: 15.05.12 FINISH DATE: 14.11.12

## ELECTRICAL CONTRACTOR

**NILSEN**

ELECTRICAL CONTRACTORS LICENSE NUMBER: 66226  
379 THYNE ROAD, PHONE 07 3899 8866  
MORNINGSIDE QLD 4170 FAX 07 3899 8766  
Nilsen QLD Pty Ltd ABN 50 115 075 048  
Contracting | Engineering Services | Switchboards

## CIVIL CONSULTANT

**geleon**  
ENGINEERS, MANAGERS, PLANNERS

28/19 COTTON ST PHONE 07 5596 0020  
NERANG QLD 4211 FAX 07 5596 0060

NAME SIGNATURE DATE  
QUEENSLAND URBAN UTILITIES DELEGATE  
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

**UrbanUtilities**

SHEET No. 27 OF 27

QUEENSLAND URBAN UTILITIES DRAWING No. AMEND.

NIL-QUU-SP065-E27

A

No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	ELECTRICIANS DETAILS	DRAFTED	K. Ostrofski	K. Ostrofski	22/6/2012	BOB PRITCHARD	14.01.13	ASSET/PROJECT	DRAWING TITLE	SHEET No. 27 OF 27	QUEENSLAND URBAN UTILITIES DRAWING No. AMEND.
A	14/11/12	AS CONSTRUCTED	PC	KNO	7382	GEL	ELECTRICIAN'S NAME SIMON JARRETT	DRAFTING CHECK	P. Weightman	DESIGN	R.P.E.Q. No. DATE	APPROVED BY SIGNATURE DATE	14.01.13	STEVENS STREET (SP065) SUBMERSIBLE SEWERAGE PUMP STATION UPGRADE	ELECTRICAL SERVICES SLAB & CONDUIT DETAILS SHEET 27 OF 27		
O	22/06/12	FOR CONSTRUCTION	KNO	KNO	7382	GEL	LICENSE NUMBER 109797	CAD FILE	NIL-QUU-SP065-E27 Sheet 27 (001)	G. Lerch	7382 22/6/2012	BOB PRITCHARD	14.01.13				
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED		Q.U.U. FILE No.		DESIGN CHECK	R.P.E.Q. No. DATE	CONSTRUCTION MANAGER SIGNATURE DATE					

### 3.3 UNDERGROUND CABLE ROUTING DETAILS

Please refer to the civil as constructed drawings contained in section 3.2.

**SECTION 4: COMMISSIONING, CERTIFICATES AND TESTING INFORMATION – CONTENTS**  
**PAGE**

4.1	FORM 16 .....	323
4.2	SWITCHBOARD MANUFACTURER TEST INFORMATION .....	328
4.3	QUU COMMISSIONING PLAN .....	339
4.4	QUU FACTORY ACCEPTANCE TESTS (FAT) .....	356
4.5	ENGINEER DESIGN CERTIFICATION .....	356
4.6	LEVEL PROBE COMMISSIONING INFORMATION.....	363
4.7	CONTRACTORS CERTIFICATE OF TESTING AND SAFETY .....	367

## **4 COMMISSIONING, CERTIFICATES AND TESTING INFORMATION**

### **4.1 FORM 16**

The following pages contain the Form 16 for the Stevens St switchboard upgrade certifying that the installation has been carried out to Australian Standards.

# Inspection Certificate / Aspect Certificate / QBSA Licensee Aspect Certificate

16

<b>NOTE</b>	This form is to be used for the purposes of section 10(c) and 239 of the <i>Building Act 1975</i> and/or sections 32, 35B, 43, 44 and 47 of the <i>Building Regulation 2006</i> .	
<b>1. Indicate the type of certificate</b>  The stages of assessable building work are listed in section 24 of the <i>Building Regulation 2006</i> or as conditioned by the building certifier.  An aspect of building work is part of a stage (e.g. waterproofing).	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 10px;"> <input checked="" type="checkbox"/> Inspection Certificate for         </div> <div style="margin-bottom: 10px;"> <input type="checkbox"/> Stage of building work (for single detached class 1a or class 10 building or structure)          (indicate the stage) _____       </div> <div style="margin-bottom: 10px;"> <input checked="" type="checkbox"/> Aspect of building work          (indicate the aspect)      Electrical Services       </div> <hr/> <div style="margin-bottom: 10px;"> <input checked="" type="checkbox"/> QBSA Licensee Aspect Certificate         </div> <div> <b>Scope of the work</b>          Scope of the work covered by the licence class under the <i>Queensland Building Services Authority Regulation 2003</i> for the aspect being certified, e.g. scope of work for a waterproofing licence is "installing waterproofing materials or systems for preventing moisture penetration". An aspect being certified may include "wet area sealing to showers".         <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">           Supply and installation of replacement Electrical switchboards as part of the SQUV – Sewerage Pump Stations Reliability Improvement Project,         </div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> </div> </div>	
<b>2. Property description</b>  The description must identify all land the subject of the application.  The lot & plan details (eg. SP / RP) are shown on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details.	<div style="display: flex; flex-direction: column;"> <div> <b>Street address</b> <i>(Include no., street, suburb / locality &amp; postcode)</i> <div style="border: 1px solid black; padding: 2px;">Queensland Urban Utilities Submersible Sewerage Pump Station – Stevens St</div> <div style="border: 1px solid black; padding: 2px;">Yeronga QLD</div> <div style="border: 1px solid black; padding: 2px; text-align: right;">Postcode 4104</div> </div> <div> <b>Lot &amp; plan details</b> <i>(Attach list if necessary)</i> <div style="border: 1px solid black; padding: 2px;">n/a</div> </div> <div> <b>In which local government area is the land situated?</b> <div style="border: 1px solid black; padding: 2px;">Brisbane City Council</div> </div> </div>	
<b>3. Building/structure description</b>	<b>Building/structure description</b> <div style="border: 1px solid black; padding: 2px;">External concrete pads/landscaped areas.</div> <div style="border: 1px solid black; padding: 2px;">New Pump Station Control and Switchboard</div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div>	<b>Class of building / structure</b> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div>
<b>4. Description of component/s certified</b>  Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.	<div style="border: 1px solid black; padding: 5px;">         All Electrical works have been installed in accordance with AS/NZ 3000-2007 wiring rules.       </div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div>	

LOCAL GOVERNMENT USE ONLY

Form 16 continued

**5. Basis of certification**

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications, were relied upon.

AS/NZS 3000:2007 Amendment 1 2009

BCA codes Section J

**6. Reference documentation**

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

NIL-QUU-SP065-E25

NIL-QUU-SP065-E26

NIL-QUU-SP065-E27

**7. Building certifier reference number and development approval number**

Building certifier reference number

Development approval number

**8. Building Certifier, competent person or QBSA licensee details**

A **competent person** must be assessed as competent before carrying out the inspection.

The builder for the work cannot give a stage certificate of inspection.

A competent person is assessed by the building certifier for the work as competent to practice in an aspect of the building and specification design, because of the individual's skill, experience and qualifications. The competent person must be registered or licensed under a law applying in the State to practice the aspect.

If no relevant law requires the individual to be licensed or registered, the certifier must assess the individual as having appropriate experience, qualifications or skills to be able to give the help.

If the chief executive issues any guidelines for assessing a competent person, the building certifier must use the guidelines when assessing the person.

Name (in full)

Bob Pritchard

Company name if applicable

Nilsen Qld Ptd Ltd

Contact person

Bob Pritchard

Phone no. business hours

07 3899 8866

Mobile no.

0438384230

Fax no.

07 3899 8766

Email address

bobpritchard@nilsen.com.au

Postal address

PO BOX 488

Morningside

Postcode 4170

Licence class

Electrical

Licence number

C23551

Date approval to inspect received from building certifier

n/a

**9. Signature of building certifier, competent person or QBSA licensee**

Note: A building certifier must sign this form for temporary swimming pool fencing under section 239(2)(b) of the Building Act 1975.

Signature

Date

09/01/2013

## Inspection Certificate / Aspect Certificate / QBSA Licensee Aspect Certificate

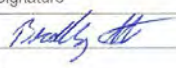
# 16

<p><b>NOTE</b></p> <p><b>1. Indicate the type of certificate</b></p> <p>The stages of assessable building work are listed in section 24 of the <i>Building Regulation 2006</i> or as conditioned by the building certifier.</p> <p>An aspect of building work is part of a stage (e.g. waterproofing).</p>	<p>This form is to be used for the purposes of section 10(c) and 239 of the <i>Building Act 1975</i> and/or sections 32, 35B, 43, 44 and 47 of the <i>Building Regulation 2006</i>.</p> <div style="margin-top: 10px;"> <input checked="" type="checkbox"/> <b>Inspection Certificate for</b> </div> <div style="margin-top: 10px;"> <input type="checkbox"/> Stage of building work (for single detached class 1a or class 10 building or structure) (indicate the stage) _____         </div> <div style="margin-top: 10px;"> <input checked="" type="checkbox"/> Aspect of building work (indicate the aspect) Concrete         </div> <hr/> <div style="margin-top: 10px;"> <input checked="" type="checkbox"/> <b>QBSA Licensee Aspect Certificate</b> </div> <p><b>Scope of the work</b>          Scope of the work covered by the licence class under the <i>Queensland Building Services Authority Regulation 2003</i> for the aspect being certified, e.g. scope of work for a waterproofing licence is "installing waterproofing materials or systems for preventing moisture penetration". An aspect being certified may include "wet area sealing to showers".</p> <div style="border: 1px solid black; padding: 5px; min-height: 40px;">             New concrete switchboard pad         </div>										
<p><b>2. Property description</b></p> <p>The description must identify all land the subject of the application.</p> <p>The lot &amp; plan details (eg. SP / RP) are shown on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details.</p>	<p>Street address (include no., street, suburb / locality &amp; postcode)</p> <div style="border: 1px solid black; padding: 2px;">             Queensland Urban Utilities Submersible Sewerage Pump Station – Stevens St              Yeronga QLD Postcode 4104         </div> <p>Lot &amp; plan details (Attach list if necessary)</p> <div style="border: 1px solid black; padding: 2px;">             n/a         </div> <p>In which local government area is the land situated?</p> <div style="border: 1px solid black; padding: 2px;">             Brisbane City Council         </div>										
<p><b>3. Building/structure description</b></p>	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 70%; border-bottom: 1px solid black;">Building/structure description</th> <th style="width: 30%; border-bottom: 1px solid black;">Class of building / structure</th> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">                     External concrete pads/landscaped areas.                 </td> <td style="border: 1px solid black; padding: 5px;"></td> </tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> </table>	Building/structure description	Class of building / structure	External concrete pads/landscaped areas.							
Building/structure description	Class of building / structure										
External concrete pads/landscaped areas.											
<p><b>4. Description of component/s certified</b></p> <p>Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.</p>	<div style="border: 1px solid black; padding: 5px; min-height: 60px;">             Steel, footings and concrete pad.         </div>										

**LOCAL GOVERNMENT USE ONLY**

DATE RECEIVED	REFERENCE NUMBERS	Approved form 16 Version 2, 11/10
---------------	-------------------	--------------------------------------

Form 16 continued

<b>5. Basis of certification</b> Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications, were relied upon.	In accordance with Australian Standards As 2870    	
<b>6. Reference documentation</b> Clearly identify any relevant documentation, e.g. numbered structural engineering plans.	NIL-QUU-SP050-E25 NIL-QUU-SP050-E26 NIL-QUU-SP050-E27	
<b>7. Building certifier reference number and development approval number</b>	Building certifier reference number 	Development approval number 
<b>8. Building Certifier, competent person or QBSA licensee details</b>  A <b>competent person</b> must be assessed as competent before carrying out the inspection. The builder for the work cannot give a stage certificate of inspection.  A competent person is assessed by the building certifier for the work as competent to practice in an aspect of the building and specification design, because of the individual's skill, experience and qualifications. The competent person must be registered or licensed under a law applying in the State to practice the aspect.  If no relevant law requires the individual to be licensed or registered, the certifier must assess the individual as having appropriate experience, qualifications or skills to be able to give the help.  If the chief executive issues any guidelines for assessing a competent person, the building certifier must use the guidelines when assessing the person.	Name (in full) Brad Williams  Company name if applicable Jarc Industrial Enterprises  Contact person Brad Williams  Phone no. business hours 07 55206 996 Mobile no. 0412 144 115 Fax no. 07 55357 100  Email address brad@jarc.com.au  Postal address 9 Flagstone Drive Burleigh Heads Postcode 4170  Licence class Concrete Licence number 1175797  Date approval to inspect received from building certifier n/a	
<b>9. Signature of building certifier, competent person or QBSA licensee</b>  Note: A building certifier must sign this form for temporary swimming pool fencing under section 239(2)(b) of the Building Act 1975.	Signature  Date 16/1/13	

The Building Act 1975 is administered by the  
Department of Infrastructure and Planning



**Queensland Government**  
Department of Infrastructure and Planning

## 4.2 SWITCHBOARD MANUFACTURER TEST INFORMATION

The following pages contain the switchboard manufacturer's internal inspection and test sheets.

SUNLINE	Form No.	ISSUE	Revision	Date
QA TEST BOOKLET	8	B	11	24/06/11

# Q.A. TEST SHEET BOOKLET

**PROJECT:** QUU – Sewerage Pump Stations

## SWITCHBOARD

**TITLE:** SP065

**JOB NO:** Q12B04

**LIENT:** Nilsen

**DRAWING  
& REVISION NO. :**

### LEGEND

P = Pass

F = Fail

R = Reinspect

N = Refer notes/comments

> = greater than

< = less than

$\mu\text{m} = \text{m} \times 10^{-6} = \text{micron}$

ITEM 1. - SHEETMETAL

ITEM 2. - PAINTING/POWDER COATING

ITEM 3. - ELECTRICAL INSPECTION

ITEM 4. - ELECTRICAL TEST

ITEM 5. - ELECTRICAL TEST CONT.

ITEM 6. - PRE DELIVERY CHECK SHEET

ITEM 7. - PRE DELIVERY CHECK SHEET CONT.

ITEM 8. – GENERAL COMMENTS

SUNLINE	Form No.	ISSUE	Revision	Date
QA TEST BOOKLET	8	B	10	15/12/08

# 1 - SHEETMETAL.

**JOB NUMBER:** \_\_\_\_\_

ITEM NO.		PASS	FAIL	RE-INSPECT P=PASS F=FAIL
1.	Is layout in accordance with as built drawings.			
2.	Are all dimensions in accordance with drawings (+ or - 1%).			
3.	Are all folds within guidelines or specification.			
4.	Are all partitions within guidelines or specification.			
5.	Are all partitions fixed and welded securely.			
6.	Are access holes in partitions located correctly.			
7.	Is segregation in accordance with relevant standard or as agreed.			
8.	Are all external and internal welds satisfactory.			
9.	Are all external welds ground off smooth.			
10.	Are all doors, covers & escutcheons fitted with nominated number of hinges.			
11.	Are all doors, covers and escutcheons hung correctly.			
12.	Are all equipment cutouts made in accordance with requirements.			
13.	Are all edges, holes and cutouts de-burred.			
14.	Are all mounting angles and supports installed and secure.			
15.	Are all gear trays correctly positioned and fixed.			
16.	Has cable access been provided for equipment connection.			
17.	Is lifting provision provided.			
18.	Are schedule holders fitted if required.			
19.	Is fabrication material in accordance with drawings.			
20.	Is gauge of material in accordance with drawings.			
21.	Is base required to be galvanised.			
22.	Has base been fitted.			

Fabrication by: CT Sheetmetal (name)

\_\_\_\_\_ (name)

**COMMENTS:**

Please refer to CT Sheetmetal

Check to Q-1

## **HOLD POINT No.1**

Enclosure has been inspected and is approved for powder coating.

Signed [Signature] Date 12/12/12

SUNLINE	Form No.	ISSUE	Revision	Date
QA TEST BOOKLET	8	B	10	15/12/08

## 2 - PAINTING/ POWDER COATING.

### JOB NUMBER:

ITEM NO.	I & T.P. DESCRIPTION	PASS		FAIL		RE-INSPECT P=PASS F=FAIL
		Criteria		Criteria		
23	Is a paint colour code specified.					
24	Has paint colour code specified been met.					
25	Is surface coating thickness within tolerance.	> 60µm		< 60µm		
26	Has the final finished coat any blemishes.					
27	If blemishes exist do they require rework.					
28	Is an independent inspection required.					
29	Is switchboard ready to proceed for electrical fitout.					
30	Final colour – external.					
31	Final colour – internal.					

Powder-coat by: CT Sintermetal (company name)

### COMMENTS :

Please refer to CT Sintermetal QA  
Check '13'

### HOLD POINT No.2

Paint finish has been inspected and is approved for electrical fit-out.

Signed [Signature] Date 15/12/15

SUNLINE	Form No.	ISSUE	Revision	Date
QA TEST BOOKLET	8	B	10	15/12/08

## 3 - ELECTRICAL INSPECTION.

JOB NUMBER:				
ITEM NO.		PASS	FAIL	RE-INSPECT P=PASS F=FAIL
32	Is all equipment laid out as required.	✓		
33	Is all equipment installed as per drawings.	✓		
34	Is all equipment requiring future adjustment accessible.	✓		
35	Are all busbars aligned correctly.	✓		
36	Is busbar phase rotation correct on all sections and feeder terminals	✓		
37	Are busbars supported in accordance with type test, where required.	✓		
38	Are busbar clearances between phases & to earth in accordance to type test or AS3000.	✓		
39	Are all busbar connections tight. Tightened By: <u>Thomas</u>  Checked By: <u>Shannon</u>			
39A	Are all Power cable lugs crimped correctly and checked for firmness of connection  Crimped By: <u>Shannon</u> Checked By: <u>Thomas</u>			
40	Is all equipment labelled.	✓		
41	Are labels straight & in accordance with label schedule (if required).	✓		
42	Does neutral bar make provision for all circuits including spares..	✓		
43	Does neutral bar have large enough terminations.	✓		
44	Does earth bar make provision for all circuits including spares.	✓		
45	Does earth bar have large enough terminations.	✓		
46	Are all fuse cartridges fitted & of the correct rating.	✓		
47	Are all line and load labels fitted (if required).	N/A		
48	Is all cabling adequately sized and supported.	✓		
49	Are all door and escutcheons hung correctly.	✓		
50	Are all locks keyed alike where required.	✓		
51	Are shrouds fitted where required.	✓		
52	Have all drawings been marked up & returned to drawing office for final as-built issue.	✓		

Electrical work by: Thomas (name)

Shannon (name)

Brett (name)

COMMENTS:

### HOLD POINT No. 3

Switchboard assembly has been inspected and is approved for electrical testing.

Signed [Signature] Date 31/8/12

<b>SUNLINE</b>	<b>Form No.</b>	<b>ISSUE</b>	<b>Revision</b>	<b>Date</b>
<b>QA TEST BOOKLET</b>	<b>8</b>	<b>B</b>	<b>10</b>	<b>15/12/08</b>

## 4 - ELECTRICAL TESTS.

**JOB NUMBER:**

ITEM NO.	I & T.P. DESCRIPTION.						
		TEST DETAILS.	PASS		FAIL		RE-INSPECT P=PASS F=FAIL
			Criteria		Criteria		
53	<b>MEGGER TEST</b>	Red Phase to Earth.	>50MΩ	✓	<50MΩ		
54	<b>1000 VOLTS</b>	White Phase to Earth.	>50MΩ	✓	<50MΩ		
55	<b>BEFORE HIGH</b>	Blue Phase to Earth.	>50MΩ	✓	<50MΩ		
56	<b>POTENTIAL TEST</b>	* Neutral to Earth.	>50MΩ	N/A	<50MΩ		
57		Red Phase to Neutral.	>50MΩ	✓	<50MΩ		
58		White Phase to Neutral.	>50MΩ	✓	<50MΩ		
59		Blue Phase to Neutral.	>50MΩ	✓	<50MΩ		
60		Red Phase to White Phase.	>50MΩ	✓	<50MΩ		
61		Red Phase to Blue Phase.	>50MΩ	✓	<50MΩ		
62		White Phase to Blue Phase.	>50MΩ	✓	<50MΩ		
		TEST DETAILS.	PASS		FAIL		RE-INSPECT P=PASS F=FAIL
63	<b>HIGH POTENTIAL</b>	All Phases to earth.	Note 1		Note 2		
64	<b>TEST 2000 VOLTS</b>	All Phases to Neutral.	Note 1		Note 2		
65	<b>DURATION</b>	Red Phase to White Phase.	Note 1		Note 2		
66	<b>1 MINUTE</b>	Red Phase to Blue Phase.	Note 1		Note 2		
67		White Phase to Blue Phase.	Note 1		Note 2		
		TEST DETAILS.	PASS		FAIL		RE-INSPECT P=PASS F=FAIL
68	<b>MEGGER TEST</b>	Red Phase to Earth.	>50MΩ	✓	<50MΩ		
69	<b>1000 VOLTS</b>	White Phase to Earth.	>50MΩ	✓	<50MΩ		
70	<b>AFTER HIGH</b>	Blue Phase to Earth.	>50MΩ	✓	<50MΩ		
71	<b>POTENTIAL TEST</b>	* Neutral Phase to Earth.	>50MΩ	N/A	<50MΩ		
72		Red Phase to Neutral.	>50MΩ	✓	<50MΩ		
73		White Phase to Neutral.	>50MΩ	✓	<50MΩ		
74		Blue Phase to Neutral.	>50MΩ	✓	<50MΩ		
75		Red Phase to White Phase.	>50MΩ	✓	<50MΩ		
76		Red Phase to Blue Phase.	>50MΩ	✓	<50MΩ		
77		White Phase to Blue Phase.	>50MΩ	✓	<50MΩ		

**NOTE: \* Caution – Do not Megger when electronic equipment is connected.**

Note 1. Insulation is satisfactory when 2kV voltmeter reads 1800V to 2000V and lamp brightness is normal.

Note 2. Insulation is unsatisfactory when 2kV voltmeter reads below 1800V and lamp brightness falls.

<b>SUNLINE</b>	<b>Form No.</b>	<b>ISSUE</b>	<b>Revision</b>	<b>Date</b>
<b>QA TEST BOOKLET</b>	<b>8</b>	<b>B</b>	<b>10</b>	<b>15/12/08</b>

## **5 - ELECTRICAL TESTS (CONT.)**

<b>JOB NUMBER :</b>				
<b>ITEM NO.</b>	<b>I &amp; T.P. DESCRIPTION</b>			
	<b>FUNCTIONAL TESTS.</b>	<b>PASS</b>	<b>FAIL</b>	<b>RE-INSPECT P=PASS F=FAIL</b>
78	Are all control switches, circuit breakers, fuses, combined fuse switches installed and operable.	✓		
79	Is all switchgear mechanically functional.	✓		
80	Are rotary handles correctly aligned with MCCB toggle position. <b>(is off actually off)</b>	✓		
81	Continuity test on all MCCB's (line to load)	✓		
82	QA sticker on each MCCB Door checked & initialled	✓		
83	Do mechanical interlocks and key interlocks function correctly (if applicable)	✓		
84	Check all voltages on all equipment before testing circuit.	✓		
5	Check Phase Rotation of all 3 phase outgoing circuits.	✓		
86	Are all control circuits functioning.	✓		
	<b>LOGIC TESTS (AS APPLICABLE)</b>	<b>PASS</b>	<b>FAIL</b>	<b>RE-INSPECT P=PASS F=FAIL</b>
87	Have all circuits been Point to Point tested (Prior to Power being applied).	✓		
88	Have all PLC Digital Inputs been Simulated and Verified	✓		
89	Have all PLC Digital Outputs been Simulated (ie lamps, buzzers etc bridged to power) and Verified.	✓		
90	Have all Transducer outputs been Simulated and Verified	✓		
91	Have all BMS, SCADA or Telemetry contacts been checked for correct operation.	✓		
92	Are all Client supplied controllers/meters the correct Operating Voltage.	✓		
93	Have all Client supplied controllers/meters been wired as per supplied information.	✓		
	<b>CURRENT INJECTION TESTS (IF APPLICABLE).</b>	<b>PASS</b>	<b>FAIL</b>	<b>RE-INSPECT P=PASS F=FAIL</b>
94	Are C/T ratios, Class and output VA correct	✓		
95	Is C/T polarity correct, primary and secondary.	✓		
96	Does the full scale reading of the ammeter match the C/T ratio.	✓		
97	Does kWh meter disc operate in correct direction	✓		
98	Does protection equipment tested, function correctly.	✓		
99	Has instrument wiring been checked by primary injection.	✓		

**COMMENTS:**

---



---



---

### **HOLD POINT No. 4**

Testing has been completed successfully and switchboard assembly is approved for pre delivery inspection

Signed ..... *[Signature]* ..... Date *17/12/12*

<b>SUNLINE</b>	<b>Form No.</b>	<b>ISSUE</b>	<b>Revision</b>	<b>Date</b>
<b>QA TEST BOOKLET</b>	<b>8</b>	<b>B</b>	<b>10</b>	<b>15/12/08</b>

## 6 - PRE DELIVERY CHECK SHEET.

JOB NUMBER :				
ITEM NO.	I & T.P. DESCRIPTION	PASS	FAIL	RE-INSPECT P=PASS F=FAIL
100	Is paintwork in satisfactory condition.	✓		
101	Doors and panels align correctly.	✓		
102	Panel fixings and bolts secured.	✓		
103	Circuit schedule card supplied if required.	✓		
104	Internal panel fixings fitted with star washers.	✓		
105	Control wiring fitted with pre-insulated type lugs (If required).	✓		
106	Main power connections fitted with heat shrink sleeving where applicable.	✓		
107	CT's fitted with bus bar links where required.	✓		
108	Bus bars P.V.C. insulated in exposed areas (If required).	N/A		
109	Spare fuse clips or racks fitted (If required).	N/A		
110	Schematic drawing supplied (If required).	✓		
111	Wires and terminals numbered (As required).	✓		
112	Equipment fitted as shown on as built drawings.	✓		
113	Equipment neat, complete and straight.	✓		
114	Are bolts provided to terminations.	✓		
115	Are shrouds fitted over live components in accessible areas (If required).	✓		
116	Earth bar has paint removed from contact surface with gear tray.	NO		
117	Is name plate fitted, stating fault level, rating etc.	Yes		
<b>ARE LABELS:</b>				
118	Straight and clearly visible.	✓		
119	Correct spelling.	✓		
120	Fixed with double sided tape or fixed with screws.	✓		
121	As per drawing.	✓		
122	Fixing screws have protruding sharp points removed (If required).	NO		
<b>IS WIRING INSTALLED IN P.V.C. DUCTS AND:</b>				
123	Duct lids neat and edges cleaned and a good fit.	✓		
124	Wiring leaving duct neat and regularly fixed with cable ties.	✓		
125	Ducts correctly fitted.	✓		
<b>IS NEUTRAL BAR FITTED AND,</b>				
126	Correct number & sizes in relation to terminations (watch submains)	✓		
127	Correctly identified and numbered.	✓		

Continued on page 8

COMMENTS:

SUNLINE	Form No.	ISSUE	Revision	Date
QA TEST BOOKLET	8	B	10	15/12/08

## 7 - PRE DELIVERY CHECK SHEET.

### JOB NUMBER:

ITEM NO.	I & T.P. DESCRIPTION	PASS	FAIL	RE-INSPECT P=PASS F=FAIL
128	Check connections for firmness and correct termination procedure.	✓		
129	Are C.F.S. units fitted with cartridges and if so is size installed correct and size indicated on door of C.F.S.	N/A		
130	Check door to ensure firm compression of seals.	✓		
131	Are door hinges securely fixed.	✓		
132	Are insect screens fitted over louvres (If required).	✓		
133	Is cable tray fitted over louvres (If required).	✓		
134	Are circuit breaker "Blanks" fitted and secure (Where required).	✓		
135	Have wiring diagrams and equipment instructions been packed	✓		
136	Has switchboard been thoroughly cleaned out.	✓		
137	Have photo's been taken of switchboard. Photo's are stored electronically for each project, camera to be given to the receptionist for downloading on completion of each project.			
138	Have delivery details been arranged.	A. Site notification/address.		
139		B. Freight company notified.		
	<b>HAS SWITCHBOARD BEEN SECURELY PACKED.</b>			
140	A. Bubble plastic wrapping (1 layer on face).	✓		
141	B. Corrugated cardboard over wrapping (1 layer).	✓		
142	C. Timber casing (Where required).	NO		
143	Is switchboard insured for transit.	Yes		
	<b>NON-CONFORMANCE CHECKS</b>			
144	Have there been any non conformances raised for this project?	NO		
145	If the answer is "Yes" documentation must be completed?			

### COMMENTS:

### HOLD POINT No. 5

Pre delivery inspection has been completed successfully and switchboard assembly is approved for despatch.

Signed  Date 31/8/12

[illegible]

"THERE IS NO COMPROMISE ON QUALITY"

**FITOUT FINAL INSPECTION FORM**Pink  
CTFB08

Assembler

*Matthew Gregory Smith*

Customer Name

*Suncor*

Job Number

*30903-1*

The following items are to be checked and marked off by the Assembler prior to QA Inspection taking place

Description	Assemb Check ✓	QAS Signoff ✓	Rectify Comp QAS ✓
Paint Colour	/	/	
Paint Finish	/	/	
Doors	/	/	
Hinges	/	/	
Rubber Neoprene	/	/	
Rubber Bubble	/	/	
Plan Pockets	/	/	
Card Holders	/	/	
General welds	/	/	
Base Frame	/	/	
Gland Plates	/	/	
Seals	/	/	
CT Label	/	/	
Perspex	/	/	
Door Stiffeners	/	/	
Fuse Racks	/	/	
Hat Section	/	/	
Earth Studs	/	/	
Eye Bolts	/	/	
Door Stays	/	/	
Meter Panels	/	/	
Eps Bolted	/	/	
Escutcheon clearances	/	/	
General Alignment	/	/	
Vents / Gauze	/	/	

Description	Assemb Check ✓	QAS Signoff ✓	Rectify Comp QAS ✓
Threads clear of paint	/	/	
Handles / locks	/	/	
Keys / Spanners	/	/	
Rivets	/	/	
Nuts & Washers	/	/	
Silicone joins	/	/	
Hoods / Roofs	/	/	
Checked & Approved By: Initial Required	Ass <i>[Signature]</i>	QAS <i>[Signature]</i>	QAS

**Final Inspection Signoff**

QA Supervisor

Comments

Production Manager

Comments

### 4.3 QUU COMMISSIONING PLAN

The following pages contain the approved QUU commissioning plan for Stevens St. This plan details the checks required by QUU before during and after the switchboard upgrade process.

These sheets were filled out by on-site electricians and are signed off by the site supervisor.

# SP065 STEVENS ST MOGILL SEWAGE PUMP STATION STANDARD 2 PUMP FIXED SPEED

## COMMISSIONING PLAN

### In Attendance

Name	Role During Commissioning	Company
Bob Pritchard	Foreman	Nilsen
Dave Roberts	Apprentice	Nilsen
John Clayton	Commissioning Manager	Q.U.V.

# 1 INTRODUCTION

## **!! IMPORTANT !!**

**This commissioning Procedure is not to replace the electrical contractors own internal quality control and statutory documentation.**

At all times during the switchboard upgrade, the pump station must be capable of running at least 1 of the 2 pumps. To achieve this during the switchboard changeover, a temporary Switchboard system will be used.

The attached document will be used by Nilsen staff in conjunction with Standard SWMS used for each task. Refer to the list of approved SWMS procedures that will be available on site

The Project Manager is to ensure that 2 sets of For Construction Documents are available on Site during the cutover. Both sets are to be marked up with all changes

Set 1 is to stay on site after commissioning

Set 2 is to be taken off site for AutoCad conversion to As constructed Drawings

## 1.1 SEQUENCE OF WORKS

The sequence of works shall be:

1. Station Preliminary Works
2. Switchboard Changeover
  - a. DAY 1 - Temporary Switchboard and preliminary's
  - b. DAY 2 - Commission New Switchboard (Pumps 1 & 2)
  - c. DAY 3 - Remove old equipment
3. Post Changeover

## 1.2 MAINTENANCE CHECK OF EXISTING INSTALLATION

Before the works on site can commence, QUU staff to ensure that all 2 pumps are fully operational shall perform a thorough maintenance inspection of the site. QUU to ensure that well access lids are free moving prior to works on Day 1

### 1.3 PRE COMMISSIONING CHECKLIST

The following checklist is to be completed and signed by the electrical contractor.

#### 1.3.1 Switchboard Factory Acceptance Test

Contractor Task	Completed
FAT has been completed as per QUU FAT Document and all defects that were identified have been rectified.	OK <input checked="" type="checkbox"/> Date: 8/11/12

#### 1.3.2 Civil Works Complete

Contractor Task	Completed
Ensure all civil works are installed as per the For construction drawings	OK <input checked="" type="checkbox"/> Date: 8/11/12

#### 1.3.3 New Switchboard Installed in Location

Contractor Task	Outcome
Install new Switchboard and all accessories in the location on the new concrete slab as per the For Construction Drawings has been completed.	OK <input checked="" type="checkbox"/>
Install all required seals between the switchboard and the well	
Ensure draw wires are intact in all conduits	OK <input checked="" type="checkbox"/>
Check the board to ensure that all components have not been damaged or loosened in transit	OK <input checked="" type="checkbox"/>
Install Main earth to Earth rod and Test Record results here	OK <input checked="" type="checkbox"/>
Install Antenna, cabling and pole and align antenna to same compass setting as the existing antenna and lock into position	OK <input checked="" type="checkbox"/>

#### 1.3.4 New Radio Antenna Mast Location

QUU Task	Result
Check the location of the antenna mast and ensure that the new position will not be directly below electrical transmission lines. Install antenna pole, antenna and wiring to the new switchboard. <i>Same as existing</i>	Location OK <input checked="" type="checkbox"/> Antenna dir. <input checked="" type="checkbox"/> °

#### 1.3.5 Generator Check

QUU Task	Checked
<ul style="list-style-type: none"> <li>The stand by generator can start run at full load for one hour and has sufficient fuel (full tank). This test is mandatory in assuring the generator is fully operational</li> <li>Confirm the generator has a current inspection certificate</li> <li>Ensure you are instructed on Operation</li> <li>Ensure cable length is sufficient to complete the works</li> </ul>	<ul style="list-style-type: none"> <li>OK <input checked="" type="checkbox"/></li> </ul>

#### 1.3.6 Pump Station preliminary operational checks

QUU Task	Checked
<p>These are checks will ensure the pump station is fully operational and that no delays will be incurred due to any pump station problem out side of the contract. These task are desirable to have completed before the SAT but are not essential. The job can proceed if they are not done.</p> <p>Commissioning Manager to request networks maintenance to inspect and rectify if necessary</p>	OK <input checked="" type="checkbox"/>

Electrical Contractor's Supervisor

Name: *Bob P.* Date: *15/11*

Signature: *[Signature]*

QUU Commissioning Manager

Name: John Clayton Date: / /2012

Signature: .....

Doc Id:

Active Date:

QUU Confidential

Printed: 25/06/2012

Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.



## 2 SWITCHBOARD CHANGEOVER PROCEDURE

The following sequence of change over works is the order in which they must be followed. **Two** pumps must be operational at all times. After each phase has been completed, the commissioning manager will record the results and instruct the commissioning team to commence work on the next phase.

### PHASE A: INSTALL TEMPORARY BOARD

#### 2.1 DAY 1 - TEMPORARY SWITCHBOARD

##### 2.1.1 Register with Control Room

Contractor Task	Outcome
Call the QUU Control Room Operator (CRO) and inform him that you are on site. Record the CRO's Name and Officer Code and record the time of the call. Advise CRO that you are performing a switchboard changeover and that you will initially be taking one pump off line. Complete the on site Log Book Permit to Work Number and validity date <u>6960</u> <b>Give the operator your contact name and number and advise the operator that communications will be lost to the pump station until the job is finished.</b>	Name: <u>Bob.</u> CRO: <u>Brett</u> Time: <u>07.15.</u>

##### 2.1.2 Secure the Work Zone

Contractor Task	Outcome
Ensure sufficient work areas are established and fenced off to stop unauthorized entry. Ensure entry to properties is not hindered or access to the well. Ensure QUU has notified resident of access requirements.	NA <input type="checkbox"/> OK <input checked="" type="checkbox"/>

##### 2.1.3 Existing Switchboard Parameters

Contractor Task	Outcome
Ensure that the station is fully functional (all 2 pumps can run)	P1 <input checked="" type="checkbox"/> P2 <input checked="" type="checkbox"/>
<b>THIS IS A HOLD POINT.</b> <b>Do not proceed until the ALL 2 PUMPS are confirmed to be fully operational</b>	Signature: <u>[Signature]</u> TIME: <u>07.30.</u>
Record 3 phase motor currents from display panel (At 50Hz) and on a hand held tester to verify display  <div style="text-align: right;">             Pump # 1              Pump # 2           </div> <b>Verify motor phase rotation at motor leads</b>	U. <u>12.9</u> V. <u>13</u> W. <u>12.9</u> U. <u>12.8</u> V. <u>12.9</u> W. <u>12.9</u> ↺ <input type="checkbox"/> ↻ <input checked="" type="checkbox"/>

Electrical Contractor's Supervisor

Name: BOB P. Date: 15/11/12

Signature: .....

QUU Commissioning Manager

Name: **John Clayton** Date: **1 / 12/2012**

Signature: .....

Doc Id:

Active Date:



QUU Confidential

Printed: 25/06/2012

Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.

**2.1.4 Generator Checks**

Contractor Task	Outcome
Ensure that the generator has a full fuel tank.	OK <input checked="" type="checkbox"/>
Start the generator and measure the 3 phase volts and run one pump on load	U. <u>418</u> V. <u>417</u> W. <u>418</u>
Check Phase and Pump Rotation	 <input type="checkbox"/>  <input checked="" type="checkbox"/>

**2.1.5 Installation of temporary pumping board and field wiring**

Contractor Task	Outcome
Install and test independent battery backed high alarm system (with Multitrode level sensor) in the wet well to provide audible and Visual alarm if the wet well level exceeds 200mm above the current start level.	OK <input checked="" type="checkbox"/>
Mount the temporary pumping board in a secure location.	OK <input checked="" type="checkbox"/>
Connect the temporary level probes and electrodes and temporary pumping controls circuits	OK <input checked="" type="checkbox"/>

**2.1.6 Test of temporary pumping board and field wiring**

Contractor Task	Outcome
Isolate and tag and lock out Pump No.2 and remove motor control cable from the wet well	OK <input checked="" type="checkbox"/>
Install Pump 2 Motor control cable to Temporary Switchboard	OK <input checked="" type="checkbox"/>
Turn existing switchboard to Manual setting	OK <input checked="" type="checkbox"/>
Start Generator and turn the connected Pump 2 to manual and ensure that the well pumps down. Confirm motor currents are correct as per previous readings	OK <input checked="" type="checkbox"/>
Set the Temporary switchboard to Auto and observe a full cycle of pumping to ensure Auto operation and checking the operation of all alarms.	OK <input checked="" type="checkbox"/>
Turn Off Temporary switchboard and lock and tag out	OK <input checked="" type="checkbox"/>
Turn Existing station back to Auto	OK <input checked="" type="checkbox"/>
Disconnect Pump 2 from Temp switchboard	OK <input checked="" type="checkbox"/>
Reconnect Pump 2 to existing switchboard	OK <input checked="" type="checkbox"/>
De-isolate pump 2 on existing board and remove tag and lock	OK <input checked="" type="checkbox"/>
Confirm station operates correctly by watching a complete cycle of the pump station to ensure the station stops and starts at the correct levels	OK <input checked="" type="checkbox"/>
Confirm all materials and site is secure and ready for cutover Ensure Generator is Re-fueled and topped up. Generator cables are to be secured.	OK <input checked="" type="checkbox"/>

Electrical Contractor's Supervisor

QUU Commissioning Manager

Name: Bob P. Date: 15/11/12Name: John Clayton Date: 1 / 12/2012Signature: [Signature]Signature: [Signature]

Doc Id:

Active Date:

QUU Confidential

Printed: 25/06/2012

Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.

Run each pump in local mode and record.

Contractor Task	Outcome
-----------------	---------

<p>The contractor is to record all settings on the existing switchboard, including but not limited to.</p> <p><b>Probe as found hanging lengths,</b></p> <p><b>Starter setting,</b></p> <p><b>Antenna direction,</b></p> <p><b>Condition of existing consumer mains to be reused,</b></p>	<p>OK <input type="checkbox"/></p>
---	------------------------------------

### 2.1.8 Preparation for the Existing Energex consumer Mains Cutover

Contractor Task	Outcome
Use a "wand" to determine the location of the underground services, This may have been undertaken prior to this day and is acceptable as long as the markings are still present	OK <input checked="" type="checkbox"/>
Expose the mains in the location where the new conduits will join together and fence off this area	OK <input checked="" type="checkbox"/>
<b>Ensure that correct materials are available to join the conduits</b> <b>NOTE CABLE JOINTS ARE NOT PERMITTED</b> <b>ENSURE SUFFICIENT CABLE IS AVAILABLE TO INSTALL NEW MAINS CABLES IF REQUIRED</b> <b>existing cable will require insulation testing before reusing</b>	OK <input checked="" type="checkbox"/>

Electrical Contractor's Supervisor

Name: Bob P Date: 15/11/12Signature: 

QUU Commissioning Manager

Name: John Clayton Date: 1 / 12/2012Signature: .....

Doc Id:

Active Date:

QUU Confidential

Printed: 25/06/2012

Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.

Contractor Task	Outcome
Call the QUU Control Room Operator (CRO) and inform him that you are leaving site. Record the CRO's Name and Officer Code and record the time of the call. Complete the log book and ensure station is secured	OK <input checked="" type="checkbox"/>

**NOTICE****THE STATION CAN NOW BE LEFT UNATTENDED AT THIS STAGE**

Electrical Contractor's Supervisor

Name: Bos P Date: 15/11/12Signature: 

QUU Commissioning Manager

Name: John Clayton Date: 1 / 12012Signature: .....

Doc Id:

Active Date:

QUU Confidential

Printed: 25/06/2012

Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.

## PHASE B: COMMISSION NEW SWITCHBOARD

The following works shall be continuous and the station can NOT be left unattended during this work, Multiple shifts shall be used if required and each employee can only working a maximum hours as per their WH&S regulations.

Remove Pole fuse and lock fuses in a lockout box and Tag,	OK <input checked="" type="checkbox"/>
TEST the existing Switchboard for DEAD using approved SWMS	OK <input checked="" type="checkbox"/>
<b>HOLD Point</b>	

### 2.3 REMOVE EXISTING SWITCHBOARD WIRING

Contractor Task	Completed
Disconnect all external equipment from the switchboard DO NOT remove from the wet well until it is proved that the station has passed as SAT works. Draw ropes are to be installed in all conduits	OK <input checked="" type="checkbox"/>

### 2.4 REMOVE EXISTING PROBES

Contractor Task	Completed
Remove all existing wet well level probes and Vega level sensor and their associated cabling and conduits. Take note of existing heights of all sensors <b>Record Results Here</b>	OK <input checked="" type="checkbox"/>

### 2.5 WET WELL INSTRUMENTATION JUNCTION BOX

Contractor Task	Completed
Remove existing Probes. Ensure that all materials that are removed from the box are not permitted to fall into the wet well.	OK <input checked="" type="checkbox"/>

### 2.6 WET WELL SENSORS

Contractor Task	Completed
Install all new well level probes and Vega sensor to correct heights and connect to the new Switchboard and re test each component as it is installed. The switchboard 24VDC can be energised to do these checks.	OK <input checked="" type="checkbox"/>

Electrical Contractor's Supervisor

QUU Commissioning Manager

Name: Bos P. Date: 15/11/12Name: John Clayton Date: 1 / 12/2012Signature: [Signature]Signature: [Signature]

Doc Id:

Active Date:

QUU Confidential

Printed: 25/06/2012

Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.

Contractor Task	Completed
Place all new required wet well and discharge sensors in the correct positions and wire to the new Switchboard, Test each component as it is installed +	OK <input checked="" type="checkbox"/>

Contractor Task	Completed
Remove the motor cable for Pump 1 and install in the new switchboard	OK <input checked="" type="checkbox"/>

Contractor Task	Completed
Re run the mains from the Old Switchboard to the new switchboard, The join point for the conduits was uncovered previously and all materials are on site to complete. Once new mains are installed test each leg	OK <input checked="" type="checkbox"/>

Contractor Task	Completed
<p>Energex has been arranged to be on site at 1.00...am. Follow Energex direction to complete meter installation, <b>HOLD POINT</b></p> <p><b>Energex Contact Number</b></p> <p><b>Energex Booking Number</b></p>	<p>OK <input checked="" type="checkbox"/></p>

Contractor Task	Completed
Once the new Meters are installed, pole fuses are installed and mains connected. Turn on Main switch and test each subsequent down stream breaker for correct operation. <b>Conduct mandatory tests and record results before energising</b>	OK <input checked="checked" type="checkbox"/>

QUU Commissioning Manager

Name: **John Clayton** Date:    /    /2012



Signature: .....

QUU Confidential



Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.

## 2.12 TEST PUMP 1 IN MAUNAL

Contractor Task	Completed
Connect Pump 1 Motor leads from Old Switchboard to the New Switchboard. Test Pump 1 in Manual. ENSURE WELL PUMPS DOWN Motor cable has already been disconnected in previous 2.8 and connected into the new switchboard Check Phase Rotation and motor current	OK <input checked="" type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/>

## 2.13 CONNECT AND TEST PUMP 2 IN MANUAL

Contractor Task	Completed
Isolate and tag out pump 2 from the Temporary board, remove the pump 2 power and control cable what control cable Pump No.1 does not have one. and reinstall in the new conduit to the new switchboard why is this procedure different from Pump No.1	
Remove tag and lock the Pump 2 cubicle and test run in Manual to ensure correct phase rotation and current. Ensure current is the same as previously recorded for this pump. ENSURE WELL PUMPS DOWN why is this procedure different from Pump No.1	OK <input checked="" type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/>

### NOTE:

The new switchboard should now be fully function tested in all operating modes, Remote, Local, Emergency override. Check interlocking, E-stops and all other functions. The pump station can be placed in remote and will operated in this mode until and during the SAT, the back up audible alarm can stay in place.

## 2.14 CLEAN UP

Contractor Task	Completed
Turn Off generator and remove generator cables.  Prepare site for removal of Redundant Equipment  Site Clean and tidy and secure	OK <input checked="" type="checkbox"/>

## 2.15 COMMENCE SAT

### Commissioning of Pump No.1, No.2

QUU Programmer & Contractor Task	Outcome
Before beginning the next step ensure that the well level is below the Duty A/B Start Level (Station under the control of the new board)	OK <input checked="" type="checkbox"/>

Electrical Contractor's Supervisor

Name: ..... *Bob P* ..... Date: *15/11/12*

Signature: ..... *[Signature]* .....

QUU Commissioning Manager

Name: **John Clayton** Date: **1 / 12/2012**

Signature: .....

Doc Id:

Active Date:

QUU Confidential

Printed: 25/06/2012

Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.

QUU Programmer must complete the following procedures <u>SP065 Stevens St S.A.T</u> <u>Section2: On Site Commissioning Procedure and full functioning and safety testing</u>	OK <input checked="" type="checkbox"/>
--	--

**SCADA Testing**

<del>QUU Programmer &amp; Contractor Task</del>	<b>Outcome</b>
The QUU Programmer must complete the following procedures with the assistance from the Commissioning Engineer and SCADA Commissioning Engineer in the Control Room. <u>SP065 Stevens St S.A.T</u> <u>Section3 : SCADA Commissioning Procedure</u>	OK <input checked="" type="checkbox"/>

<del>QUU Programmer &amp; Contractor Task</del>	<b>Outcome</b>
The QUU Programmer must complete the following procedures with the assistance from the Commissioning Engineer and SCADA Commissioning Engineer in the Control Room. <u>SP065 Stevens St S.A.T</u> <u>Section5 : Site Migration to the Operational Area</u>	OK <input checked="" type="checkbox"/>

<del>Contractor Task</del>	<b>Outcome</b>
Call the QUU Control Room Operator (CRO) and inform him that you are leaving site. Record the CRO's Name and Officer Code and record the time of the call. Complete the log book and ensure station is secured	OK <input checked="" type="checkbox"/>

**NOTICE****THE STATION CAN NOW BE LEFT UNATTENDED AT THIS STAGE**

Electrical Contractor's Supervisor

Name: Bob P. Date: 15/11/12Signature: [Signature]

QUU Commissioning Manager

Name: John Clayton Date: 1 / 12 /2012Signature: [Signature]

Doc Id:

Active Date:

QUU Confidential

Printed: 25/06/2012

Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.

## DAY 3 REMOVE TEMPORARY BOARD

## Remove Temporary Switchboard

**!!! WARNING !!!**

The following works shall be continuous and the station can NOT be left unattended during this work, Multiple shifts shall be used if required and each employee can only working a maximum hours as per their WH&S regulations.

**2.15.1 Remove Switchboard**

Contractor Task	Outcome
Remove Temp Switchboard, Old QUU Switchboard, Old cables and probes and Generator for Site	OK <input checked="" type="checkbox"/>
Ensure Site Clean and tidy, Remove temp fencing	OK <input checked="" type="checkbox"/>

**3 POST CHANGE OVER CHECKLIST****3.1 DELIVERABLES FROM RTU PROGRAMMER**

QUU Programmer	Date Completed
Within 7 days of the change over the following must be completed and signed off by the QUU Programmer Complete <b>Section 4: Post Commissioning</b>	/ /
The QUU Programmer will ensure that the Control Room Acceptance (CRA) form is signed by the Manager of the Control Room Officers. The form is to be handed to the Contracts Manager (CM).	/ /

**3.2 DELIVERABLES FROM ELECTRICAL CONTRACTOR**

Contractor Task	Date Completed
All documentation required under the contract is to be provided with the time specified (AS BUILT's, Electrical Certificates and documentation etc).	/ /

**3.3 DELIVERABLES FROM COMMISSIONING MANAGER**

Commissioning Manager	Date Completed
All documentation is handed to the Project Manager to that the new switchboard asset can be capitalised and handed over to the customer.	
Factory Acceptance Test Sheet – Completed & signed off.	OK <input type="checkbox"/>

Contractor's Supervisor

QUU Commissioning Manager

Name: Bos P. Date: 15-11-12

Name: ..... Date: .....

Signature: [Signature]

Signature: .....

Doc Id:

Active Date:

QUU Confidential

Printed: 25/06/2012

Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.

Electrical Inspection Sheet – Completed & signed off.	OK <input type="checkbox"/>
Site Acceptance Test Sheet – Completed & signed off.	OK <input type="checkbox"/>
Commissioning Plan – Completed & signed off.	OK <input type="checkbox"/>
As built Drawings have been updated, drafted and taken to site along with the Site Specific Functional Specification.	/ /

### 3.4 SUGGESTIONS FOR IMPROVEMENT

Suggestion	Recommended By

Contactor's Supervisor

Name: Bes P Date: 15-11-12

Signature: 

QUU Commissioning Manager

Name: ..... Date: .....

Signature: .....

Doc Id:

Active Date:

QUU Confidential

Printed: 25/06/2012

Owner:

Note: Printed copies of this document should be verified for currency against the published electronic copy.

#### 4.4 QUU FACTORY ACCEPTANCE TESTS (FAT)

Factory acceptance tests were carried out on-site in collaboration with representatives from QUU as per the scope of the contract.

QUU retained these tests and therefore these tests are not part of this manual.

#### 4.5 ENGINEER DESIGN CERTIFICATION

The following pages contain the report completed by an RPEQ certified electrical engineer certifying that the design of the replacement switchboard and associated connections comply with Australian standards.

## Memo

Project : Stevens Street (SP065)

No.: 12109

To : Bob Pritchard  
CC :

Company : Nilsen  
:

From : Lionel Ferris

Date : 10 September 2012

Subject : Electrical Review

Attachments : Cable Selection, CB Curves

We have reviewed the electrical design for the above site and confirm that compliance with the requirements of AS3000 have been met.

Voltage drop to the furthest load (pumps) is 1.68% from the point of Energex connection, well within the 5% permitted by AS3000.

Current carrying capacities of the selected cables exceed the connected loads and the rating of the protective devices.

Automatic disconnection is required in order to satisfy touch voltage, short circuit energy withstand and fault loop impedance requires. Inspection of the circuit breaker curves indicate that the disconnection times are achieved within the permitted durations as required by AS3000 (appendix B).

Attached find cable selection data and circuit breaker curves.

Regards



Lionel Ferris  
Electrical Engineer  
RPEQ5938



**Building  
Services  
Design**  
Pty Ltd

Consulting Engineers

• Electrical

ABN 48 139 403 848

P.O. Box 296  
Arana Hills 4054

☎ 07 3056 0230  
☎ 07 3041 0249

[info@buildingservicesdesign.com.au](mailto:info@buildingservicesdesign.com.au)

**Cable Size Calculation**

Job Number	12109	Company Name	Building Services Design
Job Name	Stevens Street	ABN	
Author		License Number	
User Name			
Client		Date Printed	11 Sep 2012
Job Description			
Load Description	MSB		

**Inputs**

Run Length	40.00 m	Voltage	400 V / 3 Ø
Conductor	Copper	Max Volt Drop	3.00 %
Load	40.38 A	Allowed Expansion	0.00 %
Efficiency	100 %	Power Factor	1.00
Cable Reference		Device Fault Limit	0.00 kA
Protective Device	Custom Circuit Breaker	Protection Rating	62.5 A
Cable	1 x 4 core flat V-90 Thermoplastic cable In underground ducts		
Calculated to	AS3000:2007 & AS3008.1.1:2009		
Additional derating factor	1.00		
Ambient Temperature	25.0° C		
Depth of laying	0.5m		
Number of other circuits in enclosure	0		
Number of other enclosures in group	0		
Parallel sets of cables in the same pipe	No		
Spacing between enclosures	0.3		
Thermal Resistivity	1.2° C.m/W		

<b>Solution</b>			
Active	1 x 16 mm <sup>2</sup>		
Neutral	1 x 16 mm <sup>2</sup>		
Earth	N/A		
Load On Cable	40.38 A	Operating Temperature	40.30 degrees
Capacity	73.00 A	Spare Capacity	32.62 A
Phase Resistance	0.0504 ohms	Phase Reactance	0.0034 ohms
Earth Resistance	0.0504 ohms	Earth Reactance	0.0034 ohms
Volt Drop on Cable	3.53 V / 0.88 %	Total Volt Drop	3.53 V / 0.88 %
Cable Fault Loop Imp.	0.1122 ohms	Total Fault Loop Imp.	0.1310 ohms
Max Fault Loop Imp.	0.2457 ohms		
Fault kA at Source	6.00 kA	Fault kA at Destination	2.94 kA
Max. Run Length	87.60 m	Touch Potential	98.90 V
<b>Derating Factors</b>		Total Derating	1.00
Cable Configuration	1.00	Ambient Temperature	1.00
Depth of Laying	1.00	Thermal Resistivity	1.00
Other Circuits	1.00	Cable Drum / Reel	1.00

**Cable Size Calculation**

Job Number	12109	Company Name	Building Services Design
Job Name	Stevens Street	ABN	
Author		License Number	
User Name			
Client		Date Printed	11 Sep 2012
Job Description			
Load Description	Pump Subcircuit		

**Inputs**

Run Length	30.00 m	Voltage	400 V / 3 Ø
Conductor	Copper	Max Volt Drop	3.00 %
Load	7.50 kW	Allowed Expansion	0.00 %
Efficiency	90.00 %	Power Factor	0.80
Cable Reference		Device Fault Limit	0.00 kA
Protective Device	Custom Circuit Breaker	Protection Rating	20.0 A
Cable	1 x 4 core circular V-90 Thermoplastic cable In underground ducts		
Calculated to	AS3000:2007 & AS3008.1.1:2009		

Additional derating factor	1.00
Ambient Temperature	25.0° C
Depth of laying	0.5m
Number of other circuits in enclosure	0
Number of other enclosures in group	0
Parallel sets of cables in the same pipe	No
Spacing between enclosures	0.3
Thermal Resistivity	1.2° C.m/W

<b>Solution</b>			
Active	1 x 4 mm <sup>2</sup>		
Neutral	1 x 4 mm <sup>2</sup>		
Earth	1 x 2.5 mm <sup>2</sup>		
Load On Cable	15.04 A	Operating Temperature	35.38 degrees
Capacity	33.00 A	Spare Capacity	17.96 A
Phase Resistance	0.1518 ohms	Phase Reactance	0.0031 ohms
Earth Resistance	0.2442 ohms	Earth Reactance	0.0031 ohms
Volt Drop on Cable	3.21 V / 0.80 %	Total Volt Drop	6.74 V / 1.68 %
Cable Fault Loop Imp.	0.4386 ohms	Total Fault Loop Imp.	0.5643 ohms
Max Fault Loop Imp.	1.7935 ohms		
Fault kA at Source	2.94 kA	Fault kA at Destination	0.96 kA
Max. Run Length	112.13 m	Touch Potential	133.56 V
<b>Derating Factors</b>		Total Derating	1.00
Cable Configuration	1.00	Ambient Temperature	1.00
Depth of Laying	1.00	Thermal Resistivity	1.00
Other Circuits	1.00	Cable Drum / Reel	1.00

**Maximum Demand Calculation**

Job Number	12109	Company Name	Building Services Design
Job Name	Stevens Street	ABN	
Author		License Number	
User Name			
Client		Date Printed	11 Sep 2012
Job Description			

Load Description MSB

Installation type	Factories
Supply details	400 V / 3 Ø
Calculated maximum demand	40.38 A
Phase 1 load	40.38 A
Phase 2 load	33.89 A
Phase 3 load	30.64 A

Inputs					
Group	Qty	Description	Phase 1	Phase 2	Phase 3
B(i)	2	Laptop GPO			
B(i)	1	Aux Controls			
B(i)	1	3 Phase Outlet			
B(i)	1	Emergency Relay			
D	2	Pump	15.04	15.04	15.04

Result					
Group	Qty	Description	Phase 1	Phase 2	Phase 3
B(i)	5	Total 10A socket outlets	14.07	7.58	4.33
D	1	Pump	15.04	15.04	15.04
D	1	Pump	11.28	11.28	11.28

**Building Services Design**

PO Box 296

Arana Hills 4054



Selectivity Analysis Program

Ph No. : 07 3056 0230

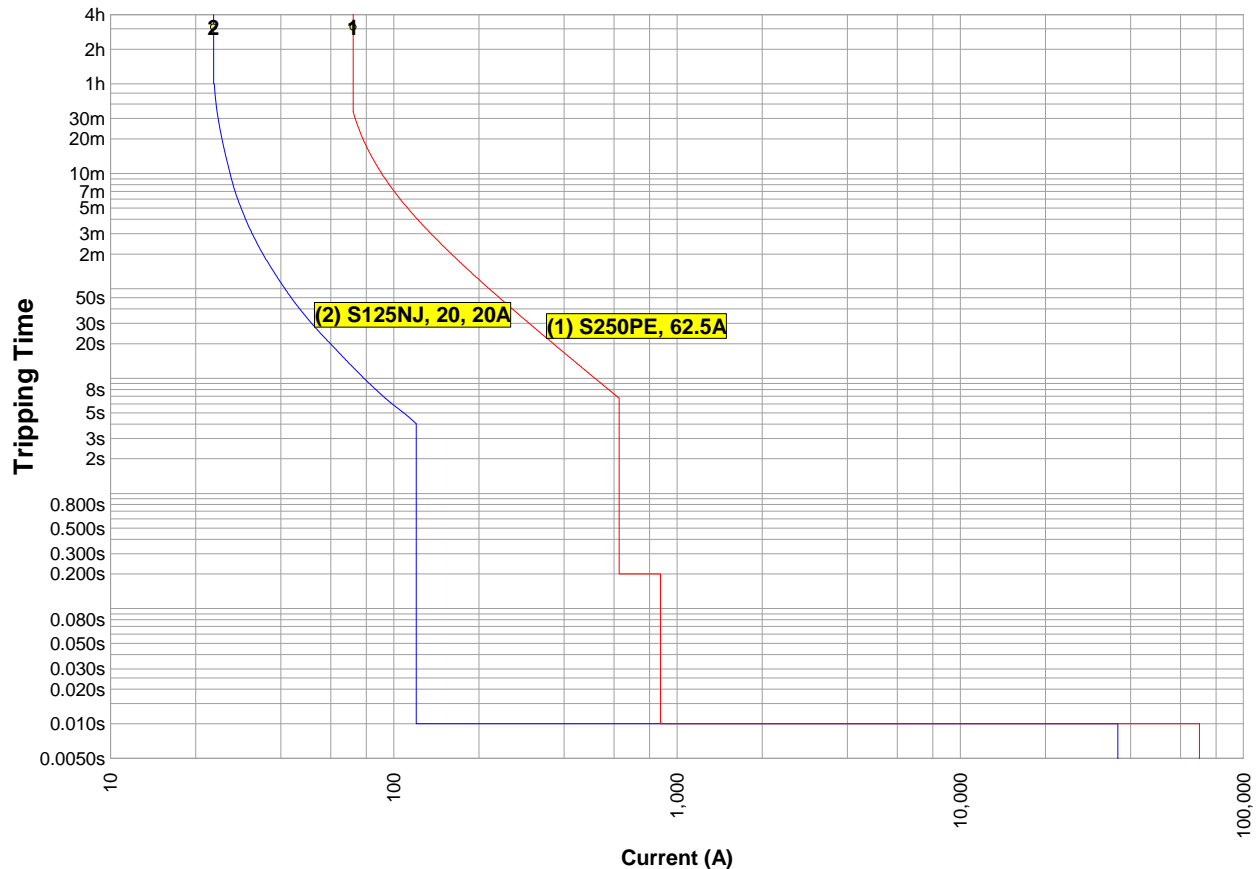
Mobile No. :

Fax No. :

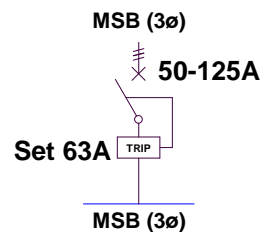
Email :

**Project :** Stevens Street**File :** Stevens Street**Printed :** 10 Sep 2012

10:27 pm

**SUPPLY**Circuit: **MSB - C (3ø)****TIME/CURRENT CURVE****1 Up Stream - MSB (3ø) :****Model :** S250PE**OCR :** 125**Trip Setting :** 63 A**Breaking Capacity :****Catalogue # :** S250PE 3 125**Adjustable Settings:**

IR	Characteristics
0.5	6
62.5 A	



**Building Services Design**

PO Box 296

Arana Hills 4054



Selectivity Analysis Program

Ph No. : 07 3056 0230

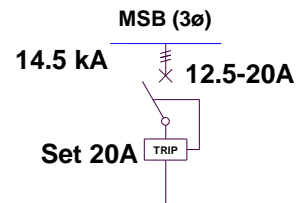
Mobile No. :

Fax No. :

Email :

**Project :** Stevens Street**File :** Stevens Street**Printed :** 10 Sep 2012

10:27 pm

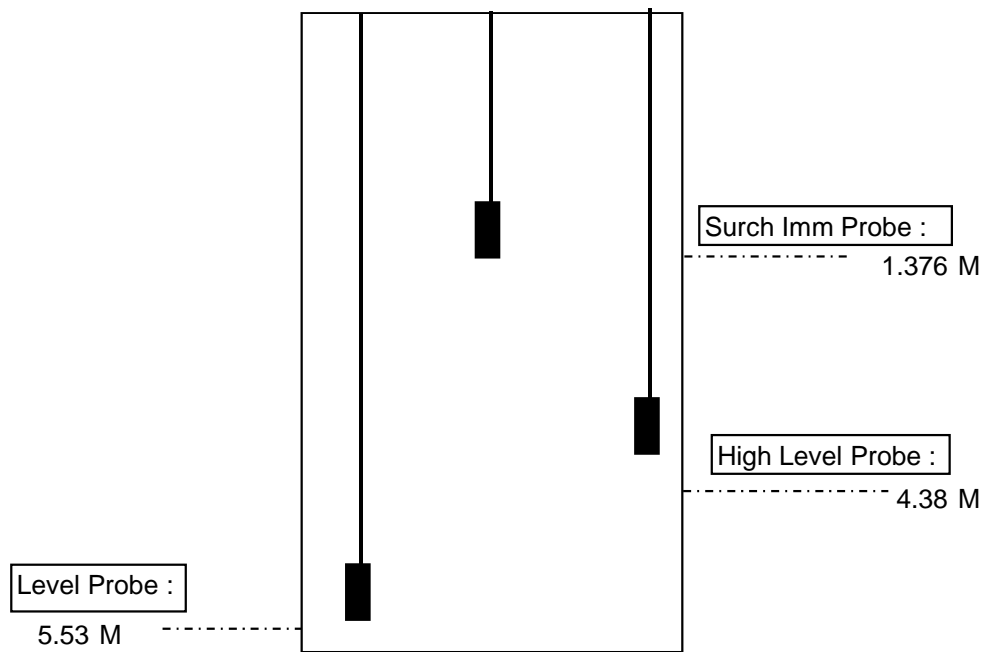
**SUPPLY**Circuit: **MSB - C (3ø)****TIME/CURRENT CURVE****2** **Down Stream - MSB (3ø) :****Circuit I.D. :** C2 (3ø)**Circuit Breaker (MCCB) Model :** S125NJ**Trip Unit :** 20**Trip Setting :** 20 A**Breaking Capacity :** 36 kA**Catalogue # :** S125NJ 3 20**Adjustable Settings:**

<b>I<sub>r</sub></b>	<b>I<sub>m</sub></b>
1	6
20 A	120 A

#### 4.6 LEVEL PROBE COMMISSIONING INFORMATION

As part of the commissioning process the level probes within the wet well were commissioned to ensure the operation of the pumping station.

The following pages contain the commissioning data for the probes within the wet well.



Hanging Depths (from electrode box clamp)		
Surch Imm Probe	1.376	M
High Level Probe	4.380	M
Wet Well Probe	5.530	M

Existing RTU LUT in Main file

/\* wet well level to volume lookup table - based on vega probe 0 level \*/  
record 1

Range	5 M		Level	Units	Percent	ma	RTU Units
		Max VEGA Level	2.900	MAHD	100	20	4000
		Surcharge Occuring	2.354	MAHD	89.08%	18.3	3651
		Surcharge Imminent + 100 mm	2.154	MAHD	85.08%	17.6	3523
		Surcharge Imminent	2.054	MAHD	83.08%	17.3	3459
		Inhibit start level	1.854	MAHD	79.08%	16.7	3331
		Inhibit stop level	1.654	MAHD	75.08%	16.0	3203
		High Alarm + 100 mm	-0.850	MAHD	25.00%	8.0	1600
		High Alarm	-0.950	MAHD	23.00%	7.7	1536
		Duty B Start Level	-1.300	MAHD	16.00%	6.6	1312
		Duty A Start Level	-1.350	MAHD	15.00%	6.4	1280
		Duty B Stop Level	-1.800	MAHD	6.00%	5.0	992
		Duty A Stop Level	-1.850	MAHD	5.00%	4.8	960
		Low Level alarm	-2.000	MAHD	2.00%	4.3	864
		Wet Well Probe elevation	-2.100	MAHD	0.00%	4.0	800

Range	10 M	<b>DELIVERY PRESSURE PROBE</b>	Pressure	Units	Percent	ma	RTU Units
		20mA Value	12.901	MAHD	100.00%	20.0	4000
		High Alarm	12.901	MAHD	100.00%	20.0	4000
		Low Level alarm	2.901	MAHD	0.00%	4.0	800
		Pressure Probe 1 Elevation	2.901	MAHD	0.00%	4.0	800

Elevation  
3.43

Water Height Location	Water Height	Volume in	Remaining Storage	mm	MD3311 Staged Volume	Existing Vol in LUT
<b>BWL of PS</b>	1.025	0.000	6.308	0	0.000	0.000
	1.095	0.299	6.009	70	0.299	0.299
	1.165	0.599	5.710	140	0.299	0.599
	1.235	0.898	5.411	210	0.299	0.898
	1.305	1.197	5.111	280	0.299	1.197
	1.375	1.496	4.812	350	0.299	1.496
	1.445	1.796	4.513	420	0.299	1.796
<b>TWL of PS</b>	1.525	2.139	4.169	500	0.344	2.139
	1.585	2.394	3.914	560	0.255	2.394
	1.655	2.693	3.615	630	0.299	2.693
	1.724	2.993	3.316	699	0.299	2.993
	1.794	3.292	3.016	769	0.299	3.292
	1.864	3.591	2.717	839	0.299	3.591
<b>High Alarm Level</b>	1.925	3.851	2.458	900	0.259	3.851
	2.004	4.190	2.119	979	0.339	4.190
	2.074	4.489	1.819	1049	0.299	4.489
	2.144	4.789	1.520	1119	0.300	4.789
	2.214	5.201	1.107	1189	0.413	5.201
	2.284	5.738	0.570	1259	0.536	5.738
<b>Surcharge Level</b>	2.354	6.308	0.000	1329	0.570	6.308

SP065

#### 4.7 CONTRACTORS CERTIFICATE OF TESTING AND SAFETY

The following document certifies that the installed electrical equipment has been tested to ensure it is electrically safe and in accordance with wiring rules and AS3000.



Contractors License Number: 66226

Nilsen Project Number: 32887

# Certificate of Testing and Safety

This certificate is issued in accordance with Clause S15 of the Electrical Safety Regulations 2002, to certify the electrical equipment below, to the extent it is affected by the electrical work performed, has been tested to ensure it is electrically safe and is in accordance with the requirements of the wiring rules and any other standard applying under this regulation to the electrical installation.

Customer: QUEENSLAND URBAN UTILITIES

Contact: MORGAN KAREY

Address: SP065 STEVENS STREET

Date of Testing: 15/11/12

Electrical Equipment Tested: SUB MAINS TO PANEL, EARTH PANEL  
LOOP + CONTINUITY + RCD PUSH BUTTON.

Limitations of the Work: The work was limited to the installation / testing of the above equipment by Nilsen personnel only.

Reference Documents: Refer to Nilsen Engineering Services Test Report.

Exclusions: Any work not included within Nilsen Engineering Services Test Report.

Signed: 

Date: 15-11-12

Position: PROJECT MANAGER / ELECTRICIAN

ENERGY DISTRIBUTION  
BY SUNLINE

# Sunline Switchboards Pty. Ltd.

A.B.N. 13 010 342 622

7 Duntroon Street, Brendale, Qld. 4500 Australia

P.O. Box 5274, Brendale MDC, Qld. 4500

International Telephone: +61 7 3881 3433

International Facsimile: +61 7 3881 3611

Telephone: (07) 3881 3433 Facsimile: (07) 3881 3611

Email: admin@sunline.net.au

Website: www.sunline.net.au


**Quality  
Endorsed  
Company**  
ISO9001 Lic No. 12559  
Standards Australia

## CERTIFICATE OF:

(Please mark relevant check-box)

☐ **TESTING AND COMPLIANCE** ( **Electrical installations** )
Issued in accordance with s159 of the *Electrical Safety Regulation 2002*
☒ **TESTING AND SAFETY** ( **Electrical equipment** )
Issued in accordance with s15 of the *Electrical Safety Regulation 2002*

\* Work performed for:

\* Name Quu

Title

Given name/s

Surname

\* Address Queensland Urban Utilities Western Tower Level 7 171 Roma St

Street

Brisbane

Suburb/town

4000

Postcode

\* Electrical installation / equipment tested (detailed list of all work done):

Manufacture of replacement switchboard for SP065 Stevens Street Pumping Station.

Refer to drawings: 486/5/7-0271-001 to 486/5/7-0271-025


\* Date of test 31 / 8 / 2012\* Electrical contractor licence number 55629Name on contractor licence SUNLINE SWITCHBOARDS PTY LTDElectrical contractor phone number (07)38813433

For **electrical installations**, this certifies that the electrical installation, to the extent it is affected by the electrical work, has been tested to ensure that it is electrically safe and is in accordance with the requirements of the wiring rules and any other standard applying under the *Electrical Safety Regulation 2002* to the electrical installation.

For **electrical equipment**, this certifies that the electrical equipment, to the extent it is affected by the electrical work, is electrically safe.

Name Neil O'Brien

Person who performed, or person who is responsible for work

Signature Date 14 / 1 / 2013