



## **OPERATIONS & MAINTENANCE MANUALS**

### **ELECTRICAL EQUIPMENT**

## **REFURBISHMENT OF PRIMARY SETTLING TANKS 1 & 2 AT LUGGAGE POINT WRP**



# Table Of Contents

<b>SECTION 1</b>	<b>INTRODUCTION</b>
	1.1 GENERAL DESCRIPTION
	1.2 ELECTRICAL
	1.3 PURPOSE OF MANUAL
	1.4 ELECTRICAL CONTRACTOR
<b>SECTION 2</b>	<b>SERVICE &amp; MAINTENANCE CONTACT DETAILS</b>
	2.1 CLIENT SERVICES CONTACT DETAILS & FLOW CHARTS
	2.3 HEYDAY GROUP 24-HOUR SERVICE FLYER
<b>SECTION 3</b>	<b>SWITCHBOARDS/ CONTROL PANELS</b>
	3.1 GENERAL DESCRIPTION
	3.2 MAINTENANCE
	3.2.1 Safety Switch Testing
	3.3 SCHEMATICS
<b>SECTION 4</b>	<b>EQUIPMENT LISTINGS</b>
	4.1 GENERAL DESCRIPTION
	4.2 MAINTENANCE
	4.3 DRAWINGS / INSTALLATION MANUALS
	4.4 BROCHURES
<b>SECTION 5</b>	<b>ELECTRICAL ACCESSORIES</b>
	5.1 GENERAL DESCRIPTION
	5.2 CABLE TRAY
	5.3 ACCESSORIES MANUFACTURER'S PARTS LIST
	5.4 ACCESSORIES BROCHURES
<b>SECTION 6</b>	<b>CABLING</b>
	6.1 GENERAL DESCRIPTION
	6.2 MANUFACTURER'S PARTS LIST
	6.3 CABLING BROCHURES
<b>SECTION 7</b>	<b>TESTING &amp; COMMISSIONING</b>
<b>SECTION 8</b>	<b>AS INSTALLED DRAWINGS</b>

## SECTION 1 INTRODUCTION

### 1.1 GENERAL DESCRIPTION

Refurbishment of Primary Settling Tanks 1 and 2 at Luggage Point Waste Water Treatment Plant.

### 1.2 ELECTRICAL

Supply and install new cable paths, cabling, control panels and earthing for the electrical operation of the Primary Settling Tanks 1 and 2.

### 1.3 PURPOSE OF MANUAL

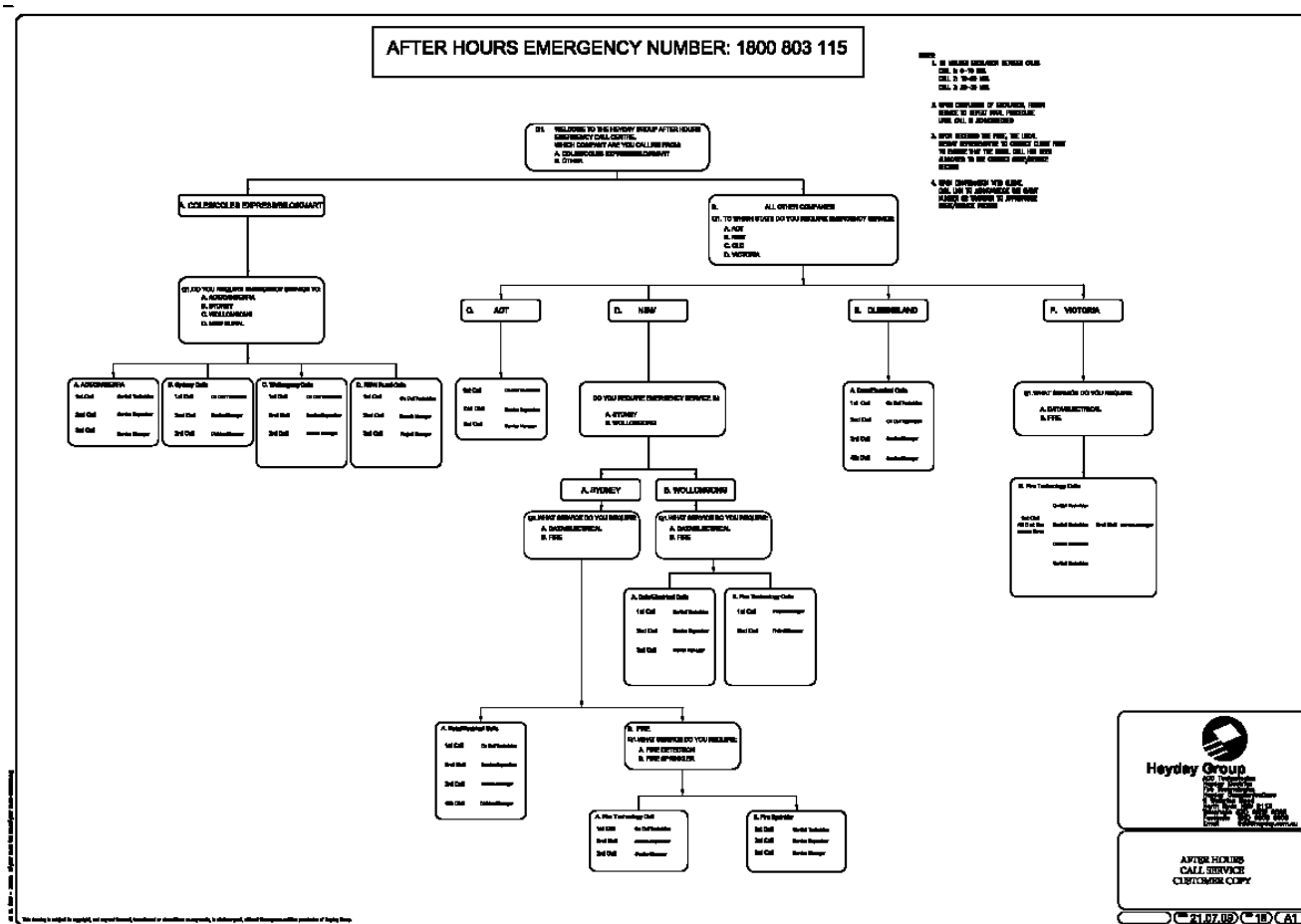
The purpose of this manual is to demonstrate to the operator how to operate the complete electrical system and how to execute periodical services and preventative maintenance procedures. The O&M manual is divided into various sections that relate back to the Table of Contents at the front of the manual. Please refer to the As Installed Drawings in this manual for detailed locations of all electrical equipment.

### 1.4 ELECTRICAL CONTRACTOR

The Electrical Contractor for this project was Heyday Group whom can be contacted as per the following details.

If you require any periodical maintenance operations to be carried out or emergency breakdowns, please see [Section 2](#) of this manual for Heyday Group's 24-Hour Service contact details.

## 2.1 CLIENT SERVICES CONTACT DETAILS & FLOW CHARTS



## 2.3 HEYDAY GROUP 24-HOUR SERVICE FLYER



**24-Hour Service**  
**Phone: 1800 803 115**

Heyday Group Pty Ltd  
 ABN 62 121 276 168  
 Heyday Electrics  
 ACC Technologies  
 Heyday Communications  
 Heyday Fire Technologies

For more than 30 years the Heyday Group has been providing electrical, data & communication solutions to corporate Australia. Our specialist support for your electrical & data requirements includes a comprehensive range of technical services.

### DATA & VOICE SERVICES

- Category 5E, 6, 7, SFTP & Fibre Optic Structured Cabling Systems
- Installation, Maintenance, Moves, Adds & Changes (MAC) Services
- Network Integration
- Telephone Systems
- Design & Certification for all Major Cabling System Vendors
- Network Hardware
- Patching & Jumpering Services
- Communication Cabling Audits



### ELECTRICAL SERVICES

- Emergency & Exit Light Testing, Repairs & Certification
- Tagging & Testing Portable Equipment & Appliances
- RCD Protection Installation & Testing
- Commercial & Industrial Installations & Maintenance
- Switchboard Audits, Thermal Imaging & Repairs
- Power Monitoring
- Installation & Service of UPS & Surge Protection
- Generator Electrical Testing & Maintenance



### CONTACT US:

Electrical Services Division

Telephone: (07) 3633 5701  
 After Hours: 1800 803 115  
 Facsimile: (07) 3268 3055

Address: Unit 2, 783 Kingsford Smith Avenue,  
 Eagle Farm QLD 4009  
 Email: [terry.fisher@heyday.com.au](mailto:terry.fisher@heyday.com.au) OR  
[qld.info@heyday.com.au](mailto:qld.info@heyday.com.au)  
 Web: [www.heyday.com.au](http://www.heyday.com.au)

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BRISBANE FILE 2

27/07/2009

## SECTION 3 SWITCHBOARDS/ CONTROL PANELS

### 3.1 GENERAL DESCRIPTION

PST 1 and 2 Bridge Control Panel

<b>Manufacturer:</b>	Powertek Australia Pty Ltd
<b>Model:</b>	Custom Build
<b>Supplier Contact:</b>	Peter Freeman
<b>Address:</b>	47 Elizabeth St, Devonport 7310
<b>Phone:</b>	0364234840
<b>Facsimile:</b>	0364248260

### 3.2 MAINTENANCE

- Check Labels are in place.
- Perform trip test on the Safety Switch circuit breakers monthly.
- Shutdown Switchboards and retention connections - 12 monthly periods.
- Check and replace if required faulty pilot lamps - 6 monthly periods.
- Visual checks for HR joints on terminals - 12 monthly periods.
- General repairs to damaged or faulty components - as required.

#### 3.2.1 Safety Switch Testing

The bridge supply is protected by Residual Current Devices which should be tested each month, this is a simple matter of pressing the test switch on the Poly Phase Din T circuit breaker located in the MCC Marshalling Cubicle, when pressed the circuit breaker should trip off disconnecting the power. If it does not trip off, call your electrician as the safety switch could be faulty.

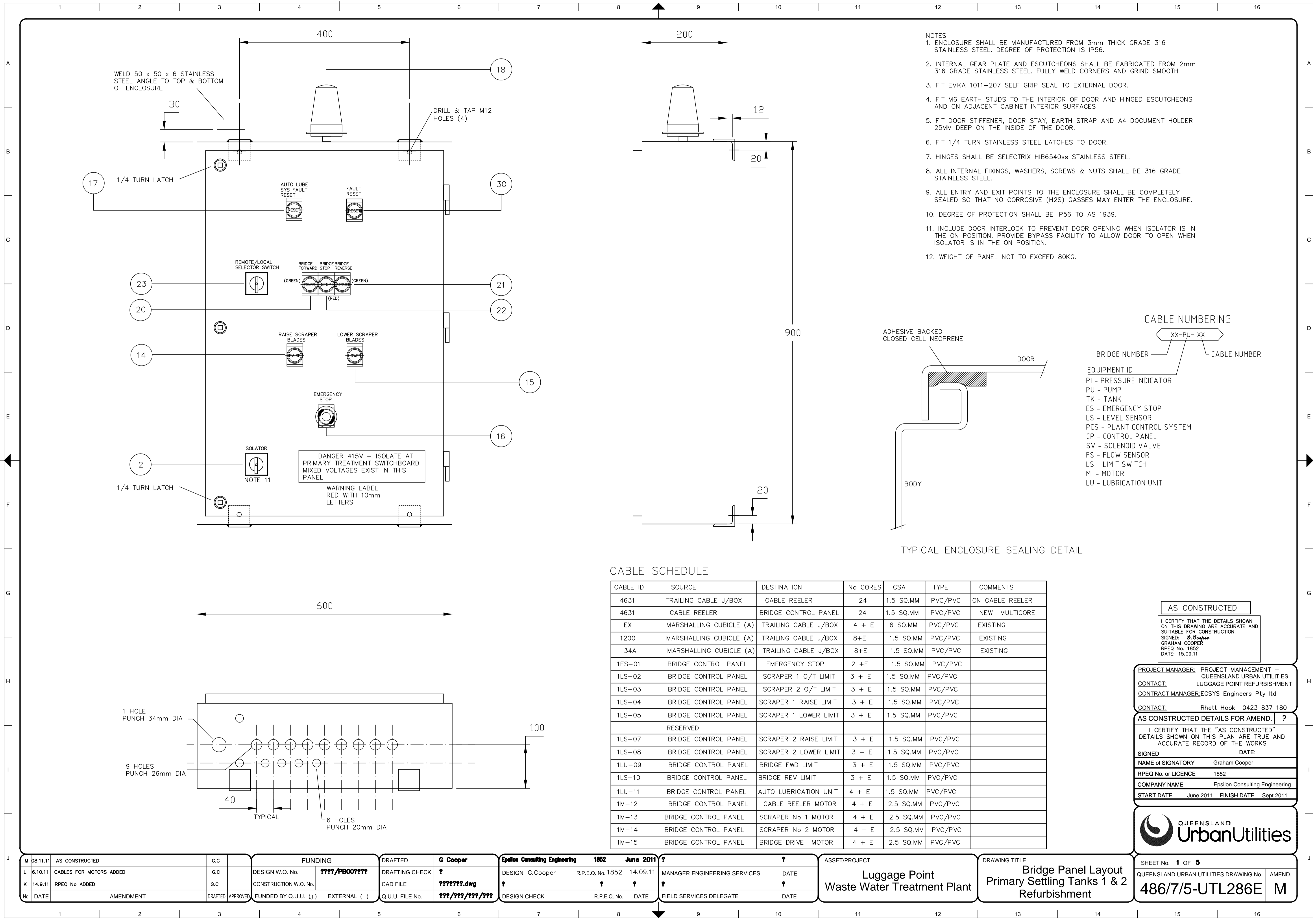
Every 3-months the safety switch must be tested using an electronic ELCB Tester. This tester tests the tripping time and current to check that the safety switch is tripping within the required codes. This test should only be performed by a licensed electrician.

### 3.3 SCHEMATICS

Drawing No.	Revision	Description
486/7/5-UTL224E	N	Circuit Diagram Bridge Control Panel
486/7/5-UTL225E	F	Circuit Diagram Bridge Control Panel
486/7/5-UTL286E	M	Front Panel Layout
486/7/5-UTL287E	L	Control Panel Layout









## SECTION 4 EQUIPMENT LISTINGS

### 4.1 GENERAL DESCRIPTION

Supplied items

ALL EQUIPMENT FOR CONTROL PANEL IS INCLUDED WITHIN THE DRAWING

Quantity	Type Product Code	Description	Supplier
2	N100 SERIES	FORWARD/REVERSE CONTROLLER	NHP
1	N100 SERIES	EMERGENCY STOP	NHP
8	CARLO GAVASSI	PROXIMITY SWITCHES 24VDC	NHP

## 4.2 MAINTENANCE

- Maintenance is essential to ensure ongoing service of plant and reduce breakdown situations
- Carry out checks as per manufacturers recommendations
- Visual inspection of components on a regular basis is recommended.
- General repairs as required.
- Earthing shall be tested on a regular basis TEST POINT LOCATED ON OLD LOCAL CONTROL PANEL.

## 4.3 DRAWINGS/ INSTALLATION MANUALS

Please see attached drawings for installed equipment..

## 4.4 BROCHURES

Please see attached brochures for installed equipment..

## 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]										
UL; CSA	[V]										
<b>Rated Impulse Voltage <math>U_{imp}</math></b>	[kV]	8 kV									
<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	62	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	1Ø	115 V	[A]	9.8	9.8	16	24	24	34	34	56	56	80
		230 V	[A]	10	12	17	17	28	28	40	50	68	68
		115 V	[HP]	1/2	1/2	1	2	2	3	3	5	5	7-1/2
		230 V	[HP]	1-1/2	2	3	3	5	5	7-1/2	10	15	15
	3Ø	200 V	[A]	7.8	11	17.5	17.5	25.3	32.2	32.2	48.3	62.1	78.2
		230 V	[A]	6.8	9.6	15.2	22	28	28	42	54	68	80
		460 V	[A]	7.6	11	14	21	27	34	40	52	65	77
		575 V	[A]	9	11	17	17	27	32	32	52	62	62
		200 V	[HP]	2	3	5	5	7-1/2	10	10	15	20	25
		230 V	[HP]	2	3	5	7-1/2	10	10	15	20	25	30
		460 V	[HP]	5	7-1/2	10	15	20	25	30	40	50	60
		575 V	[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

## Electrical Data

			CA7-9	CA7-12	CA7-16	CA7-23	CA7-30	CA7-37	CA7-43	CA7-60	CA7-72	CA7-85	
Switching Motor Loads <i>(continued)</i>													
AC4 (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	
	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	
60Hz	1Ø	115 V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38
		230 V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38
		115 V	[HP]	1/8	1/4	1/3	1/2	1/2	3/4	1	2	2	3
		230 V	[HP]	1/3	1/2	1	1-1/2	2	2	2	3	5	5
	3Ø	200 V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38
		230 V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38
		460 V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38
		575 V	[A]	4.3	6.6	9	10	12	14	16.5	25.5	31	38
		200 V	[HP]	3/4	1	2	2	3	3	3	7-1/2	7-1/2	10
		230 V	[HP]	1	1-1/2	2	3	3	3	5	7-1/2	10	10
		460 V	[HP]	2	3	5	5	7-1/2	10	10	15	20	25
		575 V	[HP]	3	5	7-1/2	7-1/2	10	10	10	20	25	30
	Max. Operating Rate		[ops/hour]	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 500,000 operations		Max FLC	[A]	8.0	11.0	16.0	21.0	27.0	31.0	37.0	43.0	54.0	62.0
	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, 3Ø Switching Ambient Temperature 40°C	$I_{th}$	[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	46	47	61	72	72	72
	500V	[kW]	28	28	28	28	56	56	74	87	87	87
	690V	[kW]	38	38	38	38	77	78	102	120	120	120
Ambient Temperature 60°C	$I_{th}$	[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	46	46	57	72	72	72
	500V	[kW]	28	28	28	28	56	56	69	87	87	87
	690V	[kW]	38	38	38	38	77	77	95	120	120	120
Max Operating Rate		[ops/hour]	1,000	1,000	1,000	1,000	1,000	1,000	300	600	600	600
<b>Continuous Current (UL/CSA)</b>												
General Purpose Rating (40°C)	Open	[A]	25	25	30	30	45	55	60	90	90	100
	Enclosed	[A]	25	25	30	30	45	55	60	90	90	100
Max. Operating Rate		[ops/hour]	1,400	1,400	1,200	1,200	1,200	1,000	1,000	700	700	600
<b>Lighting Loads</b> ⓘ												
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	77	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
<b>Switching power transformers AC-6a</b>												
<b>50Hz</b>												
Inrush		= n										
Rated transformer current		[A]	10.9	10.9	10.9	10.9	20	20	23	40.8	40.8	40.8
n = 30	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	16	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
		[A]	16.3	16.3	16.3	16.3	30	30	34.5	61.3	61.3	61.3
n = 20	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
		[A]	22	22	22	22	40	40	46	82	82	82
n = 15	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
		[A]	22	22	22	22	40	40	46	82	82	82

ⓘ 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	CA7-12	CA7-16	CA7-23	CA7-30	CA7-37	CA7-43	CA7-60	CA7-72	CA7-85
Contactors	Switching power transformers AC-6a											
	60Hz											
	Inrush	= n										
	Rated transformer current											
		[A]	10.9	10.9	10.9	10.9	20	20	23	40.8	40.8	40.8
	n = 30	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
		[A]	16.3	16.3	16.3	16.3	30	30	34.5	61.3	61.3	61.3
	n = 20	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
		[A]	22	22	22	22	40	40	46	82	82	82
	n = 15	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	10	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												
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

## Capacitor Ratings ①

## Capacitor Switching AC-6b - 50Hz

		CA7-9	CA7-12	CA7-16	CA7-23	CA7-30	CA7-37	CA7-43	CA7-60	CA7-72	CA7-85
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	24	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	10	12.5	12.5	18	28	28	28
	230 V [kVar]	5	5	8	10	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 µH; CA7-37...CA7-85 = L min. 6 µH

## 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_n</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	17.5
	DC	[W]	6.7	7.2	8.1	12.4	14.6	17.4	18.4	11	13.8	17.5
Coil Only	AC	[W]	2.6	2.6	2.6	3.0	3.0	3.0	3.2	4.5	4.5	4.5
	DC	[W]	6.0	6.0	6.0	9.2	9.2	9.2	10.0	4.9	4.9	4.9

**Short-Circuit Coordination**  
**Contactors, or Contactors with Solid-State**  
**and Bimetallic Overload Relays**
**DIN Fuses - gG, gL**

Available Fault Current	[A]						100,000					
Type "1" (690V)	[A]	50	50	50	63	100	125	160	200	250	250	
Type "2" (690V)	[A]	25	35	35	40	80	80	100	160	160	160	

**BS88 Fuses**

Available Fault Current	[A]						80,000					
Type "1" (690V)	[A]	25	32	35	50	63	80	100	100	125	160	
Type "2" (690V)	[A]	25	32	35	50	63	80	100	100	125	160	

**UL Class K1, RK1, K5 and RK5 Fuses**

Available Fault Current	[A]	5000	5000	5000	5000	5000	5000	5000	5000	5000	10000	10000
Max. Fuse (600V)	[A]	35	40	70	90	110	125	150	200	250	300	

**UL Class CC Fuses****CSA HRCI-MISC Fuses**

Available Fault Current	[A]						100,000					
Type "2" (600V)	[A]	15	20	20	30	~	~	~	~	~	~	

**UL Class J Fuses****UL Class K1, RK1 Fuses****CSA HRCI- J Fuses**

Available Fault Current	[A]						100,000					
Type "2" (600V)	[A]	15	20	20	30	40	50	50	80	100	100	

**Short Time Current Withstand Ratings**

$I_{cw}$ 60° C	1 s	[A]	210	210	290	380	480	525	650	1,110	1,150	1,250
	4 s	[A]	140	150	220	280	360	390	480	820	860	910
	10 s	[A]	100	120	175	220	290	310	375	640	680	710
	15 s	[A]	90	100	150	200	250	270	325	560	600	620
	60 s	[A]	60	60	90	125	170	175	200	350	370	380
	240 s	[A]	40	40	50	60	100	100	120	190	190	200
	900 s	[A]	30	30	38	38	524	60	75	108	108	120
	Off Time Between Operations	[Min.]	20	20	20	20	20	20	20	20	20	20

❶ 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.

## Electrical Data

Short Circuit Coordination  $I_{cs}$  AC3

Type 2 Coordination Combinations (contactor, overload and fuses) — Per UL 508 and IEC 947-4-1

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














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
	CT7-24-0.16...10			
CA7-12	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			











## Mechanical Data

			CA7-9	CA7-12	CA7-16	CA7-23	CA7-30	CA7-37	CA7-43	CA7-60	CA7-72	CA7-85
Service Life	Mechanical	AC	[Mil.]	13	13	13	13	13	13	12	10	10
		DC	[Mil.]	13	13	13	13	13	13	10	10	10
Shipping Weights												
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

## Terminations - Power

Description												
			One saddleclamp per pole: cross, slotted or Pozidrive screw				Dual connection; one saddleclamp and one box lug per pole; cross, slotted or Pozidrive 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...6	14...6	14...4	14...1	14...1	14...1
	2 Wires	[AWG]	16...10	16...10	16...10	16...10	14...6	14...6	14...4	14...1	14...1	14...1
Torque Requirement			[Nm]	1...2.5	1...2.5	1...2.5	2.5...3.5	2.5...3.5	2.5...3.5	3.5...6	3.5...6	3.5...6
			[Lb-in]	9...22	9...22	9...22	22...31	22...31	22...31	31...52	31...52	31...52

## Terminations - Control

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								

## Degree of Protection - contactor

IP 2LX per IEC 529 and DIN 40 050 (with wires installed)

## Protection Against Accidental Contact

Safe from touch by fingers and back-of-hand per VDE 0106; Part 100

## Environmental and General Specifications

## Ambient Temperature

Storage

-55...+80° C (-67...176° F) – [C17E Electronic Interface -50...+80° C (-58...176° F)]

Operation

-25...+60° C (-13...140° F)

Conditioned 15% current reduction after AC-1 at &gt;60° C

-25...+70° C (-13...158° F)

## Altitude at installed site

2000 meters above sea level per IEC 947-4

## Resistance to Corrosion / Humidity

Damp-alternating climate: cyclic to IEC 68-2, 56 cycles.

Dry heat: IEC 68-2, +100° C (212° F), relative humidity &lt;50%, 7 days.

Damp tropical: IEC 68-2, +40° C (104° F), relative humidity &lt;92%, 56 days.

## Shock Resistance

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

## Vibration Resistance

IEC 68-2: Static &gt;2g, in normal position no malfunction &lt;5g

## Pollution Degree

3

## Operating Position

Refer to Dimension Pages










## Standards

IEC947-1/4, EN 60947; UL 508; CSA 22.2, No. 14

## Approvals

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; CE			
Conformity to Standards					UL508; CSA 22.2 No.14; IEC 60947-4			
Protection Against Accidental Contact					IP2LX Finger Protection			
Terminations								
Description			Cross, slotted or Pozidrive screw		Allen Head; 5mm, 3/16		Allen Head; 7mm, 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] [Lb-in]	2...3 18...27	2...3 18...27	3...6 27...54	8...12 72...108	6...12 54...108	6...12 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	[x U <sub>g</sub> ]						0.85...1.1				
	Dropout	[x U <sub>g</sub> ]						0.3...0.6				
DC	Pickup	[x U <sub>g</sub> ]						0.8...1.1 (9V coils = 0.65...1.3; 24V coils = 0.7...1.25)				
	Dropout	[x U <sub>g</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	10...60
True DC Coils (CA7C)	Pickup	[ms]	40...70	40...70	40...70	40...70	50...80	50...80	50...80	—	—	—
without Suppression	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	17...23	—	—	—
with External Suppression	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
with Internal Suppression	Dropout	[ms]	9...20	9...20	14...24	14...24	14...24	14...24	14...24	20...35	20...35	20...35

## Auxiliary Contacts

			Built-in Auxiliary Contacts in Contactor CA7-9... CA7-23								Front Mouted Auxiliary Contacts CA7-PV, CS7-PV, CZE/A7, CV7								Side Mounted Auxiliary Contacts CA-PA, CM7								
<b>Current Switching</b>																											
AC-12 lth	at 40°C	[A]	25								10								10								
	at 60°C	[A]	20								6								6								
AC-15, switching electromagnetic loads at:		[V]	24	48	120	240	400	500	600	690	24	48	120	240	400	500	600	690	24	48	120	240	400	500	600	690	
		[A]	10	10	10	10	6	5	2.5	1	6	6	6	5	3	2.5	1.6	1	3	3	3	3	2	2	1.6	0.75	
DC-13, switching DC electromagnets at:		[V]	24	48	110	220	440				24	48	110	220	440				24	48	110	220	440				
		[A]	5	3	1.2	0.6	0.15				5	3	1.2	0.6	0.15				5	3	1.2	0.6	0.15				
<b>Continuous Current Rating per UL/CSA</b>																											
Rated Voltage	AC	[V]	600 max.								600 max.								600 max.								
Continuous Rating	40°C	[A]	10A general purpose Heavy pilot duty (A600)								10A general purpose Heavy pilot duty (A600)								10A 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 - gG Fuse</b>																											
Type 2 Coordination		[A]	20								10								10								
<b>Rated Impulse Voltage</b> $U_{imp}$		[kV]	8								8								6								
<b>Insulation Voltage</b> (between control and load circuit) per DIN, VDE 0106, Part 101 (NAMUR recommendation)																											
		[V]	380								440								440								
<b>Contact Reliability</b> (per DIN19240 without contamination, normal industrial atmosphere)																											
			17V 10mA								17V 5mA								17V 10mA								
<b>Mechanically Linked Contacts</b> (per IEC 60947-5-1 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			2 x A4								2 x A4								2 x A4								
	Flexible with Wire- End Ferrule	1 Conductor	[mm²]	1...4								0.5...2.5								0.5...2.5							
		2 Conductor	[mm²]	1... 4								0.75...2.6								0.75...2.6							
	Solid/Stranded- Conductor	1 Conductor	[mm²]	1.5...6								0.5...2.5								0.5...2.5							
		2 Conductor	[mm²]	1.5... 6								0.75...2.6								0.75...2.6							
Recommended Tightening Torque				[Nm] 1...2.5								1...1.5								1...1.5							
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>Timing Attachment, CRZE7, CRZA7</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	2.5
	250DC	0.27A/69VA	0.27A/69VA	
	301-600DC	0.1A/69VA	0.1A/69VA	

### 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 ①**

	Category	Typical Applications	Rated Current	Conditions for testing electrical life						ps.	Conditions for testing making and breaking capacity						ps.
				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 <sub>c</sub> /I <sub>e</sub>	U <sub>r</sub> /U <sub>e</sub>	cos	
ON	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	Squirrel-cage motors: Starting, switching off motors during running	I ≤ 17Amp	6	1	0.65	1	0.17	0.65	6000	10	1.1	0.65	8	1.1	0.65	50
			17Amp < I ≤ 100Amp	6	1	0.35	1	0.17	0.35		10	1.1	0.35	8	1.1	0.35	
			I > 100Amp	6	1	0.35	1	0.17	0.35		8 Å	1.1	0.35	6 Å	1.1	0.35	
	AC-4	Squirrel-cage motors: Starting, plugging, inching ⑤	I ≤ 17Amp 17Amp < I ≤ 100Amp I > 100Amp	6 6 6	1 1 1	0.65 0.35 0.35	6 6 6	1 1 1	0.65 0.35 0.35	6000	12 12 10 Ö	1.1 1.1 1.1	0.65 0.35 0.35	10 10 8 Å	1.1 1.1 1.1	0.65 0.35 0.35	50
	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							
ON	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
W	AC-20	Connecting and disconnecting under no load conditions		No testing required													
	AC-21	Switching of 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

① 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.

② With a minimum value of 1000A for  $I$  or  $I_c$ .

③ With a minimum value of 800A for  $I_c$ .

④ With a minimum value of 1200A for  $I$ .

⑤ 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 ①**

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 <sub>c</sub> /I <sub>e</sub>	U <sub>r</sub> /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 ②	1.1 ②	1 ②	1.5 ②	1.1 ②	1 ②	
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 ③	1	1	6 x P ③		1.1	1.1	6 x P ③	1.1	1.1	6 x P ③	

#### 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

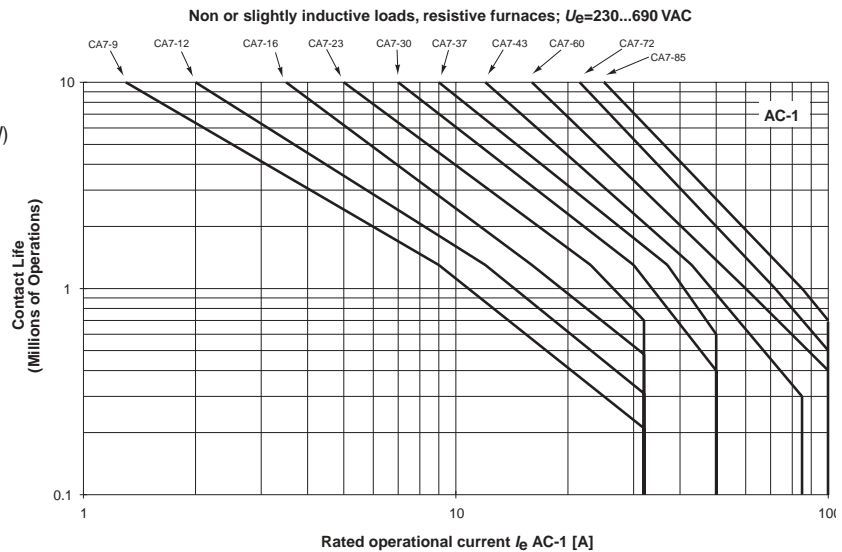
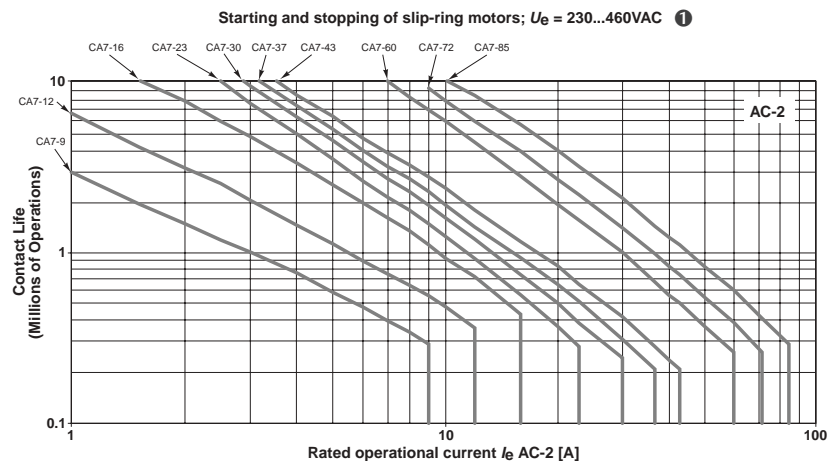
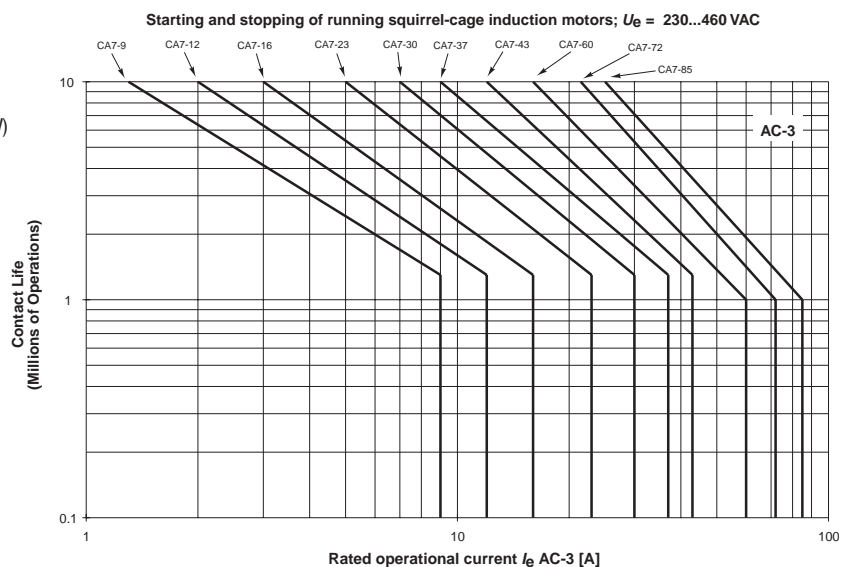
① Utilization categories and test conditions for AC & DC. For contactors according to IEC 158-1, starters according to IEC 292-1 ... 4 and control switches according to IEC 337-1 and IEC 337-1A.

② Only according to VDE.

③  $P = U_e \times I_e$  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  $P = 50W$ .

## 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-1**  
(to 690V)**AC-2**  
(to 460V)**AC-3**  
(to 460V)

**NOTE:** The life-load curves shown here are based on Sprecher+Schuh tests according to the requirements defined in IEC 947-4-1. 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.

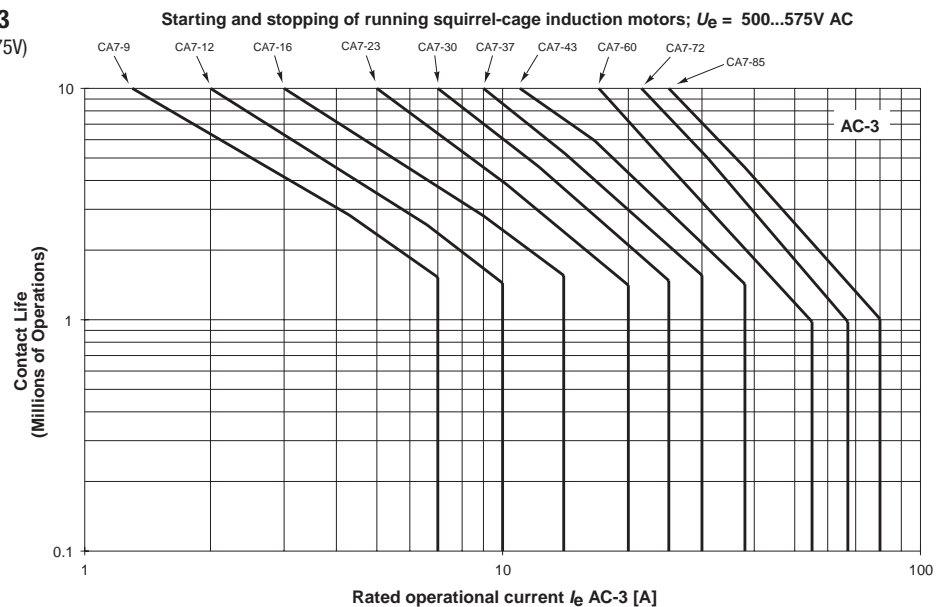
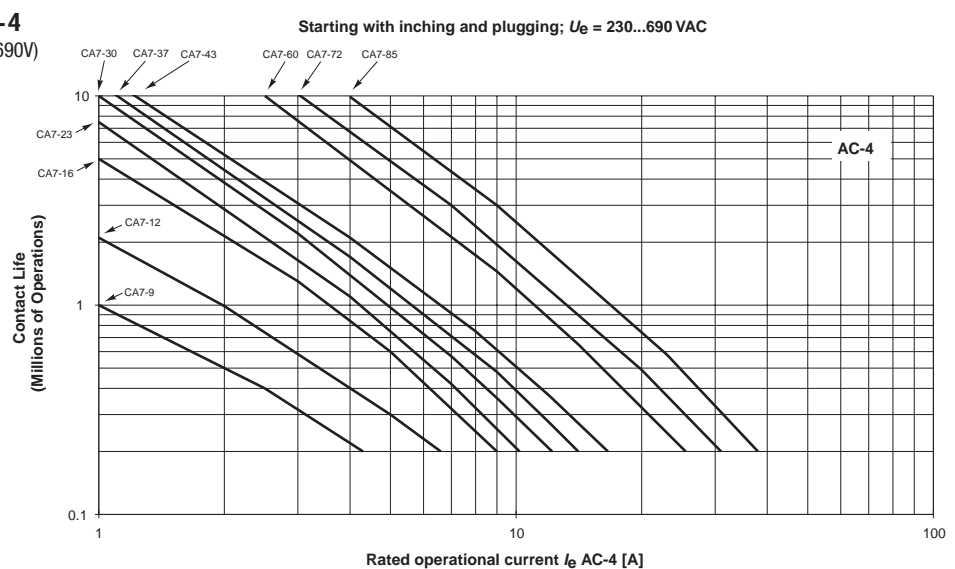
## A

## Life-Load Curves

## Contactors

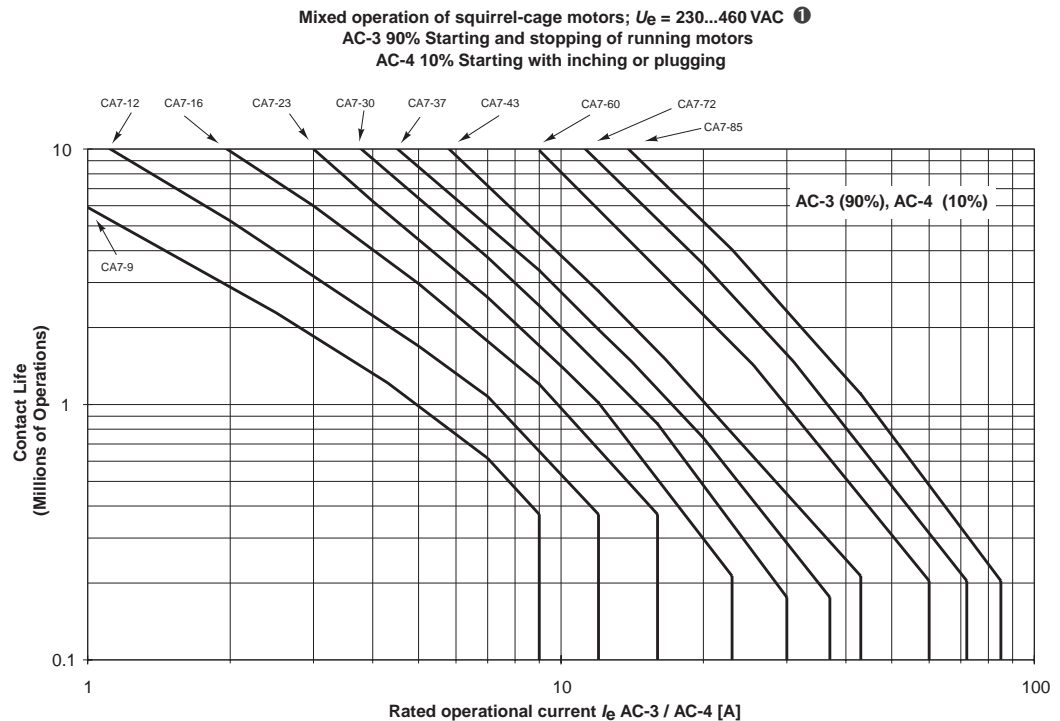
## CA7

- 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 575V)**AC-4**  
(to 690V)

**NOTE:** The life-load curves shown here are based on Sprecher+Schuh tests according to the requirements defined in IEC 947-4-1. 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.

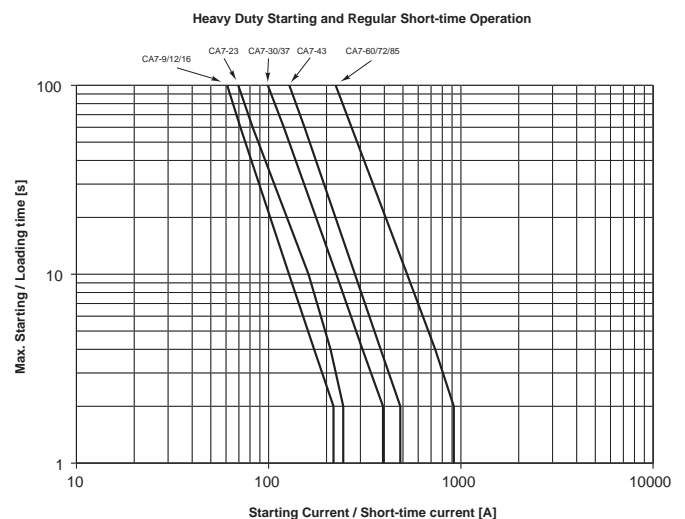
## Life-Load Curves

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 947-4-1. 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 @ $I_b$ for 200K ops. Max. ops/hr.
	Operating Parameters and Start Time				
			40% Duty Cycle 250ms ❶	250ms	250ms
CA7-9	1000	500	700	200	400
CA7-12	1000	500	700	150	300
CA7-16	1000	500	700	120	240
CA7-23	1000	400	600	80	160
CA7-30	1000	400	600	80	160
CA7-37	1000	400	600	70	140
CA7-43	1000	400	600	70	140
CA7-60	800	300	500	70	140
CA7-72	800	250	500	60	120
CA7-85	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.*

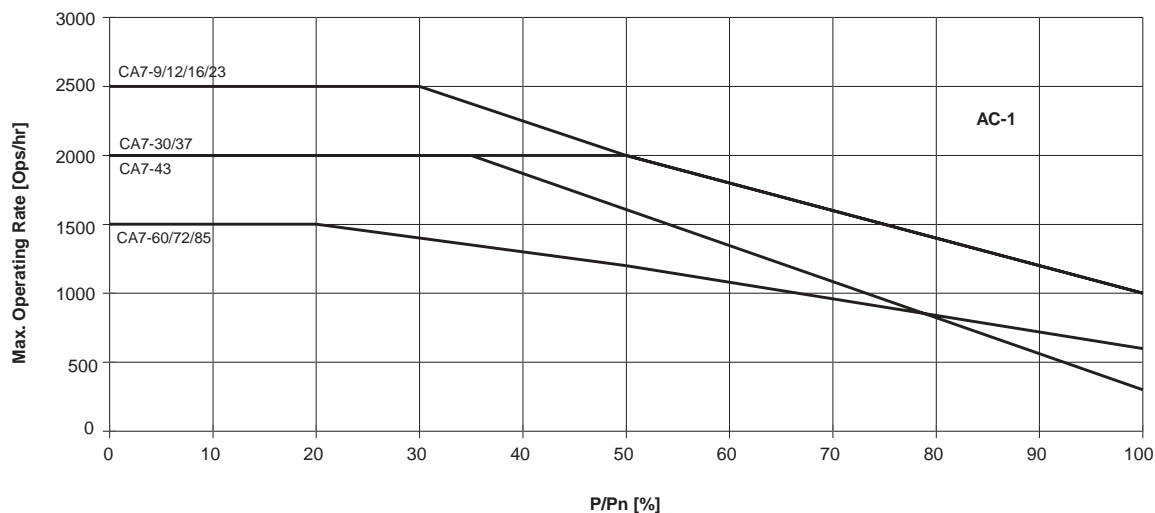
To determine the “on” time and “off” time:

- 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]

## Operating Rate Curves

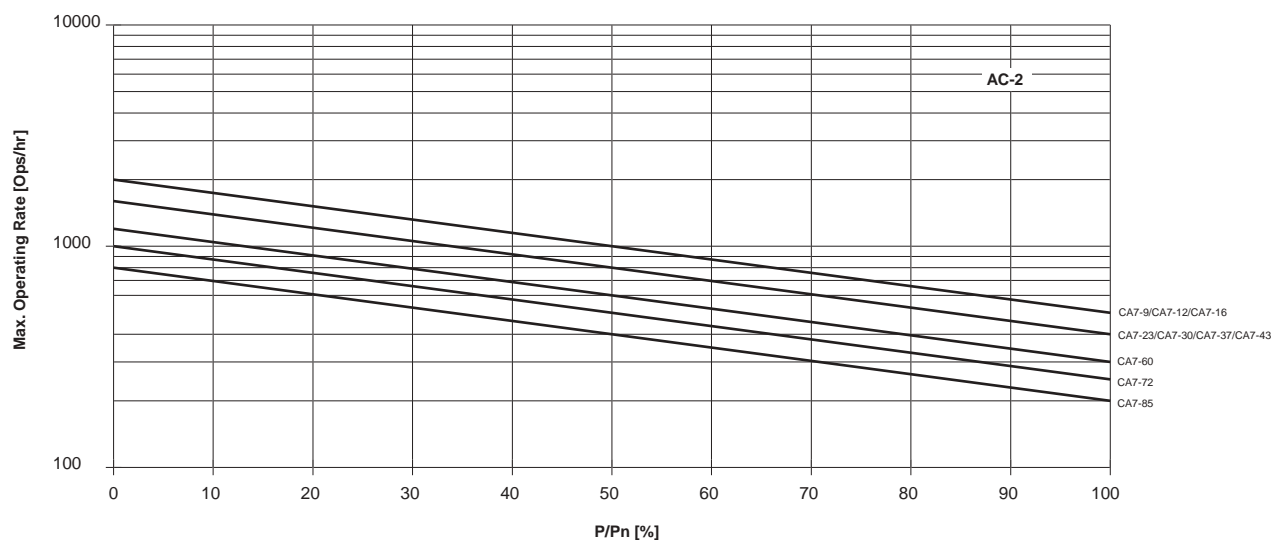
### AC-1

Non or slightly inductive loads, resistance furnaces;  $U_e = 230 \dots 690 \text{ VAC}$



### AC-2

Slip-ring motors: starting, switching off;  $U_e = 230 \dots 460 \text{ VAC}$



A

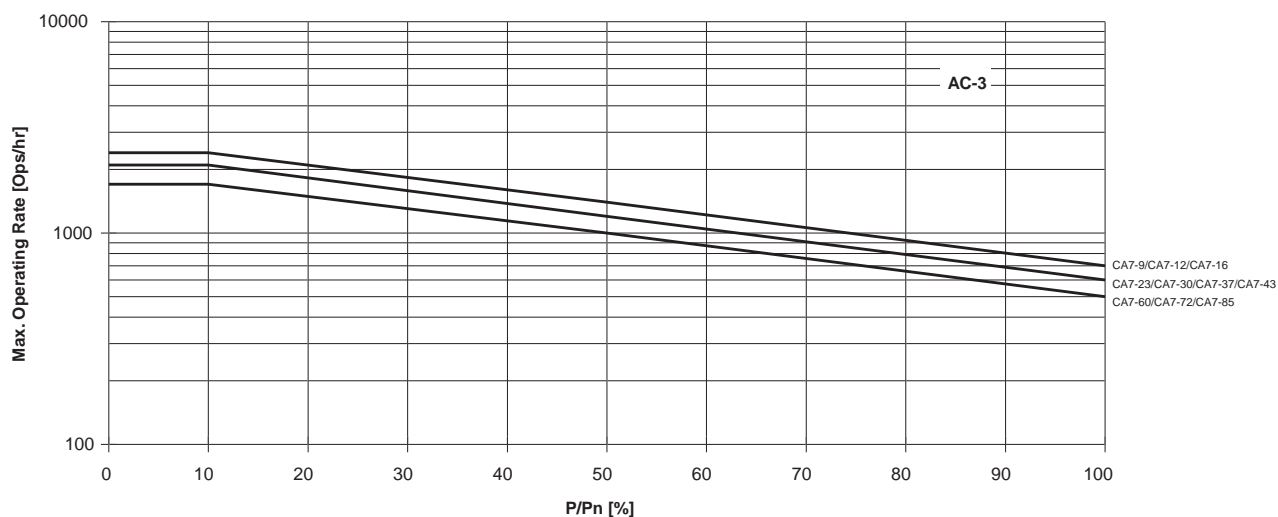
## Operating Rate Curves

Contactors

CA7

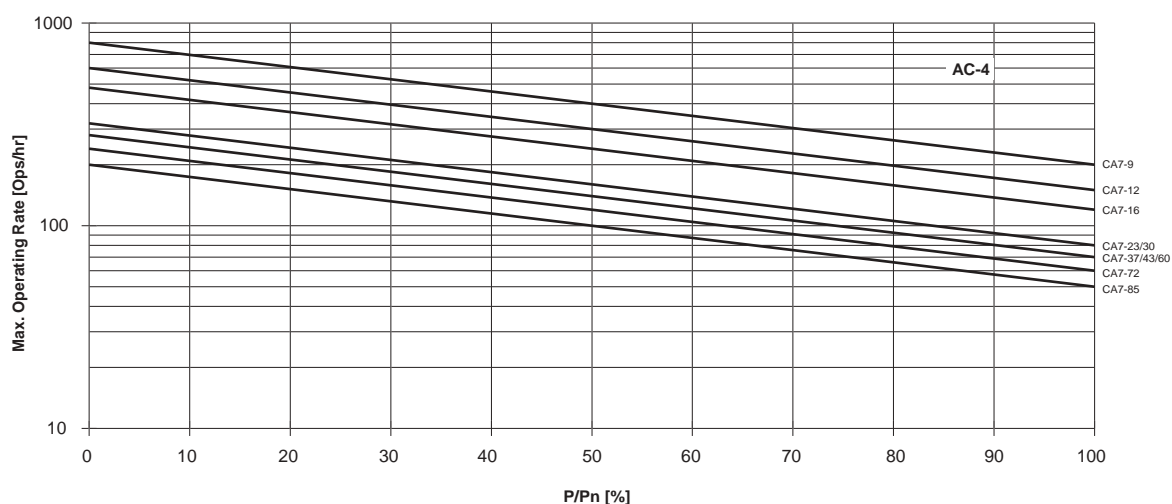
## AC-3

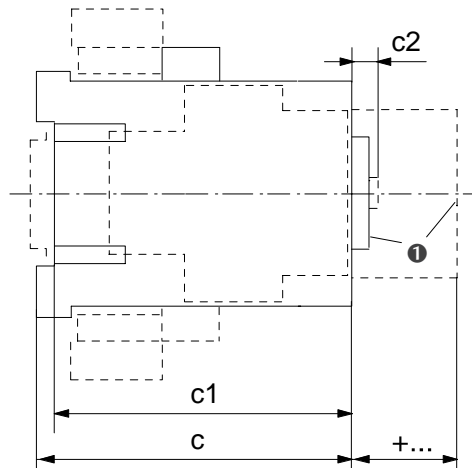
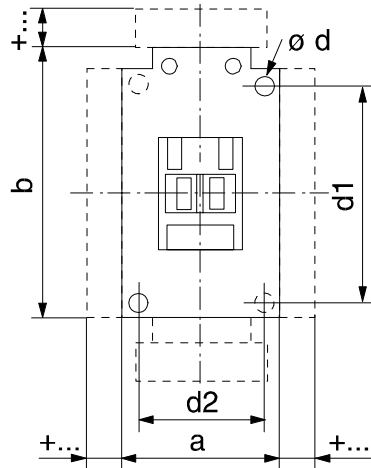
Squirrel-cage motors: starting, switching off motors during running;  $U_e = 230 \dots 460 \text{ VAC}$   
Relative operating time 40%, Starting time  $t_A = 0.25 \text{ s}$



## AC-4

Squirrel-cage motors: starting, plugging, inching;  $U_e = 230 \dots 460 \text{ VAC}$   
Starting Time  $t_A = 0.25 \text{ s}$



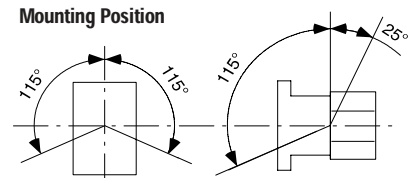
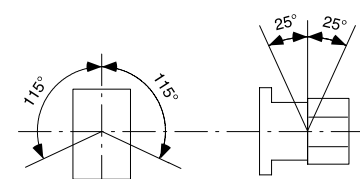
**U (Contactors & Reversing Contactors)**


- Dimensions are in millimeters (inches)
- Dimensions not intended for manufacturing purposes

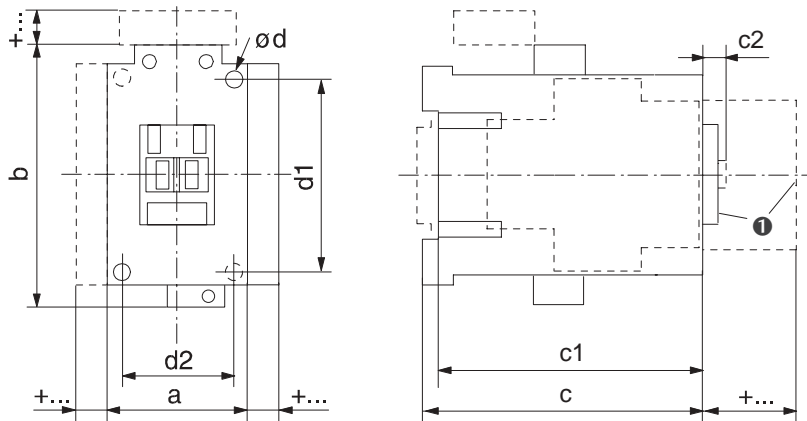
	Catalog Number	a	b	c	c1	c2	Ød	d1	d2
AC Contactors	CA7-9...CA7-23; CAN7-12, CNX-205...208	45 (1-25/32)	81 (3-3/16)	80.5 (3-11/64)	75.5 (3-3/32)	6 (1/4)	2 – 4.5 (2-3/16)	60 (2-23/64)	35 (1-25/64)
	CA(N)7-30...CA(N)7-37 CNX-209	45 (1-25/32)	81 (3-3/16)	97.5 (4)	92.6 (3-49/64)	6.5 (17/64)	2 – 4.5 (2-3/16)	60 (2-23/64)	35 (1-25/64)
	CA7-43, CNX-212	54 (2-1/8)	81 (3-3/16)	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)
	CA7-60...CA7-85 CNX-209	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)
	CA7-9C...CA7-16C, CAN7-12C, CNX-205C...206C	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)
True DC Contactors	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)
	CA(N)7-30C...CA(N)7-37C CNX-209C	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)
	CA7-43C, CNX-212C	54	81	144.5	140	6.5	2 – 4.5	60	45

**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
(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**

T W



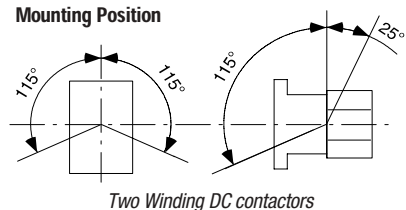
- Dimensions are in millimeters (inches)
- Dimensions not intended for manufacturing purposes

	Catalog Number	a	b	c	c1	c2	Ød	d1	d2
Two Winding DC Contactors	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								

## 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
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 + 2-31/64
interface module	on coil terminal side	b + 9	b + 23/64
Labeling with...	label sheet	+ 0	+ 0
	marking tag sheet with clear cover	+ 0	+ 0
	marking tag adapter for V7 Terminals	+ 5.5	+ 7/32

## Mounting Position





[CATALOGUE CA 7-C]

# CA 7 CONTACTORS



INDUSTRIAL SWITCHGEAR & AUTOMATION SPECIALISTS



- FOUR COMPACT SIZES
- TEN CONVENIENT CURRENT RANGES
- CHOICE OF AC OR DC COIL OPERATION



**PUT YOUR MOTOR CONTROL  
SOLUTIONS IN OUR HANDS**

## SERIES CA 7 CONTACTORS

**NHP**

### RUGGED, SPACE SAVING AND MODULAR

THE CA 7  
POWER CUBE  
CONTACTOR

**Sprecher + Schuh's innovative contactor solution for demanding applications ranging up to 45 kW.**

It goes without saying; unparalleled performance and uncompromising reliability are synonymous with the Sprecher + Schuh brand. Over one hundred years of design experience and rigorous testing have blended together to bring you the CA 7 range of switching contactors. The CA 7 represents the most modern and flexible power contactor available on the market. Meeting and far exceeding today's demanding industrial and automation applications.

#### Why you should make the CA 7 your number one choice in contactors!

- Four compact sizes
- High power to size ratio
- Ten convenient current ranges
- High mechanical and electrical life span
- Available in 3 and 4 pole versions
- Choice of AC or DC coil operation
- Modular accessories suite that is common and interchangeable across the entire range
- Reversible coil placement provides total flexibility (top or bottom mounting)
- Dual power terminals – ease up and speed up wiring
- Tested, verified and approved to Type 1 and Type 2 short circuit coordination
- Positively guided (force guided) mechanically linked contacts that meet the stringent IEC 60947-5-1 standard
- Precision manufactured in Switzerland to exacting international standards

**Four compact sizes – ten convenient ranges**



## SERIES CA 7 CONTACTORS

**NHP**

### FEATURES AND APPLICATIONS

#### Features

- Compact Dimensions
- Efficient modular design
- Rugged construction
- High switching capacity
- Low power requirements
- Safe Design
- AC and DC coil types
- Supplied with screw in terminals
- Extremely high electrical and mechanical life span
- 45 kW versions @ 690 V AC
- Control relay available
- Clip on accessories
- DIN rail or screw mounting
- Rated at 60 °C
- Auxiliary contacts suitable for low-voltage switching

#### Applications include

- Small to medium motor control
- Distribution
- Lighting loads
- Heating systems
- Office machines
- Swimming pool and sauna control
- Refrigeration control
- Household appliances
- Small conveyor systems
- Lifting equipment
- Commercial kitchen equipment
- Sprinkling and irrigation control
- Construction site lifts
- Heat pumps
- Waste water pumps

#### The CA 7 modular approach to motor protection

You can choose the type and level of motor protection by utilising a CA 7 contactor with any one of Sprecher + Schuh's overload protection devices. The modular design concept of the ACS system and the flexibility of the CA 7 contactor and its accessories suite makes this task an easy one. Let Sprecher + Schuh expertise solve your motor protection needs.

#### The choice is obvious ... CA 7

Choosing one of CA 7's many functional accessories will ensure a perfect match for your application. The CA 7 is available in both three (3) and four (4) pole contactor versions, with AC or DC operated coils. Whatever the application and no matter how complex it could be the CA 7 will undoubtedly be your winning solution. Make the switch and choose the long trusted name in motor protection ... Sprecher + Schuh.



CEP 7C



CEP 7E



CT 7K



CT 7



KTA 7

## SERIES CA 7 CONTACTORS

**NHP**

### THE CA 7 IS EQUALLY AT HOME IN A CONTROL AND AUTOMATION ENVIRONMENT

Should your application require complex switching via a PLC, contactor latching, remote release of a mechanical interlock or the implementation of simple timing circuits then the CA 7 is the contactor to choose. Its vast array of accessories and auxiliaries will simplify your installation and save you time and money. Not forgetting Swiss reliability which will give you an added peace of mind!

#### PLC driven CA 7



#### Accessories to suit CA 7 contactors

##### Top mounting auxiliary contact blocks

N/O	N/C	Position	Suit CA 7...	Cat. No.
1	0	11	All	CS 7-PV-11
0	2	03	All	CS 7-PV-02
2	0	20	All	CS 7-PV-20
1	1	S11	CA 7-9...23	CA 7-PVS11
1	1	11	CA 7-30...85	CA 7-PV-11
0	2	02	CA 7-30...85	CA 7-PV-02
1L	1L	L11	CA 7-30...85	CA 7-PV-L11
2	2	22	All	CS 7-PV-22
2	2	22	CA 7-30...85	CA 7-PV-22
2	2	S22	CA 7-9...23	CA 7-PV-S22
1+1E	1+1L	L22	All	CS 7-PV-L22
3	1	31	All	CS 7-PV-31
4	0	40	All	CS 7-PV-40
0	4	04	All	CS 7-PV-04

##### Side mounting auxiliary contact blocks

N/O	N/C	Position	Suit CA 7...	Cat. No.
0	1	01	All	CA 7-PA-01
1	0	10	All	CA 7-PA-10
0	2	02	All	CA 7-PA-02
1	1	11	All	CA 7-PA-11
2	0	20	All	CA 7-PA-20
E1	L1	L11	All	CA 7-PA-L11
1	0	10	All	CA 7-PA-H10



Auxiliary contact 2 pole top mount



Auxiliary contact 4 pole top mount



CM7-02 Mechanical Interlock with 2 x N/C contacts



Auxiliary contact 1 pole side mount



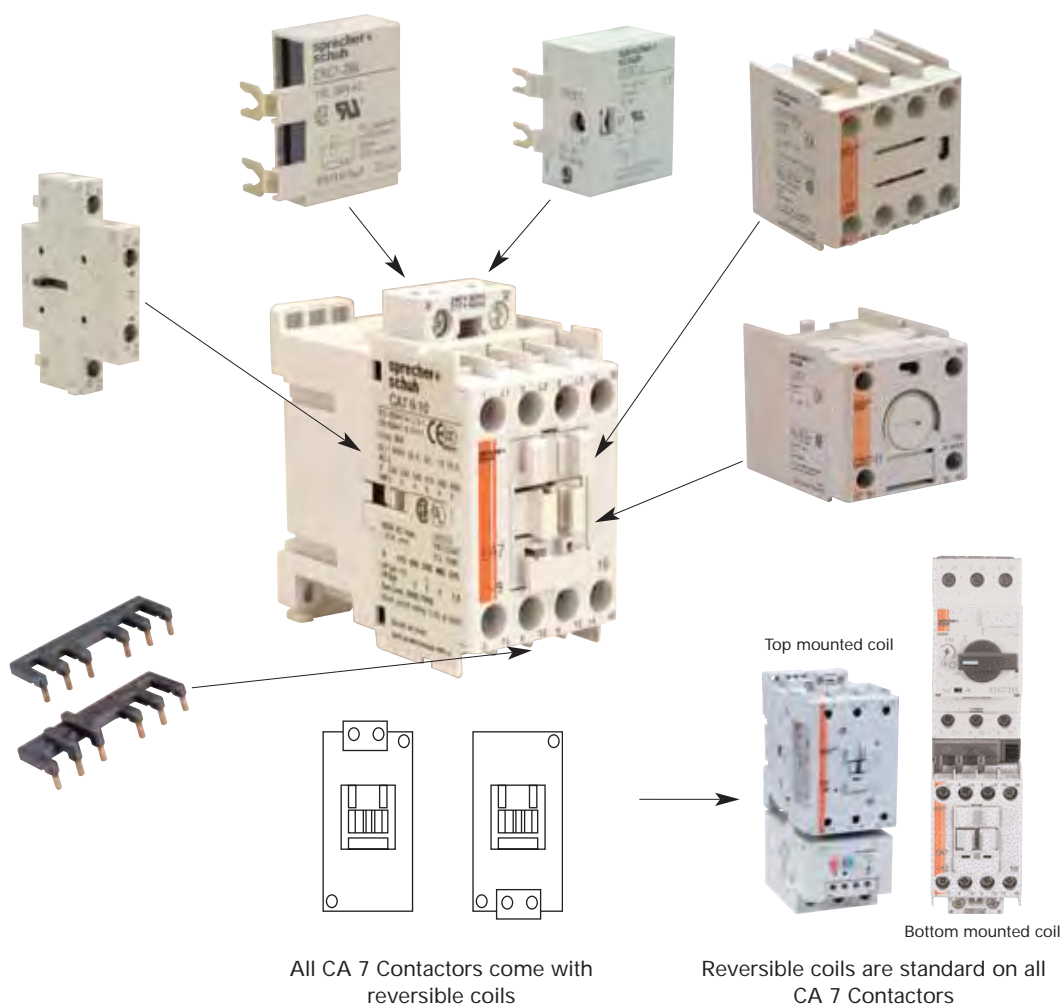
Auxiliary contact 2 pole side mount

## THE CA 7, NOT JUST A CONTACTOR ...

Don't be fooled by its compact size, the CA 7 is not just any contactor. With its vast array of functional accessories and options, fully fitted out the CA 7 becomes an integral part of the ACS (advanced control systems) solution. Whether your application involves power distribution, heating and ventilation or complex motor control, the CA 7 is more than up to the challenge.

Simplicity and time is the key to any electrical installation. Sprecher + Schuh has designed the CA 7 series of contactors and associated accessories with this philosophy in mind. A simple ... snap, click and twist and the contactor is easily fitted out with the latest set of auxiliaries, suppression devices, timers or any of the other ACS components.

**The CA 7 features a simple ... "snap, click and twist" connection philosophy!**



Replaceable and fully reversible coils simplify system installation. Whether you require a top or bottom mounted coil the procedure for reversal is quick and effortless.

## THE CA 7 SOLUTION TO MOTOR CONTROL CONNECTIVITY

CA 7 contactor size	kW rating AC3 @ 415 V	KT 7	CT 7K	CT 7	CEP 7-E	CEP7-C1	CEP 7-C2
CA 7-9	4.0						
CA 7-12	5.5						
CA 7-16	7.5						
CA 7-23	11						
CA 7-30	15						
CA 7-37	18.5						
CA 7-43	22						
CA 7-60	32						
CA 7-72	40						
CA 7-85	45						

## CA 7 contactor motor protection cross reference (direct mounting)

KTA 7-25S, 25H and 45H, KTB-25S, 25H and 45H and KTC-25S, 25H and 45H.	CEP 7-ED1AB to CEP 7-ED1EB CEP 7-EEAB to CEP 7-EEEB CEP 7S-EEPB to CEP 7S-EESB
CT 7K-17-0.15 to CT 7K-17-9.0	CEP 7-EEED to CEP 7-EEFD and CEP 7S-EETD
CT 7K-17-12.5	CEP 7-EEGE and CEP 7S-EEUE
CT 7K-17-17.5	CEP 7-C1-23-2 to CEP 7-C1-23-25
CT 7-24-0.16 to CT 7-24-10	CEP 7-C1-43-5 to CEP 7-C1-43-45
CT 7-24-16 to CT 7-24-24	CEP 7-C1-85-45 to CEP 7-C1-85-25
CT 7-24-30	CEP 7-C2-23-2 to CEP 7-C2-23-25
CT 7-45-45	CEP 7-C2-43-5 to CEP 7-C2-43-45
CT 7-75-30 to CT 7-75-75	CEP 7-C2-85-45 to CEP 7-C2-85-25

“The most modern and flexible power contactor available on the market.”

## D7 Control and indication units 22.5 mm

### New D7...Experience a touch of quality



Introducing the all new D7 range from Sprecher + Schuh. The D7 range is the latest in a long line of quality 22.5 mm control and signalling equipment from a company with a long built reputation for combining high quality manufacturing skills and attention to detail to produce only the finest quality products.

Available in both thermoplastic and metal variations, the D7 range incorporates all the features that you have come to expect from Sprecher + Schuh and raises the bar one step further with a functional low profile design and all new stylish appearance.

Once you get past the new appearance you will find the D7 range has some unique features incorporated, such as improved operational feel on the pushbuttons for a positive "tactile" response and a new positive detent on selector switches. In addition optional time saving cage style termination on contact blocks, improved LED illumination on pilot lights and hard wearing laser engraving have also been included.

Utilising state of the art modelling technologies and finite element analysis, you can be sure every component used in the D7 range has been optimised for durability and reliability with the aim of providing the ultimate in control and indication.

Designed and manufactured to meet the most exacting performance specifications, the new D7 range is **the** pushbutton to use in today's demanding environments.



## D7 Control and indication units 22.5 mm

### D7 at a glance

#### "Auto Break" Safety contacts



Separation of the contact block assembly from the front operator or mounting latch can prevent an Emergency Stop from shutting down the controlled process in an emergency.

Correct contact block installation is critical to ensure that the normally closed contacts will open when the emergency stop operator is active. The exclusive Sprecher + Schuh "Auto Break" contact block monitors itself to ensure it is always correctly installed.

A normally open "Auto Break" contact is physically moulded and wired in series with a standard set of normally closed contacts. When correctly installed the operator creates a maintained pressure on the normally open "Auto Break" contact and automatically closes the contact. In this state the normally closed contact operates as normal.

If the contact block assembly should separate from the front operator, the pressure releases and the "Auto Break" contact will automatically open. Because the "Auto Break" contact is wired in series with the normally closed, the opening of either set of contacts will open the circuit controlled by the emergency stop operator.

2



#### Coupling plates and Contact blocks

- Choice of metal or plastic coupling plates
- Rotating collar with "snap secure" system ensures fast one-hand removal
- Contact blocks snap-fit and are hinged at one end for easy installation
- Colour coded contact block plungers for easy identification
- H-bridge contact design and the option of gold contacts provides cleaner current flow for maximum reliability at lower voltages
- Bifurcated contacts provide excellent wiping and optimal switching reliability
- Option of Cage style wire termination or Screw clamp
- Live components are shrouded and touch safe to IP 20



#### Inscription caps and diffusers

- Durable abrasion-proof press plates
- 6 colour choices
- Ergonomically contoured design
- Diffusers constructed in two colour moulded assembly
- Durable wear resistant laser printing available



#### Enclosures

- Metal and plastic enclosures
- In choices to accommodate up to 6 x 22.5 mm operators
- Yellow thermoplastic pendant style enclosure available for up to 2 operators
- Metric cable entry 20 mm
- Suitable for base or panel mount contact blocks
- Accepts two piece snap-in legend



#### Illumination

- Modern and compact integrated LED lamp modules
- Superior illumination qualities
- 5 colour choices
- 11 year lamp life (100,000 hrs)
- Maintenance free
- Vibration and shock resistant
- 24 V AC/DC, 110 V AC and 240 V AC

## D7 Control and indication units 22.5 mm

2



### Design

- Functional low profile appearance
- Ergonomic easy to operate handles
- Reduced depth contact blocks
- Improved positive "tactile" operation on pushbuttons
- Improved "positive detent" on rotary selector switches
- Durable two colour plastic caps and laser engraving

### Improved safety

- Unique "Auto Break" self-monitoring emergency contact system
- IP 20 touch protection
- Tamperproof rear fixing nut

### Time saving

- New design snap-lock, twist-to-reset rotating collar on coupling plate for easier mounting and assembly
- Snap-on components
- Redesigned anti-rotation tab

### Flexibility

- Thermoplastic or metal operators
- Latching or impulse operators
- Five different colour choices
- Maximum of six contact blocks
- Full voltage and transformer lamp blocks

### Improved reliability

- IP 65/66 sealing across the range for reliability in dusty and wet conditions
- Improved vibration resistance
- Continuous wiping contacts for improved reliability
- Tested to IEC 947
- Positive detent on rotary switches which ensures operation will not "hang up" between positions

### Contact blocks

- Improved mounting from "Snapsecure" snap-fit mounting system
- Colour coded plungers for easy identification
- Optional Quadfurcated Gold contacts for improved low voltage switching
- Optional spring clamp termination on contact blocks for reduced wiring time

## D7 Control and indication units 22.5 mm

### Complete panel mounted standard units

#### Non-Illuminated momentary pushbuttons






D7P-F3-PX10

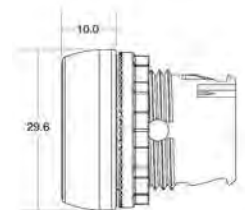


D7M-F4-MX01

- Metal or plastic options
- Improved momentary action for fast response
- Low mounting depth from panel

#### Pushbuttons

Description	Contact	Plastic body Cat. No. <sup>1)</sup>	Price \$	Metal body Cat. No. <sup>1)</sup>	Price \$
With Green insert		D7P-F3-PX10	25.50	D7M-F3-MX10	29.70
With Red insert		D7P-F4-PX01	25.50	D7M-F4-MX01	29.70
With Blue insert		D7P-F6-PX10	25.50	D7M-F6-MX10	29.70



Dimensions in (mm)




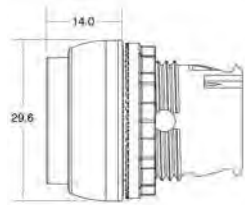
D7P-E4-PX01



D7M-E4-MX01

#### Extended pushbutton

Description	Contact	Plastic body Cat. No. <sup>1)</sup>	Price \$	Metal body Cat. No. <sup>1)</sup>	Price \$
With Red insert		D7P-E4-PX01	27.50	D7M-E4-MX01	31.80



Dimensions in (mm)

#### Non-Illuminated momentary pushbuttons with labelled inserts

- Laser etched markings for improved abrasion resistance

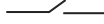





D7P-E402-PX01

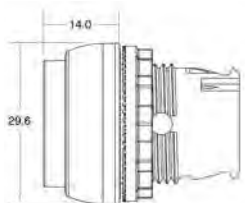


D7M-F301-MX10

#### Pushbuttons

Description	Contact	Plastic body Cat. No. <sup>1)</sup>	Price \$	Metal body Cat. No. <sup>1)</sup>	Price \$
With Green insert labelled "Start"		D7P-F301-PX10	26.50	D7M-F301-MX10	31.20
With Red insert labelled "Stop"		D7P-F402-PX01	26.50	D7M-F402-MX01	31.20
With Blue insert labelled "Reset"		D7P-F607-PX10	26.50	D7M-F607-MX10	31.20
With extended Red insert labelled "Stop"		D7P-E402-PX01	29.00	D7M-E402-MX01	33.00

Note: <sup>1)</sup> Add suffix "bx" for special box/hang-sell packaging eg: D7P-F3-PX10bx



Dimensions in (mm)

### Price Schedule 'A2'

## Front-of-Panel (Operators) (1)

Mechanical Ratings		
Description	Plastic (D7P)	Metal (D7M)
Vibration (assembled to panel)	(G) Tested at 10...2000 Hz, 1.52 mm displacement (peak-to-peak) max./G max. for 3 hr duration, no damage	
Shock	(G) Tested at 1/2 cycle sine wave for 11 ms; no damage at 100 G	
Degree of protection <sup>2)</sup>	UL Type 3/3R/4/4X/12/13 (IP 65/66)	UL Type 3/3R/4/12/13 (IP 65/66)
Mechanical durability per EN 60947 (Annex C)	10,000,000 Cycles 1,000,000 Cycles 500,000 Cycles 300,000 Cycles	Pushbuttons, momentary mushroom Multi-function Push-pull mushroom E-stops, selector switches
Operating forces (typical with one contact block)	(N)	Flush/extended = 5N E-stop = 36N Mushroom = 9N
Operating torque (typical application with one contact block) (N-m)		Selector switch = 0.25 N-m
Environmental		
Temperature range (operating) <sup>3)</sup>	(°C)	-25...+70 °C (-13...+158 °F)
Temperature range (short-term storage)	(°C)	-25...+85 °C (-13...+185 °F)
Humidity	(%) 50...95 % RH from 25...60 °C (77...140 °F) per: procedure IV of MIL-STD-810C, Method 507.1 cycling test	

## Back-of-Panel Components <sup>1)</sup>

Electrical Ratings		
Standard contact block rating		A600, Q600 600 V AC AC 15, DC 13 to EN 60947-5-1 and UL 508, 17 V, 5 mA min.
Low voltage contact block <sup>4)</sup>		5 V, 1 mA DC min. C300, R150, AC 15, DC 13 to EN 60947-5-1 and UL 508
Thermal current	(A)	10 A max. enclosed (40 °C ambient) to UL 508, EN 60947-5-1
Wire capacity		#18...12 AWG (0.75...2.5 mm <sup>2</sup> )
Screw terminal	(AWG)	Max. (2) #14 AWG or (1) #12 AWG
Spring-clamp terminal	(AWG)	#18...14 AWG (0.75...1.5 mm <sup>2</sup> )
Insulation voltage	(Ui)	Ui = 680 V (screw terminal) Ui = 300 V (screwless terminal)
Dielectric strength (minimum)		(V) 2200 V for one minute
External short circuit protection	Standard blocks Low voltage contact blocks	10 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 348-4) 6 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 348-4)
Electrical shock protection		Finger-safe conforming to IP2X
Mechanical Ratings		
Vibration (assembled to panel)	(G)	10...2000 Hz, 1.52 mm displacement (peak-to-peak) max./10 G max. 6 hr
Shock	(G)	Tested at 1/2 cycle sine wave for 11 ms and no damage at 100 G max.
Contact durability per EN 60947-5-1 (Annex C)		10,000,000 cycles
Contact operation	NO NC NOEM NCLB	Slow make, double break Slow make, double break (positive opening) Early make, double break Late break, double break (positive opening)
Opening forces (typical)	(N)	3.4 N: each single circuit contact block 5...6.6 N: each dual circuit contact block

**Notes:** <sup>1)</sup> Performance data given in this publication is provided only as a guide for the user in determining suitability and do not constitute a performance warranty of any kind. Such data may represent the results of accelerated testing at elevated stress levels, and the user is responsible for correlating the data to actual application requirements. ALL WARRANTIES AS TO ACTUAL PERFORMANCE, WHETHER EXPRESS OR IMPLIED, ARE EXPRESSLY DISCLAIMED.

<sup>2)</sup> Momentary mushroom operators are IP 65, multi-function operators have no Type 13 rating. Plastic operators with keys have no Type 4X rating.

<sup>3)</sup> Operating temperatures below 0 °C (32 °F) are based on the absence of freezing moisture and liquids.

<sup>4)</sup> Low voltage contacts are recommended for applications below 17 V, 5 mA.

## 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	<span style="border: 1px solid black; padding: 0 2px;">i</span> 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	<span style="border: 1px solid black; padding: 0 2px;">i</span> 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.**

i Available on indent only.

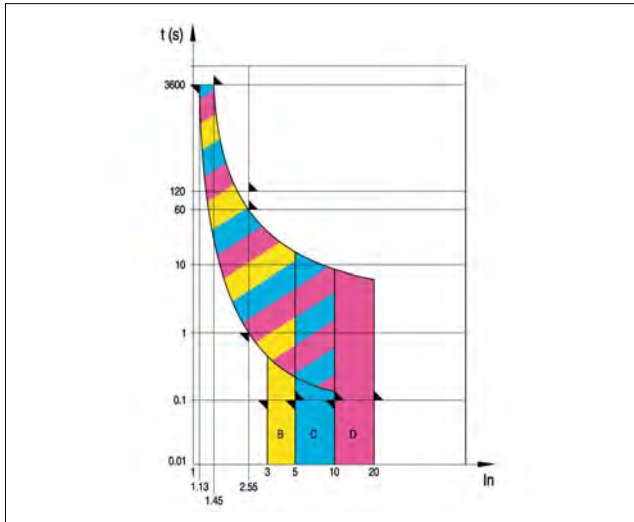
## Din-T MCBs Technical data

### 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.

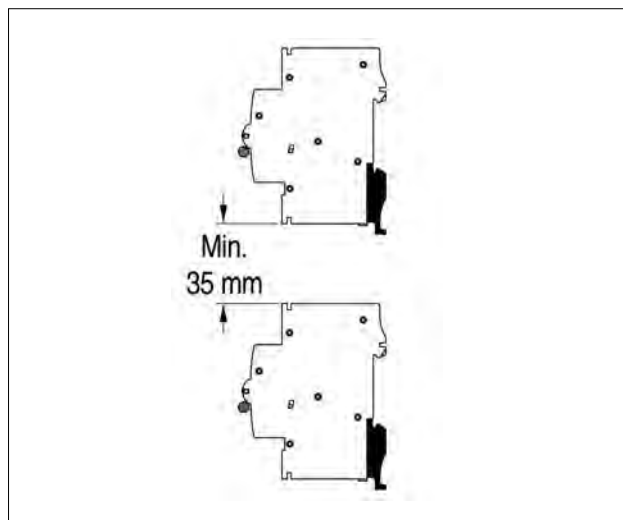
After the test the MCB is capable, without maintenance, to withstand a dielectric strength test at a test voltage of 1500 V. Moreover, the MCB shall not trip at a current of 0.96 In. The MCB shall trip within 1h when current is 1.6 In.

- 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.

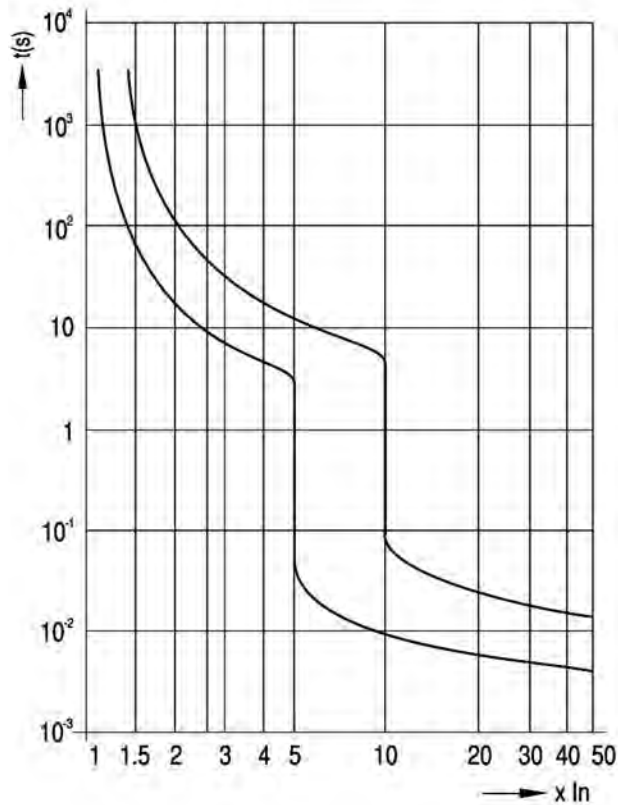


## Din-T MCBs Technical data

### 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:  $16 \text{ A} \times 0.7 = 11.2 \text{ A}$

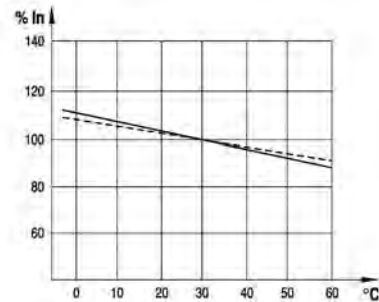
As the MCB is working at 45 °C it shall be given another factor (90 % = 0.9):

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

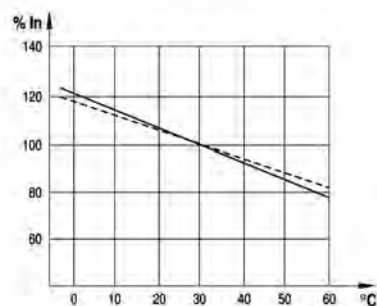
**Note:** <sup>1)</sup> Applicable for MCBs working at maximum rated currents.

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.

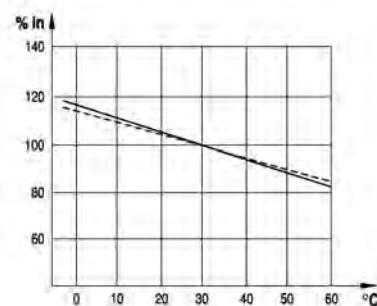
0.5 - 6 A



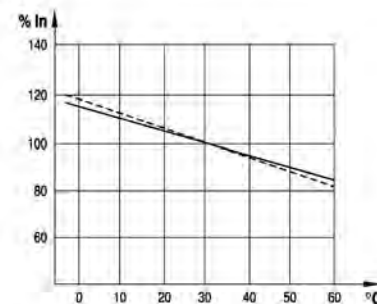
10 A



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 (mOhm)
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

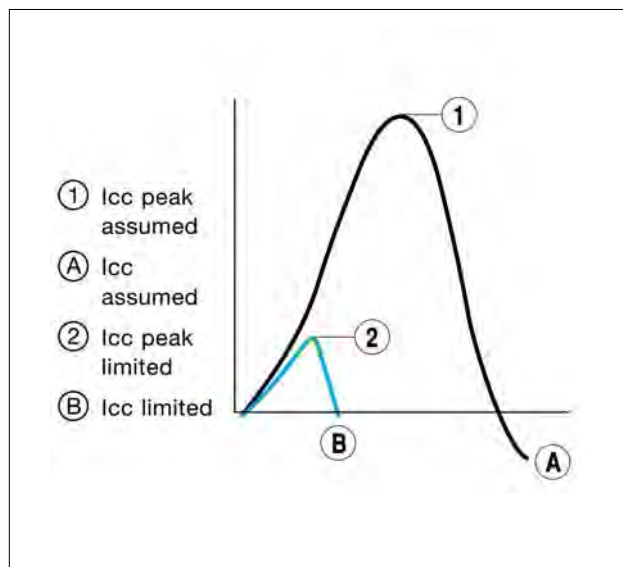
### Limitation curves

#### 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

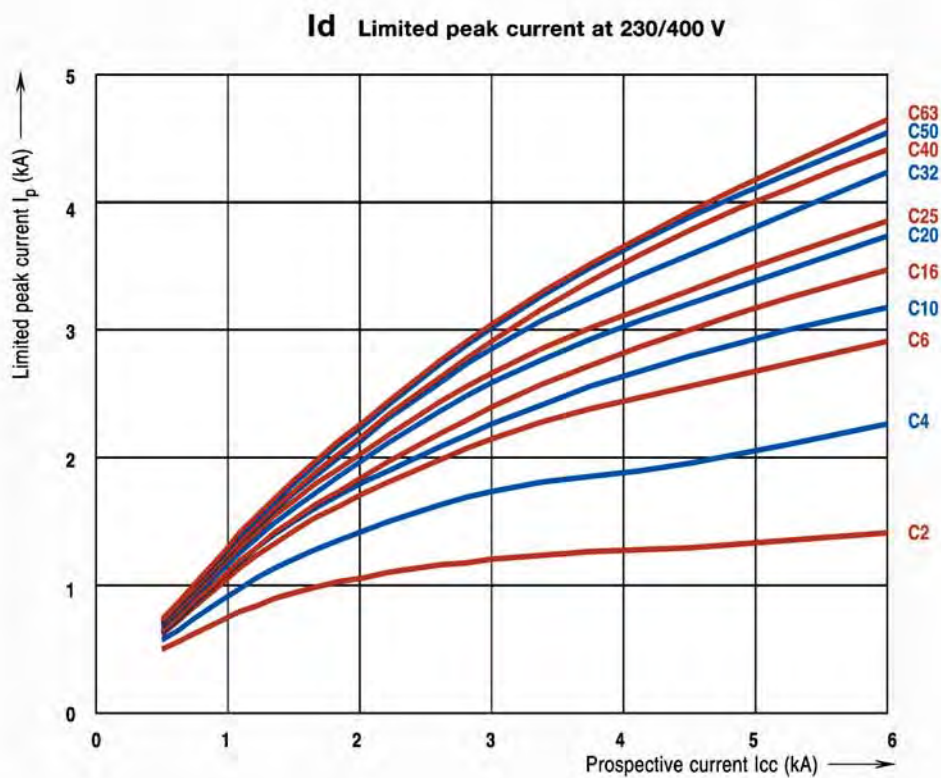
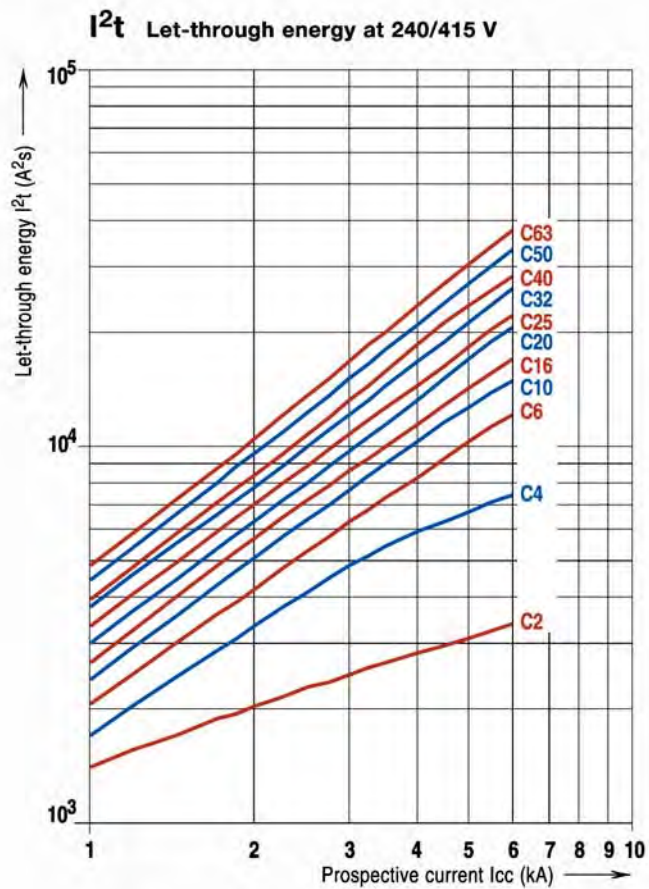
## Din-T MCBs Technical data

Din-T 6

6 kA

C curve

3



## 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
Standards (Aust / NZ / International)				AS/NZS 4898
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)	75 % Icu	
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
			≤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)

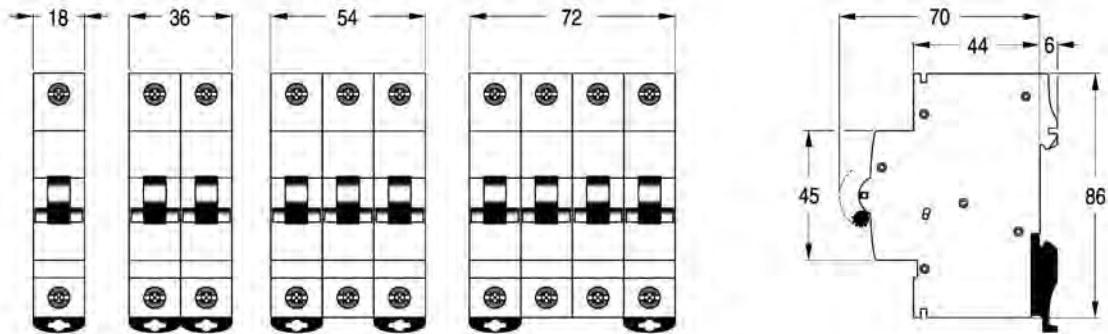
<sup>5)</sup> On request.

## Din-T MCBs Technical data

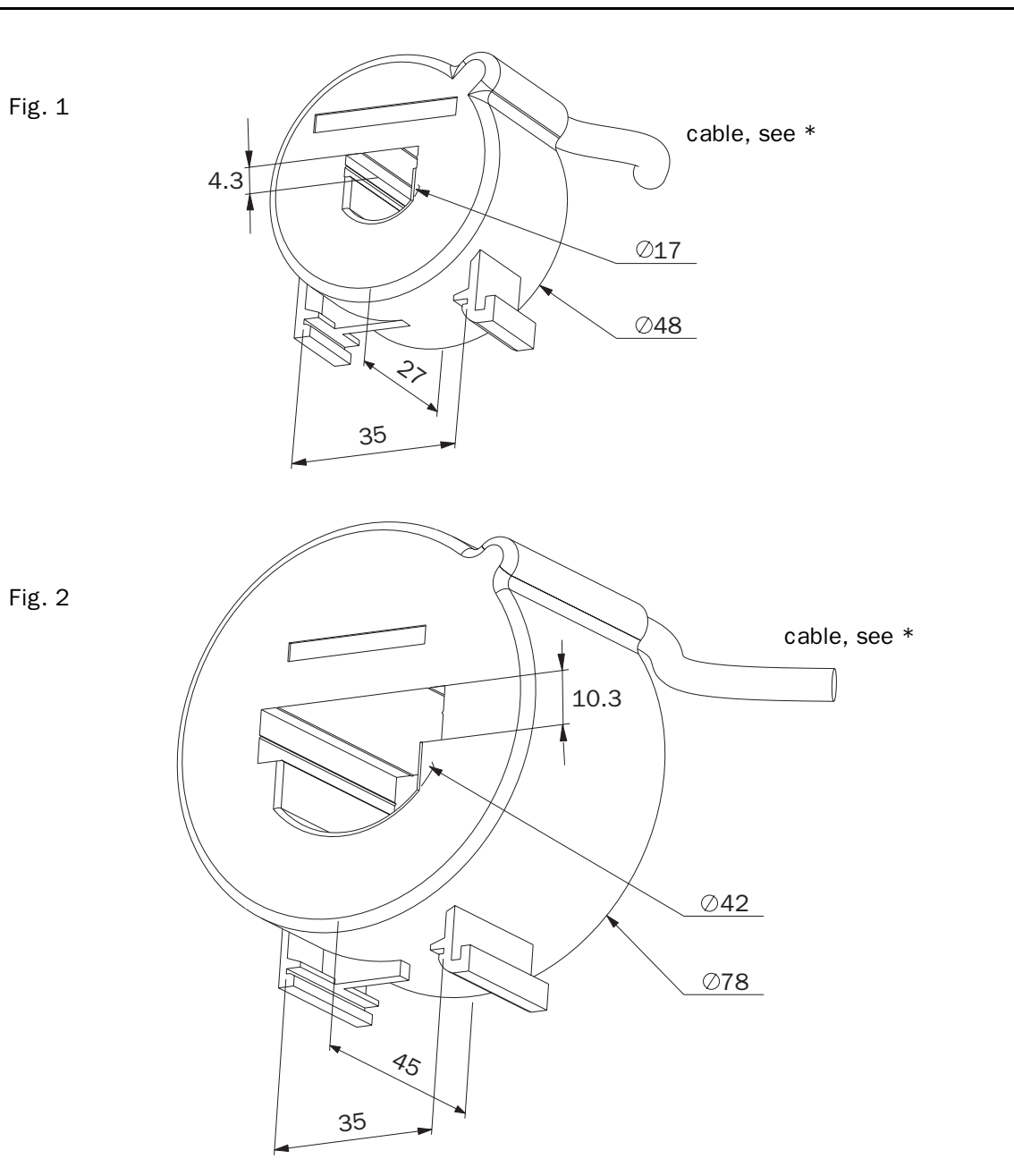
### Miniature circuit breakers - Din-T 6

Dimensions in mm.

3



# **EL-FI CTM** **Current Transformer Monitor** **(FOR MOUNTING ON STANDARD DIN-RAIL 35MM)**



\* Cable length supplied, in meter (m) : 1.0

Fig.	Type	I prim	I sec.	Part number	Suitable to;
1	CTM010	10A	0.055A	01-2471-10	M10, M20, DCM
1	CTM025	25A	0.055A	01-2471-20	M10, M20, DCM
1	CTM050	50A	0.055A	01-2471-30	M10, M20, DCM
2	CTM100	100A	0.055A	01-2471-40	M10, M20, DCM

Article number: 01-2385-00 r3



## **EL-FI® M20**

### **SHAFT POWER MONITOR INSTRUCTION MANUAL**

Motor shaft output power measurement



## **TABLE OF CONTENTS**

1	Inside the box...
2	Safety
3	Wiring
4	Selection current transformer
5	Operation
6	Programming
6.1	Set Measurement Unit "HP" or "kW"
6.2	Set RATED MOTOR POWER and CURRENT (Windows 41, 42)
6.3	Set NUMBER OF PHASES (Window 43)
6.4	Monitor Function (Window 05)
6.5	Set the START DELAY (Window 31)
6.6	Set Alarm levels with AUTOSET
6.7	Set the RESPONSE DELAY (Window 32)
7	Advanced features
8	Troubleshooting
9	Technical data
10	Parameter list
11	Service

## 1 INSIDE THE BOX ...

This instruction manual describes the installation and commissioning of the M20 load monitor. The M20 supervises induction motor driven equipment and provides alarms when abnormal conditions are detected. The M20's ability to provide reliable monitoring & protection ensures production equipment is optimised and expensive breakdowns and interruptions are minimized. Due to the special method of subtracting motor power losses, the monitor is able to accurately measure the shaft power supplied by the motor to the application. This advanced technique allows the M20 to monitor the “application” load only as opposed to the “total” motor load, which includes the varying motor losses.

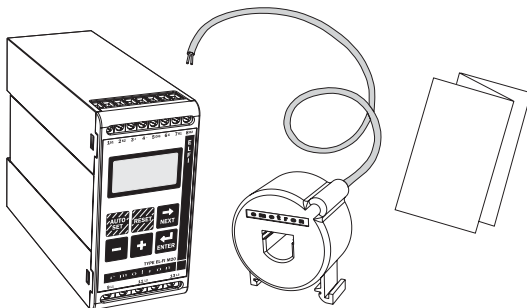
- Check the delivery. Your shipment should contain the M20 load monitor, a current transformer and this instruction manual.
- Check carefully that the ordered equipment complies with the motors input voltage and that the current transformer rating is as stated on the delivery packaging.
- Check that the contents have not been damaged in shipping.

---

**Note!**

If in doubt contact your supplier before starting to install or commissioning the product.

---



## **2 SAFETY**

- Study this manual thoroughly before installing and using the monitor.
- The monitor must be installed by qualified personal.
- Always disconnect supply circuits prior to installing.
- The installation must comply with standard and local regulations.
- Pay special attention to this SAFETY section and the part marked “CAUTION!” in the OPERATION section.
- Should questions or uncertainties arise, please contact your local sales outlet or see section 11 SERVICE.

---

**Note!**

Do not remove or break the seal on the housing. The warranty will be cancelled.

---

### 3 WIRING

This wiring example shows how the M20 can be used to control the starting and stopping circuit of the motor. Other wiring configurations are possible.

1. The current transformer CTMxxx must be be placed in the same phase that is connected to terminal 9, phase L1.
2. For single-phase connection see fig 2.

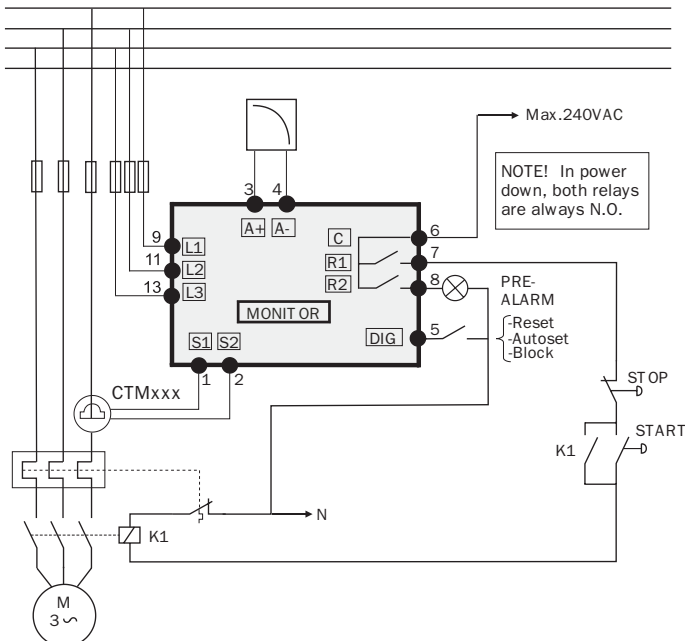


Fig 1. Connection example

#### Note!

If the START/STOP is connected according to fig. 1, it is recommended that terminals 6 and 7 be by-passed during programming. After the programming is completed the by-pass must be taken out.

ALTERNATIVE EXAMPLE FOR SINGLE-PHASE CONNECTION

This wiring example shows the deviant power connection to be made with regard to a single-phase connection. Refer to fig. 1 for the remaining wiring.

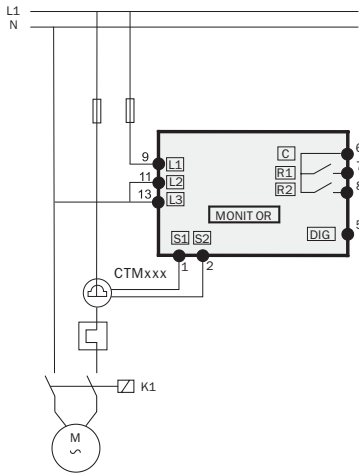


Fig 2. Single-phase connection example.

EXAMPLE - DIGITAL INPUT

The Digital Input use the terminals 5 (DIG) and 6 (C-reference). It can have either a VAC or a VDC signal. Connect “+” to terminal 5 (DIG) and “-” to terminal 6 for VDC signal. See also section 7 ADVANCED FEATURES.

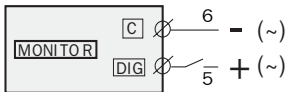


Fig 3. Wiring example for digital input.

## 4 SELECTION CURRENT TRANSFORMER

### FOR MOTORS LESS THAN 100A

1. Check the rated motor current on the motor plate.
2. Compare this value with the current in table 1.
3. From table 1, select the current transformer and the appropriate numbers of windings.

---

**Note!**

Max length of the CTM cable is 1 m (39.37 in).

---

**EXAMPLE:**

- Rated motor current = 12A.
- Select 10.1-12.5A from the first colon in table 1.
- This gives:
  - CTM025 with 2 windings.

RATED MOTOR CURRENT [A]	CURRENT TRANSFORMER TYPE NUMBER OF WINDINGS			
	CTM 010	CTM 025	CTM 050	CTM 100
0.4 – 1.0	10			
1.01 – 2.0	5			
2.01 – 3.0	3			
3.1 – 5.0	2			
5.1 – 10.0	1			
10.1 – 12.5		2		
12.6 – 25.0		1		
26.0 – 50.0			1	
51.0 – 100.0				1

Table 1. CT less than 100A.

**Note!**

Normally the appropriate Current Transformer (CT) will have been ordered and shipped with the M20, check that this is the case; contact the supplier if in doubt.

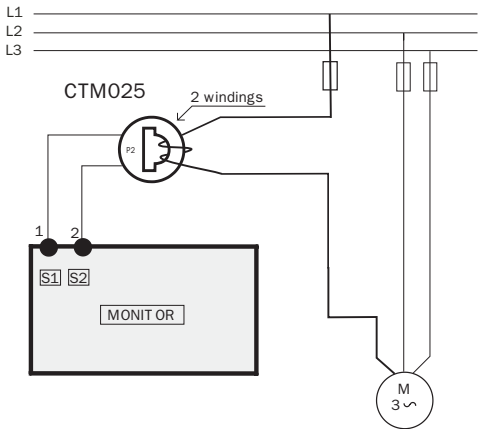


Fig 4. Example CTM 025 with 2 windings for an 12 A motor.

**Note!**

The transformer connection and orientation are not polarity sensitive, but must be connected to L1.

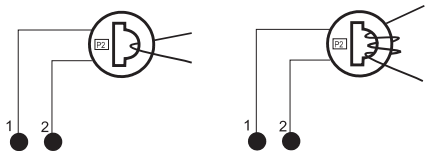


Fig 5. Example 1 and 3 windings.

## FOR MOTORS GREATER THAN 100A

1. Check the rated motor current on the motor plate.
2. Compare this value with the current in table 2.
3. Select from table 2 the primary and the secondary current transformer and the appropriate numbers of windings.

### EXAMPLE :

- Rated motor current = 260A.
- Select 251-500A from the first colon in table 2.
- This gives:
  - Primary transformer 500:5, 1 winding.
  - CTM010 with 2 windings.

RATED MOTOR CURRENT [A]	CURRENT TRANSFORMER TYPE and NUMBER OF PRIMARY WINDINGS
101 – 150	150:5 + CTM 010 1 + 2
151 – 250	250:5 + CTM 010 1 + 2
251 – 500	500:5 + CTM 010 1 + 2
501 – 999	1000:5 + CTM 010 1 + 2

Table 2. CT greater than 100 A

---

### Note!

Normally the appropriate Current Transformer (CT) will have been ordered and shipped with the M20, check that this is the case; contact the supplier if in doubt.

---

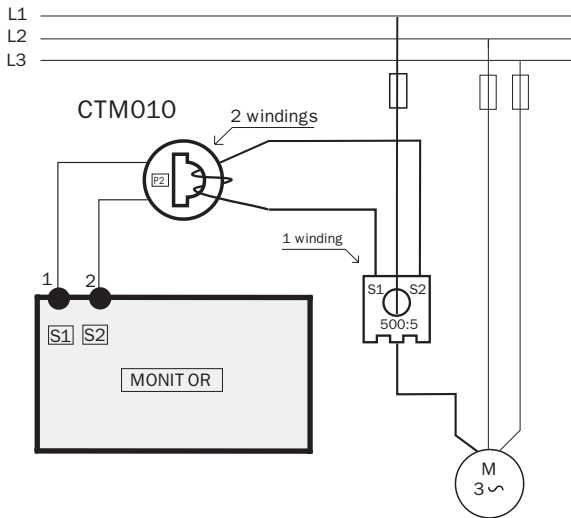


Fig 6. Example of a CTM 010 with 2 windings and a primary transformer 500:5 with 1 winding for a 260 A motor.

---

**Note!**

The transformer connection and orientation are not polarity sensitive, but must not be connected to L1.

---

## 5 OPERATION

### Overview

#### Control terminals:

- 1 S1 Current transformer input
- 2 S2 Current transformer input
- 3 + Analog output
- 4 - Analog output
- 5 DIG External RESET or AUTO SET or Block Pre-Alarm
- 6 C Common: RELAY, DIG
- 7 R1 Main Alarm Relay 1
- 8 R2 Pre-Alarm Relay 2

#### LCD display:

- 12 Function (window) number
- 123 Function Value
- ⚠ Warning signal
- ⌚ Start-, response delay or block timer active
- 🔒 Parameter locked
- V Voltage indicator
- A Current indicator
- mA Milliamp indicator
- kW Kilowatt indicator
- S Second indicator
- % Per cent indicator

#### AUTO SET key:

Press for 3 seconds during normal and stable load to apply the automatic setting of the alarm levels. Not available if Parameter Locked.

#### NEXT key:

Proceeds to next window. If no key is pressed for 1 minute the display returns to window 01 automatically.

#### RESET key:

To reset ALARM

#### ENTER key:

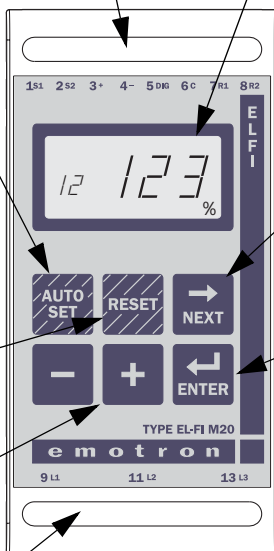
Confirm (save) changes.

#### +/- keys:

Increasing and decreasing value

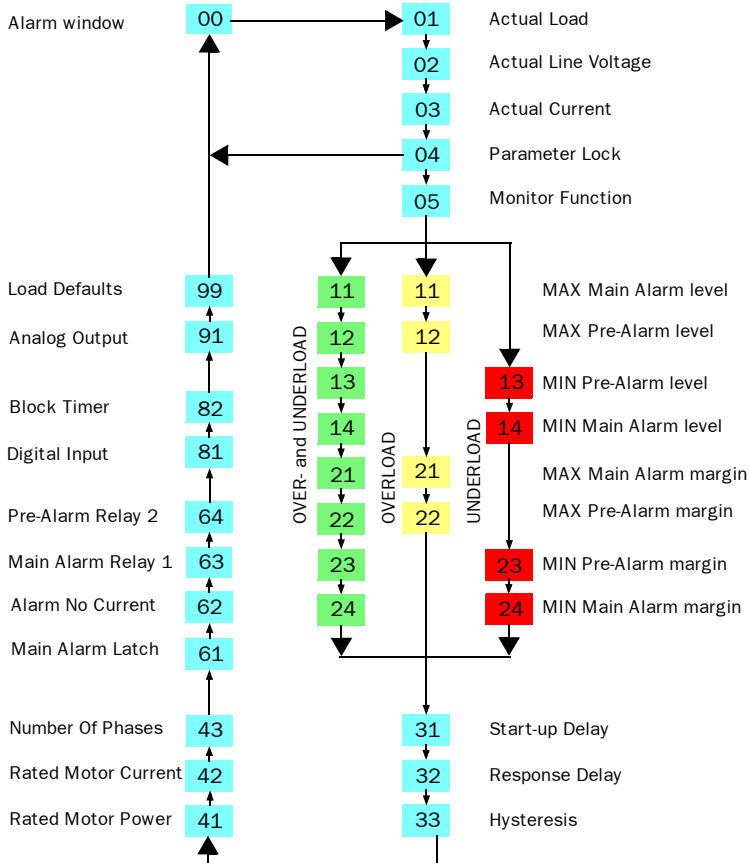
#### Motor terminals:


- 9 L1 Motor phase
- 11 L2 Motor phase
- 13 L3 Motor phase



Use the NEXT key to scroll through the function menu.

## WINDOW MENU




- The ALARM window 00 only appears if an Alarm output is active.
- The Actual Load window 01 Appears after power up.
- Use the  key to scroll through the menu.



- The Actual Load window will appear automatically if no keys are pressed for longer than 1 minute.
- If the PARAMETER LOCK is on, only windows 01 02 03 04 are visible.
- Window 05 selects the monitor function, see section 6:4.

## HOW TO CHANGE A VALUE


Example setting the RATED MOTOR CURRENT in window 42.

1. Press  until the window number 42 appears.





2. Press  or  until the desired value is reached (e.g. 23A).



3. Press  to confirm and save the change.

---

### Note!

If the value is NOT to be changed, press the  before the  is pressed.

---



---

### CAUTION!

Make sure that all safety measures have been taken before switching on the supply voltage and starting the motor/machine in order to avoid personal injury.

---

## 6 PROGRAMMING

### 6:1 Set Measurement Unit “HP” or “kW”



#### Selecting the unit of measurement









The unit of measurement can be set to kilowatts or Horsepower both as absolute or relative values. This setting is valid for the alarm levels, rated motor power and the actual load readout in window 01.

Measurement Unit	Readout load window 01	Rated power window 41	Alarm levels windows 11,12,13,14
Kilowatt relative value (def.)*	%	kW	%
Horsepower absolute value	HP	HP	HP
Horsepower relative value*	%	HP	%
Kilowatt absolute value	kW	kW	kW

\* Measured shaft power as % of rated power.

#### Programming

- Go to window 01.
- Press and hold  and  simultaneously for 3 seconds.
- The next unit of measurement is set and appears for 2 sec, (see examples). Repeat to select the desired measurement unit according to the table.

	For 2 seconds	Example readout
<b>Horsepower:</b> absolute value →		
<b>Horsepower:</b> relative value* →		
<b>Kilowatt:</b> absolute value →		
<b>Kilowatt:</b> relative value* (default) →		







## 6:2 Set **RATED MOTOR POWER** and **CURRENT** (Windows 41, 42)

The **RATED MOTOR POWER** and the **RATED MOTOR CURRENT** must be set in window 41 and 42.

Example motor plate:

TYPE: T56BN/4		NR: 948287		Prot. IP: 54	
Serv: S1		Cos φ: 0.78		Is. Cl:F	
V:Y/Δ	Hz	HP	kW	RPM	A:Y/Δ
240/415	50	3	2.2	1400	5.6/9.4
260/440	60	3	2.2	1680	5.8/9.1
ASYNCHRONOUS THREE-PHASE MOTORS					

### Programming

1. Go to window 41 (default = 2.2kW).
2. Press  or  to set the **RATED MOTOR POWER** as indicated on the motor plate (see example).
3. Press  to confirm the change.
4. Go to window 42 (default = 5.6A).
5. Press  or  to set the **RATED MOTOR CURRENT** as indicated on the motor plate (see example).
6. Press  to confirm the change.




### **6:3 Set NUMBER OF PHASES (Window 43)**

The NUMBER OF PHASES must be set according to number of motor phases. Default is 3 phase.

#### **Programming**

1. Go to window 43 (default = 3PH).



2. Press  or  to set the NUMBER OF PHASES to 1 if a single-phase motor is used.
3. Press  to confirm the change.



## 6:4 Monitor Function (Window 05)

Monitor (Protection)	Indication in window 05	Alarm	Output Relay (default)
OVER- and UNDER-LOAD (default)	—	MAX Main-Alarm	Relay 1 (NC): 6-7
		MAX Pre-Alarm	Relay 2 (NO): 6-8
		MIN Pre-Alarm	Relay 2 (NO): 6-8
		MIN Main-Alarm	Relay 1 (NC): 6-7
OVERLOAD	—	MAX Main-Alarm	Relay 1 (NC): 6-7
		MAX Pre-Alarm	Relay 2 (NO): 6-8
UNDERLOAD	—	MIN Pre-Alarm	Relay 2 (NO): 6-8
		MIN Main-Alarm	Relay 1 (NC): 6-7

### Over- and underload monitor

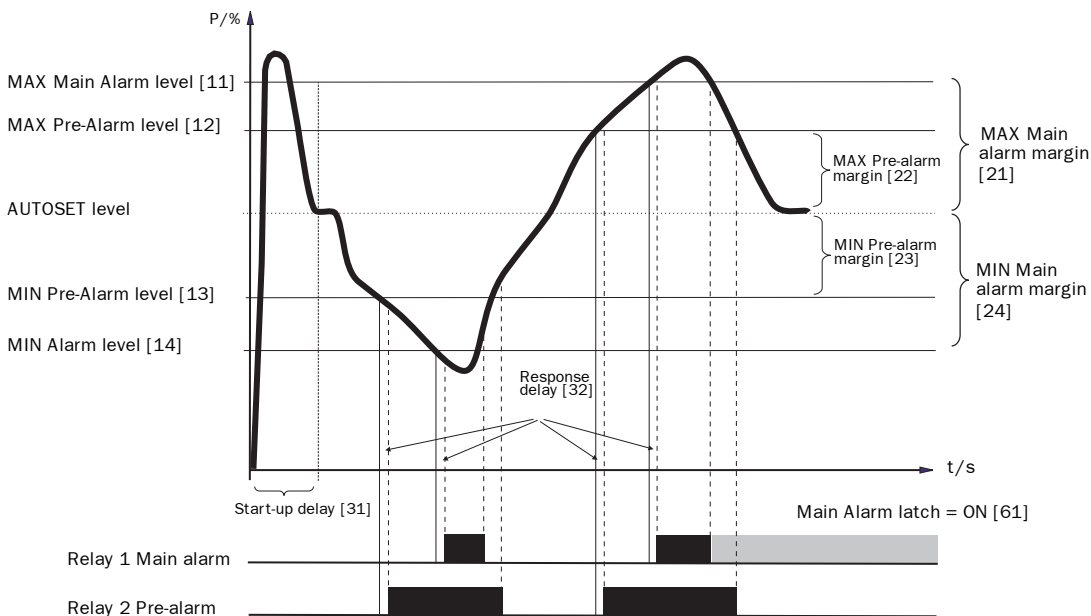




Fig 7. Over- and underload monitor.

## Programming


1. Go to window 05. The default selection is OVER- and UNDERLOAD monitor.
2. Press  or  to select UNDERLOAD or OVERLOAD monitor.



OVER- and UNDERLOAD    UNDERLOAD






OVERLOAD

3. Press  to confirm the change.

**6:5 Set the START DELAY (window 31)**

A START DELAY must be set to allow the motor and machine to speed up and to allow the power in-rush currents to be ignored by the monitor.

**Programming**

1. Determine in seconds, how long it takes for the motor and machine to reach speed and for the power in-rush to pass. This will be the minimum START DELAY.
2. Go to window 31 (default = 2.0s).
3. Press  or  to set the determined START DELAY time in seconds.
4. Press  to confirm the change.

Example: Start Delay 2.0 s

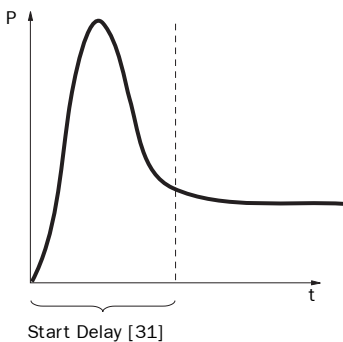



Fig 8. Start Delay.

## 6:6 Set Alarm levels with AUTOSET

The AUTOSET command performs a measurement of the actual motor load and automatically sets the relevant Alarm levels depending on the selected monitor function.

Protection (Monitor function window 05)	Alarm	Margin Value (Default margins)	Margins (Windows)	Alarm Level at AUTOSET
OVER- and UNDERLOAD (Default)	MAX Main-Alarm	16%	21: MAX Main Alarm margin	Normal machine load+Window 21
	MAX Pre-Alarm	8%	22: MAX Pre- Alarm margin	Normal machine load+Window 22
	MIN Pre-Alarm	8%	23: MIN Pre- Alarm margin	Normal machine load-Window 23
	MIN Main-Alarm	16%	24: MIN Main Alarm margin	Normal machine load-Window 24
OVERLOAD	MAX Main-Alarm	16%	21: MAX Main Alarm margin	Normal machine load+Window 21
	MAX Pre-Alarm	8%	22: MAX Pre- Alarm margin	Normal machine load+Window 22
UNDERLOAD	MIN Pre-Alarm	8%	23: MIN Pre- Alarm margin	Normal machine load-Window 23
	MIN Main-Alarm	16%	24: MIN Main Alarm margin	Normal machine load-Window 24

### Programming

1. Start the motor and let it run at the normal machine load, until the START DELAY has expired.
2. Press  for 3 seconds. This can be done in any window.
3. The display shows “Set”, to confirm that the AUTOSET level has been measured and the Alarm levels have been set. The display reverts to window 01.

3 seconds






4. If the alarm levels are too high or too low, readjust the appropriate MARGINS (see table above) and perform a new AUTOSET. Alternatively, alarm levels can be set manually – see section 7.

## 6:7 Set the RESPONSE DELAY (Window 32)

A RESPONSE DELAY allows the machine to remain in an over- or under-load condition for a specific time before the alarm relays are activated.

### Programming

1. Determine in seconds, how long an under- or overload condition is allowed. This depends on machine properties and behavior. This will be the RESPONSE DELAY.
2. Go to window 32 (default = 0.5s).
3. Press  or  to set the determined RESPONSE DELAY time in seconds.
4. Press  to confirm the change.

Example: RESPONSE DELAY

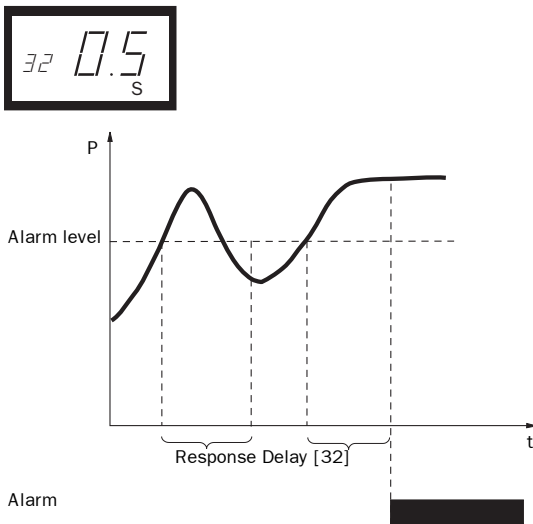


Fig 9. Response Delay.

## 7 ADVANCED FEATURES

### Set ALARM LEVELS manually (Window 11-14)

The alarm levels can be set manually, without using the AUTOSET. Also after an AUTOSET has been performed, these levels can be readjusted e.g. for fine-tuning.

Protection (Monitor function window 05)	Alarm levels (Window)	Default
OVER- and UNDERLOAD (Default)	11: MAX Main Alarm	100%
	12: MAX Pre-Alarm	100%
	13: MIN Pre-Alarm	0%
	14: MIN Main Alarm	0%
OVERLOAD	11: MAX Main Alarm	100%
	12: MAX Pre-Alarm	100%
UNDERLOAD	13: MIN Pre-Alarm	0%
	14: MIN Main Alarm	0%

### Set MARGINS (window 21-24)

The MARGINS for the AUTOSET can be changed manually. After the adjustment, the AUTOSET action must be performed once again to activated the new margins.

Protection (Monitor function window 05)	Window	Default
OVER- and UNDERLOAD (Default)	21: MAX Main Alarm margin	16%
	22: MAX Pre-Alarm margin	8%
	23: MIN Pre-Alarm margin	8%
	24: MIN Main Alarm margin	16%
OVERLOAD	21: MAX Main Alarm margin	16%
	22: MAX Pre-Alarm margin	8%
UNDERLOAD	23: MIN Pre-Alarm margin	8%
	24: MIN Main Alarm margin	16%

## Set HYSTERESIS (Window 33)

The HYSTERESIS of an Alarm level prevents the alarm relay “chattering” if the load fluctuates even in a normal “stable” condition . Apply also for pre-alarm. This feature is normally only used if the “Main Alarm Latch” (Window 61) is set to “OFF”. Default = 0%.

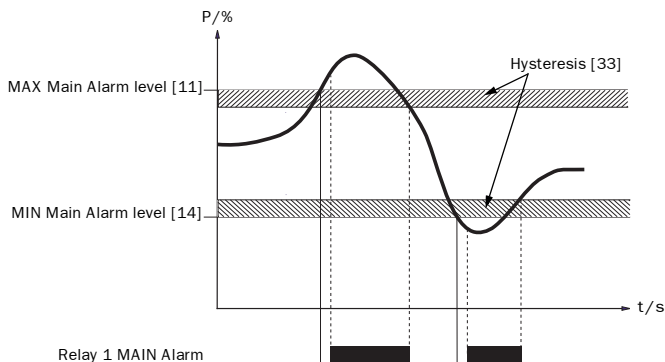


Fig. 10 Hysteresis

## Set MAIN ALARM LATCH (Window 61)

The MAIN ALARM LATCH keeps the MAIN ALARM output active, even if the alarm condition has been removed (relay R1). A latched alarm output can be reset by:

- the reset key
- external reset via Digital input (see window 81).
- switching of the power of the monitor (see also “Wiring”).

Default = OFF

## Set ALARM AT NO MOTOR CURRENT (Window 62)

The “ALARM AT NO MOTOR CURRENT” gives an alarm if the motor current becomes zero (ON). Default = OFF (No alarm at no motor current).

### Set RELAY OUTPUTS (Window 63 and 64)

The RELAY OUTPUTs R1 and R2 can be set to NO or NC contacts.

**Note!**

If the power to the load monitor is switched off the relay contacts are allways in the NO.

### Set DIGITAL INPUT (window 81)

The DIGITAL INPUT can be set for:

RES: External RESET (Default)	to reset an Alarm.
AU: External AUTOSET	to perform an AUTOSET with an external command.
bLo: Block Pre-Alarm	to block the Pre-Alarm function and start the Block timer. If the input is high a Pre-Alarm is blocked, e.g. it is neglected. See also window 82.

### Set BLOCK TIMER (window 82)

To set the timer for the blocking time after the Block command is released (see also window 81). Default = 0.0 sec.

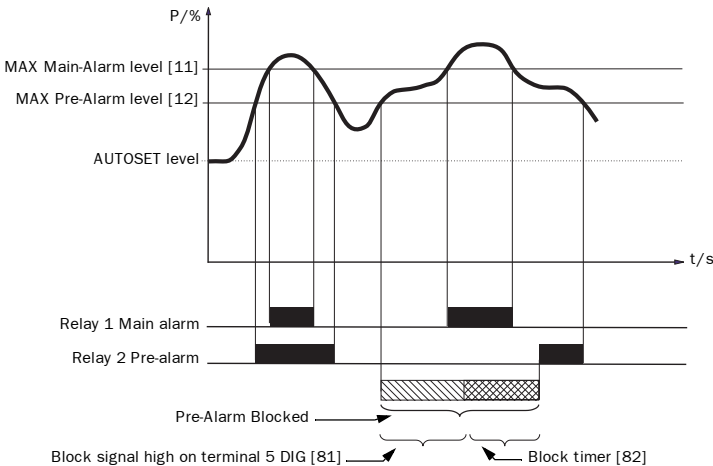


Fig 11. Block timer

## Set ANALOG OUTPUT (Window 91)

The ANALOG OUTPUT provides an analog signal of either 0–20 mA or 4–20 mA signal which represents the motor shaft power. The signal can be inverted. Full scale: rated motor power. To set P-span/scaling (full scale) see below.

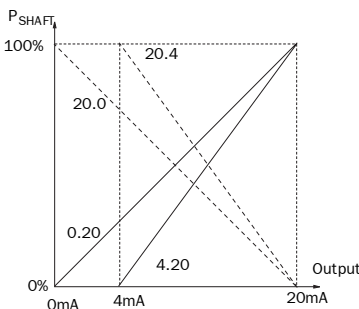


Fig 12. Analog Output.

## Set ANALOG OUTPUT LOAD RANGE: P-span (window 92-93)

With window 92 and 93 the full scale of the analog output can be set according to the minimum and maximum load (P-span).

1. In Window 91, press RESET and + for two seconds until "on" shows. Windows 92 and 93 are now active.
2. Set the lowest load value in window 92 (e.g. 20%)
3. Set the highest load value in window 93 (e.g. 55%)

The full scale of the analog output is now set between 20% and 55% load. See figure 13. To inactivate: Press RESET and + for two seconds until "OFF" shows in Window 91. Windows 92 and 93 are now inactive.

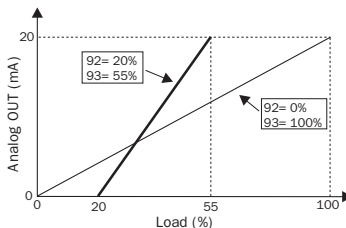


Fig. 13.

LOCK PARAMETERS (Window 04)

To avoid unintentional change of parameter settings the programming can be locked by entering the code “369” in window 04. Now only the motor variables LOAD [01], VOLTAGE [02] and CURRENT [03] can be checked. Follow the same procedure to UNLOCK the monitor. The AutoSet button is disabled when parameters are locked. AutoSet via Digital Input is always active if window 81 is set to AU (AutoSet).



**Note!**  
The “Lock” symbol appears in all windows.

Reset to FACTORY DEFAULTS (Window 99)

The FACTORY DEFAULTS are reset by entering “dEF” in window 99. If Window 99 shows “USr” it indicates that the settings have been changed to user specific settings.

View ALARM MESSAGE (Window 00)

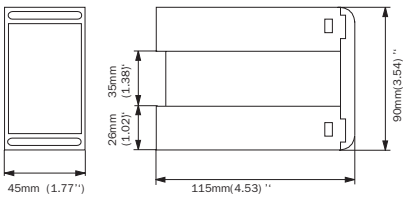
In an alarm condition, the window 00 appears automatically. The window indicates the following Alarm conditions. Window 00 is always blinking.

	Pre-Alarm MAX level reached		Under voltage, switch off the supply!
	Alarm MAX level reached		Over voltage, switch of the supply!
	Pre-Alarm MIN level reached		No motor current Window 62=on
	Alarm MIN level reached		Out Of Range. This message appears only in window 01 (actual load) or 03 (actual current)

## 8 TROUBLESHOOTING

Problem	Solution
Window 01 always shows zero load, even if the motor is running	<ul style="list-style-type: none"> <li>- Check the connection of the current transformer(s).</li> <li>- Check that value of the rated motor power in window 41 is the same as the rated motor power on the motor plate.</li> <li>- Check that window 03 shows a phase current value in correspondents with the rated motor current.</li> </ul>
Window 01 shows an improper power value when the motor is running	<ul style="list-style-type: none"> <li>- Check that the current transformer is connected in phase L1.</li> </ul>
Window 03 shows an improper value of the phase current	<ul style="list-style-type: none"> <li>- Check that current transformer has been selected according to the tables 1 and 2.</li> <li>- Check that the number of windings is according to table 1 and 2.</li> <li>- Check that the value of the motor current in window 42 is the same as the value of the motor current on the motor plate.</li> </ul>
The monitor never gives an alarm	<ul style="list-style-type: none"> <li>- Check that window 01 shows a value greater than zero.</li> <li>- Check the alarm levels in windows 11 to 14. If not correct readjust the levels or perform an AUTOSET.</li> </ul>
The monitor always gives an alarm	<ul style="list-style-type: none"> <li>- Check the alarm levels in windows 11 to 14. If not correct readjust the levels or perform an AUTOSET.</li> <li>- Check if the monitor is programmed for "latched alarm" (window 61=on). If so reset the monitor by pressing the reset key.</li> </ul>
Window 00 shows "LU" or "OU". Under- or over voltage alarm.	<p>Switch off the supply:</p> <ul style="list-style-type: none"> <li>- Check that the supply voltage is corresponding with the voltage range on the monitor type plate.</li> </ul>
Window 01 shows "oor". "Out Of Range" alarm.	<ul style="list-style-type: none"> <li>- The measured shaft power is higher than 125% of the rated motor power programmed in window 41.</li> </ul>
Window 03 shows "oor". "Out Of Range" alarm.	<ul style="list-style-type: none"> <li>- The measured motor current is higher than 125% of the rated motor current programmed in window 42.</li> </ul>
The alarm relays are not switching	<ul style="list-style-type: none"> <li>- Check that the wire links between terminals 6 and 7 are removed according to "Wiring".</li> </ul>

## 9 TECHNICAL DATA

Dimensions (WxHxD)	45x90x115 mm (1.77" x 3.54" x 4.53") 
Mounting	35 mm DIN-rail 46277
Weight	0.30 kg (10.5 oz)
Supply voltage ( $\pm 10\%$ )	1x100-240 VAC, 3x100-240 VAC, 3x380-500 VAC, 3x525-600 VAC, 3x600-690 VAC
Frequency	50 or 60 Hz
Current input	Current transformer; CTM 010, 025, 050 and 100 (>100A extra transformer needed)
Power consumption	max 6 VA
Start-up delay	1-999 s
Hysteresis	0-50% of rated motor power
Response delay	0.1-90 s
Relay output	5 A/240 VAC Resistive, 1.5 A/240 VAC Pilot duty/AC12
Analog output	max load 500 ohm
Digital input	max 240 VAC or 48 VDC. High: $\geq 24$ VAC/DC, Low: $< 1$ VAC/DC. Reset $> 50$ ms
Fuse	max 10 A
Terminal wire size	Use 75°C copper (CU) wire only. 0.2-4.0 mm <sup>2</sup> single core (AWG12). 0.2-2.5 mm <sup>2</sup> flexible core (AWG14), stripped length 8 mm (0.32")
Terminal tightening torque	0.56-0.79 Nm (5-7 lb-in)
Accuracy	$\pm 2\%$ , $\pm 1$ unit $\cos \phi > 0.5$ ; excl. current transformer; $+20^\circ\text{C}$ ( $+68^\circ\text{F}$ )
Repeatability	$\pm 1$ unit 24h; $+20^\circ\text{C}$ ( $+68^\circ\text{F}$ )
Temperature tolerance	max 0.1%/°C
Operating temperature	$-20$ to $+50^\circ\text{C}$ ( $4^\circ\text{F}$ to $+122^\circ\text{F}$ )
Storage temperate	$-30$ to $+80^\circ\text{C}$ ( $22^\circ\text{F}$ to $+176^\circ\text{F}$ )
Protection class	IP20
Approved to	CE, cUL and UL and CSA standard (up to 600 V)

Dismantling and disposal

The housing is made of recyclable plastic, PC/ABS and the circuit board contain small amount of tin and lead. When disposing, the parts must be handled and recycled in accordance with local regulations.

EU (European Union) specifications

EMC	EN 50081-1, EN 50081-2, EN 50082-1, EN 61000-6-2
Electrical safety	IEC 947-5-1
Rated insulated voltage	690 V
Rated impulse withstand voltage	4000V
Pollution degree	2

Terminals 3, 4, 5, 6, 7 and 8 are basic insulated from the line.

Terminals 3 and 4 are basic insulated from terminals 5, 6, 7 and 8.

US specifications

FCC (Federal Communications Commission). This equipment has been tested and found to comply with the limits for a class A digital device pursuant to the Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference, in which case, the user will be required to correct the interference at their own expense.

Canada specifications

DOC (Department of communications). This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the Canadian interference-Causing Equipment Regulations. Le présent appareil numérique n'émet pas de bruits radio-électriques dépassant les limites applicables aux appareils numériques de la Classe A prescrite dans le Règlement sur le brouillage radioélectrique édicté du Canada.

## 10 PARAMETER LIST

Window	Function	Range	Default	Custom	Symbol
00	Alarm indication				
01	Measured shaft power in % rated power	0-125	0-125		%
	Measured shaft power in kW	0-745			kW
	Measured shaft power in % rated power	0-125			%
	Measured shaft power in HP	0-999			
02	Measured line voltage	90-760 V			V
03	Measured current	0.00-999 A			A
04	Parameter lock	0-999			🔒
05	Monitor function	OVER- and UNDER-LOAD, OVERLOAD, UNDERLOAD	OVERLOAD and UNDERLOAD		
11	MAX Main Alarm (relay R1)	0-125	100		%
		0-745	2.2		kW
		0-125	100		%
		0-999	3		
12	MAX Pre-Alarm (relay R2)	0-125	100		%
		0-745	2.2		kW
		0-125	100		%
		0-999	3		
13	MIN Pre-Alarm (relay R2)	0-125	0		%
		0-745	0		kW
		0-125	0		%
		0-999	0		

Window	Function	Range	Default	Custom	Symbol
14	MIN Main Alarm (relay R1)	0-125	0		%
		0-745	0		kW
		0-125	0		%
		0-999	0		
21	MAX Main Alarm margin	0-100	16		%
22	MAX Pre-Alarm margin	0-100	8		%
23	MIN Pre-Alarm margin	0-100	8		%
24	MIN Main Alarm margin	0-100	16		%
31	Start delay	1-999	2		s
32	Response delay	0.1-90	0.5		s
33	Hysteresis	0-50	0		%
41	Rated motor power	0.10-745	2.2		kW
		0.13-999	3		
42	Rated current	0.01-999	5.6		A
43	Number of phases	1PH/3PH	3PH		
61	Main alarm latch	on/OFF	OFF		
62	Alarm at no motor current	on/OFF	OFF		
63	Main Alarm relay R1	nc/no	nc		
64	Pre-Alarm relay R2	nc/no	no		
81	Digital input	rES/AU/bLo	rES		
82	Block timer	0.0-90	0.0		s
91	Analog output	0.20/4.20/20.0/20.4	0.20		
92*	Analog Out low value	0-100	Not used		
93*	Analog Out high value	0-125	Not used		
99	Factory defaults	dEF/USr	dEF		

★ Optional parameters, see section 7.

## **11 SERVICE**

This manual is valid for the following model:

EL-FI M20

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Document version: r2

Date of release: 2003-04-15

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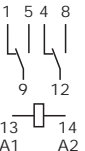
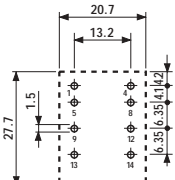
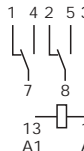
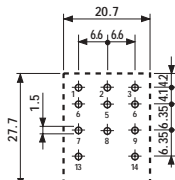
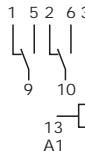
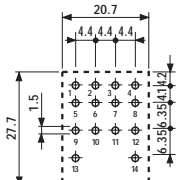














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Protected by utility patent SE 9703952-3

International utility patent application pending WO 9925049

- Plug-in or P.C.B. versions
- AC or DC coils
- Lockable test button and mechanical flag indicator as standard on 2 and 4 CO relays types
- Sockets and accessories: see 94, 99 and 86 series
- RT III (wash tight) version available

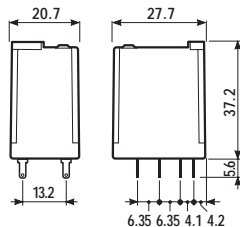
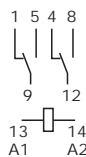
	55.12	55.13	55.14
			
	- 2 pole - P.C.B. mounting	- 3 pole - P.C.B. mounting	- 4 pole - P.C.B. mounting
	  Copper side view h = 35.8 mm	  Copper side view h = 35.8 mm	  Copper side view h = 35.8 mm
<b>Contact specifications</b>			
Contact configuration	2 CO	3 CO	4 CO
Rated current/Maximum peak current A	10/20	10/20	5/10
Rated voltage/Maximum switching voltage V AC	250/400	250/400	250/250
Rated load in AC1 VA	2,500	2,500	1,250
Rated load in AC15 (230 VAC) VA	500	500	250
Single phase motor rating (230 VAC) kW	0.37	0.37	0.125
Breaking capacity in DC1: 30/110/220V A	10/0.25/0.12	10/0.25/0.12	5/0.25/0.12
Minimum switching load mW (V/mA)	300 (5/5)	300 (5/5)	300 (5/5)
Standard contact material	AgNi	AgNi	AgNi
<b>Coil specifications</b>			
Nominal voltage ( $U_N$ ) V AC (50/60 Hz)	6 · 12 · 24 · 48 · 60 · 110 · 120 · 230 · 240		
V DC	6 · 12 · 24 · 48 · 60 · 110		
Rated power AC/DC VA (50 Hz)/W	1.5/1	1.5/1	1.5/1
Operating range AC (50 Hz)	$(0.8...1.1)U_N$	$(0.8...1.1)U_N$	$(0.8...1.1)U_N$
DC	$(0.8...1.1)U_N$	$(0.8...1.1)U_N$	$(0.8...1.1)U_N$
Holding voltage AC/DC	$0.8 U_N/0.5 U_N$	$0.8 U_N/0.5 U_N$	$0.8 U_N/0.5 U_N$
Must drop-out voltage AC/DC	$0.2 U_N/0.1 U_N$	$0.2 U_N/0.1 U_N$	$0.2 U_N/0.1 U_N$
<b>Technical data</b>			
Mechanical life AC/DC cycles	$20 \cdot 10^6/50 \cdot 10^6$	$20 \cdot 10^6/50 \cdot 10^6$	$20 \cdot 10^6/50 \cdot 10^6$
Electrical life at rated load AC1 cycles	$200 \cdot 10^3$	$200 \cdot 10^3$	$150 \cdot 10^3$
Operate/release time (bounce included) ms	10/15	10/15	10/15
Insulation according to EN 61810-5	3.6 kV/2	3.6 kV/2	3.6 kV/2
Insulation between coil and contacts (1.2/50µs) kV	3.6	3.6	3.6
Dielectric strength between open contacts V AC	1,000	1,000	1,000
Ambient temperature range °C	-40...+70	-40...+70	-40...+70
Environmental protection	RT I	RT I	RT I
<b>Approvals:</b> (according to type)	      GOST   RINA      		

- Plug-in or P.C.B. versions
- AC or DC coils
- Lockable test button and mechanical flag indicator as standard on 2 and 4 CO relays types
- Sockets and accessories: see 94, 99 and 86 series

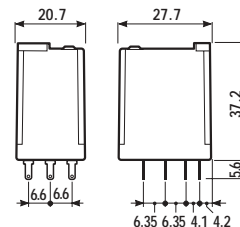
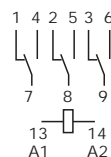
55

**55.32**

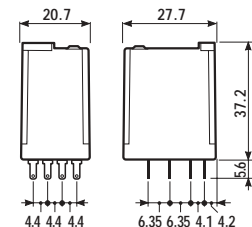
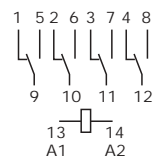
- 2 pole
- Plug-in for use with 94 Series sockets

**55.33**

- 3 pole
- Plug-in for use with 94 Series sockets

**55.34**

- 4 pole
- Plug-in for use with 94 Series sockets

**Contact specifications**

Contact configuration		2 CO	3 CO	4 CO
Rated current/Maximum peak current	A	10/20	10/20	5/10
Rated voltage/Maximum switching voltage	V AC	250/400	250/400	250/250
Rated load in AC1	VA	2,500	2,500	1,250
Rated load in AC15 (230 VAC)	VA	500	500	250
Single phase motor rating (230 VAC)	kW	0.37	0.37	0.125
Breaking capacity in DC1: 30/110/220V	A	10/0.25/0.12	10/0.25/0.12	5/0.25/0.12
Minimum switching load	mW (V/mA)	300 (5/5)	300 (5/5)	300 (5/5)
Standard contact material		AgNi	AgNi	AgNi

**Coil specifications**

Nominal voltage ( $U_N$ )	V AC (50/60 Hz)	6 - 12 - 24 - 48 - 60 - 110 - 120 - 230 - 240		
	V DC	6 - 12 - 24 - 48 - 60 - 110		
Rated power AC/DC	VA (50 Hz)/W	1.5/1	1.5/1	1.5/1
Operating range	AC (50 Hz)	$(0.8 \dots 1.1) U_N$	$(0.8 \dots 1.1) U_N$	$(0.8 \dots 1.1) U_N$
	DC	$(0.8 \dots 1.1) U_N$	$(0.8 \dots 1.1) U_N$	$(0.8 \dots 1.1) U_N$
Holding voltage	AC/DC	$0.8 U_N / 0.5 U_N$	$0.8 U_N / 0.5 U_N$	$0.8 U_N / 0.5 U_N$
Must drop-out voltage	AC/DC	$0.2 U_N / 0.1 U_N$	$0.2 U_N / 0.1 U_N$	$0.2 U_N / 0.1 U_N$

**Technical data**

Mechanical life AC/DC	cycles	$20 \cdot 10^6 / 50 \cdot 10^6$	$20 \cdot 10^6 / 50 \cdot 10^6$	$20 \cdot 10^6 / 50 \cdot 10^6$
Electrical life at rated load AC1	cycles	$200 \cdot 10^3$	$200 \cdot 10^3$	$150 \cdot 10^3$
Operate/release time (bounce included)	ms	10/15	10/15	10/15
Insulation according to EN 61810-5		3.6 kV/2	3.6 kV/2	3.6 kV/2
Insulation between coil and contacts (1.2/50μs)	kV	3.6	3.6	3.6
Dielectric strength between open contacts	V AC	1,000	1,000	1,000
Ambient temperature range	°C	-40...+70	-40...+70	-40...+70
Environmental protection		RT I	RT I	RT I

**Approvals:** (according to type)

## ORDERING INFORMATION

Example: a 55 series plug-in relay, 4 CO contacts, coil rated 12 V DC with a lockable test button and mechanical indicator.

<b>5</b>	<b>5</b>	<b>.</b>	<b>3</b>	<b>.</b>	<b>4</b>	<b>.</b>	<b>9</b>	<b>.</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>.</b>	<b>0</b>	<b>A</b>	<b>0</b>	<b>B</b>	<b>0</b>	<b>C</b>	<b>4</b>	<b>D</b>	<b>0</b>
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**Series** ———

**Type** ———  
 1 = P.C.B.  
 3 = Plug-in

**No. of poles** ———  
 2 = 2 pole, 10 A  
 3 = 3 pole, 10 A  
 4 = 4 pole, 5 A

**Coil version** ———  
 8 = AC (50/60 Hz)  
 9 = DC

**Coil voltage** ———  
 see coil specifications

**A: Contact material**  
 0 = Standard AgNi  
 2 = AgCdO  
 5 = AgNi + 5µm Au

**B: Contact circuit**  
 0 = CO

**D: Special versions**  
 0 = Standard  
 1 = Wash tight (RT III)  
     for 55.12, 55.13 and 55.14 only  
 6 = Rear flange mount

**C: Options**  
 0 = None  
 1 = Lockable test button  
 2 = Mechanical indicator  
 3 = LED (AC)  
 4 = Lockable test button + mechanical indicator  
 5 = Lockable test button + LED (AC)  
 54 = Lockable test button + LED (AC)  
     + mechanical indicator  
 6 = LED + diode (positive to pin A2/14,  
     DC non standard polarity)  
 7 = Lockable test button + LED + diode (positive  
     to pin A2/14, DC non standard polarity)  
 74 = Lockable test button + LED + diode (positive  
     to pin A2/14, DC non standard polarity)  
     + mechanical indicator  
 8 = LED + diode (positive to pin A1/13,  
     DC standard polarity)  
 9 = Lockable test button + LED + diode (positive  
     to pin A1/13, DC standard polarity)  
 94 = Lockable test button + LED + diode (positive  
     to pin A1/13, DC standard polarity)  
     + mechanical indicator

### Only combinations in the same row are possible

Preferred versions

	coil version	A	B	C	D
55.32/34	AC/DC	0	0	4	0
55.12/13/14	AC/DC	0	0	0	0
55.33	AC/DC	0	0	0	0

All versions

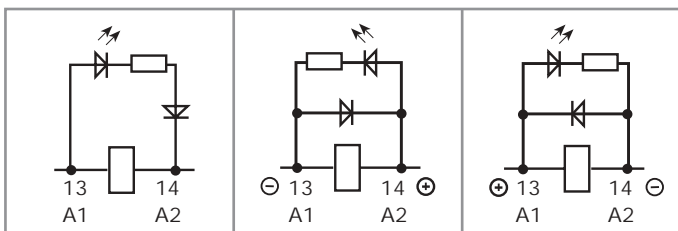
	coil version	A	B	C	D
55.32/34	AC/DC	0 - 2 - 5	0	0	0 - 6
	AC	0 - 2 - 5	0	2 - 3 - 4 - 5	0 - 6
	AC	0 - 2 - 5	0	54	/
	DC	0 - 2 - 5	0	2 - 4 - 6 - 7 - 8 - 9	0 - 6
	DC	0 - 2 - 5	0	74 - 94	/
55.33	AC/DC	0 - 2 - 5	0	0	0 - 6
	AC	0 - 2 - 5	0	1 - 3 - 5	0 - 6
	DC	0 - 2 - 5	0	1 - 6 - 7 - 8 - 9	0 - 6
55.12/13/14	AC/DC	0 - 2 - 5	0	0	0 - 1

## POSSIBLE OPTIONS

AC

DC - Non standard polarity

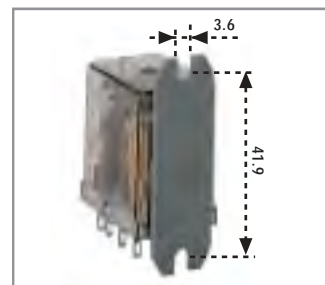
DC - Standard polarity



Option = 0030  
0050  
0054

Option = 0060  
0070  
0074

Option = 0080  
0090  
0094



Option = 0006  
REAR FLANGE MOUNT



### LOCKABLE TEST BUTTON AND MECHANICAL FLAG INDICATOR (0040)

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

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

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

In both cases ensure that the test button actuation is swift and decisive.

## TECHNICAL DATA

### INSULATION

INSULATION according to EN 61810-5	insulation rated voltage	V	250
	rated impulse withstand voltage	kV	3.6
	pollution degree		2
	overvoltage category		III

### IMMUNITY

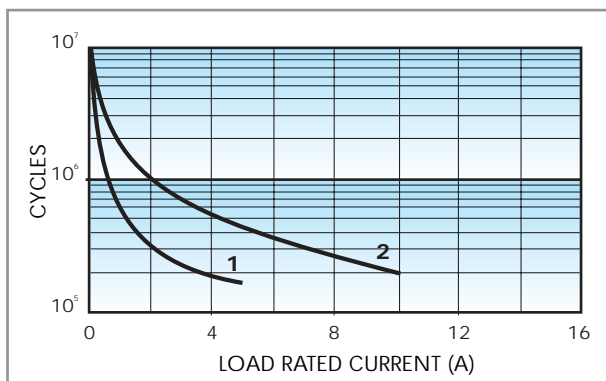
CONDUCTED DISTURBANCE IMMUNITY	BURST (according to EN 61000-4-4) level 4 (4 kV)
	SURGE (according to EN 61000-4-5) level 4 (4 kV)

### OTHER DATA

VIBRATION RESISTANCE (10...55Hz): NO/NC	g/g	6/6		
POWER LOST TO THE ENVIRONMENT		<b>2 CO</b>	<b>3 CO</b>	<b>4 CO</b>
	without contact current W	1	1	1
	with rated current W	3	4	2.6
RECOMMENDED DISTANCE between RELAYS mounted on P.C.B.s	mm	≥5		

## CONTACT SPECIFICATIONS

### F 55

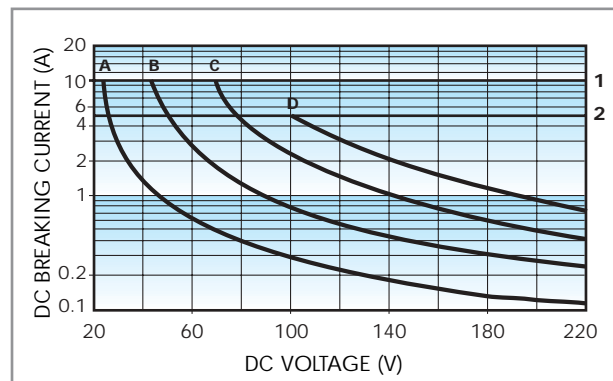


Electrical life vs AC1 load.

**1** = 4 CO relay type (5 A).

**2** = 2 · 3 CO relay type (10 A).

### H 55



Breaking capacity for DC1 load.

**1** = 2 · 3 CO type.

**2** = 4 CO type.

**A** = Load applied to 1 contact

**B** = Load applied to 2 contacts in series

**C** = Load applied to 3 contacts in series

**D** = Load applied to 4 contacts in series

- When switching a resistive load (DC1) having voltage and current values under the curve the expected electrical life is  $\geq 100 \cdot 10^3$  cycles.

- In case of DC13 loads the connection of a diode in parallel with the load will permit the same electrical life as for a DC1 load.

**Note:** the release time of load will be increase.

## COIL SPECIFICATIONS

### AC VERSION DATA

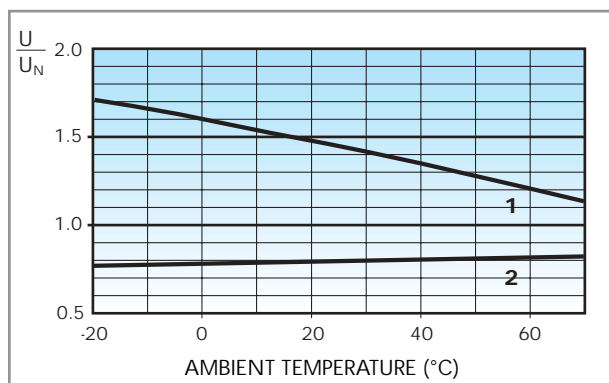
Nominal voltage $U_N$	Coil code	Operating range		Resistance	Rated coil consumption
V		$U_{min}$ V	$U_{max}$ V	R $\Omega$	I at $U_N$ (50Hz) mA
6	<b>8.006</b>	4.8	6.6	12	200
12	<b>8.012</b>	9.6	13.2	50	97
24	<b>8.024</b>	19.2	26.4	190	53
48	<b>8.048</b>	38.4	52.8	770	25
60	<b>8.060</b>	48	66	1,200	21
110	<b>8.110</b>	88	121	4,000	12.5
120	<b>8.120</b>	96	132	4,700	12
230	<b>8.230</b>	184	253	17,000	6
240	<b>8.240</b>	192	264	19,100	5.3

### DC VERSION DATA

Nominal voltage $U_N$	Coil code	Operating range		Resistance	Rated coil consumption
V		$U_{min}$ V	$U_{max}$ V	R $\Omega$	I at $U_N$ mA
6	<b>9.006</b>	4.8	6.6	40	150
12	<b>9.012</b>	9.6	13.2	140	86
24	<b>9.024</b>	19.2	26.4	600	40
48	<b>9.048</b>	38.4	52.8	2,400	20
60	<b>9.060</b>	48	66	4,000	15
110	<b>9.110</b>	88	121	12,500	8.8

**55**

### R 55 AC

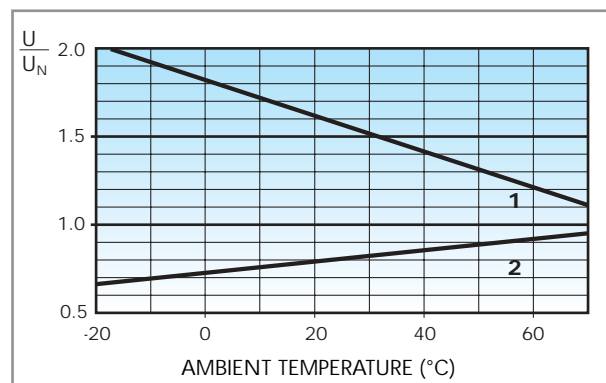


Operating range (AC type) vs ambient temperature.

**1** - Max coil voltage permitted.

**2** - Min pick-up voltage with coil at ambient temperature.

### R 55 DC



Operating range (DC type) vs ambient temperature.

**1** - Max coil voltage permitted.

**2** - Min pick-up voltage with coil at ambient temperature.



94.04

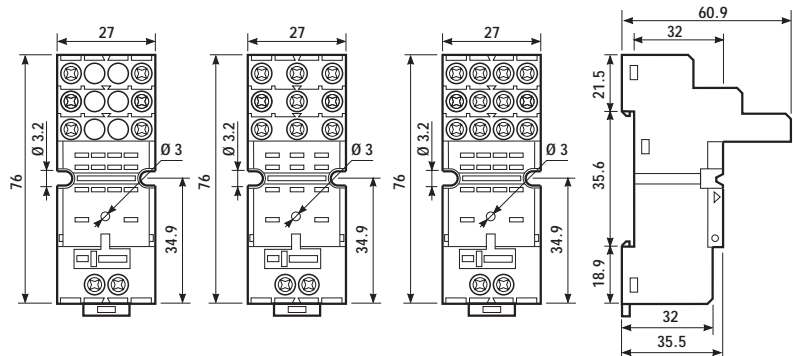
Approvals  
(according to type):



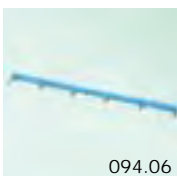
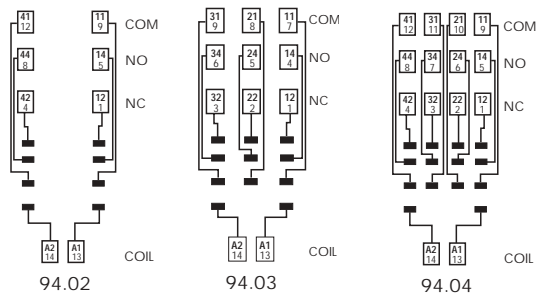
Relay type	55.32		55.33		55.32, 55.34	
Colour	BLUE	BLACK	BLUE	BLACK	BLUE	BLACK
<b>Clamp terminal socket:</b> panel or 35 mm rail (EN 50022) mount retaining clip 094.71 supplied with socket packaging code SMA	94.02	94.02.0	94.03	94.03.0	94.04	94.04.0
Metal retaining clip	094.71					
Plastic retaining and release clip	094.01					
6-way jumper link for 94.02, 94.03 and 94.04 sockets	094.06	094.06.0	094.06	094.06.0	094.06	094.06.0
Identification tag	094.00.4					
Modules (see table below)	99.02					
Timer modules	86.10, 86.20					
Sheet of marker tags for retaining and release clip 094.01	060.72					

- RATED VALUES: 10 A - 250 V
- DIELECTRIC STRENGTH:  $\geq 2$  kV AC
- PROTECTION CATEGORY: IP 20
- AMBIENT TEMPERATURE:  $(-40 \dots +70)^\circ\text{C}$
- SCREW TORQUE: 0.5 Nm
- WIRE STRIP LENGTH: 8 mm
- MAX WIRE SIZE:

	solid wire	stranded wire
mm <sup>2</sup>	1x6 / 2x2.5	1x4 / 2x2.5
AWG	1x10 / 2x14	1x12 / 2x14

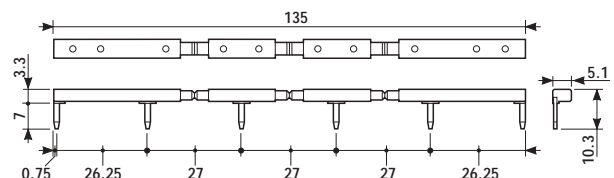


094.01



094.06

<b>6-way jumper link</b> for 94.02, 94.03 and 94.04 sockets	094.06
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- RATED VALUES: 10 A - 250 V



99.02

99.02 modules for 94.02, 94.03 and 94.04 sockets		BLUE
Diode** (+A1)	(6...220) V DC	99.02.3.000.00
Diode (inverted polarity)	(6...220) V DC	99.02.2.000.00
LED	(6...24) V DC/AC	99.02.0.024.59
LED	(28...60) V DC/AC	99.02.0.060.59
LED	(110...240) V DC/AC	99.02.0.230.59
LED + Diode** (+A1)	(6...24) V DC	99.02.9.024.99
LED + Diode** (+A1)	(28...60) V DC	99.02.9.060.99
LED + Diode** (+A1)	(110...220) V DC	99.02.9.220.99
LED + Diode (inverted polarity)	(6...24) V DC	99.02.9.024.79
LED + Diode (inverted polarity)	(28...60) V DC	99.02.9.060.79
LED + Diode (inverted polarity)	(110...220) V DC	99.02.9.220.79
LED + Varistor	(6...24) V DC/AC	99.02.0.024.98
LED + Varistor	(28...60) V DC/AC	99.02.0.060.98
LED + Varistor	(110...240) V DC/AC	99.02.0.230.98
RC circuit	(6...24) V DC/AC	99.02.0.024.09
RC circuit	(28...60) V DC/AC	99.02.0.060.09
RC circuit	(110...240) V DC/AC	99.02.0.230.09
No - remanence (62 kΩ/1W)	(110...240) V AC	99.02.8.230.07

\*\*For DC supply, apply the positive to terminal A1. Modules in Black housing are available on request.



## 94 Series - Sockets and Accessories for 55 Series Relays



94.74

Approvals  
(according to type):

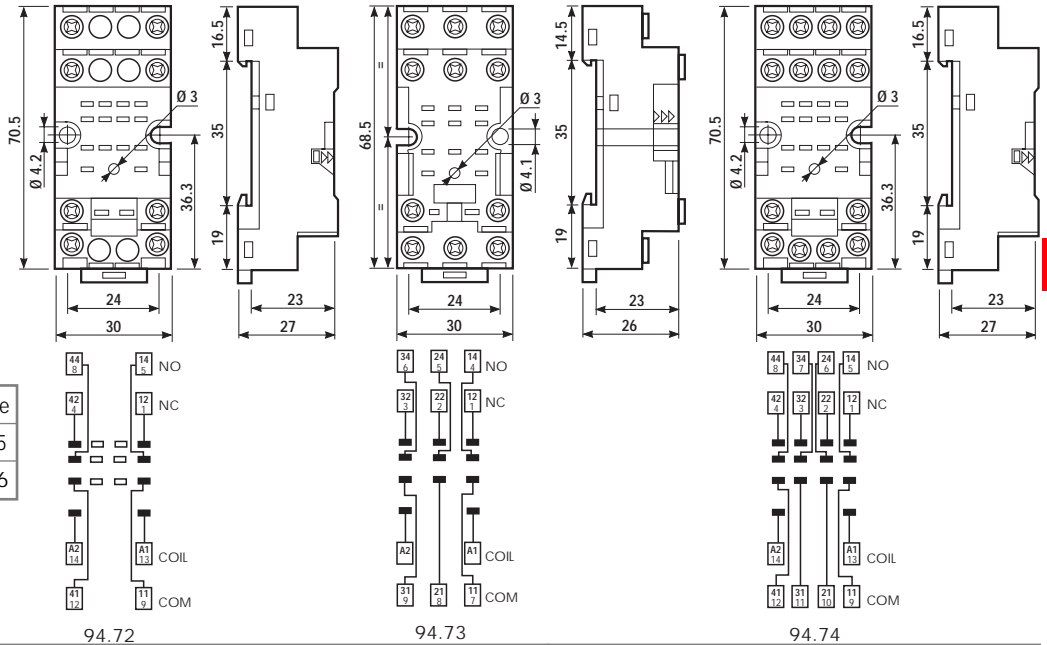


GOST US

- RATED VALUES: 10 A - 250 V
- DIELECTRIC STRENGTH:  $\geq 2$  kV AC
- PROTECTION CATEGORY: IP 20
- AMBIENT TEMPERATURE:  $(-40...+70)^{\circ}\text{C}$
- SCREW TORQUE: 0.5 Nm
- WIRE STRIP LENGTH: 8 mm
- MAX WIRE SIZE:

	solid wire	stranded wire
mm <sup>2</sup>	1x2.5 / 2x1.5	1x2.5 / 2x1.5
AWG	1x14 / 2x16	1x14 / 2x16

Relay type	55.32		55.33		55.32, 55.34	
Colour	BLUE	BLACK	BLUE	BLACK	BLUE	BLACK
<b>Screw terminal socket:</b> panel or 35 mm rail (EN 50022) mount retaining clip 094.71 supplied with socket packaging code SMA	94.72	94.72.0	94.73	94.73.0	94.74	94.74.0
Retaining clip	094.71					
Modules (see table below)	99.01					



94.82

Approvals  
(according to type):



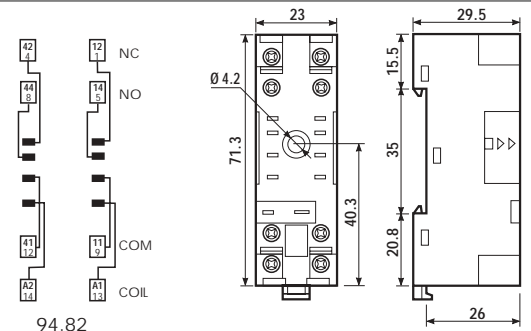
US

- RATED VALUES: 10 A - 250 V
- DIELECTRIC STRENGTH:  $\geq 2$  kV AC
- PROTECTION CATEGORY: IP 20
- AMBIENT TEMPERATURE:  $(-40...+70)^{\circ}\text{C}$
- SCREW TORQUE: 0.5 Nm
- WIRE STRIP LENGTH: 9 mm

- MAX WIRE SIZE:

	solid wire	stranded wire
mm <sup>2</sup>	1x2.5 / 2x1.5	1x2.5 / 2x1.5
AWG	1x14 / 2x16	1x14 / 2x16

Relay type	55.32	
Colour	BLUE	BLACK
<b>Screw terminal socket:</b> panel or 35 mm rail (EN 50022) mount retaining clip 094.71 supplied with socket packaging code SMA	94.82	94.82.0
Retaining clip	094.71	
Modules (see table below)	99.01	



99.01

99.01 modules for 94.72, 94.73, 94.74 and 94.82 sockets		BLUE
Diode** (+A1)	(6...220) V DC	99.01.3.000.00
Diode (inverted polarity)	(6...220) V DC	99.01.2.000.00
LED	(6...24) V DC/AC	99.01.0.024.59
LED	(28...60) V DC/AC	99.01.0.060.59
LED	(110...240) V DC/AC	99.01.0.230.59
LED + Diode** (+A1)	(6...24) V DC	99.01.9.024.99
LED + Diode** (+A1)	(28...60) V DC	99.01.9.060.99
LED + Diode** (+A1)	(110...220) V DC	99.01.9.220.99
LED + Diode (inverted polarity)	(6...24) V DC	99.01.9.024.79
LED + Diode (inverted polarity)	(28...60) V DC	99.01.9.060.79
LED + Diode (inverted polarity)	(110...220) V DC	99.01.9.220.79
LED + Varistor	(6...24) V DC/AC	99.01.0.024.98
LED + Varistor	(28...60) V DC/AC	99.01.0.060.98
LED + Varistor	(110...240) V DC/AC	99.01.0.230.98
RC circuit	(6...24) V DC/AC	99.01.0.024.09
RC circuit	(28...60) V DC/AC	99.01.0.060.09
RC circuit	(110...240) V DC/AC	99.01.0.230.09
No - remanence (62 k $\Omega$ /1W)	(110...240) V AC	99.01.8.230.07

\*\*For DC supply, apply the positive to terminal A1. Modules in Black housing are available on request.

Green LED is standard. Red LED available on request.  
Active: 16/05/2012



94.84.1

Approvals  
(according to type):

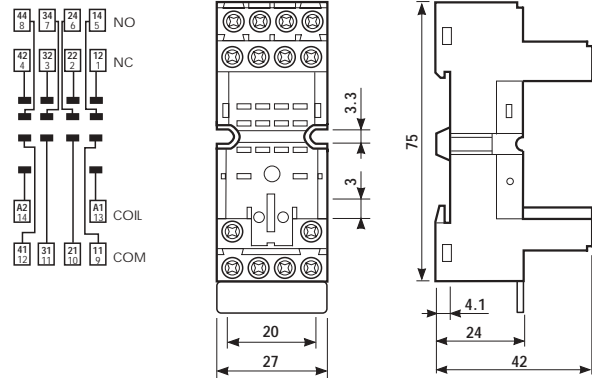


- RATED VALUES: 10 A - 250 V
- DIELECTRIC STRENGTH:  $\geq 2$  kV AC
- PROTECTION CATEGORY: IP 20
- AMBIENT TEMPERATURE:  $(-40...+70)^{\circ}\text{C}$
- SCREW TORQUE: 0.5 Nm
- WIRE STRIP LENGTH: 7 mm
- MAX WIRE SIZE:

55

	solid wire	stranded wire
mm <sup>2</sup>	1x6 / 2x2.5	1x4 / 2x2.5
AWG	1x10 / 2x14	1x12 / 2x14

Relay type	55.32, 55.34	
Colour	BLUE	BLACK
<b>Clamp terminal socket:</b> panel or 35 mm rail (EN 50022) mount retaining clip 094.71 supplied with socket packaging code SMA	94.84.1	94.84.10
Retaining clip	094.71	
Identification tag	094.80.2	
Modules (see table below)	99.80	



99.80

99.80 modules for 94.84.1 sockets		BLUE
Diode** (+A1)	(6...220) V DC	99.80.3.000.00
LED	(6...24) V DC/AC	99.80.0.024.59
LED	(28...60) V DC/AC	99.80.0.060.59
LED	(110...240) V DC/AC	99.80.0.230.59
LED + Diode** (+A1)	(6...24) V DC	99.80.9.024.99
LED + Diode** (+A1)	(28...60) V DC	99.80.9.060.99
LED + Diode** (+A1)	(110...220) V DC	99.80.9.220.99
LED + Varistor	(6...24) V DC/AC	99.80.0.024.98
LED + Varistor	(28...60) V DC/AC	99.80.0.060.98
LED + Varistor	(110...240) V DC/AC	99.80.0.230.98
RC circuit	(6...24) V DC/AC	99.80.0.024.09
RC circuit	(28...60) V DC/AC	99.80.0.060.09
RC circuit	(110...240) V DC/AC	99.80.0.230.09
No - remanence (62 kΩ/1W)	(110...240) V AC	99.80.8.230.07

\*\*For DC supply, apply the positive to terminal A1. Modules in Black housing are available on request.  
Green LED is standard. Red LED available on request.



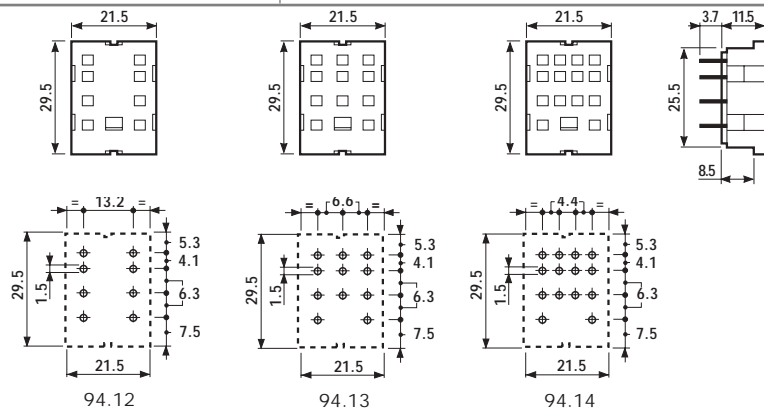
94.14

Approvals  
(according to type):



- RATED VALUES: 10 A - 250 V
- DIELECTRIC STRENGTH:  $\geq 2$  kV AC
- AMBIENT TEMPERATURE:  $(-40...+70)^{\circ}\text{C}$

Relay type	55.32		55.33		55.32, 55.34	
Colour	BLUE	BLACK	BLUE	BLACK	BLUE	BLACK
<b>P.C.B. socket</b>	94.12	94.12.0	94.13	94.13.0	94.14	94.14.0
retaining clip 094.51 supplied with socket packaging code SMA						
Metal retaining clip	094.51					



Copper side view



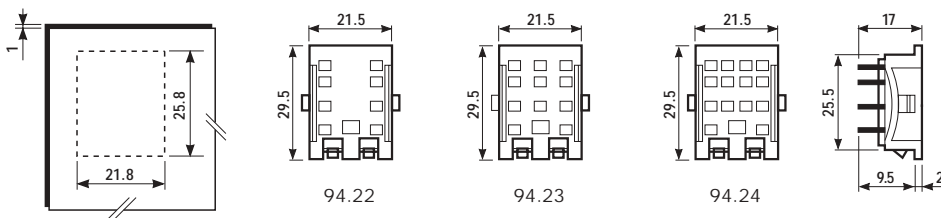
94.22

Relay type	55.32		55.33		55.32, 55.34	
Colour	BLUE	BLACK	BLUE	BLACK	BLUE	BLACK
<b>Panel mount solder socket:</b> 1 mm thick panel retaining clip 094.51 supplied with socket packaging code SMA	94.22	94.22.0	94.23	94.23.0	94.24	94.24.0
Metal retaining clip	094.51					

Approvals  
(according to type):



- RATED VALUES: 10 A - 250 V
- DIELECTRIC STRENGTH:  $\geq 2$  kV AC
- AMBIENT TEMPERATURE:  $(-40...+70)^{\circ}\text{C}$



55



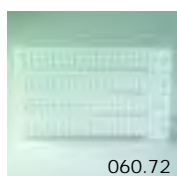
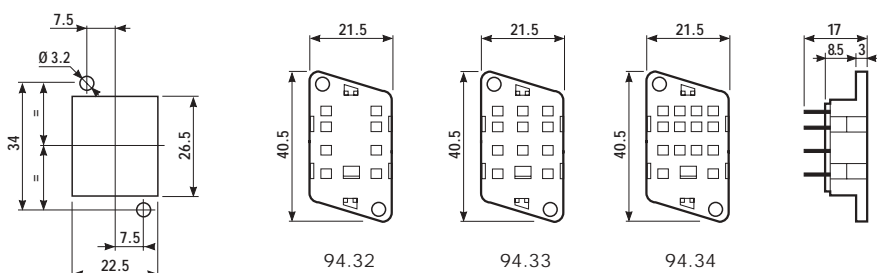
94.34

Relay type	55.32		55.33		55.32, 55.34	
Colour	BLUE	BLACK	BLUE	BLACK	BLUE	BLACK
<b>Panel mount socket:</b> M3 screw mount - solder connections retaining clip 094.51 supplied with socket packaging code SMA	94.32	94.32.0	94.33	94.33.0	94.34	94.34.0
Metal retaining clip	094.51					

Approvals  
(according to type):



- RATED VALUES: 10 A - 250 V
- DIELECTRIC STRENGTH:  $\geq 2$  kV AC
- AMBIENT TEMPERATURE:  $(-40...+70)^{\circ}\text{C}$



060.72

<b>Sheet of marker tags</b> for retaining clip 094.01 (72 tags)	060.72
---	--------

## PACKAGING CODES

How to code and identify retaining clip and packaging options for sockets.

Code options according to the last three letters:

**9 4 0 4 S M A**

**A** Standard packaging

**SM** Metal retaining clip  
**SP** Plastic retaining clip  
**SX** No retaining clip

## WARNING LIGHTS

### Lampalarm Xeno

**SIRENA** ipA

- Stainless steel
- 6J xenon
- IP67
- Wide choice of voltages

#### SPECIFICATIONS

VOLTAGE	CURRENT	CANDELA
12/24Vac/dc	1.8/0.85A	3,000 Cd(p)
110Vac	130mA	2,000 Cd(p)
240Vac	100mA	5,000 Cd(p)

Flash Rate:	65 fpm ±10
Flash Energy:	6 J
Voltage Tolerance:	±10% (ac 50/60Hz)
Protection:	IP67
Temp Rating (°C):	-30 to +40
Cable Entry:	Through base
Construction:	316 stainless steel Polycarbonate Lens
Weight:	1.53Kg

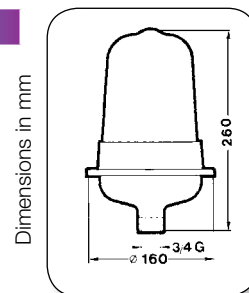
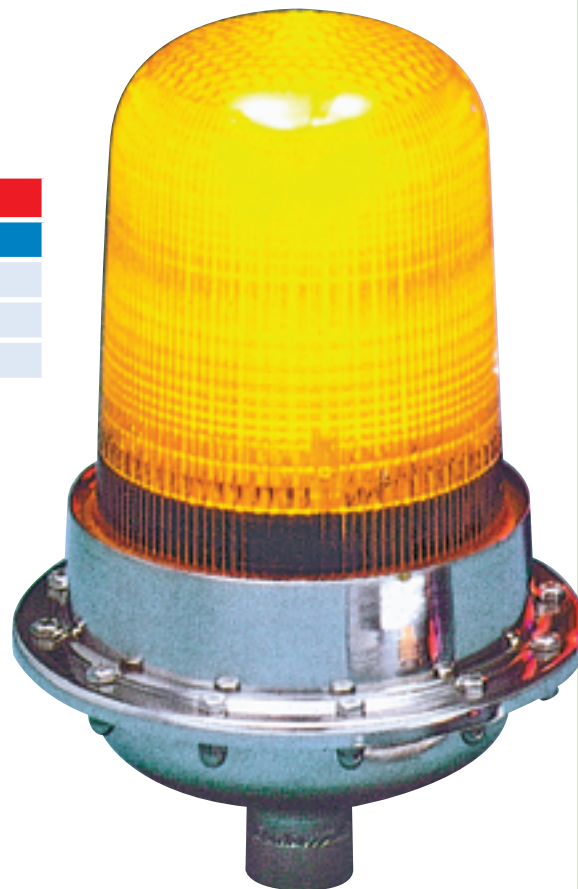
#### ORDER CODE

SIRM2502440*	12/24Vac/dc
SIRM2511040*	110Vac
SIRM2524040*	240Vac

**\*\*SPECIFY COLOUR** A = Amber, B = Blue, C = Clear, G = Green, R = Red

#### ACCESSORIES AND SPARE PARTS

SIR3999060	6 Joule Xenon Tube
------------	--------------------



**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT****POWER SUPPLY**

- AC 100-120 / 200-240V Auto Select Input
- Efficiency up to 90.2%
- Width only 32mm
- 20% Output Power Reserves
- Full Output Power Between -25°C and +60°C
- Minimal Inrush Current Surge
- 3 Year Warranty

**1. GENERAL DESCRIPTION**

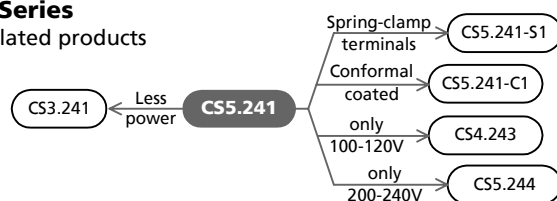
The Dimension C-Series are cost optimized power supplies without compromising quality, reliability and performance. The C-Series is part of the Dimension power supply family, existing alongside the high featured Q-series.

The C series includes all the essential basic functions and the devices have a power reserve of 20%. This extra current may even be used continuously at temperatures up to +45°C. The most important features are the small size, the high efficiency and the wide temperature range.

The Auto-select input makes worldwide installation and usage very simple. Defects or system failures caused by wrongly set switches can not occur.

**C-Series**

Related products

**2. SHORT-FORM DATA**

Output voltage	DC 24V	
Adjustment range	24 - 28V	
Output current	5 – 4.3A	ambient <60°C
	6 – 5,1A	ambient <45°C
Output power	120W	ambient <60°C
	144W	ambient <45°C
Output ripple	< 50mVpp	20Hz to 20MHz
Input voltage	AC 100-120 / 200-240V	Auto-select Input
Mains frequency	50-60Hz	±6%
AC Input current	typ. 2.05 / 1.23A	at 120 / 230Vac
Power factor	typ. 0.56 / 0.47	at 120 / 230Vac
AC Inrush current	typ. 3A peak	
DC Input	not allowed	
Efficiency	typ. 89.4 / 90.2%	at 120 / 230Vac
Losses	typ. 14.5 / 13.2W	at 120 / 230Vac
Temperature range	-25°C to +70°C	operational
Derating	3W/°C	+60 to +70°C
Hold-up time	typ. 80 / 78ms	at 120 / 230Vac
Dimensions	32x124x117mm	WxHxD

**3. ORDER NUMBERS**

Power Supply	<b>CS5.241</b> <b>CS5.241-C1</b> <b>CS5.241-S1</b>	Standard unit Conformal coated PC-boards Quick-connect spring-clamp terminals
Accessory	ZM1.WALL ZM11.SIDE YRM2.DIODE	Wall mount bracket Side mount bracket Redundancy module

**4. MARKINGS**

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT****INDEX****PAGE**

1. General Description .....	1
2. Short-form Data .....	1
3. Order Numbers .....	1
4. Markings .....	1
5. AC-Input .....	3
6. Input Inrush Current Surge .....	4
7. Hold-up Time .....	4
8. Output .....	5
9. Efficiency and Power Losses .....	6
10. Functional Diagram .....	7
11. Reliability .....	7
12. Front Side and User Elements .....	8
13. Terminals and Wiring .....	8
14. EMC .....	9
15. Environment .....	11
16. Protection Features .....	11
17. Safety .....	12
18. Dielectric Strength .....	12
19. Approvals .....	13

**INDEX****PAGE**


20. Fulfilled Standards .....	13
21. Used Substances .....	13
22. Physical Dimensions and Weight .....	14
23. Installation and Operation Instructions .....	14
24. Accessory .....	15
25. Application Notes .....	16
25.1. Peak Current Capability .....	16
25.2. Charging of Batteries .....	16
25.3. Back-feeding Loads .....	16
25.4. Output Circuit Breakers .....	17
25.5. Inductive and Capacitive Loads .....	17
25.6. Series Operation .....	18
25.7. Parallel Use to Increase Output Power .....	18
25.8. Parallel Use for 1+1 Redundancy .....	18
25.9. External Input Protection .....	19
25.10. Operation on Two Phases .....	19
25.11. Use in a Tightly Sealed Enclosure .....	19
25.12. Mounting Orientations .....	20

**INTENDED USE**

The power supply shall only be installed and put into operation by qualified personnel.

This power supply is designed for installation in an enclosure and is intended for the general use, such as in industrial control, office, communication, and instrumentation equipment. Do not use this device in aircraft, trains and nuclear equipment, where malfunctioning of the power supply may cause severe personal injury or threaten human life.

**TERMINOLOGY AND ABBREVIATIONS****PE and  symbol**

PE is the abbreviation for **P**rotective **E**arth and has the same meaning as the symbol .

**Earth, Ground**

This document uses the term "earth" which is the same as the U.S. term "ground".

**T.b.d.**

To be defined, value or description will follow later.

**AC 230V**

A figure displayed with the AC or DC before the value represents a nominal voltage with standard tolerances (usually  $\pm 20\%$ ) included.

E.g.: DC 12V describes a 12V battery disregarding whether it is full (13.7V) or flat (10V)

As long as not otherwise stated, AC 100V and AC 230V parameters are valid at 50Hz and AC 120V parameters are valid at 60Hz mains frequency.

**230Vac**

A figure with the unit (Vac) at the end is a momentary figure without any additional tolerances included.

**DISCLAIMER**

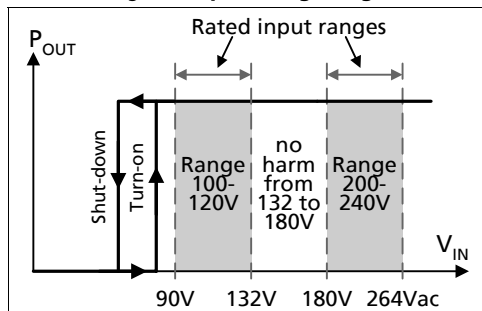
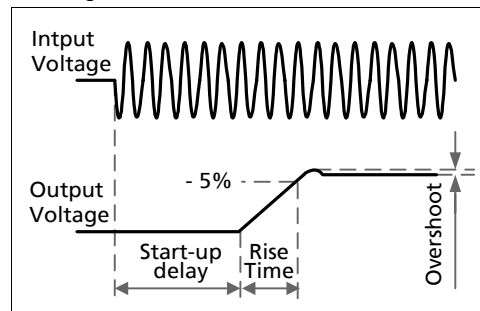
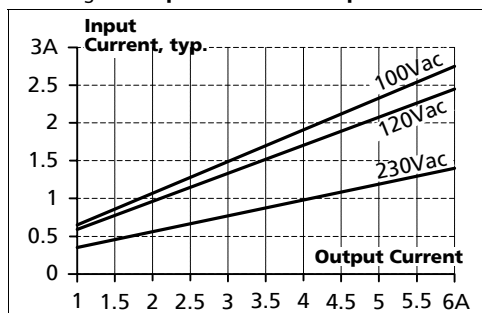
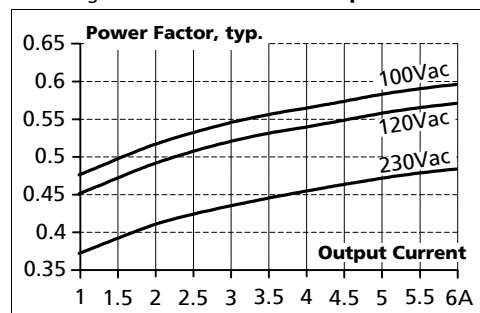
The information presented in this document is believed to be accurate and reliable and may change without notice.

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT****5. AC-INPUT**

AC input	nom.	AC 100-120V / 200-240V	auto-select input, TN-, TT-, IT-Mains, see <b>Fig. 5-1</b>		
AC input range		90-132Vac 180-264Vac 85-90Vac 264-300Vac	100-120V range, continuous operation 200-240V range, continuous operation Short term or with output derating < 0.5s		
Input frequency	nom.	50 – 60Hz	±6%		
		<b>AC 100V</b>	<b>AC 120V</b>	<b>AC 230V</b>	
Input current	typ.	2.34A	2.05A	1.23A	at 24V, 5A see <b>Fig. 5-3</b>
Power factor *)	typ.	0.58	0.56	0.47	at 24V, 5A see <b>Fig. 5-1</b>
Crest factor **)	typ.	2,9	3,1	3,7	at 24V, 5A
Start-up delay	typ.	740ms	900ms	720ms	see <b>Fig. 5-2</b>
Rise time	typ.	8ms	8ms	8ms	0mF, 24V, 5A, see <b>Fig. 5-2</b>
	typ.	25ms	25ms	25ms	5mF, 24V, 5A, see <b>Fig. 5-2</b>
Turn-on overshoot	max.	400mV	400mV	400mV	see <b>Fig. 5-2</b>
Turn-on voltage	typ.	75Vac	75Vac	N / A	steady-state value, see <b>Fig. 5-1</b>
Shut-down voltage	typ.	55Vac	55Vac	N / A	steady-state value, see <b>Fig. 5-1</b>

\*) The power factor is the ratio of the true (or real) power to the apparent power in an AC circuit.

\*\*) The crest factor is the mathematical ratio of the peak value to the RMS value of the input current waveform

**Fig. 5-1 Input voltage range****Fig. 5-2 Turn-on behavior, definitions****Fig. 5-3 Input current vs. output load****Fig. 5-4 Power Factor vs. output load**

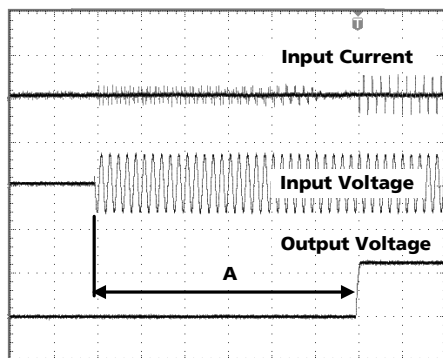
**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT**

## 6. INPUT INRUSH CURRENT SURGE

An active inrush limitation circuitry limits the input inrush current after turn-on of the input voltage. The charging current into EMI suppression capacitors is disregarded in the first milliseconds after switch-on.

		<b>AC 100V</b>	<b>AC 120V</b>	<b>AC 230V</b>	
Inrush current	max.	10A <sub>peak</sub>	10A <sub>peak</sub>	10A <sub>peak</sub>	-25°C to +70°C
	typ.	3A <sub>peak</sub>	3A <sub>peak</sub>	3A <sub>peak</sub>	-25°C to +70°C
Inrush energy	typ.	1A <sup>2</sup> s	1A <sup>2</sup> s	1A <sup>2</sup> s	-25°C to +70°C

Fig. 6-1 **Input inrush current, typical behavior**



**A:** Start-up delay = Inrush delay

Input: 230Vac  
Output: 24V, 5A  
Ambient: 25°C

Upper curve: Input current 10A / DIV  
Medium curve: Input voltage 500V / DIV  
Lower curve: Output voltage 20V / DIV  
Time scale: 100ms / DIV

## 7. HOLD-UP TIME

		<b>AC 100V</b>	<b>AC 120V</b>	<b>AC 230V</b>	
Hold-up Time	typ.	109ms	165ms	161ms	2,5A, 24V, see Fig. 7-1
	typ.	50ms	80ms	78ms	5A, 24V, see Fig. 7-1
	typ.	37ms	62ms	63ms	6A, 24V, see Fig. 7-1

Fig. 7-1 **Hold-up time vs. input voltage**

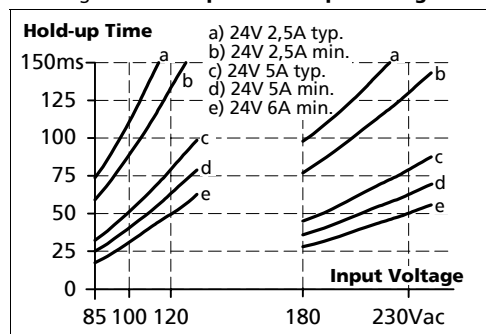
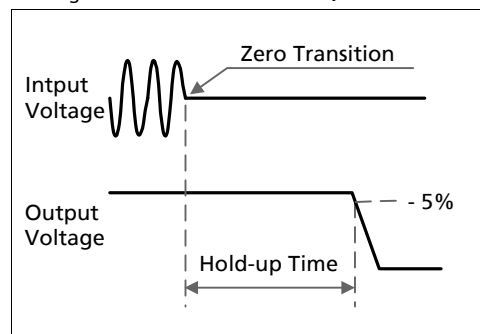


Fig. 7-2 **Shut-down behavior, definitions**



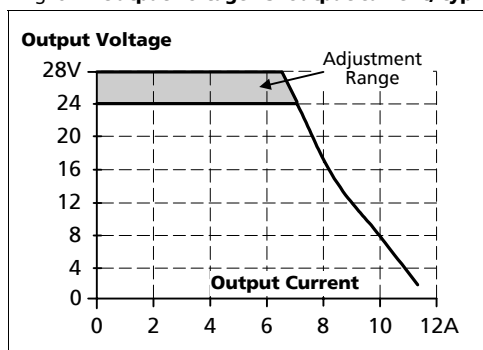
Note: At no load, the hold-up time can be up to several seconds. The green DC-ok lamp is on during this time.

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT****8. OUTPUT**

Output voltage	nom.	24V	
Adjustment range	min.	24-28V	guaranteed
	max.	30V	at clockwise end position of potentiometer
Factory setting		24.1V	±0.2%, at full load, cold unit
Line regulation	max.	70mV	90 to 132Vac or 180 to 264Vac
Load regulation	max.	100mV	static value, 0A → 5A → 0A
Ripple and noise voltage	max.	50mVpp	20Hz to 20MHz, 50Ohm
Output capacitance	typ.	1 800µF	
Output current	nom.	6A <sup>U)</sup>	at 24V, ambient < 45°C, see Fig. 8-1
	nom.	5A	at 24V, ambient < 60°C, see Fig. 8-1
	nom.	5.1A <sup>U)</sup>	at 28V, ambient < 45°C, see Fig. 8-1
	nom.	4.3A	at 28V, ambient < 60°C, see Fig. 8-1
Output power	nom.	144W <sup>U)</sup>	ambient < 45°C
	nom.	120W	ambient < 60°C
Short-circuit current	min.	10A	load impedance 200mOhm, see Fig. 8-1
	max.	14A	load impedance 200mOhm, see Fig. 8-1

U) The unit may respond with a thermal shut-down when continuously loaded with more than 120W and operated with a mains voltage of 100V or below.

Fig. 8-1 **Output voltage vs. output current, typ.**

**Peak current capability (up to several ms)**

The power supply can deliver a peak current which is higher than the specified short term current. This helps to start current demanding loads or to safely operate subsequent circuit breakers.

The extra current is supplied by the output capacitors inside the power supply. During this event, the capacitors will be discharged and causes a voltage dip on the output. Detailed curves can be found in chapter 25.1.

Peak current voltage dips	typ.	from 24V to 18.5V	at 10A for 50ms, resistive load
	typ.	from 24V to 22V	at 25A for 2ms, resistive load
	typ.	from 24V to 20V	at 25A for 5ms, resistive load

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT****9. EFFICIENCY AND POWER LOSSES**

		<b>AC 100V</b>	<b>AC 120V</b>	<b>AC 230V</b>	
Efficiency	typ.	88.8%	89.4%	90.2%	5A, 24V
Power losses	typ.	1.9W	2.0W	1.7W	0A
	typ.	9.1W	8.8W	8.2W	2.5A, 24V
	typ.	15.3W	14.5W	13.2W	5A, 24V
	typ.	19.4W	18.2W	16.1W	6A, 24V

Fig. 9-1 Efficiency vs. output current at 24V

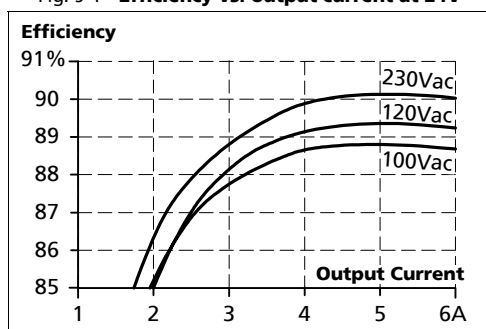


Fig. 9-2 Losses vs. output current at 24V

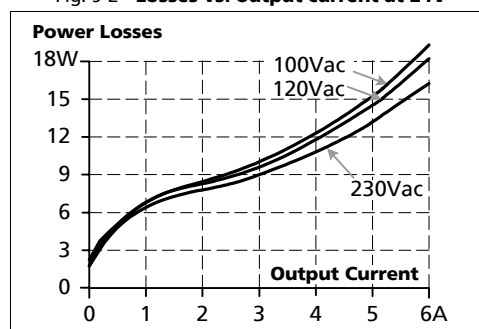


Fig. 9-3 Efficiency vs. input voltage, 24V, 5A

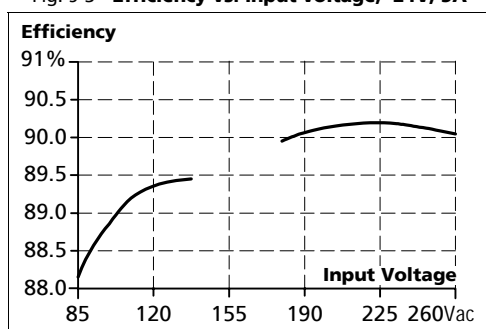
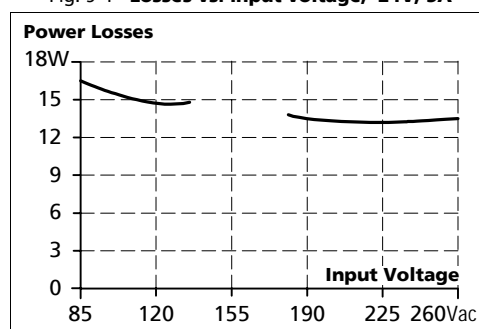
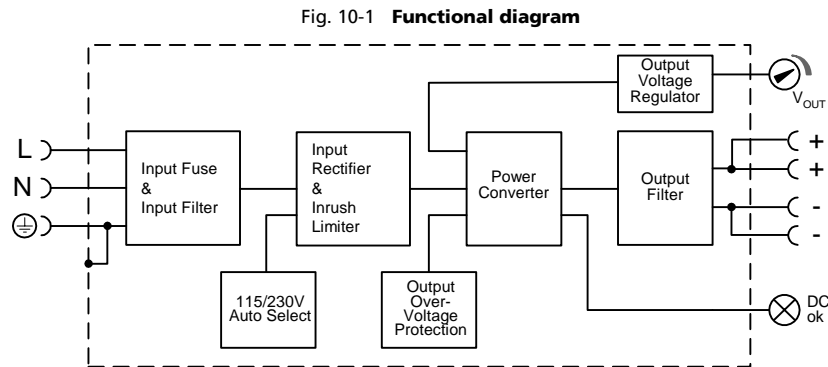


Fig. 9-4 Losses vs. input voltage, 24V, 5A



**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT**

## 10. FUNCTIONAL DIAGRAM



## 11. RELIABILITY

		AC 100V	AC 120V	AC 230V	
Lifetime expectancy	min.	52 000h	58 000h	72 000h	40°C, 24V, 5A
	min.	27 000h	34 000h	42 000h	40°C, 24V, 6A
	min.	135 000h	128 000h	144 000h	40°C, 24V, 2,5A
	min.	142 000h	15 years	15 years	25°C, 24V, 5A
MTBF SN 29500, IEC 61709		638 000h	661 000h	869 000h	40°C, 24V, 5A
		542 000h	562 000h	739 000h	40°C, 24V, 6A
		1 077 000h	1 111 000h	1 495 000h	25°C, 24V, 5A
MTBF MIL HDBK 217F		552 000h	546 000h	574 000h	40°C, 24V, 5A, Ground Benign GB40
		497 000h	491 000h	517 000h	40°C, 24V, 6A, Ground Benign GB40
		788 000h	775 000h	800 000h	25°C, 24V, 5A, Ground Benign GB25

The **Lifetime expectancy** shown in the table indicates the operating hours (service life) and is determined by the lifetime expectancy of the built-in electrolytic capacitors.

Lifetime expectancy is specified in operational hours. Lifetime expectancy is calculated according to the capacitor's manufacturer specification. The prediction model allows a calculation of up to 15 years from date of shipment.

**MTBF** stands for **Mean Time Between Failure**, which is calculated according to statistical device failures, and indicates reliability of a device. It is the statistical representation of the likelihood of a unit to fail and does not necessarily represent the life of a product.

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT**

## 12. FRONT SIDE AND USER ELEMENTS

**Fig. 12-1** Front side**Output Terminals**

Screw terminals  
(Spring-clamp terminals on the CS5.241-S1)

- + Positive output
- Negative (return) output
- Dual pins per pole

**Output voltage potentiometer**

Open the flap to tune the output voltage.  
Factory set: 24.1V

**DC-on lamp (green)**

On when the voltage on the output terminals is > 21 V

**Input Terminals**

Screw terminals  
(Spring-clamp terminals on the CS5.241-S1)

- N** ... Neutral input
- L** ... Line (hot) input
- ⊕** ... PE (Protective Earth) input



## 13. TERMINALS AND WIRING

Type	Screw terminals (CS5.241, CS5.241-C1), ); Spring-clamp terminals (CS5.241-S1)
Solid wire	0.5-6mm <sup>2</sup>
Stranded wire	0.5-4mm <sup>2</sup>
American wire gauge	20-10 AWG
Ferrules	allowed, but not required
Wire stripping length	7mm / 0.275inch
Screwdriver	3.5mm slotted or Pozidrive No 2 (only for screw terminals)
Recommended tightening torque	0.8Nm, 7lb.in (only for screw terminals)

**Instructions:**

- a) Use appropriate copper cables that are designed for an operating temperature of:  
60°C for ambient up to 45°C and  
75°C for ambient up to 60°C minimum.
- b) Follow national installation codes and installation regulations!
- c) Ensure that all strands of a stranded wire enter the terminal connection!
- d) Up to two stranded wires with the same cross section are permitted in one connection point (except PE wire).
- e) Do not use the unit without PE connection.

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT****14. EMC**

The CE mark is in conformance with EMC guideline 89/336/EEC and 93/68/EEC and the low-voltage directive (LVD) 73/23/EEG. A detailed EMC Report is available on request.

<b>EMC Immunity</b>	EN 61000-6-2 EN 61000-6-1	Generic standards		
Electrostatic discharge	EN 61000-4-2	Contact discharge Air discharge	8kV 15kV	Criterion A Criterion A
Electromagnetic RF field	EN 61000-4-3	80MHz-1GHz	10V/m	Criterion A
Fast transients (Burst)	EN 61000-4-4	Input lines Output lines	4kV 2kV	Criterion A Criterion A
Surge voltage on input	EN 61000-4-5	L → N N / L → PE	2kV 4kV	Criterion A Criterion A
Surge voltage on output	EN 61000-4-5	+ → - + / - → PE	500V 500V	Criterion A Criterion A
Conducted disturbance	EN 61000-4-6	0,15-80MHz	10V	Criterion A
Mains voltage dips	EN 61000-4-11	0% of 100Vac 40% of 100Vac 70% of 100Vac 0% of 200Vac 40% of 200Vac 70% of 200Vac	0Vac, 20ms 40Vac, 200ms 70Vac, 500ms 0Vac, 20ms 80Vac, 200ms 140Vac, 500ms	Criterion A Criterion C Criterion A Criterion A Criterion C Criterion A
Voltage interruptions	EN 61000-4-11		0Vac, 5000ms	Criterion C
Input voltage swells	PULS internal standard		300Vac, 500ms	Criterion A
Powerful transients	VDE 0160	over entire load range	750V, 1.3ms	Criterion A

**Criteria:**

**A:** Power supply shows normal operation behavior within the defined limits.

**C:** Temporary loss of function is possible. Power supply might shut-down and restarts by itself. No damages or hazards for the power supply occur.

<b>Switching frequency</b>	175kHz to 225kHz	input voltage dependent 24V, 2.5A
	100kHz to 130kHz	input voltage dependent 24V, 5A

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT**

<b>EMC Emission</b>	<b>EN 61000-6-4</b>	<b>Generic standards</b>
Conducted emission	EN 55011, EN 55022, FCC Part 15, CISPR 11, CISPR 22 EN 55022	Class B, input lines Class A, output lines
Radiated emission	EN 55011, EN 55022	Class B
Harmonic input current	EN 61000-3-2	>2.7A output current not fulfilled
Voltage fluctuations, flicker	EN 61000-3-3	fulfilled

This device complies with FCC Part 15 rules.

Operation is subjected to following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Above an average output current of 2.7A, the harmonic current standard EN61000-3-2 is not fulfilled.

Please note:

**A power supply has to comply with EN 61000-3-2 (Standard for harmonic input current) when:**

- 1) the end-device is used within the European Union **and**
- 2) the end-device is connected to a public mains supply with a nominal voltage  $\geq 220\text{Vac}$  **and**
- 3) the power supply is:
  - fitted in an end-device with an average input power in excess of 75W **or**
  - fitted in an end-device with a continuous input power in excess of 75W **or**
  - part of a lighting system.

#### **Exceptions:**

End-devices for professional applications with an input power > 1000W do not need to fulfill EN 61000-3-2.

#### **Comments:**

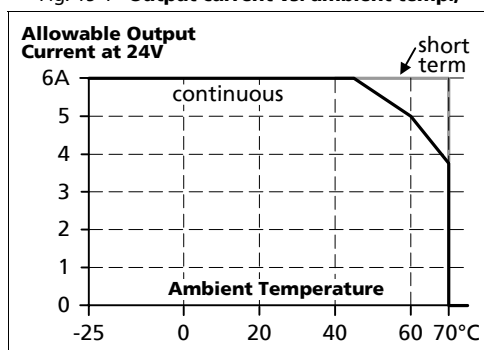
- The average input power must be determined in accordance with EN 61000-3-2.
- Industrial mains supplies with their own transformer are considered to be "non-public".
- Where individual self-contained items of equipment are installed in a rack or case (e.g. devices connected in parallel), they are regarded as being individually connected to the mains supply. The rack or case need not be tested as a whole. Alternatively it is also permitted to assess the whole rack or case. This is recommended for devices used in professional applications with an input power greater than 1000W.

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT**

## 15. ENVIRONMENT

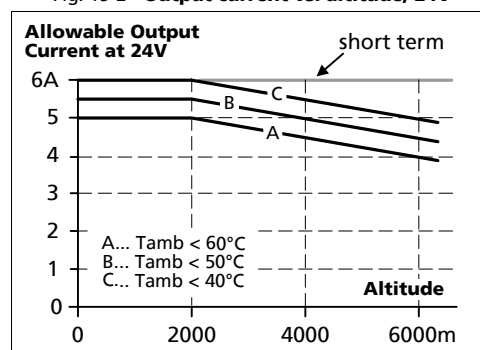
Operational temperature	-25°C to +70°C (-13°F to 158°F)	reduce output power according <b>Fig. 15-1</b>
Output de-rating	1.6W/°C 3W/°C	45-60°C (113°F to 140°F), 60-70°C (140°F to 158°F), storage and transportation
Storage temperature	-40 to +85°C (-40°F to 185°F)	
Humidity	5 to 95% r.H.	IEC 60068-2-30 Do not energize while condensation is present
Vibration sinusoidal	2-17.8Hz: ±1.6mm; 17.8-500Hz: 2g 2 hours / axis	IEC 60068-2-6
Shock	30g 6ms, 20g 11ms 3 bumps / direction, 18 bumps in total	IEC 60068-2-27
Altitude	0 to 6000m (0 to 20 000ft)	Reduce output power or ambient temperature above 2000m sea level.
Output de-rating (for altitude)	7.5W/1000m or 5°C/1000m	above 2000m (6500ft), see <b>Fig. 15-2</b>
Over-voltage category	III	EN 50178, altitudes up to 2000m
	II	Altitudes from 2000m to 6000m
Degree of pollution	2	EN 50178, not conductive

Fig. 15-1 Output current vs. ambient temp.,



The ambient temperature is defined 2cm below the unit.

Fig. 15-2 Output current vs. altitude, 24V



## 16. PROTECTION FEATURES

Output protection	Electronically protected against overload, no-load and short-circuits	
Output over-voltage protection	typ. 35Vdc max. 39Vdc	In case of an internal power supply defect, a redundant circuitry limits the maximum output voltage. The output shuts down and automatically attempts to restart.
Output over-current protection	electronically limited	see <b>Fig. 8-1</b>
Degree of protection	IP 20	EN/IEC 60529
Penetration protection	> 3.5mm	e.g. screws, small parts
Over-temperature protection	yes	output shut-down with automatic restart
Input transient protection	MOV	Metal Oxide Varistor
Internal input fuse	T4A H.B.C.	not user replaceable

Note: In case of a protection event, audible noise may occur.

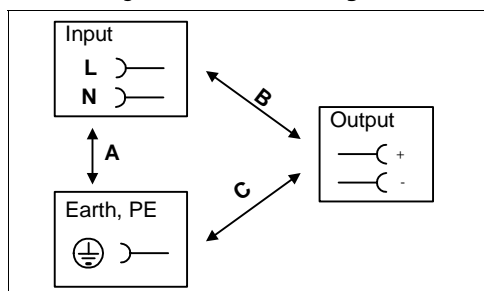
**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT**

## 17. SAFETY

Input / output separation	SELV PELV double or reinforced insulation	IEC/EN 60950-1 EN 60204-1, EN 50178, IEC 60364-4-41
Class of protection	I	PE (Protective Earth) connection required
Isolation resistance	> 5MΩ	input to output, 500Vdc
PE resistance	< 0.1Ω	between housing and PE terminal
Touch current (leakage current)	typ. 0.24mA typ. 0.35mA typ. 0.40mA < 0.36mA < 0.53mA < 0.60mA	100Vac, 50Hz, TN mains 120Vac, 60Hz, TN mains 230Vac, 50Hz, TN mains 110Vac, 50Hz, TN mains 132Vac, 60Hz, TN mains 264Vac, 50Hz, TN mains

## 18. DIELECTRIC STRENGTH

Fig. 18-1 Dielectric strength



		<b>A</b>	<b>B</b>	<b>C</b>
Type test	60s	2500Vac	3000Vac	500Vac
Factory test	5s	2500Vac	2500Vac	500Vac
Field test	5s	2000Vac	2000Vac	500Vac

**Type tests and factory tests:**

Conducted by the manufacturer. Do not repeat test in field!

**Rules for field test:**




Use appropriate test equipment which applies the voltage with a slow ramp! Connect L and N together as well as all output poles.

The output voltage is floating and has no ohmic connection to ground.

To fulfill the PELV requirements according to EN60204-1 § 6.4.1, we recommend that either the + pole, the – pole or any other part of the output circuit shall be connected to the protective earth system. This helps to avoid situations in which a load starts unexpectedly or can not be switched off any more when unnoticed earth faults occur.

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT**

## 19. APPROVALS

IEC 60950-1	<i>IECEE</i> CB SCHEME	CB Scheme, Information Technology Equipment
UL 508		LISTED as Industrial Control Equipment E198865
UL 60950-1		RECOGNIZED E137006 recognized for the use in U.S.A. (UL 60950-1) and Canada (C22.2 No. 60950) Information Technology Equipment, Level 3
Marine pending		GL (Germanischer Lloyd) classified and ABS (American Bureau for Shipping) PDA for marine and offshore applications. Environmental category: C, EMC2

## 20. FULFILLED STANDARDS

EN 61558-2-17	Safety of Power Transformers
EN/IEC 60204-1	Safety of Electrical Equipment of Machines
EN/IEC 61131-1	Programmable Controllers
EN 50178	Electronic Equipment in Power Installations

## 21. USED SUBSTANCES

The unit does not release any silicone and is suitable for the use in paint shops.

Electrolytic capacitors included in this unit do not use electrolytes such as Quaternary Ammonium Salt Systems.

Plastic housings and other molded plastic materials are free of halogens, wires and cables are not PVC insulated.

The production material within our production does not include following toxic chemicals:

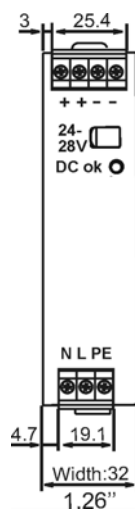
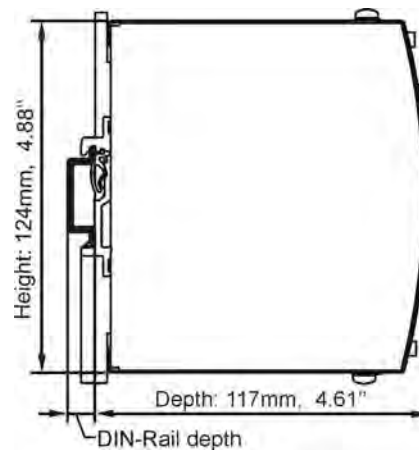
Polychlorized Biphenyl (PCB), Polychlorized Terphenyl (PCB), Pentachlorophenol (PCP), Polychlorinated naphthalene (PCN), Polybrom Biphenyl (PBB), Polybrom Bipheny-oxyd (PBO), Polybrominated Diphenylether (PBDE), Polychlorinated Diphenylether (PCDE), Polydibromophenyl Oxyd (PBDO), Cadmium, Asbest, Mercury, Silicia

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT**

## 22. PHYSICAL DIMENSIONS AND WEIGHT

Weight	500g / 1.1lb
DIN-Rail	Use 35mm DIN-rails according to EN 60715 or EN 50022 with a height of 7.5 or 15mm. The DIN-rail height must be added to the depth (117mm) to calculate the total required installation depth.

Electronic files with mechanical data can be downloaded at [www.pulspower.com](http://www.pulspower.com)

Fig. 22-1 **Front view**Fig. 22-2 **Side view**

## 23. INSTALLATION AND OPERATION INSTRUCTIONS

### Mounting Orientation:

Output terminal must be located on top and input terminal on the bottom. For other orientations consult factory.

### Cooling:

Convection cooled, no forced cooling required. Do not cover ventilation grid (e.g. cable conduits) by more than 30%!

### Installation clearances:

40mm on top, 20mm on the bottom, 5mm on the left and right side are recommended when loaded permanently with full power. In case the adjacent device is a heat source, 15mm clearance are recommended.

### Risk of electrical shock, fire, personal injury or death!

Do not use the unit without proper earth connection (Protective Earth). Use the pin on the terminal block for earth connection and not one of the screws on the housing.

Turn power off before working on the power supply. Protect against inadvertent re-powering.

Make sure the wiring is correct by following all local and national codes.

Do not open, modify or repair the unit.

Use caution to prevent any foreign objects from entering into the housing.

Do not use in wet locations or in areas where moisture or condensation can be expected.

### Service parts:

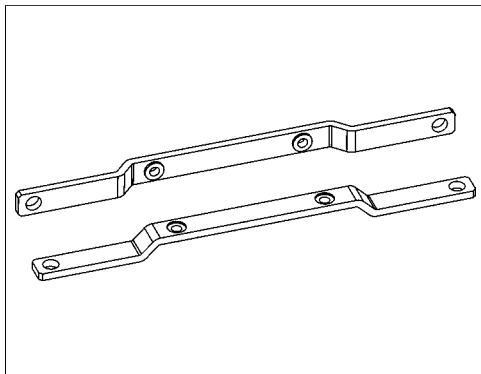
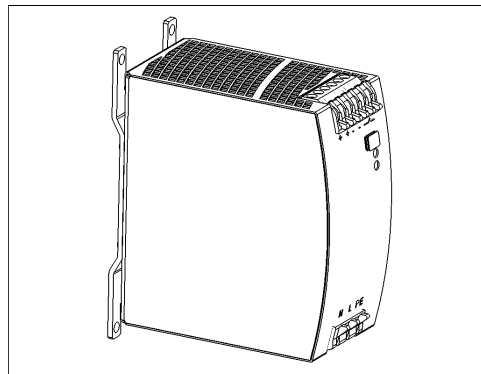
The unit does not contain any service parts. The tripping of an internal fuse is caused by an internal defect. If damage or malfunctioning should occur during operation, immediately turn power off and send unit to factory for inspection!

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT**

## 24. ACCESSORY

### **ZM1.WALL Wall mounting bracket**

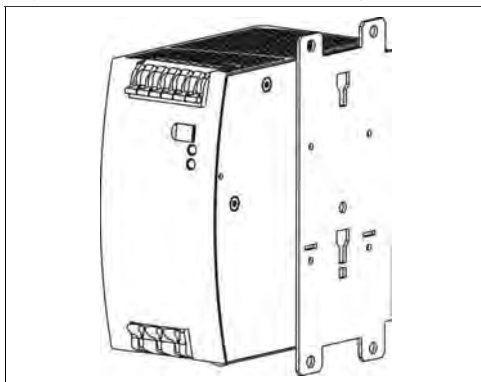
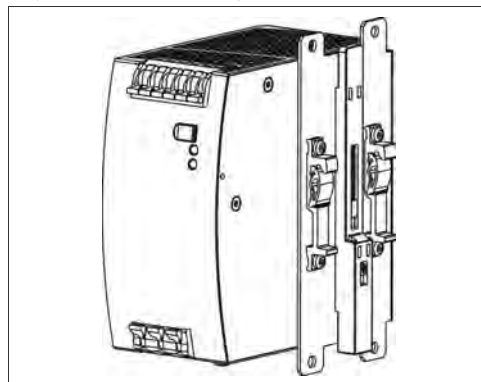
This bracket is used to mount Dimension units onto a flat surface without utilizing a DIN-Rail. The two aluminum brackets and the black plastic slider of the unit have to be detached, so that the two steel brackets can be mounted.

Fig. 24-1 **ZM1.WALL Wall Mounting Bracket**Fig. 24-2 **Assembled Wall Mounting Bracket**

### **ZM11.SIDE Side mounting bracket**

This bracket is used to mount Dimension units sideways with or without utilizing a DIN-Rail. The two aluminum brackets and the black plastic slider of the unit have to be detached, so that the steel brackets can be mounted.

For sideways DIN-rail mounting, the removed aluminum brackets and the black plastic slider need to be mounted on the steel bracket.

Fig. 24-3 **ZM11.SIDE Side Mounting Bracket**Fig. 24-4 **Side Mounting with DIN-rail brackets**

**PULS****DIMENSION C-Series****CS5.241, CS5.241-C1, CS5.241-S1****24V, 5A, SINGLE PHASE INPUT**

## 25. APPLICATION NOTES

### 25.1. PEAK CURRENT CAPABILITY

Solenoids, contactors and pneumatic modules often have a steady state coil and a pick-up coil. The inrush current demand of the pick-up coil is several times higher than the steady state current and usually exceeds the nominal output current (including the PowerBoost). The same situation applies, when starting a capacitive load.

Branch circuits are often protected with circuit breakers or fuses. In case of a short or an overload in the branch circuit, the fuse needs a certain amount of over-current to trip or to blow. The peak current capability ensures the safe operation of subsequent circuit breakers.

Assuming the input voltage is turned on before such an event, the built-in large sized output capacitors inside the power supply can deliver extra current. Discharging this capacitor causes a voltage dip on the output. The following two examples show typical voltage dips:

Fig. 25-1 **Peak load 20A for 50ms, typ.**

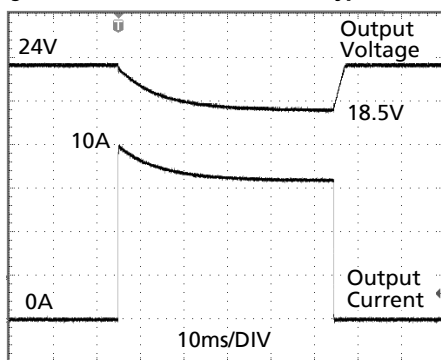
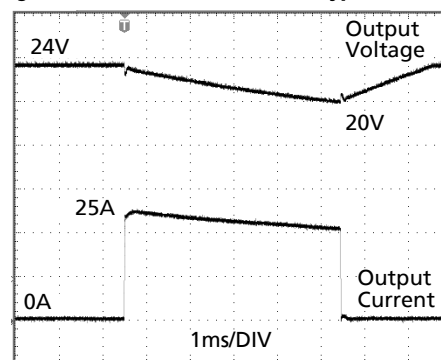


Fig. 25-2 **Peak load 50A for 5ms, typ.**



### 25.2. CHARGING OF BATTERIES

The power supply shall not be used to charge batteries. Choose Q-Series for charging batteries.

### 25.3. BACK-FEEDING LOADS

Loads such as decelerating motors and inductors can feed voltage back to the power supply. This feature is also called return voltage immunity or resistance against Back- E.M.F. (Electro Magnetic Force).

This power supply is resistant and does not show malfunctioning when a load feeds back voltage to the power supply. It does not matter, whether the power supply is on or off.

The maximum allowed feed back voltage is 35Vdc. The absorbing energy can be calculated according to the built-in large sized output capacitor which is specified in chapter 8.

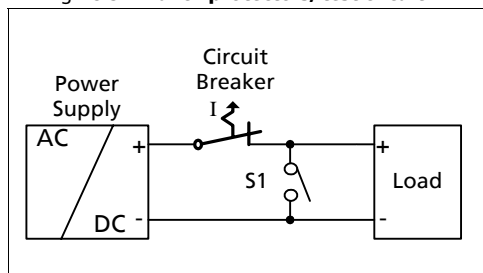
### 25.4. OUTPUT CIRCUIT BREAKERS

Standard miniature circuit breakers (MCBs) can be used for branch protection. Ensure that the MCB is rated for DC voltage, too. The following tests show which circuit breakers the power supply typically trips.

Circuit breakers have huge tolerances in their tripping behavior. Therefore, these typical tests can only be used as a recommendation or for comparing two different power supplies. Furthermore, the loop impedance has a major influence on whether a breaker trips or not. Two tests were performed, representing typical situations:

**Test 1:** Short circuit with S1 on the power supply end of the cable (loop impedance approx. 20mOhm)

Fig. 25-3 Branch protectors, test circuit 1



Parameters:

Input voltage: 230Vac, load current: 0A

The following circuit breaker tripped during the test:

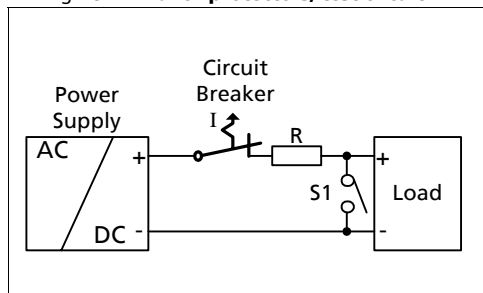
**A- or Z- Characteristic:** equal or smaller 8A

**B- Characteristic:** no tripping  $\geq 6A$   
no breaker available  $< 6A$

**C- Characteristic:** equal or smaller 4A

**Test 2:** Short circuit with S1 on the load end (additional impedance included; represents longer load wire length).

Fig. 25-4 Branch protectors, test circuit 2



Parameters:

Input voltage: 230Vac, load current: 0A

The following circuit breaker tripped during the test:

**A- or Z- Characteristic:**  $\leq 6A$  and  $R = 180m\Omega$

**B- Characteristic:** no tripping  $\geq 6A$   
no breaker available  $< 6A$

**C- Characteristic:**  $\leq 3A$  and  $R = 270m\Omega$

What does this resistance mean in wire length?

	0.5mm <sup>2</sup>	0.7mm <sup>2</sup>	1.0mm <sup>2</sup>	1.5mm <sup>2</sup>	2.5mm <sup>2</sup>	4.0mm <sup>2</sup>
<b>180mOhm</b>	5.0m	7.0m	10m	15m	25m	40m
<b>270mOhm</b>	7.5m	10.5m	15m	23m	38m	60m

#### Example:

Which wire gauge must be used to trip a C-Characteristic circuit breaker with a rating of 3A? The load wire length is 21m.

Answer: A 3A C-Characteristic circuit breaker requires a loop impedance of less than 270mOhm (test results). The wire length table shows that up to 23m wire with a cross section of 1.5mm<sup>2</sup> are below 270mOhm. A wire not smaller than 1.5mm<sup>2</sup> shall be used.

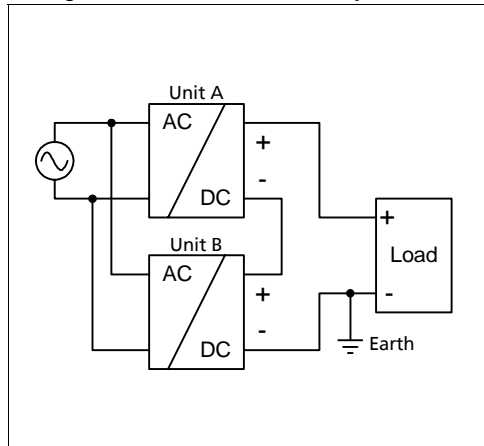
### 25.5. INDUCTIVE AND CAPACITIVE LOADS

The unit is designed to supply any kind of load, including unlimited capacitive and inductive loads.

### 25.6. SERIES OPERATION

The power supply can be put in series to increase the output voltage.

Fig. 25-5 Schematic for series operation



#### Instructions for use in series:

- It is possible to connect as many units in series as needed, providing the sum of the output voltage does not exceed 150Vdc.
- Voltages with a potential above 60Vdc are not SELV any more and can be dangerous. Such voltages must be installed with a protection against touching.
- For serial operation use power supplies of the same type.
- Earthing of the output is required when the sum of the output voltage is above 60Vdc.
- Keep an installation clearance of 15mm (left/right) between two power supplies and avoid installing the power supplies on top of each other.

**Note:** Avoid return voltage (e.g. from a decelerating motor or battery) which is applied to the output terminals.

### 25.7. PARALLEL USE TO INCREASE OUTPUT POWER

The power supply shall not be used in parallel to increase the output power.

### 25.8. PARALLEL USE FOR 1+1 REDUNDANCY

Power supplies can be paralleled for 1+1 redundancy to gain a higher system availability. Redundant systems require a certain amount of extra power to support the load in case one power supply unit fails. The simplest way is to put two C-Series power supplies in parallel. In case one power supply unit fails, the other one is automatically able to support the load current without any interruption. This simple way to build a redundant system has two major disadvantages:

- The faulty power supply can not be recognized. The green LED will still be on since it is reverse-powered from the other power supply.
- It does not cover failures such as an internal short circuit in the secondary side of the power supply. In such a - virtually nearly impossible - case, the defective unit becomes a load for the other power supplies and the output voltage can not be maintained any more.

This can only be avoided by utilizing decoupling diodes which are included in the decoupling module YR2.DIODE or redundancy module YRM2.DIODE.

Recommendations for building redundant power systems:

- Use separate input fuses for each power supply.
- Monitor the individual power supply units. A DC-ok lamp and a DC-ok contact is included in the redundancy module YRM2.DIODE. This feature reports a faulty unit.
- When possible, connect each power supply to different phases or circuits.

## 25.9. EXTERNAL INPUT PROTECTION

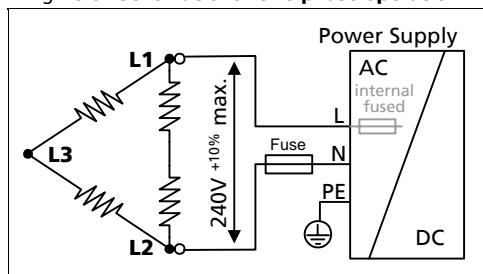
The unit is tested and approved for branch circuits up to 20A. External protection is only required if the supplying branch has an ampacity greater than this. In some countries local regulations might apply. Check also local codes and local requirements.

If an external fuse is necessary or utilized, a minimum value is required to avoid undesired tripping of the fuse.

		B-Characteristic	C-Characteristic
Ampacity	max.	20A	20A
	min.	10A	6A

## 25.10. OPERATION ON TWO PHASES

Fig. 25-6 Schematic for two phase operation



### Instructions for two phase operation:

- A phase to phase connection is allowed as long as the supplying voltage is below  $240V^{+10\%}$ .
- Use a fuse or a circuit breaker to protect the N input. The N input is internally not protected and is in this case connected to a hot wire.

Appropriate fuses or circuit breakers are specified in section 25.9 "External Input Protection".

## 25.11. USE IN A TIGHTLY SEALED ENCLOSURE

When the power supply is installed in a tightly sealed enclosure, the temperature inside the enclosure will be higher than outside. The inside temperature defines the ambient temperature for the power supply.

Results from such an installation:

Power supply is placed in the middle of the box, no other heat producer inside the box

Enclosure:	Rittal Type IP66 Box PK 9516 100, plastic, 110x180x165mm
Load:	24V, 4A; (=80%) load is placed outside the box
Input:	230Vac
Temperature inside the box:	44.3°C (in the middle of the right side of the power supply with a distance of 2cm)
Temperature outside the box:	23.3°C
Temperature rise:	21K

### 25.12. MOUNTING ORIENTATIONS

Mounting orientations other than input terminals on the bottom and output on the top require a reduction in continuous output power or a limitation in the max. allowed ambient temperature. The amount of reduction influences the lifetime expectancy of the power supply. Therefore, two different derating curves for continuous operation can be found below:

**Curve A1** Recommended output current.

**Curve A2** Max allowed output current (results approx. in half the lifetime expectancy of A1).

Fig. 25-7

**Mounting Orientation A**  
Standard Orientation

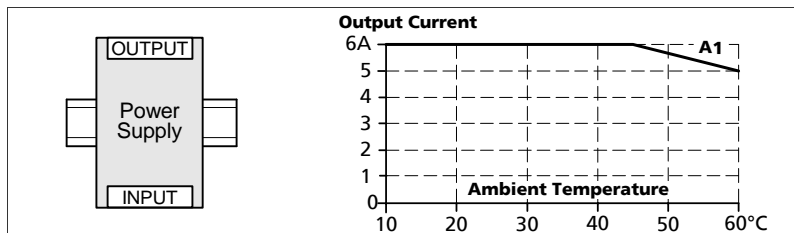


Fig. 25-8

**Mounting Orientation B**  
(Upside down)

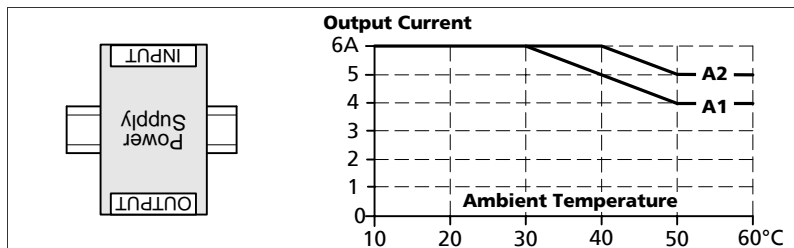


Fig. 25-9

**Mounting Orientation C**  
(Table-top mounting)

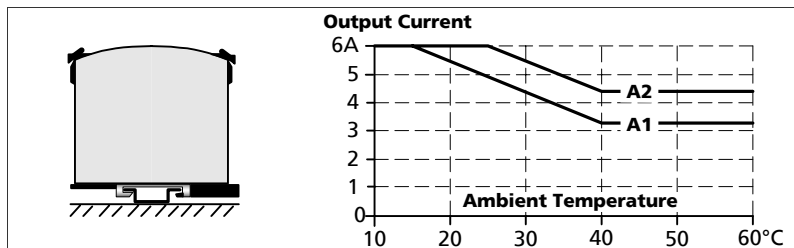


Fig. 25-10

**Mounting Orientation D**  
(Horizontal cw)

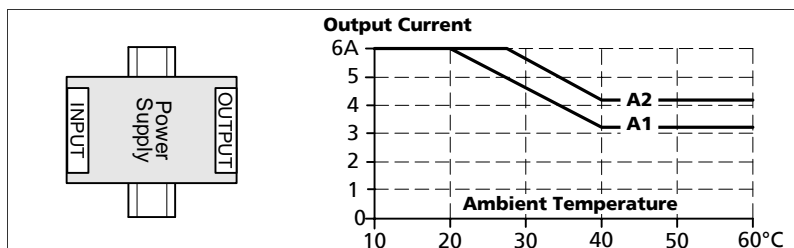
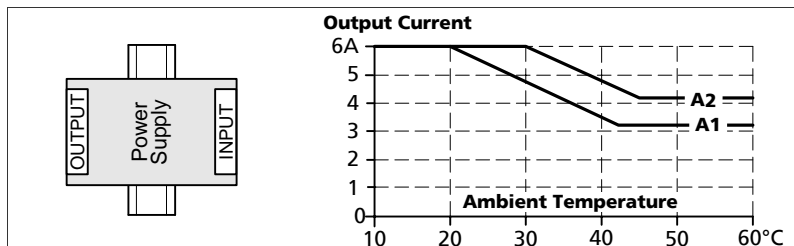


Fig. 25-11

**Mounting Orientation E**  
(Horizontal ccw)



# SLB

## Standard load-break switches 16 to 4000 A



**NEW  
Sirco M**



**SICRO M**  
with terminal covers

### SIRCO M 16 to 125 A

The SIRCO M range of load-break switches offer compact IP 20 finger safe solutions for switching up to and including 125 A. They are ideal for the arduous switching of motors.

Standard mounting is by DIN rail or base mount with screws.

The SIRCO M comes complete with direct mount handle, panel mount, pistol handle complete with shaft. Fourth pole and auxiliary switching can also be achieved with easy clip-on modules - refer accessories.

### Front or side operated

	AC 21 400 V (A)	AC 23 400 V (A)	AC 23 400 V (kW)	Cat. No. <sup>1)</sup>	Direct handle Price \$	Panel mount handle Price \$
<b>16 A</b>	16	16	5.5	SLBM163P_	52.00	101.00
<b>20 A</b>	20	20	9	SLBM203P_	56.00	105.00
<b>25 A</b>	25	25	11	SLBM253P_	65.00	114.00
<b>32 A</b>	32	32	15	SLBM323P_	76.00	125.00
<b>40 A</b>	40	40	18.5	SLBM403P_	81.00	130.00
<b>63 A</b>	63	63	30	SLBM633P_	101.00	150.00
<b>80 A</b>	80	80	40	SLBM803P_	110.00	159.00
<b>100 A</b>	100	100	40	SLBM1003P_ <sup>2)</sup>	183.00	247.00
<b>125 A</b>	125	125	63	SLBM1253P_ <sup>2)</sup>	215.00	279.00

**Notes:** <sup>1)</sup> Insert D for direct mount handle or leave blank for panel mount pistol handle complete with 320 mm shaft.

<sup>2)</sup> Available 2nd quarter 2009



**SICRO M**  
Fitted with:

- 4th pole
- 3- Aux contacts
- Terminal covers

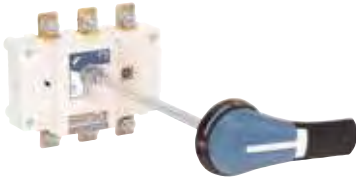
### Accessories for SIRCO M switches

Description	Page
Accessories	11 - 8 to 11 - 10
Technical data	11 - 11 to 11 - 14
Dimensions	11 - 15 to 11 - 18
Enclosed options	11 - 41

### Price Schedule 'B2'

## SLB Standard load-break switches

### SIRCO 125 to 4000 A



SLB 2003P  
With panel mount handle

The SIRCO range of load-break switches offer compact solutions for switching from 125 A to 4000 A. Base mounting is standard.

The SIRCO range are a proven, reliable design that more than suit harsh Australian conditions.

### Front operated surface mount

	AC 21 400 V (A)	AC 23 400 V (A)	AC 23 400 V (kW)	No. of poles	Cat. No. <sup>1)</sup> <sup>2)</sup>	Direct handle Price \$	Panel mount handle Price \$
125 A	125	125	63	3	SLB1253P_	350.00	350.00
				4	SLB1254P_	480.00	480.00
160 A	160	160	80	3	SLB1603P_	465.00	465.00
				4	SLB1604P_	570.00	570.00
200 A	200	200	100	3	SLB2003P_	510.00	510.00
				4	SLB2004P_	670.00	670.00
250 A	250	250	132	3	SLB2503P_	550.00	550.00
				4	SLB2504P_	710.00	710.00
315 A	315	315	160	3	SLB3153P_	690.00	690.00
				4	SLB3154P_	910.00	910.00
400 A	400	400	220	3	SLB4003P_	820.00	820.00
				4	SLB4004P_	1070.00	1070.00
500 A	500	500	280	3	SLB5003P_	1100.00	1100.00
				4	SLB5004P_	1350.00	1350.00
630 A	630	500	280	3	SLB6303P_	1250.00	1250.00
				4	SLB6304P_	1620.00	1620.00
800 A	800	800	450	3	SLB8003P_	1750.00	1750.00
				4	SLB8004P_	2290.00	2290.00
1000 A	1000	1000	560	3	SLB10003P_	2510.00	2510.00
				4	SLB10004P_	3380.00	3380.00
1250 A	1250	1250	710	3	SLB12503P_	3380.00	3380.00
				4	<sup>i</sup> SLB12504P_	4390.00	4390.00
1600 A	1600	1250	710	3	SLB16003P_	3990.00	3990.00
				4	SLB16004P_	5180.00	5180.00
1800 A	1800	1250	710	3	SLB18003P_	4760.00	4760.00
				4	<sup>i</sup> SLB18004P_	5980.00	5980.00
2000 A	2000	1250	710	3	SLB20003P_	5590.00	5590.00
				4	<sup>i</sup> SLB20004P_	7170.00	7170.00
2500 A	2500	1250	710	3	SLB25003P_	6610.00	6610.00
				4	<sup>i</sup> SLB25004P_	8370.00	8370.00
3200 A	3200	1250	710	3	SLB32003P_	8440.00	8440.00
				4	<sup>i</sup> SLB32004P_	10900.00	10900.00
4000 A	3200	1250	710	3	SLB40003P_ <sup>3)</sup>	18610.00	18610.00
				4	<sup>i</sup> SLB40004P_ <sup>3)</sup>	23920.00	23920.00



SLB 32003PD  
With direct mount handle

**Notes:** <sup>1)</sup> Insert D for direct mount handle or leave blank for panel mount pistol handle complete with 320 mm shaft.  
<sup>2)</sup> 6 and 8 pole switches available on indent. Refer to NHP.  
<sup>3)</sup> Supplied with 2 N/O and 2 N/C auxiliaries as standard.  
<sup>i</sup> Available on indent only

### Accessories for SIRCO M switches

Description	Page
Accessories	11 - 8 to 11 - 10
Technical data	11 - 11 to 11 - 14
Dimensions	11 - 15 to 11 - 18
Enclosed options	11 - 42

### Price Schedule 'B2'

## SLB Standard load-break switches

### Accessories



Direct handle  
2799 7012

#### Direct mount handles

To suit	Colour	Cat. No.	Price \$
SLBM 16...80	Blue	2299 5012	8.00
SLBM 100...125	Blue	2299 5032	11.00
SLB 125...160	Black	2699 5042	95.00
SLB 200...630	Black	2699 5052	123.00
SLB 800...3200	Black	2799 7012	189.00
SLB 4000	Black	2799 7062	500.00



Selector handle  
1473 1111

#### External mount handles (Accepts up to 3 padlocks in the 'OFF' position)

To suit	Type	Colour	IP rating	Cat. No. <sup>3)</sup>	Price \$
SLBM 16...80	Selector	Blue	65	1473 1111	34.00
		Red/Yellow	65	1474 1111	34.00
	Door mount kit	Blue	-	2299 3309 <sup>4)</sup>	12.00
I-0-II I-I+II-II	Selector	Blue	65	1473 1113	35.00
		Blue	65	1473 1114	35.00
SLBM 100...125	Selector	Blue	65	1483 1111	52.00
		Red/Yellow	65	1484 1111	52.00
SLB 125...630	Pistol - S2	Blue	65	1423 2111	110.00
		Red/Yellow	65	1424 2111	142.00
SLB 800...1800	T-type - S4	Black	65	1443 3111	210.00
		Red	65	1444 3111	210.00
SLB 2000...3200	T-type	Black	65	SLBPH09	220.00
		Red	65	SLBPH10	220.00
SLB 4000	T-type	Stainless Steel	54	SLBPH11	380.00
SLB 125...1800	S2...S4	Shaft Guide	-	14290000	23.00




S Type External handle

#### External mount stainless steel handle

To suit	Description	Cat. No.	Price \$
SLB 125...3200	Stainless steel handle <sup>1)</sup>	SLBPHM	295.00
SLB 125...3200	IP 65 adaptor <sup>2)</sup>	2799 7016	215.00
SLB 125...630	10 mm – 15 mm shaft adaptor	SLBADAP2	44.00
SLB 800...1800	Shaft (450 mm)	2799 3019	82.00

#### Shafts for external handles

	Shaft length (mm)	Type		
To suit		Selector	Pistol	Cat. No. Price \$
SLBM 16...125	200	✓		 1407 0520 18.00
5 mm² shaft	320	✓		1407 0532 23.00
SLB 125...630	320		✓	1400 1032 44.00
10 mm² shaft	500		✓	1400 1050 68.00
SLB 800...1800	320		✓	1401 1532 88.00
12 mm² shaft	540		✓	1401 1540 142.00
SLB 2000...4000	200		✓	2799 3015 75.00
15 mm² shaft	320		✓	2799 3018 80.00
SLB125...1800		Shaft Lock Device		SLBDL01 163.00

**Notes:** <sup>1)</sup> Can be direct mounted onto 15 mm shaft otherwise a shaft adaptor is required.

<sup>2)</sup> Required for external mount stainless steel handle.

<sup>3)</sup> Padlockable in off position as standard, other positions on request

<sup>4)</sup> Add handle and switch.

<sup>1)</sup> Available on indent only.

#### Price Schedule 'B2'

## SLB Standard load-break switches

### Accessories

#### Fourth pole module (Simultaneous switching)



To suit	AC 21 400 V (A)	AC 23 400 V (A)	AC 23 400 V (kW)	Cat. No.	Price \$
SLBM 16...40	16	16	5.5	2200 1000	16.00
	20	20	9	<sup>i</sup> 2200 1001	17.00
	25	25	11	2200 1002	20.00
	32	32	15	<sup>i</sup> 2200 1003	23.00
SLBM 63...125	40	40	18.5	2200 1004	25.00
	63	63	30	<sup>i</sup> 2200 1006	29.00
	80	80	40	2200 1008	32.00
	100	100	40	2200 1010 <sup>2)</sup>	50.00
	125	125	63	2200 1011 <sup>2)</sup>	58.00



SLBM AUX  
Contacts  
2299 0001

#### Auxiliary contacts (Early-break)

To suit	Type	Current (A)	Contacts	Cat. No.	Price \$
SLBM 16...125	N/O + N/C	10	N/O + N/C	2299 0001	22.00
SLB 125...3200	1 changeover	16	1st C/O	2699 0031	70.00
			2nd C/O	2699 0032	70.00
SLB 4000 <sup>1)</sup>	2 changeover	16	2 C/O	STANDARD	-
SLB 125...1800	N/O + N/C	16	1st N/O + N/C	2699 0141	116.00
	N/O + N/C	16	2nd N/O + N/C	2699 0142	116.00
SLB 2000...3200	N/O + N/C	16	1st N/O + N/C	2699 0005	129.00
	N/O + N/C	16	2nd N/O + N/C	2799 0006	129.00



SLB AUX  
Contacts  
2699 0031

#### SLBM Mechanical couplings

To suit		Cat. No.	Price \$
SLBM 16...80	Makes two 3P / 4P into 6P / 8P	2269 6009	56.00
SLBM 16...80	Makes two load break into changeover (I-O-II)	2209 6009	87.00
SLBM 16...80	Makes two load break into changeover (I-I+I-II)	2299 6009	95.00

#### SLB Mechanical coupling

To suit		Cat. No.	Price \$
SLB 125...160	Makes two 3P / 4P into 6P / 8P	2699 9170	610.00
SLB 200...250	Makes two 3P / 4P into 6P / 8P	2699 9230	850.00
SLB 315...630	Makes two 3P / 4P into 6P / 8P	2699 9290	1220.00

#### Terminal Bolt Sets

To suit	Cat. No.	Price \$
SLB 125...160	2030 211 <sup>1)</sup>	12.00
SLB 200...250	2032 211 <sup>1)</sup>	20.00
SLB 315...400	2030 801 <sup>1)</sup>	20.00
SLB 500...630	2032 601 <sup>1)</sup>	31.00
SLB 800...1000	27SE 3080	31.00
SLB 1250...1800	27SE 3121	37.00
SLB 2000...4000	27SE 3210	78.00

**Note:** <sup>1)</sup> Included as standard with switch.

<sup>2)</sup> Available 2nd quarter 2009.

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

#### Price Schedule 'B2'

## SLB Standard load-break switches

### Accessories







#### Terminal shrouds and screens (Screw fixing) <sup>4)</sup>



Shroud



Screen

To suit	IP rating	Mounting position	No. of poles	Cat. No.	Price \$
SLBM 16...40	20	top & bottom	3 Set	2294 3005	20.00
SLBM 63...80	20	top & bottom	3 Set	2294 3009	29.00
SLBM 100...160	20	top & bottom	3 Set	2294 3016	36.00
SLBM 16...40	20	top & bottom	1 Set	2294 1005	8.00
SLBM 63...100	20	top & bottom	1 Set	2294 1009	12.00
SLBM 125...160	20	top & bottom	1 Set	2294 1011	13.00
SLB 125...160	20	top or bottom	3	2694 3014	68.00
	20	top or bottom	4	2694 4014	86.00
SLB 200...250	20	top or bottom	3	2694 3021	119.00
	20	top or bottom	4	 2694 4021	125.00
SLB 315...630	20	top or bottom	3	2694 3051	157.00
	20	top or bottom	4	 2694 4051	170.00
SLB 800...1000	screen	top or bottom	3	2698 3080	97.00
			4	 2698 4080	112.00
SLB 1250...1800	screen	top or bottom	3	2698 3120	163.00
			4	 2698 4120	170.00
SLB 2000...4000 <sup>5)</sup>		top or bottom		- <sup>5)</sup>	-

**Note:** One terminal shroud/screen required per side.

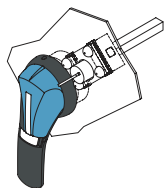


Phase Barriers

#### Phase barriers

To suit	Mounting position	No of poles	Cat. No.	Price \$
SLB 125...160	Top or bottom	3	2998 0033	31.00
	Top or bottom	4	2998 0034	40.00
SLB 200...250	Top or bottom	3	2998 0023	37.00
	Top or bottom	4	2998 0024	47.00
SLB 315...630	Top or bottom	3	2998 0013	44.00
	Top or bottom	4	2998 0014	53.00
SLB 800...1800	Top or bottom	3	- <sup>5)</sup>	STD
	Top or bottom	4	- <sup>5)</sup>	STD
SLB 2000...2500	Top or bottom	3	2998 0003 <sup>3)</sup>	66.00
	Top or bottom	4	2998 0004 <sup>3)</sup>	77.00

#### Interlocking device - to accommodate Fortress/Haake lock (Lock not supplied)



1499 7702

To suit	Haake	Fortress lock	Cat. No.	Price \$
SLB 125...1800	Bolt lock	H31QDS	1499 7702	184.00
SLB 2000...4000	Bolt lock	H31QDS	SLBLK4 <sup>1)</sup>	275.00
SLB 2000...3200	Escutcheon plate		2799 7065	395.00
Haake Bolt lock			HSTTHB1R0 <sup>2)</sup>	520.00
Haake Bolt lock key			HSTK1 <sup>2)</sup>	110.00


**Notes:** <sup>1)</sup> SLB 2000...3200 requires Cat. No. 2799 7065.

<sup>2)</sup> Insert key code A,B,C e.g. HSTK1A.

<sup>3)</sup> For 2000...2500 use 2 sets.

<sup>4)</sup> Required for 690 V AC applications.

<sup>5)</sup> Included as standard with switch.

 Available on indent only.

#### Price Schedule 'B2'

## Technical data and ratings chart

### SIRCO M SLB 16 to 160 A

#### Ratings to AS/NZS 3947-3 and IEC 60947-3

Thermal current $I_{th}$ (40 °C)			16 A	20 A	25 A	32 A	40 A	63 A	80 A	100 A	125 A
Rated insulation voltage and rated operation voltage AC 20/DC 20	V		800	800	800	800	800	800	800	800	800
Rated impulse withstand voltage	kV		8	8	8	8	8	8	8	8	8
Thermal current (60 °)			12.8	16	20	25.6	32	50.4	64	80	100
Rated operational current											
AC 21A	400 V	A	16	20	25	32	40	63	80	100	125
	500 V	A	16	20	25	32	40	63	80	100	125
	690 V	A	16	20	25	32	40	63	80	100	125
AC 22A	400 V	A	16	20	25	32	40	63	80	100	125
	500 V	A	16	20	25	32	40	63	80	100	125
	690 V	A	16	20	25	32	40	63	80	100	100
AC 23A	400 V	A	16	20	25	32	40	63	80	100	125
	500 V	A	16	20	25	25	25	63	63	80	100
	690 V	A	16	20	25	25	25	40	40	63	63
Operational power											
AC 23A	400 V	kW	5.5	9	11	15	18.5	30	40	40	63
	500 V	kW	7.5	9	11	15	18.5	33	40	40	63
	690 V	kW	7.5	11	15	15	15	45	45	45	75
Overload capacity											
Short time withstand current $I_{cw}$ (RMS 0.3s) 400 V	kA		2.5	2.5	2.5	2.5	2.5	3	3	5	5
Short-circuit making capacity $I_{cm}$ (kA peak)	kA		6	6	6	6	6	9	9	12	12
Fuse protected short circuit withstand (kA RMS prospective)	400 V AC	kA	50	50	50	50	50	50	50	50	50
	Fuse	A	40	40	40	40	40	80	80	100	125
Mechanical endurance	Ops		100000	100000	100000	100000	100000	100000	100000	100000	100000
Weight (3 pole)	Kg		0.16	0.16	0.16	0.16	0.16	0.26	0.26	0.7	0.7
Tightening torque min/max	Nm		2/2.2	2/2.2	2/2.2	2/2.2	2/2.2	3.5/385	3.5/385	-	-
Connection cable size	mm <sup>2</sup>		1.5/16	1.5/16	1.5/16	1.5/16	1.5/16	2.5/35	2.5/35	10/70	10/70

**Notes:** 240/415 V ratings suitable for use on 230/400 V in accordance with AS 60038 : 2000.

## Technical data and ratings chart

### SIRCO SLB 125 to 630 A

#### Ratings to AS/NZS 3947-3 and IEC 60947-3

Thermal current $I_{th}$ (40 °C)			125 A	160 A	200 A	250 A	315 A	400 A	500 A	630 A
Rated insulation voltage and rated operation voltage AC 20/DC 20	V		800	800	800	800	1000	1000	1000	1000
Rated impulse withstand voltage	kV		8	8	8	8	12	12	12	12
Thermal current (60°)			100	128	160	200	252	320	400	504
Rated operational current										
AC 21A	400 V	A	125	160	200	250	315	400	500	630
	500 V	A	125	160	200	250	315	400	500	630
	690 V <sup>1)</sup>	A	125	160	160	200	315	400	400	500
AC 22A	400 V	A	125	160	200	250	315	400	500	630
	500 V	A	125	125	200	250	315	400	400	500
	690 V <sup>1)</sup>	A	125	125	125	125	250	250	250	315
AC 23A	400 V	A	125	160	200	250	315	400	500	500
	500 V	A	100	100	160	200	315	315	315	315
	690 V <sup>1)</sup>	A	63	63	80	100	160	160	160	160
Rated operational current										
DC 21A	220 V	A	125	160	160	250	315	400	400	630
	500 V	A	125 <sup>2)</sup>	125 <sup>2)</sup>	160 <sup>2)</sup>	200 <sup>2)</sup>	315 <sup>2)</sup>	400 <sup>2)</sup>	400 <sup>2)</sup>	500 <sup>2)</sup>
DC 22A	220 V	A	125	160	160	250	315	400	400	500
	500 V	A	125 <sup>3)</sup>	125 <sup>3)</sup>	160 <sup>3)</sup>	200 <sup>3)</sup>	315 <sup>3)</sup>	315 <sup>3)</sup>	315 <sup>3)</sup>	500 <sup>3)</sup>
DC 23A	220 V	A	125	125	160	200	315	400	400	500
	500 V	A	125 <sup>3)</sup>	125 <sup>3)</sup>	160 <sup>3)</sup>	200 <sup>3)</sup>	315 <sup>3)</sup>	400 <sup>3)</sup>	400 <sup>3)</sup>	500 <sup>3)</sup>
Operational power										
AC 23A	400 V	kW	63	80	100	132	160	220	280	280
	500 V	kW	63	63	110	140	220	220	220	220
	690 V	kW	55	55	75	90	150	150	150	150
Overload capacity	RMS 0.3s	kA	15	15	17	17	25	25	25	25
Short time withstand current $I_{cw}$ RMS 1s	kA		7	7	9	9	13	13	13	13
400 V										
Rated peak withstand current (kA peak) 400 V	kA		20	20	30	30	45	45	45	46
Breaking capacity AC 23A	400 V	A	1000	1280	1600	2000	2520	3200	4000	4000
Making capacity AC 23A	400 V	A	1250	1600	2000	2500	3150	4000	5000	6000
Fuse protected short circuit withstand (kA RMS prospective).	400 V AC	kA	100	100	80	50	100	100	100	70
	Fuse	A	125	160	200	250	315	400	500	630
Rated capacitor power	kVAr		55	75	90	115	145	185	230	290
Power dissipation w/pole			1.8	3	4	5.8	7.6	10.8	16	30.9
Mechanical endurance	Ops		10000	10000	10000	10000	5000	5000	5000	5000
Weight (3 pole)	Kg		1	1.1	1.7	1.7	4	4	4.1	4.7
Min. tightening torque	Nm		6.5	6.5	10	10	14.5	14.5	14.5	14.5
Connection cable size	mm <sup>2</sup>		35/50	50/95	70/95	95/150	150/240	185/240	240/240	2 (150/300)

**Notes:** <sup>1)</sup> 690 V with terminal shrouds or phase barriers.

<sup>2)</sup> 2 poles in series for + and 1 pole for -.

<sup>3)</sup> 2 poles in series for each polarity.

## Technical data and ratings chart

### SIRCO SLB 800 to 4000 A

#### Ratings to AS/NZS 3947-3 and IEC 60947-3

Thermal current $I_{th}$ (40 °C)			800 A	1000 A	1250 A	1600 A	1800 A	2000 A	2500 A	3200 A	4000 A
Rated insulation voltage and rated operation voltage AC 20/DC 20	V		1000	1000	1000	1000	1000	1000	1000	1000	1000
Rated impulse withstand voltage	kV		12	12	12	12	12	12	12	12	12
Thermal current (60°)			640	800	1000	1280	1440	1600	2000	2526	3200
Rated operational current											
AC 21A	400 V	A	800	1000	1250	1600	1800	2000	2500	3200	3200
	500 V	A	800	800	1250	1600	1600	2000	2500	3200	3200
	690 V <sup>1)</sup>	A	800	800	1000	1000	1000	2000	2000	2000	2000
AC 22A	400 V	A	800	1000	1250	1600	1800	2000	2000	2500	2500
	500 V	A	800	800	1000	1250	1250	1600	1600	2000	2000
	690 V <sup>1)</sup>	A	800	800	1000	1000	1000	1000	1000	1000	1000
AC 23A	400 V	A	800	1000	1250	1250	1250	1250	1250	1250	1250
	500 V	A	630	630	1000	1000	1000	1000	1000	1000	1000
	690 V <sup>1)</sup>	A	200	200	500	500	500	800	800	800	800
Rated operational current											
DC 21A	220 V	A	800	1000	1250	1250	1250	2000	2000	2000	2000
	500 V	A	800 <sup>3)</sup>	1000 <sup>3)</sup>	1250 <sup>3)</sup>	1250 <sup>3)</sup>	1250 <sup>3)</sup>	1250	1250	1250	1250
DC 22A	220 V	A	800	1000	1250	1250	1250	1250	1250	1250	1250
	500 V	A	800 <sup>3)</sup>	1000 <sup>3)</sup>	1250 <sup>3)</sup>	1250 <sup>3)</sup>	1250 <sup>3)</sup>	1250 <sup>3)</sup>	1250 <sup>3)</sup>	1250 <sup>3)</sup>	1250 <sup>3)</sup>
DC 23A	220 V	A	800	1000	1250	1250	1250	1250	1250	1250	1250
	500 V	A	800 <sup>3)</sup>	1000 <sup>3)</sup>	1250 <sup>3)</sup>	1250 <sup>3)</sup>	1250 <sup>3)</sup>	1000 <sup>3)</sup>	1000 <sup>3)</sup>	1000 <sup>3)</sup>	1000 <sup>3)</sup>
Operational power											
AC 23A	400 V	kW	450	560	710	710	710	710	710	710	710
	500 V	kW	450	450	710	710	710	710	710	710	710
	690 V	kW	185	185	475	475	475	750	750	750	750
Overload capacity	RMS 0.3s	kA	50	65	100	100	100	100	100	110	110
Short time withstand current $I_{cw}$	RMS 1s	kA	26	35	50	50	50	50	50	55	70
400 V											
Rated peak withstand current (kA peak) 400 V	kA		55	105	105	110	110	110	110	120	120
Breaking capacity AC 23A	400 V	A	6400	8000	8000	8000	8000	10000	10000	10000	10000
Making capacity AC 23A	400 V		8000	10000	10000	10000	10000	12500	12500	12500	12500
Fuse protected short circuit withstand (kA RMS prospective).	400 V AC	kA	50	100	100	100	100	100	100	–	–
	Fuse	A	800	1000	1250	2x800	2x800	2x1000	2x1250	–	–
Rated capacitor power	kVAr		365	460	575	–	–	–	–	–	–
Power dissipation w/pole			39.2	45	85	122	153	178	255	444	916
Mechanical endurance	Ops		3000	3000	4000	4000	4000	3000	2500	2500	2500
Weight (3 pole)	Kg		9.2	9.5	12	12	12	41.5	42.6	56.4	106
Min. tightening torque	Nm		37	37	56	56	56	60	60	60	110
Connection cable size	mm <sup>2</sup>		2 (185/300)	2 240/4 185	4 185 max	6 185 max	6 185 max	–	–	–	–

**Notes:** Refer to previous page

## Application data load-break / MCCB

### Socomec load-break switch and TemBreak MCCB co-ordination chart

#### TemBreak 2 MCCB

Socomec load-break switch	(ExxxNJ model)		(SxxxNJ model)		(SxxxGJ model)		(HxxxNJ model)	
	Cat. No.	(kA)	Cat. No.	(kA)	Cat. No.	(kA)	Cat. No.	(kA)
SLBM 63	E125NJ	6.5	S125NJ	6.5	S125GJ	6.5	H125NJ	7.5
SLB 125	E125NJ	22	S125NJ	22	S125GJ	22	H125NJ	30
	-	-	S160NJ	15	S160GJ	15	H160NJ	27
	E250NJ	15	S250NJ	15	S250GJ	15	H250NJ	26
SLB 200	E125NJ	25	S125NJ	36	S125GJ	65	H125NJ	80
	-	-	S160NJ	30	S160GJ	30	H160NJ	80
	E250NJ	25	S250NJ	30	S250GJ	30	H250NJ	80
SLB 250	E250NJ	25	S250NJ	30	S250GJ	30	H250NJ	50
	E400NJ	25	S400NJ	25	S400GJ	25	H400NJ	35
SLB 315	E250NJ	25	S250NJ	36	S250GJ	65	H250NJ	100
	E400NJ	25	S400NJ	50	S400GJ	65	H400NJ	100
SLB 400	E400NJ	25	S400NJ	50	S400GJ	65	H400NJ	100

#### TemBreak MCCB

Socomec load-break switch						
	Cat. No.	(kA)	Cat. No.	(kA)	Cat. No.	(kA)
SLB 630	E630NE	35	S630CE	35	TL630NE	24
SLB 800	XS800NJ	40	XH800PJ	40	TL800NE	28
SLB 1000	XS1250SE	45	XS1600SE	45	TL1250NE	45
SLB 1250	XS1250SE	65	XS1600SE	75	TL1250NE	70
SLB 1600	XS1600SE	75	XS2000NE	60	-	-
SLB 2000	XS2000NE	60	XS2500NE	60	-	-
SLB 2500	XS2500NE	60	-	-	-	-

**Notes:** Figures based on / valid for – 400/415 V AC.

All Socomec load-break switches can be used in higher prospective fault current level applications, due to the upstream Terasaki TemBreak MCCB reducing the peak let-through current.

Example: SLB 250 can be used in a 30 kA application if there is an upstream S250NJ MCCB.

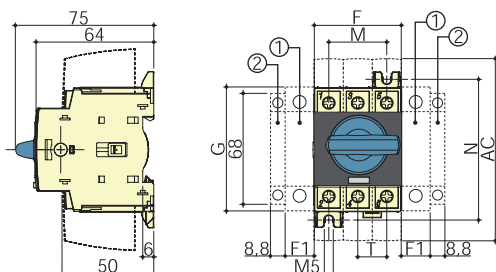
For other combinations please refer to NHP.

## Technical data and dimensions (mm)

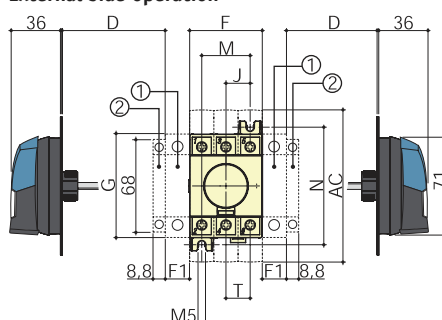
### SIRCO M SLB 16 to 125 A

#### SIRCO M 16 to 80 A

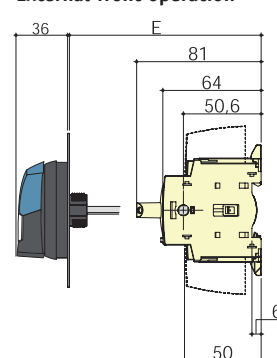
Direct operation with handle



External side operation



External front operation



Rating A	D min.	Overall Dimensions			Terminal shrouds		Switch body			Switch mounting		Connection terminals
		D max.	E min.	E max.	AC	F	F1	G	J	M	N	T
16...40	30	235	100	372	110	45	15	68	15	30	75	15
63...80	30	235	100	372	110	52.5	17.5	76	17.5	35	85	17.5

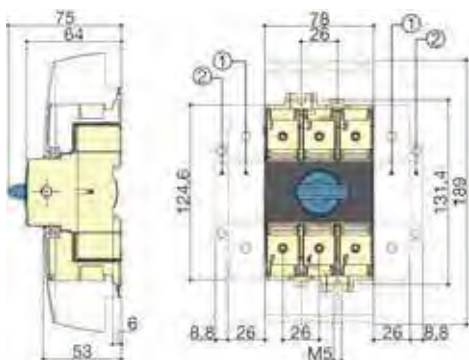
① 1 switched fourth pole module (1 per device max.) or 1 unswitched neutral pole or 1 protective earth module or 1 auxiliary contact.

② 1 auxiliary contact only.

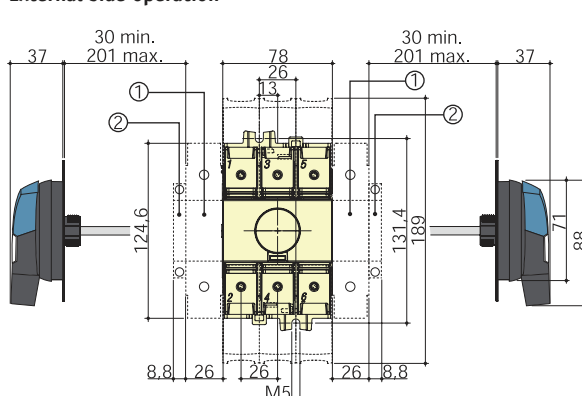
Note: Max 4 additional blocks

#### SIRCO M 100 A to 125 A

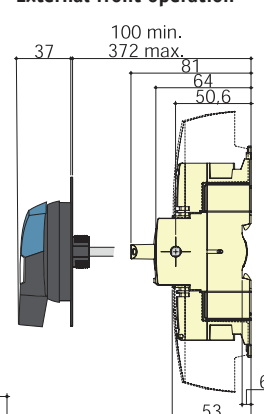
Direct operation with handle



External side operation



External front operation





## Grounding

### Mechanical

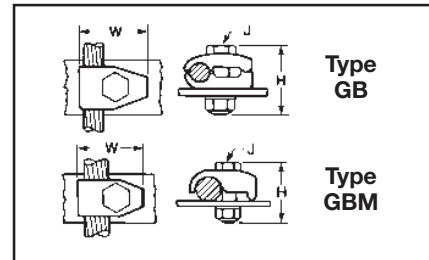
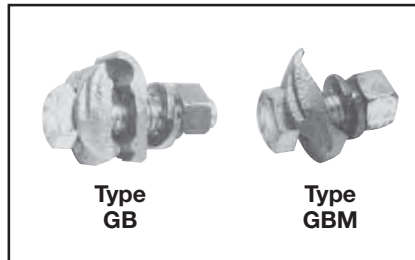
**BURNDY®**

## TYPES GB, GBM

### GROUND CONNECTOR

#### For Copper Cable to Bar

High copper alloy ground connector for joining a range of cable to 1/4" thick bar.\* Type GB separates cable from bar, GBM clamps cable directly on bar surface. One-wrench installation. UL467 Listed. The high copper alloy cast body and DURIMUM™ bolts, nuts, and lockwashers make the GB and GBM suitable for direct burial in concrete or ground.



Catalog Number		Conductor	H Type	H Type	J	W	W
Type GB	Type GBM		GB/GBL	GBM		Type GB/GBL	Type GBM
<b>GB4C</b>	<b>GBM4C</b>	8 Sol. - 4 Str.	1-1/2	1-1/2	3/8	1-1/4	1-1/4
<b>GB26</b>	<b>GBM26</b>	4 Sol. - 2/0 Str.	2			1-1/2	1-1/2
<b>+GBL30</b>		4 Sol. - 300				7/8	0
<b>GB29</b>	<b>GBM29</b>	2/0 Sol. - 250		2	1/2	2	2
<b>GB34</b>	<b>GBM34</b>	300 - 500	3	2-1/4		2-3/8	2-3/8

+ GBL30 is not UL listed.

Add "GS" suffix for galvanized steel hardware.

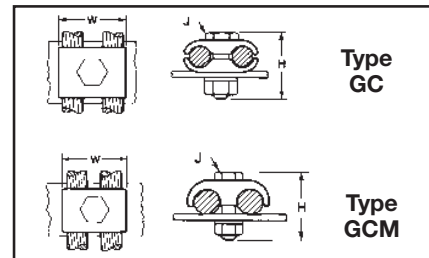
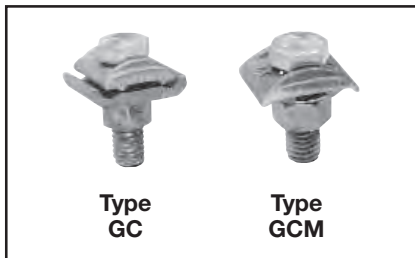
\* For other bar thicknesses see note at bottom of page E-48.

## TYPES GC, GCM

### GROUND CONNECTOR

#### For Two Copper Cables to Bar

High copper alloy ground connector for joining a wide range of two parallel cables to 1/4" thick bar.\* Type GC separates cable from bar, GCM clamps cable to bar surface. One-wrench installation. UL467 Listed. The high copper alloy cast body and DURIMUM™ bolts, nuts, and lockwashers make the GC and GCM suitable for direct burial in concrete or ground.



Catalog Number		Conductor	H Type	H Type	J	W	W
Type GC	Type GCM		GC/GCL	GCM		Type GC/GCL	Type GCM
<b>GC4C4C</b>	<b>GCM4C</b>	8 Sol. - 4 Str.	1-1/2	1-1/2	3/8	1-3/8	1
<b>GC2626</b>	<b>GCM26</b>	4 Sol. - 2/0 Str.	2			1-3/4	1-3/8
<b>GCL30</b>	<b>GCM30</b>	4 Str. - 300	2	—	—	1	—
<b>GC2929</b>	<b>GCM29</b>	2/0 Sol. - 250	2-1/4	2	—	2-1/4	2
<b>GC3434</b>	<b>GCM34</b>	300 - 500	2-7/8	2-1/4	1/2	2-7/8	2-5/8

Smooth oval-shank bolts are available upon request for cable-tray applications (example: GC30G3). Also refer to type GC-CT.

Add "GS" suffix for galvanized steel hardware.

\* For other bar thicknesses see note at bottom of page E-48.

Blue highlighted items are industry standard and most frequently ordered.

Canada: 1-800-387-6487

www.burndy.com

US: 1-800-346-4175

# Proximity Sensors Inductive Thermoplastic Polyester Housing Type IC 40, 40 x 40 x 118 mm

CARLO GAVAZZI



- Rotable-head, 5 positions
- Mounting dimensions in accordance with DIN 43694
- Thermoplastic polyester housing
- Sensing distance: 30 mm
- LED-indication for power and output ON
- Fully protected
- DC types 4-wire NO & NC, 10-30 VDC
- AC/DC types 2-wire NO or NC, 20-250 VAC/DC
- AC type 2-wire NO & NC

## Product Description

Inductive proximity switch in standard limit switch housing. Rugged polyester housing. Sensing face adjustable in up to 5 positions. 2-wire AC/DC for maximum efficiency.

## Ordering Key

**IC40CNN30NAT1**

Ind. prox. switch \_\_\_\_\_  
 Housing style \_\_\_\_\_  
 Housing size \_\_\_\_\_  
 Housing material \_\_\_\_\_  
 Housing length \_\_\_\_\_  
 Detection principle \_\_\_\_\_  
 Sensing distance \_\_\_\_\_  
 Output type \_\_\_\_\_  
 Output configuration \_\_\_\_\_  
 Connection \_\_\_\_\_

## Type Selection - DC

Rated operating dist. (S <sub>n</sub> )	Ordering no. Transistor NPN Make & break switching	Ordering no. Transistor PNP Make & break switching
30 mm <sup>1)</sup>	IC40CNN30NAT1	IC40CNN30PAT1

<sup>1)</sup> For non-flush mounting

## Type Selection - AC and AC/DC

Rated operating dist. (S <sub>n</sub> )	Ordering no. Power MOSFET Make switching, AC/DC	Ordering no. Power MOSFET Break switching, AC/DC	Ordering no. Power MOSFET Make & Break switching, AC
30 mm <sup>1)</sup>	IC40CNN30COT1	IC40CNN30CCT1	IC40CNN30TAT1 <sup>2)</sup>

<sup>1)</sup> For non-flush mounting

<sup>2)</sup> Delivered: NO (make switching)

## Specifications

	Transistor NPN/PNP	Power MOSFET output AC types
Rated operational voltage (U <sub>B</sub> )	10 to 30 VDC (rippled included)	20 to 250 VAC/VDC (VAC: 45 to 65 Hz)
Ripple	≤ 15%	-
Rated operational current (I <sub>e</sub> ) Continuous	≤ 200 mA	5 - 200 mA @ 25°C 5 - 160 mA @ 70°C
Short-time	-	≤ 2 A, t ≤ 20 ms (Max. 1 pulse per s)
No-load supply current (I <sub>o</sub> )	≤ 25 mA	-
Minimum load current	-	5 mA

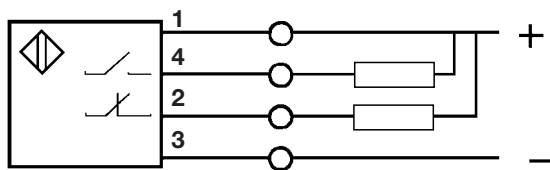
IC40CNN30....



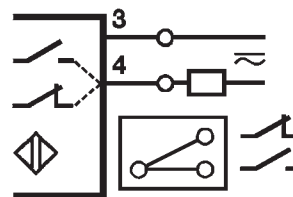
## Specifications (cont.)

	Transistor NPN/PNP	Power MOSFET output AC types
<b>OFF-state current</b> ( $I_r$ ) (leakage)	50 $\mu$ A	$\leq 1.7$ mA @ 120 VAC $\leq 2.5$ mA @ 220 VAC
<b>Voltage drop</b> ( $U_d$ )	0.8 to 3.5 V	Static: $\leq 10.0$ V Dynamic: $\leq 8.0$ V
<b>Protection</b>	Reverse polarity, short-circuit	Transient voltages, short-circuit
<b>Power ON delay</b>	$\leq 100$ ms	$\geq 10$ ms
<b>Frequency of operating cycles</b> (f)	$\leq 100$ Hz	$\leq 25$ Hz AC; 40 Hz DC
<b>Indication for supply ON</b> (LED 2)	LED, green	LED, green
<b>Indication for output ON</b> (LED 1)	LED, red	LED, red
<b>Rated operating dist.</b> ( $S_n$ )	30 mm	30 mm
<b>Repeat accuracy</b> (R)	$\leq 1\%$	$\leq 1\%$
<b>Hysteresis</b> (H) (Differential travel)	3 to 20% of sensing distance	3 to 20% of sensing distance
<b>Effective operating dist.</b> ( $S_r$ )	$0.9 \times S_n \leq S_r \leq 1.1 \times S_n$	$0.9 \times S_n \leq S_r \leq 1.1 \times S_n$
<b>Usable operating dist.</b> ( $S_u$ )	$0.9 \times S_r \leq S_u \leq 1.1 \times S_r$	$0.9 \times S_r \leq S_u \leq 1.1 \times S_r$
<b>Ambient temperature</b> Operating Storage	-25° to +70°C (-13° to +158°F) -30° to +80°C (-22° to +176°F)	-25° to +70°C (-13° to +158°F) -30° to +80°C (-22° to +176°F)
<b>Degree of protection</b>	IP 67 (Nema 1, 3, 4, 6, 13)	IP 67 (Nema 1, 3, 4, 6, 13)
<b>Shock resistance</b>	30 G/ 11 ms	30 G/ 11 ms
<b>Vibration resistance</b>	10 to 50 Hz/1 mm/5 min.	10 to 50 Hz/1 mm/5 min.
<b>Housing material</b>	PBT	PBT
<b>Terminal block</b>	4 terminals for 2 x 2.5 mm <sup>2</sup> wires, self-lifting	2 terminals for 2 x 2.5 mm <sup>2</sup> wires, self-lifting
<b>Cable gland</b>	M20 x 1.5	M20 x 1.5
<b>Weight</b>	200 g	200 g
<b>CE-marking</b>	Yes	Yes

## Wiring Diagrams

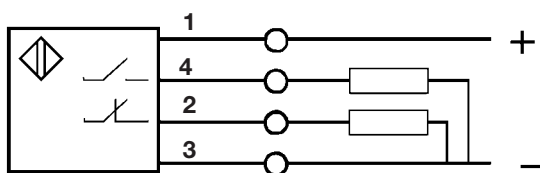


IC40CNN30NAT1



IC40CNN30TAT1  
IC40CNN30COT1  
IC40CNN30CCT1

Internal programmable

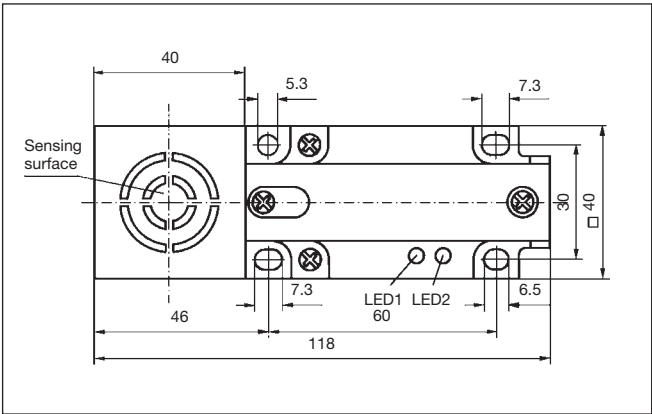


IC40CNN30PAT1

IC40CNN30....

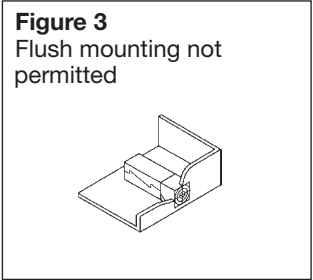
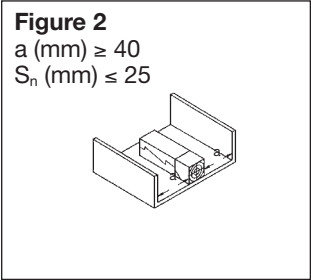
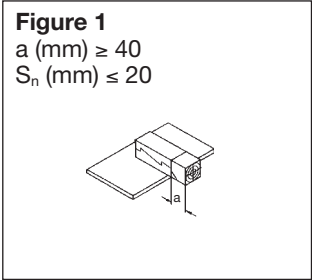


Dimensions

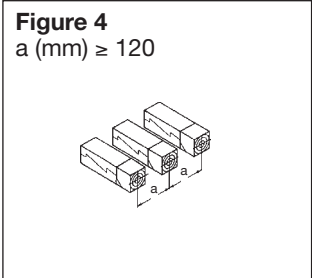


Installation Hints

**Table 1**  
**Installation examples**  
Sensing surface on head ("top"); other orientations of the sensing surface mean deviations from nominal sensing distance.



**Table 2**  
**Adjacent mounting**  
To avoid cross-interference when mounting the sensors next to each other, the given separations (a) should be maintained.





Extract from the online  
catalog

## USA 10/4,6

Order No.: 1202713


The illustration shows versions USA 10 and USA 10/4,6



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=1202713>

Rail adapters, Length: 10 mm, Width: 42.6 mm, Height: 19 mm,  
Color: gray

### Commercial data

GTIN (EAN)	4 017918 018009 
sales group	B224
Pack	10 pcs.
Customs tariff	39269097
Catalog page information	Page 349 (CL2-2011)

### Product notes

WEEE/RoHS-compliant since:  
01/01/2003



<http://www.download.phoenixcontact.com>  
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

### Technical data

#### General

Length (b)	10 mm
Height	19 mm
Width (a)	42.6 mm
Color	gray
Inflammability class according to UL 94	V2

USA 10/4,6 Order No.: 1202713

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=1202713>

Material	PA
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**Accessories**

Item	Designation	Description
<b>Assembly</b>		
1201028	NS 32 AL UNPERF 2000MM	G rail 32 mm (NS 32)
1201280	NS 32 CU/120QMM UNPERF 2000MM	G-profile DIN rail, deep-drawn, material: Copper, unperforated, height 15 mm, width 32 mm, length 2 m
1201358	NS 32 CU/35QMM UNPERF 2000MM	G-profile DIN rail, material: Copper, unperforated, height 15 mm, width 32 mm, length 2 m
1201002	NS 32 PERF 2000MM	G-profile DIN rail, material: Steel, perforated, height 15 mm, width 32 mm, length 2 m
1201015	NS 32 UNPERF 2000MM	G-profile DIN rail, material: Steel, unperforated, height 15 mm, width 32 mm, length 2 m
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801733	NS 35/ 7,5 PERF 2000MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 2000 mm
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201756	NS 35/15 AL UNPERF 2000MM	DIN rail, deep drawn, high profile, unperforated, 1.5 mm thick, material: aluminum, height 15 mm, width 35 mm, length 2000 mm
1201895	NS 35/15 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1201730	NS 35/15 PERF 2000MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 15 mm, width 35 mm, length: 2000 mm
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNPERF 2000MM	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m

USA 10/4,6 Order No.: 1202713

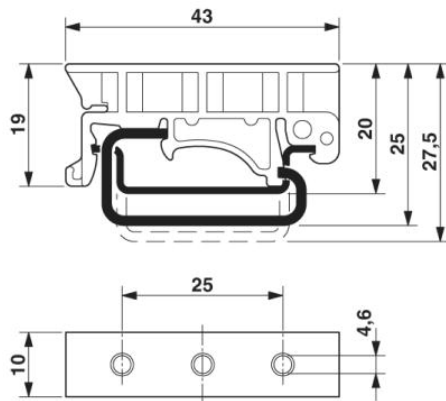
<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=1202713>

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## Diagrams/Drawings

Dimensioned drawing

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USA 10/4,6 Order No.: 1202713

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=1202713>

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**Address**

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Flachsmarktstr. 8  
32825 Blomberg, Germany  
Phone +49 5235 3 00  
Fax +49 5235 3 41200  
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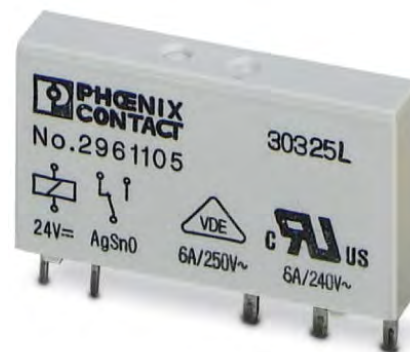
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Extract from the online  
catalog

## REL-MR- 24DC/21

Order No.: 2961105



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961105>

Pluggable miniature relays, with power contact, 1 PDT, input voltage  
24 V DC

### Commercial data

GTIN (EAN)	
sales group	G084
Pack	10 pcs.
Customs tariff	85364190
Catalog page information	Page 98 (IF-2011)

### Product notes

WEEE/RoHS-compliant since:  
06/01/2005



<http://www.download.phoenixcontact.com>  
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

### Technical data

#### Coil side

Nominal input voltage $U_N$	24 V DC
Nominal input current at $U_{IN}$	7 mA
Typical response time	5 ms
Typical release time	2.5 ms
Coil resistance	3390 $\Omega \pm 10\%$ (at 20°C)

REL-MR- 24DC/21 Order No.: 2961105

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961105>**Contact side**

Contact type	Single contact, 1-PDT
Contact material	AgSnO
Maximum switching voltage	250 V AC/DC
Minimum switching voltage	5 V (at 100 mA)
Maximum inrush current	(on request)
Min. switching current	10 mA (at 12 V)
Limiting continuous current	6 A
Interrupting rating (ohmic load) max.	140 W (at 24 V DC)
	20 W (for 48 V DC)
	18 W (for 60 V DC)
	23 W (for 110 V DC)
	40 W (for 220 V DC)
	1500 VA (for 250 V AC)

**General data**

Width	5 mm
Height	28 mm
Depth	15 mm
Test voltage relay winding/relay contact	4 kV AC (50 Hz, 1 min.)
Ambient temperature (operation)	-40 °C ... 85 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Operating mode	100% operating factor
Mechanical service life	2 x 10 <sup>7</sup> cycles
Standards/regulations	IEC 60664
	EN 50178
	IEC 62103
Pollution degree	3
Surge voltage category	III
Mounting position	Any
Assembly instructions	In rows with zero spacing

**Connection data**

Connection method	Plug / solder connection
-------------------	--------------------------

REL-MR- 24DC/21 Order No.: 2961105

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961105>**Certificates / Approvals**

Certification

CUL, GL, GOST, UL, VDE-PZI, VDE-PZI

**Additional products**

Item	Designation	Description
<b>General</b>		
2980458	PLC-BSC- 24DC/21/SO46	6.2 mm PLC basic terminal blocks with screw connection method and integrated filter against interference voltages and currents on the control side, input voltage 24 V DC(without relay or optocoupler)
2982799	PLC-BSC- 24UC/ 1/ACT	PLC-BS...-24UC/1/ACT basic terminal block for assembly with pluggable OPT-24DC...solid-state relays or mechanical REL-MR-24DC... relays.All connections of actuators, i.e. the load return lines can be directly connected to the PLC actuator terminal block.
2982809	PLC-BSP- 24UC/ 1/ACT	PLC-BS...-24UC/1/ACT basic terminal block for assembly with pluggable OPT-24DC...solid-state relays or mechanical REL-MR-24DC... relays.All connections of actuators, i.e. the load return lines can be directly connected to the PLC actuator terminal block.
<b>Relay base</b>		
2900262	PLC-BPT- 24DC/ 1/SEN	6.2 mm PLC sensor basic terminal blocks with Push-In connection method, input voltage of 24 V DC (without relay or optocoupler)
2900445	PLC-BPT- 24DC/21	6.2 mm PLC basic terminal blocks with Push-In connection method, input voltage of 24 V DC (without relay or optocoupler)
2900450	PLC-BPT- 24UC/ 1/ACT	PLC-BPT-24UC/1/ACT basic terminal block for assembly with plug-in OPT-24DC... solid-state relays or REL-MR-24DC... mechanical relaysAll actuator connections, i.e., the load return lines can be directly connected to the PLC actuator terminal block.
2900446	PLC-BPT- 24UC/21	6.2 mm PLC basic terminal blocks in Push-In connection method, input voltage of 24 V AC/DC (without relay or optocoupler)
2900447	PLC-BPT- 48DC/21	6.2 mm PLC basic terminal blocks with Push-In connection method, input voltage 48 V DC(without relay or optocoupler)
2966061	PLC-BSC- 24DC/ 1/SEN	6.2 mm PLC Sensor basic terminal blocks with screw connection method, input voltage 24 V DC(without relay or optocoupler)
2966016	PLC-BSC- 24DC/21	6.2 mm PLC basic terminal blocks with screw connection method, input voltage 24 V DC(without relay or optocoupler)

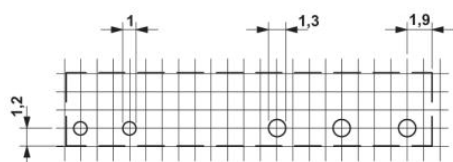
REL-MR- 24DC/21 Order No.: 2961105

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961105>

2966029	PLC-BSC- 24UC/21	6.2 mm PLC basic terminal blocks with screw connection method, input voltage 24 V AC/DC(without relay or optocoupler)
2966090	PLC-BSC- 48DC/21	6.2 mm PLC basic terminal blocks with screw connection method, input voltage 48 V DC(without relay or optocoupler)
2967206	PLC-BSP- 24DC/ 1/SEN	6.2 mm PLC Sensor basic terminal blocks with spring-cage connection method, input voltage 24 V DC(without relay or optocoupler)
2967219	PLC-BSP- 24DC/21	6.2 mm PLC basic terminal blocks with spring-cage connection method, input voltage 24 V DC(without relay or optocoupler)
2967222	PLC-BSP- 24UC/21	6.2 mm PLC basic terminal blocks with spring-cage connection method, input voltage 24 V AC/DC(without relay or optocoupler)
2967329	PLC-BSP- 48DC/21	6.2 mm PLC basic terminal blocks with spring-cage connection method, input voltage 48 V DC(without relay or optocoupler)

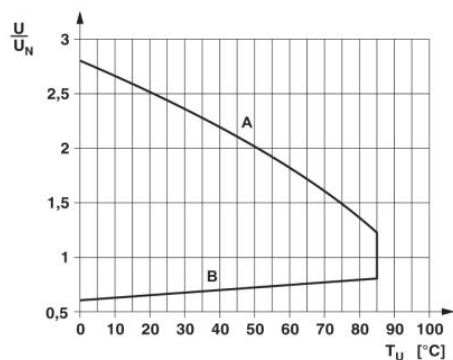
### Diagrams/Drawings

Drilling plan/solder pad geometry



a = pitch division 1.25 mm and 1.27 mm

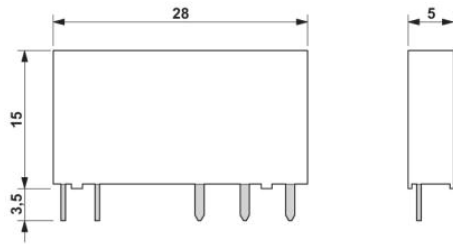
Diagram



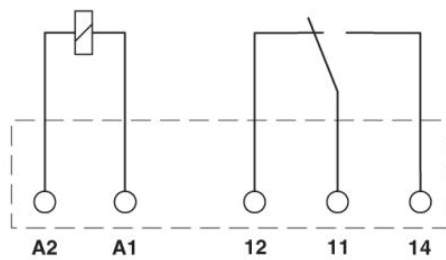
REL-MR- 24DC/21 Order No.: 2961105

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961105>

#### Dimensioned drawing



#### Circuit diagram



REL-MR- 24DC/21 Order No.: 2961105

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961105>

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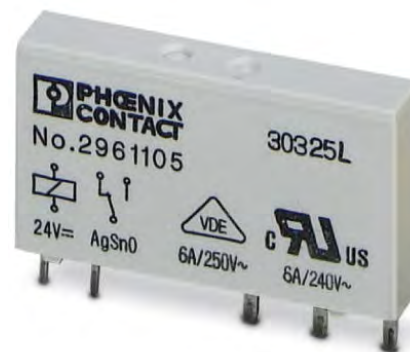


Extract from the online  
catalog

## REL-MR- 60DC/21

Order No.: 2961118

The illustration shows the version REL-MR- 24DC/21



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961118>

Pluggable miniature relays, with power contact, 1 PDT, input voltage  
60 V DC

### Commercial data

GTIN (EAN)	
sales group	G084
Pack	10 pcs.
Customs tariff	85364190
Catalog page information	Page 98 (IF-2011)

### Product notes

WEEE/RoHS-compliant since:  
01/23/2006



<http://www.download.phoenixcontact.com>  
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

### Technical data

#### Coil side

Nominal input voltage $U_N$	60 V DC
Nominal input current at $U_{IN}$	3 mA
Typical response time	5 ms
Typical release time	2.5 ms
Coil resistance	20500 $\Omega$ +/-15% (at 20°C)

REL-MR- 60DC/21 Order No.: 2961118

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961118>**Contact side**

Contact type	Single contact, 1-PDT
Contact material	AgSnO
Maximum switching voltage	250 V AC/DC
Minimum switching voltage	5 V (at 100 mA)
Maximum inrush current	(on request)
Min. switching current	10 mA (at 12 V)
Limiting continuous current	6 A
Interrupting rating (ohmic load) max.	140 W (at 24 V DC)
	20 W (for 48 V DC)
	18 W (for 60 V DC)
	23 W (for 110 V DC)
	40 W (for 220 V DC)
	1500 VA (for 250 V AC)

**General data**

Width	5 mm
Height	28 mm
Depth	15 mm
Test voltage relay winding/relay contact	4 kV AC (50 Hz, 1 min.)
Ambient temperature (operation)	-40 °C ... 85 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Operating mode	100% operating factor
Mechanical service life	2 x 10 <sup>7</sup> cycles
Standards/regulations	IEC 60664
	EN 50178
	IEC 62103
Pollution degree	3
Surge voltage category	III
Mounting position	Any
Assembly instructions	In rows with zero spacing

**Connection data**

Connection method	Plug / solder connection
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REL-MR- 60DC/21 Order No.: 2961118

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961118>**Certificates / Approvals**

Certification

CUL, GL, GOST, UL, VDE-PZI, VDE-PZI

**Additional products**

Item	Designation	Description
<b>Basic terminal block with filter</b>		
2980322	PLC-BSC-120UC/ 1/SEN/SO46	6.2 mm PLC sensor basic terminal blocks with screw connection method and integrated RCZ filter against interference voltages and currents on the control side, input voltage 120 V AC/DC(without relay or optocoupler)
2980319	PLC-BSC-120UC/21/SO46	6.2 mm PLC basic terminal blocks with screw connection method and integrated RCZ filter against interference voltages and currents on the control side, input voltage 120 V AC/DC(without relay or optocoupler)
2980348	PLC-BSC-230UC/ 1/SEN/SO46	6.2 mm PLC sensor basic terminal blocks with screw connection method and integrated RCZ filter against interference voltages and currents on the control side, input voltage 230 V AC/DC(without relay or optocoupler)
2980335	PLC-BSC-230UC/21/SO46	6.2 mm PLC basic terminal blocks with screw connection method and integrated RCZ filter against interference voltages and currents on the control side, input voltage 230 V AC/DC(without relay or optocoupler)
2980364	PLC-BSP-120UC/ 1/SEN/SO46	6.2 mm PLC sensor basic terminal blocks with spring-cage connection method and integrated RCZ filter against interference voltages and currents on the control side, input voltage 120 V AC/DC(without relay or optocoupler)
2980351	PLC-BSP-120UC/21/SO46	6.2 mm PLC basic terminal blocks with spring-cage connection method and integrated RCZ filter against interference voltages and currents on the control side, input voltage 120 V AC/DC(without relay or optocoupler)
2980380	PLC-BSP-230UC/ 1/SEN/SO46	6.2 mm PLC sensor basic terminal blocks with spring-cage connection method and integrated RCZ filter against interference voltages and currents on the control side, input voltage 230 V AC/DC(without relay or optocoupler)
2980377	PLC-BSP-230UC/21/SO46	6.2 mm PLC basic terminal blocks with spring-cage connection method and integrated RCZ filter against interference voltages and currents on the control side, input voltage 230 V AC/DC(without relay or optocoupler)

REL-MR- 60DC/21 Order No.: 2961118

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961118>**General**

2980018	PLC-BSC-125DC/21	6.2 mm PLC basic terminal blocks with screw connection technology, input voltage 125 V DC(without relay or optocoupler)
2967332	PLC-BSP- 60DC/21	6.2 mm PLC basic terminal blocks with spring-cage connection method, input voltage 60 V DC(without relay or optocoupler)
2967154	PLC-BSP-120UC/ 1/SEN	6.2 mm PLC sensor basic terminal blocks with spring-cage connection method, input voltage 120 V AC/DC(without relay or optocoupler)
2967167	PLC-BSP-120UC/21	6.2 mm PLC basic terminal blocks with spring-cage connection method, input voltage 120 V AC/DC(without relay or optocoupler)
2967170	PLC-BSP-230UC/ 1/SEN	6.2 mm PLC sensor basic terminal blocks with spring-cage connection method, input voltage 230 V AC/DC(without relay or optocoupler)
2967183	PLC-BSP-230UC/21	6.2 mm PLC basic terminal blocks with spring-cage connection method, input voltage 230 V AC/DC(without relay or optocoupler)

**Relay base**

2900279	PLC-BPT- 60DC/21	6.2 mm PLC basic terminal blocks in Push-In connection method, input voltage of 60 V DC (without relay or optocoupler)
2900451	PLC-BPT-120UC/ 1/SEN	6.2 mm PLC sensor basic terminal blocks with Push-In connection method, input voltage of 120 V AC (without relay or optocoupler)
2900456	PLC-BPT-120UC/ 1/SEN/SO46	6.2 mm PLC sensor basic terminal blocks with Push-In connection and integrated RCZ filter against interference currents/voltages on the control side, input voltage 120 V AC/DC(without relay or optocoupler)
2900280	PLC-BPT-120UC/21	6.2 mm PLC basic terminal blocks with Push-In connection method, input voltage of 120 V AC (without relay or optocoupler)
2900453	PLC-BPT-120UC/21/SO46	6.2 mm PLC basic terminal blocks with Push-In connection and integrated RCZ filter against interference currents/voltages on the control side, input voltage 120 V AC/DC (without relay or optocoupler)
2900452	PLC-BPT-230UC/ 1/SEN	6.2 mm PLC sensor basic terminal blocks with Push-In connection method, input voltage of 230 V AC (without relay or optocoupler)
2900457	PLC-BPT-230UC/ 1/SEN/SO46	6.2 mm PLC sensor basic terminal blocks with Push-In connection and integrated RCZ filter against interference currents/voltages on the control side, input voltage 230 V AC/DC(without relay or optocoupler)
2900281	PLC-BPT-230UC/21	6.2 mm PLC basic terminal blocks with Push-In connection method, input voltage of 230 V AC (without relay or optocoupler)
2900455	PLC-BPT-230UC/21/SO46	6.2 mm PLC basic terminal blocks with Push-In connection and integrated RCZ filter against interference currents/voltages on the control side, input voltage 230 V AC/DC(without relay or optocoupler)
2966100	PLC-BSC- 60DC/21	6.2 mm PLC basic terminal blocks with screw connection method, input voltage 60 V DC(without relay or optocoupler)

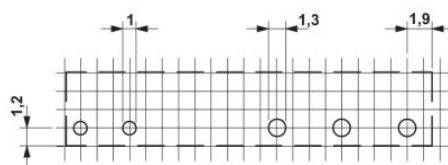
REL-MR- 60DC/21 Order No.: 2961118

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961118>

2966074	PLC-BSC-120UC/ 1/SEN	6.2 mm PLC sensor basic terminal blocks with screw connection method, input voltage 120 V AC/DC(without relay or optocoupler)
2966032	PLC-BSC-120UC/21	6.2 mm PLC basic terminal blocks with screw connection method, input voltage 120 V AC/DC(without relay or optocoupler)
2966087	PLC-BSC-230UC/ 1/SEN	6.2 mm PLC sensor basic terminal blocks with screw connection method, input voltage 230 V AC/DC(without relay or optocoupler)
2966045	PLC-BSC-230UC/21	6.2 mm PLC basic terminal blocks with screw connection method, input voltage 230 V AC/DC(without relay or optocoupler)

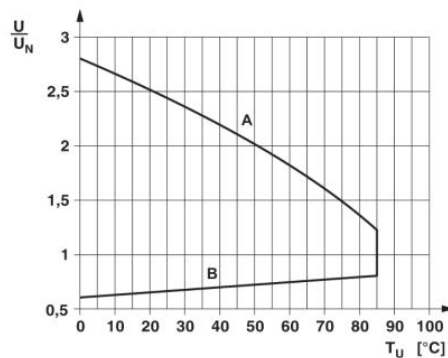
### Diagrams/Drawings

Drilling plan/solder pad geometry

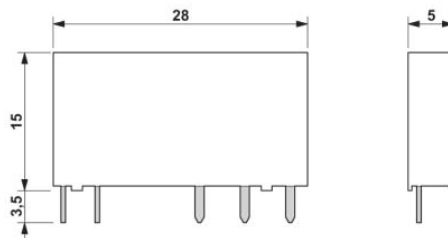


a = pitch division 1.25 mm and 1.27 mm

Diagram



Dimensioned drawing



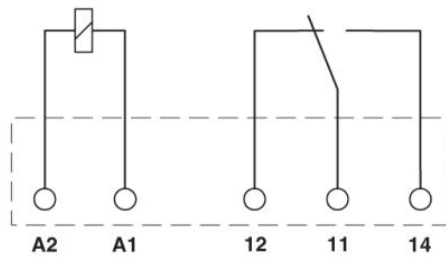
REL-MR- 60DC/21 Order No.: 2961118

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#### Circuit diagram

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REL-MR- 60DC/21 Order No.: 2961118

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2961118>

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## PLC-RSC- 24DC/21

Order No.: 2966171

The illustration shows the version PLC-RSC-24DC/21



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2966171>

PLC relay, consisting of base terminal block PLC-BSC.../21 with screw connection and pluggable miniature relay with power contact, for assembly on DIN rail NS 35/7.5, 1 PDT, input voltage 24 V DC



### Commercial data

GTIN (EAN)	
sales group	G220
Pack	10 pcs.
Customs tariff	85364190
Catalog page information	Page 82 (IF-2011)

### Product notes

WEEE/RoHS-compliant since:  
11/15/2005



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Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

### Technical data

#### Coil side

Nominal input voltage $U_N$	24 V DC
Nominal input current at $U_{IN}$	9 mA
Typical response time	5 ms

PLC-RSC- 24DC/21 Order No.: 2966171

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2966171>

Typical release time	8 ms
Operating voltage display	Yes
Protective circuit	Protection against polarity reversal Polarity protection diode
	Free-wheeling diode Damping diode

**Contact side**

Contact type	Single contact, 1-PDT
Contact material	AgSnO
Maximum switching voltage	250 V AC/DC (The separating plate PLC-ATP should be installed for voltages larger than 250 V (L1, L2, L3) between identical terminal blocks in adjacent modules. Potential bridging is then carried out with FBST 8-PLC... or ...FBST 500...)
Minimum switching voltage	5 V (at 100 mA)
Maximum inrush current	(on request)
Min. switching current	10 mA (at 12 V)
Limiting continuous current	6 A
Interrupting rating (ohmic load) max.	140 W (at 24 V DC)
	20 W (for 48 V DC)
	18 W (for 60 V DC)
	23 W (for 110 V DC)
	40 W (for 220 V DC)
	1500 VA (for 250 V AC)

**General data**

Width	6.2 mm
Height	80 mm
Depth	94 mm
Test voltage relay winding/relay contact	4 kV AC (50 Hz, 1 min.)
Ambient temperature (operation)	-40 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Operating mode	100% operating factor
Mechanical service life	2 x 10 <sup>7</sup> cycles
Inflammability class according to UL 94	V0
Name	Standards/regulations
Standards/regulations	IEC 60664
	EN 50178
	IEC 62103

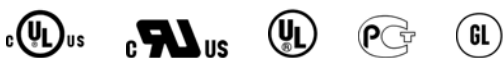
PLC-RSC- 24DC/21 Order No.: 2966171

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2966171>

Pollution degree	3
Surge voltage category	III
Mounting position	Any
Assembly instructions	In rows with zero spacing

**Connection data**

Connection method	Screw connection
Conductor cross section solid min.	0.14 mm <sup>2</sup>
Conductor cross section solid max.	2.5 mm <sup>2</sup>
Conductor cross section stranded min.	0.14 mm <sup>2</sup>
Conductor cross section stranded max.	2.5 mm <sup>2</sup>
Conductor cross section AWG/kcmil min.	26
Conductor cross section AWG/kcmil max	14
Stripping length	8 mm
Screw thread	M3

**Certificates / Approvals**

Certification

CUL, CUL Listed, GL, GOST, UL, UL Listed

**Accessories**

Item	Designation	Description
<b>Assembly</b>		
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801733	NS 35/ 7,5 PERF 2000MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 2000 mm
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801377	NS 35/ 7,5 V2A UNPERF 2000MM	DIN rail, Width: 35 mm, Height: 7.5 mm, Length: 2000 mm, Color: silver
1201756	NS 35/15 AL UNPERF 2000MM	DIN rail, deep drawn, high profile, unperforated, 1.5 mm thick, material: aluminum, height 15 mm, width 35 mm, length 2000 mm

PLC-RSC- 24DC/21 Order No.: 2966171

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2966171>

1201895	NS 35/15 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1201730	NS 35/15 PERF 2000MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 15 mm, width 35 mm, length: 2000 mm
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNPERF 2000MM	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m
2966841	PLC-ATP BK	Separating plate, 2 mm thick, required at the start and end of a PLC terminal strip. Furthermore, it is used for: visual separation of groups, safe isolation of different voltages of neighboring PLC relays in acc. with DIN VDE 0106-101, isolation

**Bridges**

2966812	FBST 6-PLC BU	Single plug-in bridge, Length: 6 mm, Number of positions: 2, Color: blue
2966825	FBST 6-PLC GY	Single plug-in bridge, Length: 6 mm, Number of positions: 2, Color: gray
2966236	FBST 6-PLC RD	Single plug-in bridge, Length: 6 mm, Number of positions: 2, Color: red
2967688	FBST 8-PLC GY	Single plug-in bridge, Length: 8 mm, Number of positions: 2, Color: gray
2966692	FBST 500-PLC BU	Continuous plug-in bridge, Length: 500 mm, Color: blue
2966838	FBST 500-PLC GY	Continuous plug-in bridge, Length: 500 mm, Color: gray
2966786	FBST 500-PLC RD	Continuous plug-in bridge, Length: 500 mm, Color: red

**General**

2966508	PLC-ESK GY	Power terminal block, for the input of up to four potentials, for mounting on NS 35/7.5
2296061	PLC-V8/D15B/OUT	V8-OUTPUT adapter for eight 6.2 mm PLC interfaces (1 PDT, etc./see "Additional Products"). 15-pin D-SUB female connector, control logic: Positive switching
2296058	PLC-V8/D15S/OUT	V8-OUTPUT adapter for eight 6.2 mm PLC interfaces (1 PDT, etc./see "Additional Products"). 15-pin D-SUB male connector, control logic: Positive switching
2295554	PLC-V8/FLK14/OUT	V8-OUTPUT adapter for eight 6.2 mm PLC interfaces (1 PDT, etc./see "Supplementary Products"). 14-pos. flat-ribbon cable connection for the PLC system cabling, control logic: Plus switching
2304102	PLC-V8/FLK14/OUT/M	V8-OUTPUT adapter for eight 6.2 mm PLC interfaces (1 PDT, etc./see "Supplementary Products"). 14-pos. flat-ribbon cable connection for the PLC system cabling, control logic: Minus switching

PLC-RSC- 24DC/21 Order No.: 2966171

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2966171>**Marking**

1051016	ZB 6,LGS:FORTL.ZAHLEN	Zack marker strip, Strip, white, Labeled, Printed horizontally: Consecutive numbers 1 - 10, 11 - 20, etc. up to 491 - 500, Mounting type: Snap into tall marker groove, For terminal block width: 6.2 mm, Lettering field: 6.15 x 10.5 mm
5060935	ZB 6/WH-100:UNBEDRUCKT	Zack marker strip, Strip, white, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into tall marker groove, For terminal block width: 6.2 mm, Lettering field: 6.15 x 10.5 mm
1051003	ZB 6:UNBEDRUCKT	Zack marker strip, Strip, white, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into tall marker groove, For terminal block width: 6.2 mm, Lettering field: 6.15 x 10.5 mm

**Relay**

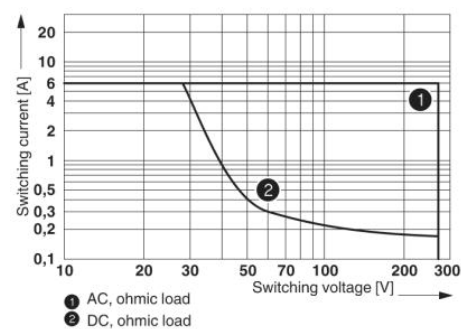
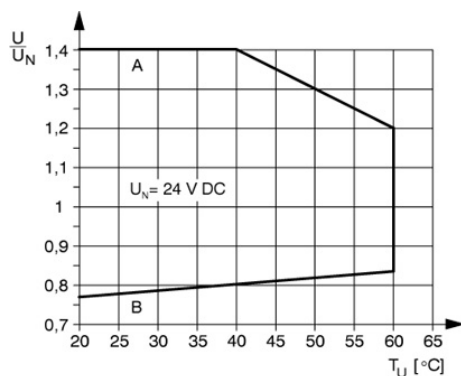
2961105	REL-MR- 24DC/21	Pluggable miniature relays, with power contact, 1 PDT, input voltage 24 V DC
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**Relay base**

2966016	PLC-BSC- 24DC/21	6.2 mm PLC basic terminal blocks with screw connection method, input voltage 24 V DC(without relay or optocoupler)
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**Tools**

1204517	SZF 1-0,6X3,5	Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip
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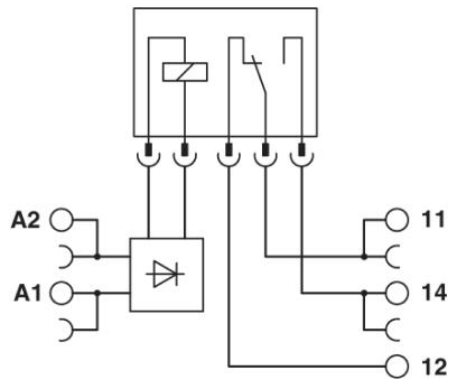
**Diagrams/Drawings****Diagram**

Interrupting rating

PLC-RSC- 24DC/21 Order No.: 2966171

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2966171>

# Circuit diagram



PLC-RSC- 24DC/21 Order No.: 2966171

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2966171>

---

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## PLC-BSC-230UC/21/SO46

Order No.: 2980335

The figure shows 120 UC version



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2980335>

6.2 mm PLC basic terminal blocks with screw connection method and integrated RCZ filter against interference voltages and currents on the control side, input voltage 230 V AC/DC (without relay or optocoupler)



### Commercial data

GTIN (EAN)	
sales group	G200
Pack	10 pcs.
Customs tariff	85364900
Catalog page information	Page 94 (IF-2011)

### Product notes

WEEE/RoHS-compliant since:  
02/09/2006



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### Technical data

#### Input data

Nominal input voltage $U_N$	230 V AC
Status display	LED
Protective circuit	Bridge rectifier Bridge rectifier
	RCZ filter RCZ filter

PLC-BSC-230UC/21/SO46 Order No.: 2980335  
<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2980335>

**Output data**

Compatible components	Miniature relay, REL-MR-60DC/21AU, REL-MR-60DC/21; miniature optocoupler, OPT-60DC/48DC/100, OPT-60DC/24DC/2, OPT-60DC/230AC/1
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**Connection data**

Conductor cross section solid min.	0.14 mm <sup>2</sup>
Conductor cross section solid max.	2.5 mm <sup>2</sup>
Conductor cross section stranded min.	0.14 mm <sup>2</sup>
Conductor cross section stranded max.	2.5 mm <sup>2</sup>
Conductor cross section AWG/kcmil min.	26
Conductor cross section AWG/kcmil max	14
Connection method	Screw connection
Stripping length	8 mm
Screw thread	M3

**General data**

Width	6.2 mm
Height	80 mm
Depth	94 mm
Color	green
Ambient temperature (operation)	-25 °C ... 55 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Operating mode	100% operating factor
Inflammability class according to UL 94	V0
Mounting position	Any
Assembly instructions	In rows with zero spacing

**Certificates / Approvals**

Certification

CUL, GL, UL

PLC-BSC-230UC/21/SO46 Order No.: 2980335  
<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2980335>

## Accessories

Item	Designation	Description
<b>Assembly</b>		
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801733	NS 35/ 7,5 PERF 2000MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 2000 mm
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801377	NS 35/ 7,5 V2A UNPERF 2000MM	DIN rail, Width: 35 mm, Height: 7.5 mm, Length: 2000 mm, Color: silver
1201756	NS 35/15 AL UNPERF 2000MM	DIN rail, deep drawn, high profile, unperforated, 1.5 mm thick, material: aluminum, height 15 mm, width 35 mm, length 2000 mm
1201895	NS 35/15 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1201730	NS 35/15 PERF 2000MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 15 mm, width 35 mm, length: 2000 mm
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNPERF 2000MM	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m
2966841	PLC-ATP BK	Separating plate, 2 mm thick, required at the start and end of a PLC terminal strip. Furthermore, it is used for: visual separation of groups, safe isolation of different voltages of neighboring PLC relays in acc. with DIN VDE 0106-101, isolation
<b>Bridges</b>		
2966812	FBST 6-PLC BU	Single plug-in bridge, Length: 6 mm, Number of positions: 2, Color: blue
2966825	FBST 6-PLC GY	Single plug-in bridge, Length: 6 mm, Number of positions: 2, Color: gray
2966236	FBST 6-PLC RD	Single plug-in bridge, Length: 6 mm, Number of positions: 2, Color: red
2967688	FBST 8-PLC GY	Single plug-in bridge, Length: 8 mm, Number of positions: 2, Color: gray
2966692	FBST 500-PLC BU	Continuous plug-in bridge, Length: 500 mm, Color: blue
2966838	FBST 500-PLC GY	Continuous plug-in bridge, Length: 500 mm, Color: gray
2966786	FBST 500-PLC RD	Continuous plug-in bridge, Length: 500 mm, Color: red
<b>General</b>		
2966508	PLC-ESK GY	Power terminal block, for the input of up to four potentials, for mounting on NS 35/7.5

PLC-BSC-230UC/21/SO46 Order No.: 2980335

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2980335>

2296087	PLC-V8/D15B/IN	V8-INPUT adapter for eight 6.2 mm PLC interfaces (1 PDT, etc./ see "Additional Products"). 15-pin D-SUB female connector, control logic: Positive switching
2296074	PLC-V8/D15S/IN	V8-INPUT adapter for eight 6.2 mm PLC interfaces (1 PDT, etc./ see "Additional Products"). 15-pin D-SUB male connector, control logic: Positive switching
2296553	PLC-V8/FLK14/IN	V8L-INPUT adapter for eight 6.2 mm PLC interfaces (1 PDT, etc./see "Supplementary Products"). 14-pos. flat-ribbon cable connection for the PLC system cabling, control logic: Plus switching
2304115	PLC-V8/FLK14/IN/M	V8L-INPUT adapter for eight 6.2 mm PLC interfaces (1 PDT, etc./see "Supplementary Products"). 14-pos. flat-ribbon cable connection for the PLC system cabling, control logic: Minus switching

**Marking**

1053001	ZB 10:UNBEDRUCKT	Zack marker strip, Strip, white, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into tall marker groove, For terminal block width: 10.2 mm, Lettering field: 10.5 x 10.15 mm
1053014	ZB10,LGS:FORTL.ZAHLEN	Zack marker strip, Strip, white, Labeled, Printed horizontally: Consecutive numbers 1 - 10, 11 - 20, etc. up to 991 - 1000, Mounting type: Snap into tall marker groove, For terminal block width: 10.2 mm
5060883	ZB10/WH-100:UNBEDRUCKT	Zack marker strip, Strip, white, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into tall marker groove, For terminal block width: 10.2 mm

**Tools**

1204517	SZF 1-0,6X3,5	Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip
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**Additional products**

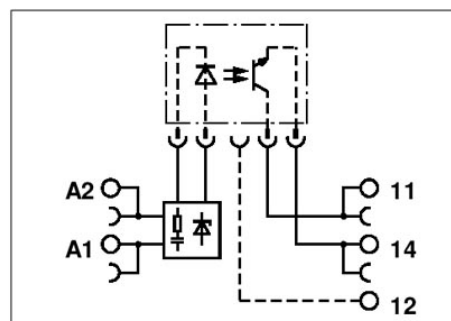
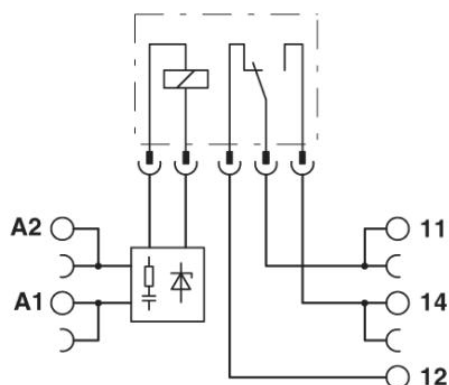
Item	Designation	Description
<b>General</b>		
2966605	OPT-60DC/ 24DC/ 2	Plug-in miniature solid-state relay, power solid-state relay, input: 60 V DC, output: 3 - 33 V DC/3 A
2966621	OPT-60DC/ 48DC/100	Plug-in miniature solid-state relay, input solid-state relay, input: 60 V DC, output: 3 - 48 V DC/100 mA
2967963	OPT-60DC/230AC/ 1	Plug-in miniature solid-state relay, power solid-state relay, input: 60 V DC, output: 24 - 253 V AC/0.75 A
<b>Relay</b>		
2961118	REL-MR- 60DC/21	Pluggable miniature relays, with power contact, 1 PDT, input voltage 60 V DC

PLC-BSC-230UC/21/SO46 Order No.: 2980335  
<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2980335>

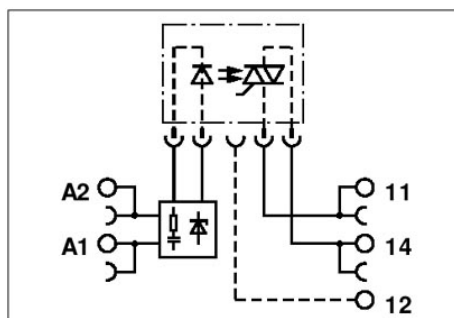
2961134	REL-MR- 60DC/21AU	Pluggable miniature relays, with multi-layer contact, 1 PDT, input voltage 60 V DC
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### Diagrams/Drawings

#### Circuit diagram



DC output



AC output

PLC-BSC-230UC/21/SO46 Order No.: 2980335  
<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2980335>

---

**Address**

PHOENIX CONTACT GmbH & Co. KG  
Flachsmarktstr. 8  
32825 Blomberg, Germany  
Phone +49 5235 3 00  
Fax +49 5235 3 41200  
<http://www.phoenixcontact.com>



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## SECTION 5 ELECTRICAL ACCESSORIES

### 5.1 GENERAL DESCRIPTION

There were many different items used though out this project, all fixings were 316 s/s as per specification, most items were purchased through local suppliers. The sundry items such as glands, shrouds etc were procured from the local electrical wholesaler.

#### The Electrical Accessories Were Supplied By:

<b>Name:</b>	Ideal Electrical
<b>Address:</b>	1133 Kingsford Smith Drive Eagle Farm, 4006
<b>Phone:</b>	07 38689000
<b>Facsimile:</b>	07 38689030

### 5.2 Cable Tray

All Cable Tray and fixings were NEMA 3 Aluminium.

#### The Cable Tray Was Supplied By:

<b>Name:</b>	Burndy
<b>Address:</b>	Sunnybank Hills
<b>Phone:</b>	1300287639
<b>Facsimile:</b>	1300329669

### 5.3 ACCESSORIES MANUFACTURER'S PARTS LIST

Description	Manufacturer	Catalogue No.	Material
Glands	Alco	SSG20-16	316 SS
Glands	Nicote	ALBRGM32-SS	316 SS

### 5.4 ACCESSORIES BROCHURES

Please see enclosed brochures for illustrations and descriptions on the various glands, ties etc utilised. All electric motors supplied with this project are included within this brochure list.



Search by:

Part No



## Cable Glands

Alco Cable Glands » ALCBRGM- Stainless Steel Shutter Type Glands for Unarmoured Cable

[Home](#)[About Us](#)[Products](#)[Alco Cable Glands](#)[Tools & Instruments](#)[Flex Metal Conduit &](#)[Fittings](#)[Flex PVC Conduit & Fittings](#)[PVC Fittings](#)[Terminals, Lugs & Links](#)[Alco Heatshrink](#)[Cast Resin](#)[Cable Pulling Lubricants](#)[Watts New](#)[Watts Special](#)[Downloads](#)[Agents](#)[Distributors](#)[Tutorials](#)[Contact Us](#)

### METAL CABLE GLANDS (IP68) SHUTTER TYPE STAINLESS STEEL CABLE GLANDS FOR UNARMoured CABLE



#### APPLICATIONS

For indoor or outdoor use

#### FUNCTION

Provides water tight seal on cable sheath and provides strain relief.

#### APPROVALS

IP68

#### MATERIAL

Stainless Steel

#### CLAMPING RING

Clamping: Polyamide 6

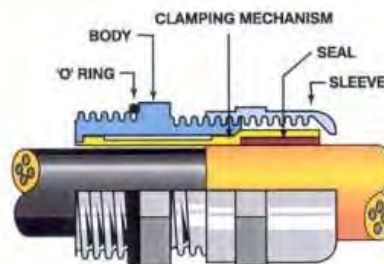
Sealing: Neoprene

#### O RING

NBR

#### TEMPERATURE RANGE

-40°C to +100°C

[Click part no for more info](#)

Part No	Mounting Thread dia x length (mm)	OD Cable Range (mm)		Diameter Across Flats (mm)	Suitable Shroud Orange*	Box Qty
		min	max			
ALCBRGM16-SS	M16x12	4.0	8.0	19	ALCSG0S	15
ALCBRGM20-SS	M20x12	8.0	14.0	22	ALCSG1S	10
ALCBRGM25-SS	M25x12	11.0	17.0	27	ALCSG2S	10
ALCBRGM32-SS	M32x15	13.0	18.0	36	ALCSG3S	5
ALCBRGM40-SS	M40x15	18.0	25.0	46	ALCSG3L	4
ALCBRGM50-SS	M50x15	22.0	32.0	55	ALCSG5S	2
ALCBRGM63-SS	M63x18	34.0	44.0	70	ALCSG6S	1

\*For black shrouds add B to part no eg ALCSG3SB

Note: Mounting thread pitch is 1.5mm, unless otherwise specified

Supplied complete with lock nut. NPT and PG fittings available upon request, however lead times apply.

Copyright ©2012 Wattmaster

**Ty-Rap®****316 Stainless Steel - Ball Lock Ties**

Cat. No.	Width (mm)	Length (mm)	Pack Size
LSY-4.6-100B	4.6	100	100
LSY-4.6-150B	4.6	150	100
LSY-4.6-200B	4.6	201	100
LSY-4.6-360B	4.6	360	100
LSY-4.6-520B	4.6	520	100
LSY-4.6-680B	4.6	679	100
LSY-4.6-840B	4.6	838	100
LSY-4.6-1000B	4.6	1000	100
LSY-7.9-100B	7.9	100	100
LSY-7.9-150B	7.9	150	100
LSY-7.9-200B	7.9	201	100
LSY-7.9-360B	7.9	360	100
LSY-7.9-520B	7.9	520	100
LSY-7.9-680B	7.9	679	100
LSY-7.9-840B	7.9	838	100
LSY-7.9-1010B	7.9	1010	100
LSY-7.9-1200B	7.9	1200	100
LSY-7.9-1300B	7.9	1300	100
LSY-7.9-1400B	7.9	1400	100

Nylon coated ties are also available: Add suffix C to part number eg LSY-7.9-200BC

**Wide range of sizes**

Eleven standard lengths up to 1400mm long will cover most applications but custom lengths are also available. Two widths are offered with minimum loop tensile strengths of 45kg and 113 kg. Space requirements are minimised by the low head profile.

**Fast, easy installation**

Thomas & Betts stainless steel ties are self-locking, requiring no time consuming crimping or folding operations. The strong locking mechanism, incorporating a steel ball, has a low insertion force while the strap section has rounded edges and smooth surfaces making the ties ideal for fast, safe, hand installation.

**Thomas & Betts****Continuous Length and Heads  
316 Stainless Steel**

Cat No.	Width (mm)	Continuous Lengths
LSY-4.6-50XB	4.6	50mt
LSY-4.6-100XB	4.6	100mt
LSY-4.6-HEADB	4.6	Box of 100
LSY-7.9-50XB	7.9	50mt
LSY-7.9-100XB	7.9	100mt
LSY-7.9-HEADB	7.9	Box of 100

Convenient continuous lengths of band with loose heads. This enables ties of any length to be made on the job, eliminating costly down time and scrap.

**Installation Tool & Sleeving**

Cat No.	Description
TC1	LSY series pull up tool for use with 4.6mm and 7.9mm width ties. Manual tension and cut off.
LSY-Sleeve	PVC Sleeving for Stainless Steel ties. 30mt roll.



# Cable Ties - Nylon Polyamide 66

## HALOGEN FREE

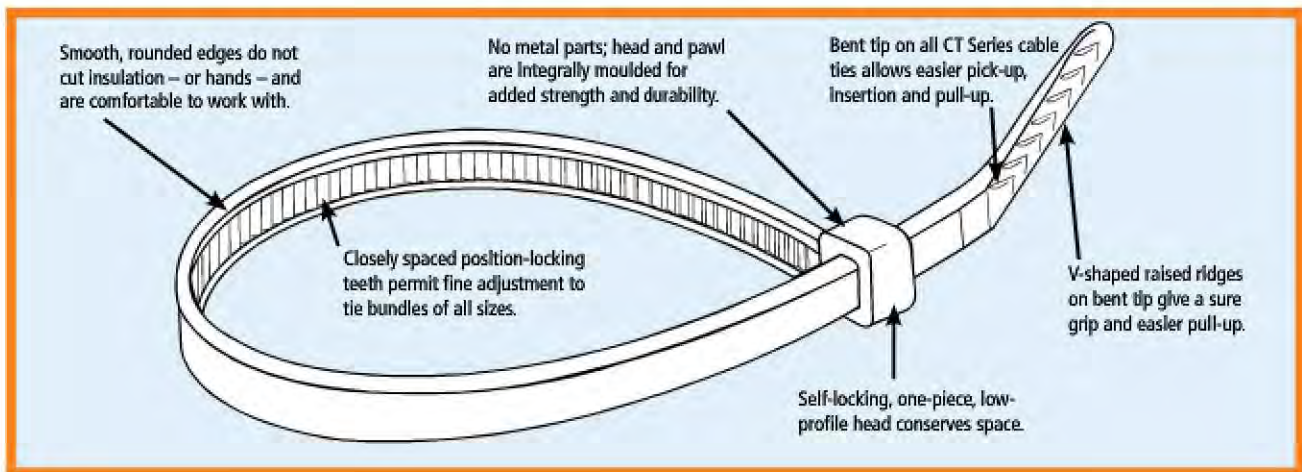
Our ties meet most basic cable tie needs, with choices covering a wide range of requirements for size and strength. One-piece, injection-moulded construction provides maximum strength and adjustability for securing all sizes of bundles. Extra features such as rounded edges and bent-tip design make installation easy, fast, accurate and secure. Installation tools are not required but are suggested where controlled, uniform tension and cut-off applications are desired.

Split mandrel, loop tensile strength tests show that the most vulnerable stress point for a nylon cable tie is its pawl. There is a trade-off between insertion/pull-up ease and strength of a cable tie. The stronger the pawl, the more

force is required to insert and pull up the strap as it engages the pawl teeth. Cable ties are designed to optimise insertion ease and still meet or exceed all applicable strength requirements. This magnified cross-section illustrates our full four-tooth locking engagement between strap and pawl under load. This intimate contact between pawl and strap teeth, ensures that the strength of the pawl is fully utilised.

Installations under conditions of full tropical sun and/or very low relative humidity, must be referred to CABAC design engineers for evaluation and recommendations.

Exterior applications should use black (U.V. stabilised) ties.



### Technical Data

#### Conformant Standards

UL; Mil Spec; IEC; VDE; DIN

#### Refer

MS 3367 MS 3368-physical dimensions  
Mil-S-23190E - testing  
Mil-Std-105D - sampling  
Mil-C-45662 - test equipment calibration  
Mil-1-45208A - QC manual and systems

#### Smoke Emission

Low smoke / Halogen free

#### Material

NATURAL - Nylon 66 with additives  
BLACK - Nylon 66 with UV stabilisers

#### Material Tensile Strength

80 N/mm<sup>2</sup> or 11200 psi

### Electrical data

Breakdown voltage 20 kV/mm  
Volume resistivity  $2 \times 10^{10}$  ohm cm  
Moisture content 2.5% w.v. @ 23%/50%RH

### Operating Temperature

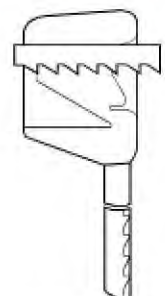
-40°C to 85°C

### Flammability

Passed - U.L. 94V-2

### UV Stability

Exceeds ASTM-D-4066 with 2.5% carbon black giving nominal 15 years normal exposure to UV with less than 10% yield in tensile strength.



(Multi Toothed Pawl)

# Cable Ties - Nylon - Halogen Free

Catalogue No. Black (UV Rated)	Catalogue No. Natural	Loop Tensile Strength (kg)	Bundle Diameter (mm)	Length (mm)	Width (mm)	Thickness (mm)	Packs Available
--------------------------------------	--------------------------	----------------------------	----------------------	-------------	------------	----------------	-----------------

## Light Duty Ties

CT196BK-LD	CT196NT-LD	8	53	200	2.5	1.1	100
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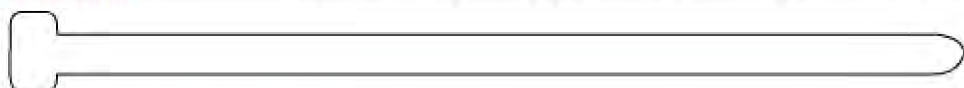
## Standard Duty Ties

CT98BK	CT98NT	8	22	100	2.5	1.1	100/1000
CT140BK	CT140NT	18	33	140	3.6	1.2	100/1000
CT200BK	CT200NT	22	50	200	4.8	1.3	100/1000
CT250BK	CT250NT	22	60	250	4.8	1.4	100/1000
CT290BK	CT290NT	22	76	300	4.8	1.4	100/1000
CT360BK	CT360NT	22	102	370	4.8	1.4	100
CT430BK		22	110	430	4.8	1.4	100



## Heavy Duty Ties

CT203BK-HD	CT203NT-HD	54	50	200	7.6	2.1	100
CT365BK-HD	CT365NT-HD	54	102	370	7.6	2.1	100
CT540BK-HD		54	140	533	7.6	2.1	25
CT710BK-HD	CT710NT-HD	79	190	710	9.0	2.1	25
	CT838NT-HD	79	239	812	9.0	2.1	25
CT1220BK-HD		79	365	1220	9.0	2.1	25
CT1530BK-HD		79	460	1530	9.0	2.1	25



## Ultra Heavy Duty Ties

CT500BK-UHD		114	120	480	12.6	2.1	25/100
CT600BK-UHD		114	152	580	12.6	2.1	25



# CMG

m o t o r s

**3rd Edition**  
Includes extended range to 1120kW  
& hazardous location motors



**PPA & PPC series motors**

High specification cast iron units



Shaft locking clamp to prevent transport damage



Class H windings with Class B temperature rise



Low noise fan and Vibration sensor



THE PPA MOTOR



Thru-Flushing grease relief valve Inc. "V"-ring seal



Rugged one piece rotor construction



The PPA series motor, now extended to 1120kW, is part of Australia's largest range of electric motors and transmission equipment. CMG's world best practices and technologies, plus our national computerised sales, spare parts and service back-up means we can offer a total commitment to every customer. You can be sure every product supplied by CMG's Motors, Transmission or Drives Divisions will perform exactly to specification, and deliver reliable performance year after year with a minimum of maintenance and downtime. CMG's Technology division is a recognised R & D leader with professional engineering staff and NATA accredited laboratory provides design, testing, product development and quality control services. When you think Motors, Transmission, Drives or research and development Technology.....think CMG.



# PPA & PPC High Efficiency cast iron motors

## H Class - IP66 - Sizes 80 to 500

---

CMG's premium high efficiency motor range extends to 1120kW and features all of your engineer's specifications as standard.

- ❑ **Standard power supply 415 volt, 3 phase, 50hz**  
100 to 1100 volts, 40 to 60Hz optional (motors 710kW and above are 690 volt minimum).
- ❑ **AS/NZS1359 frame sizes (IEC frame sizes complying with IEC 60072)**  
Full interchangeability with motors in the field.  
Both Australian/British and CENELEC frame allocations.
- ❑ **Full cast iron construction**  
For durability and reliability in operation.
- ❑ **TEFC – IP66 enclosure**  
Maximum Protection against dust and water.
- ❑ **H Class insulation**  
With a temperature rise limited to 80°C (B class).
- ❑ **Winding design life of 20 years**  
H class insulation, Low temperature rise and High efficiency = 20 years design life.
- ❑ **Meets high efficiency standards**  
AS/NZS1359.5-2000 specifies High Efficiency levels (complies with European Eff 1).
- ❑ **Low noise fan and conical fan cover**  
PPA complies with most low noise specifications with standard fan.
- ❑ **Low mechanical vibration**  
All rotors are balanced to G1 tolerances.
- ❑ **Cast iron fan and steel fan cover (cast iron fan covers optional)**  
Meets requirements for use in arduous environments and mining specifications.
- ❑ **Thru-flushing pressure grease relief valve**  
Incorporating a V-ring seal enables regreasing without stopping the motor.
- ❑ **Oversized terminal box with removable gland plate**  
To suit oversized and/or aluminium cables with Bi-metal lugs.
- ❑ **Thermistors supplied throughout the entire range**  
Auxiliary terminal boxes for thermistors fitted 160 frame and above.
- ❑ **Anti-condensation heaters, with auxiliary terminal box**  
Fitted to frames 250 and above.
- ❑ **SPM Vibration sensors**  
For use with the SPM Vibration Monitor. Fitted to frame sizes 250 and above.
- ❑ **Central Terminal Box**  
Designed for easy reversal of the terminal box handing from right to left-hand side.
- ❑ **Additional external earth screw**  
Located on the motor foot. Frames 250 and above.
- ❑ **2 - Pack Epoxy paint to customers preferred colour**  
In addition to the epoxy Primer. Top coat is RAL8015-Brown unless otherwise specified.
- ❑ **Stainless Steel Rating Labels**  
To ensure maximum life and readability of nameplate.

Motors certified for use in hazardous locations also available  
(Class 1 Zone 1 Ex e, Class 1 Zone 2 Ex n & DIP).

Our 3-year warranty provides ultimate peace of mind.

# Introduction

This catalogue details CMG's premium range of PPA & PPC series motors. PPA & PPC motors are three phase squirrel cage TEFC (IC411) with frame sizes 80 to 500, designed and manufactured in accordance with AS/NZS1359 (IEC 60034 & 60072). Unless specified "PPA" refers to both PPA and PPC ranges, the difference being the kW/frame allocation.

The catalogue provides all data for frames 80-400 as those motors are normally available ex stock. For data relating to 450 & 500 frames refer CMG

## High Specification Design

In Australia and New Zealand electric motors are installed in a wide range of conditions from the frozen Antarctic to tropical Darwin and dusty deserts. The PPA range is designed to suit these harsh conditions, to provide a combination of high operational reliability and low operating costs in a rugged cast iron enclosure.

## 20 Year design life

All motors in the PPA range are manufactured with Class H insulation. They are designed to operate with a temperature rise of 80°C or less (Class B), providing a thermal reserve in excess of 45°C when operating in a 40°C ambient. This ample thermal reserve has enabled CMG to provide a motor with a winding design life of **20 years**.

## Ultimate protection

The entire PPA range has an enclosure protection rating of IP66. The windings are tropic protected and oil resistant with the motors being weather protected as standard.

## Exceeds High Efficiency standard

The PPA range of motors are designed for high efficiency operation in accordance with AS/NZS1359.5:2000 for High Efficiency motors. (Equivalent to European Eff1)

High efficiency not only means lower running costs but also means a reduction in the volume of greenhouse gas discharged into our atmosphere when electricity is produced, assisting the international drive for a reduction of this gas. (1000kW = 1000kg CO<sub>2e</sub>)

It is estimated that electric motors account for nearly 30% of all electricity used in Australia/New Zealand, and this percentage is projected to increase. High efficiency means reduced power consumption, and in a large plant this gives a significant cost saving difference.

Aside from the environmental issues, using a high efficiency motor makes sound economic sense. The power cost savings made can pay for the capital cost difference between a high efficiency and a standard efficiency motors in under 1 year. From then the savings continue to accumulate.

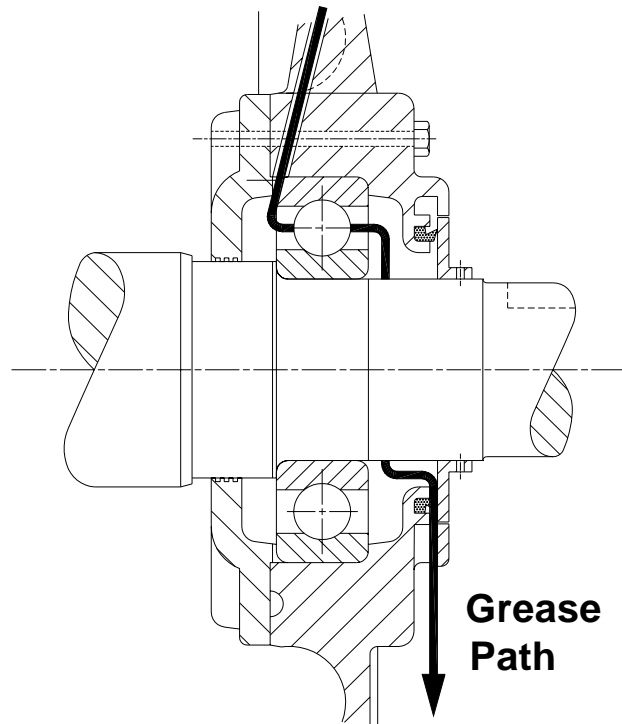
## A complete selection

PPA series motors can be supplied for use on 100 to 1100 Volt systems and designed to operate on the common world

frequencies of 40Hz, 50Hz or 60Hz. Variations on these standards for the customer's needs are readily available. The most common power supplies being 380V, 400V, 415V, 440V, 525V, 690V, 1000V and 1100V.

## Thru-flushing grease relief valve

The pressure grease relief valve, incorporating a V-ring seal, eliminates downtime by enabling relubrication of the bearings without stopping the motor.



## Standards and specifications

The main dimensions and rated outputs of **PPA** motors generally conform to AS/NZS1359 (Australian/British kW-frame size allocation table).

The **PPC** range has a similar specification to that of the PPA range with the kW/frame allocation being taken from the CENELEC table. (The term "PPC" is used only where the frame allocation is different from the PPA.)

CMG's technology division is able to conduct full load testing on all motors within the PPA & PPC ranges in our NATA accredited laboratory. Speed-torque / current / efficiency curves are also available upon request.

## Hazardous location certification

The PPA and PPC ranges are now certified in Australia for use in hazardous locations from frames 80 to 400 (.55kW to 630kW).

Location	Amb	Certificate
Class 1 Zone 1 Ex e IIC T <sub>3</sub>	50°C	AUS Ex 3852X
Class 1 Zone 2 Ex n IIC T <sub>3</sub>	60°C	AUS Ex 3853X
DIP A21 T <sub>A</sub> T <sub>4</sub>	50°C	AUS Ex 3853X

# Product code specification

When placing an order, the motor product code should be specified together with details of any additional features required. The product code of the motor is composed in accordance with the following example.

M 3	4	0 1 5 0 0	3	P P A	E
1-2	3	4-8	9	10-12	13-14

## Positions 1 and 2

**M3** = metric frame size, 3 phase, single speed.

## Position 3

### Number of poles

2 = 2 pole    8 = 8 pole  
4 = 4 pole    A = 10 pole  
6 = 6 pole    C = 12 pole

## Positions 4 to 8

Rated power output  
(kW x 100)

## Position 9

### Mounting arrangement

1 = V1    3 = B3  
4 = B3/B5    5 = B5

## Position 10 to 12

### Series

**PPA** = CMG PPA series  
Australian/British kW-frame

**PPC** = CMG PPC series

CENELEC kW-frame  
(when different to PPA)

## Positions 13 and 14

### Variation suffix

**E** = Class 1 Zone 1 Ex e

**N** = Class 1 Zone 2 Ex n

**D** = D I P

**L** = LHS terminal box

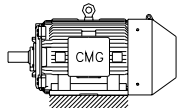
**R** = Airstream rated

# Mechanical design

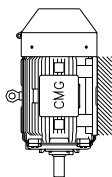
## Mountings

CMG PPA Motors are available in the mounting arrangements listed in the table below. **For mounting arrangements outside this list please contact CMG.**

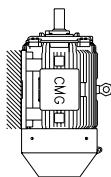
### Foot mount



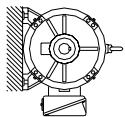
B3 (IM1001)  
[PPA 80 - 500]



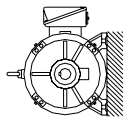
V5 (IM1011)  
[PPA 80 - 280]



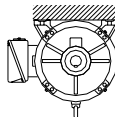
V6 (IM1031)  
[PPA 80 - 280]



B6 (IM1051)  
[PPA 80 - 280]

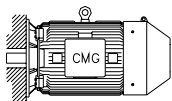


B7 (IM1061)  
[PPA 80 - 280]

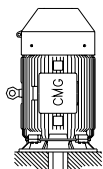


B8 (IM1071)  
[PPA 80 - 280]

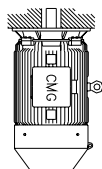
### Flange



B5 (IM3001)  
[PPA 80 - 280]

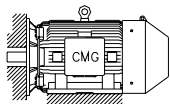


V1 (IM3011)  
[PPA 80 - 500]

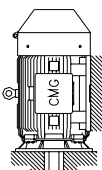


V3 (IM3031)  
[PPA 80 - 280]

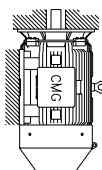
### Flange and feet



B3/B5 (IM2001)  
[PPA 80 - 500]



V1/V5 (IM2011)  
[PPA 80 - 280]



V3/V6 (IM2031)  
[PPA 80 - 280]

# Materials and construction

## General

Frames 80–400	One piece Cast Iron construction
Frames 450–500	Fabricated steel
Endshields	Cast Iron construction
Terminal box	Cast Iron construction
Fan	Bi-directional Cast Iron or fabricated steel
Fan Cowl	Fabricated Steel (Heavy gauge)
	Cast iron optional
Fasteners	Corrosion protected (Stainless optional)

## Endshields

Endshields are manufactured from close-grained pearlite grey cast iron, having a 250MPa tensile strength. The endshields are adequately ribbed to provide cooling to the area around the bearing. Their shallow design ensures they remain rigid under the stresses of starting and running, and are designed to withstand the radial and axial forces encountered during most applications.

## Stator Frame

Stators are manufactured from close-grained pearlitic grey cast iron having a 250MPa tensile strength. They are of a one-piece design to ensure that the stator remains rigid under all starting and running conditions.

The ribs are designed to dissipate the optimum amount of heat with the lowest airflow over the motor. This helps to ensure that windage noise is minimized. Adequate spacing between the ribs is maintained to lessen the possibility of blockage due to the build up of dirt.

## Shaft

Shafts are manufactured from high tensile steel and adequately proportioned to provide strength and rigidity in operation. Bearing journals are ground to ensure an accurate bearing fit and positioning. Keys are provided with each motor.

Shaft extension run out, concentricity and perpendicularity to the face of standard flange mount motors comply with normal grade tolerance as specified in AS/NZS1359 and IEC60072. Precision grade tolerance is available upon special order.

Non-standard dimensions and shaft materials are available on request.

## Rotor

Rugged one piece rotor cages are die cast aluminium. After fitting the rotor core to the shaft the rotor assembly is dynamically balanced for smooth operation.

## Finish

All castings and steel parts are painted with a prime coat of 2-pack epoxy primer, followed by a top coat of 2-pack epoxy to the customer's color specification. (Unless otherwise specified, the PPA is painted RAL 8015 – Brown & 1000V RAL 5019-Harbour Blue).

Special paint systems can be provided to accommodate stringent requirements for motors in corrosive environments. Special coatings may be required to resist substances such as acid, salt water and extreme climatic conditions.

## Stainless Steel Labels

The motor nameplate is manufactured from Stainless Steel, with markings embossed, not printed, to provide permanency. Thermistor and Heater labels are all manufactured from Stainless Steel.

## Protection

### For vertically mounted motors

The PPA series motor can be mounted vertically without the need for additional covers or protection.

In cases where motors are to be mounted with their shaft vertically downwards the fan cover is not equipped with a protective hood as a standard feature. Protective hoods are available upon special request.

### Against solar radiation

High solar radiation from exposure to direct sunlight may result in an adverse total motor temperature. In these circumstances motors should be screened by placement of adequate and appropriate sunshades that will not inhibit airflow.

### Degree of protection

Standard levels of enclosure protection for all PPA series motors, for both **Motor and Terminal box, is IP66**. The sintered bronze porous drain plugs are fitted to the lowest point of the motor enclosure, as standard.

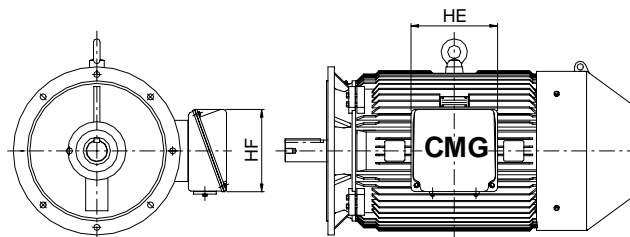
**IP66 Enclosure protection** means dust tight (no ingress of dusts), and protected against heavy seas (water from heavy seas or water projected in powerful jets shall not enter the enclosure in harmful quantities).

Enclosure designations comply with AS1939-1990 (IEC60529). The enclosure protection rating required depends upon the environmental and operational conditions within which the motor is to operate.

## Terminal box

Cast iron diagonally split terminal boxes are provided on all motors in the PPA range. They are located on the centre line of the stator allowing easy change of the terminal box from the right hand side to the left.

The terminal box is designed oversize to accommodate fitting of larger than standard cables used to minimise voltage drop over long cable runs. The box's ample dimensions also allow aluminum cables to be terminated using Bi-metal lugs.



Motor frame	Dimensions		Number of entries	Entry / pitch
	HE	HF		
<b>80</b>	135	125	2	M20 x 1.5
<b>90</b>	135	125	2	M20 x 1.5
<b>100</b>	135	125	2	M20 x 1.5
<b>112</b>	160	175	1	M25 x 1.5
<b>132</b>	160	175	1	M25 x 1.5
<b>160</b>	238	223	1	M50 x 1.5
<b>180</b>	238	223	1	M50 x 1.5
<b>200</b>	238	223	1	M50 x 1.5
<b>225</b>	342	326	1	M63 x 1.5
<b>250</b>	342	326	1	M63 x 1.5
<b>280</b>	342	326	1	M63 x 1.5
<b>315</b>	342	326	1	M63 x 1.5
<b>355</b>	530	500	Nil	6 mm gland plate
<b>400</b>	530	500	Nil	6 mm gland plate

For data relating to 450 & 500 frames refer CMG.

A removable gland plate is fitted to all terminal boxes, frame 225 and above (smaller frames optional).

For frames 80 to 315 the gland entry is drilled and tapped with standard metric threads as per the table above. Motors frame 355 and above are fitted with undrilled steel gland plates. (Non ferrous optional)

Neoprene O-ring gaskets are used between all mating surfaces to ensure that the IP66 degree of protection is maintained.

During transportation and storage the conduit entry hole is fitted with a removable plug to limit the ingress of moisture.

The main terminal box is located on the right hand side of the motor when viewed from the drive-end (left hand side optional). The terminal box is supplied as standard, with the conduit entry facing downward and can be rotated through 360° in 90° increments.

## Cooling

These motors are fitted with a low noise bi-directional cast iron or fabricated steel fans.

The fan, with its radial blades, and its associated fan cover of a conical shape, is designed to minimize turbulence within the fan housing and allow a smooth transition of air.

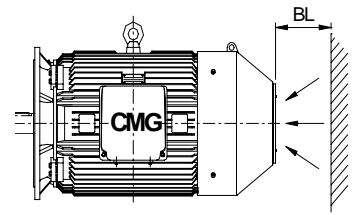
The fan and cover are designed to remove the need, in the majority of cases, for special acoustic attenuation needed to meet stringent noise level requirements.

For special applications such as low speed, operation on a VVVF drive or frequent starting and stopping, a separately driven cooling fan is available as an optional extra. See later section on VVVF Drives.

Cooling air flows from the non-drive-end to the drive end. When the motor is installed care should be taken not to impede the airflow into the motor cowl.

As a guide the following minimum dimension BL should be adopted.

Motor Frame	Dimensions BL[mm]
80 -100	60
112-132	70
160-180	80
200-250	100
280-355	150
400	200



For data relating to 450 & 500 frames, refer CMG.

### Additional Earth Terminal

In addition to the earth terminal fitted within the main terminal box an additional external earth, for grounding of the frame, is fitted on the motor foot for frame sizes 250 and above. (Optional on smaller sizes.)

## Bearings & Lubrication

### Drive and Non-Drive Bearing Housings

PPA motors with frames 80 to 100 have sealed, non-regreasable bearing housings. The bearings are pre-lubricated with a lithium based grease. All motors frames 112 and above are fitted with a thru-flushing pressure grease relief valve incorporating a V-ring seal which allows the bearing to be relubricated without stopping the motor.

### Bearings

As standard all PPA motors have high quality bearings, made from vacuum degassed steel. The standard bearings in the range are selected to provide long operational life, quiet running and high load carrying capacity.

4, 6 and 8 pole motors up to 280 frame, and all 2 pole motors, as standard are fitted with high quality deep groove ball bearings. 4, 6 and 8 pole motors 315 frame and above are fitted with cylindrical roller bearings on the drive end.

### Optional roller bearings

For frame sizes 112 to 280 in applications with increased radial force, cylindrical roller bearings can be substituted for ball bearings at the drive end, in accordance with the accompanying table. When a roller bearing is fitted to the drive end, the non-drive end ball bearing is locked to prevent axial movement.

### Shaft Locking Clamps

All motors within the PPA range 200 frame and above are fitted with a substantial shaft-locking clamp to help prevent false brinnelling in transport. The motors should always be transported or stored with this clamp fitted and tensioned to avoid bearing damage.

Once the motor has reached it's final destination and is ready for installation the shaft-locking clamp must be removed to prevent damage and the motor run no-load to confirm that the bearings are in good condition.

After this initial run normal installation can continue with additions of pulleys or couplings.

### Bearings

Motor Frame	DE Standard	DE Optional	NDE Standard
<b>80</b>	6204 ZZ		6204 ZZ
<b>90</b>	6205 ZZ		6205 ZZ
<b>100</b>	6206 ZZ		6206 ZZ
<b>112</b>	6306	NU306	6306
<b>132</b>	6308	NU308	6308
<b>160</b>	6309	NU309	6309
<b>180</b>	6310	NU310	6310
<b>200</b>	6312	NU312	6312
<b>225</b>	6313	NU313	6313
<b>250-2</b>	6313		6313
<b>250-4, 6, 8</b>	6315	NU315	6313
<b>280-2</b>	6314		6314
<b>280-4, 6, 8</b>	6317	NU317	6314
<b>315-2</b>	6316		6316
<b>315-4, 6, 8</b>	NU318		6316
<b>355-2</b>	6318		6318
<b>355-4, 6, 8</b>	NU324		6324
<b>400-2</b>	6318		6318
<b>400-4, 6, 8</b>	NU326		6326

For data relating to 450 & 500 frames, refer CMG.

Note: The use of roller bearings is generally **not recommended for 2 pole motors.**

## Lubrication

Standard bearings are lubricated with a lithium based rolling contact bearing grease, having an R3 consistency and suitable for operation within the cooling air temperature range of -20°C to +55°C. For operation outside this temperature range special lubricants are required.

Special lubricants or additional maintenance may also be required in cases where motors are exposed to a comparatively high degree of pollution, high humidity, increased or changed bearings loads, or prolonged continuous operation.

For details of grease quantities, re-lubrication intervals and recommended grease types – refer to the installation and maintenance instructions at the end of this catalogue.

## Balancing, vibration and noise

### Balancing

The rotor is balanced separately to the external cooling fan so that this fan can be removed or changed without altering the balance of the rotor.

All rotors are balanced with a half key to fine tolerances (G1).

Pulleys or couplings used with motors must be appropriately balanced.

### Vibration

PPA series motors fall within the limits of vibration severity as set out in Australian Standards AS1359.114:1997 (IEC 60034-14:1996) which are listed below. Values relate to rotating machinery measured in soft suspension.

#### Vibration severity limit

Motor frame	Maximum RMS vibration velocity [ mm/s ]	Motor frame	Maximum RMS vibration velocity [ mm/s ]
80	1.8	200	2.8
90	1.8	225	2.8
100	1.8	250	3.5
112	1.8	280	3.5
132	1.8	315	3.5
160	2.8	355	3.5
180	2.8	400	3.5

For data relating to 450 & 500 frames, refer CMG.

### Vibration Sensors

Provision for fitting vibration sensors for condition monitoring is standard on all motors, frame size 250 and above. (Optional on smaller sizes).

Vibration levels can be checked with an SPM Monitor, or its equivalent, when the motor is new and on a regular basis usually at the same time as re-greasing. This ensures optimum bearing life is achieved and bearing failures avoided.

## Low Noise

The PPA fan cooling system is designed to achieve the required air flow with the minimum of losses which enables the fan to cool the motor whilst keeping noise levels to a minimum.

The levels detailed in the table below show the overall sound pressure levels of PPA motors at 1 metre (No Load).

#### Sound pressure level

Output (kW)	PPA sound pressure level dB(A) at 1 metre			
	3000 r/min	1500 r/min	1000 r/min	750 r/min
0.37	60	58	54	51
0.55	60	58	54	51
0.75	60	58	58	51
1.1	60	62	60	54
1.5	60	62	63	54
2.2	60	62	63	63
3	63	62	67	63
4	63	62	67	63
5.5	74	62	67	63
7.5	74	62	67	63
11	74	72	67	63
15	77	72	67	68
18.5	77	72	71	68
22	77	72	71	68
30	79	72	72	68
37	80	73	72	68
45	80	73	72	68
55	80	73	72	68
75	80	74	73	73
90	82	75	74	73
110	82	76	75	73
132	82	78	77	73
150	83	78	77	73
185	84	79	77	74
200	85	79	77	74
220	87	81	77	74
250	89	83	77	74
280	90	83	77	74
315	90	84	77	74
355	90	85	78	74
400	90	88	78	
450	95	88	78	
500	95	89	78	
560	95	90		
630		90		

For data relating to 450 & 500 frames, refer CMG.

Where very low levels are specified alternate devices are available for noise reduction. These include uni-directional fans, separately driven cooling fans, inlet attenuation or full motor attenuation.

# Electrical design

## Operating Parameters

Standard PPA series motors have the design and operating parameters listed below. Performance data is based on this standard.

Three phase .....415 Volts, 50 Hz (690V min for 710kW and above)

Ambient cooling air Temperature.....40°C

Altitude .....up to 1000 m

Duty cycle.....S1 (continuous)

Rotation.....Clockwise viewed from drive end.

Any variation from these operating parameters should be examined and performance data altered in accordance with the information provided in this section.

## Voltage and frequency

Standard PPA motors are designed for a power supply of three phase 415 Volts, 50 Hz. Motors can be manufactured for any supply between 100 and 1100 volts and frequencies other than 50 Hz.

Standard PPA and PPC motors are designed to operate on VVVF drives and will provide constant torque provided that the voltage/frequency ratio remains constant i.e. 415:50 = 8.3:1.

Standard PPA motors may operate when connected to certain other non-standard voltages and frequencies. The accompanying table covers some common non-standard voltages and frequencies. Rated performance data values should be multiplied by the factors to give more realistic operating data values which, if used, will reduce additional motor temperature rise.

Supply [ Volts / Hz ]	Rated speed	Rated power	Rated current $I_N$	Rated torque $T_N$	Locked rotor torque $T_L$	Break down torque $T_B$
<b>380/50</b>	1.00	<b>0.95</b>	1.00	0.95	0.83	0.83
<b>400/50</b>	1.00	<b>1.00</b>	1.00	1.00	0.93	0.93
<b>415/50</b>	1.00	<b>1.00</b>	1.00	1.00	1.00	1.00
<b>440/50</b>	1.00	<b>1.00</b>	1.00	1.00	1.10	1.10
<b>415/60</b>	1.20	<b>1.00</b>	1.00	0.83	0.69	0.69
<b>440/60</b>	1.20	<b>1.05</b>	1.00	0.87	0.77	0.77
<b>460/60</b>	1.20	<b>1.10</b>	1.00	0.91	0.85	0.85
<b>480/60</b>	1.20	<b>1.15</b>	1.00	0.96	0.92	0.92

For critical applications data should be confirmed.

Standard torque values for alternative supplies are obtainable only with special windings. For these purpose built motors the performance data is the same as for 415 volt motors except for the currents which are calculated with the accompanying formula.

$$I_x = \frac{415 \times I_N}{U_x}$$

Where:  
 $I_x$  = Current  
 $I_N$  = Rated current at 415 volt  
 $U_x$  = design voltage

## Temperature and altitude

Rated and output power specified in the performance data tables apply for standard ambient conditions of 40°C up to 1000 m above sea level. Where temperature or altitude differ from the standard, multiplication factors in the table below should be used.

Ambient temperature	Temperature Factor	Altitude above sea level	Altitude Factor
30°C	1.06	1000 m	1.00
35°C	1.03	1500 m	0.98
40°C	1.00	2000 m	0.94
45°C	0.97	2500 m	0.91
50°C	0.93	3000 m	0.87
55°C	0.88	3500 m	0.82
60°C	0.82	4000 m	0.77

$$\text{Effective Power} = \text{Rated Power} \times \text{Temperature Factor} \times \text{Altitude Factor}$$

## Rotation

For clockwise rotation, viewed from drive end, standard three phase PPA motor terminal markings coincide with the sequence of the phase line conductors.

For counter clockwise rotation, viewed from drive end, two of the line conductors have to be reversed. This is made clear in the accompanying table.

Non-standard motors with the terminal box located on the left, viewed from drive end, have a counter-clockwise rotation for coinciding markings, and reversing two of the line conductors will reverse the rotation to clockwise.

Terminal box location (viewed from D-end)	Sequential connection of L1 L2 and L3	Direction of rotation
Right	U1 V1 W1 V1 U1 W1	Clockwise Counter-clockwise
Left	V1 U1 W1 U1 V1 W1	Clockwise Counter-clockwise

## Duty

PPA motors are supplied suitable for S1 operation (continuous operation under rated load). When the motor is to operate under any other type of duty the following information should be supplied to determine the correct motor size.

- Type and frequency of switching (short time, intermittent, periodic, high inertia, braking).
- Load torque variation during motor acceleration and braking (in graphical form).
- Moment of inertia of the load on the motor shaft.
- Type of braking (e.g. mechanical, electrical through phase reversal or DC injection.)

For duty cycles other than S1 please contact CMG.

## Insulation

Standard PPA series motors are wound with **Class H** insulation and winding designs limit the temperature rise to 80K (unless otherwise noted) for which Class B insulation would normally be sufficient. The use of Class H insulation provides an additional safety margin of 45K, as shown in the accompanying table, together with a **design life of 20 years**.

Due to their conservative design many sizes in the PPA range of motors have temperature rises considerably less than 80K and therefore provide even greater safety margins.

	Insulation class		
	B	F	H
Max. Permissible winding temp. (°C)	130	155	<b>180</b>
Less ambient temp. (°C)	- 40	- 40	<b>- 40</b>
Less hotspot allowance (K)	- 10	- 10	<b>- 15</b>
Equals <b>max. permissible temp. rise. (K)</b>	80	105	<b>125</b>
Less max. design temp. rise (K)	- 80	- 80	<b>- 80</b>
Equals <b>min. safety margin (K)</b>	--	25	<b>45</b>

## Connection and starting

PPA motors are suitable for both 415 Volt DOL operation and for use with 415 Volt three phase variable frequency drives. 3kW and below can also be used with 240V three phase variable frequency drives.

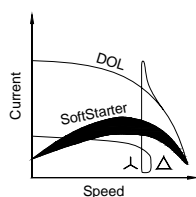
Alternatively 415 Volt Delta connected motors can be operated DOL in the star configuration with a 720/690 Volt supply or with a 720/690 Volt variable frequency drive. In this latter case the drive must be supplied with an output reactor to protect the winding insulation.



In addition to DOL and Star-Delta starting the following starter options are available through CMG Drives division, and are best supplied together with the motor.

### Electronic soft starters

Through the use of an electronic soft starter, which controls such parameters as current and voltage, the starting sequence can be totally controlled. The starter can be programmed to limit the amount of starting current and by limiting the rate of the current increase the startup time is extended.



### VVVF Drives

Variable voltage, variable frequency (VVVF) drives are primarily recognized for their ability to manipulate power from a constant 3 phase 50 Hz supply converting it to

variable voltage and variable frequency power. This enables the speed of the motor to be matched to its load in a flexible and energy efficient manner. The only way of producing starting torque equal to full load torque with full load current is by using VVVF drives. The functionally flexible VVVF drive is also commonly used to reduce energy consumption on fans, pumps and compressors and offer a simple and repeatable method of changing speeds or flow rates.

The standard insulation provided on PPA motors can accept a rise time of 3000V/μS and a peak voltage of 2600V. To ensure that this parameter is not exceeded, care should be taken in the selection of the VVVF drive and where necessary suitable output voltage filters should be used.

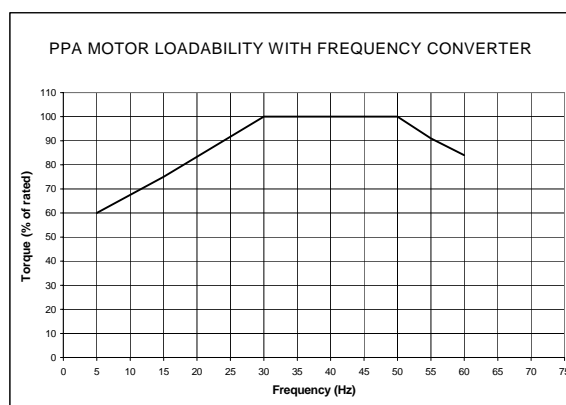
**All drives supplied by the CMG Drives Division will comply with this parameter.**

Operation below 30Hz: motor cooling fan efficiency drops significantly. Hence, in the constant torque application, a separately driven cooling fan should be fitted to provide sufficient cooling of the motor.

Operation between 30Hz and 50Hz: In this speed range, the motor is capable of delivering full rated torque with its standard fan.

Operation above 50Hz: All PPA motors are capable of delivering constant rated power up to 60Hz. However, most of these motors are suitable to run and deliver constant power at much higher frequency than 60Hz with maximum being 100Hz. In the case of application between 60Hz and 100Hz, please contact CMG for the advice on suitability.

The PPA range of motors will operate without modification on VVVF drives however under certain conditions additional features should be considered.



### EDM Concerns:

Due to an effect caused by harmonics in the waveform capacitive voltages in the rotor can be generated, causing voltage discharge to earth through the bearings. This discharge results in etching of the bearing running surfaces (EDM). This can be controlled with the fitment of appropriate filters to the drive. To further reduce this effect, a partial VVVF drive kit, as described in the Optional Extras section can be used.

CMG recommend the use of these kits for all motors 200kW and above (100kW and above for hazardous location motors).

## Thermal protection

Thermistors and RTD's can be installed in both the windings and the bearings.

The bearing temperature monitors assist when used in conjunction with vibration sensors in monitoring the bearing condition and continuing reliability.

### Thermistors

PPA motors are fitted, as standard, with one set (3) PTC thermistors selected for a tripping temperature of 145°C. These thermo-variable resistors have a positive temperature co-efficient, and are fitted one per phase in the motor windings.

Additional sets of thermistors can be fitted with the same or alternate tripping temperatures, if required, for such functions as alarm or spare.

Frames 80 to 132 – The thermistors are terminated within the main terminal box.

Frames 160 and above – The thermistors are terminated in an auxiliary terminal box fitted to the right hand side of the main terminal box.

### RTDs

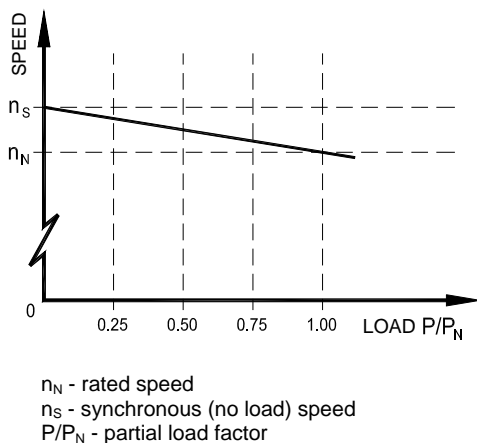
An alternative method of monitoring temperatures is to fit 3 wire PT100 Resistive Temperature Detectors (RTD's). RTD's are terminated in an auxiliary terminal box affixed to the main terminal box. These devices have a linear temperature / resistance gradient and can be used in conjunction with electronic control equipment e.g. PLC's

## Anti-condensation Heaters

PPA motors frames 250 and above are fitted with anti-condensation heaters (optional on smaller sizes). These heaters are connected during manufacture for 230/250-Volt operation however they can be supplied connected for 400/440 Volt operation against special order. They are terminated in an auxiliary terminal box fitted to the left hand side of the main terminal box.

## Speed at partial loads

The relationship between motor speed and degree of loading in a PPA motor is approximately linear up to the rated load. This is expressed graphically in the accompanying graph.



## Current at partial loads

Current at partial loads can be calculated using the following formula:

$$I_x = \frac{P_{out\ x}}{\sqrt{3} \times U_N \times \cos\phi_x \times \eta_x} \times 10^5$$

Where:

$I_x$	= partial load current (amps)
$P_{out\ x}$	= partial load (kW)
$\cos\phi_x$	= partial load power factor
$\eta_x$	= partial load efficiency (%)
$U_N$	= rated voltage

## Torque characteristics

Typical characteristics of torque behavior relative to speed are shown in the torque speed curve example below.

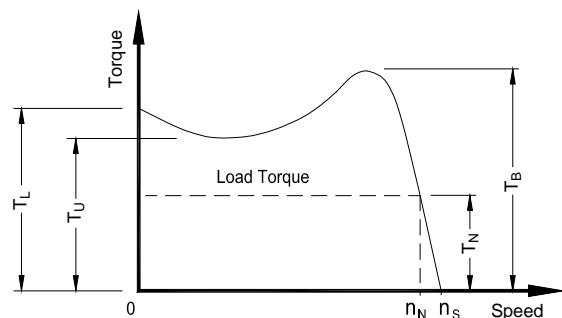
CMG PPA motors all exceed the minimum starting torque requirements for Design N (Normal torque) as specified in AS1359.41-1986 (IEC60034-12).

Rated torque can be calculated with the following formula.

$$T_N = \frac{9550 \times P_N}{n_N}$$

Where:

$T_N$	= rated torque (Nm)
$P_N$	= rated power (kW)
$n_N$	= rated speed (r/min)



$T_N$  - rated torque  
 $T_L$  - starting torque  
 $T_U$  - pull-up torque  
 $T_B$  - brake down torque

$n_N$  - rated speed  
 $n_s$  - synchronous  
 (no load) speed

# Performance data

## PPA series 415V 50Hz

### IP66 Insulation class H, Temperature rise class B

kW	Motor frame		Speed [r/min]	Efficiency[%]			Power factor, Cosφ			Current		T <sub>E</sub> <sup>(1)</sup> Time [sec]	Torque				Moment of Inertia J=1/4GD <sup>2</sup> [kg.m <sup>2</sup> ]	Weight of foot mount motor [kg]
				at % full load			at % full load			Full load I <sub>N</sub> [A]	Locked rotor I <sub>L</sub> /I <sub>N</sub>		Full load T <sub>N</sub> [Nm]	Locked rotor T <sub>L</sub> /T <sub>N</sub>	Pull up T <sub>U</sub> /T <sub>N</sub>	Break down T <sub>B</sub> /T <sub>N</sub>		
				100	75	50	100	75	50									
3000 r/min = 2 poles																		
0.55	80A	- 19	2880	80.7	80.3	77.1	0.85	0.79	0.68	1.2	7.9	-	1.8	2.7	2.2	3.3	0.0002	20
0.75	80B	- 19	2885	81.8	81.6	79.1	0.85	0.79	0.68	1.5	8.0	18	2.5	2.7	2.4	3.2	0.00022	21
1.1	80C	- 19	2880	83.8	84.2	82.4	0.86	0.80	0.69	2.2	8.1	12	3.6	2.9	2.5	3.3	0.00023	24
1.5	90S	- 24	2890	86.3	86.6	84.9	0.88	0.84	0.75	2.8	8.4	16	5	2.7	2.2	3.0	0.0003	29
2.2	90L	- 24	2880	87.1	88.0	87.5	0.87	0.84	0.76	4.1	8.0	12	7.3	2.8	2.2	2.9	0.00035	33
3	100L	- 28	2910	88.2	88.3	86.8	0.89	0.85	0.75	5.4	7.8	12	9.8	2.2	2.0	3.3	0.00073	45
4	112M	- 28	2920	87.6	87.6	87.2	0.88	0.86	0.81	7.3	8.9	10	13.1	2.6	1.8	3.6	0.0014	55
5.5	132SA	- 38	2940	89.3	88.8	86.8	0.89	0.86	0.78	9.6	9.3	15	17.9	2.3	1.7	3.6	0.003	84
7.5	132SB	- 38	2940	90.3	90.3	89.0	0.90	0.87	0.81	12.8	8.6	12	24.4	2.2	1.8	3.4	0.0032	88
11	160MA	- 42	2930	90.6	90.5	88.9	0.91	0.90	0.83	18.5	6.4	11	35.9	2.0	1.4	2.5	0.054	139
15	160MB	- 42	2940	91.3	91.1	89.8	0.90	0.89	0.84	25.5	6.6	9	48.7	2.1	1.5	2.5	0.056	144
18.5	160L	- 42	2940	91.9	92.0	90.9	0.92	0.91	0.86	30.5	7.5	7	60.1	2.7	1.7	2.9	0.066	163
22	180M	- 48	2945	92.2	92.1	90.6	0.92	0.90	0.82	36.5	9.0	8	71.3	3.3	1.8	3.4	0.094	217
30	200LA	- 55	2950	92.9	92.7	91.4	0.90	0.88	0.82	50	7.5	8	97.1	2.4	1.7	2.9	0.167	282
37	200LB	- 55	2955	93.3	93.2	92.2	0.91	0.89	0.84	61	7.7	6	120	2.7	1.7	2.9	0.174	290
45	225M	- 55	2975	93.7	93.0	91.4	0.94	0.87	0.84	72	9.5	8	144	2.7	1.9	3.1	0.30	382
55	250S	- 60	2975	94.3	94.1	92.9	0.89	0.88	0.83	91	6.5	7	177	2.2	1.6	2.8	0.38	437
75	250M	- 60	2985	94.9	94.5	93.1	0.91	0.89	0.82	122	8.6	5	240	3.0	1.9	3.1	0.47	506
90	280S	- 65	2972	95.3	95.2	94.5	0.90	0.89	0.85	146	7.8	6	289	3.0	2.4	3.2	0.79	645
110	280M	- 65	2976	95.1	94.8	93.8	0.92	0.92	0.91	175	7.7	6	353	3.3	2.1	3.4	0.93	723
132	315S	- 65	2982	95.6	95.2	94.1	0.93	0.91	0.87	207	6.5	9	423	1.9	1.7	2.9	1.40	1135
150	315M	- 65	2979	95.6	95.2	94.2	0.92	0.91	0.88	237	6.4	7	481	2.0	1.7	2.9	1.55	1185
185	315L	- 65	2979	95.8	95.4	94.5	0.90	0.88	0.84	298	7.5	6	593	2.1	1.6	2.9	1.73	1240
200	315LXA	- 65	2980	95.9	95.7	94.7	0.93	0.92	0.90	312	6.3	6	641	2.0	1.5	3.0	1.81	1280
220	315LXB	- 65	2978	95.7	95.4	94.3	0.92	0.91	0.87	348	7.5	6	706	2.7	1.5	2.6	2.00	1320
250	355LA	- 85	2979	95.6	95.2	94.0	0.87	0.85	0.81	416	7.4	7	801	2.1	1.4	2.7	4.46	1630
280	355LB	- 85	2979	96.0	95.8	94.6	0.90	0.89	0.86	452	7.2	7	898	2.0	1.6	2.9	4.87	1700
315	355LC	- 85	2979	96.2	95.9	95.0	0.91	0.91	0.89	501	6.2	7	1010	1.9	1.6	2.8	4.90	1750
355	355LD	- 85	2986	96.7	96.5	95.7	0.92	0.91	0.87	557	7.0	6	1135	2.2	1.9	3.2	5.46	2245
400	355LX	- 85	2985	96.4	96.2	96.0	0.91	0.89	0.87	635	6.2	7	1280	1.8	1.4	2.5	5.60	2420
450	400LA	- 85	2980	96.5	96.6	96.4	0.90	0.89	0.86	721	5.9	6	1442	1.8	1.4	2.5	9.47	2700
500	400LB	- 85	2985	96.5	96.8	96.5	0.91	0.89	0.86	791	6.9	6	1600	2.0	1.7	2.9	11.39	3070
560	400LX	- 85	2980	96.7	96.8	96.6	0.91	0.91	0.89	885	6.2	7	1795	1.9	1.5	2.6	11.60	3170

## PPC series 415V 50Hz

45	225M	- 55	2975	93.7	93.0	91.4	0.94	0.87	0.84	72	9.5	-	144	2.7	1.9	3.1	0.30	382
55	250M	- 60	2975	94.3	94.1	92.9	0.89	0.88	0.83	91	6.5	7	177	2.2	1.6	2.8	0.38	437
75	280S	- 65	2975	94.6	94.8	94.5	0.90	0.89	0.85	123	7.9	6	241	3.0	2.1	3.1	0.67	550
90	280M	- 65	2972	95.3	95.2	94.5	0.90	0.89	0.85	146	7.8	6	289	3.0	2.4	3.2	0.79	645
110	315S	- 65	2981	95.1	94.5	93.0	0.91	0.89	0.85	178	6.7	9	352	2.0	1.7	3.1	1.15	965
132	315MA	- 65	2982	95.6	95.2	94.1	0.93	0.91	0.87	207	6.5	9	423	1.9	1.7	2.9	1.40	1135
160 <sup>(3)</sup>	315MB	- 65	2977	95.6	95.2	94.2	0.92	0.91	0.88	253	6.0	-	513	1.9	1.6	2.7	1.55	1185
200	355LA	- 80	2980	95.5	95.6	95.4	0.89	0.88	0.85	328	6.6	7	641	2.0	1.7	2.7	3.78	1300
225	355LB	- 80	2981	96.4	96.3	95.4	0.93	0.92	0.86	349	6.8	-	721	1.9	1.5	3.1	4.11	1535
250	355LC	- 80	2980	95.5	95.6	95.4	0.89	0.88	0.85	369	6.8	7	801	2.2	1.8	2.8	4.46	1600
280	355LD	- 80	2985	96.2	96.2	95.9	0.91	0.89	0.86	445	7.0	7	896	2.0	1.6	2.9	4.87	1700

This data is provided for guidance only. Results are guaranteed only when confirmed by test results. For the performance data of motors above 560kW please refer to CMG.

<sup>(1)</sup>T<sub>E</sub> time applies to Ex e motors only and is explained in the hazardous areas section.

<sup>(2)</sup> For hazardous locations the rating will be 150kW and performance data as per PPA.

## PPA series 415V 50Hz IP66 Insulation class H, Temperature rise class B

kW	Motor frame		Speed	Efficiency[%]			Power factor, Cosφ			Current		T <sub>E</sub> <sup>(1)</sup>	Torque				Moment	Weight of foot mount motor [kg]
				[r/min]	at % full load		at % full load		Full	Locked	Full		Locked	Pull	Break	of Inertia		
					100	75	50	100				75					50	
1500 r/min = 4 poles																		
0.55	80A	- 19	1440	81.0	80.4	77.0	0.71	0.62	0.49	1.4	6.8	30	3.6	2.7	2.5	3.0	0.0002	21
0.75	80B	- 19	1445	83.1	82.4	79.2	0.72	0.63	0.50	1.8	7.7	28	5	3.3	3.0	3.4	0.00025	23
1.1	90S	- 24	1440	85.7	85.7	83.7	0.77	0.7	0.57	2.4	7.9	35	7.3	3.3	2.6	3.2	0.0005	30
1.5	90L	- 24	1440	85.8	85.7	83.6	0.76	0.68	0.55	3.2	8.1	25	9.9	3.5	2.8	3.2	0.0006	34
2.2	100LA	- 28	1455	86.9	86.7	84.8	0.84	0.78	0.66	4.3	8.6	22	14.4	3.7	3.4	4.9	0.0007	40
3	100LB	- 28	1455	87.6	87.6	85.9	0.84	0.79	0.68	5.7	8.7	17	19.7	2.7	2.4	3.3	0.0009	50
4	112M	- 28	1445	87.7	88.3	87.7	0.88	0.83	0.74	7.3	7.8	13	26.4	2.7	2.5	3.1	0.002	57
5.5	132S	- 38	1460	89.7	90.1	89.2	0.83	0.78	0.65	10.3	7.7	13	36	2	1.8	3.1	0.003	95
7.5	132M	- 38	1465	91.0	91.4	90.6	0.83	0.77	0.64	13.8	8.7	12	48.9	1.8	1.6	3.3	0.007	98
11	160M	- 42	1470	91.8	92.0	91.1	0.85	0.82	0.74	19.6	7.2	20	71.5	2.3	1.6	2.6	0.089	141
15	160L	- 42	1470	91.8	91.7	90.7	0.84	0.81	0.73	27	7.6	12	97.4	2.6	1.6	2.7	0.103	163
18.5	180M	- 48	1475	92.3	92.7	92.2	0.88	0.85	0.81	32	7.3	10	120	2.5	1.8	2.9	0.16	195
22	180L	- 48	1475	92.7	93.1	92.8	0.91	0.88	0.81	36.5	7.1	10	142	2.3	1.7	2.8	0.18	215
30	200L	- 55	1480	93.9	93.9	93.2	0.89	0.84	0.75	51	8.0	15	194	2.4	2.0	3.2	0.31	293
37	225S	- 60	1485	94.6	94.6	93.9	0.90	0.88	0.82	61	7.7	12	238	2.4	1.7	2.9	0.53	370
45	225M	- 60	1485	94.5	94.5	93.9	0.90	0.87	0.81	74	7.8	13	289	2.1	1.7	2.4	0.58	395
55	250S	- 70	1480	94.5	94.8	94.3	0.90	0.90	0.88	90	7.1	13	355	2.5	1.7	2.7	0.79	487
75	250M	- 70	1485	94.8	94.9	94.4	0.91	0.89	0.81	122	7.8	7	482	2.9	2.0	3.0	0.90	536
90	280S	- 80	1489	95.2	95.2	94.5	0.91	0.89	0.84	145	7.4	13	577	2.5	1.9	3.0	1.60	692
110	280M	- 80	1492	95.9	95.9	95.1	0.92	0.90	0.86	174	7.3	7	704	2.4	2.1	3.1	1.89	787
132	315S	- 85	1486	95.6	95.5	94.7	0.87	0.85	0.80	220	6.9	13	848	2.3	1.2	2.6	2.73	1100
150	315M	- 85	1486	95.7	95.7	95.0	0.87	0.86	0.81	250	7.1	15	964	2.2	1.2	2.6	3.04	1135
185	315LA	- 85	1487	96.2	96.3	95.8	0.90	0.89	0.80	298	7.1	8	1188	2.4	1.2	2.5	3.43	1280
200	315LB	- 85	1485	95.8	95.8	95.1	0.88	0.86	0.80	330	7.6	7	1287	2.4	1.3	2.7	3.62	1330
220	315LC	- 85	1485	95.9	95.9	95.4	0.88	0.87	0.81	364	7.3	7	1415	2.4	1.3	2.7	3.89	1400
250	315LX	- 85	1485	95.9	95.9	95.3	0.88	0.86	0.81	412	8.1	7	1608	2.4	1.4	2.7	4.14	1480
280	355LA	- 110	1489	96.1	95.8	95.0	0.84	0.79	0.73	483	4.8	10	1795	1.6	1.3	2.3	7.82	2080
315	355LB	- 110	1490	96.6	96.5	95.9	0.87	0.86	0.79	520	5.3	10	2019	1.5	1.3	2.4	8.27	2125
355	355LC	- 110	1489	96.5	96.5	95.9	0.88	0.87	0.81	580	5.0	9	2277	1.5	1.3	2.4	8.90	2240
400	355LD	- 110	1490	96.3	96.1	95.3	0.88	0.86	0.80	658	5.1	8	2564	1.4	1.4	2.4	9.76	2340
450	355LX	- 110	1491	97.0	97.0	96.5	0.88	0.86	0.79	734	5.5	8	2882	1.7	1.5	2.6	10.76	2510
500	400LA	- 110	1495	96.9	96.7	96.0	0.88	0.87	0.81	813	5.8	7	3196	1.9	1.6	2.8	18.68	3010
560	400LB	- 110	1490	96.8	96.9	96.7	0.87	0.87	0.83	925	5.2	9	3589	1.7	1.5	2.5	19.70	3200
630	400LX	- 110	1490	96.9	97.0	96.8	0.87	0.86	0.82	1040	5.4	11	4038	1.5	1.2	2.5	21.64	3320

## PPC series 415V 50Hz

37	225S	- 60	1485	94.6	94.6	93.9	0.90	0.88	0.82	61	7.7	-	238	2.4	1.7	2.9	0.53	370
45	225M	- 60	1485	94.5	94.5	93.9	0.90	0.87	0.81	74	7.8	-	289	2.1	1.7	2.4	0.58	395
55	250M	- 65	1480	94.5	94.8	94.3	0.90	0.90	0.88	90	7.1	13	355	2.5	1.7	2.7	0.79	487
75	280S	- 75	1485	94.9	94.8	94.2	0.90	0.89	0.84	123	6.9	-	482	2.9	2.0	2.9	0.92	655
90	280M	- 75	1489	95.2	95.2	94.5	0.91	0.89	0.84	145	7.4	13	577	2.5	1.9	3.0	1.60	692
110	315S	- 80	1484	95.3	95.3	94.5	0.86	0.83	0.77	188	6.3	13	708	2.0	1.3	2.3	1.96	985
132	315MA	- 80	1486	95.6	95.5	94.7	0.87	0.85	0.80	220	6.9	13	848	2.3	1.2	2.6	2.73	1100
160 <sup>2)</sup>	315MB	- 80	1485	95.6	95.7	95.0	0.87	0.86	0.81	268	6.6	-	1029	2.0	1.1	2.4	3.04	1135
200	355LA	- 100	1488	96.0	95.8	95.1	0.87	0.84	0.78	335	7.5	10	1284	2.3	1.3	2.7	3.62	1480
225	355LC	- 100	1485	95.7	95.8	95.6	0.87	0.85	0.78	376	7.1	-	1447	2.4	1.3	2.7	3.89	1500
250	355LD	- 100	1487	96.1	96.1	95.6	0.87	0.85	0.80	416	7.6	10	1606	2.5	1.4	2.7	4.14	1630
280	355LE	- 100	1485	95.8	95.8	95.4	0.88	0.86	0.80	462	5.3	10	1801	1.5	1.3	2.4	7.82	2080

This data is provided for guidance only. Results are guaranteed only when confirmed by test results. For the performance data of motors above 630kW please refer to CMG.

<sup>(1)</sup>T<sub>E</sub> time applies to Ex e motors only and is explained in the hazardous areas section.

<sup>(2)</sup> For hazardous locations the rating will be 150kW and performance data as per PPA.

# PPA series 415V 50Hz

## IP66 Insulation class H, Temperature rise class B

kW	Motor frame		Speed	Efficiency[%]			Power factor, Cosφ			Current		T <sub>E</sub> <sup>(1)</sup>  Time [sec]	Torque				Moment of Inertia  J= <sup>1</sup> / <sub>4</sub> GD <sup>2</sup> [kg.m <sup>2</sup> ]	Weight of foot mount motor [kg]
				[r/min]	at % full load		at % full load		Full	Locked	Full		Locked	Pull	Break			
					100	75	50	100								75		
1000 r/min = 6 poles																		
0.37	80A	- 19	930	69.3	69.4	65.4	0.71	0.61	0.48	1.1	3.9	-	3.8	1.8	1.4	2.4	0.0004	20
0.55	80B	- 19	930	72.3	72.3	68.5	0.70	0.60	0.46	1.6	4.2	-	5.6	2.1	1.7	2.7	0.0005	21
0.75	90S	- 24	950	79.1	78.8	75.5	0.70	0.61	0.48	1.9	5.4	45	7.5	2.2	1.8	2.7	0.0007	28
1.1	90L	- 24	950	80.6	80.5	77.5	0.70	0.61	0.47	2.7	5.7	18	11.1	2.3	1.8	2.7	0.0009	32
1.5	100L	- 28	970	82.4	81.5	78.0	0.72	0.63	0.50	3.6	6.6	19	14.8	2.3	1.8	2.9	0.0017	49
2.2	112M	- 28	960	84.0	84.0	81.7	0.73	0.65	0.51	5.0	6.6	33	21.9	2.4	1.7	2.9	0.035	53
3	132S	- 38	975	87.0	87.1	85.5	0.77	0.70	0.57	6.2	6.8	20	29.4	2.0	1.4	2.8	0.007	78
4	132MA	- 38	970	86.9	87.5	86.5	0.79	0.73	0.60	8.2	6.8	14	39.4	2.3	1.8	2.6	0.009	91
5.5	132MB	- 38	970	87.8	88.6	87.9	0.79	0.73	0.62	11	7.0	11	54.1	2.0	1.9	2.6	0.046	100
7.5	160M	- 42	975	89.4	89.5	88.3	0.78	0.73	0.62	15	6.3	24	73.5	2.5	1.9	2.8	0.11	139
11	160L	- 42	970	89.7	89.8	88.5	0.76	0.70	0.57	22.5	6.4	19	108	2.5	1.9	2.6	0.13	161
15	180L	- 48	975	90.6	91.1	90.4	0.86	0.81	0.69	27	6.5	13	147	2.4	2.0	2.6	0.25	211
18.5	200LA	- 55	985	91.8	91.9	90.7	0.84	0.79	0.68	33.5	7.0	14	179	2.7	1.9	2.7	0.31	268
22	200LB	- 55	975	91.6	92.2	91.8	0.85	0.83	0.76	39.5	6.8	13	215	2.4	1.8	2.6	0.41	282
30	225M	- 60	985	92.8	92.7	91.6	0.84	0.80	0.75	54	7.3	22	291	2.4	2.0	3.0	0.67	373
37	250S	- 70	985	93.0	93.5	93.1	0.88	0.87	0.82	63	6.5	20	359	2.1	1.6	2.6	0.94	443
45	250M	- 70	990	93.9	94.2	93.7	0.90	0.88	0.83	75	6.9	20	434	2.2	1.8	2.6	1.15	501
55	280S	- 80	994	94.8	94.8	94.3	0.90	0.89	0.87	90	7.4	12	528	2.4	1.9	2.7	1.82	613
75	280M	- 80	992	94.9	95.0	94.3	0.90	0.89	0.83	123	7.7	13	722	2.8	2.1	3.0	2.33	735
90	315S	- 85	991	94.9	94.8	93.9	0.87	0.84	0.77	153	6.5	7	867	2.2	1.8	2.6	4.57	1015
110	315MA	- 85	991	95.5	95.6	95.1	0.86	0.84	0.77	186	6.5	6	1060	2.1	2.0	3.4	4.83	1075
132	315MB	- 85	990	95.4	95.6	95.2	0.87	0.85	0.80	222	6.2	7	1274	2.0	1.5	2.4	5.32	1145
150	315L	- 85	990	95.5	95.8	95.5	0.90	0.90	0.89	244	6.1	7	1447	2.3	1.4	2.3	5.95	1170
185	315LX	- 85	990	95.8	95.9	95.9	0.88	0.88	0.86	306	4.9	6	1785	2.2	1.3	2.1	6.64	1570
200	355LA	- 110	989	95.8	96.0	95.7	0.87	0.86	0.80	334	5.5	8	1931	1.7	1.1	2.3	8.63	1900
220	355LB	- 110	987	95.7	96.1	96.0	0.88	0.88	0.84	362	5.2	8	2129	1.6	1.0	2.2	9.17	1985
250	355LC	- 110	989	96.1	96.3	96.0	0.87	0.86	0.82	415	5.7	9	2414	1.5	1.1	2.4	9.83	2050
280	355LD	- 110	989	95.9	96.3	96.3	0.88	0.87	0.84	462	5.2	9	2704	1.4	0.8	2.4	10.64	2150
315	355LX	- 110	992	96.1	96.2	95.7	0.88	0.86	0.81	521	6.1	7	3033	1.8	1.2	2.5	11.25	2245
355	400LA	- 110	994	96.6	96.6	96.0	0.88	0.86	0.80	584	8.1	8	3411	2.4	1.3	3.0	16.56	2790
400	400LB	- 110	993	96.9	97.0	96.7	0.88	0.86	0.81	655	7.6	7	3847	2.3	1.3	2.8	19.26	2960
450	400LC	- 110	994	96.6	96.8	96.7	0.88	0.87	0.83	737	7.9	8	4323	2.3	0.8	2.8	20.34	3050
500	400LX	- 110	994	96.7	96.6	96.0	0.87	0.85	0.79	825	8.4	7	4804	2.7	1.4	3.1	21.83	3140

## PPC series 415V 50Hz

30	225M	- 60	985	92.8	92.7	91.6	0.84	0.80	0.75	54	7.3	-	291	2.4	2.0	3.0	0.67	373
37	250M	- 65	985	93.0	93.5	93.1	0.88	0.87	0.82	63	6.5	20	359	2.1	1.6	2.6	0.94	443
45	280S	- 75	990	93.5	93.6	92.8	0.88	0.87	0.80	76	6.3	12	434	2.3	1.8	2.6	1.20	558
55	280M	- 75	995	94.8	94.8	94.3	0.90	0.89	0.87	90	7.4	12	528	2.4	1.9	2.7	1.82	613
75	315S	- 80	990	94.4	94.3	93.2	0.86	0.83	0.76	129	6.4	7	723	1.9	1.7	2.5	3.80	930
90	315MA	- 80	991	94.9	94.8	93.9	0.87	0.84	0.77	153	6.5	7	867	2.2	1.8	2.6	4.57	1015
110	315MB	- 80	991	95.5	95.6	95.1	0.86	0.84	0.77	186	6.5	6	1060	2.1	2.0	3.4	4.83	1075
132	315MC	- 80	990	95.4	95.6	95.2	0.87	0.85	0.80	222	6.2	7	1274	2.0	1.5	2.4	5.32	1145
160 <sup>2)</sup>	315L	- 80	989	95.5	95.8	95.5	0.90	0.90	0.89	259	5.8	-	1545	2.1	1.3	2.1	5.95	1170
185	355LA	- 100	989	95.8	95.9	95.9	0.88	0.88	0.86	306	5.9	8	1786	2.2	1.3	2.1	6.64	1620
200	355LB	- 100	989	95.8	96.2	96.2	0.87	0.86	0.84	334	5.2	8	1931	1.4	0.9	2.2	8.63	1900
225	355LC	- 100	986	95.8	96.0	96.1	0.88	0.87	0.84	372	5.0	8	2179	1.6	0.9	2.2	9.17	2000
250	355LD	- 100	989	95.9	96.2	96.2	0.87	0.86	0.83	417	5.6	9	2414	1.5	0.8	2.4	9.83	2050
280	355LE	- 100	989	95.9	96.3	96.3	0.88	0.87	0.84	462	5.2	9	2704	1.4	0.8	2.2	10.84	2150

This data is provided for guidance only. Results are guaranteed only when confirmed by test results. For the performance data of motors above 500kW please refer to CMG.

<sup>(1)</sup>T<sub>E</sub> time applies to Ex e motors only and is explained in the hazardous areas section.

<sup>(2)</sup> For hazardous locations the rating will be 150kW and performance data as per PPA.

## PPA series 415V 50Hz IP66 Insulation class H, Temperature rise class B

kW	Motor frame	Speed [r/min]	Efficiency[%]			Power factor, Cosφ			Current		T <sub>E</sub> <sup>(1)</sup> Time [sec]	Torque				Moment of Inertia J= <sup>1</sup> / <sub>4</sub> GD <sup>2</sup> [kg.m <sup>2</sup> ]	Weight of foot mount motor [kg]	
			at % full load			at % full load			Full load I <sub>N</sub> [A]	Locked rotor I <sub>L</sub> /I <sub>N</sub>		Full load T <sub>N</sub> [Nm]	Locked rotor T <sub>L</sub> /T <sub>N</sub>	Pull up T <sub>U</sub> /T <sub>N</sub>	Break down T <sub>B</sub> /T <sub>N</sub>			
			100	75	50	100	75	50										
750 r/min = 8 poles																		
1.1	100L	- 28	700	76.3	70.5	64.7	0.82	0.54	0.42	2.5	3.5	-	15.0	2.3	1.8	2.8	0.0028	33
1.5	112M	- 28	700	78.4	77.3	74.5	0.89	0.60	0.48	3.0	4.0	-	20.5	2.1	1.8	2.8	0.0062	45
2.2	132S	- 38	705	80.9	84.0	84.6	0.73	0.69	0.59	5.2	5.5	20	29.8	2.1	1.5	2.1	0.031	65
3	132M	- 38	705	82.7	85.6	86.2	0.73	0.69	0.59	6.9	5.5	18	40.6	2.1	1.6	2.1	0.040	80
4	160MA	- 42	720	84.2	85.3	85.2	0.77	0.69	0.56	8.6	5.5	12	53.1	2.2	1.7	2.6	0.085	110
5.5	160MB	- 42	720	85.8	87.0	86.7	0.78	0.70	0.57	11.4	5.6	10	73.0	2.3	1.8	2.6	0.10	115
7.5	160L	- 42	720	87.2	88.1	87.6	0.76	0.68	0.55	15.7	5.8	8	99.5	2.6	2.0	2.8	0.18	139
11	180L	- 48	730	88.8	89.3	88.6	0.78	0.71	0.56	22.1	6.2	15	144	2.3	1.7	2.7	0.24	205
15	200L	- 55	730	90.0	90.8	90.6	0.78	0.70	0.58	29.7	5.3	11	196	2.1	1.5	2.4	0.37	300
18.5	225S	- 60	735	90.7	91.0	90.4	0.77	0.72	0.58	36.9	5.8	12	240	2.3	1.6	2.5	0.60	360
22	225M	- 60	735	91.2	91.5	90.9	0.77	0.72	0.58	43.6	5.9	11	286	2.3	1.6	2.6	0.69	400
30	250S	- 70	740	92.1	92.6	92.5	0.79	0.75	0.63	57.4	5.7	10	387	2.0	1.6	2.4	0.96	565
37	250M	- 70	740	92.7	93.2	93.0	0.80	0.76	0.68	69.4	5.3	11	478	1.9	1.4	2.2	1.15	575
45	280S	- 80	745	93.2	93.6	93.4	0.82	0.79	0.71	81.9	5.8	10	577	2.1	1.5	2.4	1.82	650
55	280M	- 80	743	94.0	93.7	92.5	0.80	0.74	0.63	103	6.5	8	707	2.7	2.2	3.0	2.14	678
75	315S	- 85	740	94.4	94.8	94.2	0.82	0.78	0.70	135	4.9	10	968	1.5	1.2	2.0	4.60	1000
90	315M	- 85	740	94.7	94.9	94.8	0.83	0.80	0.72	159	4.9	11	1161	1.5	1.3	2.0	5.32	1100
110	315L	- 85	740	95.2	95.3	95.0	0.83	0.79	0.70	194	5.1	9	1420	1.6	1.2	2.1	5.95	1270
132	315LXA	- 85	740	95.4	95.6	95.2	0.82	0.78	0.71	235	5.3	8	1704	1.6	1.3	2.1	6.70	1480
150	315LXB	- 85	740	95.7	95.8	95.7	0.83	0.80	0.73	263	4.7	8	1936	1.2	0.9	1.8	9.11	1680
185	355LA	- 110	740	95.5	95.6	95.1	0.83	0.80	0.73	327	5.1	12	2386	1.9	1.1	2.3	9.87	2125
200	355LB	- 110	740	95.8	96.0	96.0	0.83	0.82	0.75	350	4.8	11	2581	1.3	0.9	1.8	10.64	2400
220	355LB	- 110	740	95.8	96.0	96.1	0.83	0.82	0.76	385	4.7	11	2839	1.2	0.9	1.8	11.19	2580
250	355LX	- 110	742	95.9	95.9	95.9	0.83	0.81	0.75	437	5.2	10	3218	1.6	1.1	2.2	12.48	2650
280	400LA	- 110	745	96.1	96.3	96.2	0.83	0.82	0.75	488	6	13	3589	1.3	1.0	2.4	17.25	3000
315	400LB	- 110	744	95.9	95.8	94.8	0.81	0.77	0.66	565	6.8	12	4043	1.8	1.2	3.2	18.24	3030
355	400LX	- 110	745	96.2	96.5	96.4	0.83	0.82	0.76	618	6.1	11	4551	1.3	0.9	2.4	26.16	3500

## PPC series 415V 50Hz

18.5	225S	- 60	735	90.7	91.0	90.4	0.77	0.72	0.58	36.9	5.8	-	240	2.3	1.6	2.5	0.60	360
22	225M	- 60	735	91.2	91.5	90.9	0.77	0.72	0.58	43.6	5.9	-	286	2.3	1.6	2.6	0.69	400
30	250M	- 65	740	92.1	92.6	92.5	0.79	0.75	0.63	57.4	5.7	10	387	2.0	1.6	2.4	0.96	575
37	280S	- 75	740	92.7	93.1	93.0	0.80	0.76	0.69	69.4	5.6	10	478	2.0	1.4	2.2	1.60	625
45	280M	- 75	745	93.2	93.6	93.4	0.82	0.79	0.71	81.9	5.8	10	577	2.1	1.5	2.4	1.82	675
55	315S	- 80	740	93.7	93.9	93.5	0.82	0.78	0.70	99.6	4.9	10	710	1.4	1.1	2.0	3.60	800
75	315MA	- 80	740	94.4	94.8	94.2	0.82	0.78	0.70	135	4.9	10	968	1.5	1.2	2.0	4.60	1050
90	315MB	- 80	740	94.7	94.9	94.8	0.83	0.80	0.72	160	4.9	11	1161	1.5	1.3	2.0	5.32	1100
110	315L	- 80	740	95.4	95.3	95.0	0.83	0.79	0.70	194	5.1	9	1420	1.6	1.2	2.1	5.95	1270
132	355LA	- 100	740	95.4	95.6	95.2	0.82	0.78	0.71	235	5.3	12	1704	1.6	1.3	2.1	7.60	1530
160 <sup>2)</sup>	355LB	- 100	740	95.7	95.8	95.7	0.83	0.80	0.73	281	4.5	-	2065	1.1	0.8	1.7	9.11	1730
185	355LC	- 100	740	95.5	95.6	95.1	0.83	0.80	0.73	326	5.1	12	2388	1.9	1.1	2.3	9.87	2125
200	355LD	- 100	740	95.8	96.0	96.0	0.83	0.82	0.75	350	4.8	11	2581	1.3	0.9	1.8	10.64	2400
225	355LE	- 100	740	95.8	96.0	96.1	0.83	0.82	0.76	385	4.7	11	2804	1.2	0.9	1.8	11.19	2580
250	355LF	- 100	742	95.7	96.1	96.1	0.83	0.82	0.76	438	5.0	10	3218	1.3	0.9	1.9	12.48	2650

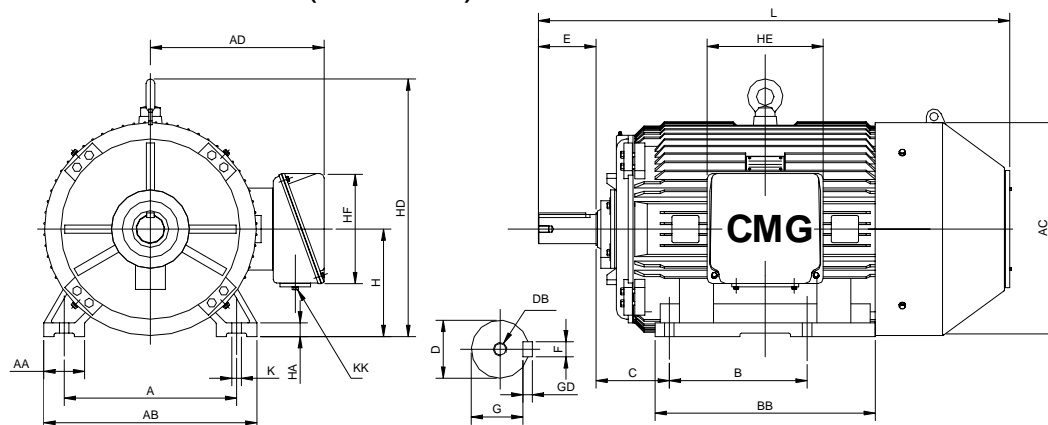
This data is provided for guidance only. Results are guaranteed only when confirmed by test results. For the performance data of motors above 355kW please refer to CMG.

<sup>(1)</sup>T<sub>E</sub> time applies to Ex e motors only and is explained in the hazardous areas section.

<sup>(2)</sup> For hazardous locations the rating will be 150kW.

# Dimensions - PPA (Australian/British kW/Frame Sizes)

## Foot mount B3 (IM1001)



Motor frame	A	AA	AB	AC	AD	B	BB	C	D	DB	E	F	GD	G	H	HA	HD	HE	HF	K	KK	L
<b>80 - 19</b>	125	35	160	175	152	100	182	50	19	M6	40	6	6	15.5	80	10	210	134	121	10	M20 <sup>2)</sup>	340
<b>90S - 24</b>	140	40	180	185	158	100	196	56	24	M8	50	8	7	20	90	12	215	134	121	10	M20 <sup>2)</sup>	375
<b>90L - 24</b>	140	40	180	185	158	125	221	56	24	M8	50	8	7	20	90	12	215	134	121	10	M20 <sup>2)</sup>	400
<b>100L - 28</b>	160	40	200	220	186	140	235	63	28	M10	60	8	7	24	100	14	250	134	121	12	M20 <sup>2)</sup>	450
<b>112M - 28</b>	190	50	240	235	210	140	245	70	28	M10	60	8	7	24	112	15	270	160	171	12	M25	470
<b>132S - 38</b>	216	60	276	265	230	140	238	89	38	M12	80	10	8	33	132	18	315	160	171	12	M25	525
<b>132M - 38</b>	216	60	276	265	230	178	276	89	38	M12	80	10	8	33	132	18	315	160	171	12	M25	565
<b>160M - 42</b>	254	70	325	320	280	210	314	108	42	M16	110	12	8	37	160	20	380	238	223	15	M50	655
<b>160L - 42</b>	254	70	325	320	280	254	354	108	42	M16	110	12	8	37	160	20	380	238	223	15	M50	695
<b>180M - 48</b>	279	70	349	355	305	241	349	121	48	M16	110	14	9	42.5	180	22	420	238	223	15	M50	715
<b>180L - 48</b>	279	70	349	355	305	279	349	121	48	M16	110	14	9	42.5	180	22	420	238	223	15	M50	715
<b>200L - 55</b>	318	70	395	395	325	305	380	133	55	M20	110	16	10	49	200	25	470	238	223	19	M50	805
<b>225S - 60</b>	356	75	435	442	390	286	370	149	60	M20	140	18	11	53	225	25	525	342	326	19	M63	860
<b>225M - 55*</b>	356	75	435	442	390	311	395	149	55	M20	110	16	10	49	225	25	525	342	326	19	M63	855
<b>225M - 60</b>	356	75	435	442	390	311	395	149	60	M20	140	18	11	53	225	25	525	342	326	19	M63	885
<b>250S - 60*</b>	406	80	485	485	415	311	395	168	60	M20	140	18	11	53	250	30	580	342	326	24	M63	930
<b>250S - 70</b>	406	80	485	485	415	311	395	168	70	M20	140	20	12	62.5	250	30	580	342	326	24	M63	930
<b>250M - 60*</b>	406	80	485	485	415	349	433	168	60	M20	140	18	11	53	250	30	580	342	326	24	M63	965
<b>250M - 70</b>	406	80	485	485	415	349	433	168	70	M20	140	20	12	62.5	250	30	580	342	326	24	M63	965
<b>280S - 65*</b>	457	85	550	544	445	368	530	190	65	M20	140	18	11	58	280	35	660	342	326	24	M63	1035
<b>280S - 80</b>	457	85	550	544	445	368	530	190	80	M20	170	22	14	71	280	35	660	342	326	24	M63	1065
<b>280M - 65*</b>	457	85	550	544	445	419	580	190	65	M20	140	18	11	58	280	35	660	342	326	24	M63	1085
<b>280M - 80</b>	457	85	550	544	445	419	580	190	80	M20	170	22	14	71	280	35	660	342	326	24	M63	1115
<b>315S - 65*</b>	508	114	622	700	525	406	508	216	65	M20	140	18	11	58	315	32	775	342	326	28	M63	1155
<b>315S - 85</b>	508	114	622	700	525	406	508	216	85	M20	170	22	14	76	315	32	775	342	326	28	M63	1185
<b>315M - 65*</b>	508	114	622	700	525	457	559	216	65	M20	140	18	11	58	315	32	775	342	326	28	M63	1205
<b>315M - 85</b>	508	114	622	700	525	457	559	216	85	M20	170	22	14	76	315	32	775	342	326	28	M63	1235
<b>315L - 65*</b>	508	114	622	700	525	508	610	216	65	M20	140	18	11	58	315	32	775	342	326	28	M63	1255
<b>315L - 85</b>	508	114	622	700	525	508	610	216	85	M20	170	22	14	76	315	32	775	342	326	28	M63	1285
<b>315LX - 65*</b>	508	114	622	700	525	508	810	216	65	M20	140	18	11	58	315	32	775	342	326	28	M63	1455
<b>315LX - 85</b>	508	114	622	700	525	508	810	216	85	M20	170	22	14	76	315	32	775	342	326	28	M63	1485
<b>355L - 85*</b>	610	145	735	810	675	630	810	254	85	M20	170	22	14	76	355	40	845	530	550	28	BGP <sup>1)</sup>	1630
<b>355L - 110</b>	610	145	735	810	675	630	810	254	110	M20	210	28	16	100	355	40	845	530	500	28	BGP <sup>1)</sup>	1670
<b>355LX - 85*</b>	610	145	735	810	675	630	810	254	85	M20	170	22	14	76	355	40	845	530	500	28	BGP <sup>1)</sup>	1760
<b>355LX - 110</b>	610	145	735	810	675	630	810	254	110	M20	210	28	16	100	355	40	845	530	500	28	BGP <sup>1)</sup>	1800
<b>400L - 85*</b>	686	165	810	910	725	710	920	280	85	M20	170	22	14	76	400	45	935	530	500	35	BGP <sup>1)</sup>	1725
<b>400LX - 110</b>	686	165	810	910	725	710	920	280	110	M24	210	28	16	100	400	45	935	530	500	35	BGP <sup>1)</sup>	1765
<b>400LX - 85*</b>	686	165	810	910	725	710	920	280	85	M20	170	22	14	76	400	45	935	530	500	35	BGP <sup>1)</sup>	1805
<b>400LX - 110</b>	686	165	810	910	725	710	920	280	110	M24	210	28	16	100	400	45	935	530	500	35	BGP <sup>1)</sup>	1845

450 and 500 frame dimensions available from CMG on request.

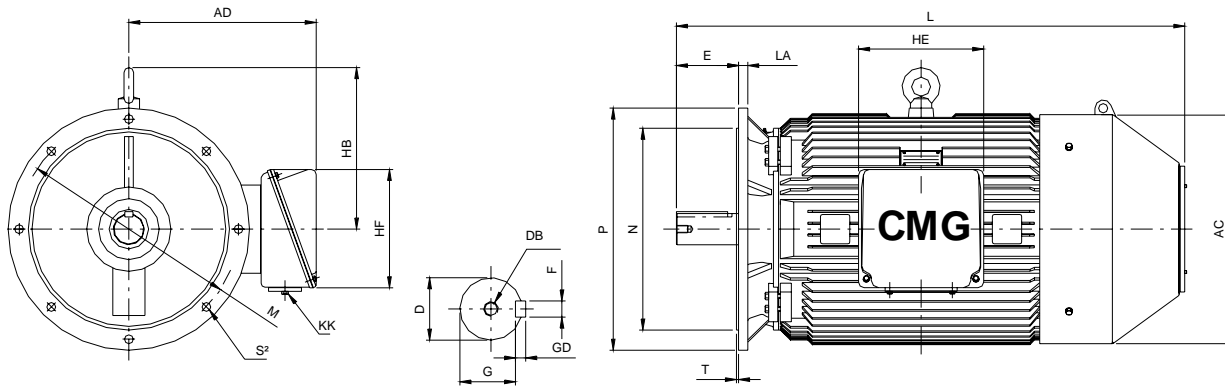
\* 2 pole motors only

<sup>1)</sup> BGP = Blank Gland Plate

<sup>2)</sup> Two conduit entries provided

# PPA (Australian/British kW/Frame Sizes)

## Flange mount B5 (IM3001)



Motor frame	AC	AD	D	DB	E	F	GD	G	HB	HE	HF	KK	L	LA	M	N	P	S <sup>3)</sup>	T
<b>80 - 19</b>	175	152	19	M6	40	6	6	15.5	130	134	121	M20 <sup>2)</sup>	340	12	165	130	200	12	3.5
<b>90S - 24</b>	185	158	24	M8	50	8	7	20	125	134	121	M20 <sup>2)</sup>	375	12	165	130	200	12	3.5
<b>90L - 24</b>	185	158	24	M8	50	8	7	20	125	134	121	M20 <sup>2)</sup>	400	12	165	130	200	12	3.5
<b>100L - 28</b>	220	186	28	M10	60	8	7	24	150	134	121	M20 <sup>2)</sup>	450	14	215	180	250	12	4
<b>112M - 28</b>	235	210	28	M10	60	8	7	24	155	160	171	M25	470	14	215	180	250	15	4
<b>132S - 38</b>	266	230	38	M12	80	10	8	33	183	160	171	M25	525	14	265	230	300	15	4
<b>132M - 38</b>	266	230	38	M12	80	10	8	33	183	160	171	M25	565	14	265	230	300	15	4
<b>160M - 42</b>	320	280	42	M16	110	12	8	37	220	238	223	M50	655	16	300	250	350	19	5
<b>160L - 42</b>	320	280	42	M16	110	12	8	37	220	238	223	M50	695	16	300	250	350	19	5
<b>180M - 48</b>	355	305	48	M16	110	14	9	42.5	240	238	223	M50	715	16	300	250	350	19	5
<b>180L - 48</b>	355	305	48	M16	110	14	9	42.5	240	238	223	M50	715	16	300	250	350	19	5
<b>200L - 55</b>	395	325	55	M20	110	16	10	49	270	238	223	M50	805	16	350	300	400	19	5
<b>225S - 60</b>	442	390	60	M20	140	18	11	53	300	342	326	M63	860	18	400	350	450	19	5
<b>225M - 55*</b>	442	390	55	M20	110	16	10	49	300	342	326	M63	855	18	400	350	450	19	5
<b>225M - 60</b>	442	390	60	M20	140	18	11	53	300	342	326	M63	885	18	400	350	450	19	5
<b>250S - 60*</b>	485	415	60	M20	140	18	11	53	330	342	326	M63	930	18	500	450	550	19	5
<b>250S - 70</b>	485	415	70	M20	140	20	12	62.5	330	342	326	M63	930	18	500	450	550	19	5
<b>250M - 60*</b>	485	415	60	M20	140	18	11	53	330	342	326	M63	965	18	500	450	550	19	5
<b>250M - 70</b>	485	415	70	M20	140	20	12	62.5	330	342	326	M63	965	18	500	450	550	19	5
<b>280S - 65*</b>	544	445	65	M20	140	18	11	58	380	342	326	M63	1035	18	500	450	550	19	5
<b>280S - 80</b>	544	445	80	M20	170	22	14	71	380	342	326	M63	1065	18	500	450	550	19	5
<b>280M - 65*</b>	544	445	65	M20	140	18	11	58	380	342	326	M63	1085	18	500	450	550	19	5
<b>280M - 80</b>	544	445	80	M50	170	22	14	71	380	342	326	M63	1115	18	500	450	550	19	5
<b>315S - 65*</b>	700	525	65	M20	140	18	11	58	460	342	326	M63	1155	25	600	550	660	24	6
<b>315S - 85</b>	700	525	85	M20	170	22	14	76	460	342	326	M63	1185	25	600	550	660	24	6
<b>315M - 65*</b>	700	525	65	M20	140	18	11	58	460	342	326	M63	1205	25	600	550	660	24	6
<b>315M - 85</b>	700	525	85	M20	170	22	14	76	460	342	326	M63	1235	25	600	550	660	24	6
<b>315L - 65*</b>	700	525	65	M20	140	18	11	58	460	342	326	M63	1255	25	600	550	660	24	6
<b>315L - 85</b>	700	525	85	M20	170	22	14	76	460	342	326	M63	1285	25	600	550	660	24	6
<b>315LX - 65*</b>	700	525	65	M20	140	18	11	58	460	342	326	M63	1455	25	600	550	660	24	6
<b>315LX - 85</b>	700	525	85	M20	170	22	14	76	460	342	326	M63	1485	25	600	550	660	24	6
<b>355L - 85*</b>	810	675	85	M20	170	22	14	76	490	530	500	BGP <sup>1)</sup>	1630	30	740	680	800	24	6
<b>355L - 110</b>	810	675	110	M24	210	28	16	100	490	530	500	BGP <sup>1)</sup>	1670	30	740	680	800	24	6
<b>355LX - 85*</b>	810	675	85	M20	170	22	14	76	490	530	500	BGP <sup>1)</sup>	1760	30	740	680	800	24	6
<b>355LX - 110</b>	810	675	110	M24	210	28	16	100	490	530	500	BGP <sup>1)</sup>	1800	30	740	680	800	24	6
<b>400L - 85*</b>	910	725	85	M20	170	22	14	76	535	530	500	BGP <sup>1)</sup>	1725	30	940	880	1000	28	6
<b>400L - 110</b>	910	725	110	M24	210	28	16	100	535	530	500	BGP <sup>1)</sup>	1765	30	940	880	1000	28	6
<b>400LX - 85*</b>	910	725	85	M20	170	22	14	76	535	530	500	BGP <sup>1)</sup>	1805	30	940	880	1000	28	6
<b>400LX - 110</b>	910	725	110	M24	210	28	16	100	535	530	500	BGP <sup>1)</sup>	1845	30	940	880	1000	28	6

450 and 500 frame dimensions available from CMG on request.

\* 2 pole motors only

<sup>1)</sup> BGP = Blank Gland Plate

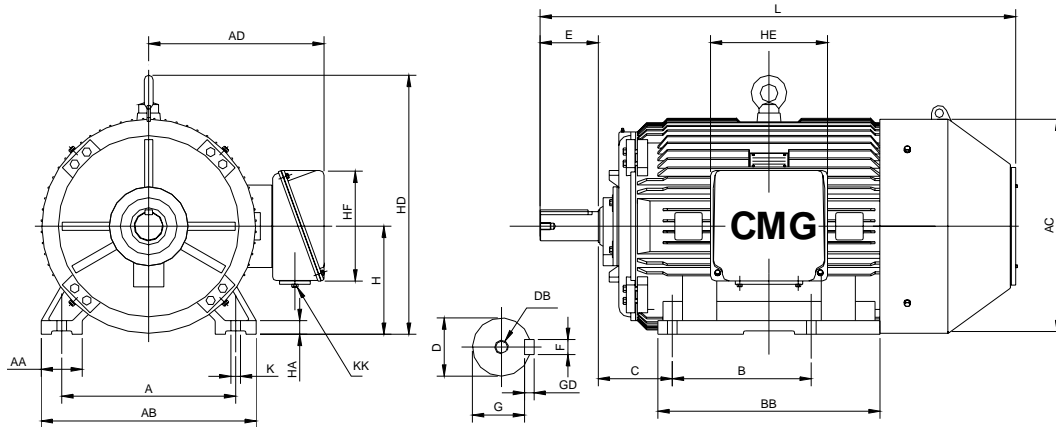
<sup>2)</sup> Two conduit entries provided

<sup>3)</sup> Mounting Holes: Frames 80 - 200 have 4 holes at 45° offset from top.

Frames 225 and above have 8 holes at 0° offset from top.

# Dimensional - PPC (CENELEC kW/Frame Sizes)

## Foot mount B3 (IM1001)



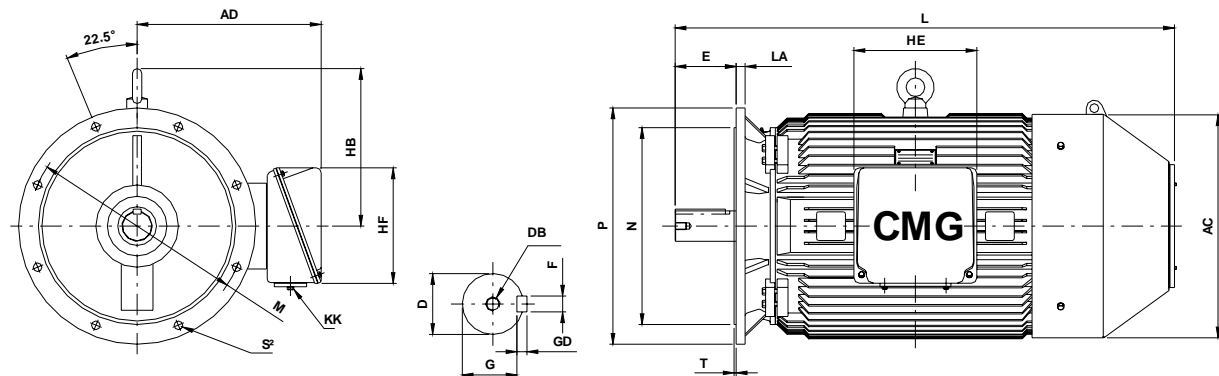
Motor frame	A	AA	AB	AC	AD	B	BB	C	D	DB	E	F	GD	G	H	HA	HD	HE	HF	K	KK	L
<b>80 - 19</b>	125	35	160	175	152	100	182	50	19	M6	40	6	6	15.5	80	10	210	134	121	10	M20 <sup>2)</sup>	340
<b>90S - 24</b>	140	40	180	185	158	100	196	56	24	M8	50	8	7	20	90	12	215	134	121	10	M20 <sup>2)</sup>	375
<b>90L - 24</b>	140	40	180	185	158	125	221	56	24	M8	50	8	7	20	90	12	215	134	121	10	M20 <sup>2)</sup>	400
<b>100L - 28</b>	160	40	200	220	186	140	235	63	28	M10	60	8	7	24	100	14	250	134	121	12	M20 <sup>2)</sup>	450
<b>112M - 28</b>	190	50	240	235	210	140	245	70	28	M10	60	8	7	24	112	15	270	160	171	12	M25	470
<b>132S - 38</b>	216	60	276	265	230	140	238	89	38	M12	80	10	8	33	132	18	315	160	171	12	M25	525
<b>132M - 38</b>	216	60	276	265	230	178	276	89	38	M12	80	10	8	33	132	18	315	160	171	12	M25	565
<b>160M - 42</b>	254	70	325	320	280	210	314	108	42	M16	110	12	8	37	160	20	380	238	223	15	M50	655
<b>160L - 42</b>	254	70	325	320	280	254	354	108	42	M16	110	12	8	37	160	20	380	238	223	15	M50	695
<b>180M - 48</b>	279	70	349	355	305	241	349	121	48	M16	110	14	9	42.5	180	22	420	238	223	15	M50	715
<b>180L - 48</b>	279	70	349	355	305	279	349	121	48	M16	110	14	9	42.5	180	22	420	238	223	15	M50	715
<b>200L - 55</b>	318	70	395	395	325	305	380	133	55	M20	110	16	10	49	200	25	470	238	223	19	M50	805
<b>225S - 60</b>	356	75	435	442	390	286	370	149	60	M20	140	18	11	53	225	25	525	342	326	19	M63	860
<b>225M - 55*</b>	356	75	435	442	390	311	395	149	55	M20	110	16	10	49	225	25	525	342	326	19	M63	855
<b>225M - 60</b>	356	75	435	442	390	311	395	149	60	M20	140	18	11	53	225	25	525	342	326	19	M63	885
<b>250M - 60*</b>	406	80	485	485	415	349	433	168	60	M20	140	18	11	53	250	30	580	342	326	24	M63	965
<b>250M - 65</b>	406	80	485	485	415	349	433	168	65	M20	140	18	11	58	250	30	580	342	326	24	M63	965
<b>280S - 65*</b>	457	85	550	544	445	368	530	190	65	M20	140	18	11	58	280	35	660	342	326	24	M63	1035
<b>280S - 75</b>	457	85	550	544	445	368	530	190	75	M20	140	20	12	67.5	280	35	660	342	326	24	M63	1035
<b>280M - 65*</b>	457	85	550	544	445	419	580	190	65	M20	140	18	11	58	280	35	660	342	326	24	M63	1085
<b>280M - 75</b>	457	85	550	544	445	419	580	190	75	M20	140	20	12	67.5	280	35	660	342	326	24	M63	1085
<b>315S - 65*</b>	508	114	622	700	525	406	508	216	65	M20	140	18	11	58	315	32	775	342	326	28	M63	1155
<b>315S - 80</b>	508	114	622	700	525	406	508	216	80	M20	170	22	14	71	315	32	775	342	326	28	M63	1185
<b>315M - 65*</b>	508	114	622	700	525	457	559	216	65	M20	140	18	11	58	315	32	775	342	326	28	M63	1205
<b>315M - 80</b>	508	114	622	700	525	457	559	216	80	M20	170	22	14	71	315	32	775	342	326	28	M63	1235
<b>315L - 65*</b>	508	114	622	700	525	508	610	216	65	M20	140	18	11	58	315	32	775	342	326	28	M63	1255
<b>315L - 80</b>	508	114	622	700	525	508	610	216	80	M20	170	22	14	71	315	32	775	342	326	28	M63	1285
<b>315LX - 65*</b>	508	114	622	700	525	508	610	216	65	M20	140	18	11	58	315	32	775	342	326	28	M63	1455
<b>315LX - 80</b>	508	114	622	700	525	508	610	216	80	M20	170	22	14	71	315	32	775	342	326	28	M63	1485
<b>355L - 80*</b>	610	145	735	810	675	630	810	254	80	M20	170	22	14	71	355	40	845	530	500	28	BGP <sup>1)</sup>	1603
<b>355L - 100</b>	610	145	735	810	675	630	810	254	100	M24	210	28	16	90	355	40	845	530	500	28	BGP <sup>1)</sup>	1670
<b>355LX - 80*</b>	610	145	735	810	675	630	810	254	80	M20	170	22	14	71	355	40	845	530	500	28	BGP <sup>1)</sup>	1760
<b>355LX - 100</b>	610	145	735	810	675	630	810	254	100	M24	210	28	16	90	355	40	845	530	500	28	BGP <sup>1)</sup>	1800

400 Frame and above available in PPA series only

<sup>2)</sup> pole motors only<sup>1)</sup> BGP = Blank Gland Plate<sup>2)</sup> Two conduit entries provided

# PPC (CENELEC kW/Frame Sizes)

## Flange mount B5 (IM3001)



Motor frame	AC	AD	D	DB	E	F	GD	G	HB	HE	HF	KK	L	LA	M	N	P	S <sup>3)</sup>	T
<b>80 - 19</b>	175	152	19	M6	40	6	6	15.5	130	134	121	M20 <sup>2)</sup>	340	12	165	130	200	12	3.5
<b>90S - 24</b>	185	158	24	M8	50	8	7	20	125	134	121	M20 <sup>2)</sup>	375	12	165	130	200	12	3.5
<b>90L - 24</b>	185	158	24	M8	50	8	7	20	125	134	121	M20 <sup>2)</sup>	400	12	165	130	200	12	3.5
<b>100L - 28</b>	220	186	28	M10	60	8	7	24	150	134	121	M20 <sup>2)</sup>	450	14	215	180	250	12	4
<b>112M - 28</b>	234	210	28	M10	60	8	7	24	155	160	171	M25	470	14	215	180	250	15	4
<b>132S - 38</b>	266	230	38	M12	80	10	8	33	183	160	171	M25	525	14	265	230	300	15	4
<b>132M - 38</b>	266	230	38	M12	80	10	8	33	183	160	171	M25	565	14	265	230	300	15	4
<b>160M - 42</b>	320	280	42	M16	110	12	8	37	220	238	223	M50	655	16	300	250	350	19	5
<b>160L - 42</b>	320	280	42	M16	110	12	8	37	220	238	223	M50	695	16	300	250	350	19	5
<b>180M - 48</b>	355	305	48	M16	110	14	9	42.5	240	238	223	M50	715	16	300	250	350	19	5
<b>180L - 48</b>	355	305	48	M16	110	14	9	42.5	240	238	223	M50	715	16	300	250	350	19	5
<b>200L - 55</b>	395	325	55	M20	110	16	10	49	270	238	223	M50	805	16	350	300	400	19	5
<b>225S - 60</b>	442	390	60	M20	140	18	11	53	300	342	326	M63	860	18	400	350	450	19	5
<b>225M - 55*</b>	442	390	55	M20	110	16	10	49	300	342	326	M63	855	18	400	350	450	19	5
<b>225M - 60</b>	442	390	60	M20	140	18	11	53	300	342	326	M63	885	18	400	350	450	19	5
<b>250M - 60*</b>	485	415	60	M20	140	18	11	53	330	342	326	M63	965	18	500	450	550	19	5
<b>250M - 65</b>	485	415	65	M20	140	18	11	58	330	342	326	M63	965	18	500	450	550	19	5
<b>280S - 65*</b>	544	445	65	M20	140	18	11	58	380	342	326	M63	1035	18	500	450	550	19	5
<b>280S - 75</b>	544	445	75	M20	140	20	12	67.5	380	342	326	M63	1035	18	500	450	550	19	5
<b>280M - 65*</b>	544	445	65	M20	140	18	11	58	380	342	326	M63	1085	18	500	450	550	19	5
<b>280M - 75</b>	544	445	75	M20	140	22	14	67.5	380	342	326	M63	1085	18	500	450	550	19	5
<b>315S - 65*</b>	700	525	65	M20	140	18	11	58	460	342	326	M63	1155	25	600	550	660	24	6
<b>315S - 80</b>	700	525	80	M20	170	22	14	71	460	342	326	M63	1185	25	600	550	660	24	6
<b>315M - 65*</b>	700	525	65	M20	140	18	11	58	460	342	326	M63	1205	25	600	550	660	24	6
<b>315M - 80</b>	700	525	80	M20	170	22	14	71	460	342	326	M63	1235	25	600	550	660	24	6
<b>315L - 65*</b>	700	525	65	M20	140	18	11	58	460	342	326	M63	1255	25	600	550	660	24	6
<b>315L - 80</b>	700	525	80	M20	170	22	14	71	460	342	326	M63	1285	25	600	550	660	24	6
<b>315LX - 65*</b>	700	525	65	M20	140	18	11	58	460	342	326	M63	1455	25	600	550	660	24	6
<b>315LX - 80</b>	700	525	80	M20	170	22	14	71	460	342	326	M63	1485	25	600	550	660	24	6
<b>355L - 80*</b>	810	675	80	M20	170	22	14	71	490	530	500	BGP <sup>1)</sup>	1630	30	740	680	800	24	6
<b>355L - 100</b>	810	675	100	M24	210	28	16	90	490	530	500	BGP <sup>1)</sup>	1670	30	740	680	800	24	6
<b>355LX - 80*</b>	810	675	80	M20	170	22	14	71	490	530	500	BGP <sup>1)</sup>	1760	30	740	680	800	24	6
<b>355LX - 100</b>	810	675	100	M24	210	28	16	90	490	530	500	BGP <sup>1)</sup>	1800	30	740	680	800	24	6

400 Frame and above available in PPA series only

\* 2 pole motors only

<sup>1)</sup> BGP = Blank Gland Plate<sup>2)</sup> Two conduit entries provided.<sup>3)</sup> Mounting Holes: Frames 80 - 200 have 4 holes at 45° offset from top

Frames 225 and above have 8 holes at 22.5° offset from top

# Motors for hazardous areas – PPAE/PPAN/PPAD

Motors used within a hazardous location require a higher level of protection against the risk of harmful occurrences. CMG PPA motors are available in the three most common high protection configurations, Ex e, Ex n and DIP, supplied with protection ratings of IP66. PPA Hazardous area motors are available in motor frame sizes 80 to 400.

Combinations of protection such as Ex e and DIP or Ex n and DIP are also available.

## Australian Standards

AS/NZS 2381.1 : 1999 specify general requirements for the selection of electrical equipment, and its installation and maintenance to ensure safe use in areas where flammable materials are generated, prepared, processed, handled, stored or otherwise used, and which are therefore potentially hazardous.

The term 'flammable material' includes gas, vapors, liquids, mists, solids and dusts, but does not include those materials which are specifically manufactured as explosives or materials which are inherently explosive.

The requirements of the listed standards apply only to the use of electrical equipment under normal or near normal atmospheric conditions. The requirements specified for hazardous location electrical equipment are supplementary to and not alternative to any requirements which would apply to equipment and installations in non-hazardous areas. (See AS3000-2000).

## Paint

The standard paint colours for PPA hazardous location motors are:

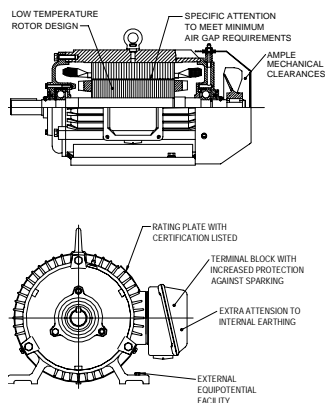
PPA E (Ex e)	Golden Yellow (RAL 1033)
PPA N (Ex n)	Brown (RAL 8015)
PPA D (DIP)	Brown (RAL 8015)

## Motor protection types

### PPAE – Ex e - Range 0.55kW to 630kW

Ex e motor protection designates **Increased safety** as outlined in AS2380.6-1988.

The increased safety (Ex e) type of protection describes electrical equipment that does not produce arcs or sparks in normal service in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks.



Increased safety (Ex e) motors are suitable for Class I, Zone 1, Group IIA,B&C hazardous areas, and CMG provides for a temperature class of T3 (200°C) in a 50°C ambient.

### Ex e Protection - ( $t_E$ time)

$T_E$  time is the time it takes for the stator winding or rotor cage to heat up from normal operating temperature, at the highest permitted ambient temperature, to the highest permitted limit temperature (temperature class), with the rotor locked and the stator winding loaded with the starting current.

For selection and setting of suitable current dependent protection the  $t_E$  time and the ratio of locked rotor current to nominal current are used. In the case of a rotor locking, this device must cut off the supply within the specified  $t_E$  time, which is listed in the performance data.

### PPAN – Ex n – Range 0.55kW to 630kW

Ex n motor protection designates **Non-sparking** as outlined in AS2380.9-1991.

The non-sparking (Ex n) type of protection describes electrical equipment that, in normal operation, is not capable of igniting a surrounding explosive atmosphere, and a fault capable of causing ignition is not likely to occur.

Non-sparking (Ex n) motors are suitable for Class I, Zone 2, Group IIA,B&C hazardous areas, and CMG provides for a temperature class of T3 (200°C) in a 60°C ambient.

### PPAD – DIP – Range 0.55kW to 630kW

DIP motor protection designates **Dust-excluding Ignition Proofing** as outlined in AS/NZS61241.1.1:1999.

The Dust-excluding ignition proofing (DIP) type of protection describes electrical equipment which is enclosed so that it excludes dust, and which will not permit arcs, sparks or heat otherwise generated or liberated inside the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specific dust on or in the vicinity of the enclosure.

Dust-excluding ignition proofed (DIP) motors are suitable for dust laden hazardous areas, and CMG provides for a temperature class of T4 (135°C) in a 50°C ambient.

## Hazardous area classifications

Hazardous areas fall into two classes: hazards due to flammable gases (vapors or mists) and hazards due to combustible dusts (fibres or flyings), Class I, Zones I, II and A21 respectively, and are briefly explained below.

### Gaseous Hazards – Class I

Class I hazards are specified by Zone and Group.

The word 'Zone' is internationally accepted as indicating the probability of the presence of a flammable, combustible or explosive material, and the extent, dimension and shape of the hazardous area and the volume in which the hazardous material can be expected.

AS2430.1-1987 defines three zones:

Zone 0 – an area in which an explosive gas atmosphere is present continuously, or is present for long periods.

Zone 1 – an area in which an explosive gas atmosphere is likely to occur in normal operation.

Zone 2 – an area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only.

Groups are defined as follows:

Group I – coal mining (methane)

Group II – other industries

High surface temperatures can cause ignition of flammable gases or vapors therefore the surface temperature of equipment in hazardous areas must not exceed the ignition temperature of these gases or vapors.

Group I electrical equipment may not have a surface temperature that exceeds 150°C where coal dust can form a layer, and 450°C for internal surfaces where the above risk is avoided by sealing against ingress or dust.

Group II electrical equipment may not have a surface temperature that exceeds its specified temperature class, as listed in the table below.

Temperature class of electrical equipment	Maximum surface temperature of electrical equipment	Ignition temperature of gas or vapor
T1	≤450°C	> 450°C
T2	≤300°C	> 300°C
T3	≤200°C	> 200°C
T4	≤135°C	> 135°C
T5	≤100°C	> 100°C
T6	≤85°C	> 85°C

Group specification and characteristics of some common flammable liquids, gases and vapors are listed in the table below.

Material	Boiling point [°C]	Flash point [°C]	Ignition temp. [°C]	Gas group
Acetone	56	-20	465	IIA
Acetylene	-83	Gas	305	IIC
Ammonia	-33	Gas	651	IIA
Benzene	80	12	498	IIA
Butane	-1	Gas	287	IIA
Carbon monoxide	-192	Gas	609	IIA
Ethane	-89	Gas	472	IIA
Ethyl alcohol	78	55	363	IIA
Ethylene	-104	Gas	450	IIB
Heptane	98	-4	204	IIA
Hydrogen	-252	Gas	500	IIC
Hydrogen cyanide	26	-18	538	IIB
Methane	-162	Gas	537	IIA
Propane	-42	Gas	432	IIA
Toluene	111	4	480	IIA

Note the data given in this table is derived from NFPA 325M. Flashpoint is the lowest temperature at which a material gives off sufficient vapor to form an explosive gas/air mixture in the air immediately above the surface.

Equipment within a specific group may only be used within a location with an equal or less level of hazard. Allowable groups are summarized in the table below.

Gas group	Allowable Equipment group
IIA	IIA, IIB, IIC
IIB	IIB, IIC
IIC	IIC

### Particle Hazards – DIP

Dust areas cannot be divided into normal and abnormal conditions dependent upon time like gases and vapours since the accumulation of dust, unlike gas, is not self-correcting by ventilation over a period of time.

Combustible dusts, fibres or flyings are delineated in AS/NZS61241.3:1999 as follows:

- Electrically conductive dusts – Areas in which combustible dusts, fibres or flyings of an electrically conductive nature are present, regardless of particle size, with electrical resistivity  $\leq 10^3 \Omega \text{ m}$ .
- Electrically non-conductive dusts – Areas in which electrically non-conductive combustible dusts, fibres or flyings of such fineness as to be capable of producing explosive mixtures when suspended in the air.

It should be noted that the distinction between these two types does not affect the selection of equipment for dust areas.

The following table summarizes the relationship between temperature class, surface temperature and cloud or layer ignition temperature (whichever is the lower).

Temperature class of electrical equipment	Maximum surface temperature of electrical equipment	Cloud or layer ignition temperature of dust
T1	≤450°C	≥500°C
T2	≤300°C	≥350°C
T3	≤200°C	≥250°C
T4	≤135°C	≥185°C
T5	≤100°C	≥150°C
T6	≤85°C	≥135°C

Specifications and characteristics of some common combustible dusts are listed in the table below.

Material	Minimum ignition energy [mJ]	Ignition temperature	
		Cloud [°C]	Layer [°C]
Aluminium	15	550	740
Cellulose	80	480	270
Corn	40	400	250
Flax	80	230	430
Polypropylene	30	420	-
Rayon	2400	520	250
Rice	50	440	220
Rubber (synthetic)	30	320	-
Sugar	30	370	400
Wheat flour	50	380	360

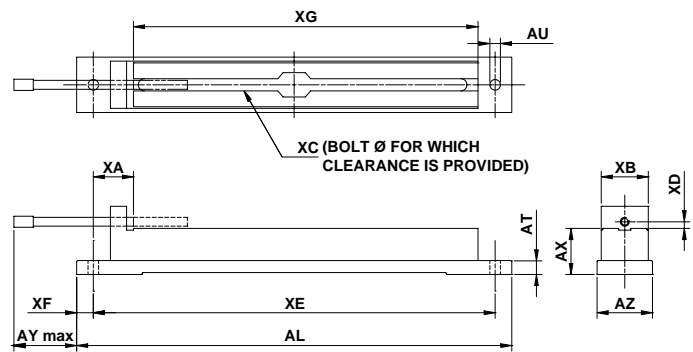
# Slide rails

Slide rails are designed for motor position adjustment. Applications include tension adjustment for belt driven equipment.

CMG stock slide rails to suit frame sizes 80 to 355.

Rail sets are manufactured from cast iron and provided with mounting bolts and nuts between motor and rail.

Dimensional specifications for the range are set out in the accompanying table



Slide rail Product Code	To suit motor frame	Dimensions [mm]													Weight per set [kg]
		AL	AT	AU	AX	AY	AZ	XA	XB	XC	XD	XE	XF	XG	
MR 080 090	<b>80 / 90</b>	375	18	25x 13	30	70	48	40	46	8	10	325	25	240	3.5
MR 100 132	<b>100 / 112 / 132</b>	480	19	30x 14	37	115	70	45	67	10	10	430	25	335	7
MR 160 180	<b>160 / 180</b>	570	19	35x 18	48	100	72	60	68	12	11	520	25	390	15
MR 200 225	<b>200 / 225</b>	790	32	20x 20	60	180	90	60	86	16	16	730	30	605	35
MR 250 280	<b>250 / 280</b>	940	38	22x 22	72	230	100	65	95	20	16	870	35	725	60
MR 315 355	<b>315 / 355</b>	1215	40	30x 30	125	275	122	105	116	24	20	1115	50	915	85

## Optional extras

### VVVF drives

The PPA motor performs excellently without cogging at low speed when operating in conjunction with a VVVF (Variable Voltage Variable Frequency) Drive.

Two types of VVVF drives kit are available for the PPA range.

#### VVVF drive kit A

Separately driven cooling fan should be used when the motor speed is required to be reduced below 30Hz in constant torque mode. For centrifugal fan or pump, no separate cooling fan is required. For all other loads refer to the loadability curve in the section on VVVF Drives.

#### VVVF drive kit B1 – Standard Motor

Incorporates a single insulated bearing – normally at the non-drive end. It is designed to remove the effect of electrical discharge in the bearings and is available for all frames 315 and larger. CMG recommends it be used for motors of 200kW and above when connected to VVVF drives.

#### VVVF drive kit B2 – Hazardous location motors

In hazardous locations earthing brushes are not permitted. In this case two insulated bearings should be fitted.

### Dust shields

For use in very dusty environments, shields are available manufactured from either stainless steel or fibreglass. These shields are fitted over the motor in the IM 1001, 2001 or 3001 (horizontal mounted) position and prevent the ribs of the motor from clogging with dust.

### Vertical hoods

PPA motors have, as standard, IP66 protection and therefore rain hoods for motors mounted vertically shaft down are not required. However, where additional protection from solids in the atmosphere is required hoods can be fitted.

### Special shafts

Special shafts for the full PPA range are available upon request. Special shafts, including double shaft extension, stainless steel, and customer specific are available on request.

### Special labels

Additional identification and warning labels in stainless steel (unless otherwise specified) can be fitted to this PPA range, these include:

- ☐ Equipment number labels
- ☐ Direction of Rotation (Arrow)
- ☐ Phasing labels
- ☐ RTD labels
- ☐ Lubrication instruction labels

### Bearing RTDs

In addition to the winding RTD's previously described in this catalogue, bearing RTD's (one per bearing) are available as an option on the full PPA range. These RTD's would be terminated in the winding RTD terminal box or alternatively their own auxiliary box.

### Chemical environments

Where the motor is to be installed in harsh chemical conditions optional surface treatment are available to protect against acid and alkaline splashing.

In addition to these surface systems we are able to supply stainless steel hardware (nuts, bolts and screws) plus inlet fan grills manufactured from stainless steel.

The optional extras shown in this section does not represent the total range available. Please refer to CMG for your requirements.

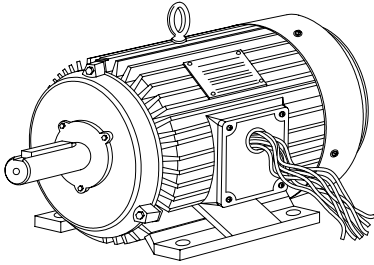
# Modifications and variations

## Terminal box

PPA motors come as standard with a terminal box on the right hand side viewed from drive end.

The following alternatives are available:

- Left hand terminal box – **PPAL**
- Removed terminal box (fitted with a blanking plate and threaded conduit entry. Extended leads, including earth connector).



## Bearings

CMG can address applications where bearings need special consideration. Attention may need to be given to the following:

- Bearing monitors
- Alternative bearing types
- Low/high temperature bearing grease
- Oil seals
- Non contact labyrinth seals
- Insulated bearings

## Shafts

PPA motors come standard with a single output shaft to Australian standard dimensions. The following alternatives are available:

- Double shaft extension
- Special shaft extension
- Stainless steel shaft material type
- Reduced shafts for geared motors

## Environmental considerations

Where environmental factors need special consideration CMG can provide the following modifications:

- Winding temperature monitors
- Anti-condensation heaters on motors below frame 250
- Separately driven cooling fans
- Tropic proofing
- Special paint finish

## Accessories

Accessories available for CMG PPA motors include:

- Slide rails (refer previous page)
- VVVF drives
- Alternative paint colors
- Rain cowls
- Uni-directional and bi-directional low-noise fans
- Coal/dust shields

## Testing services

CMG can provide both type test certificates and individual motor test reports on any CMG SGA motor. Testing is carried out by CMG Technology Pty Ltd in our own NATA accredited test laboratory



# PPA Motor Installation and Maintenance

The CMG PPA series motor is designed and manufactured to be robust and reliable for minimal maintenance. The following items should be taken into consideration to ensure a trouble free installation and reliable running throughout the motor's life.

## Inspection

On receipt of the motor check the following:

- ☐ rating plate details and enclosure are as ordered
- ☐ shaft turns freely (in absence of shaft locking clamp)
- ☐ motor was not damaged during transport
- ☐ condensation drain holes are in the correct position for the motor mounting application (They should be located at the lowest point of the motor when it is in its operating position.)
- ☐ If the winding is meggered to earth, ensure that the thermal protectors are not inadvertently damaged. (The thermistor leads should be shorted together whilst meggering takes place)

## Storage

When the motor is not for immediate use store as follows:

- ☐ Clean location
- ☐ Dry location
- ☐ Free from vibration (vibration can damage bearings)
- ☐ Shaft locking clamps, where supplied, are fitted securely.
- ☐ Anti-condensation heaters, where fitted, should be energised if the environment is likely to be damp

## Installation

The following items should be considered on installation to ensure motor reliability:

### Surroundings

Ensure that the motor is properly protected against ingress of oil, water or dust if construction work is in progress around the motor.

### Shaft locking clamp

Motors 200 frame and above are fitted with a shaft-locking clamp. The clamp should remain fitted for as long as possible, preferably until the motor is put into service. Motors that are likely to remain stationary for lengthy periods should have locking clamps refitted. Shaft-locking clamps stop axial movement of the rotor assembly caused by vibration. This causes a phenomenon known as "false brinelling", which eventually leads to premature bearing failure particularly where roller bearings are fitted.

### Pulleys and couplings

- ☐ Pulleys and couplings should be machined to H7 limits. Both shaft and bore should be cleaned and lubricated. If the fit is still too tight the pulley or coupling should be heated up in air or oil to approximately 93°C.
- ☐ Shock methods must not be used in removing pulleys and couplings. Proper wheel or pulley removers should be used to prevent shaft and bearing damage.
- ☐ Pulleys and couplings should be balanced before the keyway is cut to eliminate vibration caused by lack of

balancing. (Rotor and shaft assemblies have been finely balance during manufacture, and drive end shafts balanced with a **half key**.)

- ☐ When slide rails are used in conjunction with pulley drives the adjusting screw ends should be positioned between the motor and load at drive shaft end and the other diagonally opposite. This helps speedy and accurate belt aligning, tensioning and replacement.

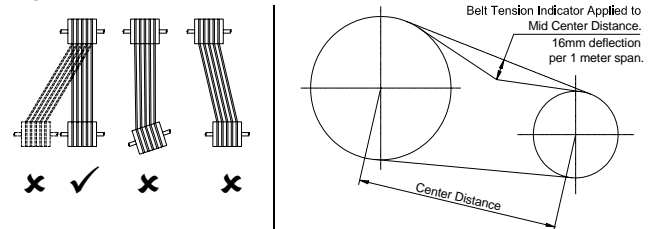
### Shafts and keys

Shafts are machined to AS1359.10-1985 dimensions.

Shaft Dia.	Tolerance		Length	Key Size	Seat
19	+0.009	-0.004	40	6 x 6 x 25	15.5
24	+0.009	-0.004	50	8 x 7 x 32	20
28	+0.009	0.004	60	8 x 7 x 40	24
38	+0.018	+0.002	80	10 x 18 x 56	33
42	+0.018	+0.002	110	12 x 8 x 80	37.0
48	+0.018	+0.002	110	14 x 9 x 80	42.5
55	+0.030	+0.011	110	16 x 10 x 80	49.0
60	+0.030	+0.011	140	18 x 11 x 110	53.0
65	+0.030	+0.011	140	18 x 11 x 110	58.0
70	+0.030	+0.011	140	20 x 12 x 110	62.5
75	+0.030	+0.011	140	20 x 12 x 110	67.5
80	+0.030	+0.011	170	22 x 14 x 140	71.0
85	+0.035	+0.013	170	22 x 14 x 140	76.0
110	+0.035	+0.013	210	28 x 16 x 160	100

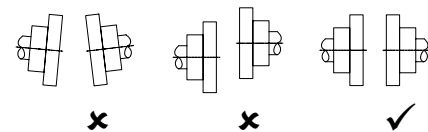
### Belt Drives

The belt manufacturer's recommendations for installation, alignment and tensioning must be strictly adhered to when fitting belt drives.



### Direct Coupling

Care must be taken in checking alignment of driving and driven shafts. The motor and driven equipment must be in alignment from all aspects.



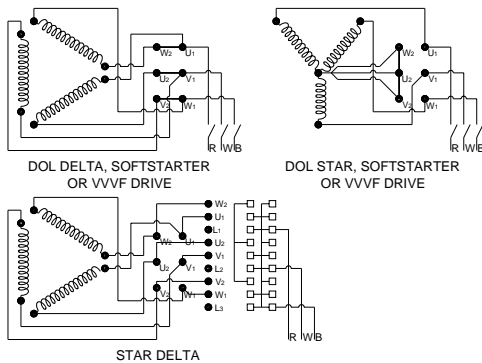
**WARNING: Misalignment of pulleys will lead to premature bearing failure**

### Connection

Up to and including 3kW 240volt Delta / 415 Volt Star.  
From 4kW up to 630kW 415 volt Delta / 720 volt Star.  
Motors above 630kW 690 volt Delta.

All PPA motors are suitable for both 415 Volt DOL operation and for use with 415 Volt three phase variable frequency drives. 3kW and below can also be used with 240V three phase variable frequency drives. Alternatively 415 Volt Delta connected motors can be operated DOL in the star configuration with a 720/690 Volt supply or with a 720/690 Volt variable frequency drive. In this latter case

the drive must be supplied with an output reactor to protect the winding insulation.



Where special windings are supplied, a separate connection diagram will be supplied with the motor.

All motors are provided with suitable earthing studs.

#### Running current check

Check the running current of the motor on no load and full load.

## Basic maintenance

### Bearings

When re-greasing motors ensure that the correct type of grease is used. If in doubt about the existing grease type, clean out old grease thoroughly from bearings and bearing housings, prior to regreasing.

#### **WARNING: Never Mix Grease Types**

#### Grease Replenishment

The addition of fresh grease, to renew the original charge, must be made at a regular intervals.

PPA motors with frames 80 to 100 are fitted with sealed bearing housing (non regreaseable).

Thru-flushing Grease valves are fitted to all PPA motors. For frames 112 and above replenishment should be carried out whilst the motor is running. The rotating slinger expels excess grease through an exhaust port in the bearing cap ensuring the correct level of fresh grease is maintained in the bearing housing. See the table for bearing relubrication volumes.

#### Grease Packing

##### **Assembly**

The Thru-flushing Grease Valve operates automatically and cannot be overgreased. This feature eliminates problems associated with overpacking as any excess will be expelled from the housing as the motor operates. (Overpacking can cause churning and over-heating which may result in breakdown of the grease and leakage from the housing. Too little grease can result in dry running and cage wear.)

##### **Bearing**

The bearing itself should always be packed as full as possible, working the grease thoroughly into the bearing parts in order to ensure proper lubrication immediately upon starting.

##### **Bearing caps**

The most convenient way of packing bearing caps is to fill the inner-bearing cap completely and the outer bearing cap to one third of its capacity, preferably on the opposite side to the exhaust port.

#### Dismantling

If a motor is dismantled, cover the bearings with plastic sheet or clean lint free rag to prevent ingress of foreign matter. Never use cotton waste.

#### Removing and Fitting Bearings

If bearings are removed they should be renewed, not refitted. Proper drawing and fitting equipment must be used when removing bearings as the bearings are interference fit on the shaft. Replacement bearings must be the correct size and have the correct internal clearance grade. See the table for bearing sizes and clearances.

#### Recommended Greases Types

##### **General Purpose Grease (standard)**

- ☐ Lithium Hydroxy-stearate grease
- ☐ NLGI consistency No. 3
- ☐ Operating temp. -35°C to +120°C
- ☐ High oxidation resistance
- ☐ Retains consistency after extreme periods of service
- ☐ Contains effective rust inhibitors
- ☐ Shell Alvania No. 3 or equivalent.

##### **High Temperature Grease (optional)**

- ☐ Teflon base with mineral oils
- ☐ Operating temp. -10°C to +260°C.
- ☐ Non melting with high oxidation resistance
- ☐ Retains consistency
- ☐ Contains rust inhibitors
- ☐ Magnalube G or equivalent.

### Current

Check periodically that the current drawn is balanced and is the same as at the time of installation.

### Cable Terminations

Cable terminations should have all incoming supply leads compressed between two nuts, locked with a locking nut.

Other combinations may cause overheating due to high resistance joints.

#### **WARNING: The Correct Clearance Between Live Parts Should Be Maintained**

### Thermal Protection Devices

#### Standard

One set (3) of PTC Thermistors are embedded in the head windings and the leads brought out to an auxiliary terminal box, as standard for all PPA motors.

#### Optional

Other thermal protection devices may be optionally fitted, including Resistance Temperature Detectors (RTD's), additional sets of PTC Thermistors or Bi-metal temperature monitors.

#### **WARNING: DO NOT APPLY MORE THAN 2.5 VOLTS ACROSS ANY PROTECTION DEVICE**

#### Insulation testing

When checking for insulation resistance (IR) the test voltage must not be applied across the protection device. The correct procedure is to short the entire protector leads together and apply the test voltage between the shorted leads and earth and/or phases. "Meggering" across the terminals of the device, when not shorted, is likely to cause irreparable damage, and must not be carried out.

Table 1: Bearing Size and Relubrication data

Standard Bearings					Optional Bearings							
Drive End (Ball bearing)					Drive End (Roller bearing)							
Frame Size	No.	Bearing Size	Relubrication		No.	Bearing Size	Relubrication		No.	Bearing Size	Relubrication	
			Grease Volume (grams)	Interval (Hours)			Grease Volume (grams)	Interval (Hours)			Grease Volume (grams)	Interval (Hours)
3000 r/min = 2 Pole												
112	6306	30 x 72 x 19	7	9000	6306	30 x 72 x 19	7	9000				
132	6308	40 x 90 x 23	11	7500	6308	40 x 90 x 23	11	7500				
160	6309	45 x 100 x 25	13	6500	6309	45 x 100 x 25	13	6500				
180	6310	50 x 110 x 27	15	6000	6310	50 x 110 x 27	15	6500				
200	6312	60 x 130 x 31	20	5000	6312	60 x 130 x 31	20	5000				
225	6313	65 x 140 x 33	23	4800	6313	65 x 140 x 33	23	4800				
250	6313	65 X 140 X 33	30	4200	6313	65 x 140 x 33	23	4800				
280	6314	70 X 150 X 35	37	2500	6314	70 x 150 x 35	26	4000				
315	6316	80 x 170 x 39	41	2000	6316	80 x 170 x 39	41	2000				
355	6318	90 x 190 x 43	41	2000	6318	90 x 190 x 43	41	2000				
400	6318	90 x 190 x 43	41	2000	6318	90 x 190 x 43	41	2000				
1500 r/min = 4 Pole												
112	6306	30 x 72 x 19	7	12000	6306	30 x 72 x 19	7	12000	NU 306	30 x 72 x 19	7	11000
132	6308	40 x 90 x 23	11	11000	6308	40 x 90 x 23	11	11000	NU 308	40 x 90 x 23	11	9500
160	6309	45 x 100 x 25	13	11000	6309	45 x 100 x 25	13	11000	NU 309	45 x 100 x 25	13	8500
180	6310	50 x 110 x 27	15	10500	6310	50 x 110 x 27	15	11000	NU 310	50 x 110 x 27	15	8500
200	6312	60 x 130 x 31	20	10000	6312	60 x 130 x 31	20	10000	NU 312	60 x 130 x 31	20	6000
225	6313	65 x 140 x 33	23	9500	6313	65 x 140 x 33	23	9500	NU 313	65 x 140 x 33	23	7000
250	6315	75 X 160 X 37	30	9100	6313	65 x 140 x 33	23	9500	NU 315	75 X 160 X 37	30	7000
280	6317	85 X 180 X 41	37	8900	6314	70 x 150 x 35	26	8900	NU 317	85 X 180 X 41	37	6800
315	NU 318	90 x 190 x 43	41	6500	6316	80 x 170 x 39	41	7000				
355	NU 324	120 x 260 x 55	72	4000	6324	120 x 260 x 55	72	7000				
400	NU 326	130 x 280 x 58	81	3500	6326	130 x 280 x 58	81	6200				
1000 r/min = 6 Pole												
112	6306	30 x 72 x 19	7	17000	6306	30 x 72 x 19	7	17000	NU 306	30 x 72 x 19	7	14000
132	6308	40 x 90 x 23	11	15000	6308	40 x 90 x 23	11	15000	NU 308	40 x 90 x 23	11	11000
160	6309	45 x 100 x 25	13	14000	6309	45 x 100 x 25	13	14000	NU 309	45 x 100 x 25	13	8500
180	6310	50 x 110 x 27	15	14000	6310	50 x 110 x 27	15	14000	NU 310	50 x 110 x 27	15	8500
200	6312	60 x 130 x 31	20	14000	6312	60 x 130 x 31	20	14000	NU 312	60 x 130 x 31	20	6000
225	6313	65 x 140 x 33	23	13500	6313	65 x 140 x 33	23	13500	NU 313	65 x 140 x 33	23	7000
250	6315	75 X 160 X 37	30	13000	6313	65 x 140 x 33	23	13500	NU 315	75 X 160 X 37	30	7000
280	6317	85 X 180 X 41	37	12500	6314	70 x 150 x 35	26	12500	NU 317	85 X 180 X 41	37	6800
315	NU 318	90 x 190 x 43	41	9500	6316	80 x 170 x 39	41	10000				
355	NU 324	120 x 260 x 55	72	8000	6324	120 x 260 x 55	72	7000				
400	NU 326	130 x 280 x 58	81	7000	6326	130 x 280 x 58	81	6200				
750 r/min = 8 Pole												
112	6306	30 x 72 x 19	7	20000	6306	30 x 72 x 19	7	20000	NU 306	30 x 72 x 19	7	17000
132	6308	40 x 90 x 23	11	17000	6308	40 x 90 x 23	11	17000	NU 308	40 x 90 x 23	11	13000
160	6309	45 x 100 x 25	13	16000	6309	45 x 100 x 25	13	16000	NU 309	45 x 100 x 25	13	8500
180	6310	50 x 110 x 27	15	15500	6310	50 x 110 x 27	15	16000	NU 310	50 x 110 x 27	15	8500
200	6312	60 x 130 x 31	20	15000	6312	60 x 130 x 31	20	15000	NU 312	60 x 130 x 31	20	6000
225	6313	65 x 140 x 33	23	15000	6313	65 x 140 x 33	23	15000	NU 313	65 x 140 x 33	23	7000
250	6315	75 X 160 X 37	30	14500	6313	65 x 140 x 33	23	15000	NU 315	75 X 160 X 37	30	7000
280	6317	85 X 180 X 41	37	14000	6314	70 x 150 x 35	26	14000	NU 317	85 X 180 X 41	37	6800
315	NU 318	90 x 190 x 43	41	13000	6316	80 x 170 x 39	41	13000				
355	NU 324	120 x 260 x 55	72	10000	6324	120 x 260 x 55	72	7000				
400	NU 326	130 x 280 x 58	81	9000	6326	130 x 280 x 58	81	6200				

Note 1 : The bearings fitted to 80, 90 & 100 frames are greased for life. For these bearing sizes, refer to the table listed on page 7.

Note 2: For data relating to 450 & 500 frames refer CMG.

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## non-metallic conduit & fittings

With over 21 different non metallic conduit systems to choose from we are sure to have a system to meet your application. Systems are available in a wide variety of sizes, ranging from 10mm up to 106mm, manufactured from a range of materials offering different properties.

### Key features

- Wide range of sizes
- Light weight
- Easy to cut
- High fatigue life
- Superior IP ratings - up to IP69K
- Slit versions available
- Non corrosive
- Highly flexible

### Key benefits

- Suitable for a wide range of applications
- Easy to work with for ease of installation
- Reduced installation times
- Reduced whole life costs
- No risk of water or dust ingress
- Suitable for retrofit applications
- Suitable for diverse environments
- Movement without any impact on performance



### NON-METALLIC SYSTEMS

[Selection & application guide](#)[FPA ANIMATION](#)[Fittings overview](#)

# Thomas & Betts

## SSG Cable Gland

### GENERAL PURPOSE STAINLESS STEEL CABLE GLANDS

Thomas & Betts Stainless Steel Cable Glands are high quality glands designed for use in severe environments. Made from 316 grade stainless steel, each gland features a wide cable diameter range and IP65 protection.

#### Applications

Indoor and outdoor use in harsh environments

#### Standards

AS 1939 - 1990

#### Function

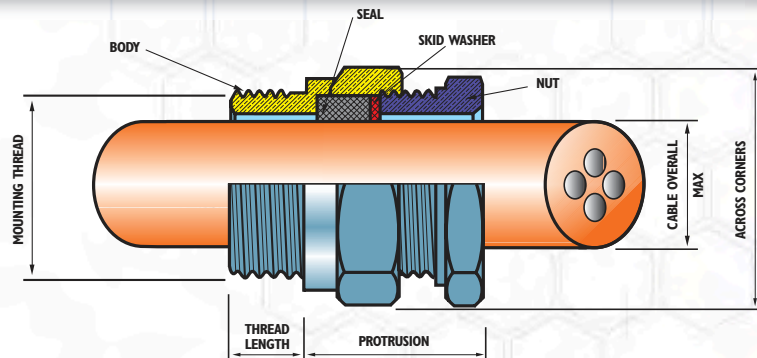
Provides seal on cable sheath

#### Protection Class

IP65

#### Construction

Body and compression nut  
316 Stainless Steel



Part Number	Mounting Thread		Cable Acceptance Details		Across Corners (mm)	Pack Qty
	Size (mm)	Length (mm)	Overall Diameter			
			Min (mm)	Max (mm)		
SSG-16-8	M16x1.5	10	3.5	8.4	22	50
SSG-20-11	M20x1.5	10	6.4	11.5	22	25
SSG-20-16	M20x1.5	12	11	16.3	27.5	25
SSG-25	M25x1.5	12	15	21	32	25
SSG-32	M32x1.5	12	19	27.7	40	10

Product specifications may change at any time without notice.

# Thomas & Betts

## EMC Cable Gland

### CABLE GLAND FOR EMC SCREENED CABLE

Thomas & Betts EMC Cable Glands are high quality glands designed for use with EMC screened cables using a garter spring to earth the screen. EMC glands can also be used with Belden Armoured Cables.

#### Applications

Indoor and outdoor use with EMC screened cables

#### Function

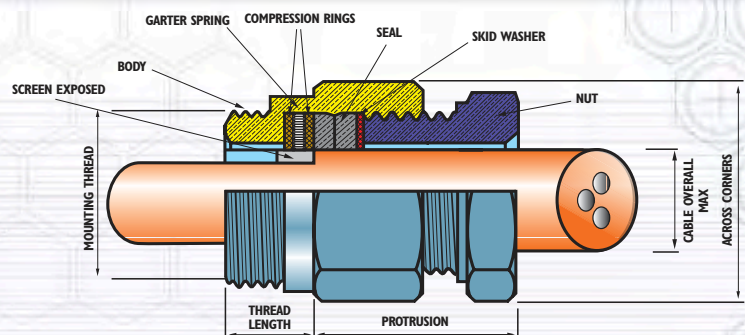
Provides seal on cable sheath and earthing of screen

#### Protection Class

IP65

#### Construction

Body and compression nut  
Nickel plated brass,



#### Fitting Instructions

1. Screw the gland body into the apparatus.
2. Measure the length of tails required and add about 15 mm to this point.
3. Strip the outer sheath.
4. Cut the screen so that approx 15mm is exposed.
5. Pass the cable through the gland and ensure that the exposed screen aligns with the garter spring.
5. Tighten gland nut so that the seal grips firmly onto the cable.

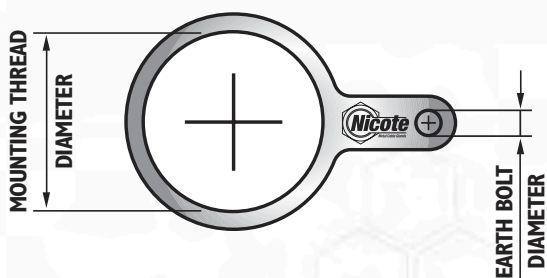
Part Number	Mounting Thread		Cable Acceptance Details		Across Corners (mm)	Pack Qty
	Size (mm)	Length (mm)	Overall Diameter			
			Min (mm)	Max (mm)		
SCG-20-10	M20x1.5	10	6.5	10	22	25
SSG-20-13	M20x1.5	10	10	13.5	28	25

Product specifications may change at any time without notice.

# Cable Gland Accessories

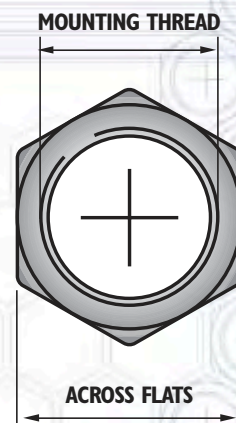
## Earth Tags

Part Number	Mounting Thread	Earth Bolt Diameter (mm)	Inner Carton Pack Quantity
E16	M16	6.35	TBA
E20	M20	6.35	200
E25	M25	6.35	100
E32	M32	6.35	50
E40	M40	6.35	50
E50	M50	6.35	25
E63	M63	6.35	25



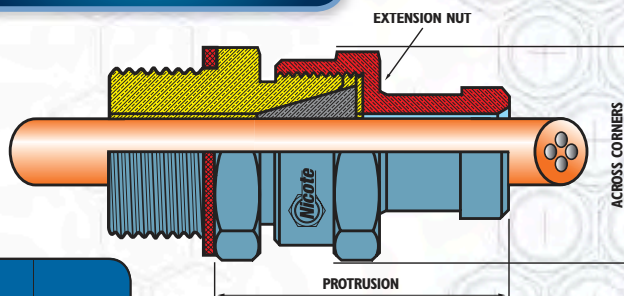
## Locknuts

Part Number	Mounting Thread	Across Flats Hexagon (mm)	Inner Carton Pack Quantity
L12	1/2" X 26 TPI	16	100
LNB-16	M16 x 1.5	20.7	100
LNB-20	M20 x 1.5	27	100
LNB-25	M25 x 1.5	31.6	100
LNB-32	M32 x 1.5	40	100
LNB-40	M40 x 1.5	48.2	40
LNB-50	M50 x 1.5	57.3	25
LNB-63	M63 x 1.5	82	20
L250	2.5 BSP	94	6
L275	2.75 BSP	102	6
L300	3.0 BSP	116	6
L325	3.25 BSP	116	6
L350	3.5 BSP	124	6
L400	4.0 BSP	140	4



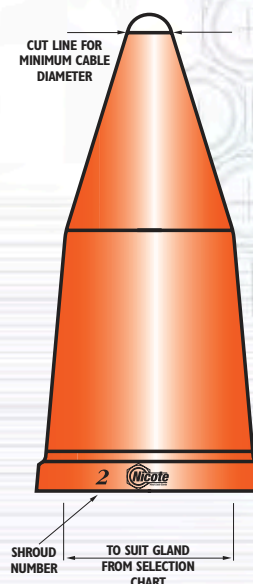
## Extension Nuts for UFPN Glands

Part Number	Suits Gland	Cable Gland		Inner Carton Pack Quantity
		Across Corners (mm)	Protrusion (mm)	
EN20A	UFPN20A	28	40	18
EN20B	UFPN20B	28	37	14
EN20C	UFPN20C	31	39	10
EN25A	UFPN25A	36	42	8
EN32A	UFPN32A	42	45	8
EN32B	UFPN32B	46	47	6



## Orange Shrouds

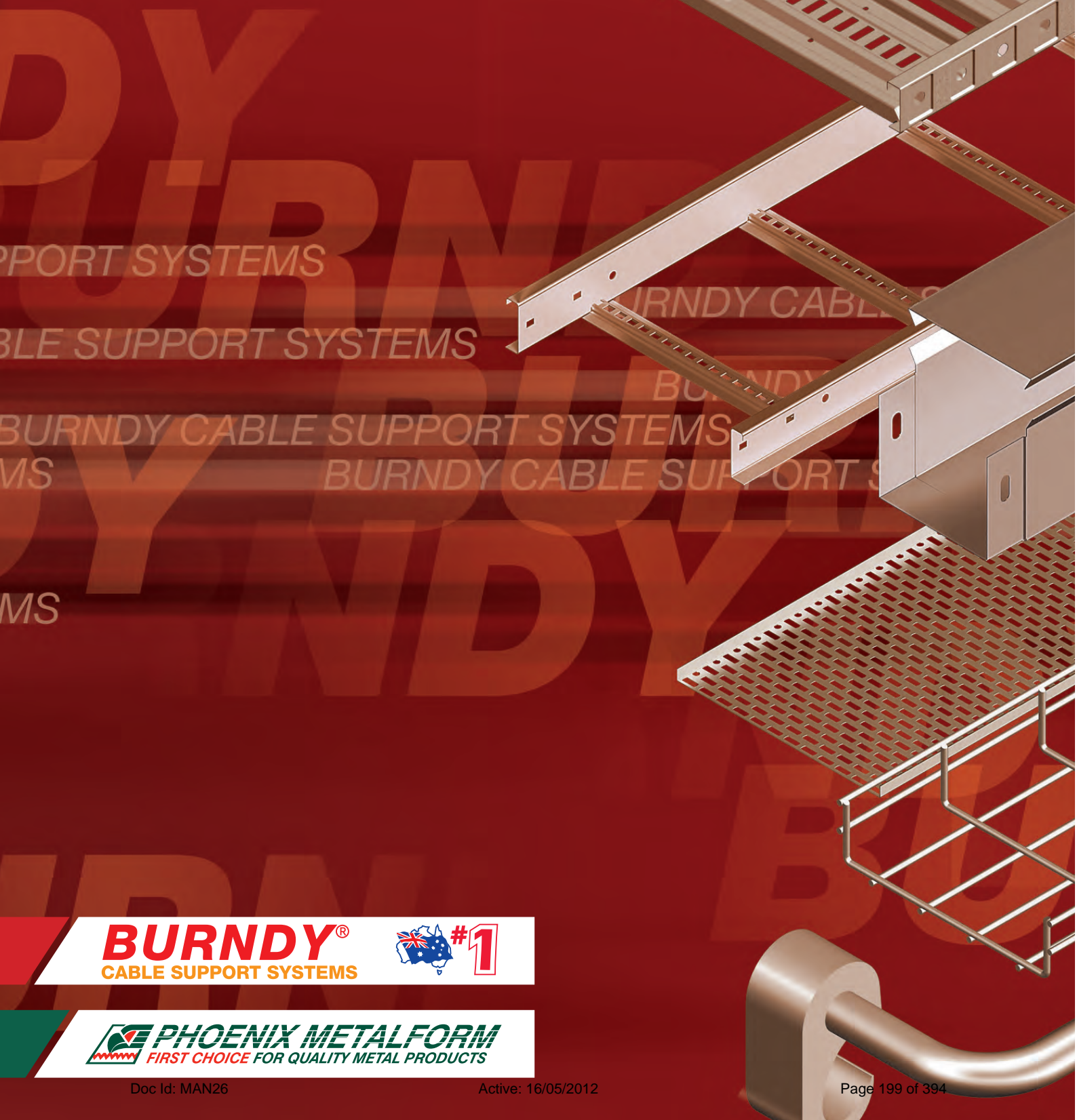
Part Number	Cable Gland						Carton Pack Quantity
	UN	UFPN	GN	WGN	FLWN	FLPWB	
S0-Orange	UN20A	UFPN20A	GN204	WGN162			150
	UN20B	UFPN20B	GN206 GN254	WGN164 WGN202			
S1-Orange	UN25A	UFPN20C	GN256	WGN203 WGN204	FLWN202 FLWN203 FLWN204	FLPW203B	140
S2-Orange	UN32A	UFPN25A		WGN206 WGN254	FLWN205 FLWN206	FLPW206B	110
S3-Orange		UFPN32A	GN324 GN326	WGN256	FLWN253 FLWN254 FLWN255 FLWN256	FLPW256B	90
S4-Orange	UN40A	UFPN32B					70
S5-Orange	UN40B	UFPN40A	GN405	WGN324	FLWN323	FLPW326B	50
	UN50A	UFPN40B		WGN326	FLWN324 FLWN325 FLWN326		
S6-Orange	UN50B	UFPN50A	GN503	WGN403	FLWN403	FLPW405B	40
	UN63A	UFPN50B	GN505	WGN404 WGN405	FLWN404 FLWN405		
S7-Orange	UN63B	UFPN63A UFPN63B	GN636	WGN502 WGN503	FLWN502 FLWN503	FLPW503B	18



# BURNDY

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FIRST CHOICE FOR • TRAY • LADDER • STRUT • HYGROUND • CABLE MESH



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Mar 2011

**1 Channels**

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Channels	1.1 - 1.4
Slotted Channels	1.5 - 1.7
Back to Back Channels	1.8
Slotted Angle	1.9

**2 Nuts & Bolts**

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Nuts & Bolts	2.1 - 2.5
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**3 Cantilever Brackets**

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Cantilever Brackets	3.1 - 3.2
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**4 Channel Fittings**

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Channel Fittings	4.1 - 4.5
Beam Clamps	4.6
Channel Covers, Joiners & Hangers	4.7 - 4.8
Channel Accessories	4.9 - 4.10

**5 Laddertrays**

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LT1 Laddertrays and Accessories	5.1
LT3 Laddertrays	5.2
LT3 Laddertray Accessories	5.3 - 5.4
LT5 Laddertrays	5.5
LT5 Laddertray Accessories	5.6 - 5.7
Laddertray LT3/LT5 - Cable Ladder Flat Covers	5.8

Laddertray Assembly, Horizontal Bend	5.9
Laddertray Assembly, External Riser	5.10
Laddertray Assembly, Internal Riser	5.11
Laddertray Assembly, Tee	5.12
Cable Ducts	5.13 - 5.14
Cable Trays	5.15

## **6 Cable Mesh**

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Wire Mesh Cable Tray	6.1
Wire Mesh Cable Tray Fixing and Accessories	6.2 - 6.4
Assembly Guides - 90° Short and Long Radius Bends	6.5
Assembly Guides - Reducers and Tees	6.6
Assembly Guides - Vertical Bends	6.7

## **7 Steel Ladders**

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Galvanised Steel Ladders NEMA 1	7.1
Galvanised Steel Riser Ladders NEMA 1	7.2
Galvanised Steel Ladders NEMA 1, Bends	7.3
Galvanised Steel Ladders NEMA 1, Tees	7.3
Galvanised Steel Ladders NEMA 1, Risers	7.4
Galvanised Steel Ladders NEMA 1, Crosses	7.5
Galvanised Steel Ladders NEMA 1, Reducers	7.5 - 7.6
Galvanised Steel Ladders NEMA 1, Accessories	7.7 - 7.9

Galvanised and Stainless Steel Ladder NEMA 2	7.10 - 7.11
Galvanised and Stainless Steel Ladder NEMA 2, Bends	7.12
Galvanised and Stainless Steel Ladder NEMA 2, Tees	7.12
Galvanised and Stainless Steel Ladder NEMA 2, Risers	7.13
Galvanised and Stainless Steel Ladder NEMA 2, Crosses	7.14
Galvanised and Stainless Steel Ladder NEMA 2, Reducers	7.14 - 7.15
Galvanised and Stainless Steel Ladders NEMA 2, Accessories	7.16 - 7.17
Galvanised and Stainless Steel Ladder NEMA 3	7.18 - 7.19
Galvanised and Stainless Steel Ladder NEMA 3, Bends	7.20
Galvanised and Stainless Steel Ladder NEMA 3, Tees	7.20
Galvanised and Stainless Steel Ladder NEMA 3, Risers	7.21
Galvanised and Stainless Steel Ladder NEMA 3, Crosses	7.22
Galvanised and Stainless Steel Ladder NEMA 3, Reducers	7.22 - 7.23
Galvanised and Stainless Steel Ladder NEMA 3, Accessories	7.24 - 7.26
Galvanised and Stainless Steel Ladder NEMA 4	7.27 - 7.28
Galvanised and Stainless Steel Ladder NEMA 4, Bends	7.29
Galvanised and Stainless Steel Ladder NEMA 4, Tees	7.29
Galvanised and Stainless Steel Ladder NEMA 4, Risers	7.30
Galvanised and Stainless Steel Ladder NEMA 4, Crosses	7.31
Galvanised and Stainless Steel Ladder NEMA 4, Reducers	7.31 - 7.32
Galvanised and Stainless Steel Ladder NEMA 4, Accessories	7.33 - 7.34

## 8 Aluminium Ladders

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Aluminium Ladders NEMA 2	8.1
Aluminium Ladders NEMA 2, Bends	8.2
Aluminium Ladders NEMA 2, Tees	8.2
Aluminium Ladders NEMA 2, Risers	8.3
Aluminium Ladders NEMA 2, Crosses	8.4
Aluminium Ladders NEMA 2, Reducers	8.4 - 8.5
Aluminium Ladders NEMA 2, Accessories	8.6 - 8.8
Aluminium Ladders NEMA 3	8.9
Aluminium Ladders NEMA 3, Bends	8.10
Aluminium Ladders NEMA 3, Tees	8.10
Aluminium Ladders NEMA 3, Risers	8.11
Aluminium Ladders NEMA 3, Crosses	8.12
Aluminium Ladders NEMA 3, Reducers	8.12 - 8.13
Aluminium Ladders NEMA 3, Accessories	8.14 - 8.16
Aluminium Ladders NEMA 4	8.17
Aluminium Ladders NEMA 4, Bends	8.18
Aluminium Ladders NEMA 4, Tees	8.18
Aluminium Ladders NEMA 4, Risers	8.19
Aluminium Ladders NEMA 4, Crosses	8.20
Aluminium Ladders NEMA 4, Reducers	8.20 - 8.21

Aluminium Ladders NEMA 4, Accessories	8.22 - 8.24
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## **9 Covers**

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Cable Ladder Flat Covers NEMA 1	9.1
Cable Ladder Flat Covers NEMA 2, NEMA 3, NEMA 4	9.2
Cable Ladder Flat Covers NEMA 2, NEMA 3, NEMA 4 to suit 'Rail In' Ladders in Western Australia	9.3
Cable Ladder Peaked Covers NEMA 1	9.4
Cable Ladder Peaked Covers NEMA 2, NEMA 3, NEMA 4	9.5
Cable Ladder Peaked Covers NEMA 2, NEMA 3, NEMA 4 to suit 'Rail In' Ladders in Western Australia	9.6
Cable Ladder Fitting Covers	9.7 - 9.14

## **10 Hyground**

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Connectors	10.2 - 10.3
Flexible Copper Braids	10.4 - 10.6

## Introduction



Pioneers of the original Laddertray systems, Burndy are considered by many to have established the benchmark for quality and performance in commercial construction applications.

For over 30 years, it has been widely held that Burndy have been leaders in their field. Their continuous efforts at improving both products and services have been rewarded by a wide and growing user base and resellers.

Established in 1982, Phoenix Metalform, the parent company of Burndy, are a significant participant in sheet metal roll forming and fabrication.

With branch offices throughout Australia, Burndy is always conveniently placed to service it's customers.

Manufactured in a wide range of materials including Hot Dip Galvanised Steel, Aluminium and Stainless Steel, there is a Burndy product to suit your specific application and environmental conditions.

Always striving to meet the growing demands of a sophisticated market, the Burndy range has evolved to provide a genuine one stop shop with the ability to satisfy your cable support needs.

Our mission is to be your first choice for the supply of cable support systems in Australia, and having a dedicated team of professionals is an essential platform in achieving that goal.

You can be assured of Burndy's commitment to continually improving our range, our product quality, our value for money and our delivery turnaround time.



## Galvanic Corrosion

One of the prime factors to consider in achieving a long service life is to minimise the destructive effects of galvanic corrosion brought about by having dissimilar metals in close contact and in the presence of an electrolyte.

Dissimilar metals in the presence of an electrolyte (which can be just water) can set up a galvanic couple which will cause the anodic metal to corrode more quickly than it otherwise would.

Metals can be arranged into a chart or table called a galvanic series which gives an indication of which metal will act as an anode and which as the cathode, with the anode suffering an increased rate of corrosion.

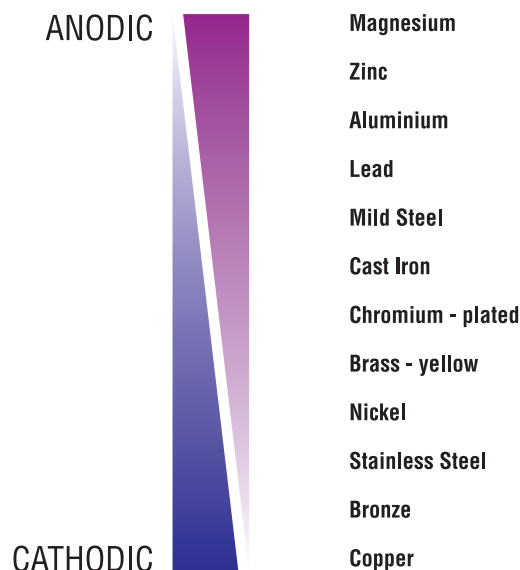
This chart provides a straightforward guide to material selection. In simple terms, galvanic

corrosion will increase as the distance between the chosen metals in the table increases.

The effects of galvanic corrosion can be greatly inhibited or even eliminated altogether by methods including:

1. Electrically insulating the two metals from one another through the use of insulating washers or grease.
2. Employing a paint or epoxy coating to seal the metal from contact with an electrolyte.
3. Using metals which are located as closely as possible on the galvanic series table.

The table below shows the position of some common metals in the Galvanic Series.



## Material Corrosion Chart

Chemical	Hot Dip Galvanised	Aluminium	Stainless Steel 304	Stainless Steel 316	Fibreglass
Benzene	N/A	R	R	R	NR
Carbon Tetrachloride	N/A	C	R	R	C
Gasoline	R	R	R	R	C
Hydrochloric Acid 40%	NR	NR	NR	NR	C
Hydrochloric Acid 10%	NR	NR	NR	NR	R
Hydrochloric Acid 2%	NR	NR	NR	NR	R
Hydrogen Peroxide 30%	N/A	R	R	R	C
Hydrogen Peroxide 3%	N/A	R	R	R	C
Hydrogen Sulphide (Gas)	N/A	R	C	R	R
Mineral Spirits	N/A	R	N/A	N/A	NR
Motor Oil	R	R	R	R	R
Nitric Acid	N/A	C	R	R	C
Phosphoric Acid 2%	NR	C	R	R	R
Sodium Chloride 25%	C	C	R	R	R
Sulphuric Acid 2%	NR	C	NR	R	R
Water-Deionised	C	R	R	R	R
Water-Sea	C	C	R	R	R
Water-Tap	R	R	C	C	R

**R** = Recommended    **C** = Conditions dependant    **NR** = Not Recommended    **N/A** = Info not available

The above Corrosion Chart gives an indication of the suitability of materials in a corrosive environment. Although providing a good guide, it is recommended that the use of this table should be supported by actual testing.

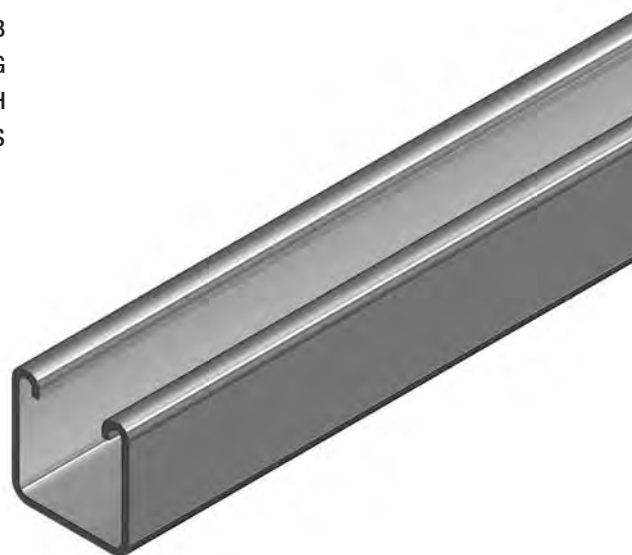
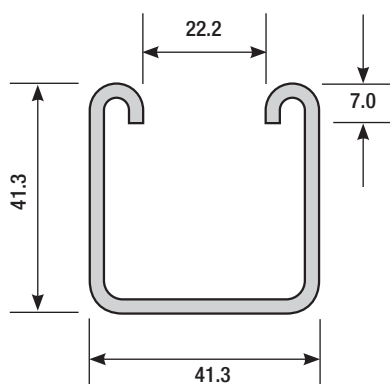
- Material Specification**
- Thickness 2.5 mm (mild steel)  
2.5 mm (stainless Steel)
  - Length 6 metres
- Ordering Details**
- Supplied in standard 6 metre lengths.

**Available  
Finish**

Black (untreated)  
Galvabond  
Hot Dip Galvanised  
Stainless Steel

**Ordering  
Code**

B1000B  
B1000G  
B1000H  
B1000S



**B1000 Channel**

15.7 kg per length

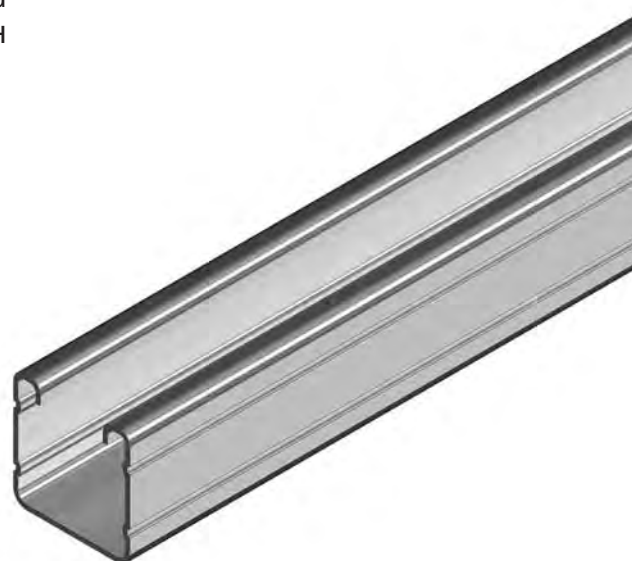
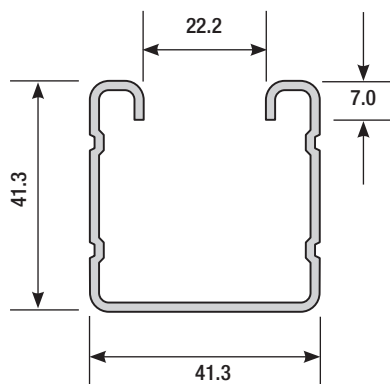
- Material Specification**
- Thickness 1.6 mm
  - Length 6 metres
- Ordering Details**
- Supplied in standard 6 metre lengths.

**Available  
Finish**

Galvabond  
Hot Dip Galvanised

**Ordering  
Code**

B2000G  
B2000H



**B2000 Channel - Steel**

10.8 kg per length

1 channels

2 nuts &amp; bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

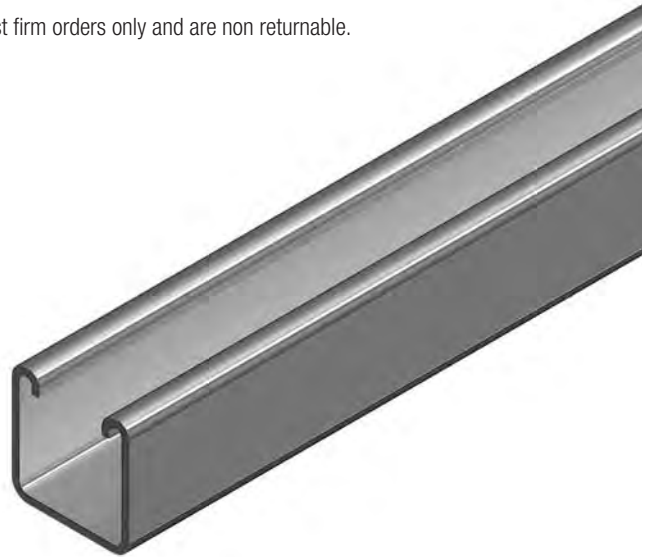
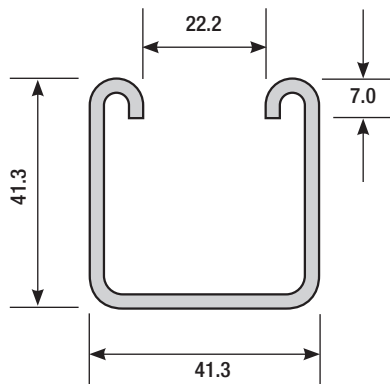
7 steel ladders

8 aluminium ladders

9 covers

10 hyground

<b>Material Specification</b>	- Thickness	2.5 mm (aluminium)
	- Length	6 metres
<b>Ordering Details</b>	- Supplied in standard 6 metre lengths.	
	<b>Available Finish</b>	<b>Ordering Code</b>
<b>Note</b>	Aluminium	B2000A
	- Aluminium channels are manufactured against firm orders only and are non returnable.	

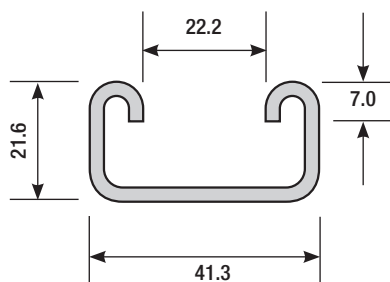


**B2000 Channel - Aluminium**

5.5 kg per length

<b>Material Specification</b>	- Thickness	2.5 mm (mild steel)
		2.5 mm (stainless Steel)
<b>Ordering Details</b>	- Length	6 metres
	- Supplied in standard 6 metre lengths.	

<b>Available Finish</b>	<b>Ordering Code</b>
Black (untreated)	B3300B
Galvabond	B3300G
Hot Dip Galvanised	B3300H
Stainless Steel	B3300S



**B3300 Channel**

10.9 kg per length

**Material Specification**

- Thickness 1.6 mm
- Length 6 metres

**Ordering Details**

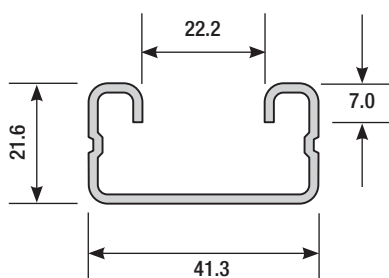
- Supplied in standard 6 metre lengths.

**Available Finish**

- Galvabond
- Hot Dip Galvanised

**Ordering Code**

- B4000G
- B4000H

**B4000 Channel - Steel**

7.6 kg per length

**Material Specification**

- Thickness 2.5 mm (aluminium)
- Length 6 metres

**Ordering Details**

- Supplied in standard 6 metre lengths.

**Available Finish**

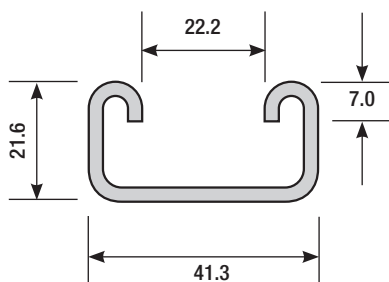
- Aluminium

**Ordering Code**

- B4000A

**Note**

- Aluminium channels are manufactured against firm orders only and are non returnable.

**B4000 Channel - Aluminium**

3.9 kg per length

1 channels

2 nuts &amp; bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

8 aluminium ladders

9 covers

10 hyground

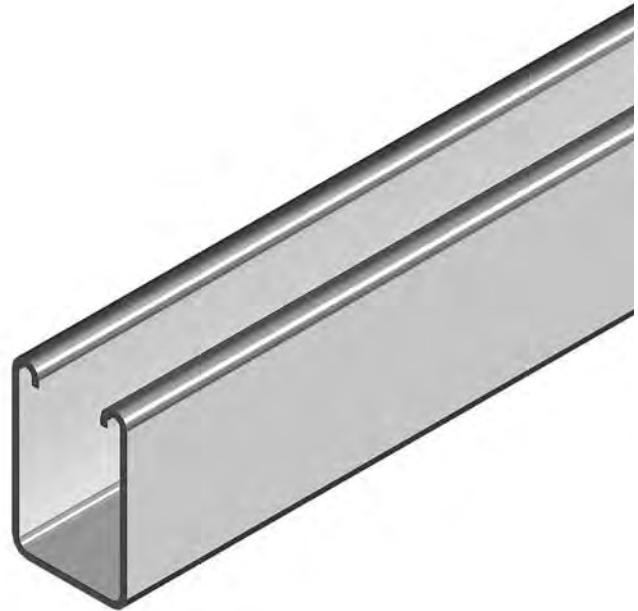
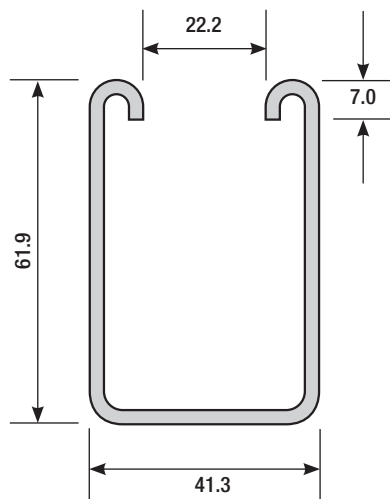
- Material Specification**
- Thickness 2.5 mm (mild steel).
  - Length 6 metres
- Ordering Details**
- Supplied in standard 6 metre lengths.

**Available  
Finish**

Galvabond  
Hot Dip Galvanised

**Ordering  
Code**

B5500G  
B5500H



**B5500 Channel**

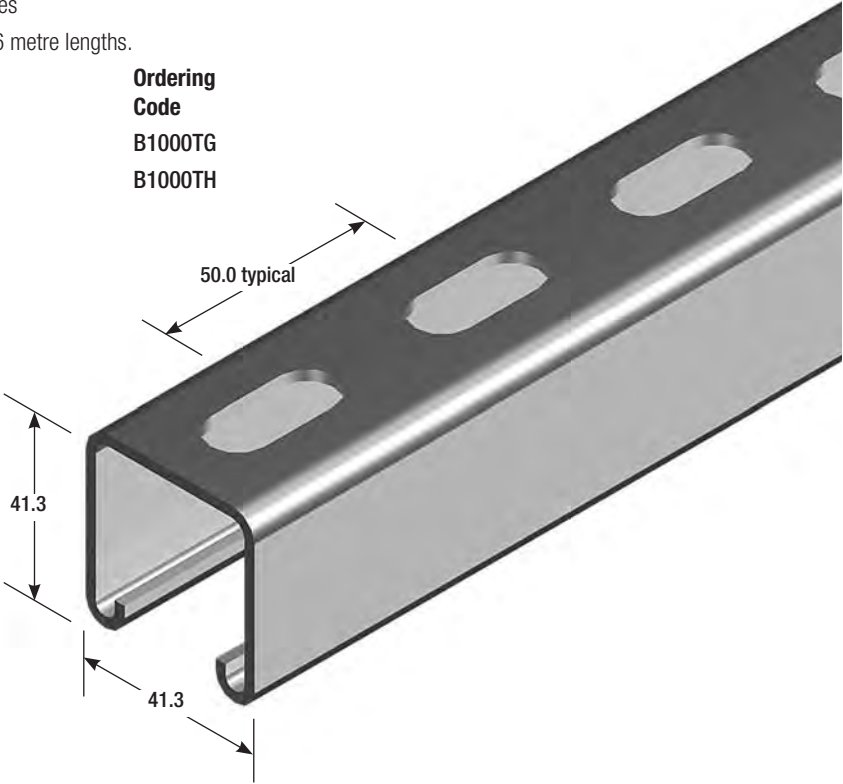
20.4 kg per length

# Slotted Channels



- Material Specification**
- Thickness 2.5 mm (mild steel)
  - Length 6 metres
- Ordering Details**
- Supplied in standard 6 metre lengths.

Available Finish	Ordering Code
Galvabond	B1000TG
Hot Dip Galvanised	B1000TH

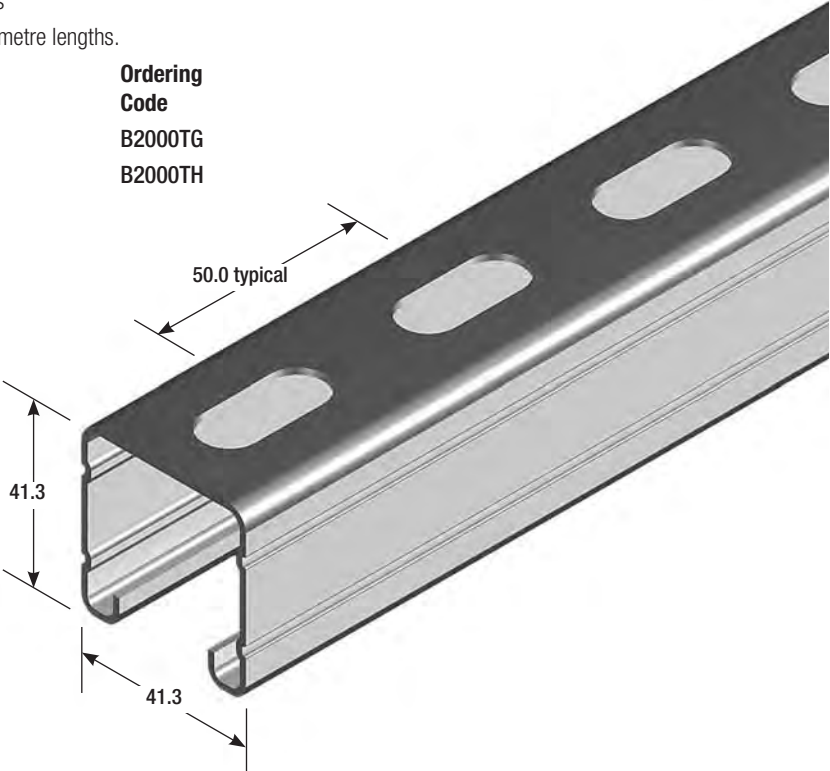


**B1000T Slotted Channel**

13.9 kg per length

- Material Specification**
- Thickness 1.6 mm
  - Length 6 metres
- Ordering Details**
- Supplied in standard 6 metre lengths.

Available Finish	Ordering Code
Galvabond	B2000TG
Hot Dip Galvanised	B2000TH



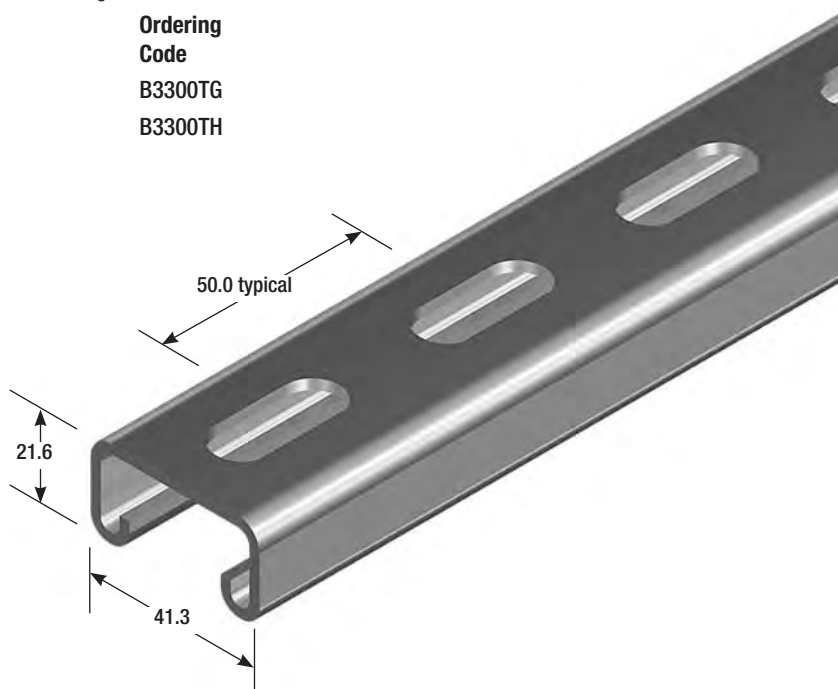
**B2000T Slotted Channel**

10.5 kg per length

1	channels
2	nuts & bolts
3	cantilever brackets
4	channel fittings
5	laddertrays
6	cable mesh
7	steel ladders
8	aluminium ladders
9	covers
10	hyground

- Material Specification**
- Thickness 2.5 mm
  - Length 6 metres
- Ordering Details**
- Supplied in standard 6 metre lengths.

Available Finish	Ordering Code
Galvabond	B3300TG
Hot Dip Galvanised	B3300TH

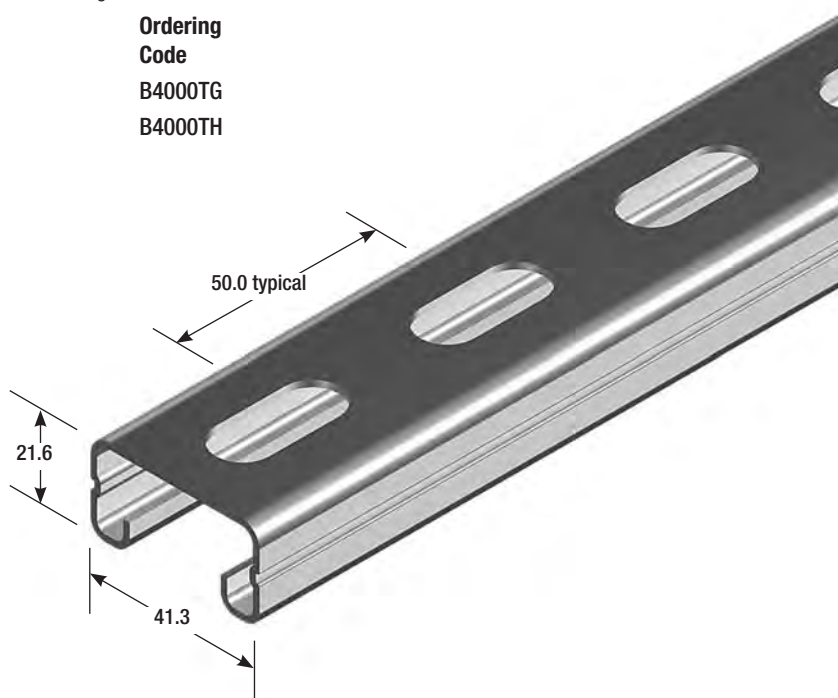


**B3300T Slotted Channel**

9.3 kg per length

- Material Specification**
- Thickness 1.6 mm
  - Length 6 metres
- Ordering Details**
- Supplied in standard 6 metre lengths.

Available Finish	Ordering Code
Galvabond	B4000TG
Hot Dip Galvanised	B4000TH



**B4000T Slotted Channel**

7.3 kg per length

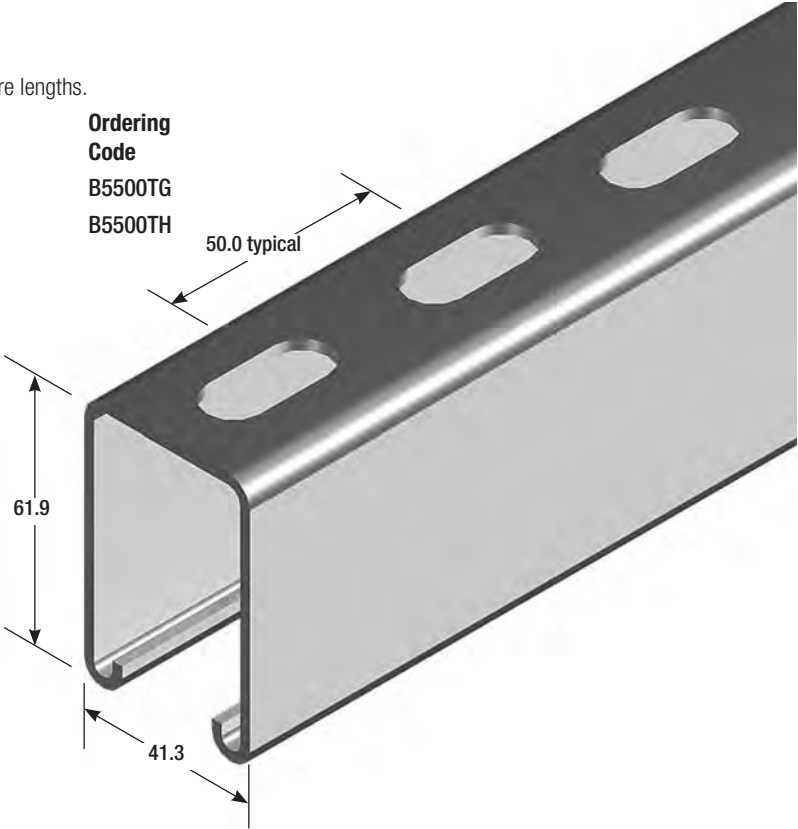
# Slotted Channels



- Material Specification**
- Ordering Details**
- Thickness 2.5 mm
  - Length 6 metres
  - Supplied in standard 6 metre lengths.

**Available Finish**  
Galvabond  
Hot Dip Galvanised

**Ordering Code**  
B5500TG  
B5500TH



**B5500T Slotted Channel**

18.7 kg per length

channels

nuts & bolts

cantilever brackets

channel fittings

laddertrays

cable mesh

steel ladders

aluminium ladders

covers

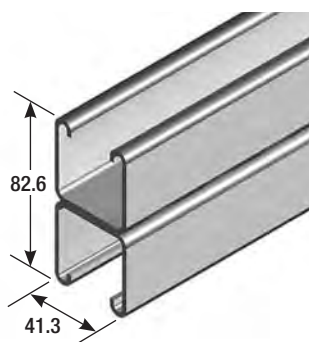
hyground

- Material Specification**
- Thickness see below
  - Length 6 metres
- Ordering Details**
- Supplied in standard 6 metre lengths.

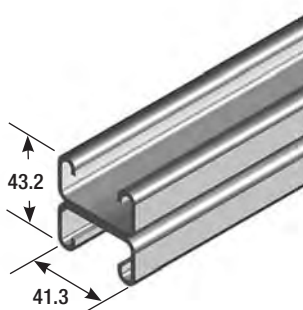
Available Finish	Code
Galvabond	G
Hot Dip Galvanised	H

**Note**

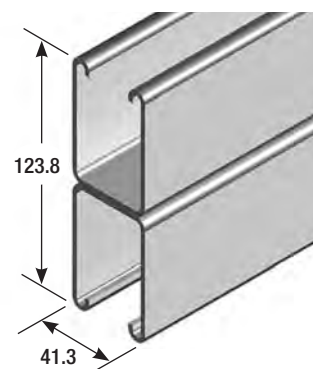
- All products are manufactured against firm orders only. They are non returnable and the order cannot be cancelled once manufacturing has commenced.



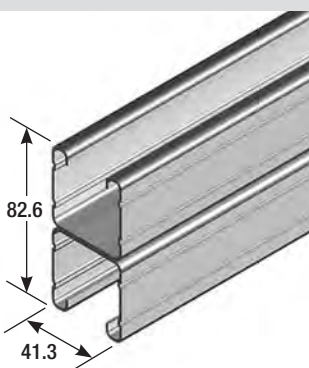
**B1001** Wt 31.4 kg/length



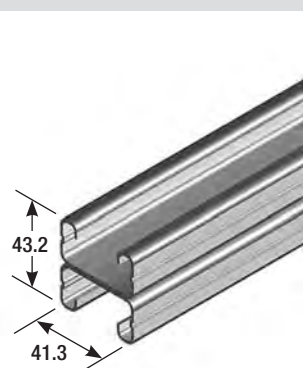
**B3301** Wt 21.8 kg/length



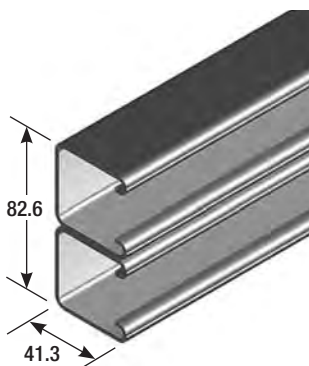
**B5501** Wt 40.8 kg/length



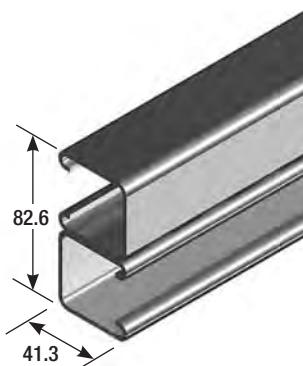
**B2001** Wt 21.6 kg/length



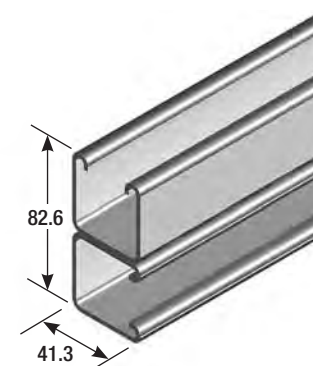
**B4001** Wt 15.2 kg/length



**B1001A** Wt 31.4 kg/length



**B1001B** Wt 31.4 kg/length



**B1001C** Wt 31.4 kg/length

- Material Specification

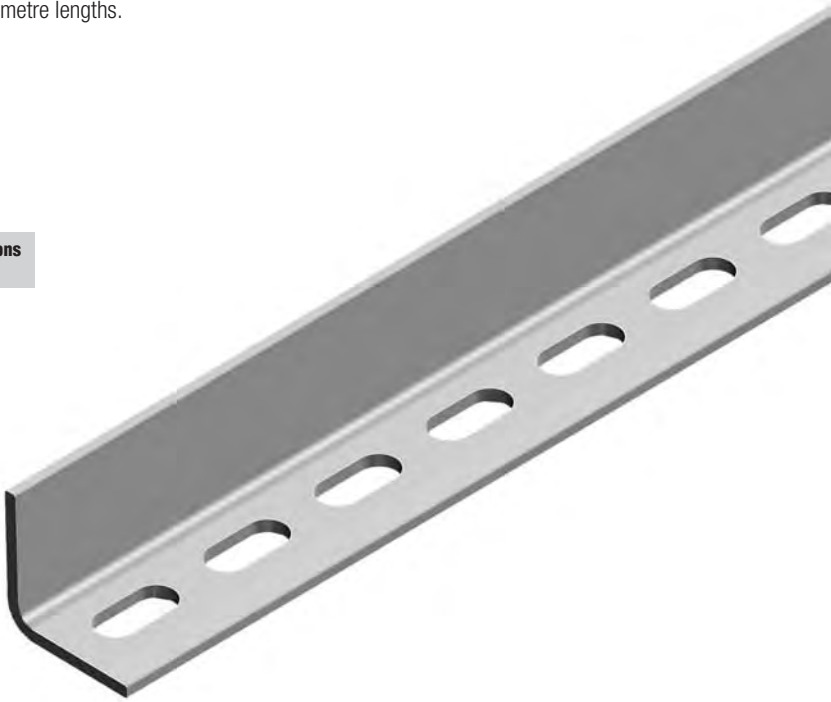
Ordering Details

Available Finish
- Length

- Supplied in standard 6 metre lengths.

- Duragal
- 3 metres

Ordering Code	Dimensions mm	Slot Dimensions mm
SA3030H	30 x 30 x 2.5	11 x 18
SA5050H	50 x 50 x 4.5	14 x 30



SA Slotted Angle

1	channels
2	nuts & bolts
3	cantilever brackets
4	channel fittings
5	laddertrays
6	cable mesh
7	steel ladders
8	aluminium ladders
9	covers
10	hyground



Thread Diameter	Thread Length mm	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	20	HS620Z	HS620H	HS620S
	25	HS625Z	HS625H	HS625S
	30	HS630Z	HS630H	HS630S
	40	HS640Z	HS640H	HS640S
M8	20	HS820Z	HS820H	HS820S
	25	HS825Z	HS825H	HS825S
	30	HS830Z	HS830H	HS830S
	40	HS840Z	HS840H	HS840S
M10	20	HS1020Z	HS1020H	HS1020S
	25	HS1025Z	HS1025H	HS1025S
	30	HS1030Z	HS1030H	HS1030S
	40	HS1040Z	HS1040H	HS1040S
M12	25	HS1225Z	HS1225H	HS1225S
	30	HS1230Z	HS1230H	HS1230S
	40	HS1240Z	HS1240H	HS1240S
	50	HS1250Z	HS1250H	HS1250S

## Hex Screw



Thread Diameter	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	HN6Z	HN6H	HN6S
M8	HN8Z	HN8H	HN8S
M10	HN10Z	HN10H	HN10S
M12	HN12Z	HN12H	HN12S
M16	HN16Z	HN16H	HN16S

## Hex Nut



Thread Diameter	Thread Length mm	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	16	PS616Z	—	—
	20	PS620Z	PS620H	PS620S
	25	PS625Z	PS625H	PS625S
	30	PS630Z	PS630H	PS630S

## Pan Screw



Thread Diameter	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	FW6Z	FW6H	FW6S
M8	FW8Z	FW8H	FW8S
M10	FW10Z	FW10H	FW10S
M12	FW12Z	FW12H	FW12S
M16	FW16Z	FW16H	FW16S

## Flat Washer



Thread Diameter	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	SW6Z	SW6H	SW6S
M8	SW8Z	SW8H	SW8S
M10	SW10Z	SW10H	SW10S
M12	SW12Z	SW12H	SW12S
M16	SW16Z	SW16H	SW16S

## Spring Washer



Thread Diameter	Zinc Plated	Hot Dip Galvanised
M6	MW6Z	MW6H
M8	MW8Z	MW8H
M10	MW10Z	MW10H
M12	MW12Z	MW12H

## Mudguard Washer



Thread Diameter	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	TR6Z	—	—
M8	TR8Z	—	—
M10	TR10Z	TR10H	TR10S
M12	TR12Z	TR12H	TR12S
M16	TR16Z	TR16H	TR16S

Standard length: 3.0 metres.

## Threaded Rod



Thread Diameter	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	RC6Z	—	—
M8	RC8Z	—	—
M10	RC10Z	RC10H	RC10S
M12	RC12Z	RC12H	RC12S
M16	RC16Z	RC16H	RC16S

Rod Coupler



Thread Diameter	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	B1006Z	B1006H	B1006S
M8	B1007Z	B1007H	B1007S
M10	B1008Z	B1008H	B1008S
M12	B1010Z	B1010H	B1010S

To fit all 41 mm high channels.

Channel Nut with Long Spring



Thread Diameter	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	B4006Z	B4006H	B4006S
M8	B4007Z	B4007H	B4007S
M10	B4008Z	B4008H	B4008S
M12	B4010Z	B4010H	B4010S

To fit all 21 mm high channels.

Channel Nut with Short Spring



Thread Diameter	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	B3006Z	B3006H	B3006S
M8	B3007Z	B3007H	B3007S
M10	B3008Z	B3008H	B3008S
M12	B3010Z	B3010H	B3010S

Fits all channel sections.

Channel Nut without Spring



Fits all channel sections.

### Channel Nut without Spring

Thread Diameter	Zinc Plated	Hot Dip Galvanised	Stainless Steel
M6	<b>B3016Z</b>	<b>B3016H</b>	<b>B3016S</b>



Thread Diameter	Thread Length mm	Zinc Plated
M6	<b>35</b>	<b>DB635Z</b>
M8	<b>40</b>	<b>DB840Z</b>
M10	<b>40</b>	<b>DB1040Z</b>
M10	<b>60</b>	<b>DB1060Z</b>
M12	<b>60</b>	<b>DB1260Z</b>
M12	<b>75</b>	<b>DB1275Z</b>

### Dynabolt



Thread Diameter	Anchor	Set In Tool
M6	<b>DI6Z</b>	<b>ST6Z</b>
M8	<b>DI8Z</b>	<b>ST8Z</b>
M10	<b>DI10Z</b>	<b>ST10Z</b>
M12	<b>DI12Z</b>	<b>ST12Z</b>

### Drop In Anchor



Ordering Code: **WN10Z**

Note: Suits M10 Allthread.



### Wedge Nut

**Vertical Hanger M10**



Ordering Code: **VH10Z** (suitable for metal)  
**VH10CZ** (suitable for concrete)

**Side Hanger M10**



Ordering Code: **SH10Z**

**Rod Hanger**

---

1	channels
2	nuts & bolts
3	cantilever brackets
4	channel fittings
5	laddertrays
6	cable mesh
7	steel ladders
8	aluminium ladders
9	covers
10	hyground

# Cantilever Brackets



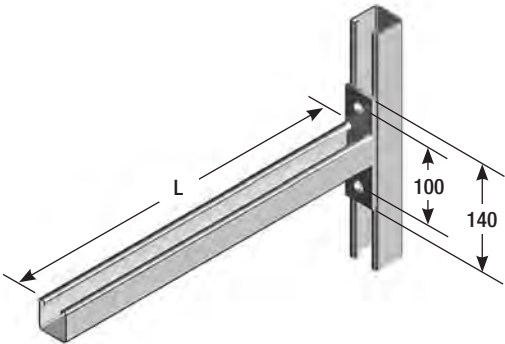
**Material Specification** - Thickness 2.5mm

**Available Finish** - Hot Dip Galvanised

- Stainless Steel

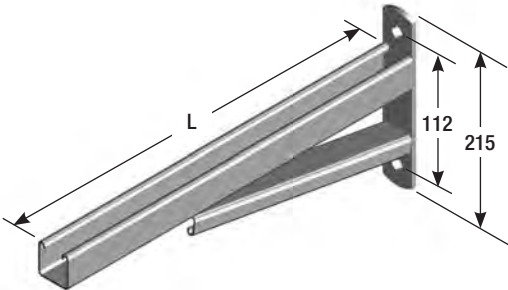
**Note** - Stainless Steel products are manufactured against firm orders only. They are non returnable and the order cannot be cancelled once manufacturing has commenced.

- Load Capacities are based on the application of a uniformly distributed load.



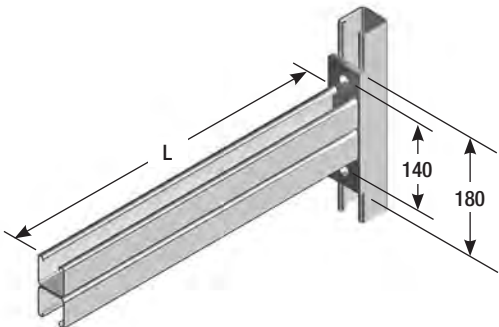
Ordering Code	Length L	Load Capacity kg
CL150	150	320
CL300	300	260
CL450	450	171
CL600	600	116
CL750	750	102

Cantilever Bracket CL



Ordering Code	Length L	Load Capacity kg
CLB320	320	445
CLB470	470	376
CLB635	635	338
CLB780	780	279

Cantilever Bracket CLB



Ordering Code	Length L	Load Capacity kg
CLD300	300	610
CLD450	450	506
CLD600	600	372
CLD750	750	259

Cantilever Bracket CLD

1 channels

2 nuts & bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

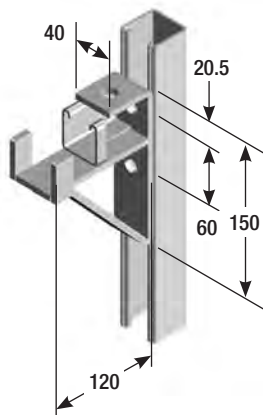
6 cable mesh

7 steel ladders

8 aluminium ladders

9 covers

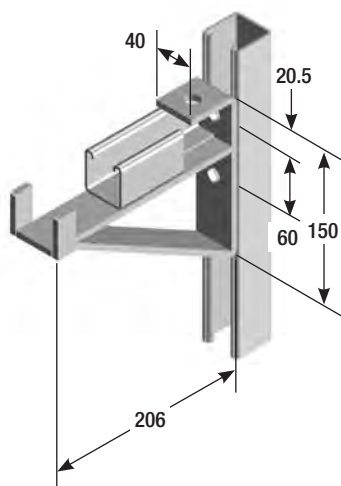
10 hyground



<b>Available Finish</b>	- Hot Dip Galvanised
<b>Channel</b>	- B1000
<b>Hole Diameters</b>	- 14 mm

Two fasteners are required for assembly. Order separately.  
1 x HS1225, 1 x B1010H  
Not available in stainless steel

### B10754H



<b>Available Finish</b>	- Hot Dip Galvanised
<b>Channel</b>	- B1000
<b>Hole Diameters</b>	- 14 mm

Two fasteners are required for assembly. Order separately.  
1 x HS1225, 1 x B1010H  
Not available in stainless steel

### B10758H

**Surface Finish**

**Available Finish**

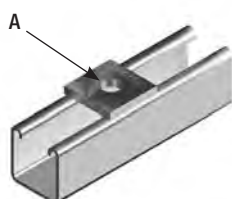
Hot Dip Galvanised  
Stainless Steel

**Code**

H  
S

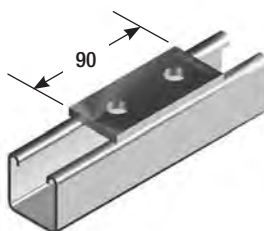
**Note**

- Stainless steel products are manufactured against firm orders only and are non returnable.



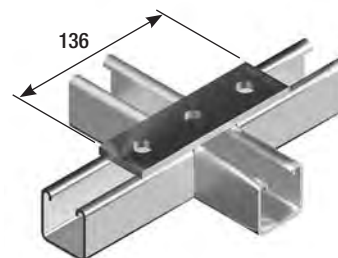
Ordering Code	A	Wt/kg
B1062	M8	0.071
B1063	M10	0.065
B1064	M12	0.064
B1964	M16	0.064

**B1062 to B1964**



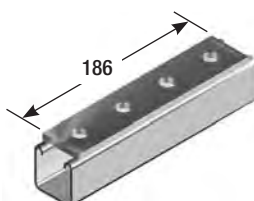
**B1065**

Wt 0.16 kg



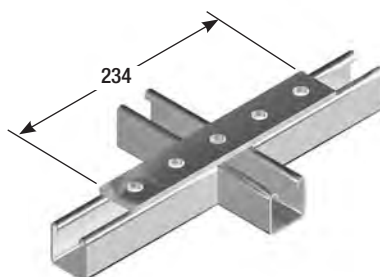
**B1066**

Wt 0.24 kg



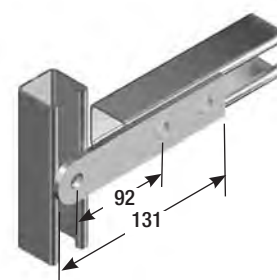
**B1067**

Wt 0.32 kg



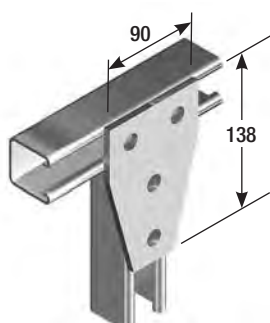
**B1941**

Wt 0.43 kg



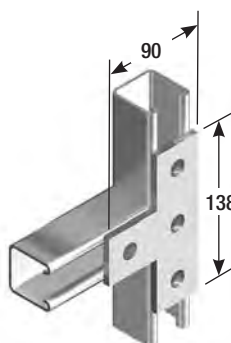
**B2324**

Wt 0.34 kg



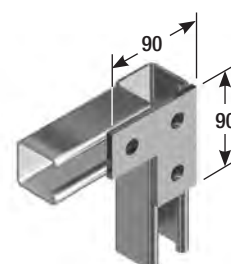
**B1358**

Wt 0.48 kg



**B1031**

Wt 0.34 kg



**B1036**

Wt 0.25 kg

1 channels

2 nuts & bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

8 aluminium ladders

9 covers

10 hyground

**Surface Finish**

**Available Finish**

**Code**

Hot Dip Galvanised

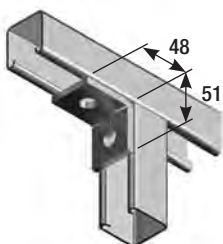
H

Stainless Steel

S

**Note**

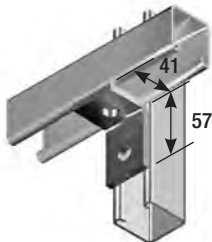
- Stainless steel products are manufactured against firm orders only and are non returnable.



**B1026**



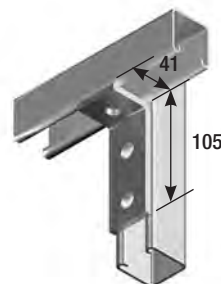
Wt 0.17 kg



**B1068**



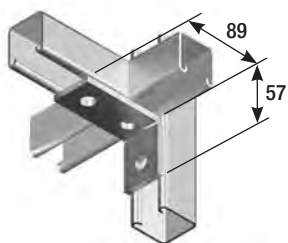
Wt 0.17 kg



**B1326**



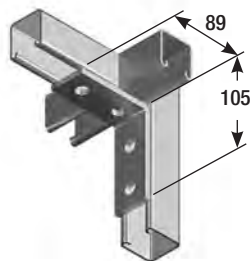
Wt 0.24 kg



**B1458**



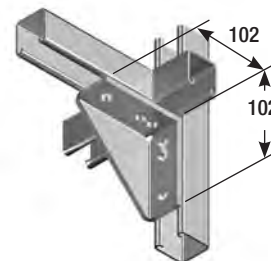
Wt 0.24 kg



**B1325**



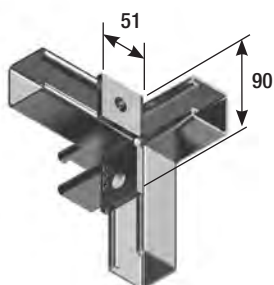
Wt 0.33 kg



**B2484**



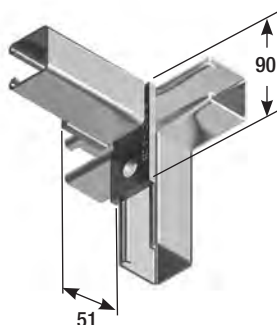
Wt 0.61 kg



**B1037**



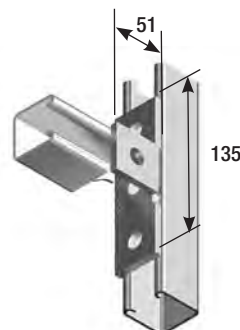
Wt 0.25 kg



**B1038**



Wt 0.25 kg



**B1033**



Wt 0.32 kg

**Surface Finish**

**Available Finish**

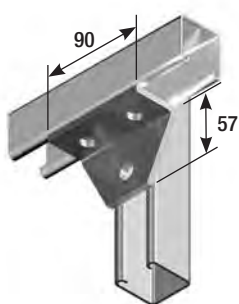
**Code**

Hot Dip Galvanised  
Stainless Steel

H  
S

**Note**

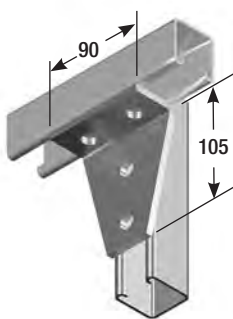
- Stainless steel products are manufactured against firm orders only and are non returnable.



**B1357**



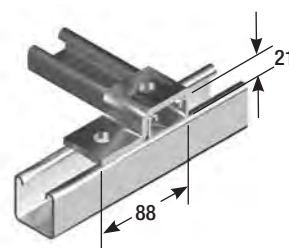
Wt 0.33 kg



**B1359**



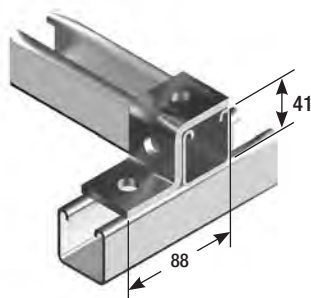
Wt 0.48 kg



**B4045**



Wt 0.25 kg



**B1045**



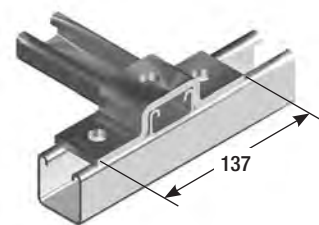
Wt 0.24 kg



**B1347**



Wt 0.24 kg



**B4047**



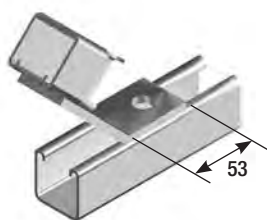
Wt 0.30 kg



**B1186**



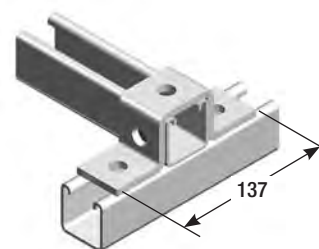
Wt 0.26 kg



**B1546**



Wt 0.26 kg



**B1047**



Wt 0.33 kg

1 channels

2 nuts & bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

8 aluminium ladders

9 covers

10 hyground

**Surface Finish**

**Available Finish**

**Code**

Hot Dip Galvanised

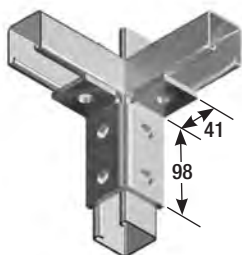
H

Stainless Steel

S

**Note**

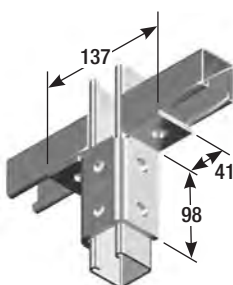
- Stainless steel products are manufactured against firm orders only and are non returnable.



**B2224**



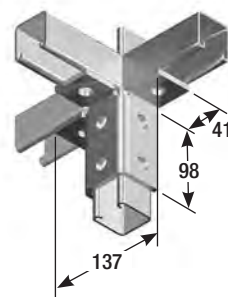
Wt 0.55 kg



**B2346**



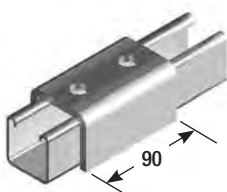
Wt 0.67 kg



**B2228**



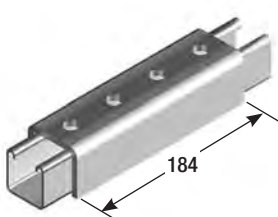
Wt 0.85 kg



**B1376**



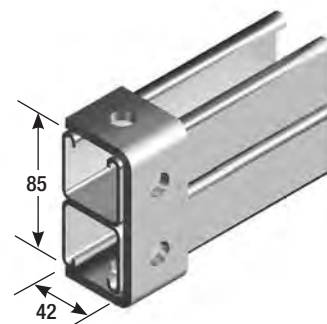
Wt 0.56 kg



**B1377**



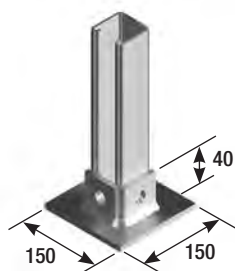
Wt 1.15 kg



**B1044**



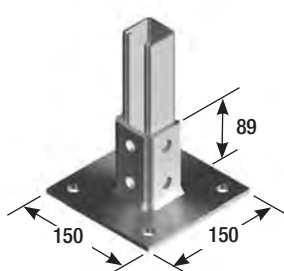
Wt 0.30 kg



**B2072S1**



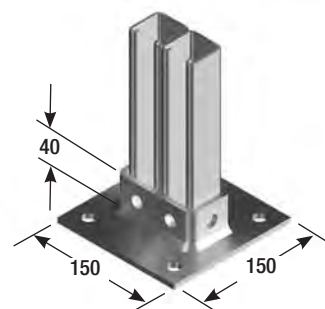
Wt 0.65 kg



**B2072A**



Wt 1.64 kg



**B2073**



Wt 1.40 kg

Surface Finish

Available  
Finish

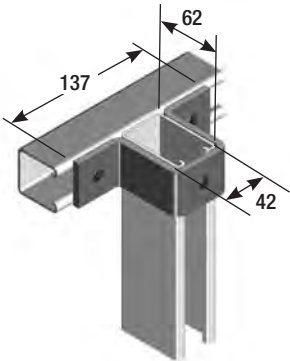
Code

Hot Dip Galvanised  
Stainless Steel

H  
S

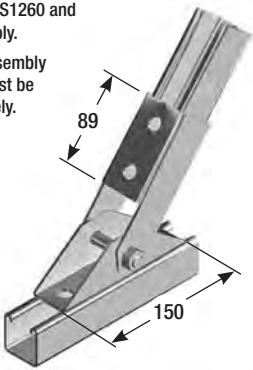
Note

- Stainless steel products are manufactured against firm orders only and are non returnable.



B5547H

Packaged with HS1260 and  
HN12 for assembly.  
Fasteners for assembly  
onto channel must be  
ordered separately.  
4 x B1010  
4 x HS1225

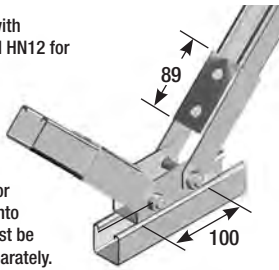


B2815

Wt 1.39 kg

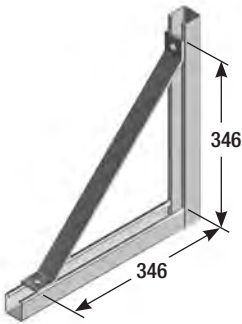
Packaged with  
HS1260 and HN12 for  
assembly.

Fasteners for  
assembly onto  
channel must be  
ordered separately.  
4 x B1010  
4 x HS1225



B2815D

Wt 2.27 kg



B2452

Wt 0.72 kg

channels

nuts & bolts

cantilever  
brackets

channel  
fittings

laddertrays

cable mesh

steel  
ladders

aluminium  
ladders

covers

hyground

**Surface Finish**

**Available Finish**

**Code**

Hot Dip Galvanised  
Stainless Steel

H  
S

**Note**

- Stainless steel products are manufactured against firm orders only and are non returnable.

Note: Must be used in pairs.



**B1271**



Wt 0.43 kg

Note: Must be used in pairs.



**B1272**



Wt 0.18 kg

Note: Must be used in pairs.



Fasteners for assembly must be ordered separately.

1 x B1010  
1 x HS1225

**B1386**



Wt 0.12 kg

Note: Must be used in pairs.



**B1796**



Wt 0.49 kg

Note: Must be used in pairs.



**B2785**



Wt 0.41 kg

Note: Must be used in pairs.

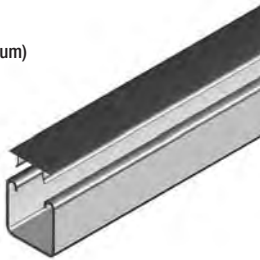


**B2786**



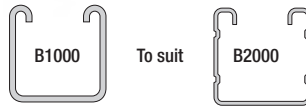
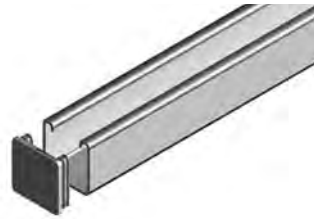
Wt 0.46 kg

B1184P (grey)  
B1184W (white)  
B1184A (aluminium)

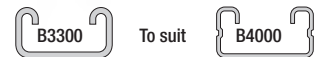


Sold in three metre lengths.

**B1184**



**B2240**

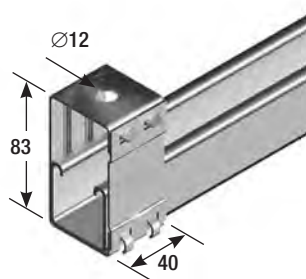


**B3380**



Suits B5500 channel.

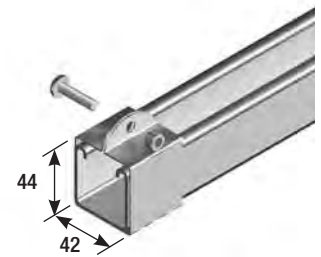
**B5580**



Hole diameter to suit M10 threaded rod.

**B2855**

Wt 0.18 kg

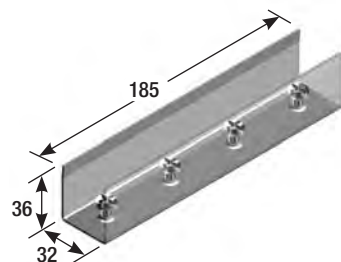


Supplied complete with PS625 and HN6 for assembly.

**B2539**

Wt 0.11 kg

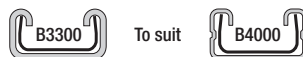
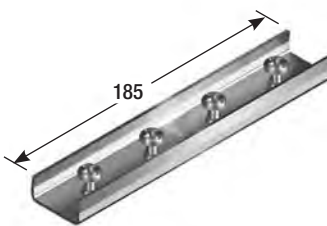
Internal Channel Joiner



**B922J**

Wt 0.28 kg

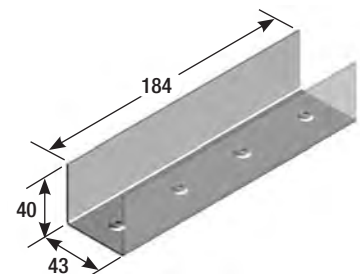
Internal Channel Joiner



**B422J**

Wt 0.18 kg

External Channel Joiner

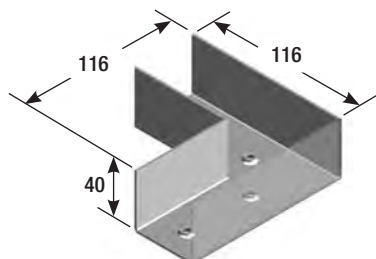


Order fasteners separately; 4 x B3016Z  
4 x CS616Z

**B2377Z**

Wt 0.28 kg

Joiner Box - Two Way



Finish: Zinc plated

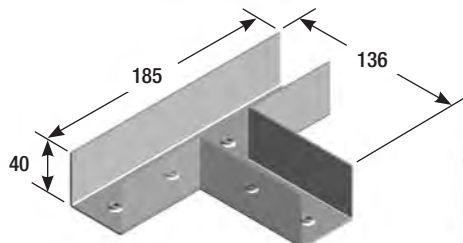
Order fasteners separately; 4 x B3016Z  
4 x CS616Z

**B1220B**



Wt 0.40 kg

Joiner Box - Two Way



Finish: Zinc plated

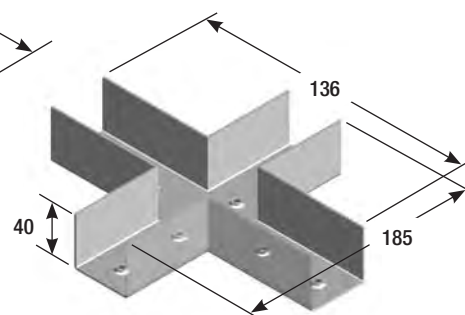
Order fasteners separately; 6 x B3016Z  
6 x CS616Z

**B1221T**



Wt 0.46 kg

Joiner Box - Two Way



Finish: Zinc plated

Order fasteners separately; 8 x B3016Z  
8 x CS616Z

**B1222C**



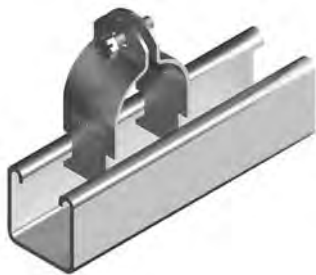
Wt 0.57 kg

**Available Finish**

- Hot Dip Galvanised
- Stainless Steel

**Note**

- Stainless steel products are manufactured against firm orders only and are non returnable.



Supplied complete with screw

**B5 Cable and Pipe Clamps**

Sold in 20 metre rolls

**B2600 Isolation Strip**

Product Code	Generic Reference	weight kg
B58	2024	0.04
B511	2025	0.04
B514	2026	0.04
B517	2027	0.04
B519	2028	0.05
B521	2029	0.05
B525	2030	0.05
B527	—	0.05
B529	2031	0.07
B532	2032	0.07
B534	2033	0.08
B538	2034	0.08
B543	2035	0.09
B548	2037	0.12
B551	2038	0.12
B554	2039	0.13
B557	2040	0.13
B560	2041	0.14
B564	2042	0.14
B567	2043	0.15
B570	2044	0.15
B573	2045	0.16
B576	2046	0.16
B579	2047	0.17

H Hot Dip Galvanised  
 S Stainless Steel

Product Code	Generic Reference	weight kg
B583	2048	0.17
B586	2049	0.18
B589	2050	0.18
B592	2051	0.19
B595	2052	0.19
B598	2053	0.20
B5102	2054	0.21
B5105	2055	0.21
B5108	2056	0.21
B5111	2057	0.22
B5114	2058	0.22
B5117	2059	0.23
B5121	2060	0.23
B5127	2062	0.24
B5133	2064	0.25
B5140	2066	0.27
B5146	2068	0.28
B5152	2070	0.28
B5160	2070-62	0.30
B5165	2070-64	0.31
B5171	2070-66	0.32
B5178	2070-70	0.33
B5191	2070-74	0.35
B5203	2070-80	0.37

H Hot Dip Galvanised  
 S Stainless Steel



The data is based on a B1000 Channel.

**B3087**



Wt: 0.84 kg



Suits M10 threaded rod.

**BC10H**



Wt: 0.18 kg



Suits M12 threaded rod.

**BC12H**



Wt: 0.25 kg



Available in zinc plated finish only.  
Suits M10 threaded rod only.

**PC10Z**



Wt: 0.05 kg



Available in zinc plated finish only.

**B2749**



Wt: 0.44 kg

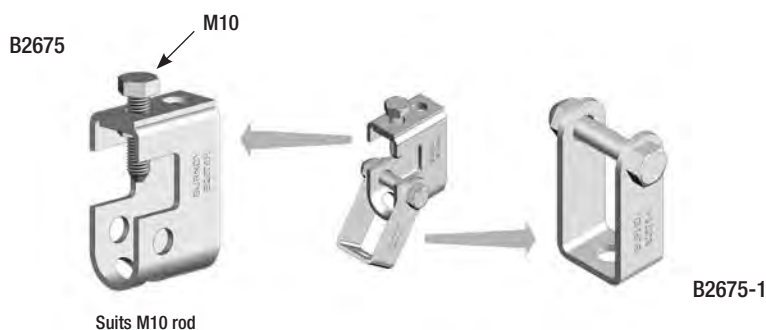


Available in zinc plated finish only.

**B2750**



Wt: 0.23 kg

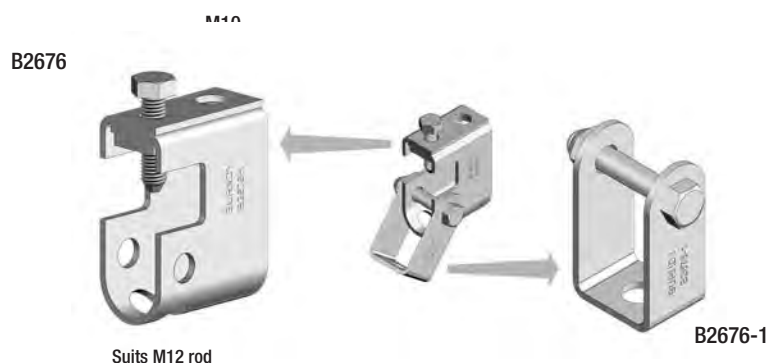


Suits M10 rod

**B2675 and B2675-1**



Wt: 0.19 kg



Suits M12 rod

**B2676 and B2676-1**



Wt: 0.26 kg

LT1 Laddertrays and Accessories

Specifications	<div>- Standard Length 3.0 metres.</div> <div>- Overall height 30 mm</div> <div>- Cable laying depth 24 mm</div>	
Surface Finish	Available Finish	Code
	Galvabond	G
Note	- Aluminium products are manufactured against firm orders only and are non returnable.	

Cable Laying Width mm	Galvabond	Overall Width mm
75	LT175G	77
100	LT1100G	102
150	LT1150G	152
225	LT1225G	227
300	LT1300G	302



LT1 Laddertray



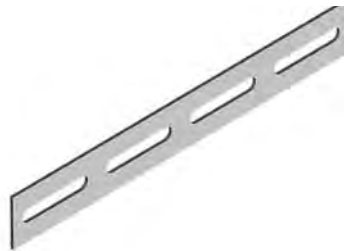
Use M6 x 10 Pan Screw (PS610Z) and M6 Flanged Nut (FN6Z) for assembly.  
Ordering Code: WIZ x 2 (PS610Z & FN6Z)

LT1SG



Use M6 x 10 Pan Screw (PS610Z) and M6 Flanged Nut (FN6Z) for assembly.  
Ordering Code: WIZ x 4 (PS610Z & FN6Z)

LT1RLG



Standard Length: 1.0 metre  
Use M6 x 10 Pan Screw (PS610Z) and M6 Flanged Nut (FN6Z) for assembly.  
Ordering Code: WIZ x 10 (PS610Z & FN6Z)

LT1RPG

channels

nuts & bolts

cantilever brackets

channel fittings

laddertrays

cable mesh

steel ladders

aluminium ladders

covers

hyground

**Specifications**

- Standard Length 3.0 metres.
- Overall height 50 mm
- Cable laying depth 40 mm

**Surface Finish**

**Available Finish**

Galvabond

Hot Dip Galvanised

**Code**

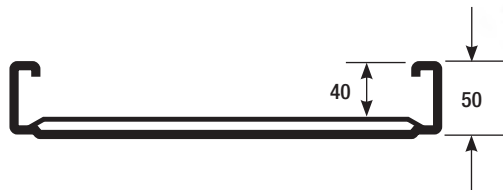
G

H

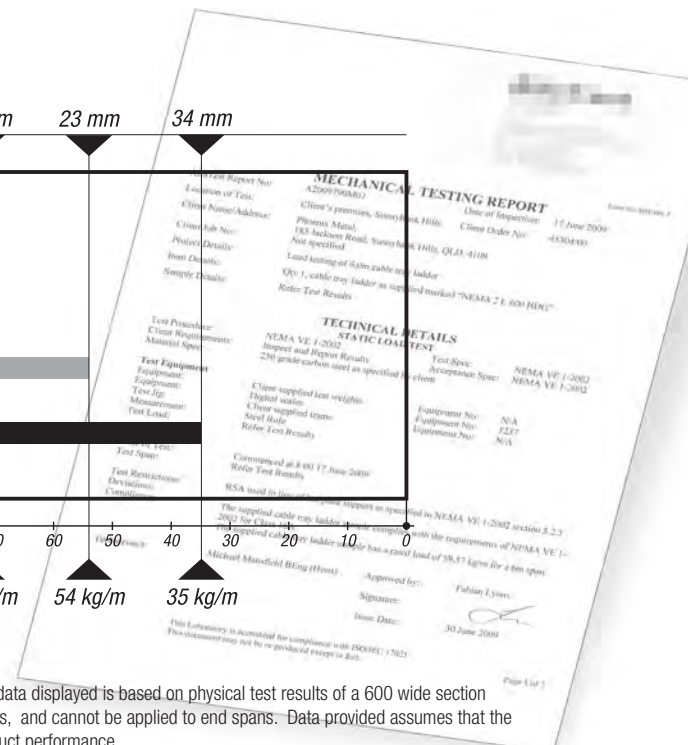
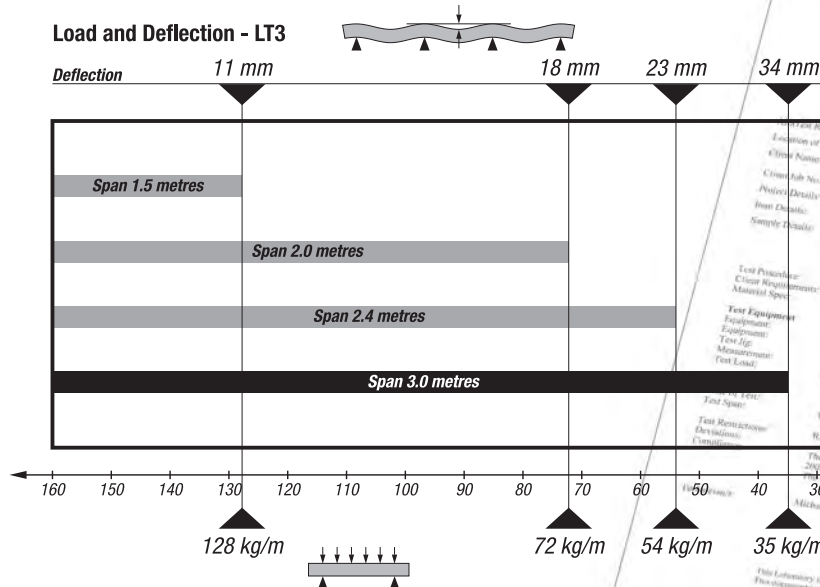
**Note**

- Aluminium products are manufactured against firm orders only and are non returnable.

Cable Laying Width mm	Galvabond	Hot Dip Galvanised	Overall Width mm
150	LT3150G	LT3150H	172
300	LT3300G	LT3300H	322
450	LT3450G	LT3450H	472
600	LT3600G	LT3600H	622



**LT3 Laddertray**

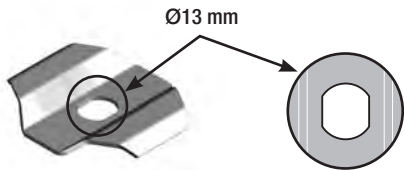


LT3 has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans, and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2. Non compliance may affect the overall product performance.

Surface Finish	Available Finish	Code
	Galvabond	G
	Hot Dip Galvanised	H

**Note**

- Hot Dip Galvanised products are manufactured against firm orders only.
- Minimum production quantities may apply.



Burndy Centre Hold Down Clamp can be used in place of traditional Hold Down Clamps to reduce the overall trapeze width.

Order fasteners separately for installation.

1 x HS1020, 1 x B1008

**LTCHD**



2 Splices required per length of tray.

Order fasteners separately for installation (per splice plate)

2 x LTBOLT, 2 x LTNUT

**LT3S**



Order fasteners separately for installation

1 x HS1025, 1 x B1008

**LT3HD**



6 Riser Links required to perform a 90 degree set.

Order fasteners separately for installation (per riser link)

2 x LTBOLT, 2 x LTNUT

**LT3RL**

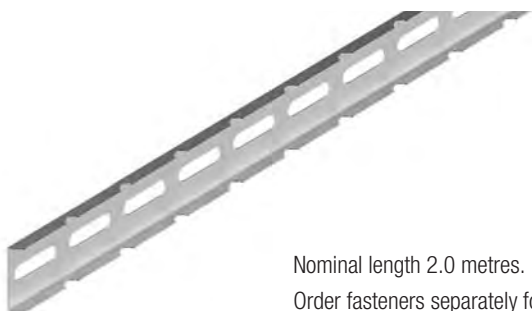


2 TX Brackets required to make a tee, and 4 required to make a cross.

Order fasteners separately for installation (per TX Bracket)

4 x LTBOLT, 4 x LTNUT

#### LT3TXH



Nominal length 2.0 metres.

Order fasteners separately for installation.

Approximate Length Required to Make a 150 Radius Bend

Tray Size	Length Required metres	Fasteners Required
LT3150	0.7	6
LT3300	0.9	6
LT3450	1.2	8
LT3600	1.4	8

#### LT3RP



#### Surface Finish

#### Available Finish

Zinc Plated  
Hot Dip Galvanised

#### Code

LTNUT / LTBOLT  
LTNUTH / LTBOLTH

Both items are ordered separately.

Splice Bolts have a smooth head to eliminate the risk of sheathing the cable during installation.

Special counterbore nuts ensure that correct tension is achieved during installation.

#### LTNUT and LTBOLT



Standard Finish Galvabond. Can also be supplied in Hot Dip Galvanised finish against firm orders.

Length 3.0 metres.

Note Order B3016 and PS620 separately for installation.

#### DSL3 (Divider Strip to suit LT3 Laddertray)

**Specifications**

- Standard Length 3.0 metres.
- Overall height 85 mm
- Cable laying depth 75 mm

**Surface Finish****Available Finish**

Galvabond

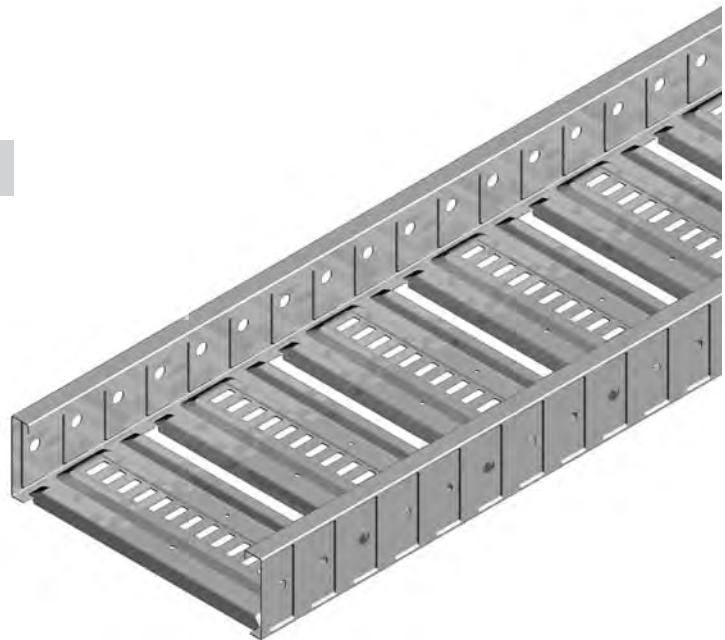
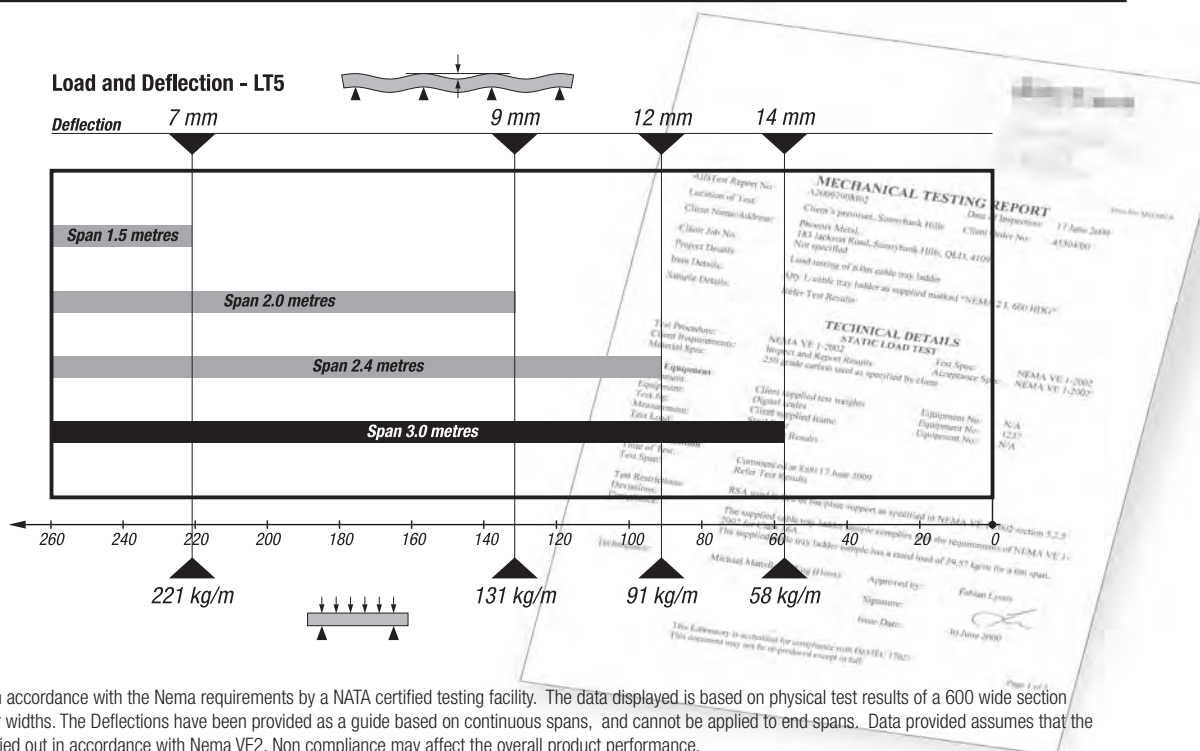
Hot Dip Galvanised

**Code**

G

H

Cable Laying Width mm	Ordering Code		Overall Width mm
	Galvabond	Hot Dip Galvanised	
150	<b>LT5150G</b>	<b>LT5150H</b>	172
300	<b>LT5300G</b>	<b>LT5300H</b>	322
450	<b>LT5450G</b>	<b>LT5450H</b>	472
600	<b>LT5600G</b>	<b>LT5600H</b>	622

**LT5 Laddertray**

LT5 has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans, and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2. Non compliance may affect the overall product performance.

**Surface Finish**

**Available Finish**

**Code**

Galvabond

G

Hot Dip Galvanised

H

**Note**

- Hot Dip Galvanised products are manufactured against firm orders only.

Minimum production quantities may apply.



2 Splices required per length of tray.

Order fasteners separately for installation  
(per splice plate)

2 x LTBOLT, 2 x LTNUT

**LT5S**



Order fasteners separately for installation

1 x HS1025, 1 x B1008

**LT5HD**

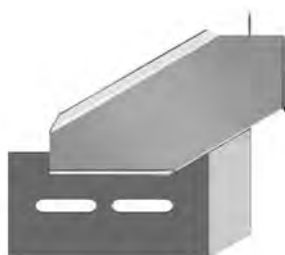


6 Riser Links required to perform a 90 degree set.

Order fasteners separately for installation (per riser link)

2 x LTBOLT, 2 x LTNUT

**LT5RL**



2 TX Brackets required to make a tee, and 4 required to make a cross.

Order fasteners separately for installation (per TX Bracket)

4 x LTBOLT, 4 x LTNUT

**LT5TX**

**Surface Finish****Available Finish****Code**

Galvabond

G

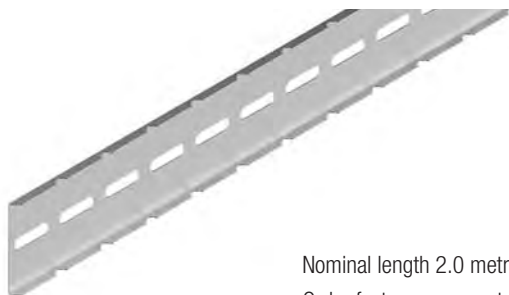
Hot Dip Galvanised

H

**Note**

- Hot Dip Galvanised products are manufactured against firm orders only.

Minimum production quantities may apply.



Nominal length 2.0 metres.

Order fasteners separately for installation.

**Approximate Length Required to Make a 150 Radius Bend**

Tray Size	Length Required metres	Fasteners Required
<b>LT5150</b>	0.7	6
<b>LT5300</b>	0.9	6
<b>LT5450</b>	1.2	8
<b>LT5600</b>	1.4	8

**LT5RP****Surface Finish****Available Finish****Code**

Zinc Plated

LTNUT / LTBOLT

Hot Dip Galvanised

LTNUTH / LTBOLTH

Both items are ordered separately.

Splice Bolts have a smooth head to eliminate the risk of sheathing the cable during installation.

Special counterbore nuts ensure that correct tension is achieved during installation.

**LTNUT and LTBOLT**

Standard Finish Galvabond. Can also be supplied in Hot Dip Galvanised finish against firm orders.

Length 3.0 metres.

Note Order B3016 and PS620 separately for installation.

**DSL5 (Divider Strip to suit LT5 Laddertray)**

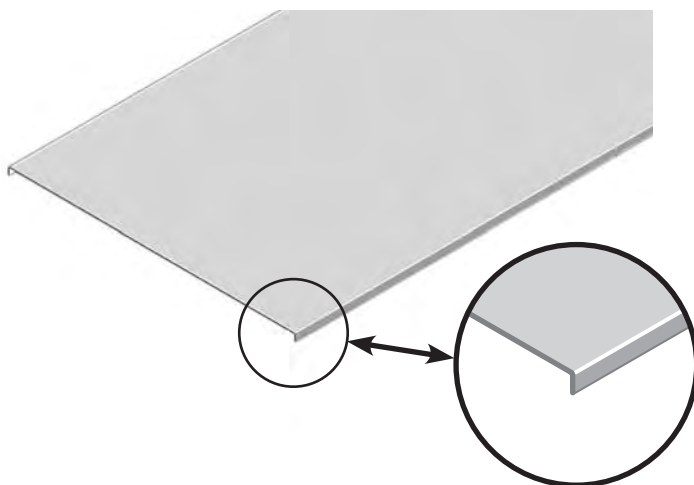
**Specifications**

- Standard Finish: Galvabond
- Standard Length: 3.0 metres.

**Note**

- Hot Dip Galvanised Covers are manufactured against firm orders only and are non returnable.
- Hot Dip Galvanising is not recommended for products such as these. Varying degrees of product distortion are likely to occur which may compromise aesthetics.

	Ordering Code	Nominal Width mm	Internal Width mm
Galvanised	CFLT150G	150	175
	CFLT300G	300	325
	CFLT450G	450	475
	CFLT600G	600	625
Hot Dip Galvanised	CFLT150H	150	175
	CFLT300H	300	325
	CFLT450H	450	475
	CFLT600H	600	625



**Laddertray LT3/LT5 - Flat Cover**

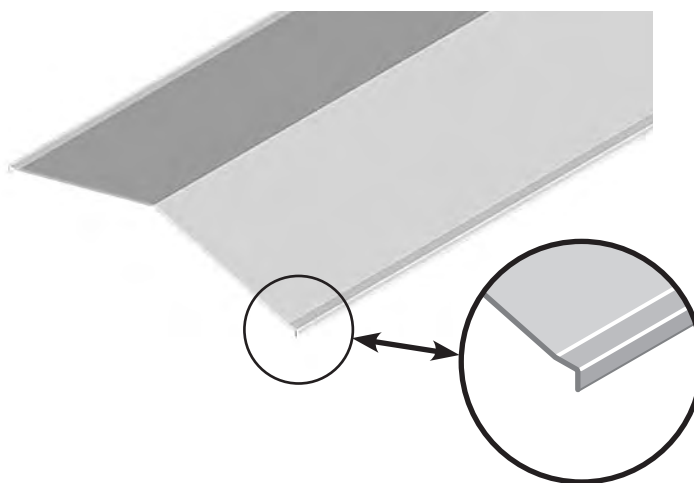
**Specifications**

- Standard Length 3.0 metres.

**Note**

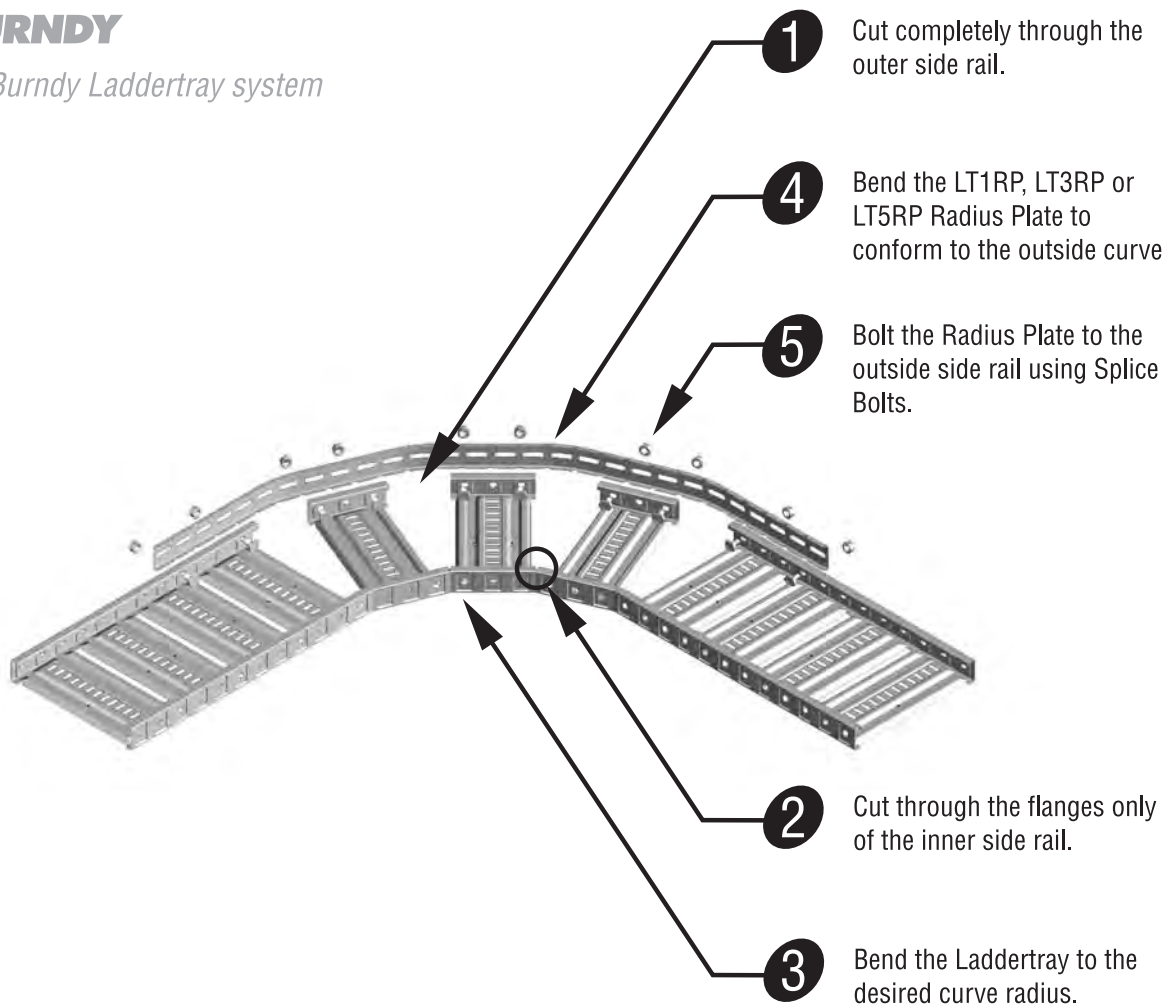
- Hot Dip Galvanised Covers are manufactured against firm orders only and are non returnable.
- Hot Dip Galvanising is not recommended for products such as these. Varying degrees of product distortion are likely to occur which may compromise aesthetics.

	Ordering Code	Nominal Width mm	Internal Width mm
Galvanised	CPLT150G	150	175
	CPLT300G	300	325
	CPLT450G	450	475
	CPLT600G	600	625
Hot Dip Galvanised	CPLT150H	150	175
	CPLT300H	300	325
	CPLT450H	450	475
	CPLT600H	600	625



**Laddertray LT3/LT5 - Peaked Cover**

## Making a Horizontal Bend

**BURNDY***the Burndy Laddertray system*

1 channels

2 nuts &amp; bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

8 aluminium ladders

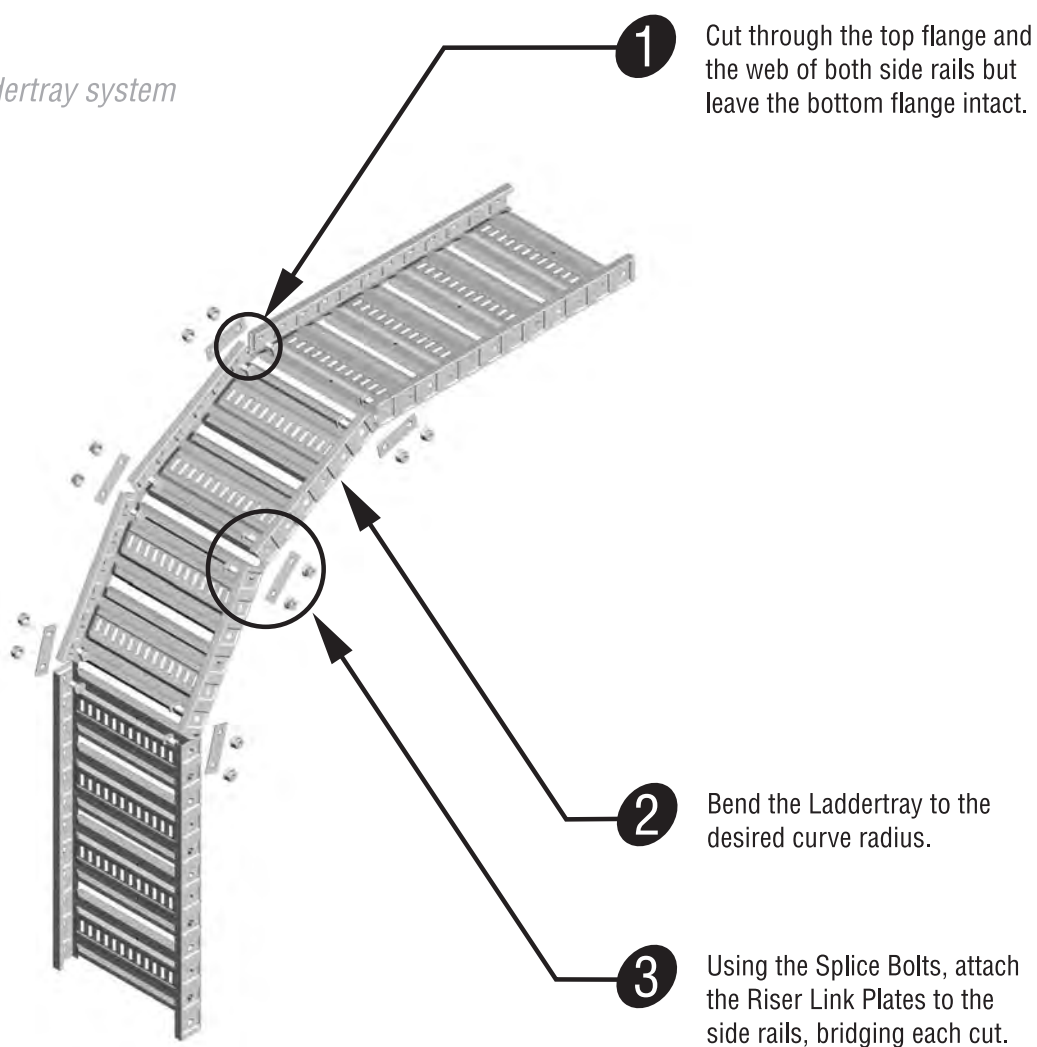
9 covers

10 hyground

## Making an External Riser

**BURNDY**

*the Burndy Laddertray system*



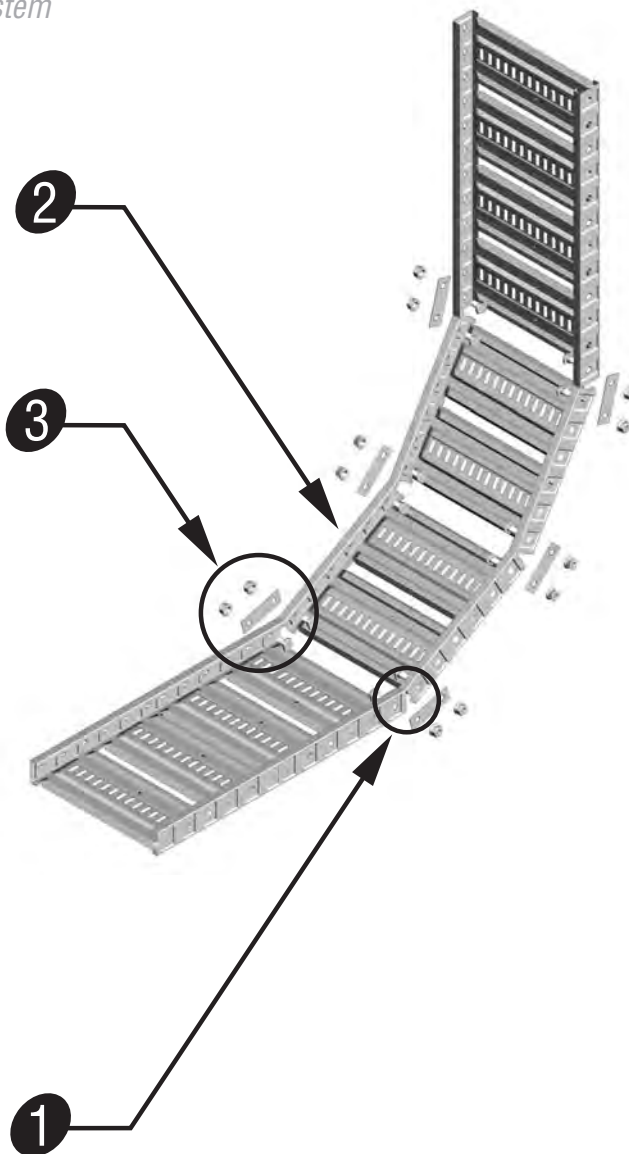
## Making an Internal Riser

**BURNDY***the Burndy Laddertray system*

2 Bend the Laddertray to the desired curve radius.

3 Using the Splice Bolts, attach the Riser Link Plates to the side rails, bridging each cut.

1 Cut through the bottom flange and the web of both side rails, but leave the top flange intact.



1 channels

2 nuts &amp; bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

8 aluminium ladders

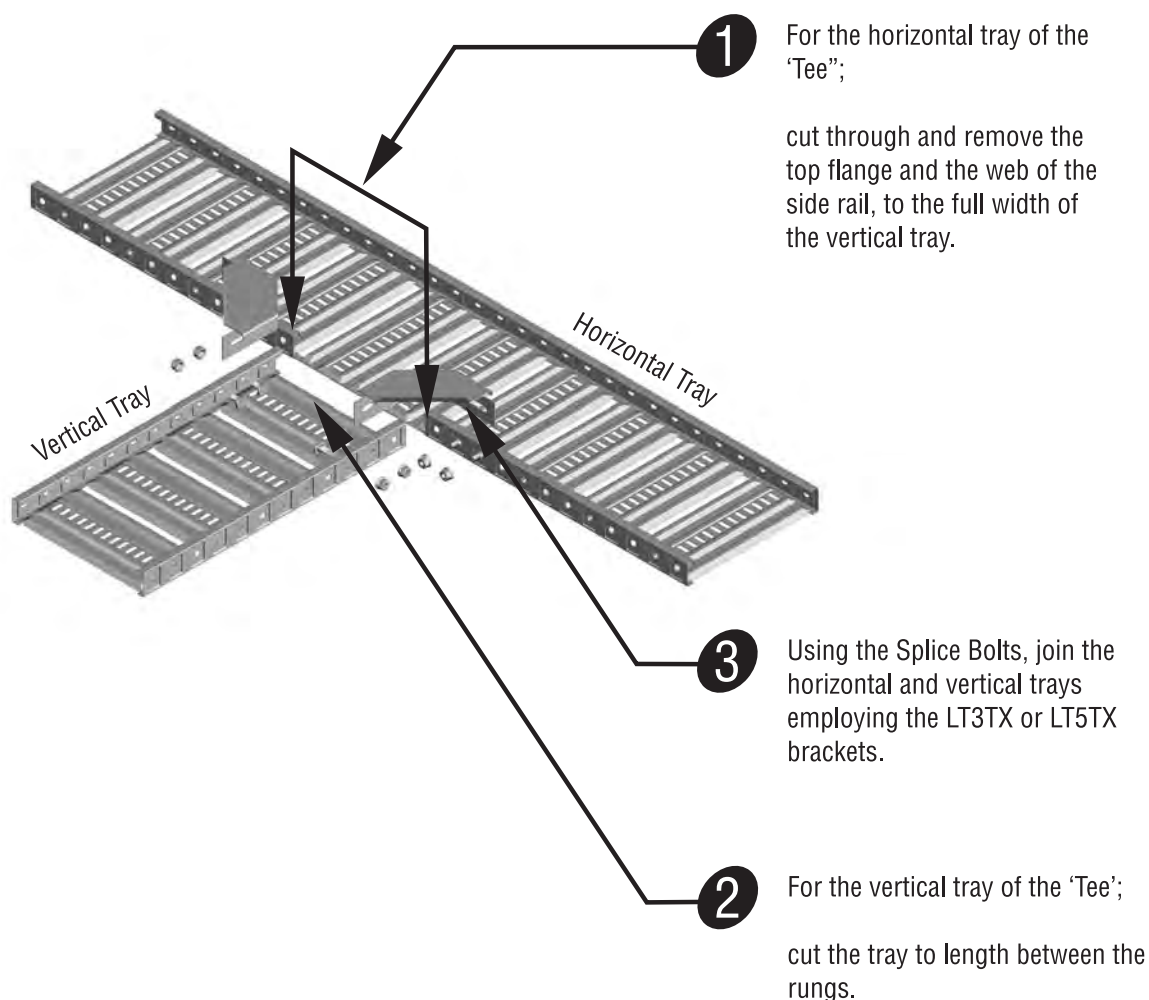
9 covers

10 hyground

## Making an Tee

**BURNDY**

*the Burndy Laddertray system*



**Surface Finish****Available Finish****Code**

Galvabond

G

Hot Dip Galvanised

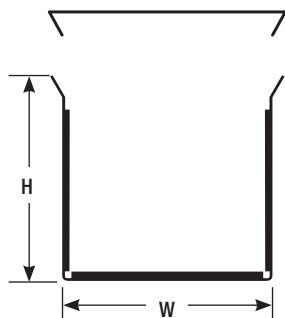
H

Aluminium

A

**Note**

- Aluminium and Hot Dip Galvanised products are manufactured against firm orders only.



Joining screws (PS610Z) and nuts (FN6Z) sold separately.  
Two (2) required per joint. Product code WIZ.

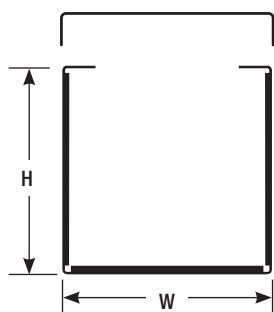
Joining Screws Ordering Code: WIZ x 2 (PS610Z & FN6Z).

Supplied in standard 2.4 metre lengths.

Other sizes can be manufactured to firm orders in minimum batch quantities of 100.

Ordering Code	Width W mm	Height H mm
DCL5050	50	50
DCL7575	75	75
DCL100100	100	100
DCL150100	150	100

• G Galvabond  
 — H Hot Dip Galvanised  
 — A Aluminum

**Cable Duct - Clip Lid**

Joining screws (PS610Z) and nuts (FN6Z) sold separately.  
Two (2) required per joint. Product code WIZ.

Joining Screws Ordering Code: WIZ x 2 (PS610Z & FN6Z).

Supplied in standard 2.4 metre lengths.

Other sizes can be manufactured to firm orders in minimum batch quantities of 100.

Ordering Code	Width W mm	Height H mm
DSL5050	50	50
DSL7575	75	75
DSL100100	100	100
DSL150100	150	100

• G Galvabond  
 — H Hot Dip Galvanised  
 — A Aluminum

**Cable Duct - Screw Lid**

**Surface Finish**

**Available Finish**

**Code**

Galvabond

G

Hot Dip Galvanised

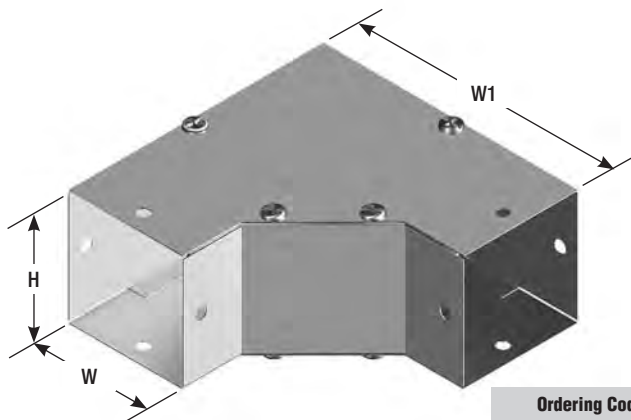
H

Aluminium

A

**Note**

- Aluminium and Hot Dip Galvanised products are manufactured against firm orders only.



Joining screws (PS610Z) and nuts (FN6Z) sold separately.  
Two (2) required per joint. Product code WIZ.

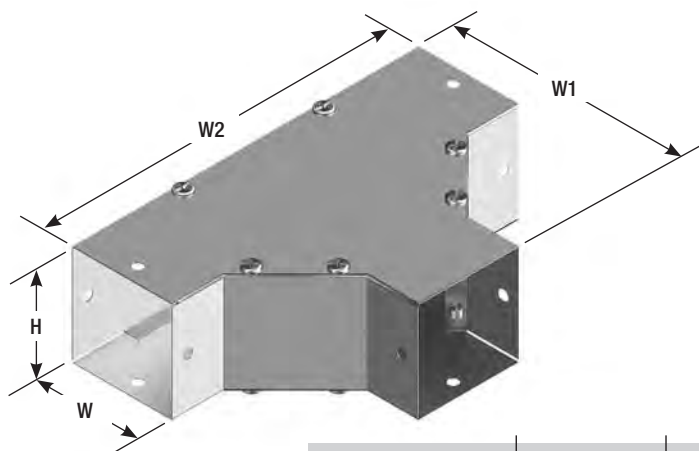
Joining Screws Ordering Code: WIZ x 4 (PS610Z & FN6Z).

Combination Bend/Riser requires four (4) screws per fitting for installation.

Ordering Code	Width W mm	Height H mm	Width W1 mm
DCB5050	50	50	167
DCB7575	75	75	192
DCB100100	100	100	217
DCB150100	150	100	267

● G Galvabond  
 — H Hot Dip Galvanised  
 — A Aluminum

**Combination Bend Riser**



Joining screws (PS610Z) and nuts (FN6Z) sold separately.  
Two (2) required per joint. Product code WIZ.

Joining Screws Ordering Code: WIZ x 6 (PS610Z & FN6Z).

Combination Tee requires six (6) screws per fitting for installation.

Ordering Code	Width W mm	Height H mm	Width W1 mm	Width W2 mm
DCT5050	50	50	167	287
DCT7575	75	75	192	312
DCT100100	100	100	217	337
DCT150100	150	100	267	387

● G Galvabond  
 — H Hot Dip Galvanised  
 — A Aluminum

**Combination Tee**

**Surface Finish****Available Finish****Code**

Galvabond

G

Hot Dip Galvanised

H

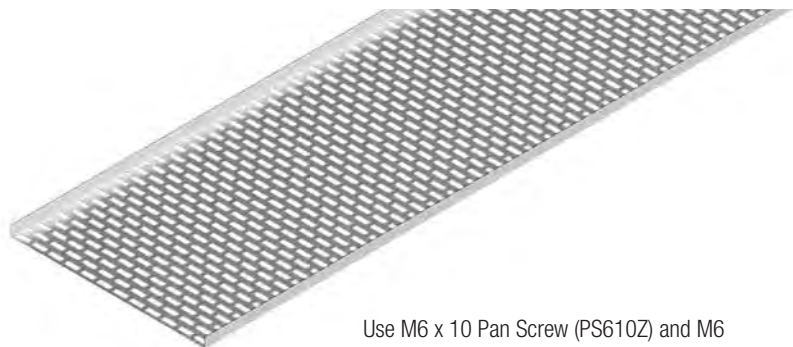
Stainless Steel

S

(Manufactured against firm orders only. Stainless steel products are non returnable and minimum batch quantities may apply).

**Length**

- 2.4 metres



Use M6 x 10 Pan Screw (PS610Z) and M6 Flanged Nut (FN62 x 2) for installation of accessories.

Ordering Code: WIZ x 2 (PS610Z & FN6Z).

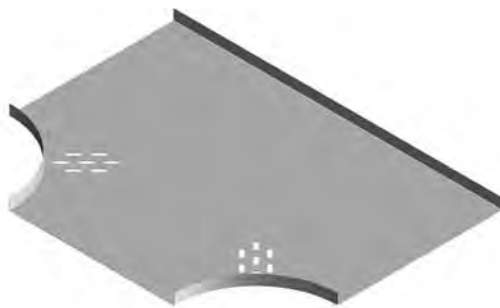
Cable Laying Width mm	Galvabond	Hot Dip Galvanised
75	CT75G	CT75H
100	CT100G	CT100H
150	CT150G	CT150H
225	CT225G	CT225H
300	CT300G	CT300H
450	CT450G	CT450H
600	CT600G	CT600H

**Cable Tray**

Use M6 x 10 Pan Screw (PS610Z) and M6 Flanged Nut (FN62 x 2) for installation of accessories.

Ordering Code: WIZ x 2 (PS610Z & FN6Z).

Cable Laying Width mm	Galvabond	Hot Dip Galvanised
75	CTB75G	CTB75H
100	CTB100G	CTB100H
150	CTB150G	CTB150H
225	CTB225G	CTB225H
300	CTB300G	CTB300H
450	CTB450G	CTB450H
600	CTB600G	CTB600H

**Cable Tray Bend**

Use M6 x 10 Pan Screw (PS610Z) and M6 Flanged Nut (FN62 x 2) for installation of accessories.

Ordering Code: WIZ x 2 (PS610Z & FN6Z).

Cable Laying Width mm	Galvabond	Hot Dip Galvanised
75	CTT75G	CTT75H
100	CTT100G	CTT100H
150	CTT150G	CTT150H
225	CTT225G	CTT225H
300	CTT300G	CTT300H
450	CTT450G	CTT450H
600	CTT600G	CTT600H

**Cable Tray Tee**

1 channels

2 nuts &amp; bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

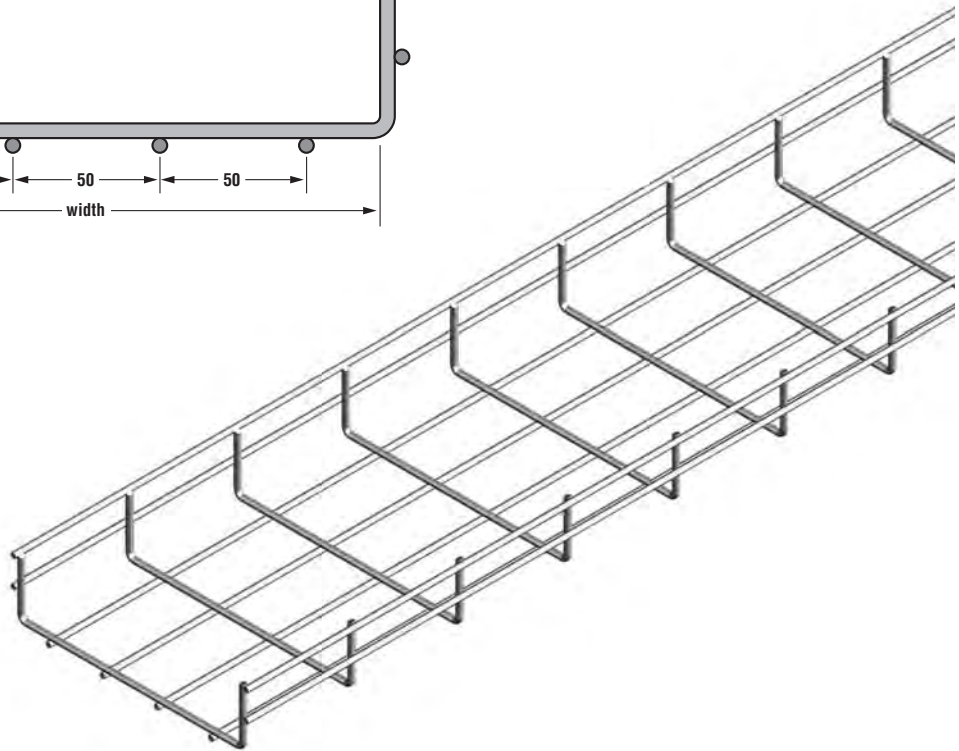
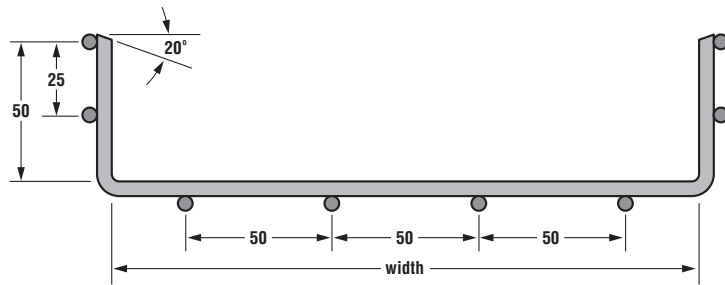
6 cable mesh

7 steel ladders

8 aluminium ladders

9 covers

10 hyground

**Safe Load**

Ordering Code	Height mm	Width		Wire Dia mm	Safe Load Capability (kg)					Safe Deflection mm
					Support Span (mm)					
		mm	inch		1000	1500	2000	2500	3000	
BCM150	50	150	6	5	228	152	101	68	45	35
BCM300	50	300	12	5	278	186	124	83	55	35
BCM450	50	450	18	5	329	219	146	98	65	35
BCM500	50	500	20	5	354	236	158	105	70	35
BCM600	50	600	24	5	380	253	169	113	75	35

- Z Electro Zinc Plated (standard)
- H Hot Dip Galvanised (made to order)

**Maximum Load**

Ordering Code	Height mm	Width		Wire Dia mm	Maximum Load Capability (kg)					Max Deflection mm
					Support Span (mm)					
		mm	inch		1000	1500	2000	2500	3000	
BCM150	50	150	6	5	532	354	236	158	105	100
BCM300	50	300	12	5	683	456	304	203	135	100
BCM450	50	450	18	5	835	557	371	248	165	100
BCM500	50	500	20	5	861	574	383	255	170	100
BCM600	50	600	24	5	911	608	405	270	180	100

- Z Electro Zinc Plated (standard)
- H Hot Dip Galvanised (made to order)

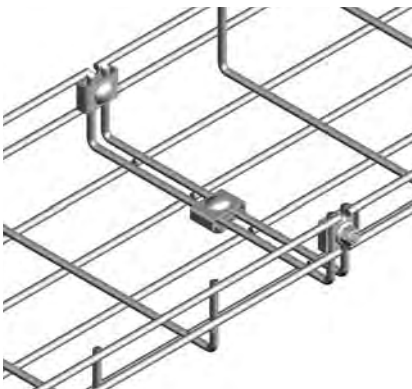
**BCM50 Wire Mesh Cable Trays**

Ordering Code: **BCMCP**

Used to join sections of straight mesh cable trays. A minimum of three couplers is required per joint. The coupler is supplied complete with an M6 bolt and an M6 flange nut.

Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)



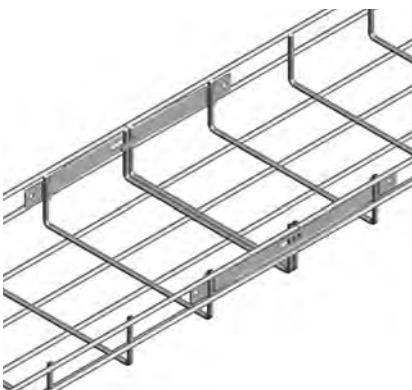
### BCMCP Coupler

Ordering Code: **BCMSP**

Intended for light loads, the BCMSP provides a quick and simple method of joining sections of straight mesh cable trays.

Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)



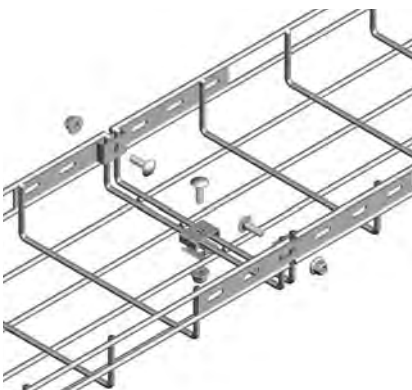
### BCMSP Fast Fix Splicer

Ordering Code: **BCMSB**

Used to make the joint between two wire mesh cable trays stronger and stiffer. Also used to construct tees, crosses, risers and reducers.

Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)



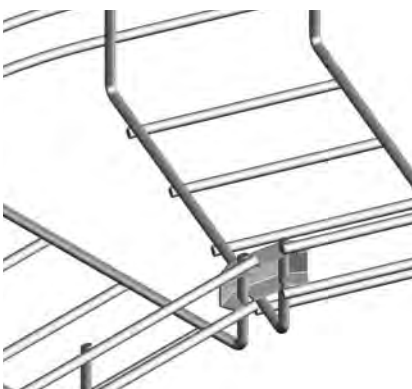
### BCMSB Strengthening Bar

Ordering Code: **BCMCPF**

An alternative to BCMCP when making bends. Mainly used for smaller wire mesh trays.

Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)



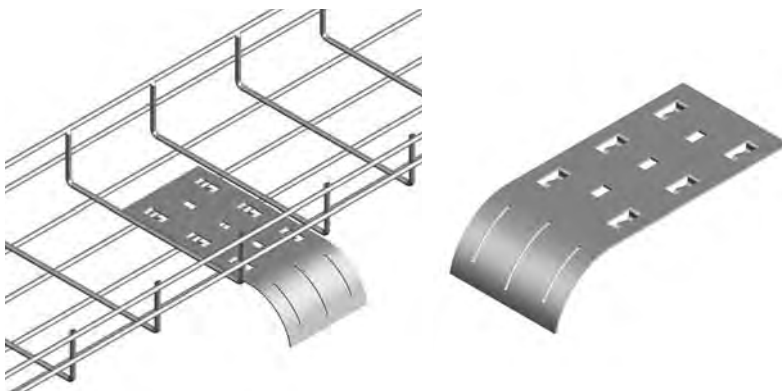
### BCMCPF Coupler Fastlock

Ordering Code: **BCMCG**

Facilitates cables to emerge from the cable tray.

Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)



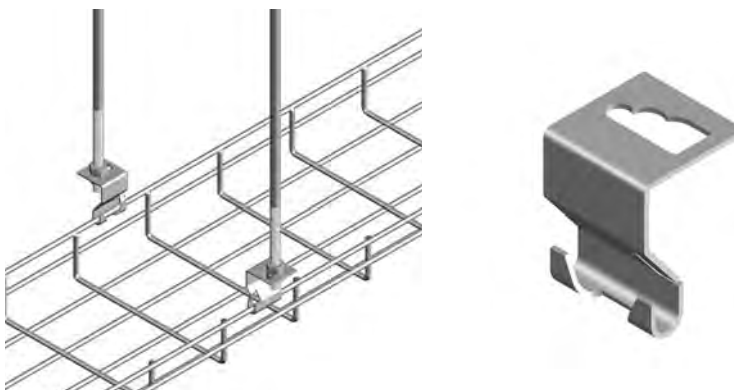
### BCMCG Cable Guide

Ordering Code: **BCMHH**

Used to hang cable trays from an overhead support. Intended for light loads.

Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)



### BCMHH Hanging Hook

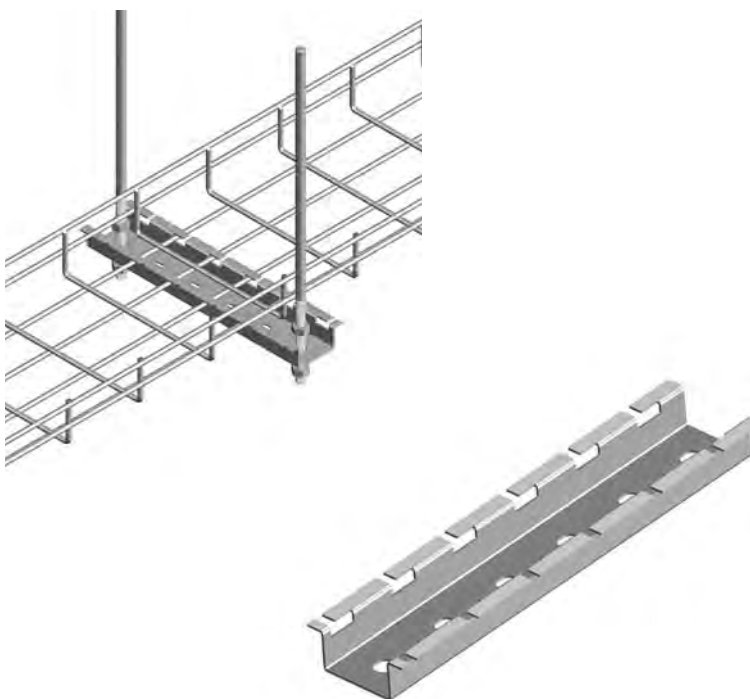
Ordering Code: **BCMT150, BCMT300, BCMT450, BCMT500, BCMT600.**

Commonly used for ceiling mounting. M10 rods allow heavier loads to be carried. Requires two M10 (1000 mm long) metric thread rods, two anchor bolts, two flange nuts and two standard M10 nuts.

BCMT series can also be used to support a cable tray from the floor.

Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)



### BCMT Trapeze

1 channels

2 nuts &amp; bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

8 aluminium ladders

9 covers

10 hyground

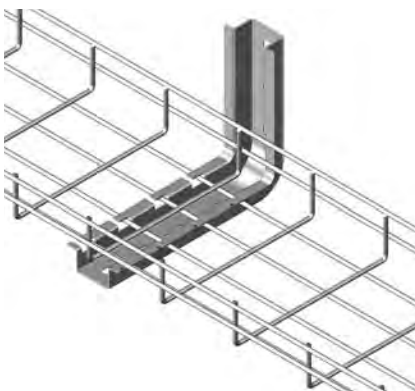
Ordering Code: **BCMWB150, BCMWB300, BCMWB450, BCMWB500, BCMWB600.**

Used to support wire mesh cable trays from a vertical surface such as a wall.

Width: 150, 300, 450, 500, 600 mm

Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)



### BCMWB L Type Wall Bracket

Ordering Code: **BCMC150, BCMC300, BCMC450, BCMC500, BCMC600.**

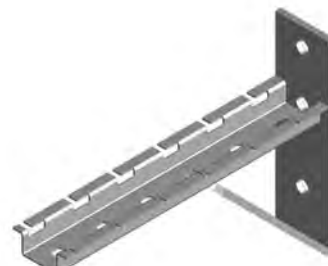
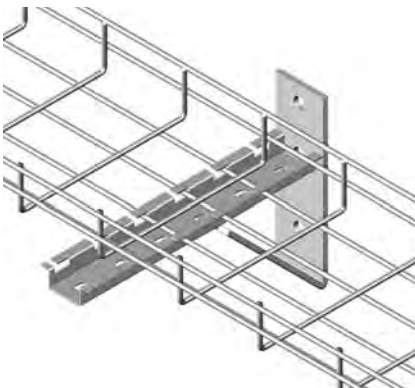
Used to support wire mesh cable trays from a vertical surface such as a wall.

Width: 150, 300, 450, 500, 600 mm

Designed for heavy loads.

Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)



### BCMC Cantilever Bracket

Ordering Code: **BCMFS300, BCMFS600**

For supporting heavy wire mesh cable trays in under floor installations.

Height: 26.5 mm

Width: 300 mm, 600 mm

Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)



### M Shaped Floor Support

Ordering Code: **BCMHD**

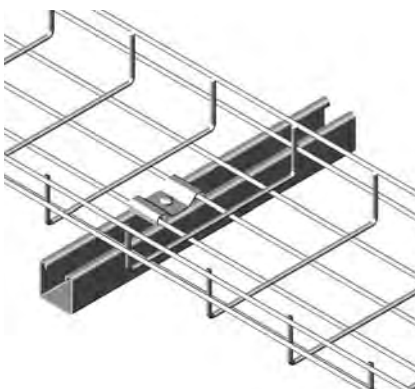
For connecting a wire mesh cable tray to a supporting channel.

Material Thickness: 1.6 mm

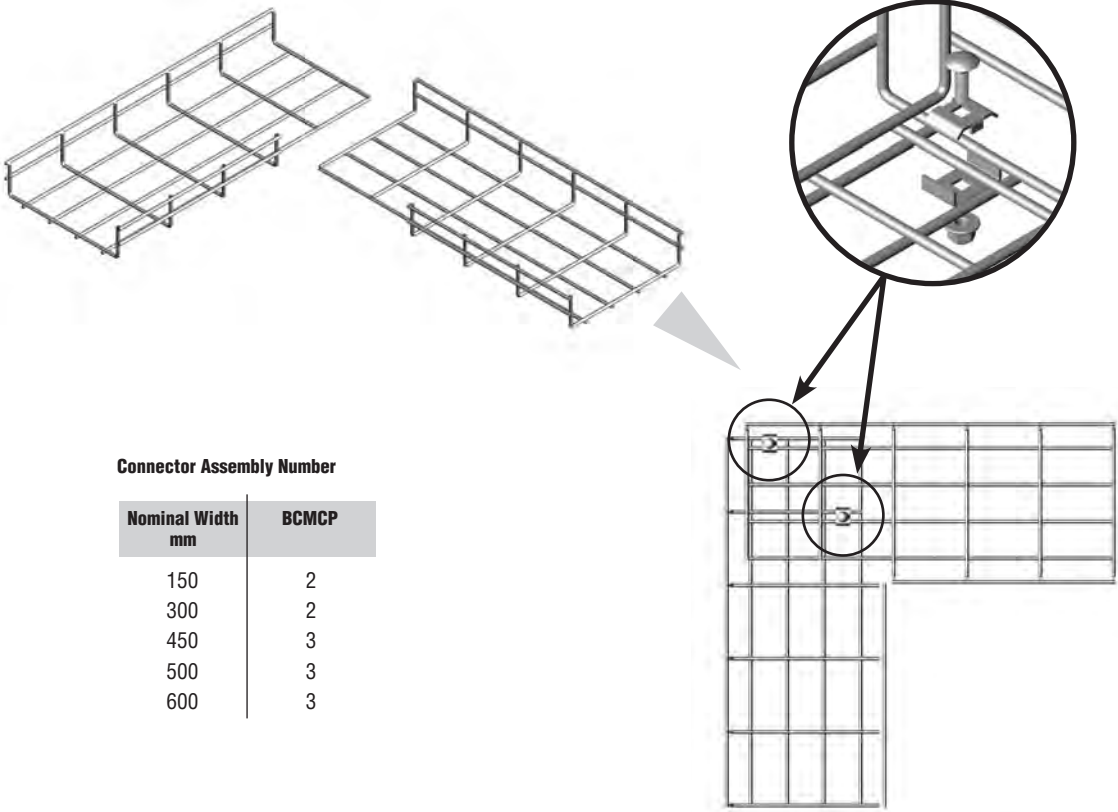
Finish: **Z** - Zinc Electro Plated

**H** - Hot Dip Galvanised (made to order)

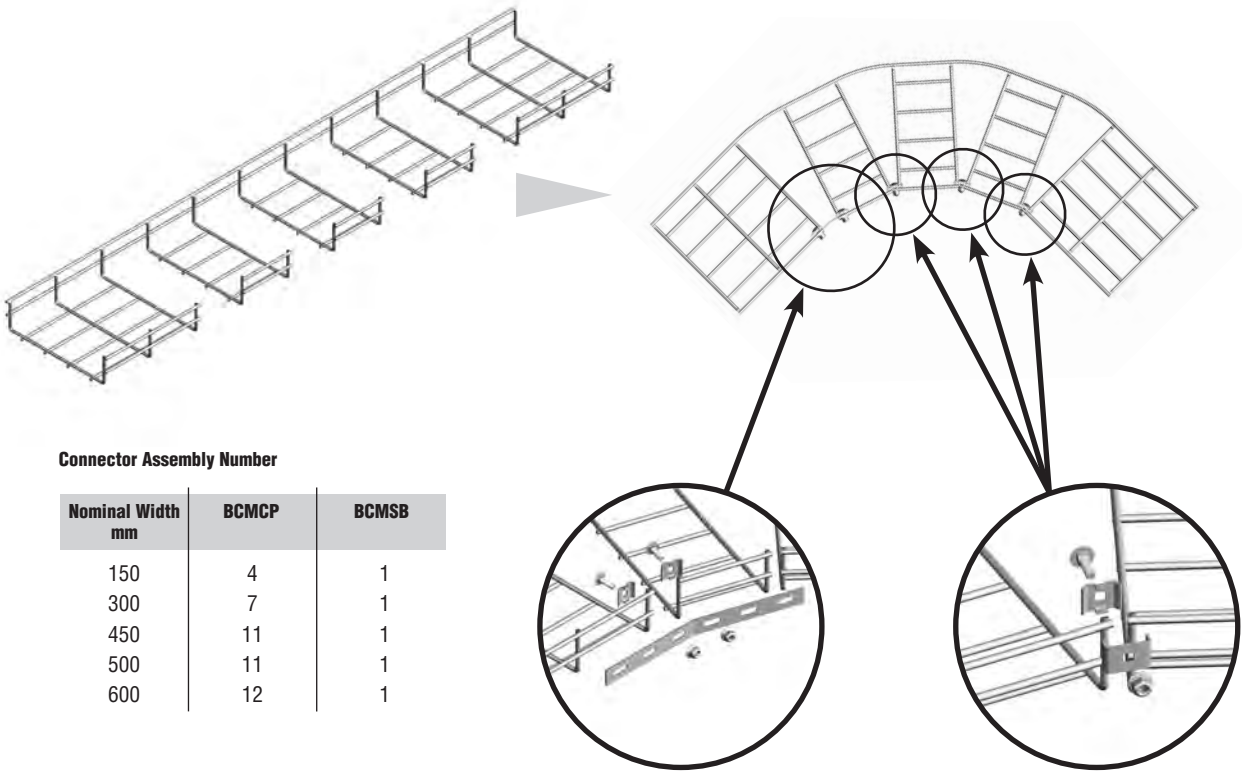
To be used with a 6 mm Pan Head Screw ordering code PS620Z and 6 mm Trunking Nut ordering code B3016Z. Both are sold separately.



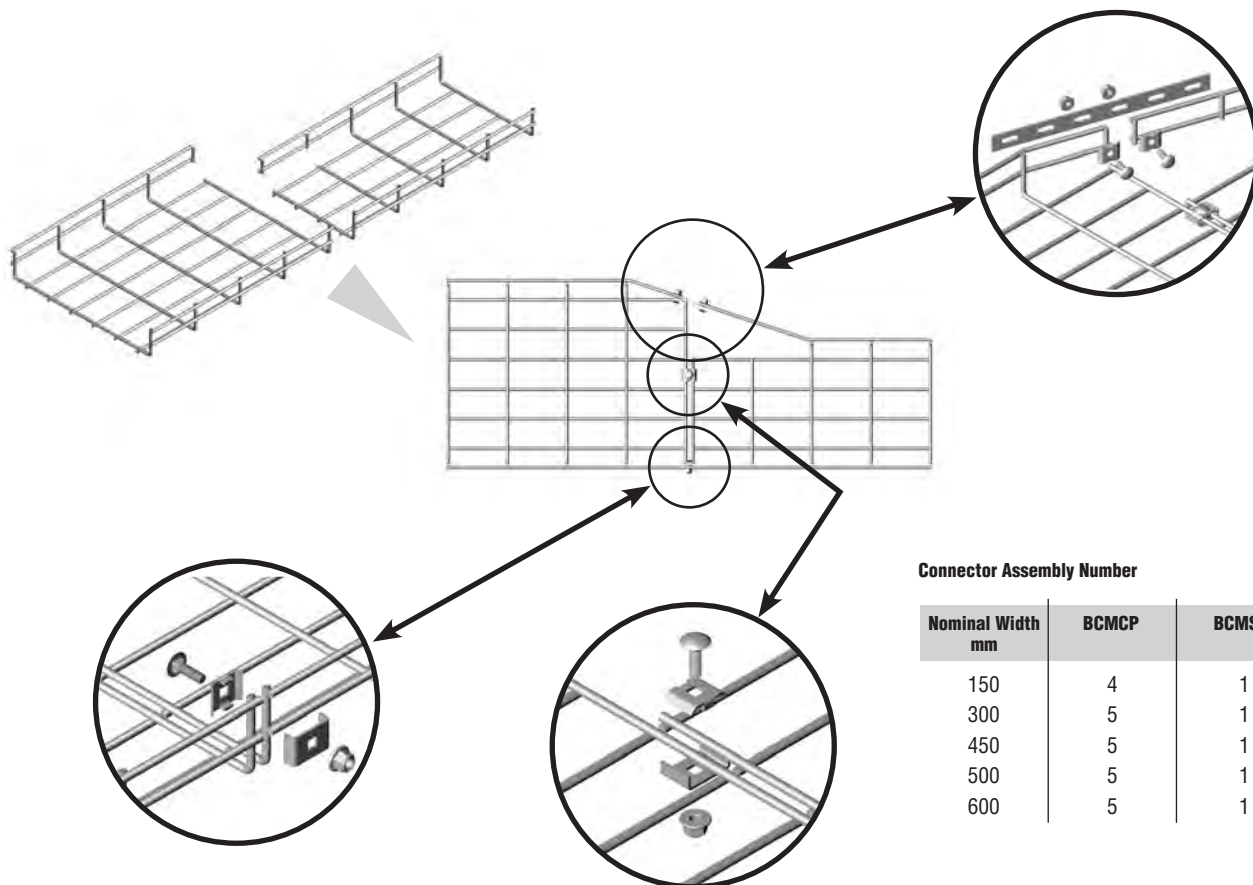
### BCMHD



**90° Short Bend - Assembled from Two Straight Sections**



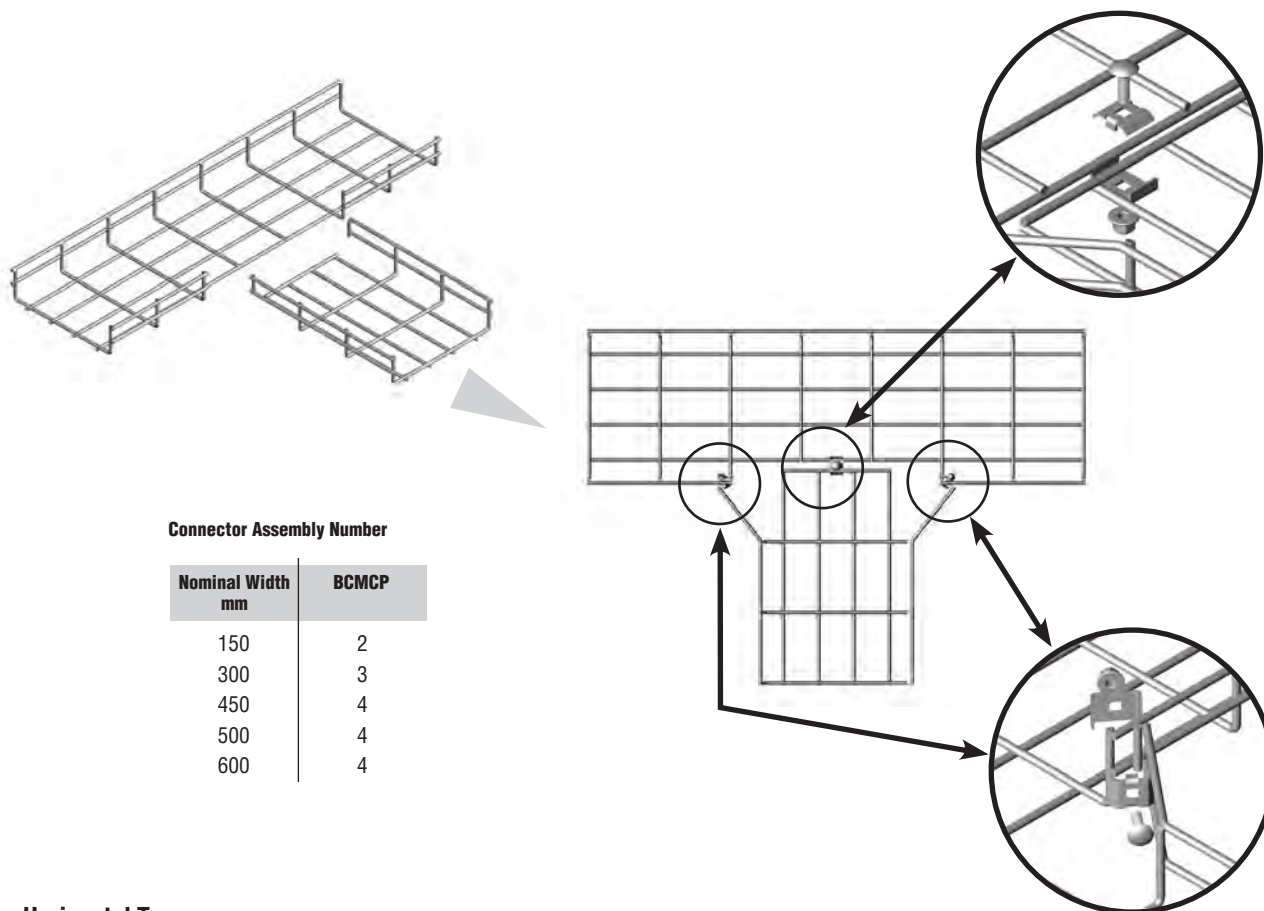
**90° Long Radius Bend**



Connector Assembly Number

Nominal Width mm	BCMCP	BCMSB
150	4	1
300	5	1
450	5	1
500	5	1
600	5	1

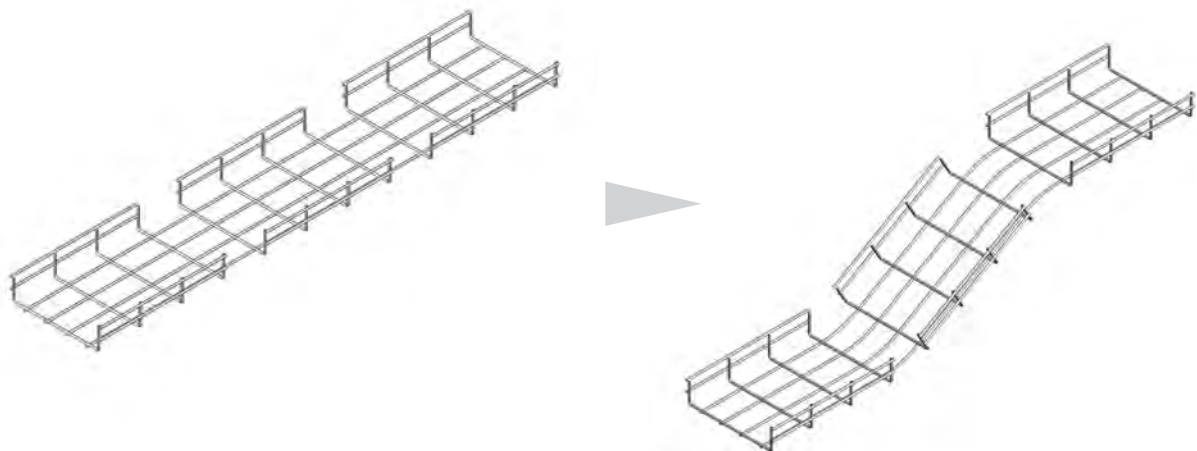
## Reducers



Connector Assembly Number

Nominal Width mm	BCMCP
150	2
300	3
450	4
500	4
600	4

## Horizontal Tees



**Vertical Inside and Outside Bend**

channels

1

nuts & bolts

2

cantilever  
brackets

3

channel  
fittings

4

laddertrays

5

cable mesh

6

steel  
ladders

7

aluminium  
ladders

8

covers

9

hyground

10

## Specifications

- Standard Length 6.0 metres.
- Overall height 75 mm
- Cable laying depth 60 mm

## Surface Finish

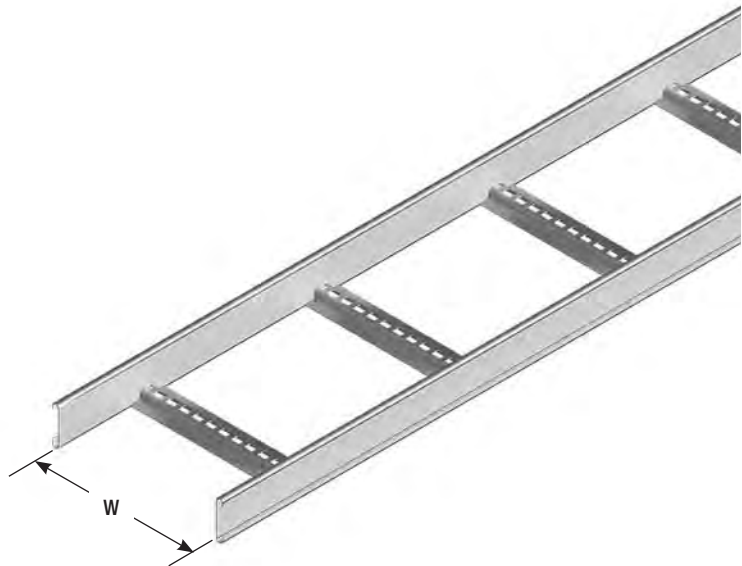
### Available Finish

Hot Dip Galvanised

### Code

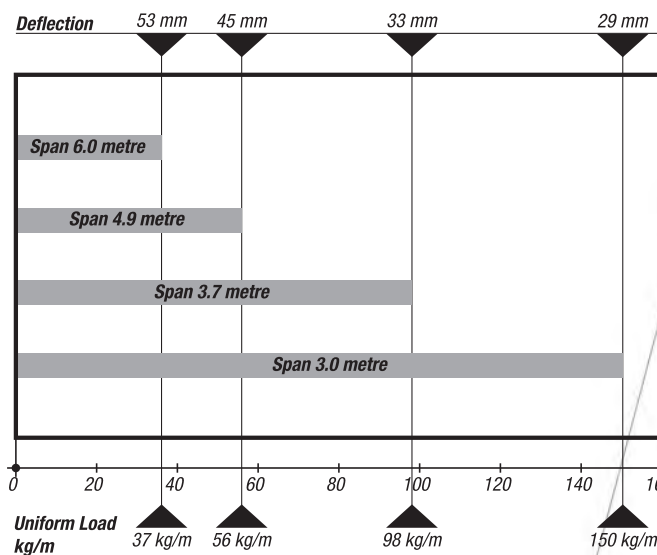
H

Cable Laying Width W mm	Ordering Code	Width Overall mm
150	<b>N1L150H</b>	176
300	<b>N1L300H</b>	326
450	<b>N1L450H</b>	476
600	<b>N1L600H</b>	626
900	<b>N1L900H</b>	926

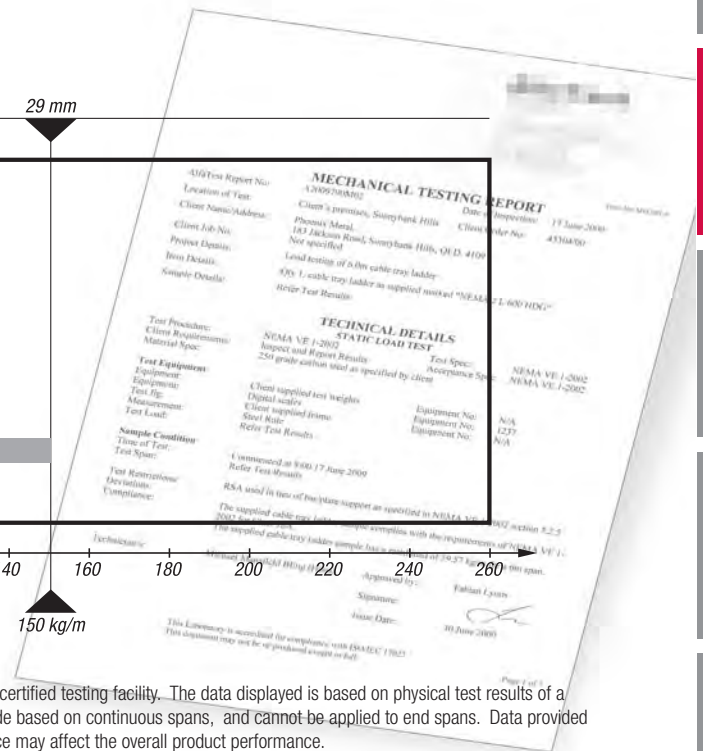


## Nema 1 Cable Ladder

### Load and Deflection - Nema 1 Steel



Nema 1 Cable Ladder has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans, and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2, non compliance may affect the overall product performance.



channels

nuts & bolts

cantilever brackets

channel fittings

laddertrays

cable mesh

steel ladders

aluminium ladders

covers

hygroud

- Specifications
- Length supplied varies according to customer's requirements.

- Overall height 75 mm

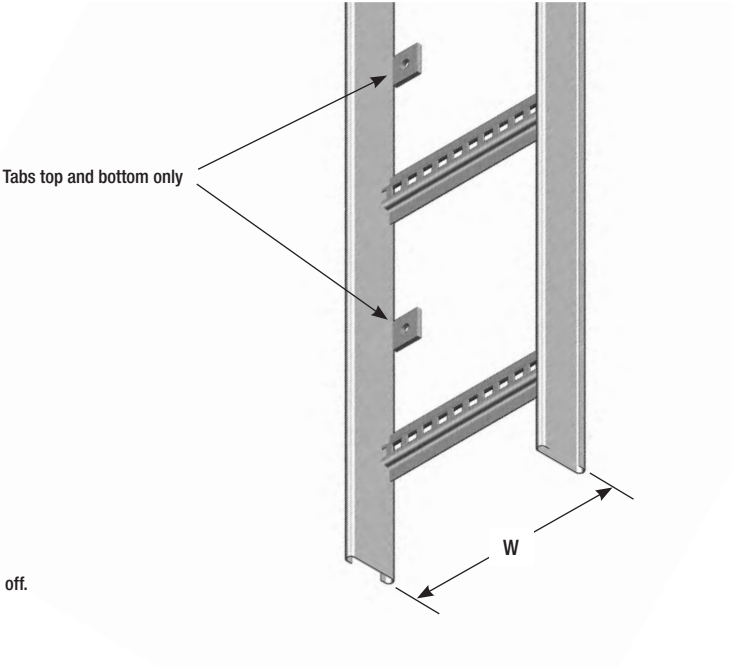
- Cable laying depth 60 mm

Surface Finish	Available Finish	Code
	Hot Dip Galvanised	H

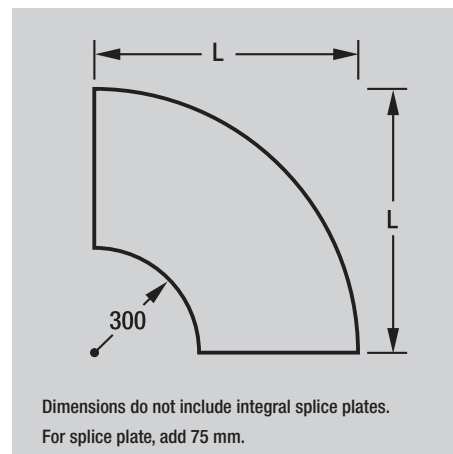
Cable Laying Width W mm	Ordering Code	Width Overall mm
150	N1RL150H	176
300	N1RL300H	326
450	N1RL450H	476
600	N1RL600H	626



Note: The set back of the rungs allows for easy installation and tying off.



Nema 1 Riser Ladder

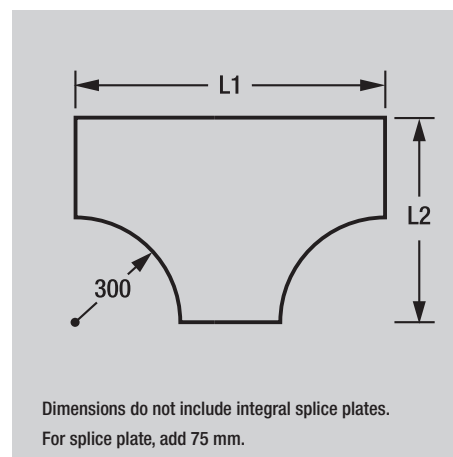
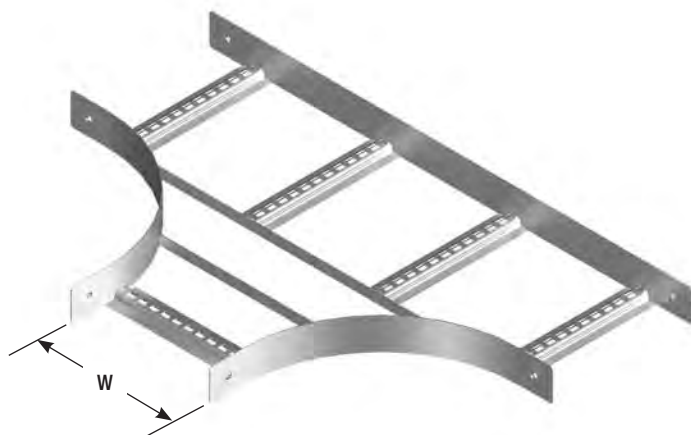


Order fasteners separately for installation. 4 x N1SBH (no nuts) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Ordering Code	Width W mm	Length L mm
N1B1503H	150	450
N1B3003H	300	600
N1B4503H	450	750
N1B6003H	600	900
N1B9003H	900	1200

### NEMA 1 Cable Ladder - Bend

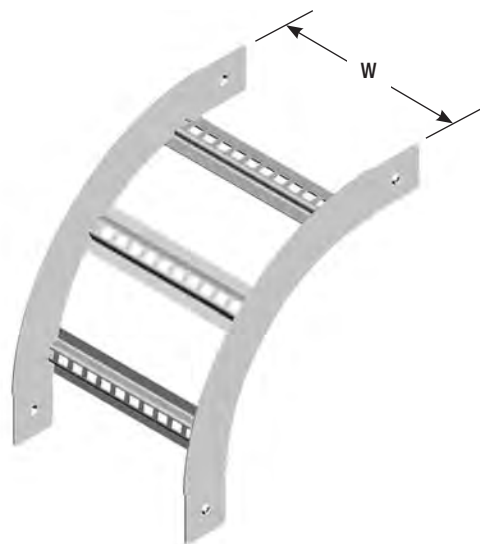


Order fasteners separately for installation. 6 x N1SBH (no nuts) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.

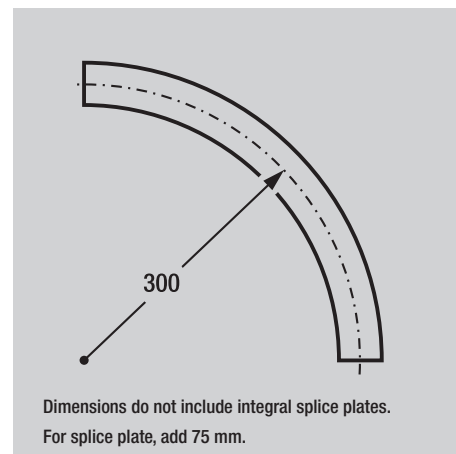
Ordering Code	Width W mm	Length L1 mm	Length L2 mm
N1T1503H	150	750	450
N1T3003H	300	900	600
N1T4503H	450	1050	750
N1T6003H	600	1200	900
N1T9003H	900	1500	1200

### NEMA 1 Cable Ladder - Tee



Order fasteners separately for installation. 4 x N1SBH (no nuts) required.

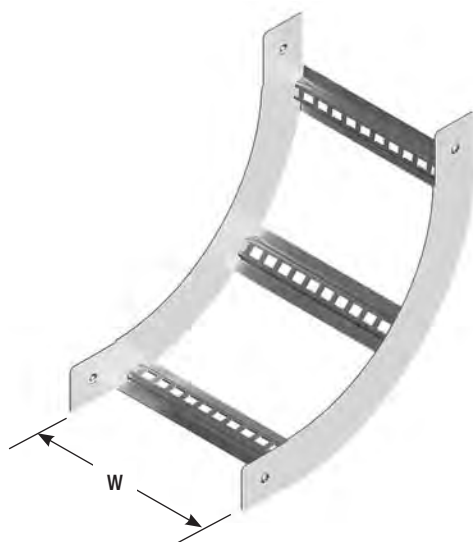
Non standard radius fittings can be manufactured against firm orders, and are non returnable.



Dimensions do not include integral splice plates.  
For splice plate, add 75 mm.

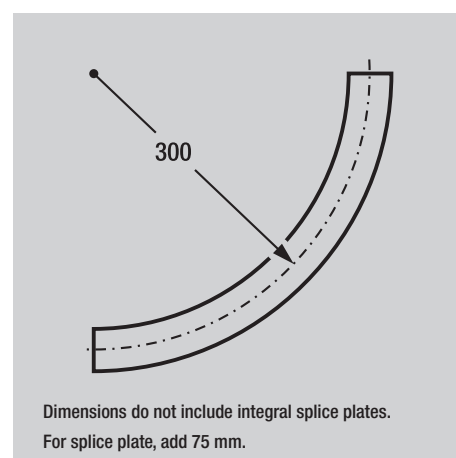
Ordering Code	Width W mm
<b>N1ER1503H</b>	150
<b>N1ER3003H</b>	300
<b>N1ER4503H</b>	450
<b>N1ER6003H</b>	600
<b>N1ER9003H</b>	900

## NEMA 1 Cable Ladder - External Riser



Order fasteners separately for installation. 4 x N1SBH (no nuts) required.

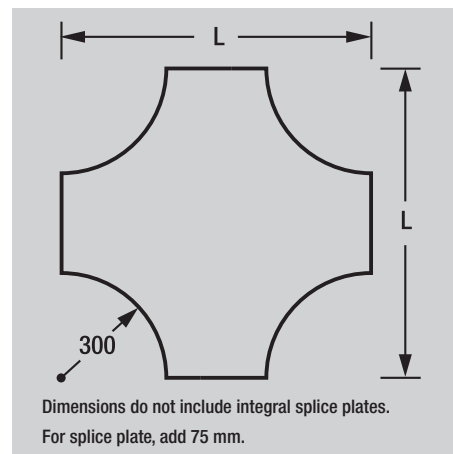
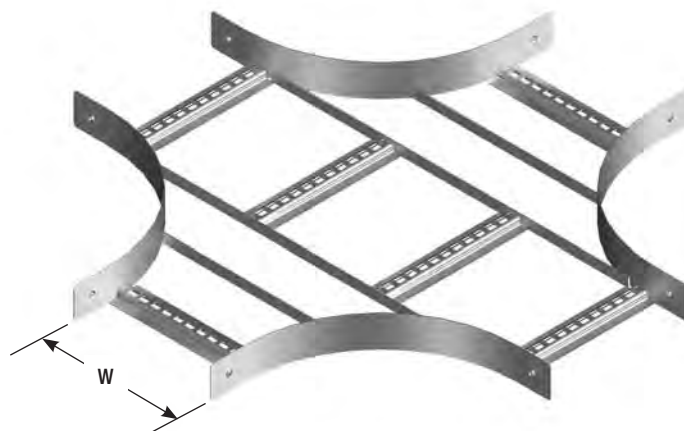
Non standard radius fittings can be manufactured against firm orders, and are non returnable.



Dimensions do not include integral splice plates.  
For splice plate, add 75 mm.

Ordering Code	Width W mm
<b>N1IR1503H</b>	150
<b>N1IR3003H</b>	300
<b>N1IR4503H</b>	450
<b>N1IR6003H</b>	600
<b>N1IR9003H</b>	900

## NEMA 1 Cable Ladder - Internal Riser



Ordering Code	Width W mm	Length L mm
<b>N1C1503H</b>	150	750
<b>N1C3003H</b>	300	900
<b>N1C4503H</b>	450	1050
<b>N1C6003H</b>	600	1200
<b>N1C9003H</b>	900	1500

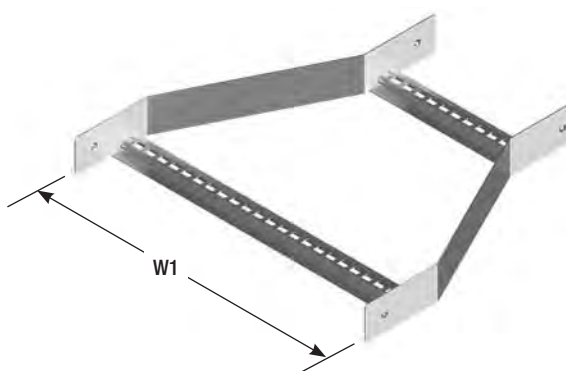
Order fasteners separately for installation. 8 x N1SBH (no nuts) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.

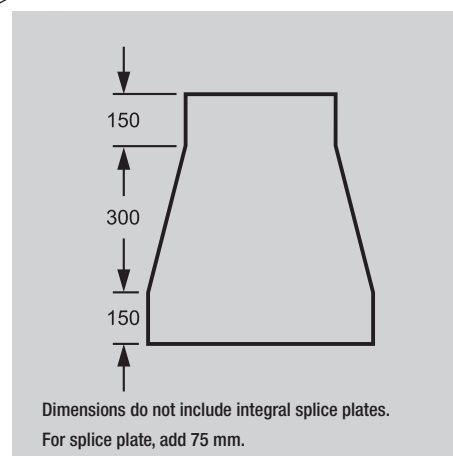
## NEMA 1 Cable Ladder - Cross

Order fasteners separately for installation.  
4 x N1SBH (no nuts) required.

Non standard radius fittings can be manufactured  
against firm orders, and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
<b>N1SR300150H</b>	300	150
<b>N1SR450150H</b>	450	150
<b>N1SR450300H</b>	450	300
<b>N1SR600150H</b>	600	150
<b>N1SR600300H</b>	600	300
<b>N1SR600450H</b>	600	450
<b>N1SR900150H</b>	900	150
<b>N1SR900300H</b>	900	300
<b>N1SR900450H</b>	900	450
<b>N1SR900600H</b>	900	600

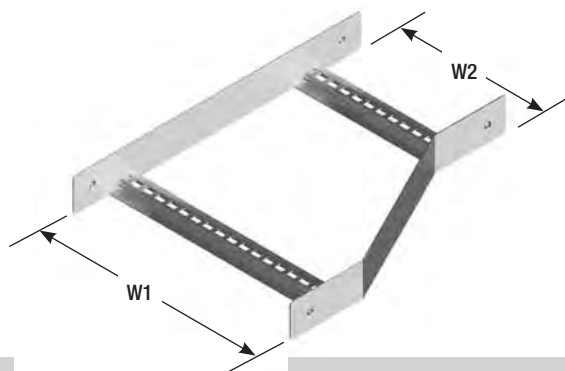


## NEMA 1 Cable Ladder - Straight Reducer

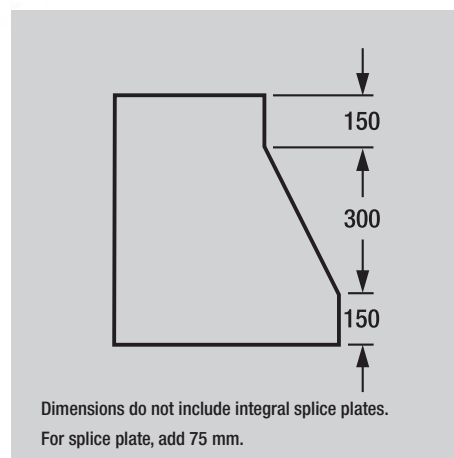
Order fasteners separately for installation.

4 x N1SBH (no nuts) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
N1LHR300150H	300	150
N1LHR450150H	450	150
N1LHR450300H	450	300
N1LHR600150H	600	150
N1LHR600300H	600	300
N1LHR600450H	600	450
N1LHR900150H	900	150
N1LHR900300H	900	300
N1LHR900450H	900	450
N1LHR900600H	900	600

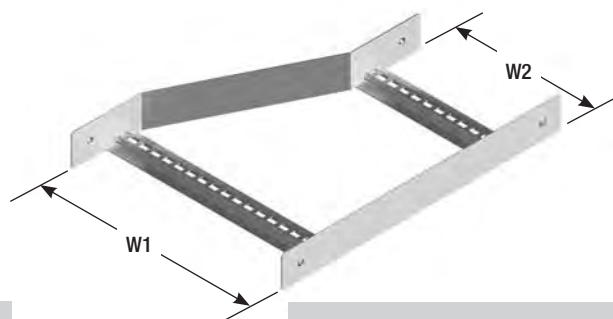


#### NEMA 1 Cable Ladder - Left Hand Reducer

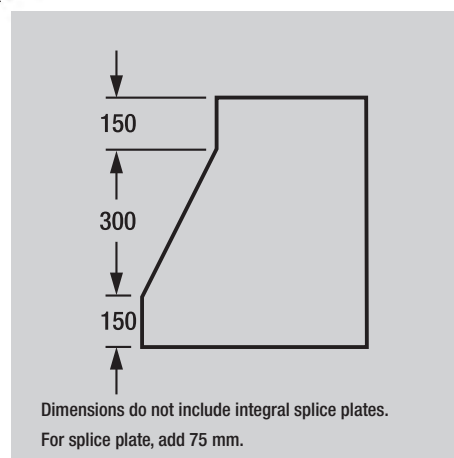
Order fasteners separately for installation.

4 x N1SBH (no nuts) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
N1RHR300150H	300	150
N1RHR450150H	450	150
N1RHR450300H	450	300
N1RHR600150H	600	150
N1RHR600300H	600	300
N1RHR600450H	600	450
N1RHR900150H	900	150
N1RHR900300H	900	300
N1RHR900450H	900	450
N1RHR900600H	900	600



#### NEMA 1 Cable Ladder - Right Hand Reducer

Ordering Code: **N1SH**



#### NEMA 1 Splice Plate

Ordering Code: **N1VSH**



#### NEMA 1 Vertical Splice Plate

Ordering Code: **N1HSH**



#### NEMA Horizontal 1 Splice Plate

channels

1

nuts & bolts

2

cantilever  
brackets

3

channel  
fittings

4

laddertrays

5

cable mesh

6

steel  
ladders

7

aluminium  
ladders

8

covers

9

hyground

10

Ordering Code: **N1CCS**



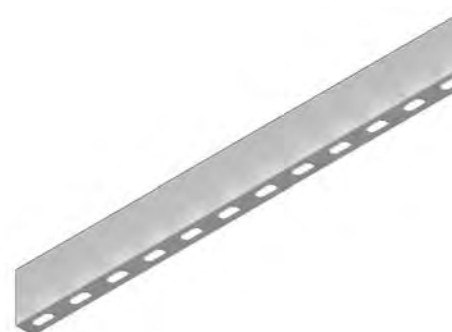
### NEMA 1 Cover Clamp

Ordering Code: **DSN1**

Standard Finish: Galvabond. Can also be made in Hot Dip Galvanised finish against firm orders.

Length: 3.0 metres.

**Note:** Order B3016 and PS620 separately for installation.



### NEMA 1 Divider Strip

Ordering Code: **N1HDH**

Channel Nut and Bolt sold separately.

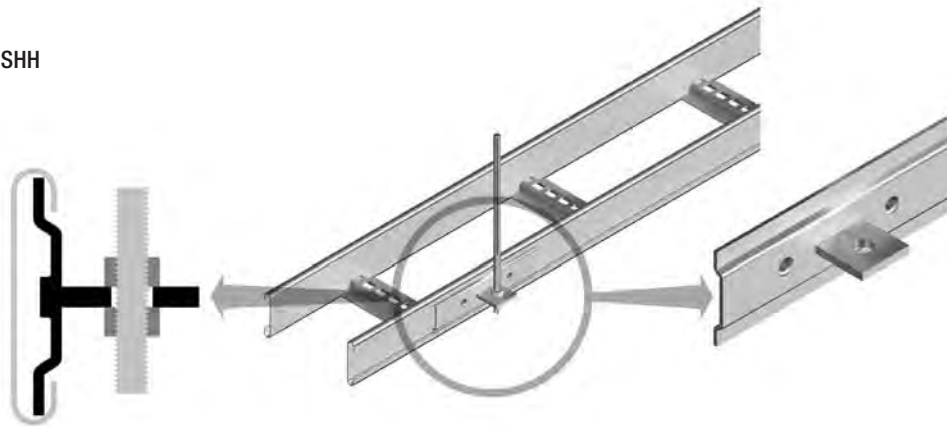
Nut: HS830H x 1

Bolt: B1007H x 1



### NEMA 1 Hold Down Bracket

Ordering Code: **N1SHH**



The Nema 1 Splice Hanging Bracket has revolutionised the industry in mid weight cable applications. Effectively it eliminates the need to use strut and conventional hold down brackets in favour of an all encompassing hanger splice. Its the ideal solution for commercial applications and has proved to provide significant labour savings during installation when compared to more traditional methods.

Note: 1 Should be used in pairs.

2 Hanging Splice may not offer full load capabilities and should be installed at the quarter point between splice joints to offer the best performance.

#### **NEMA 1 Splice Hanging Bracket**



channels

2 nuts & bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

8 aluminium ladders

9 covers

10 hyground

**Specifications**

- Standard Length 6.0 metres.
- Overall height 93 mm
- Cable laying depth 75 mm

**Surface Finish****Available Finish****Code**

Hot Dip Galvanised

H

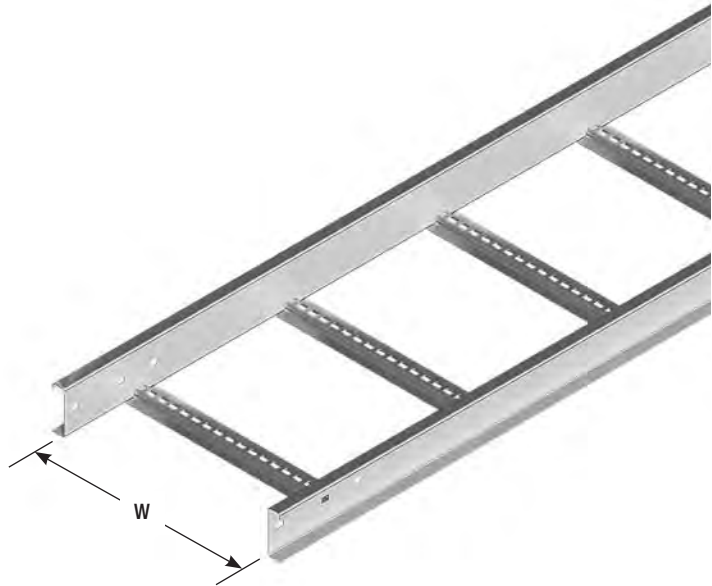
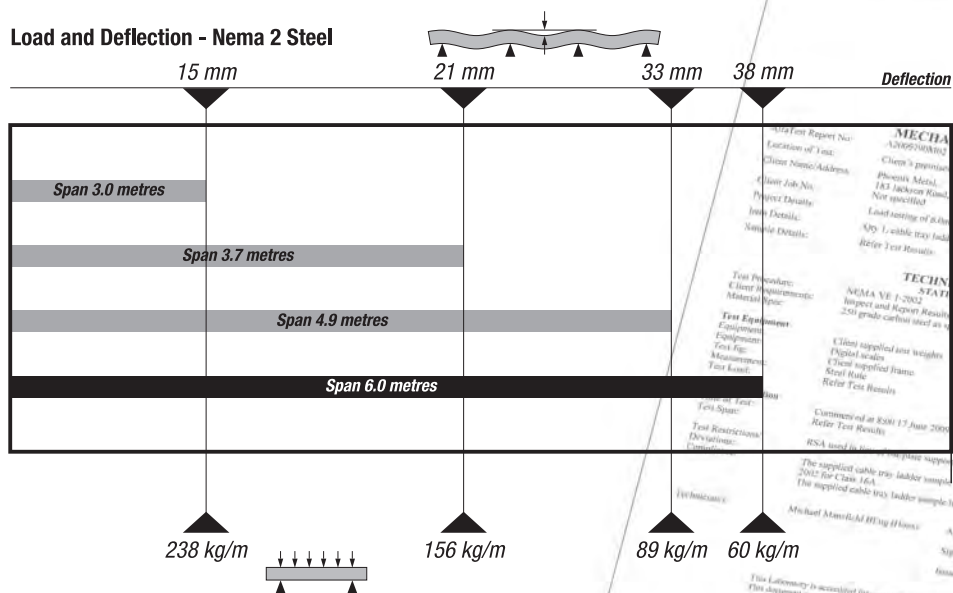
Stainless Steel

S

**Note**

- Stainless steel products are manufactured against firm orders only and are non returnable.

Cable Laying Width W mm	Ordering Code		Width Overall mm
	Hot Dip Galvanised	Stainless Steel	
150	N2L150H	N2L150S	214
300	N2L300H	N2L300S	364
450	N2L450H	N2L450S	514
600	N2L600H	N2L600S	664
900	N2L900H	N2L900S	964

**Nema 2 Cable Ladder****Load and Deflection - Nema 2 Steel**

Nema 2 Cable Ladder has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans, and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2, non compliance may affect the overall product performance.

## Specifications

- Standard Length 6.0 metres.
- Overall height 93 mm
- Cable laying depth 75 mm

## Surface Finish

### Available Finish

Hot Dip Galvanised  
Stainless Steel

### Code

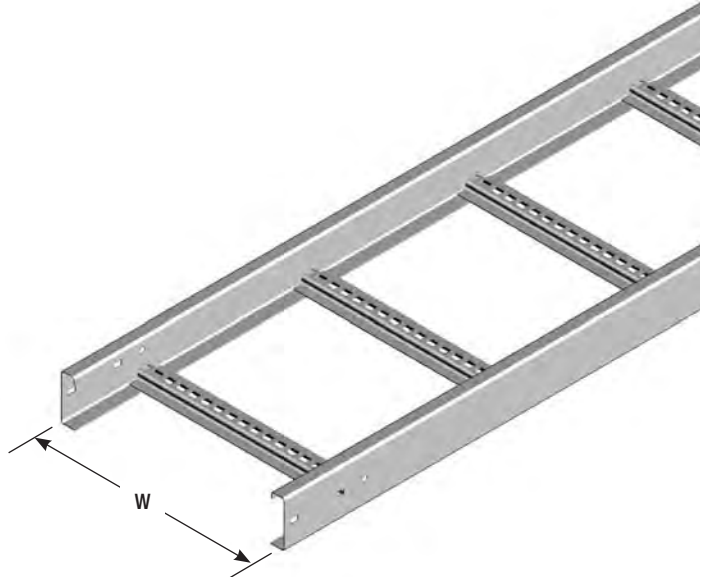
H  
S

## Note

- Stainless steel products are manufactured against firm orders only and are non returnable.

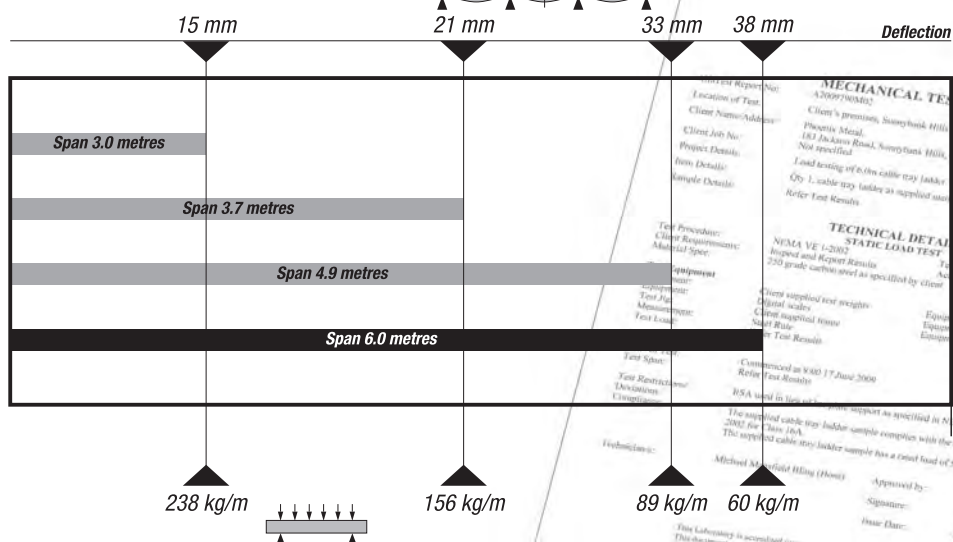
Standard Product in Western Australia

Cable Laying Width W mm	Ordering Code		Width Over mm
	Hot Dip Galvanised	Stainless Steel	
150	N2L150RIH	N2L150RIS	154
300	N2L300RIH	N2L300RIS	304
450	N2L450RIH	N2L450RIS	454
600	N2L600RIH	N2L600RIS	604
900	N2L900RIH	N2L900RIS	904

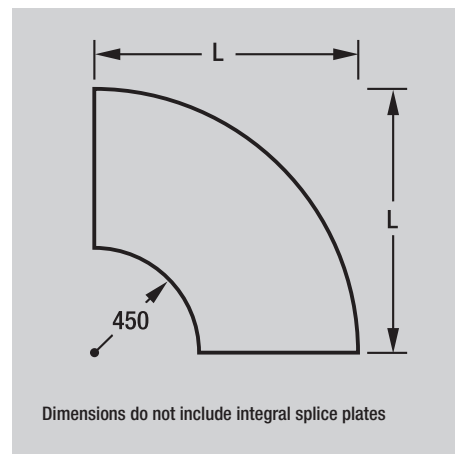


## Nema 2 Cable Ladder

### Load and Deflection - Nema 2 Steel



Nema 2 Cable Ladder has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans, and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2, non compliance may affect the overall product performance.



Order fasteners separately for installation. 8 x Splice Bolts (SBH) & 8 x Splice Nuts (SNH) required.

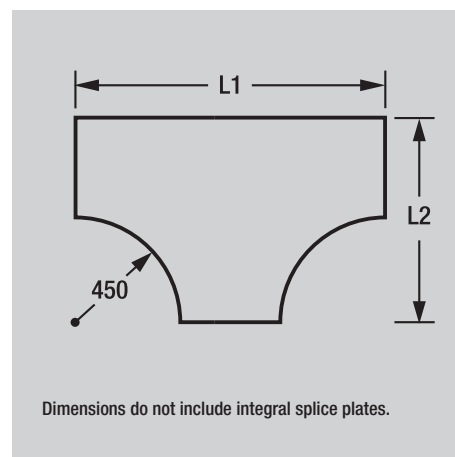
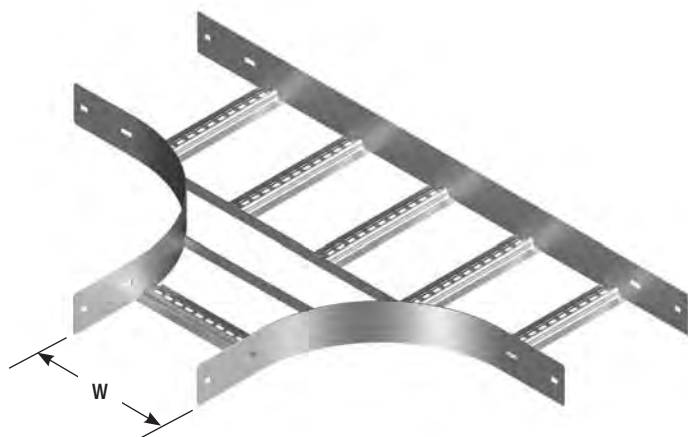
Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

Ordering Code	Width W mm	Length L mm
<b>N2B1504</b>	150	600
<b>N2B3004</b>	300	750
<b>N2B4504</b>	450	900
<b>N2B6004</b>	600	1050
<b>N2B9004</b>	900	1350

H Hot Dip Galvanised  
 S Stainless Steel

### NEMA 2 Cable Ladder - Bend



Order fasteners separately for installation. 12 x Splice Bolts (SBH) & 12 x Splice Nuts (SNH) required.

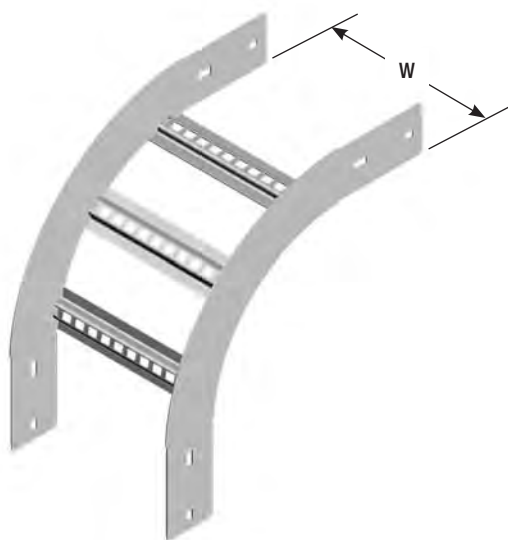
Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

Ordering Code	Width W mm	Length L1 mm	Length L2 mm
<b>N2T1504</b>	150	1050	600
<b>N2T3004</b>	300	1200	750
<b>N2T4504</b>	450	1350	900
<b>N2T6004</b>	600	1500	1050
<b>N2T9004</b>	900	1800	1350

H Hot Dip Galvanised  
 S Stainless Steel

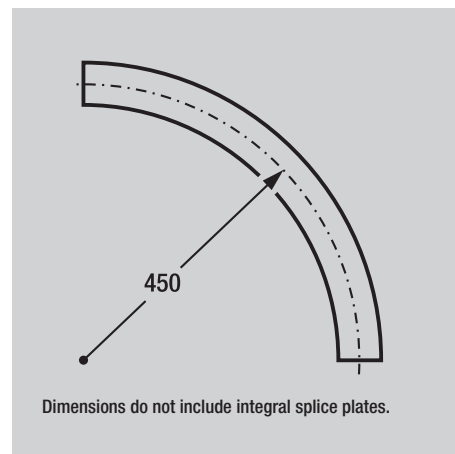
### NEMA 2 Cable Ladder - Tee



Order fasteners separately for installation. 8 x Splice Bolts (SBH) & 8 x Splice Nuts (SNH) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.

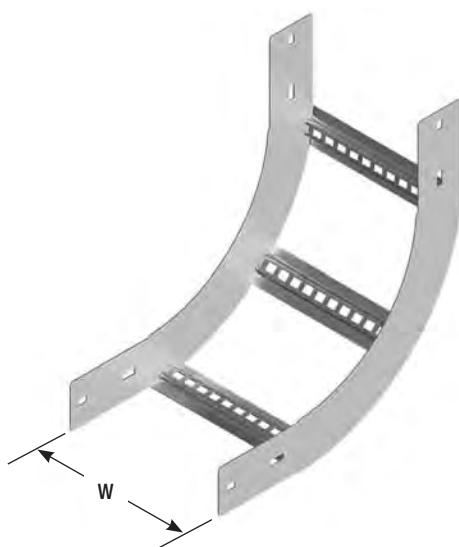
Stainless Steel is only manufactured against firm orders and is non returnable.



Ordering Code	Width W mm
N2ER1504	150
N2ER3004	300
N2ER4504	450
N2ER6004	600
N2ER9004	900

**H** Hot Dip Galvanised  
 **S** Stainless Steel

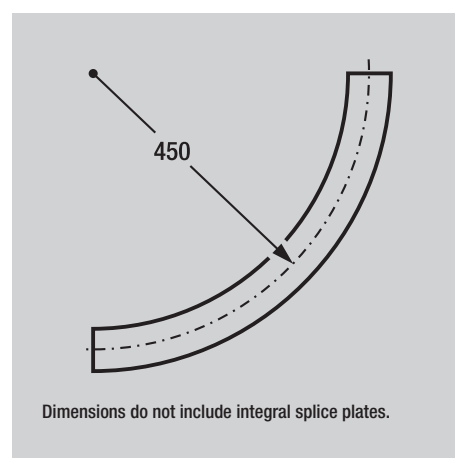
#### NEMA 2 Cable Ladder - External Riser



Order fasteners separately for installation. 8 x Splice Bolts (SBH) & 8 x Splice Nuts (SNH) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.

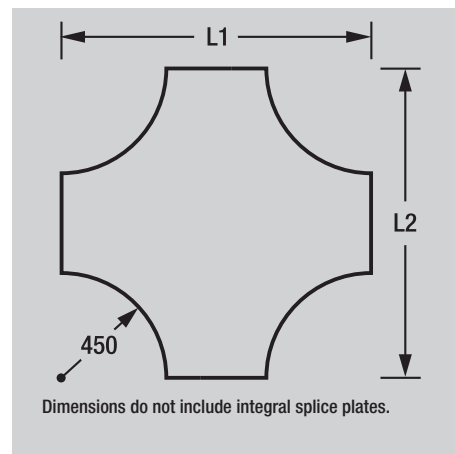
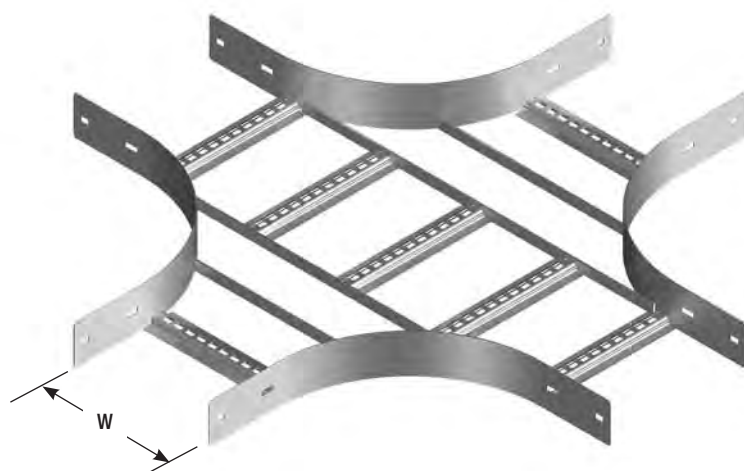
Stainless Steel is only manufactured against firm orders and is non returnable.



Ordering Code	Width W mm
N2IR1504	150
N2IR3004	300
N2IR4504	450
N2IR6004	600
N2IR9004	900

**H** Hot Dip Galvanised  
 **S** Stainless Steel

#### NEMA 2 Cable Ladder - Internal Riser



Order fasteners separately for installation. 16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

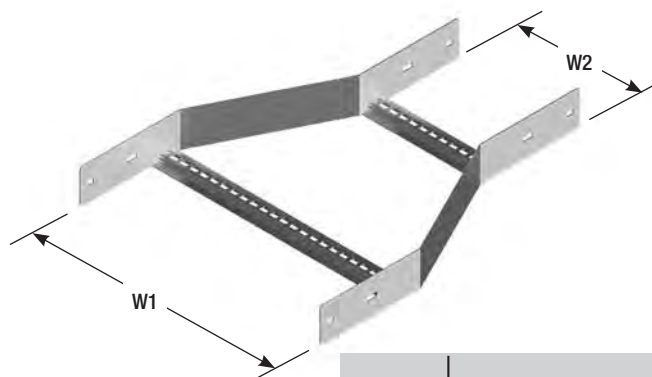
Ordering Code	Width W mm	Length L1 mm	Length L2 mm
<b>N2C1504</b>	150	1050	1050
<b>N2C3004</b>	300	1200	1200
<b>N2C4504</b>	450	1350	1350
<b>N2C6004</b>	600	1500	1500
<b>N2C9004</b>	900	1800	1800

**H** Hot Dip Galvanised  
 **S** Stainless Steel

## NEMA 2 Cable Ladder - Cross

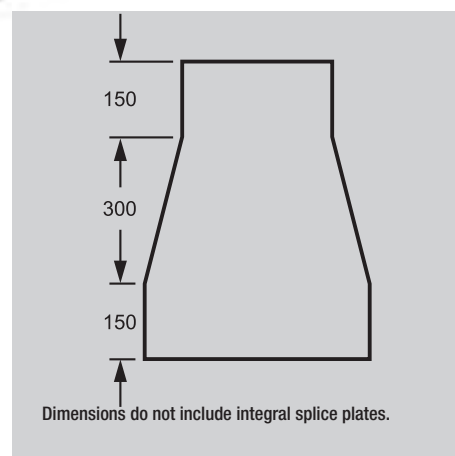
Order fasteners separately for installation. 8 x Splice Bolts (SBH) & 8 x Splice Nuts (SNH) required.

All Reducers are manufactured against firm orders, and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
<b>N2SR300150</b>	300	150
<b>N2SR450150</b>	450	150
<b>N2SR450300</b>	450	300
<b>N2SR600150</b>	600	150
<b>N2SR600300</b>	600	300
<b>N2SR600450</b>	600	450
<b>N2SR900150</b>	900	150
<b>N2SR900300</b>	900	300
<b>N2SR900450</b>	900	450
<b>N2SR900600</b>	900	600

**H** Hot Dip Galvanised  
 **S** Stainless Steel

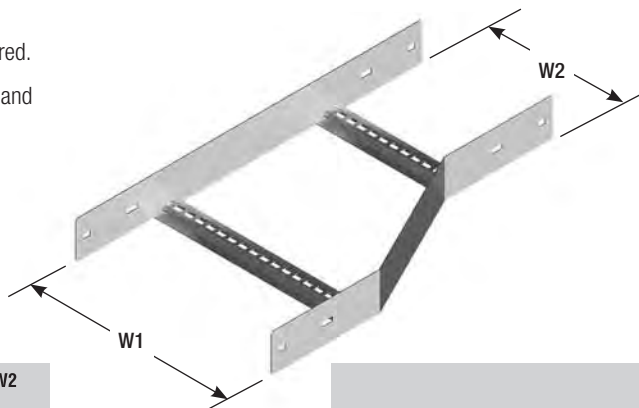


## NEMA 2 Cable Ladder - Straight Reducer

Order fasteners separately for installation.

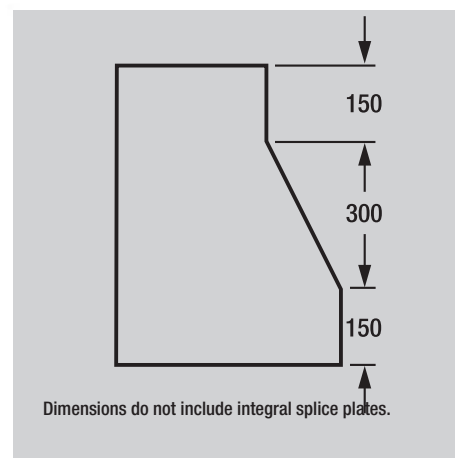
8 x Splice Bolts (SBH) & 8 x Splice Nuts (SNH) required.

All Reducers are manufactured against firm orders, and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
N2LHR300150	300	150
N2LHR450150	450	150
N2LHR450300	450	300
N2LHR600150	600	150
N2LHR600300	600	300
N2LHR600450	600	450
N2LHR900150	900	150
N2LHR900300	900	300
N2LHR900450	900	450
N2LHR900600	900	600

● H Hot Dip Galvanised  
— S Stainless Steel

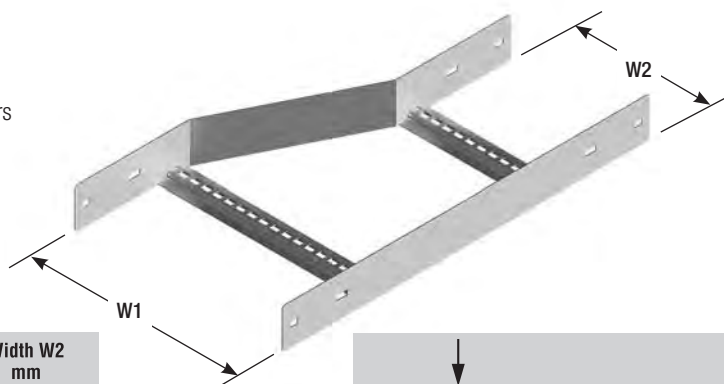


#### NEMA 2 Cable Ladder - Left Hand Reducer

Order fasteners separately for installation.

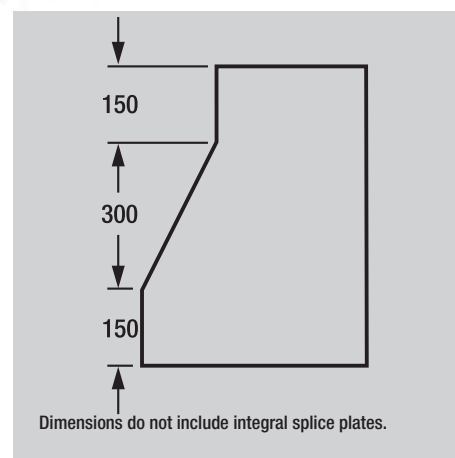
8 x Splice Bolts (SBH) & 8 x Splice Nuts (SNH) required.

All Reducers are manufactured against firm orders and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
N2RHR300150	300	150
N2RHR450150	450	150
N2RHR450300	450	300
N2RHR600150	600	150
N2RHR600300	600	300
N2RHR600450	600	450
N2RHR900150	900	150
N2RHR900300	900	300
N2RHR900450	900	450
N2RHR900600	900	600

● H Hot Dip Galvanised  
— S Stainless Steel



#### NEMA 2 Cable Ladder - Right Hand Reducer

Ordering Code: **N2S**

Note - Order splice bolts & nuts separately, SBH or SBS and SNH or SNS.

Ordering Code

**N2S**

**H** Hot Dip Galvanised  
**S** Stainless Steel



## NEMA 2 Splice

Ordering Code: **N2VS**

Note - Order splice bolts & nuts separately, SBH or SBS and SNH or SNS.

Ordering Code

**N2VS**

**H** Hot Dip Galvanised  
**S** Stainless Steel



## NEMA 2 Vertical Splice

Ordering Code: **N2HS**

Note - Order splice bolts & nuts separately, SBH or SBS and SNH or SNS.

Ordering Code

**N2HS**

**H** Hot Dip Galvanised  
**S** Stainless Steel



## NEMA 2 Horizontal Splice

Both items are ordered separately.

Splice Bolts have a smooth head to eliminate the risk of sheathing the cable during installation.

Special counterbore nuts ensure that correct tension is achieved during installation.

Ordering Code

**SB & SN**

**H** Hot Dip Galvani  
**S** Stainless Steel



## SB Splice Bolt & SN Splice Nut

Ordering Code: **N2CCS**



### NEMA 2 Cover Clamp

Ordering Code: **DSN2**

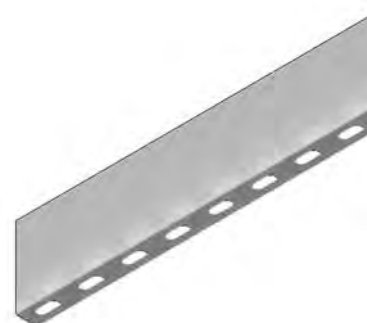
Standard Finish: Galvabond. Hot dip galvanised and stainless steel can be supplied against a firm order.

Note: Order B3016 and PS620 separately for installation.

Ordering Code

**DSN2** \_

- G** Galvabond
- H** Hot Dip Galvanised
- S** Stainless Steel



### NEMA 2 Divider Strip

Ordering Code: **HD**

Hold Down Bracket can be supplied complete with spring nut (B1008H - M10) and screw (HS1030H).

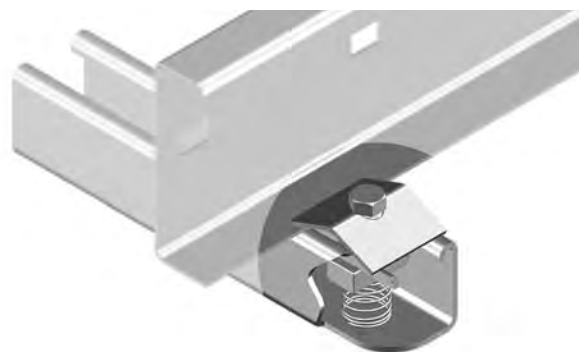
Hot dip galvanised fasteners are supplied separately.

Note: Should be used in pairs.

Ordering Code

**HD** \_

- H** Hot Dip Galvanised
- S** Stainless Steel



### NEMA 2 Hold Down Bracket

1 channels

2 nuts & bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

8 aluminium ladders

9 covers

10 hyground

**Specifications**

- Standard Length 6.0 metres.
- Overall height 130 mm
- Cable laying depth 112 mm

**Surface Finish**

**Available Finish**

Hot Dip Galvanised  
Stainless Steel

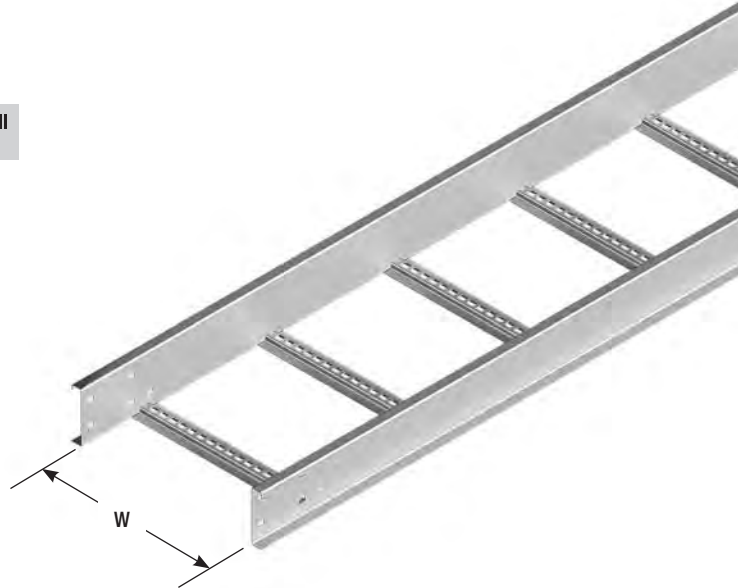
**Code**

H  
S

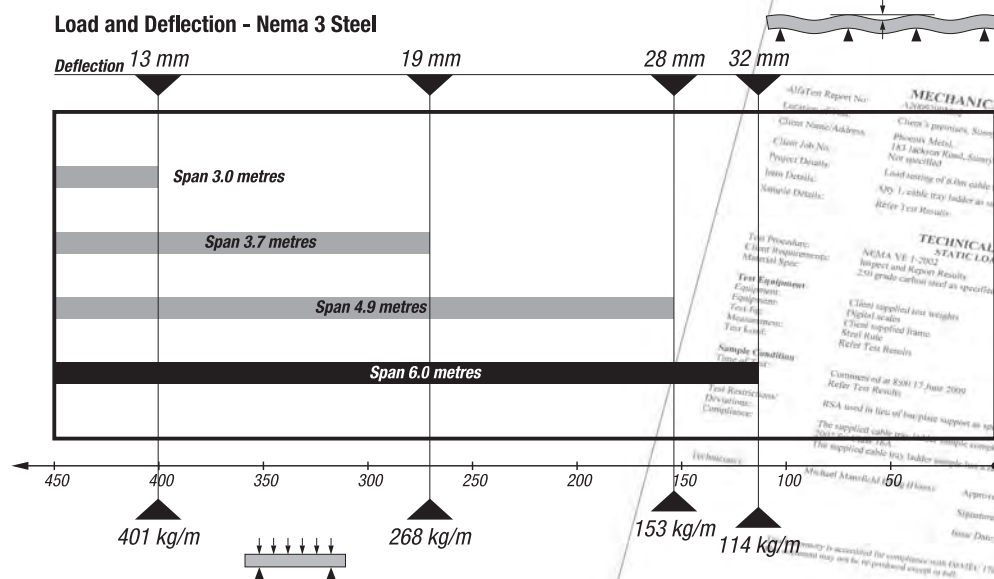
**Note**

- Stainless steel products are manufactured against firm orders only and are non returnable.

Cable Laying Width W mm	Ordering Code		Width Overall mm
	Hot Dip Galvanised	Stainless Steel	
150	N3L150H	N3L150S	214
300	N3L300H	N3L300S	364
450	N3L450H	N3L450S	514
600	N3L600H	N3L600S	664
900	N3L900H	N3L900S	964



**Nema 3 Cable Ladder**



Nema 3 Cable Ladder has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans, and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2, non compliance may affect the overall product performance.

### Specifications

- Standard Length 6.0 metres.
- Overall height 130 mm
- Cable laying depth 112 mm

### Surface Finish

#### Available Finish

Hot Dip Galvanised  
Stainless Steel

#### Code

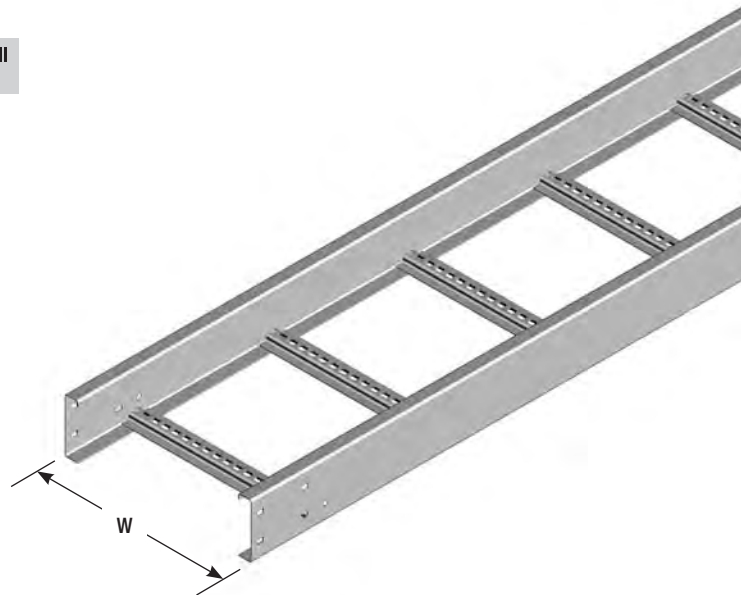
H  
S

### Note

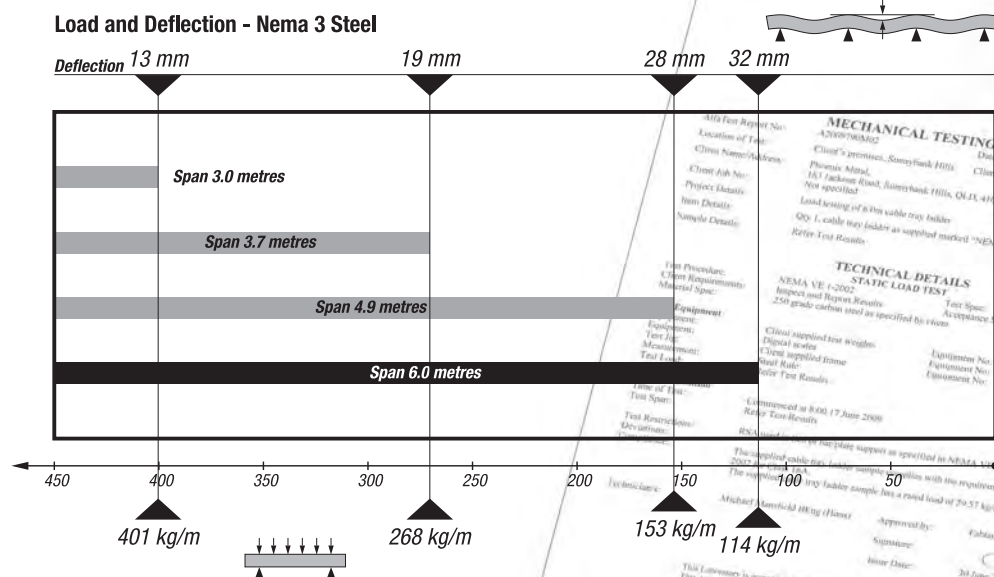
- Stainless steel products are manufactured against firm orders only and are non returnable.

Standard Product in Western Australia

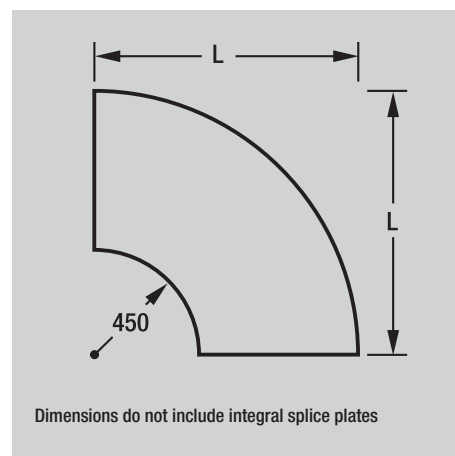
Cable Laying Width W mm	Ordering Code		Width Overall mm
	Hot Dip Galvanised	Stainless Steel	
150	N3L150RIH	N3L150RIS	154
300	N3L300RIH	N3L300RIS	304
450	N3L450RIH	N3L450RIS	454
600	N3L600RIH	N3L600RIS	604
900	N3L900RIH	N3L900RIS	904



### Nema 3 Cable Ladder



Nema 3 Cable Ladder has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans, and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2, non compliance may affect the overall product performance.



Order fasteners separately for installation. 16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

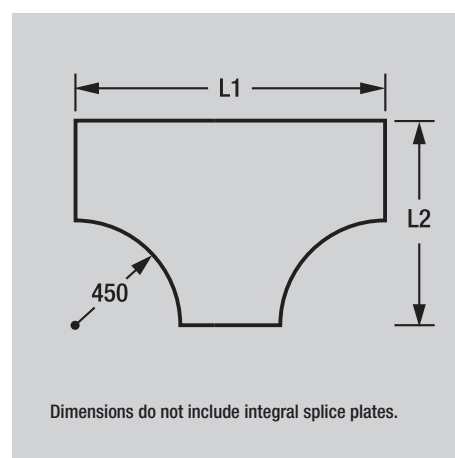
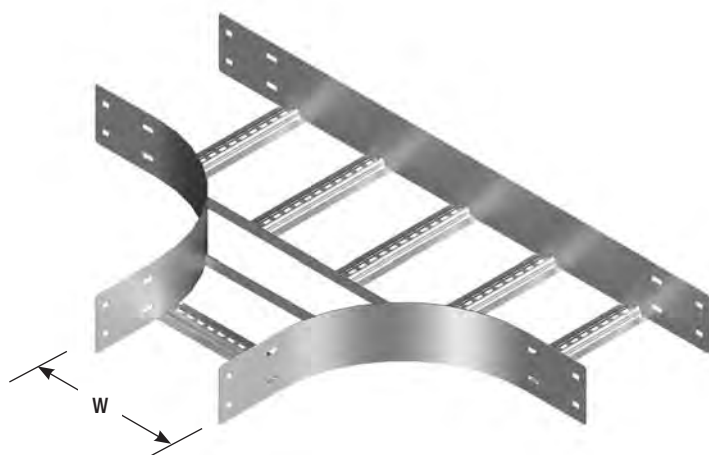
Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

Ordering Code	Width W mm	Length L mm
N3B1504	150	600
N3B3004	300	750
N3B4504	450	900
N3B6004	600	1050
N3B9004	900	1350

● H Hot Dip Galvanised  
— S Stainless Steel

### NEMA 3 Cable Ladder - Bend



Order fasteners separately for installation.  
24 x Splice Bolts (SBH) & 24 x Splice Nuts (SNH) required.

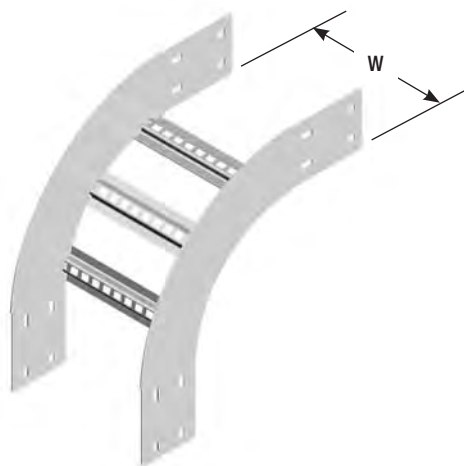
Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

Ordering Code	Width W mm	Length L1 mm	Length L2 mm
N3T1504	150	1050	600
N3T3004	300	1200	750
N3T4504	450	1350	900
N3T6004	600	1500	1050
N3T9004	900	1800	1350

● H Hot Dip Galvanised  
— S Stainless Steel

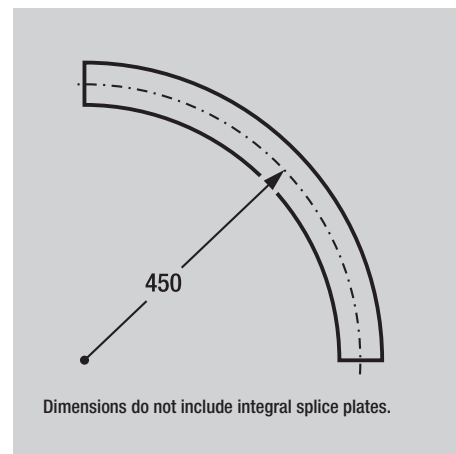
### NEMA 3 Cable Ladder - Tee



Order fasteners separately for installation. 16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.

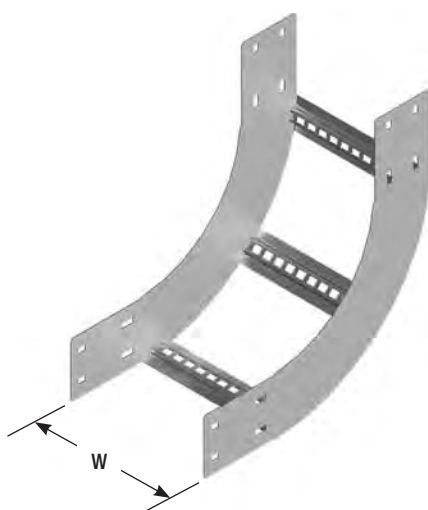
Stainless Steel is only manufactured against firm orders and is non returnable.



Ordering Code	Width W mm
N3ER1504	150
N3ER3004	300
N3ER4504	450
N3ER6004	600
N3ER9004	900

● H Hot Dip Galvanised  
— S Stainless Steel

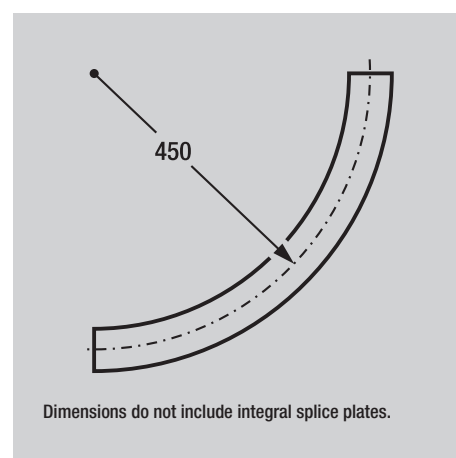
#### NEMA 3 Cable Ladder - External Riser



Order fasteners separately for installation. 16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.

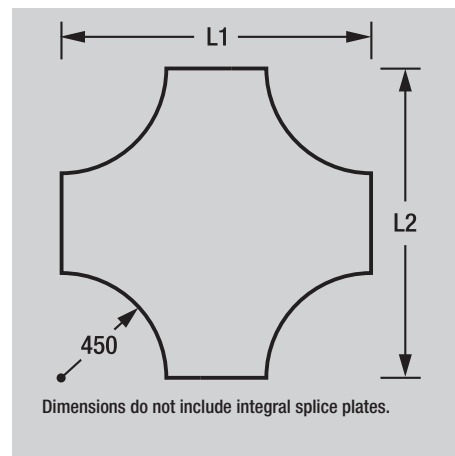
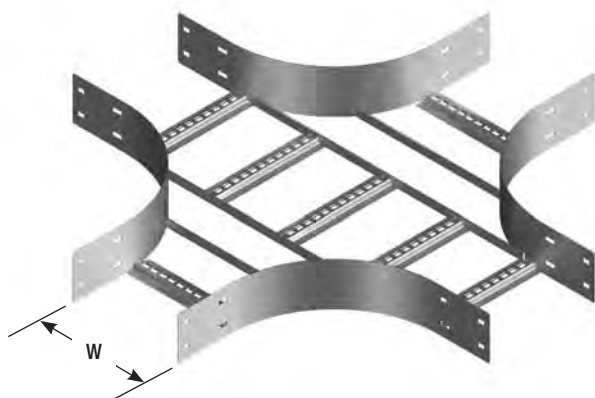
Stainless Steel is only manufactured against firm orders and is non returnable.



Ordering Code	Width W mm
N3IR1504	150
N3IR3004	300
N3IR4504	450
N3IR6004	600
N3IR9004	900

● H Hot Dip Galvanised  
— S Stainless Steel

#### NEMA 3 Cable Ladder - Internal Riser



Order fasteners separately for installation.  
32 x Splice Bolts (SBH) & 32 x Splice Nuts (SNH) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

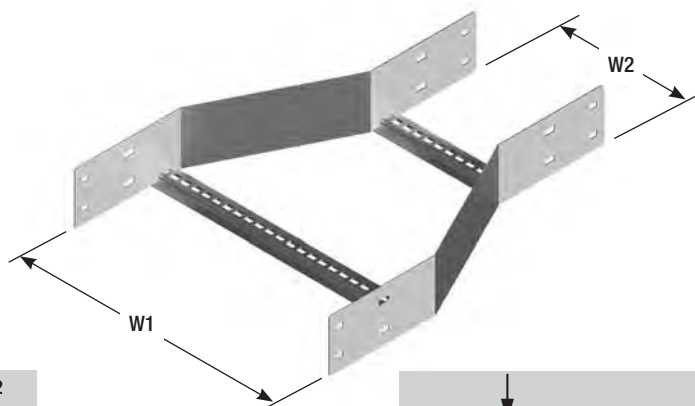
Ordering Code	Width W mm	Length L1 mm	Length L2 mm
<b>N3C1504</b>	150	1050	1050
<b>N3C3004</b>	300	1200	1200
<b>N3C4504</b>	450	1350	1350
<b>N3C6004</b>	600	1500	1500
<b>N3C9004</b>	900	1800	1800

● H Hot Dip Galvanised  
— S Stainless Steel

### NEMA 3 Cable Ladder - Cross

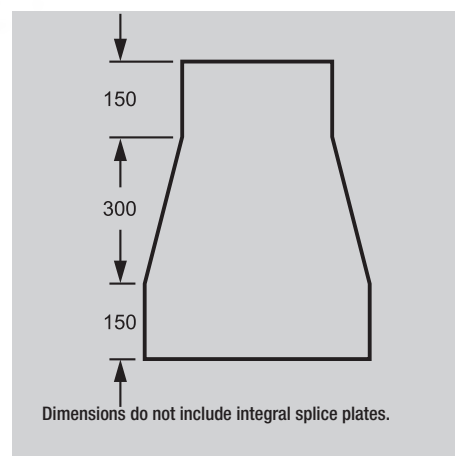
Order fasteners separately for installation.  
16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

All Reducers are manufactured against firm orders, and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
<b>N3SR300150</b>	300	150
<b>N3SR450150</b>	450	150
<b>N3SR450300</b>	450	300
<b>N3SR600150</b>	600	150
<b>N3SR600300</b>	600	300
<b>N3SR600450</b>	600	450
<b>N3SR900150</b>	900	150
<b>N3SR900300</b>	900	300
<b>N3SR900450</b>	900	450
<b>N3SR900600</b>	900	600

● H Hot Dip Galvanised  
— S Stainless Steel

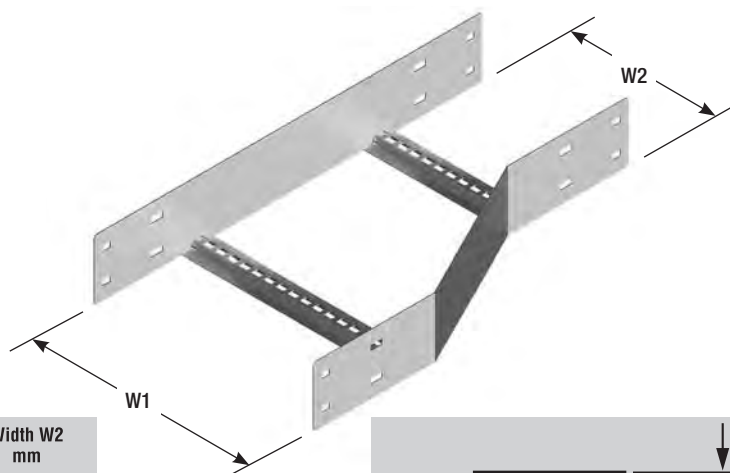


### NEMA 3 Cable Ladder - Straight Reducer

Order fasteners separately for installation.

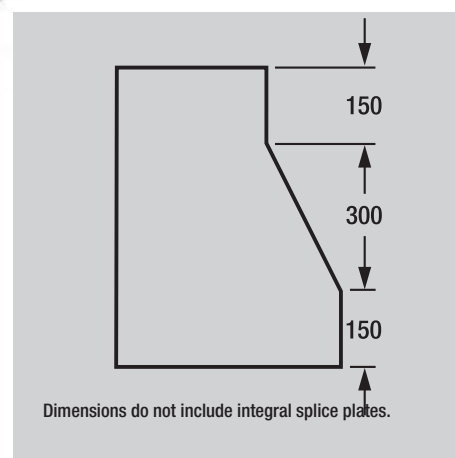
16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

All Reducers are manufactured against firm orders, and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
N3LHR300150	300	150
N3LHR450150	450	150
N3LHR450300	450	300
N3LHR600150	600	150
N3LHR600300	600	300
N3LHR600450	600	450
N3LHR900150	900	150
N3LHR900300	900	300
N3LHR900450	900	450
N3LHR900600	900	600

● H Hot Dip Galvanised  
● S Stainless Steel

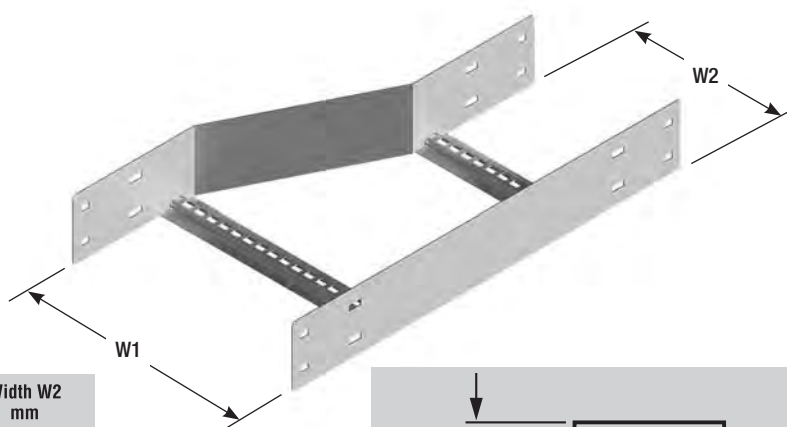


### NEMA 3 Cable Ladder - Left Hand Reducer

Order fasteners separately for installation.

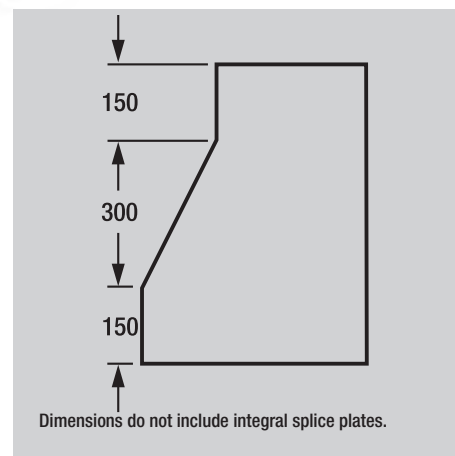
16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

All Reducers are manufactured against firm orders and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
N3RHR300150	300	150
N3RHR450150	450	150
N3RHR450300	450	300
N3RHR600150	600	150
N3RHR600300	600	300
N3RHR600450	600	450
N3RHR900150	900	150
N3RHR900300	900	300
N3RHR900450	900	450
N3RHR900600	900	600

● H Hot Dip Galvanised  
● S Stainless Steel



### NEMA 3 Cable Ladder - Right Hand Reducer

Ordering Code: **N3S**

Note - Order splice bolts & nuts separately, SBH or SBS and SNH or SNS.

Ordering Code

**N3S**

**H** Hot Dip Galvanised  
**S** Stainless Steel



### NEMA 3 Splice

Ordering Code: **N3VS**

Note - Order splice bolts & nuts separately, SBH or SBS and SNH or SNS.

Ordering Code

**N3VS**

**H** Hot Dip Galvanised  
**S** Stainless Steel



### NEMA 3 Vertical Splice

Ordering Code: **N3HS**

Note - Order splice bolts & nuts separately, SBH or SBS and SNH or SNS.

Ordering Code

**N3HS**

**H** Hot Dip Galvanised  
**S** Stainless Steel



### NEMA 3 Horizontal Splice

Special counterbore nuts ensure that correct tension is achieved during installation.



## SB &amp; SN

- **H** Hot Dip Galvanised  
 — **S** Stainless Steel

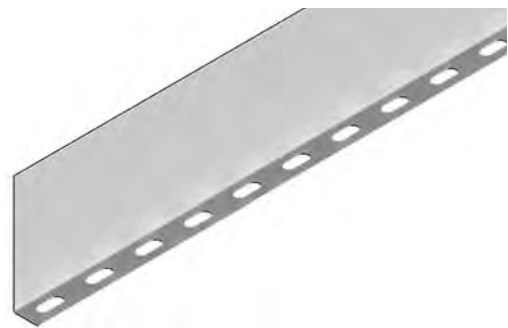
## SBH Splice Bolt & SNH Splice Nut

Ordering Code: **N3CCS** (stainless steel)



## NEMA 3 Cover Clamp

Note: Order B3016 and PS620 separately for installation.



## DSN3

- G** Galvabond
- H** Hot Dip Galvanised
- S** Stainless Steel

### NEMA 3 Divider Strip

Ordering Code: **HD**

Hold Down Bracket can be supplied complete with spring nut (B1008H-M10) and screw (HS1030H).

Hot dip galvanised fasteners are supplied separately.

Note: Should be used in pairs.



Ordering Code

HD



**H** Hot Dip Galvanised  
**S** Stainless Steel

## NEMA 3 Hold Down Bracket



## Specifications

- Standard Length 6.0 metres.
- Overall height 150 mm
- Cable laying depth 130 mm

## Surface Finish

### Available Finish

Hot Dip Galvanised  
Stainless Steel

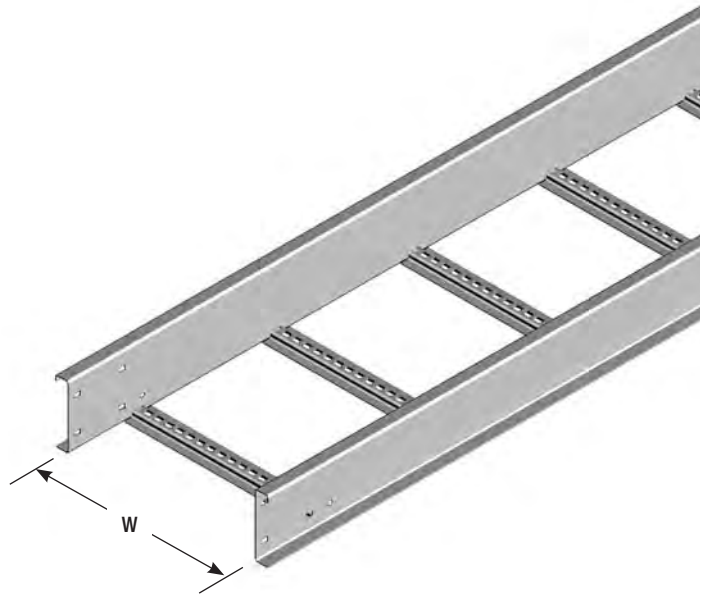
### Code

H  
S

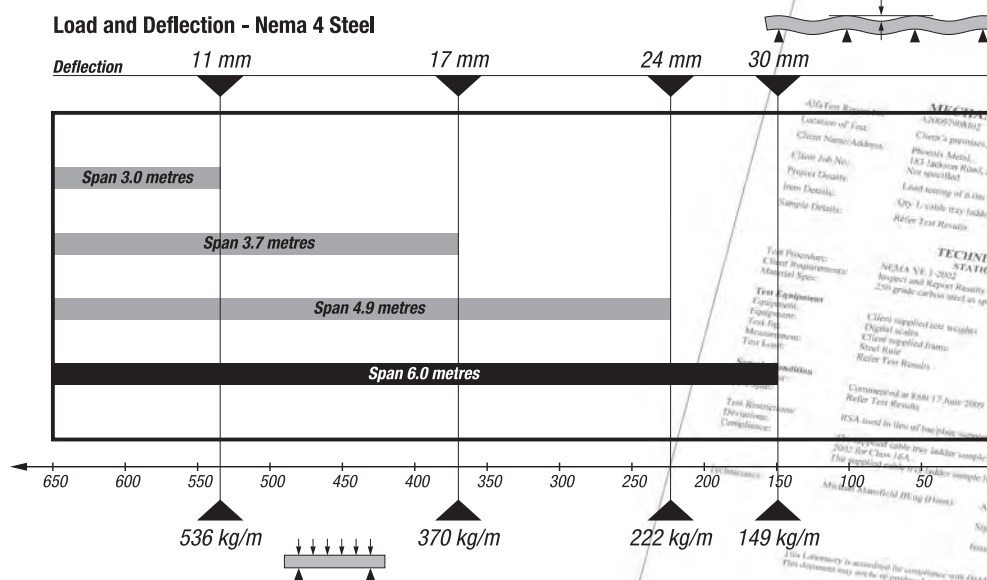
## Note

- Stainless steel products are manufactured against firm orders only and are non returnable.

Cable Laying Width W mm	Ordering Code		Width Overall mm
	Hot Dip Galvanised	Stainless Steel	
150	N4L150H	N4L150S	214
300	N4L300H	N4L300S	364
450	N4L450H	N4L450S	514
600	N4L600H	N4L600S	664
900	N4L900H	N4L900S	964



## Nema 4 Cable Ladder



Nema 4 Cable Ladder has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans, and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2, non compliance may affect the overall product performance.

**Specifications**

- Standard Length 6.0 metres.
- Overall height 150 mm
- Cable laying depth 130 mm

**Surface Finish**

**Available Finish**

Hot Dip Galvanised  
Stainless Steel

**Code**

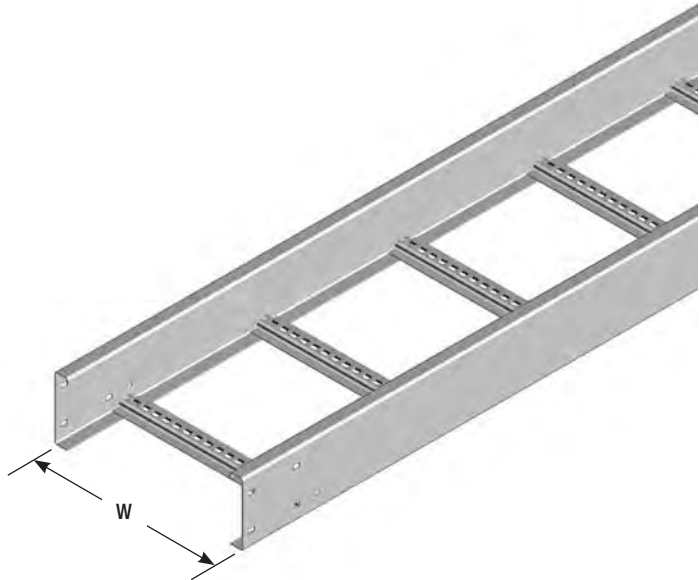
H  
S

**Note**

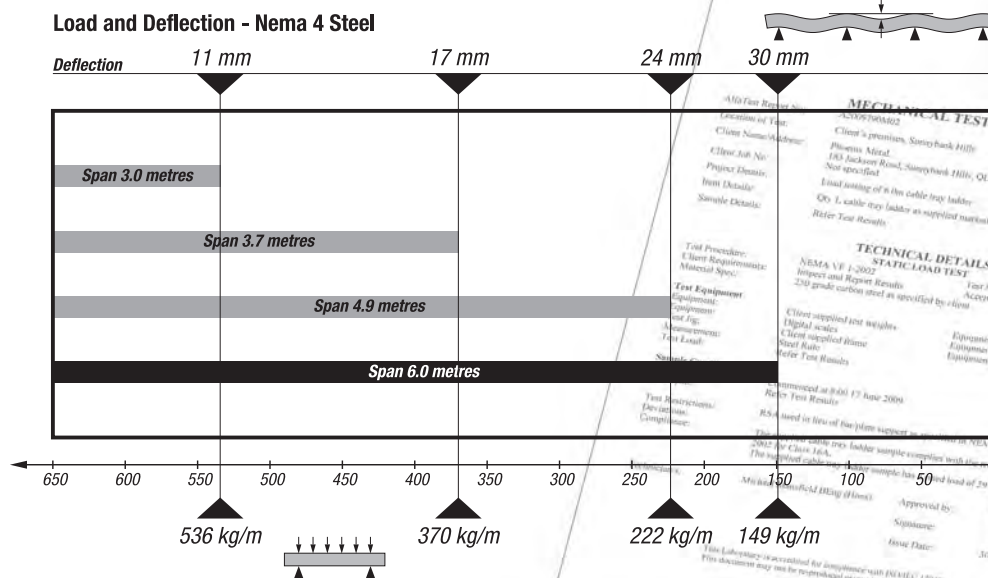
- Stainless steel products are manufactured against firm orders only and are non returnable.

**Standard Product in Western Australia**

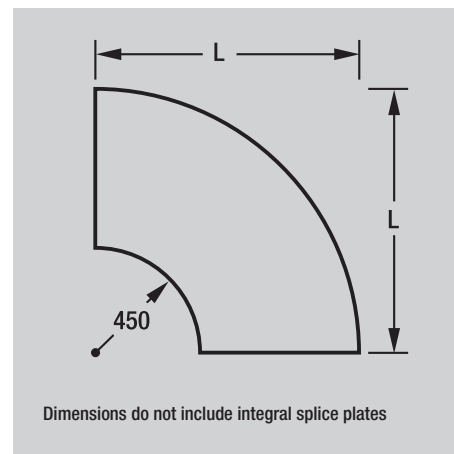
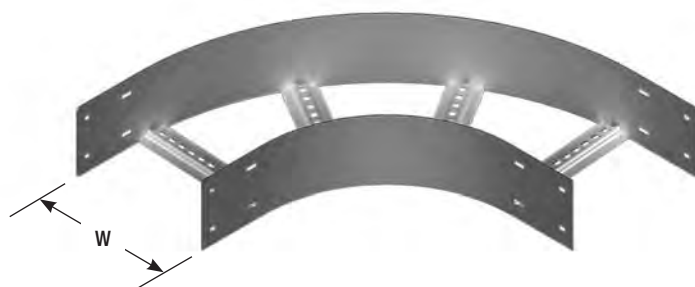
Cable Laying Width W mm	Ordering Code		Width Overall mm
	Hot Dip Galvanised	Stainless Steel	
150	N4L150RIH	N4L150RIS	154
300	N4L300RIH	N4L300RIS	304
450	N4L450RIH	N4L450RIS	454
600	N4L600RIH	N4L600RIS	604
900	N4L900RIH	N4L900RIS	904



**Nema 4 Cable Ladder**



Nema 4 Cable Ladder has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans, and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2, non compliance may affect the overall product performance.



Order fasteners separately for installation. 16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

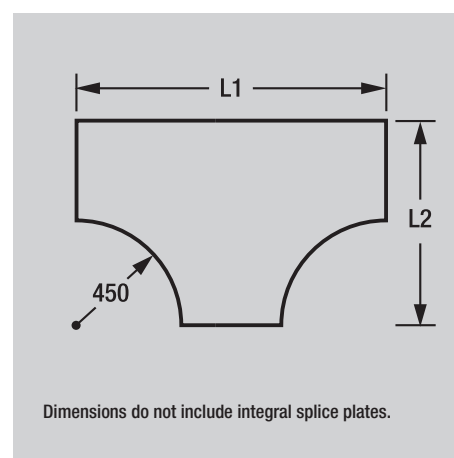
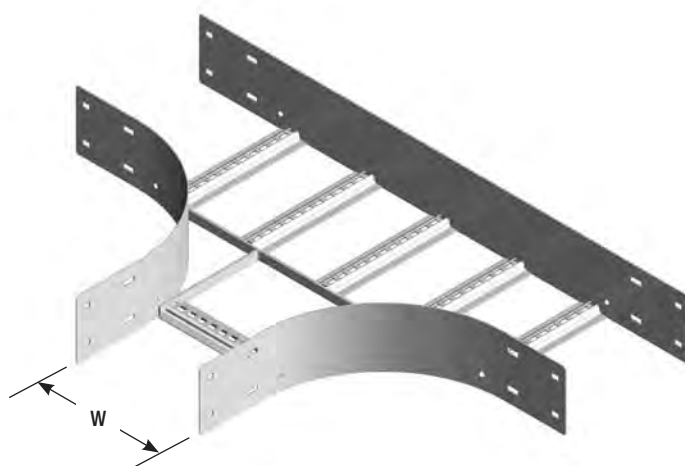
Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

Ordering Code	Width W mm	Length L mm
N4B1504	150	600
N4B3004	300	750
N4B4504	450	900
N4B6004	600	1050
N4B9004	900	1350

H Hot Dip Galvanised  
S Stainless Steel

#### NEMA 4 Cable Ladder - Bend



Order fasteners separately for installation. 24 x Splice Bolts (SBH) & 24 x Splice Nuts (SNH) required.

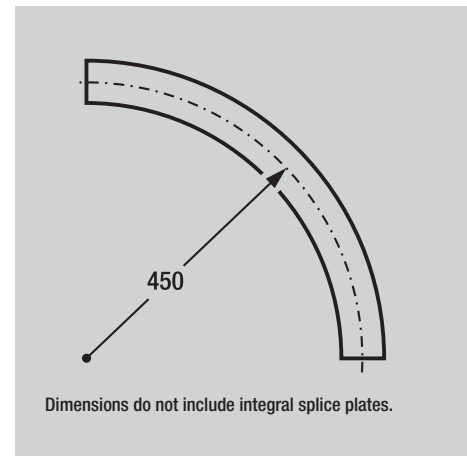
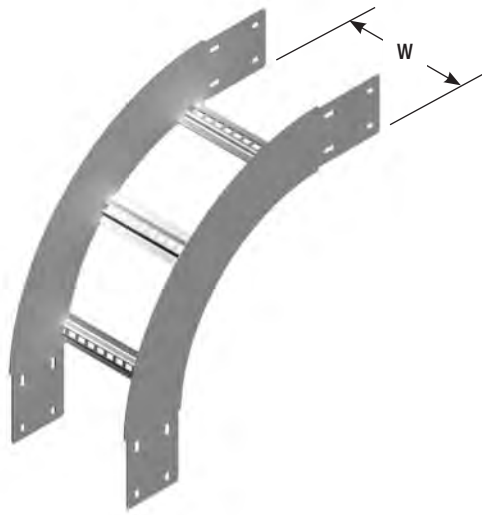
Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

Ordering Code	Width W mm	Length L1 mm	Length L2 mm
N4T1504	150	1050	600
N4T3004	300	1200	750
N4T4504	450	1350	900
N4T6004	600	1500	1050
N4T9004	900	1800	1350

H Hot Dip Galvanised  
S Stainless Steel

#### NEMA 4 Cable Ladder - Tee




Order fasteners separately for installation. 16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

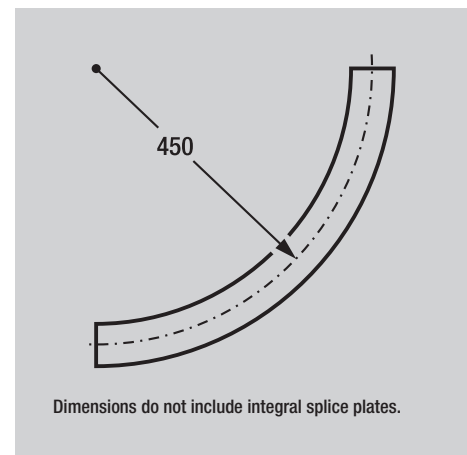
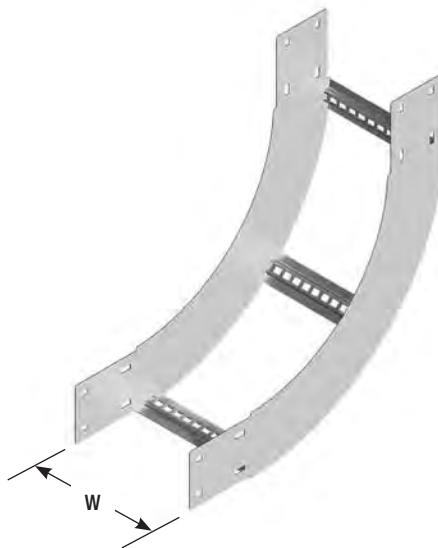
Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

Ordering Code	Width W mm
N4ER1504	150
N4ER3004	300
N4ER4504	450
N4ER6004	600
N4ER9004	900


**H** Hot Dip Galvanised  
**S** Stainless Steel

### NEMA 4 Cable Ladder - External Riser




Order fasteners separately for installation. 16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

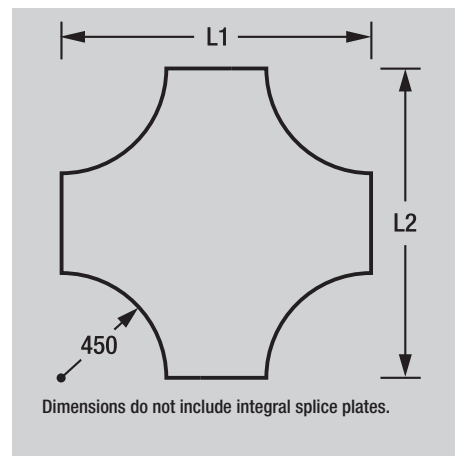
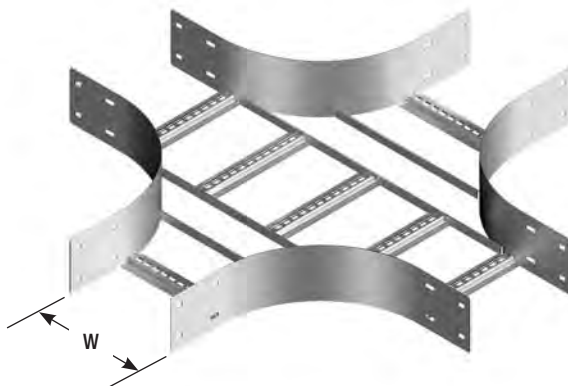
Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

Ordering Code	Width W mm
N4IR1504	150
N4IR3004	300
N4IR4504	450
N4IR6004	600
N4IR9004	900


**H** Hot Dip Galvanised  
**S** Stainless Steel

### NEMA 4 Cable Ladder - Internal Riser



Order fasteners separately for installation.  
32 x Splice Bolts (SBH) & 32 x Splice Nuts (SNH) required.

Non standard radius fittings can be manufactured against firm orders, and are non returnable.

Stainless Steel is only manufactured against firm orders and is non returnable.

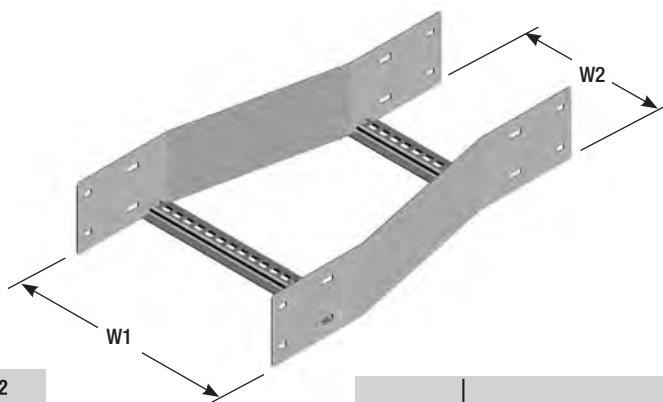
Ordering Code	Width W mm	Length L1 mm	Length L2 mm
N4C1504	150	1050	1050
N4C3004	300	1200	1200
N4C4504	450	1350	1350
N4C6004	600	1500	1500
N4C9004	900	1800	1800

● H Hot Dip Galvanised  
● S Stainless Steel

#### NEMA 4 Cable Ladder - Cross

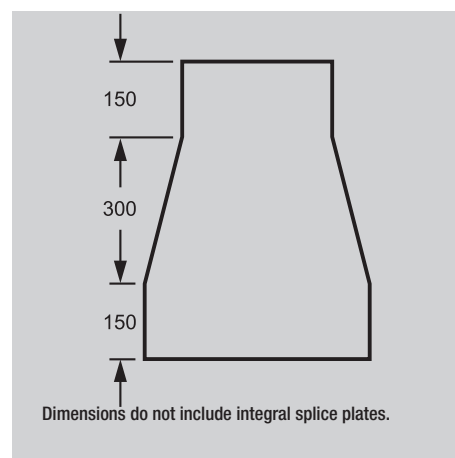
Order fasteners separately for installation.  
16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

All Reducers are manufactured against firm orders, and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
N4SR300150	300	150
N4SR450150	450	150
N4SR450300	450	300
N4SR600150	600	150
N4SR600300	600	300
N4SR600450	600	450
N4SR900150	900	150
N4SR900300	900	300
N4SR900450	900	450
N4SR900600	900	600

● H Hot Dip Galvanised  
● S Stainless Steel

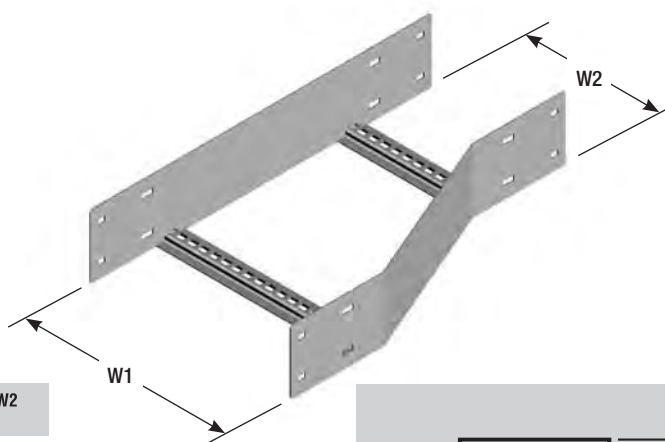


#### NEMA 4 Cable Ladder - Straight Reducer

Order fasteners separately for installation.

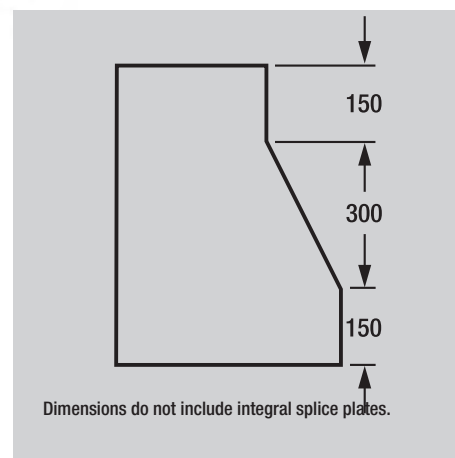
16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

All Reducers are manufactured against firm orders, and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
N4LHR300150	300	150
N4LHR450150	450	150
N4LHR450300	450	300
N4LHR600150	600	150
N4LHR600300	600	300
N4LHR600450	600	450
N4LHR900150	900	150
N4LHR900300	900	300
N4LHR900450	900	450
N4LHR900600	900	600

● H Hot Dip Galvanised  
● S Stainless Steel

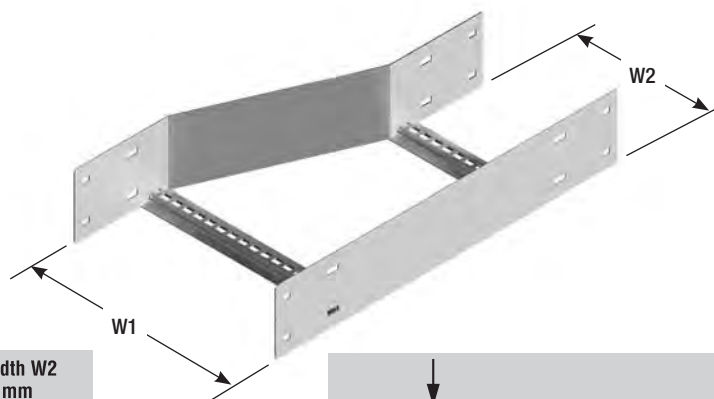


#### NEMA 4 Cable Ladder - Left Hand Reducer

Order fasteners separately for installation.

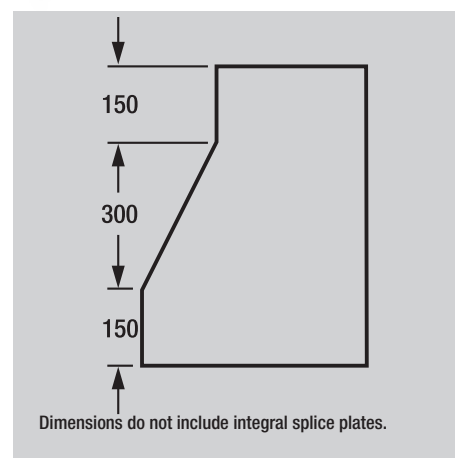
16 x Splice Bolts (SBH) & 16 x Splice Nuts (SNH) required.

All Reducers are manufactured against firm orders and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
N4RHR300150	300	150
N4RHR450150	450	150
N4RHR450300	450	300
N4RHR600150	600	150
N4RHR600300	600	300
N4RHR600450	600	450
N4RHR900150	900	150
N4RHR900300	900	300
N4RHR900450	900	450
N4RHR900600	900	600

● H Hot Dip Galvanised  
● S Stainless Steel



#### NEMA 4 Cable Ladder - Right Hand Reducer

Ordering Code: **N4S**

Note - Order splice bolts & nuts separately, SBH or SBS and SNH or SNS.

Ordering Code

**N4S**

**H** Hot Dip Galvanised  
**S** Stainless Steel



### NEMA 4 Splice

Ordering Code: **N4VS**

Note - Order splice bolts & nuts separately, SBH or SBS and SNH or SNS.

Ordering Code

**N4VS**

**H** Hot Dip Galvanised  
**S** Stainless Steel



### NEMA 4 Vertical Splice

Ordering Code: **N4HS**

Note - Order splice bolts & nuts separately, SBH or SBS and SNH or SNS.

Ordering Code

**N4HS**

**H** Hot Dip Galvanised  
**S** Stainless Steel



### NEMA 4 Horizontal Splice

Both items are ordered separately.

Splice Bolts have a smooth head to eliminate the risk of sheathing the cable during installation.

Special counterbore nuts ensure that correct tension is achieved during installation.



### SBH Splice Bolt & SNH Splice Nut

Ordering Code: **N4CCS (stainless steel)**

Supplied complete with cone screw.



### NEMA 4 Cover Clamp

Ordering Code: **DSN4**

Standard Finish: Galvabond. Hot dip galvanised and stainless steel can be supplied against a firm order.

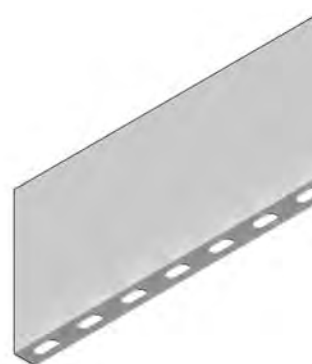
Standard Length: 3.0 metres

Note: Order B3016 and PS620 separately for installation.

Ordering Code

**DSN4**

- **G** Galvabond
- **H** Hot Dip Galvanised
- **S** Stainless Steel



### NEMA 4 Divider Strip

Ordering Code: **HD**

Hold Down Bracket can be supplied complete with spring nut (B1008H-M10) and screw (HS1030H).

Hot dip galvanised fasteners are supplied separately.

Note: Should be used in pairs.

Ordering Code

**HD**

- **H** Hot Dip Galvanised
- **S** Stainless Steel



### NEMA 4 Hold Down Bracket

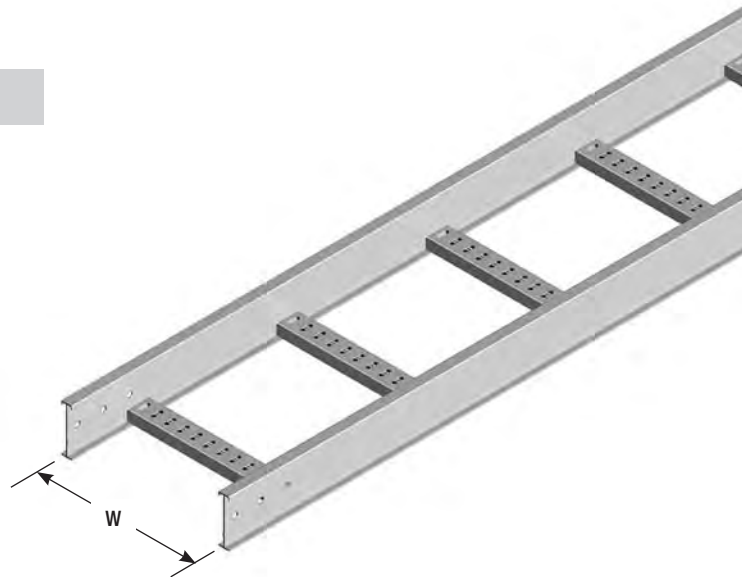
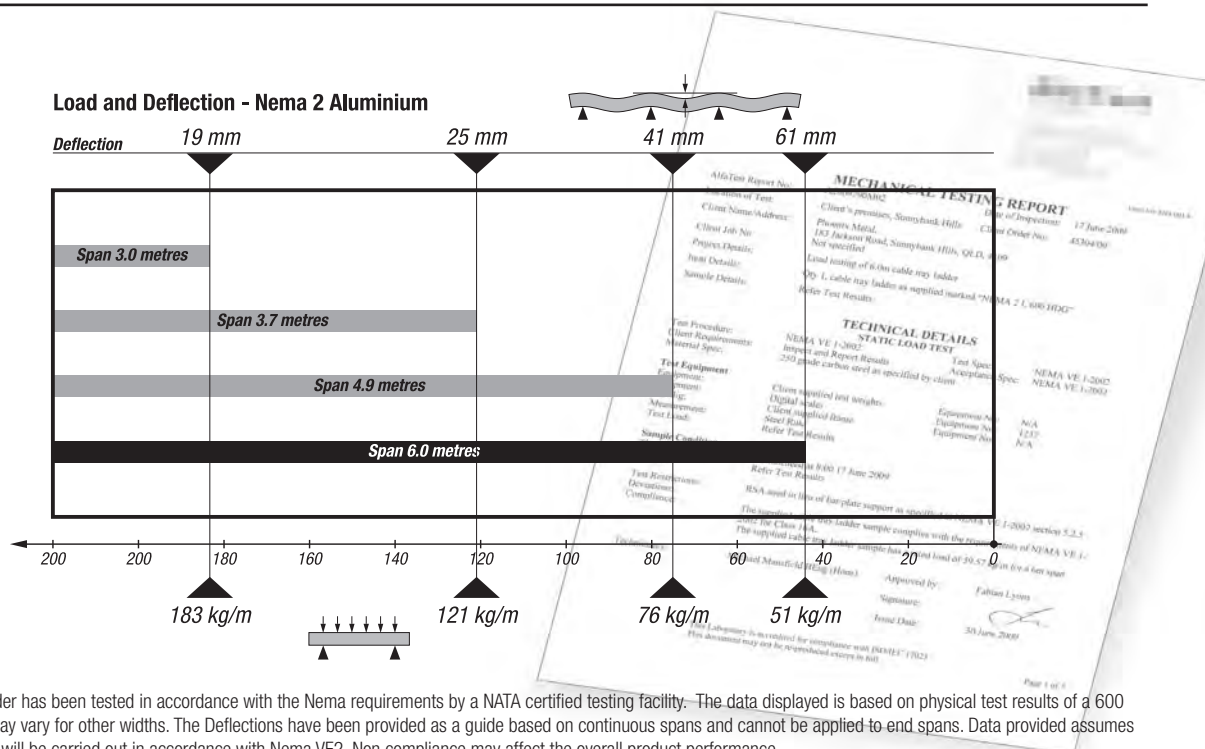
**Specifications**

- Standard Length 6.0 metres.
- Overall height 100 mm
- Cable laying depth 75 mm

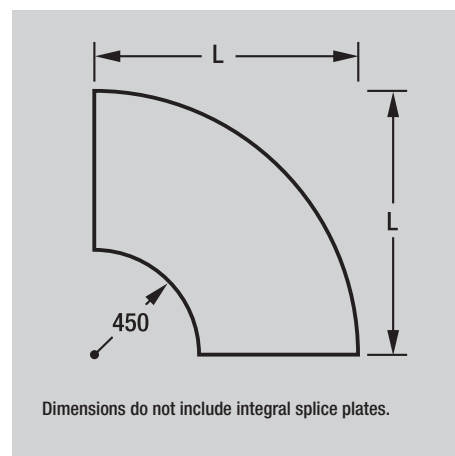
**Note**

- Aluminium products are manufactured against firm orders only and are non returnable.

Ordering Code	Cable Laying Width W mm	Width Overall W mm
N2L150A	150	184
N2L300A	300	334
N2L450A	450	484
N2L600A	600	634
N2L900A	900	934

**Nema 2 Cable Ladder - Aluminium**

Nema 2 Cable Ladder has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2. Non compliance may affect the overall product performance.



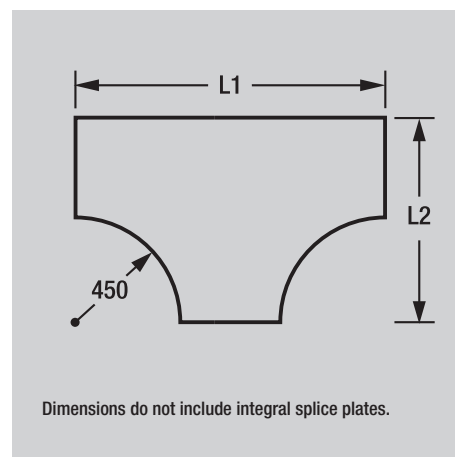
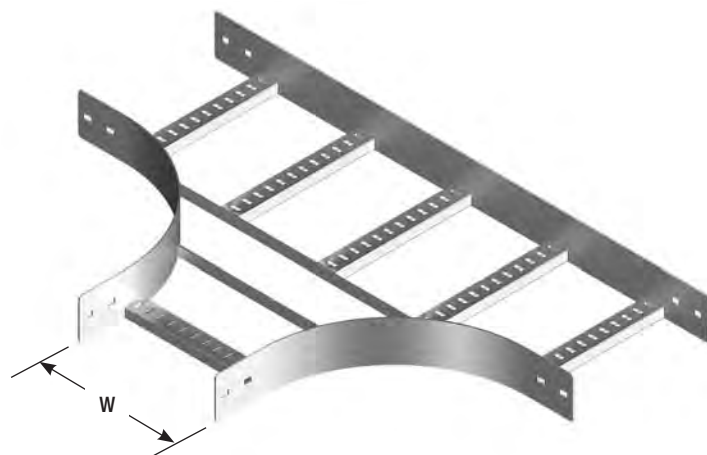
Order fasteners separately for installation.

8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.

All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

Ordering Code	Width W mm	Length L mm
<b>N2B1504A</b>	150	600
<b>N2B3004A</b>	300	750
<b>N2B4504A</b>	450	900
<b>N2B6004A</b>	600	1050
<b>N2B9004A</b>	900	1350

### NEMA 2 Cable Ladder - Bend - Aluminium



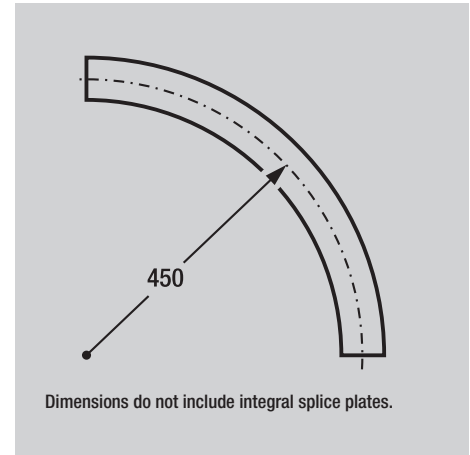
Order fasteners separately for installation.

12 x Splice Bolts (SBS) & 12 x Splice Nuts (SNS) required.

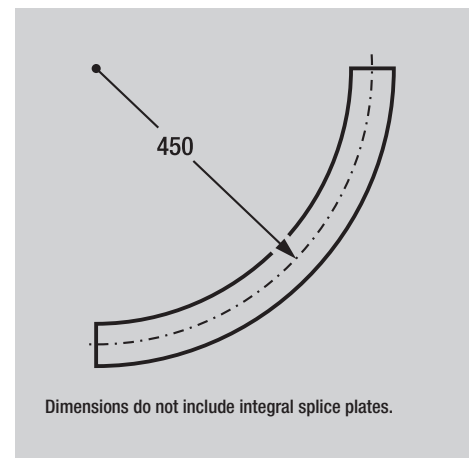
All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

Ordering Code	Width W mm	Length L1 mm	Length L2 mm
<b>N2T1504A</b>	150	1050	600
<b>N2T3004A</b>	300	1200	750
<b>N2T4504A</b>	450	1350	900
<b>N2T6004A</b>	600	1500	1050
<b>N2T9004A</b>	900	1800	1350

### NEMA 2 Cable Ladder - Tee - Aluminium

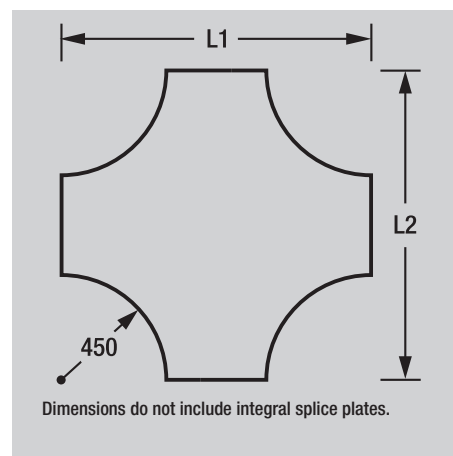
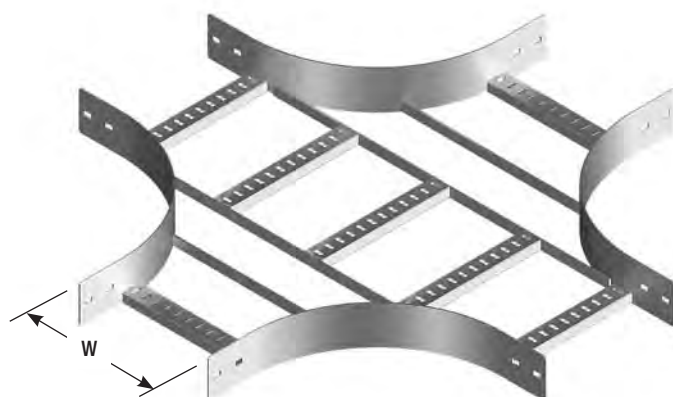


Ordering Code	Width W mm
N2ER1504A	150
N2ER3004A	300
N2ER4504A	450
N2ER6004A	600
N2ER9004A	900



Ordering Code	Width W mm
N2IR1504A	150
N2IR3004A	300
N2IR4504A	450
N2IR6004A	600
N2IR9004A	900

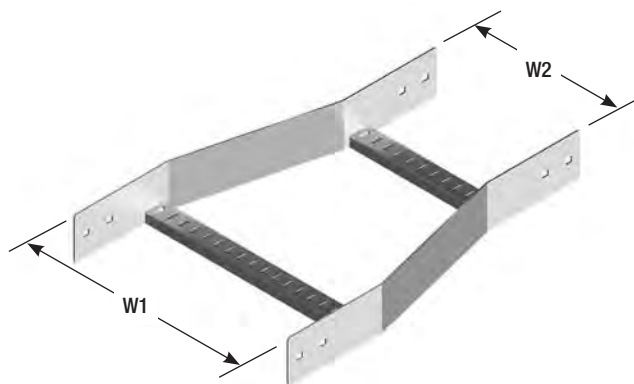
▶



Order fasteners separately for installation.  
16 x Splice Bolts (SBS) & 16 x Splice Nuts (SNS) required.  
All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

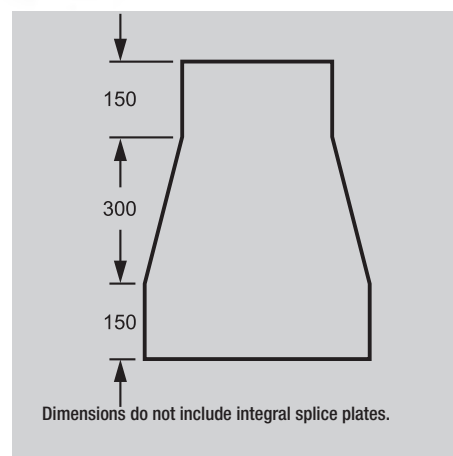
Ordering Code	Width W mm	Length L1 mm	Length L2 mm
<b>N2C1504A</b>	150	1050	1050
<b>N2C3004A</b>	300	1200	1200
<b>N2C4504A</b>	450	1350	1350
<b>N2C6004A</b>	600	1500	1500
<b>N2C9004A</b>	900	1800	1800

### NEMA 2 Cable Ladder - Cross - Aluminium



Order fasteners separately for installation.  
8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.  
All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

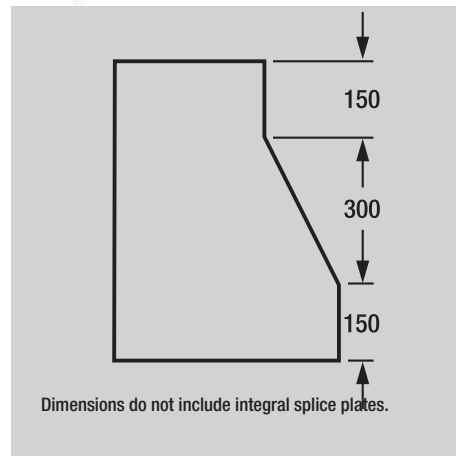
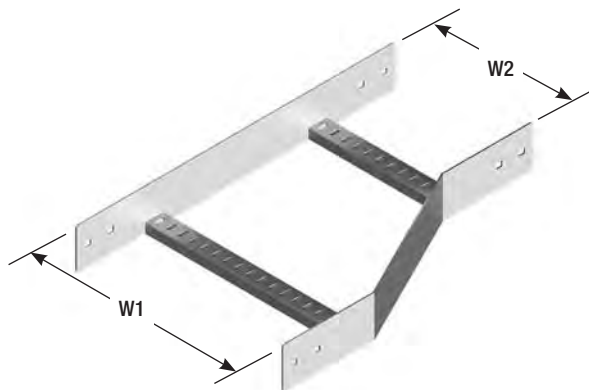
Ordering Code	Width W1 mm	Width W2 mm
<b>N2SR300150A</b>	300	150
<b>N2SR450150A</b>	450	150
<b>N2SR450300A</b>	450	300
<b>N2SR600150A</b>	600	150
<b>N2SR600300A</b>	600	300
<b>N2SR600450A</b>	600	450
<b>N2SR900150A</b>	900	150
<b>N2SR900300A</b>	900	300
<b>N2SR900450A</b>	900	450
<b>N2SR900600A</b>	900	600



### NEMA 2 Cable Ladder - Straight Reducer - Aluminium

Order fasteners separately for installation.  
8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.  
All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

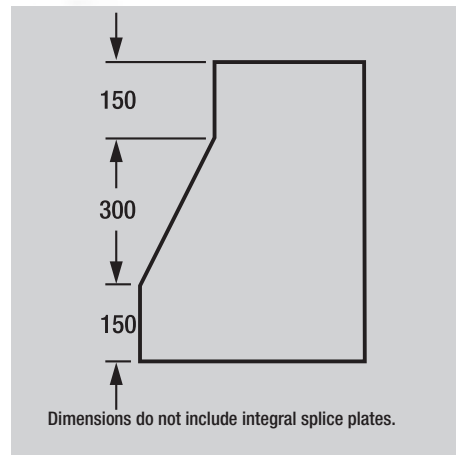
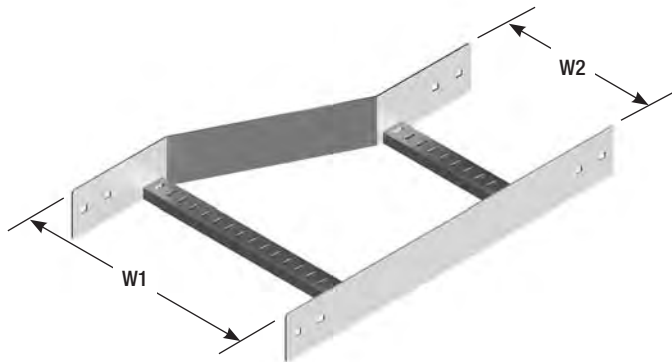
Ordering Code	Width W1 mm	Width W2 mm
N2LHR300150A	300	150
N2LHR450150A	450	150
N2LHR450300A	450	300
N2LHR600150A	600	150
N2LHR600300A	600	300
N2LHR600450A	600	450
N2LHR900150A	900	150
N2LHR900300A	900	300
N2LHR900450A	900	450
N2LHR900600A	900	600



#### NEMA 2 Cable Ladder - Left Hand Reducer - Aluminium

Order fasteners separately for installation.  
8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.  
All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

Ordering Code	Width W1 mm	Width W2 mm
N2RHR300150A	300	150
N2RHR450150A	450	150
N2RHR450300A	450	300
N2RHR600150A	600	150
N2RHR600300A	600	300
N2RHR600450A	600	450
N2RHR900150A	900	150
N2RHR900300A	900	300
N2RHR900450A	900	450
N2RHR900600A	900	600



#### NEMA 2 Cable Ladder - Right Hand Reducer - Aluminium

Ordering Code: **N2SA**

Note: Order splice bolts & nuts separately, SBS and SNS.



## NEMA 2 Splice Plate - Aluminium

Ordering Code: **N2VSA**

Note: Order splice bolts & nuts separately, SBS and SNS.



## NEMA 2 Vertical Splice Plate - Aluminium

Ordering Code: **N2HSA**

Note: Order splice bolts & nuts separately, SBS and SNS.



## NEMA 2 Horizontal Splice Plate - Aluminium

Stainless steel fasteners can be supplied for additional protection in harsh conditions. However these should only be used in conjunction with appropriate insulating bushes in order to prevent electrolytic reaction between dissimilar metals.

Stainless steel screws used in conjunction with insulators are only available in hex head type.

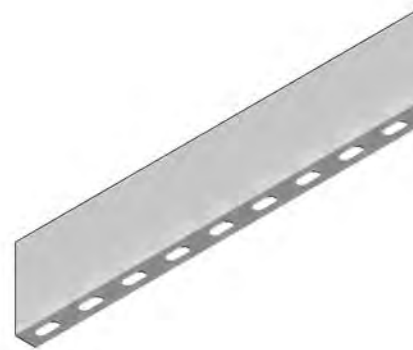
Ordering Codes:	<b>HS820S</b>	M8 x 20 hex screw
	<b>HN8S</b>	hex nut
	<b>IF8N</b>	insulating ferrule
	<b>FW8N</b>	nylon washer



## Stainless Steel Fasteners and Insulating Bushes

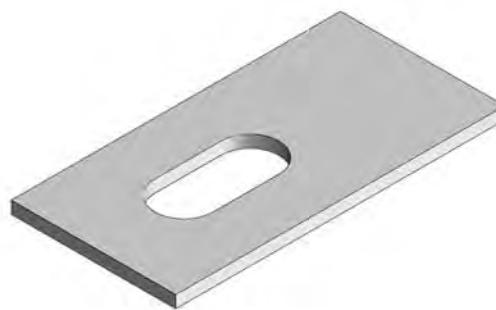
Ordering Code: **DSN2A**

Note: Order B3016 and PS620 separately for installation.



#### NEMA 2 Divider Strip - Aluminium

Ordering Code: **BIFS**



#### BIFS Burndy Interface Spacer

Ordering Code: **N2CCAS**



#### Nema 2 Cover Clamp for Aluminium

1 channels

2 nuts & bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

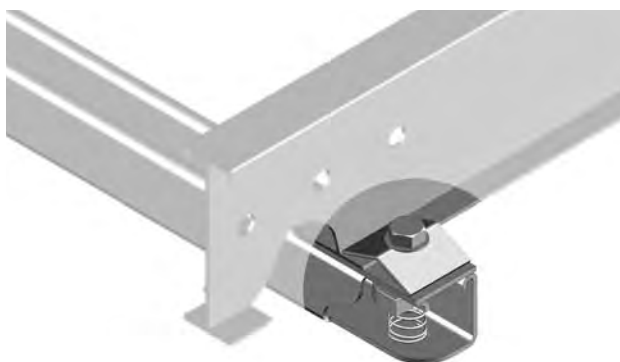
8 aluminium ladders

9 covers

10 hyground

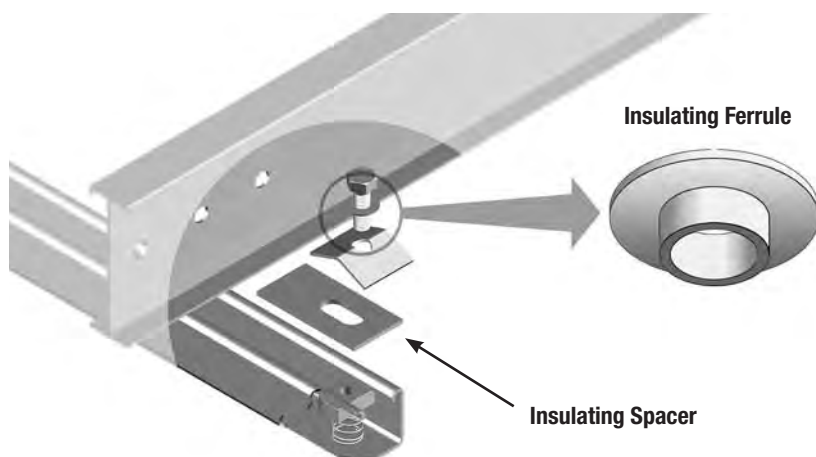
Ordering Code: **HDA**

Note: Should be used in pairs.



## Hold Down Unit

### Hold Down Unit with Insulators



The Hold Down Bracket is manufactured from aluminium as standard.

The Channel Nut and Bolt are manufactured from stainless steel as standard.

HDA x 1

HS1030S x 1

B1008S x 1

BIFS x 1

BTHF x 1

## NEMA 2 Hold Down Unit - Aluminium

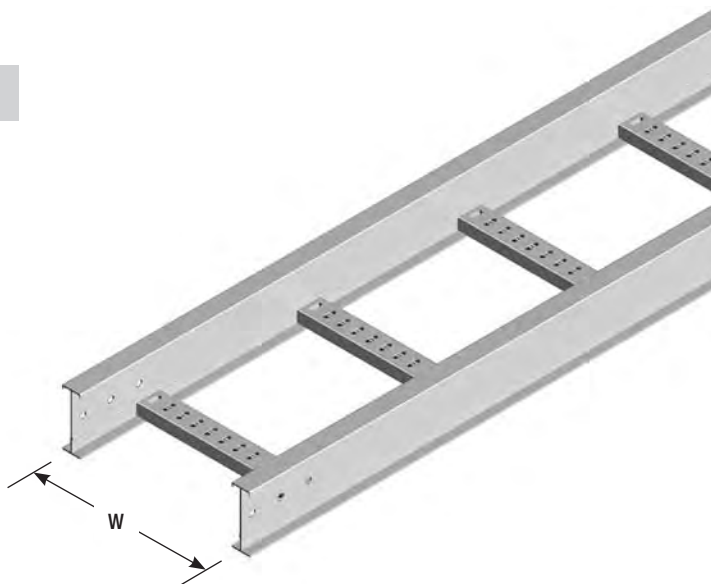
### Specifications

- Standard Length 6.0 metres.
- Overall height 120 mm
- Cable laying depth 95 mm

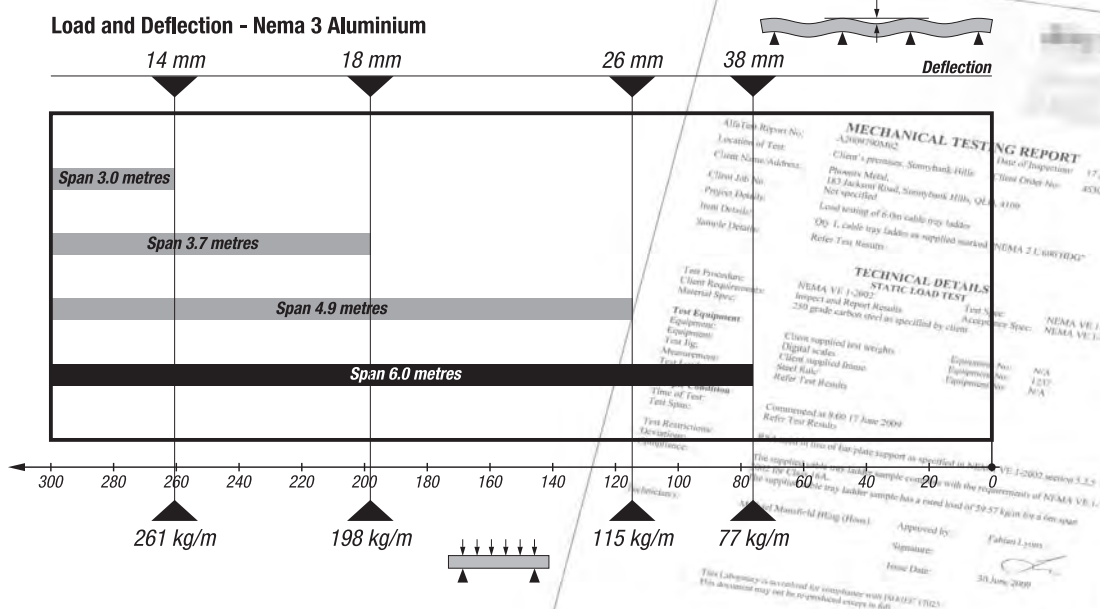
### Note

- Aluminium products are manufactured against firm orders only and are non returnable.

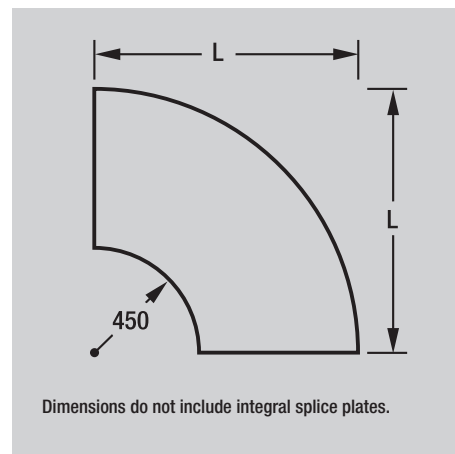
Ordering Code	Cable Laying Width W mm	Width Overall W mm
N3L150A	150	184
N3L300A	300	334
N3L450A	450	484
N3L600A	600	634
N3L900A	900	934



### Nema 3 Cable Ladder - Aluminium



Nema 3 Cable Ladder has been tested in accordance with the Nema requirements by a NATA certified testing facility. The data displayed is based on physical test results of a 600 wide section and may vary for other widths. The Deflections have been provided as a guide based on continuous spans and cannot be applied to end spans. Data provided assumes that the installation will be carried out in accordance with Nema VE2. Non compliance may affect the overall product performance.



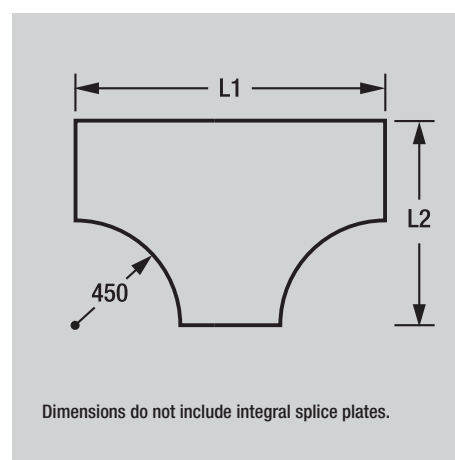
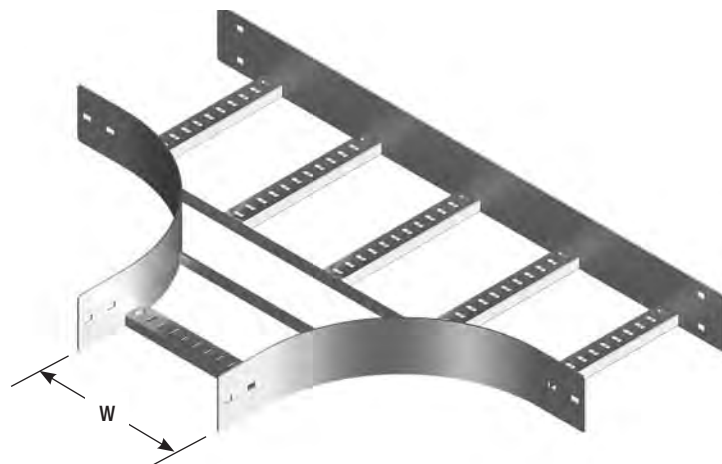
Order fasteners separately for installation.

8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.

All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

Ordering Code	Width W mm	Length L mm
<b>N3B1504A</b>	150	600
<b>N3B3004A</b>	300	750
<b>N3B4504A</b>	450	900
<b>N3B6004A</b>	600	1050
<b>N3B9004A</b>	900	1350

### NEMA 3 Cable Ladder - Bend - Aluminium



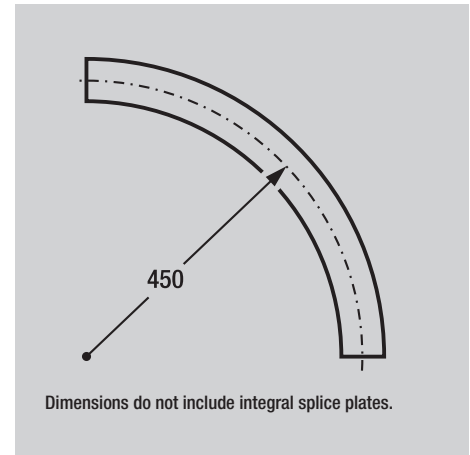
Order fasteners separately for installation.

12 x Splice Bolts (SBS) & 12 x Splice Nuts (SNS) required.

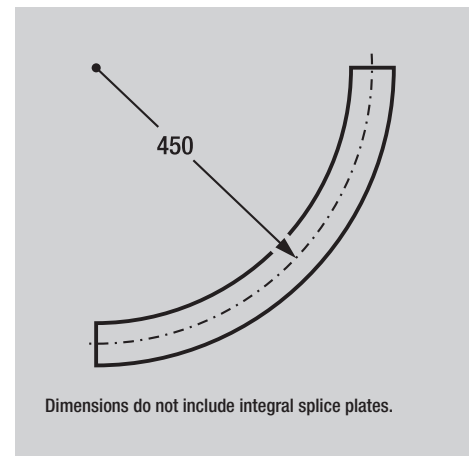
All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

Ordering Code	Width W mm	Length L1 mm	Length L2 mm
<b>N3T1504A</b>	150	1050	600
<b>N3T3004A</b>	300	1200	750
<b>N3T4504A</b>	450	1350	900
<b>N3T6004A</b>	600	1500	1050
<b>N3T9004A</b>	900	1800	1350

### NEMA 3 Cable Ladder - Tee - Aluminium

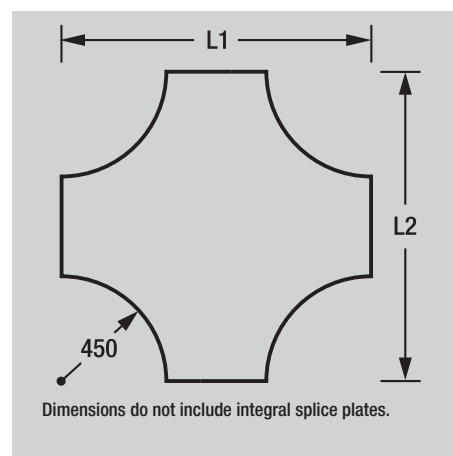
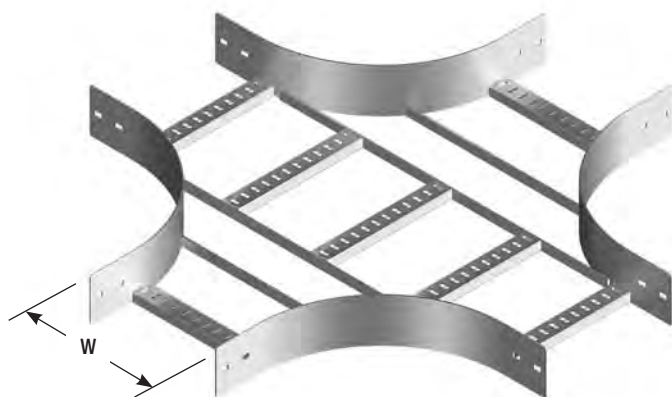


Ordering Code	Width W mm
N3ER1504A	150
N3ER3004A	300
N3ER4504A	450
N3ER6004A	600
N3ER9004A	900



Ordering Code	Width W mm
N3IR1504A	150
N3IR3004A	300
N3IR4504A	450
N3IR6004A	600
N3IR9004A	900

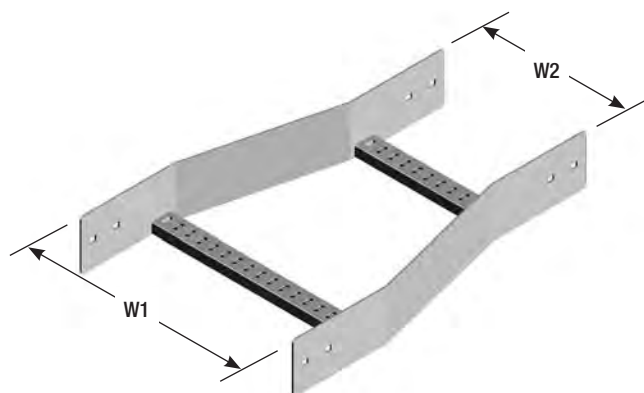
▶



Order fasteners separately for installation.  
16 x Splice Bolts (SBS) & 16 x Splice Nuts (SNS) required.  
All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

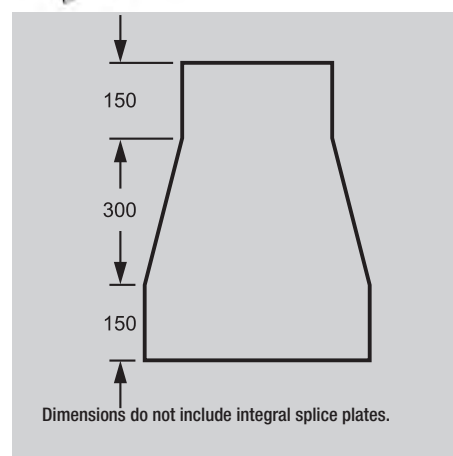
Ordering Code	Width W mm	Length L1 mm	Length L2 mm
<b>N3C1504A</b>	150	1050	1050
<b>N3C3004A</b>	300	1200	1200
<b>N3C4504A</b>	450	1350	1350
<b>N3C6004A</b>	600	1500	1500
<b>N3C9004A</b>	900	1800	1800

### NEMA 3 Cable Ladder - Cross - Aluminium



Order fasteners separately for installation.  
8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.  
All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

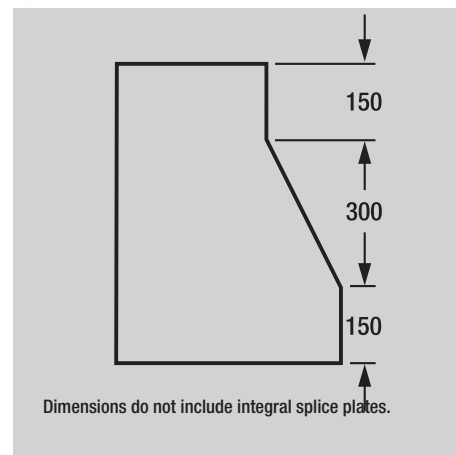
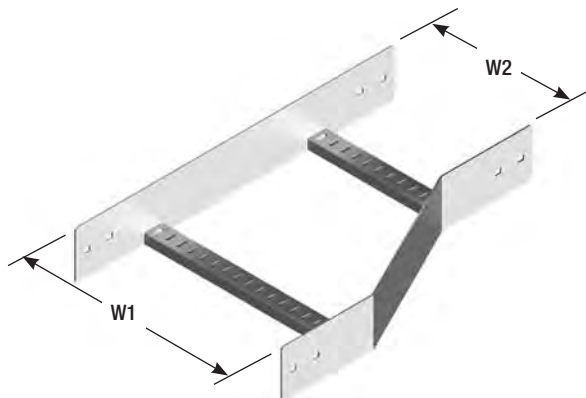
Ordering Code	Width W1 mm	Width W2 mm
<b>N3SR300150A</b>	300	150
<b>N3SR450150A</b>	450	150
<b>N3SR450300A</b>	450	300
<b>N3SR600150A</b>	600	150
<b>N3SR600300A</b>	600	300
<b>N3SR600450A</b>	600	450
<b>N3SR900150A</b>	900	150
<b>N3SR900300A</b>	900	300
<b>N3SR900450A</b>	900	450
<b>N3SR900600A</b>	900	600



### NEMA 3 Cable Ladder - Straight Reducer - Aluminium

Order fasteners separately for installation.  
8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.  
All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

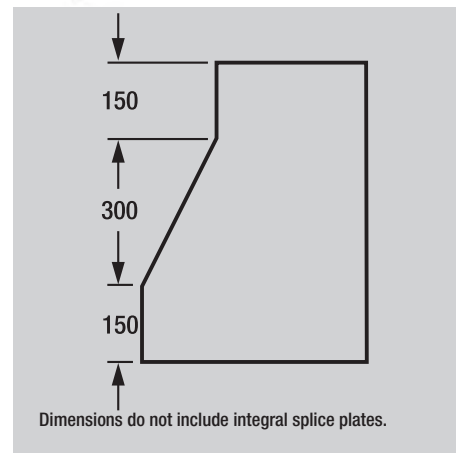
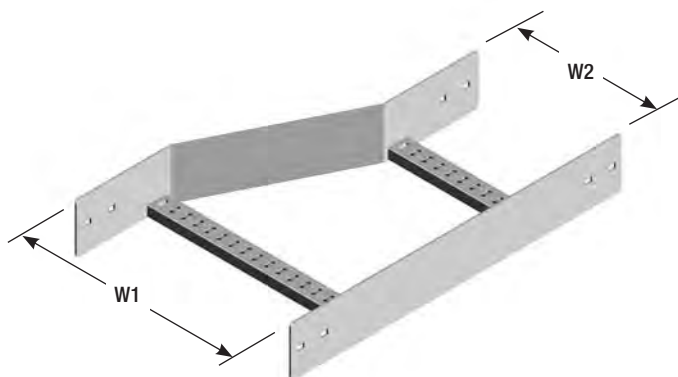
Ordering Code	Width W1 mm	Width W2 mm
N3LHR300150A	300	150
N3LHR450150A	450	150
N3LHR450300A	450	300
N3LHR600150A	600	150
N3LHR600300A	600	300
N3LHR600450A	600	450
N3LHR900150A	900	150
N3LHR900300A	900	300
N3LHR900450A	900	450
N3LHR900600A	900	600



#### NEMA 3 Cable Ladder - Left Hand Reducer - Aluminium

Order fasteners separately for installation.  
8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.  
All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

Ordering Code	Width W1 mm	Width W2 mm
N3RHR300150A	300	150
N3RHR450150A	450	150
N3RHR450300A	450	300
N3RHR600150A	600	150
N3RHR600300A	600	300
N3RHR600450A	600	450
N3RHR900150A	900	150
N3RHR900300A	900	300
N3RHR900450A	900	450
N3RHR900600A	900	600



#### NEMA 3 Cable Ladder - Right Hand Reducer - Aluminium

Ordering Code: **N3SA**

Note: Order splice bolts & nuts separately, SBS and SNS.



### NEMA 3 Splice Plate - Aluminium

Ordering Code: **N3VSA**

Note: Order splice bolts & nuts separately, SBS and SNS.



### NEMA 3 Vertical Splice Plate - Aluminium

Ordering Code: **N3HSA**

Note: Order splice bolts & nuts separately, SBS and SNS.



### NEMA 3 Horizontal Splice Plate - Aluminium

Stainless steel screws used in conjunction with insulators are only available in hex head type.

Ordering Codes:

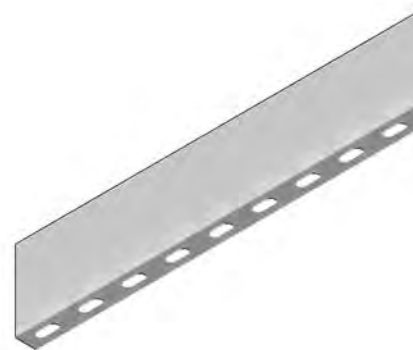
<b>HS820S</b>	M8 x 20 hex screw
<b>HN8S</b>	hex nut
<b>BTHF</b>	insulating ferrule
<b>FW8N</b>	nylon washer



### Stainless Steel Fasteners and Insulating Bushes

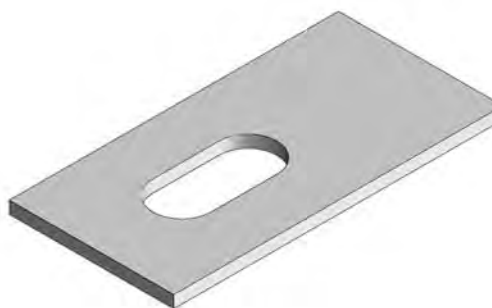
Ordering Code: **DSN3A**

Note: Order B3016 and PS620 separately for installation.



### NEMA 3 Divider Strip - Aluminium

Ordering Code: **BIFS**



### BIFS Burndy Interface Spacer

Ordering Code: **N3CCAS**



### Nema 2 Cover Clamp for Aluminium

1 channels

2 nuts & bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

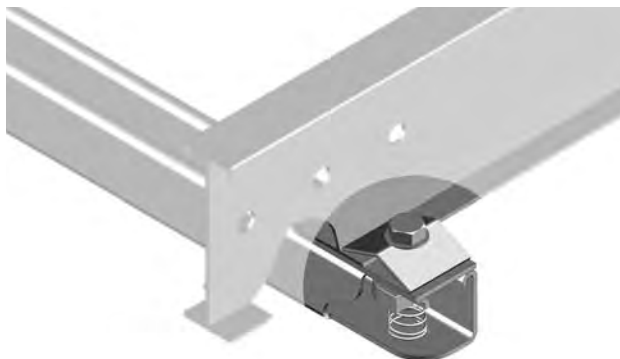
8 aluminium ladders

9 covers

10 hyground

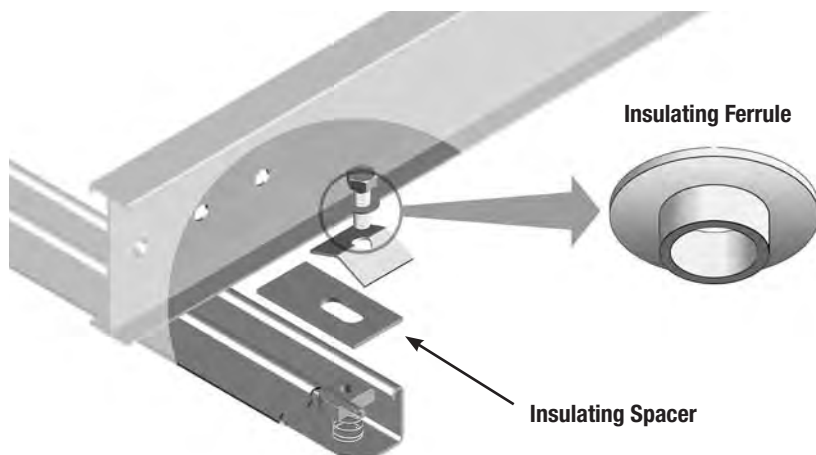
Ordering Code: **HDA**

Note: Should be used in pairs.



## Hold Down Unit

### Hold Down Unit with Insulators



The Hold Down Bracket is manufactured from aluminium as standard.

The Channel Nut and Bolt are manufactured from stainless steel as standard.

HDA x 1

HS1030S x 1

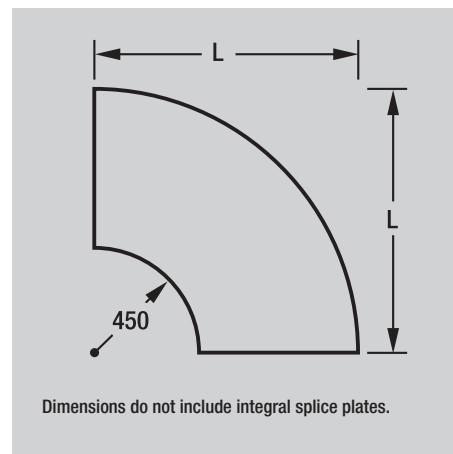
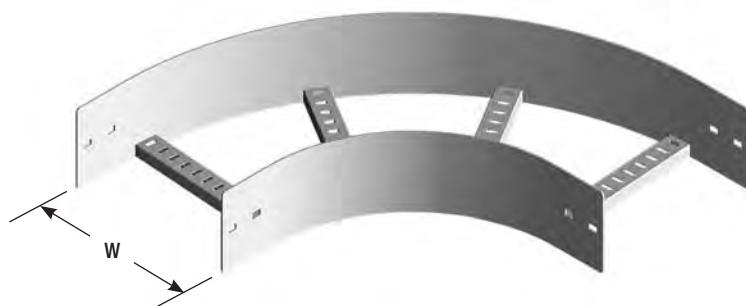
B1008S x 1

BIFS x 1

BTHF x 1

## NEMA 3 Hold Down Unit - Aluminium





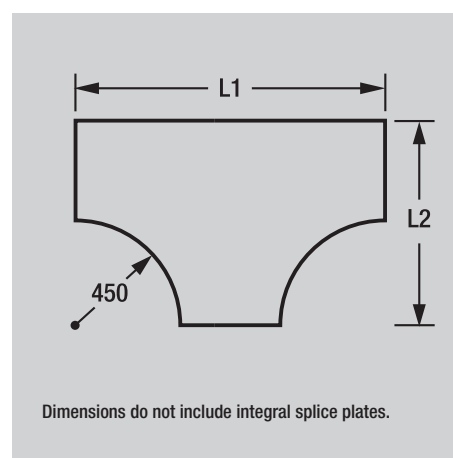
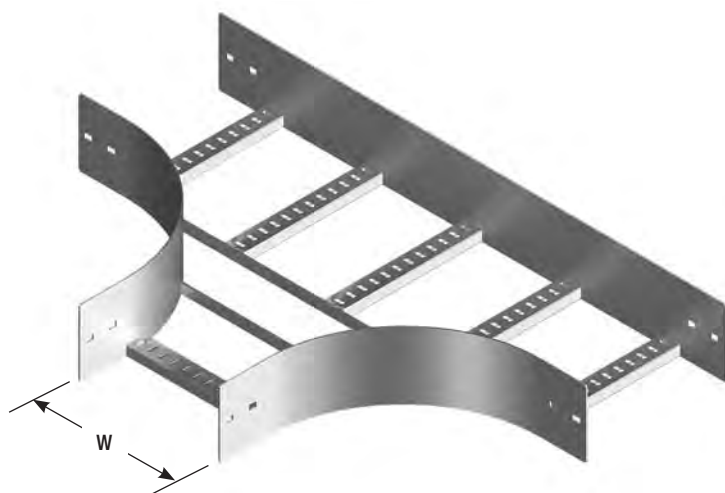
Order fasteners separately for installation.

8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.

All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

Ordering Code	Width W mm	Length L mm
<b>N4B1504A</b>	150	600
<b>N4B3004A</b>	300	750
<b>N4B4504A</b>	450	900
<b>N4B6004A</b>	600	1050
<b>N4B9004A</b>	900	1350

#### NEMA 4 Cable Ladder - Bend - Aluminium



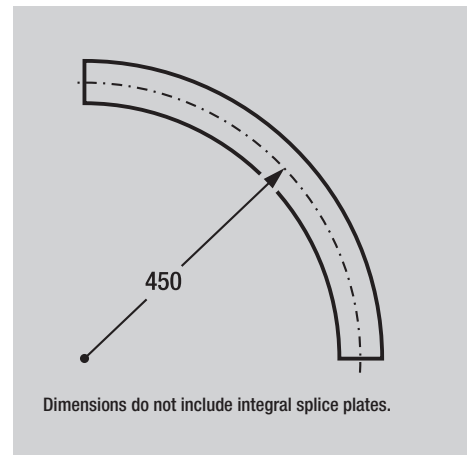
Order fasteners separately for installation.

12 x Splice Bolts (SBS) & 12 x Splice Nuts (SNS) required.

All aluminium Cable Ladder Fittings are manufactured against firm orders only, and are non returnable.

Ordering Code	Width W mm	Length L1 mm	Length L2 mm
<b>N4T1504A</b>	150	1050	600
<b>N4T3004A</b>	300	1200	750
<b>N4T4504A</b>	450	1350	900
<b>N4T6004A</b>	600	1500	1050
<b>N4T9004A</b>	900	1800	1350

#### NEMA 4 Cable Ladder - Tee - Aluminium

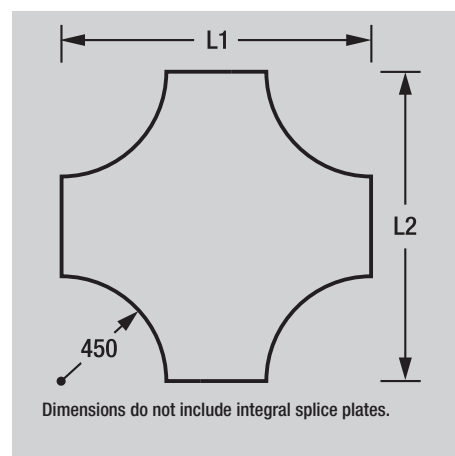
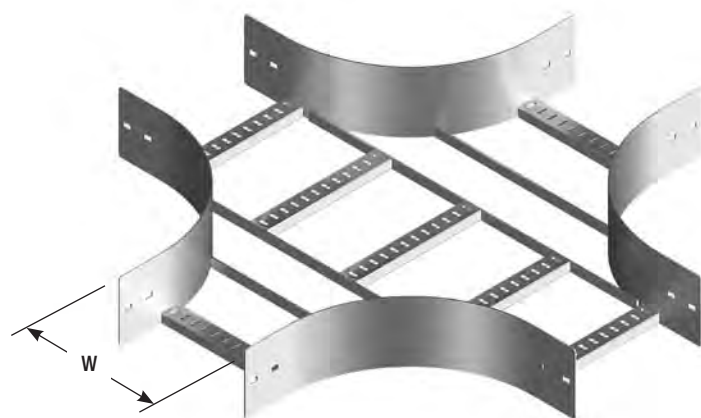


Ordering Code	Width W mm
N4ER1504A	150
N4ER3004A	300
N4ER4504A	450
N4ER6004A	600
N4ER9004A	900

A diagram of a curved structural member, possibly a pipe or duct, shown in a cross-sectional view. The member is curved, and a dimension line with arrows at both ends indicates a length of 450. The dimension line is positioned outside the member, and the number 450 is written next to it. The member itself is shown with a dashed line indicating its internal structure or a specific path.

Ordering Code	Width W mm
N4IR1504A	150
N4IR3004A	300
N4IR4504A	450
N4IR6004A	600
N4IR9004A	900

## CABLE SUPPORT SYSTEMS

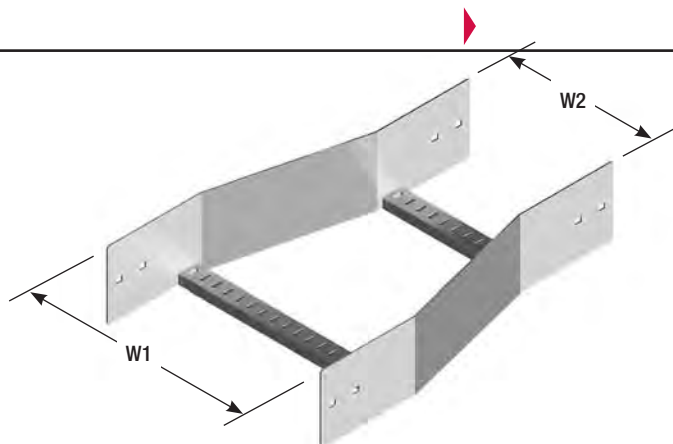


Order fasteners separately for installation. 16 x Splice Bolts (SBS) & 16 x Splice Nuts (SNS) required.

All aluminium cable ladder fittings are manufactured against firm orders and are non returnable.

Ordering Code	Width W mm	Length L1 mm	Length L2 mm
<b>N4C1504A</b>	150	1050	1050
<b>N4C3004A</b>	300	1200	1200
<b>N4C4504A</b>	450	1350	1350
<b>N4C6004A</b>	600	1500	1500
<b>N4C9004A</b>	900	1800	1800

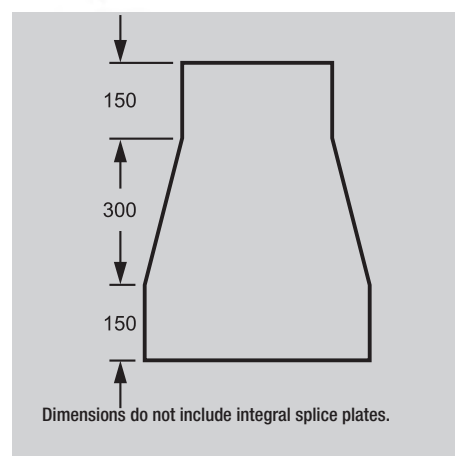
#### NEMA 4 Cable Ladder - Cross - Aluminium



Order fasteners separately for installation. 8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.

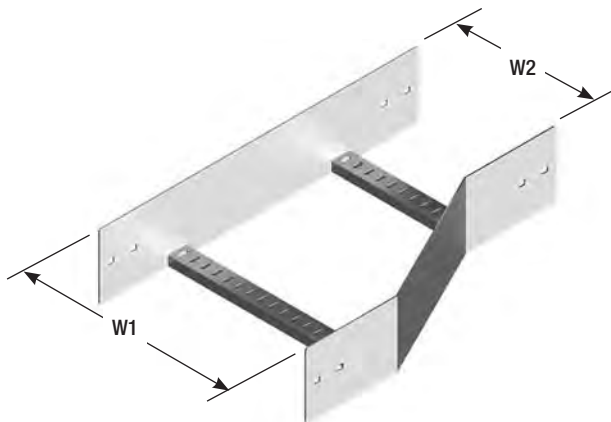
All aluminium cable ladder fittings are manufactured against firm orders and are non returnable.

Ordering Code	Width W1 mm	Width W2 mm
<b>N4SR300150A</b>	300	150
<b>N4SR450150A</b>	450	150
<b>N4SR450300A</b>	450	300
<b>N4SR600150A</b>	600	150
<b>N4SR600300A</b>	600	300
<b>N4SR600450A</b>	600	450
<b>N4SR900150A</b>	900	150
<b>N4SR900300A</b>	900	300
<b>N4SR900450A</b>	900	450
<b>N4SR900600A</b>	900	600

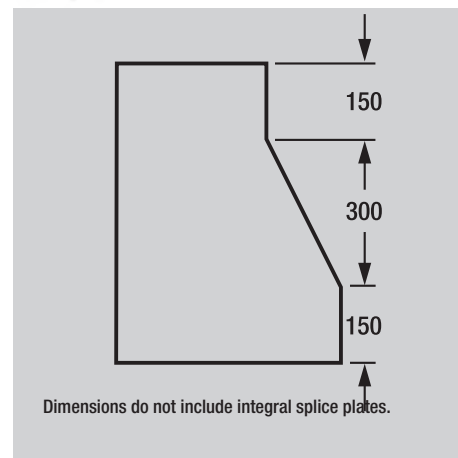


#### NEMA 4 Cable Ladder - Straight Reducer - Aluminium

Order fasteners separately for installation.  
8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.  
All aluminium cable ladder fittings are manufactured against firm orders and are non returnable.

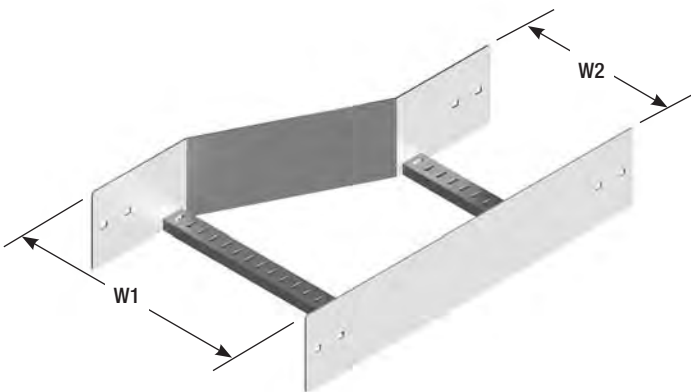


Ordering Code	Width W1 mm	Width W2 mm
N4LHR300150A	300	150
N4LHR450150A	450	150
N4LHR450300A	450	300
N4LHR600150A	600	150
N4LHR600300A	600	300
N4LHR600450A	600	450
N4LHR900150A	900	150
N4LHR900300A	900	300
N4LHR900450A	900	450
N4LHR900600A	900	600

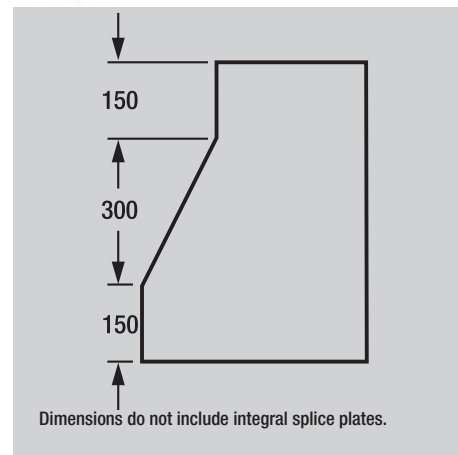


#### NEMA 4 Cable Ladder - Left Hand Reducer - Aluminium

Order fasteners separately for installation.  
8 x Splice Bolts (SBS) & 8 x Splice Nuts (SNS) required.  
All aluminium cable ladder fittings are manufactured against firm orders and are non returnable.



Ordering Code	Width W1 mm	Width W2 mm
N4RHR300150A	300	150
N4RHR450150A	450	150
N4RHR450300A	450	300
N4RHR600150A	600	150
N4RHR600300A	600	300
N4RHR600450A	600	450
N4RHR900150A	900	150
N4RHR900300A	900	300
N4RHR900450A	900	450
N4RHR900600A	900	600



#### NEMA 4 Cable Ladder - Right Hand Reducer - Aluminium

Ordering Code: **N4SA**

Note: Order splice bolts & nuts separately, SBS and SNS.



## NEMA 4 Splice Plate - Aluminium

Ordering Code: **N4VSA**

Note: Order splice bolts & nuts separately, SBS and SNS.



### NEMA 4 Vertical Splice Plate - Aluminium

Ordering Code: **N4HSA**

Note: Order splice bolts & nuts separately, SBS and SNS.



## NEMA 4 Horizontal Splice Plate - Aluminium

Stainless steel screws used in conjunction with insulators are only available in hex head type.

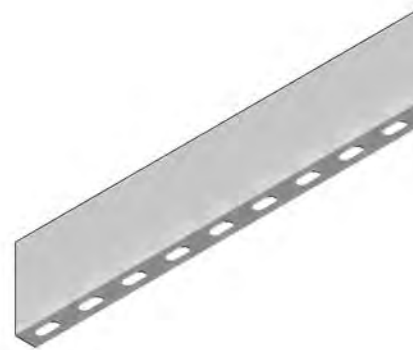
Ordering Codes:	<b>HS820S</b>	M8 x 20 hex screw
	<b>HN8S</b>	hex nut
	<b>BTHF</b>	insulating ferrule
	<b>FW8N</b>	nylon washer



## Stainless Steel Fasteners and Insulating Bushes

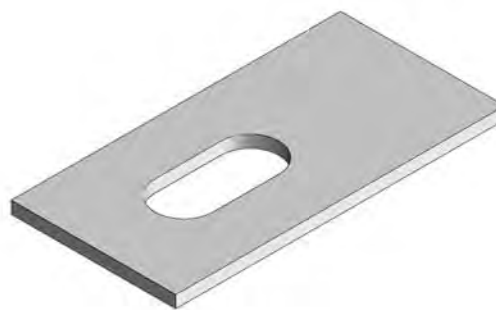
Ordering Code: **DSN4A**

Note: Order B3016 and PS620 separately for installation.



#### NEMA 4 Divider Strip - Aluminium

Ordering Code: **BIFS**



#### BIFS Burndy Interface Spacer

Ordering Code: **N4CCAS**



#### Nema 4 Cover Clamp for Aluminium

1 channels

2 nuts & bolts

3 cantilever brackets

4 channel fittings

5 laddertrays

6 cable mesh

7 steel ladders

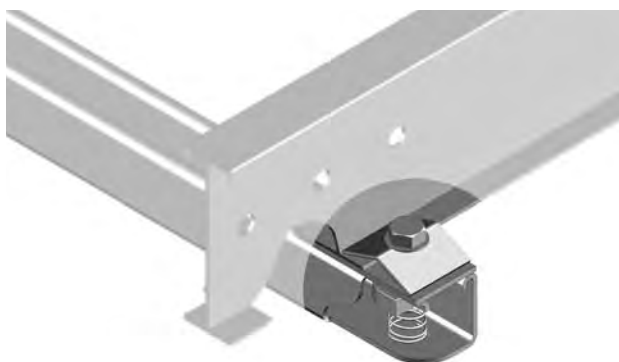
8 aluminium ladders

9 covers

10 hyground

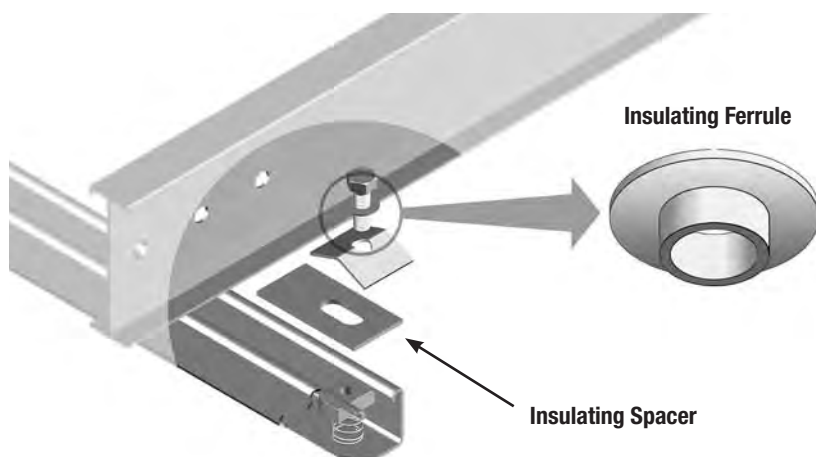
Ordering Code: **HDA**

Note: Should be used in pairs.



**Hold Down Unit**

**Hold Down Unit with Insulators**



The Hold Down Bracket is manufactured from aluminium as standard.

The Channel Nut and Bolt are manufactured from stainless steel as standard.

HDA x 1

HS1030S x 1

B1008S x 1

BIFS x 1

BTHF x 1

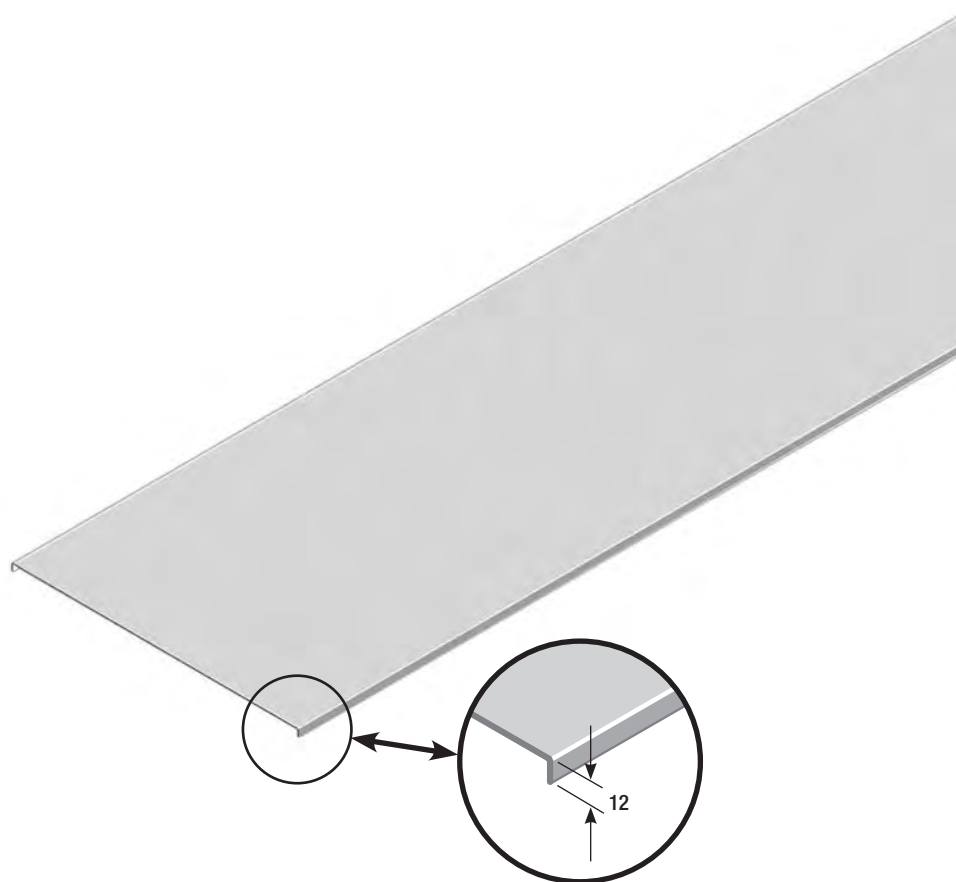
#### NEMA 4 Hold Down Unit - Aluminium

## Specifications

### Note

- Standard Length 3.0 metres.
- Hot Dip Galvanised & Galvabond Cable Ladder Covers are manufactured against firm orders only and are non returnable.
- Hot Dip Galvanising is not recommended for products such as these. Varying degrees of product distortion are likely to occur which may compromise aesthetics.

	Ordering Code	Nominal Width mm	Internal Width mm
Galvanised	CFN1150G	150	182
	CFN1300G	300	332
	CFN1450G	450	482
	CFN1600G	600	632
	CFN1900G	900	932
Hot Dip Galvanised	CFN1150H	150	182
	CFN1300H	300	332
	CFN1450H	450	482
	CFN1600H	600	632
	CFN1900H	900	932

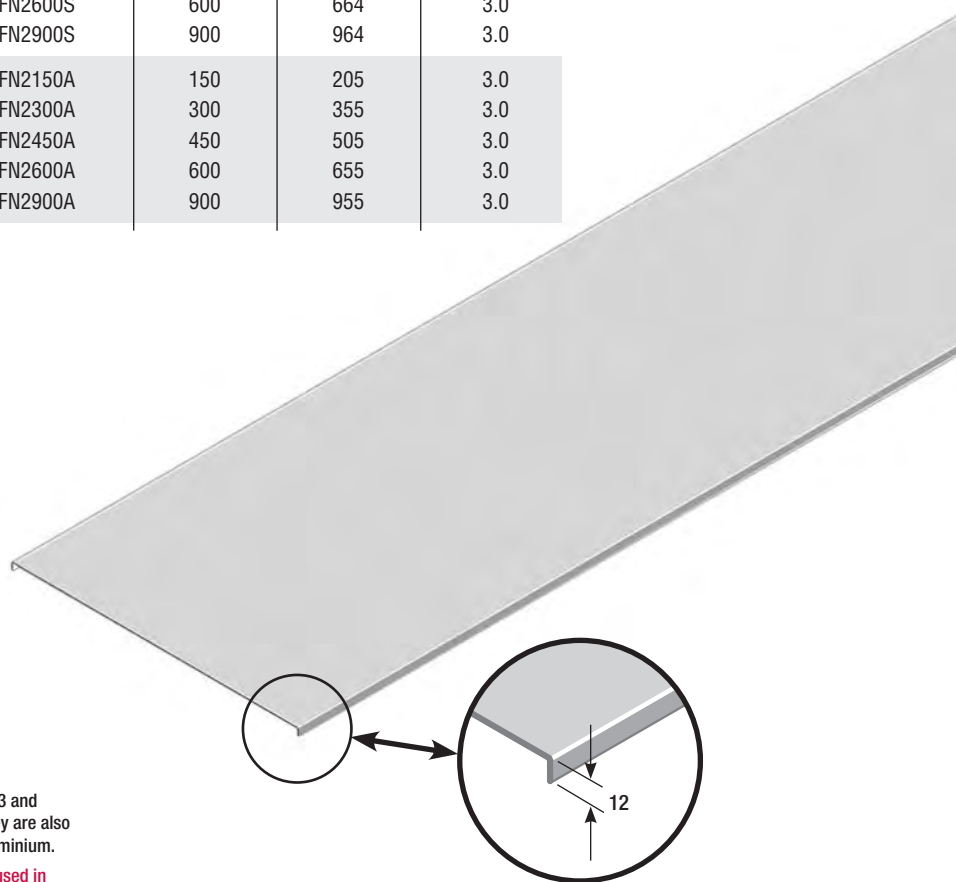


## Nema 1 Cable Ladder - Flat Cover

**Specifications****Note**

- Standard Length 3.0 metres.
- Hot Dip Galvanised, Stainless Steel & Aluminium Cable Ladder Covers are manufactured against firm orders only and are non returnable.
- Hot Dip Galvanising is not recommended for products such as these. Varying degrees of product distortion are likely to occur which may compromise aesthetics.

	Ordering Code	Nominal Width mm	Internal Width mm	Length metres
Galvanised	CFN2150G	150	214	3.0
	CFN2300G	300	364	3.0
	CFN2450G	450	514	3.0
	CFN2600G	600	664	3.0
	CFN2900G	900	964	3.0
Hot Dip Galvanised	CFN2150H	150	214	3.0
	CFN2300H	300	364	3.0
	CFN2450H	450	514	3.0
	CFN2600H	600	664	3.0
	CFN2900H	900	964	3.0
Stainless Steel	CFN2150S	150	214	3.0
	CFN2300S	300	364	3.0
	CFN2450S	450	514	3.0
	CFN2600S	600	664	3.0
	CFN2900S	900	964	3.0
Aluminium	CFN2150A	150	205	3.0
	CFN2300A	300	355	3.0
	CFN2450A	450	505	3.0
	CFN2600A	600	655	3.0
	CFN2900A	900	955	3.0

**Note**

Covers are common for Nema 2, Nema 3 and Nema 4 in steel and stainless steel. They are also common for Nema 2 and Nema 3 in aluminium.

Not suitable for 'Rail In' Cable Ladders used in Western Australia. For 'Rail In' application, refer to page 9.3

**Nema 2 / Nema 3 / Nema 4 Cable Ladder - Flat Cover**

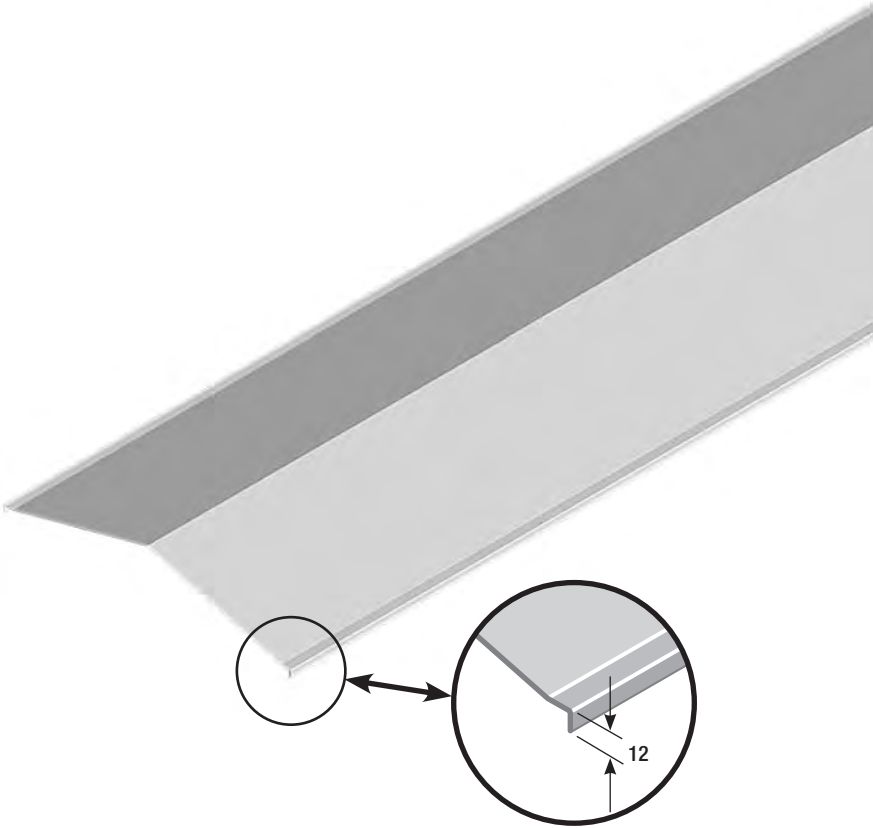


Specifications

Note

- Standard Length 3.0 metres.
- Hot Dip Galvanised & Galvabond Cable Ladder Covers are manufactured against firm orders only and are non returnable.
- Hot Dip Galvanising is not recommended for products such as these. Varying degrees of product distortion are likely to occur which may compromise aesthetics.

		Ordering Code	Nominal Width mm	Internal Width mm	Length metres
Galvanised		CPN1150G	150	182	3.0
		CPN1300G	300	332	3.0
		CPN1450G	450	482	3.0
		CPN1600G	600	632	3.0
		CPN1900G	900	932	3.0
Hot Dip Galvanised		CPN1150H	150	182	3.0
		CPN1300H	300	332	3.0
		CPN1450H	450	482	3.0
		CPN1600H	600	632	3.0
		CPN1900H	900	932	3.0

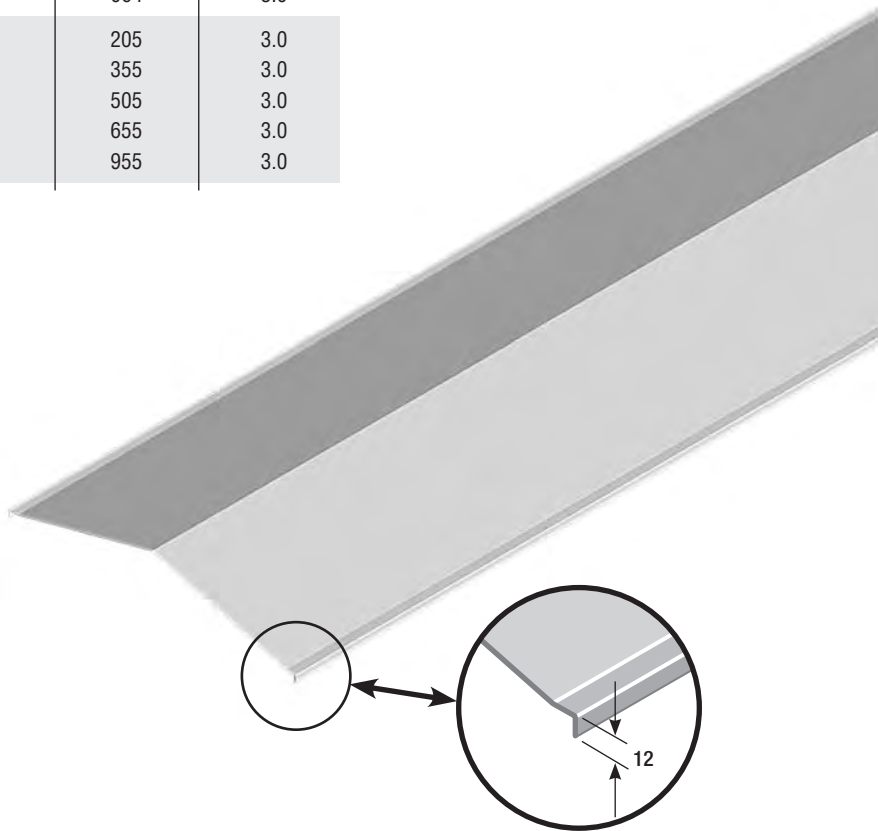


Nema 1 Cable Ladder - Peaked Cover (15 Degree Peak)

**Specifications****Note**

- Standard Length 3.0 metres.
- Hot Dip Galvanised, Stainless Steel & Aluminium Cable Ladder Covers are manufactured against firm orders only and are non returnable.
- Hot Dip Galvanising is not recommended for products such as these. Varying degrees of product distortion are likely to occur which may compromise aesthetics.

	Ordering Code	Nominal Width mm	Internal Width mm	Length metres
Galvanised	CPN2150G	150	214	3.0
	CPN2300G	300	364	3.0
	CPN2450G	450	514	3.0
	CPN2600G	600	664	3.0
	CPN2900G	900	964	3.0
Hot Dip Galvanised	CPN2150H	150	214	3.0
	CPN2300H	300	364	3.0
	CPN2450H	450	514	3.0
	CPN2600H	600	664	3.0
	CPN2900H	900	964	3.0
Stainless Steel	CPN2150S	150	214	3.0
	CPN2300S	300	364	3.0
	CPN2450S	450	514	3.0
	CPN2600S	600	664	3.0
	CPN2900S	900	964	3.0
Aluminium	CPN2150A	150	205	3.0
	CPN2300A	300	355	3.0
	CPN2450A	450	505	3.0
	CPN2600A	600	655	3.0
	CPN2900A	900	955	3.0

**Note**

Covers are common for Nema 2, Nema 3 and Nema 4 in steel and stainless steel. They are also common for Nema 2 and Nema 3 in aluminium.

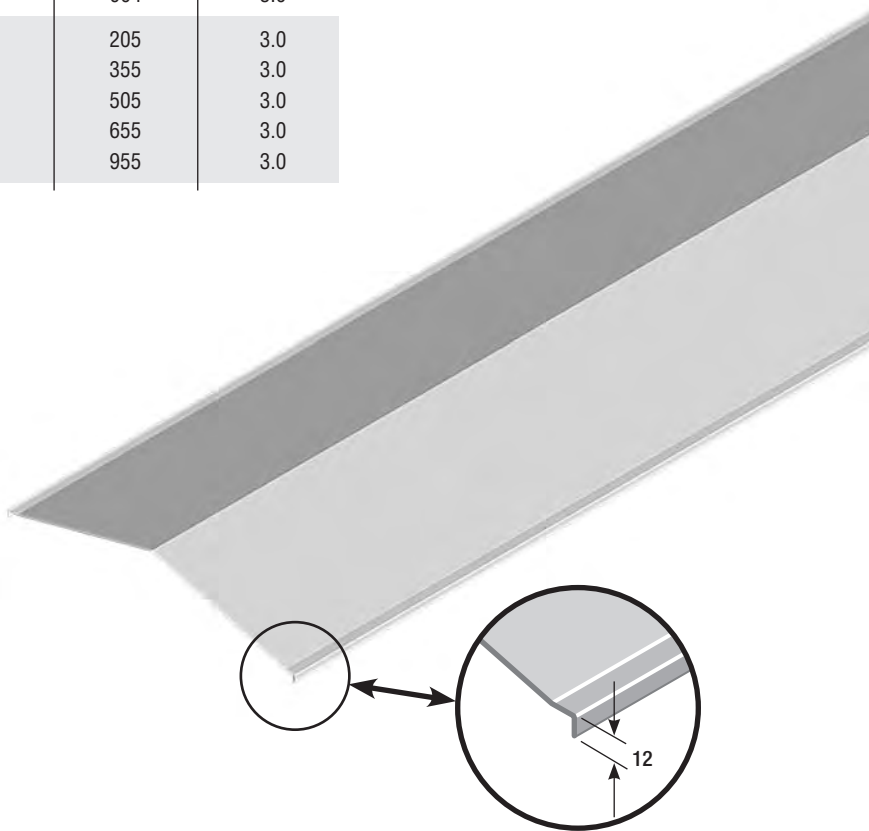
Not suitable for 'Rail In' Cable Ladders used in Western Australia. For 'Rail In' application, refer to page 9.6

**Nema 2 / Nema 3 / Nema 4 Cable Ladder Peaked Cover (15 Degree Peak)**

**Specifications****Note**

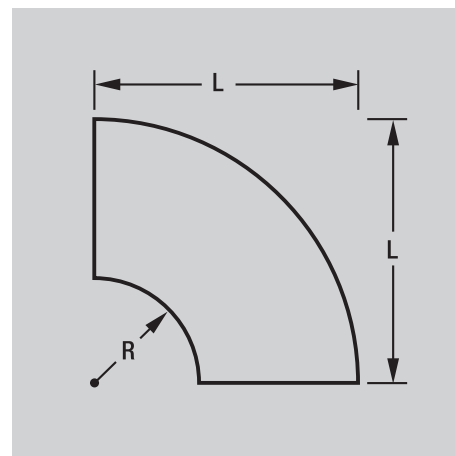
- Standard Length 3.0 metres.
- Hot Dip Galvanised, Stainless Steel & Aluminium Cable Ladder Covers are manufactured against firm orders only and are non returnable.
- Hot Dip Galvanising is not recommended for products such as these. Varying degrees of product distortion are likely to occur which may compromise aesthetics.

	Ordering Code	Nominal Width mm	Internal Width mm	Length metres
Galvanised	CPCT150G	150	154	3.0
	CPCT300G	300	304	3.0
	CPCT450G	450	454	3.0
	CPCT600G	600	604	3.0
	CPCT900G	900	904	3.0
Hot Dip Galvanised	CPCT150H	150	154	3.0
	CPCT300H	300	304	3.0
	CPCT450H	450	454	3.0
	CPCT600H	600	604	3.0
	CPCT900H	900	904	3.0
Stainless Steel	CPCT150S	150	154	3.0
	CPCT300S	300	304	3.0
	CPCT450S	450	454	3.0
	CPCT600S	600	604	3.0
	CPCT900S	900	904	3.0
Aluminium	CPN2150A	150	205	3.0
	CPN2300A	300	355	3.0
	CPN2450A	450	505	3.0
	CPN2600A	600	655	3.0
	CPN2900A	900	955	3.0

**Note**

Covers are common for Nema 2, Nema 3 and Nema 4 in steel and stainless steel. They are also common for Nema 2 and Nema 3 in aluminium.

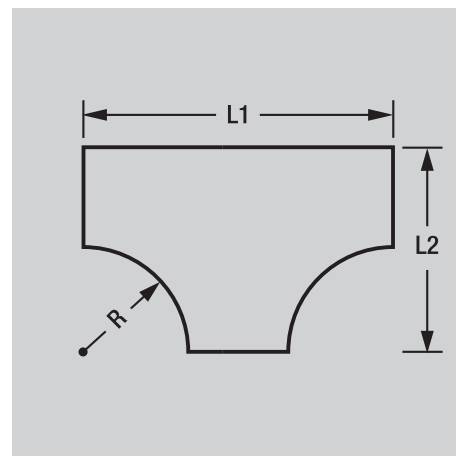
**Nema 2 / Nema 3 / Nema 4 Cable Ladder Peaked Cover (15 Degree Peak)**



	Ordering Code	Nominal Width mm	Length L mm
<b>300 Radius</b>	<b>CB1503</b>	150	450
	<b>CB3003</b>	300	600
	<b>CB4503</b>	450	750
	<b>CB6003</b>	600	900
	<b>CB9003</b>	900	1200
Standard for all NEMA 1			
<b>450 Radius</b>	<b>CB1504</b>	150	600
	<b>CB3004</b>	300	750
	<b>CB4504</b>	450	900
	<b>CB6004</b>	600	1050
	<b>CB9004</b>	900	1350
Standard for all NEMA 2, NEMA 3 & NEMA 4			

• **A** Aluminum  
 — **G** Galvabond  
 — **H** Hot Dip Galvanised  
 — **S** Stainless Steel

## Cable Ladder - Bend Cover



	Ordering Code	Nominal Width mm	Length L1 mm	Length L2 mm
<b>300 Radius</b>	<b>CT1503</b>	150	750	450
	<b>CT3003</b>	300	900	600
	<b>CT4503</b>	450	1050	750
	<b>CT6003</b>	600	1200	900
	<b>CT9003</b>	900	1500	1200
Standard for all NEMA 1				
<b>450 Radius</b>	<b>CT1504</b>	150	1050	600
	<b>CT3004</b>	300	1200	750
	<b>CT4504</b>	450	1350	900
	<b>CT6004</b>	600	1500	1050
	<b>CT9004</b>	900	1800	1350
Standard for all NEMA 2, NEMA 3 & NEMA 4				

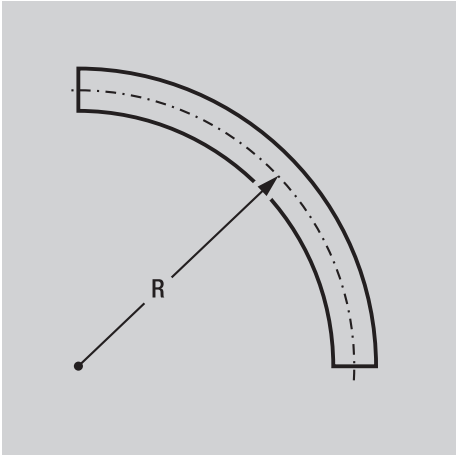
● **A** Aluminum

— **G** Galvabond

— **H** Hot Dip Galvanised

— **S** Stainless Steel





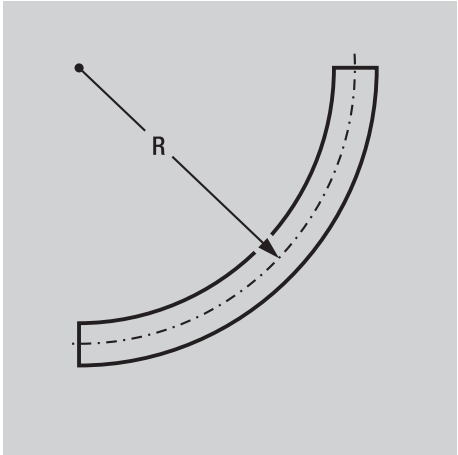
	Ordering Code	Nominal Width mm
<b>300 Radius</b>  Standard for all NEMA 1	<b>CER1503</b>	150
	<b>CER3003</b>	300
	<b>CER4503</b>	450
	<b>CER6003</b>	600
	<b>CER9003</b>	900
<b>450 Radius</b>  Standard for all NEMA 2, NEMA 3 & NEMA 4	<b>CER1504</b>	150
	<b>CER3004</b>	300
	<b>CER4504</b>	450
	<b>CER6004</b>	600
	<b>CER9004</b>	900

**A** Aluminum

**G** Galvabond

**H** Hot Dip Galvanised

**S** Stainless Steel



Ordering Code		Nominal Width mm
300 Radius  Standard for all NEMA 1	CIR1503	150
	CIR3003	300
	CIR4503	450
	CIR6003	600
	CIR9003	900
450 Radius  Standard for all NEMA 2, NEMA 3 & NEMA 4	CIR1504	150
	CIR3004	300
	CIR4504	450
	CIR6004	600
	CIR9004	900

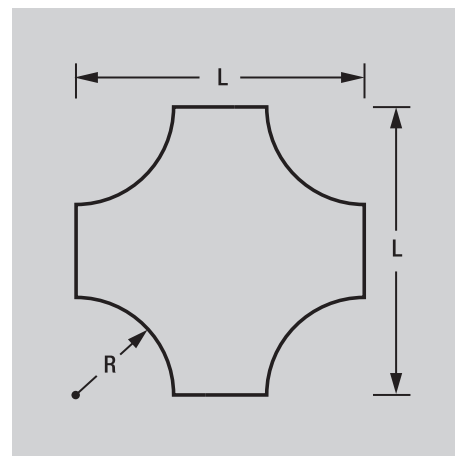
A Aluminum

G Galvabond

H Hot Dip Galvanised

S Stainless Steel

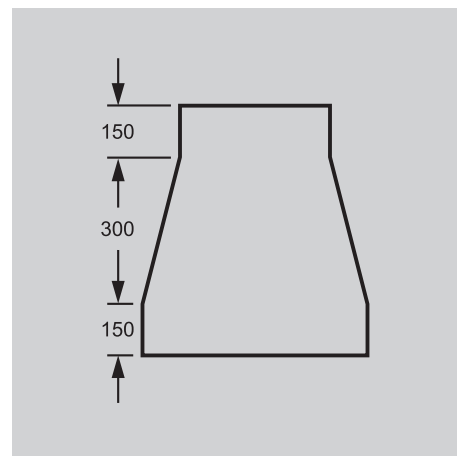
Cable Ladder - Internal Riser Cover



	Ordering Code	Nominal Width mm	Length L mm
<b>300 RADIUS</b>  Standard for all NEMA 1	CC1503	150	750
	CC3003	300	900
	CC4503	450	1050
	CC6003	600	1200
	CC9003	900	1500
<b>450 RADIUS</b>  Standard for all NEMA 2, NEMA 3 & NEMA 4	CC1504	150	1050
	CC3004	300	1200
	CC4504	450	1350
	CC6004	600	1500
	CC9004	900	1800

A Aluminum  
 G Galvabond  
 H Hot Dip Galvanised  
 S Stainless Steel

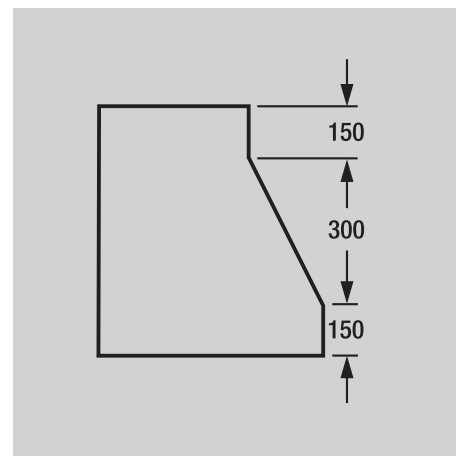
## Cable Ladder - Cross Cover



Ordering Code	Width W1 mm	Width W2 mm
CSR300150	300	150
CSR450150	450	150
CSR450300	450	300
CSR600150	600	150
CSR600300	600	300
CSR600450	600	450
CSR900150	900	150
CSR900300	900	300
CSR900450	900	450
CSR900600	900	600

- A Aluminum
- G Galvabond
- H Hot Dip Galvanised
- S Stainless Steel

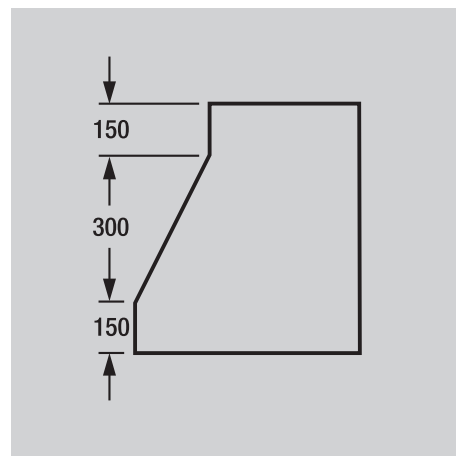
### Cable Ladder - Straight Reducer Cover



Ordering Code	Width W1 mm	Width W2 mm
CLHR300150	300	150
CLHR450150	450	150
CLHR450300	450	300
CLHR600150	600	150
CLHR600300	600	300
CLHR600450	600	450
CLHR900150	900	150
CLHR900300	900	300
CLHR900450	900	450
CLHR900600	900	600

- A Aluminum
- G Galvabond
- H Hot Dip Galvanised
- S Stainless Steel

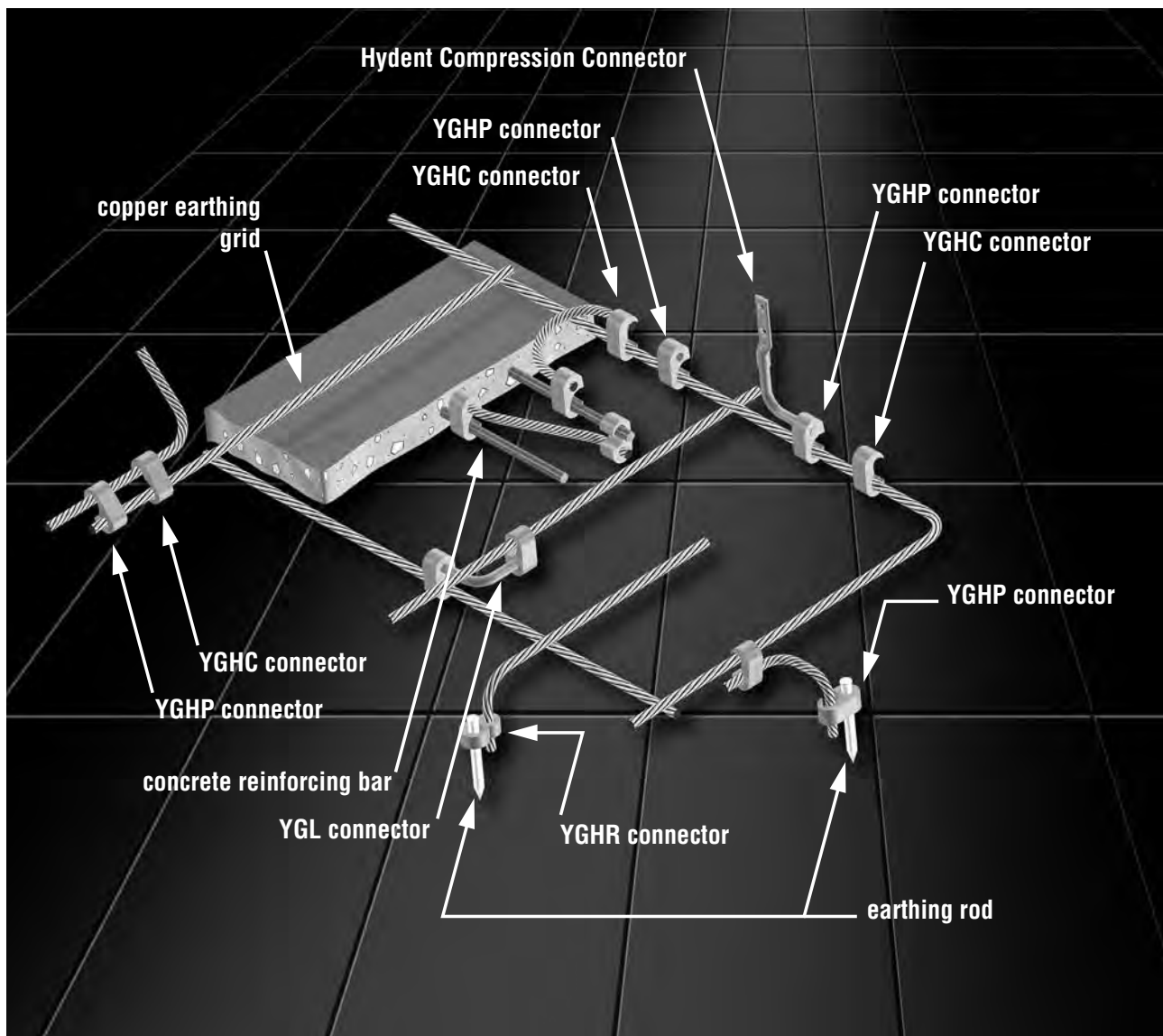
## Cable Ladder - Left Hand Reducer Cover



Ordering Code	Width W1 mm	Width W2 mm
CRHR300150	300	150
CRHR450150	450	150
CRHR450300	450	300
CRHR600150	600	150
CRHR600300	600	300
CRHR600450	600	450
CRHR900150	900	150
CRHR900300	900	300
CRHR900450	900	450
CRHR900600	900	600

- A Aluminum
- G Galvabond
- H Hot Dip Galvanised
- S Stainless Steel

#### Cable Ladder - Right Hand Reducer Cover



## Features of Hyground

Hyground connectors are manufactured from pure wrought copper extrusions.

Hyground connectors have a current carrying capacity greater than or equivalent to the conductor.

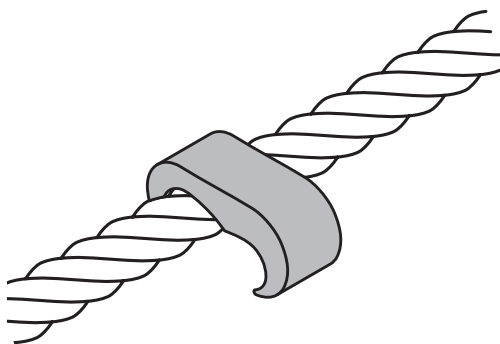
The simplicity of installation of Hyground connectors means that installation is not affected by the weather.

The crimping process produces a very clear and evident embossing of the Hyground connector. A sound crimp can be

confirmed by a quick visual inspection.

Hyground connectors are safe and simple to use. Installation requiring no special training, protective clothing, elaborate fixtures or cleaning procedures.

All Hyground connectors are clearly marked with a number, conductor size and installation die number.

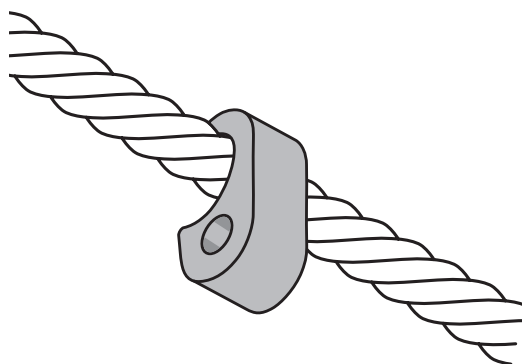


### HYGROUND YGHC

Catalogue Number	Copper Conductor Range		Installation Tooling	
	Run (mm²)	Tap (mm²)	Y35/Y750 Die	Y46 Die *
YGHC2C2	10-35	10-35	U-C	U-C
YGHC26C2	50-70	10-35	U-O	U-O
YGHC26C26	50-70	50-70	U-O	U-O
YGHC29C26	95-120	16-70	U997	U997
YGHC29C29	95-120	95-120	U997	U997
YGHC34C26	150-240	16-70	U1011	U1011 or P1011
YGHC34C29	150-240	95-120	U1011	U1011 or P1011
YGHC34C34	150-240	150-240	-	U1011 or P1011

\* P-UADP adaptor to be used in Y46 Head to accept U or PU dies.

### Hyground YGHC

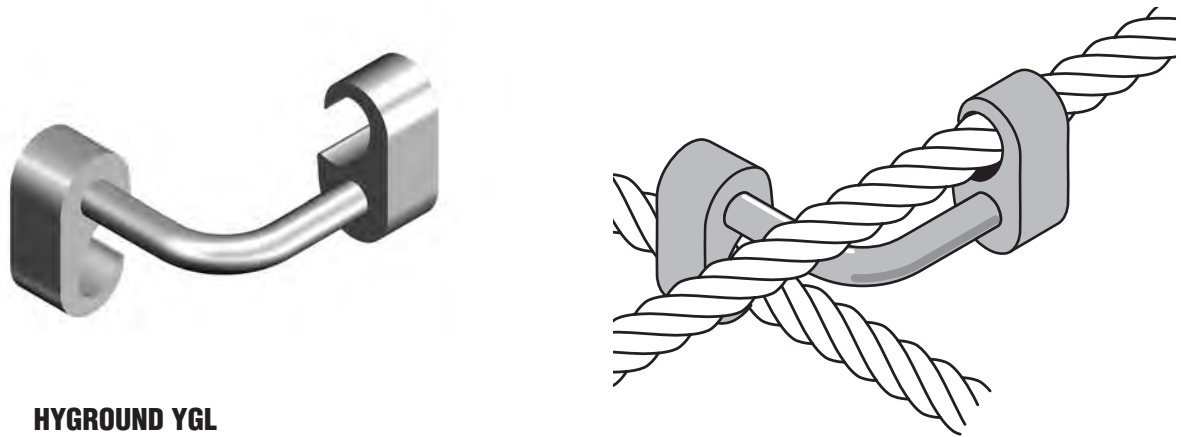


### HYGROUND YGHP

Catalogue Number	Copper Conductor Range		Installation Tooling	
	Run (mm²)	Tap (mm²)	Y35/Y750 Die	Y46 Die *
YGHP2C2	10-35	10-35	U-O	U-O
YGHP29C2	50-120 (13-15mm rod)	16-35	U997	U997
YGHP29C26	50-120 (13-15mm rod)	50-70	U997	U997
YGHP29C29	50-120 (13-15mm rod)	95-120	U997	U997
YGHP34C2	150-240 (16-19mm rod)	16-35	PU998	PU998 or P998
YGHP34C26	150-240 (16-19mm rod)	50-70	PU998	PU998 or P998
YGHP34C29	150-240 (16-19mm rod)	95-120	PU998	PU998 or P998
YGHP34C34	150-240 (16-19mm rod)	150-240	-	U1011 or P1011

\* P-UADP adaptor to be used in Y46 Head to accept U or PU dies.

### Hyground YGHP



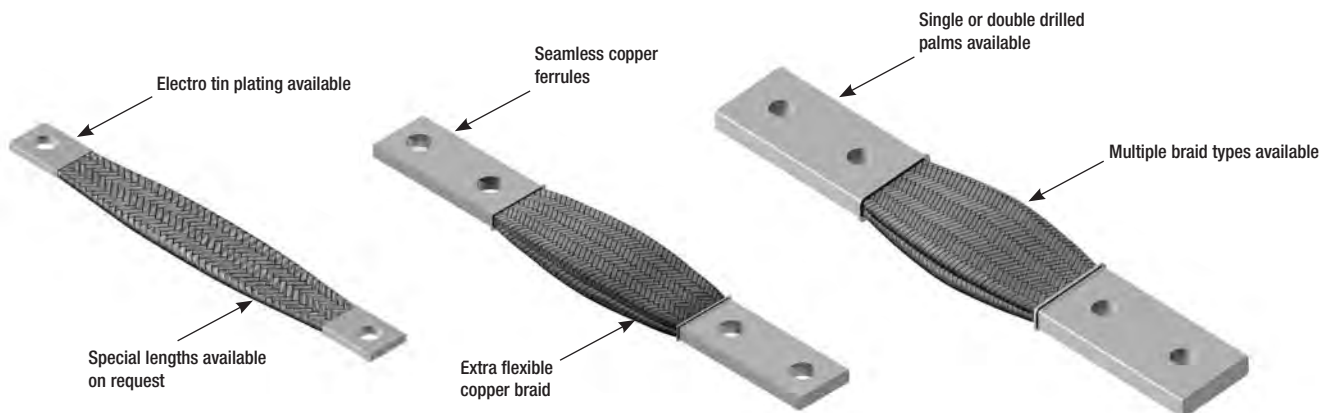
HYGROUND YGL

Catalogue Number	Copper Conductor Range		Installation Tooling			
	Run (mm²)	Tap (mm²)	Y35/Y750 Die		Y46 Die *	
			Run A	Run B	Run A	Run B
YGL2C2	10-35	10-35	U-0	U-0	U-0	U-0
YGL29C2	50-120 (13-15mm rod)	10-35	U997	U-0	U997	U-0
YGL29C29	35-120 (13-15mm rod)	35-120	U997	U997	U997	U997
YGL34C2	150-240 (16-19mm rod)	10-35	PU998	U-0	PU998 or P998	U-0
YGL34C29	150-240 (16-19mm rod)	35-120	PU998	U997	PU998 or P998	U997
YGL34C34	150-240 (16-19mm rod)	150-240	U1011	U1011	P1011	P1011

\* P-UADP adaptor to be used in Y46 Head to accept U or PU dies.

Hyground YGL





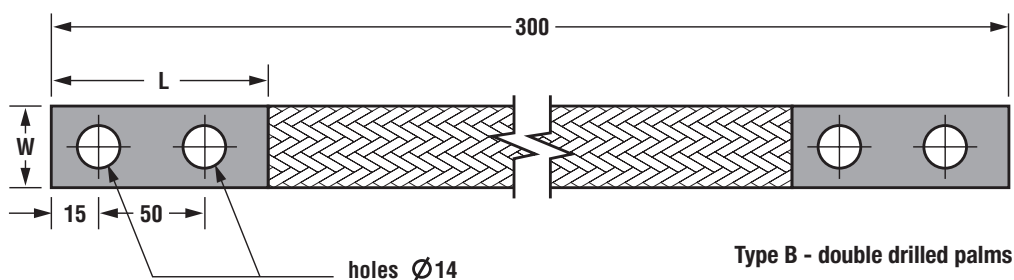
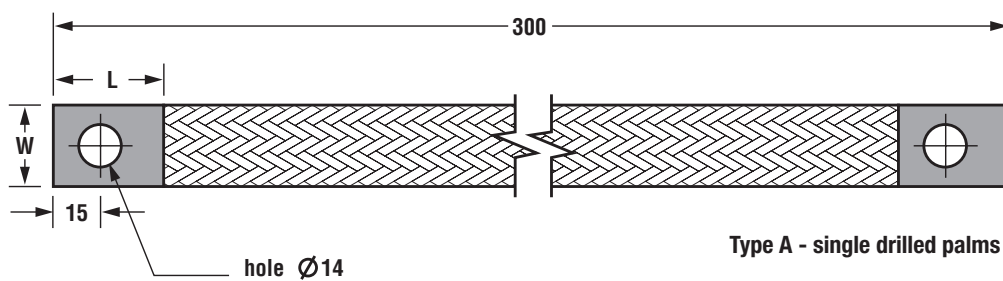
**Type D - single layer**

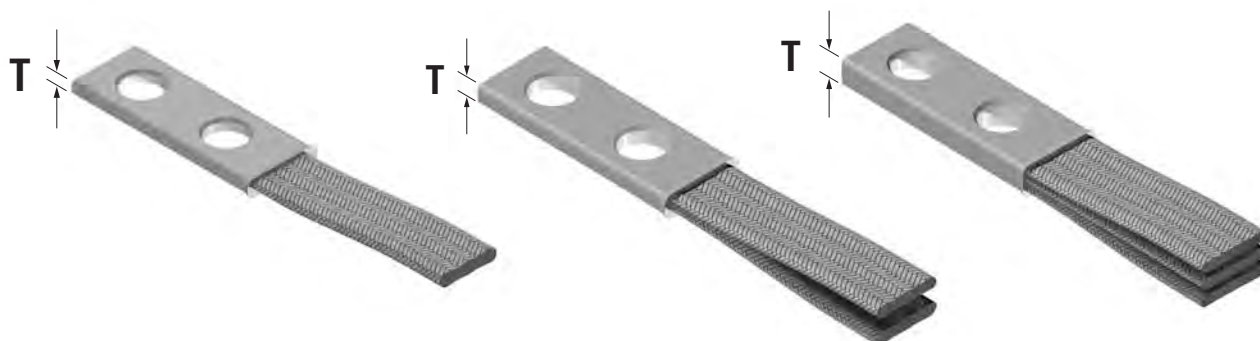


**Type E - double layer**



**Type F - triple layer**





### Flexible Copper Braids - Single Braid

Catalogue Number	Current Rating (Amperes)	Braids in Ferrule	Holes in Each Ferrule	Braid Weave	Ferrule Finish	Ferrule Dimensions (mm)		
						W	L	T
BUA19L30M12	190	1	1	D	Untinned	24	35	3
BTA19L30M12	190	1	1	D	Tinned	24	35	3
BUB19L30M12	190	1	2	D	Untinned	24	35	3
BUB19L30MU	190	1	2	D	Untinned	24	35	3
BUA19L30M12	190	1	2	D	Tinned	24	35	3
BUA34L30M12	340	1	1	E	Untinned	30	40	6
BTA34L30M12	340	1	1	E	Tinned	30	40	6
BUB34L30M12	340	1	2	E	Untinned	30	85	6
BTB34L30M12	340	1	2	E	Tinned	30	85	6

### Flexible Copper Braids - Double Braid

Catalogue Number	Current Rating (Amperes)	Braids in Ferrule	Holes in Each Ferrule	Braid Weave	Ferrule Finish	Ferrule Dimensions (mm)		
						W	L	T
BUB53L30M12	530	2	2	E	Untinned	30	85	9
BTB53L30M12	530	2	2	E	Tinned	30	85	9
BUB60L30M12	600	2	2	F	Untinned	30	85	10
BTB60L30M12	600	2	2	F	Tinned	30	85	10

### Flexible Copper Braids - Triple Braid

Catalogue Number	Current Rating (Amperes)	Braids in Ferrule	Holes in Each Ferrule	Braid Weave	Ferrule Finish	Ferrule Dimensions (mm)		
						W	L	T
BUB82L30M12	820	3	2	F	Untinned	37	85	14
BTB82L30M12	820	3	2	F	Tinned	37	85	14
BUB100L30M12	1000	3	2	F	Untinned	38	85	19
BTB100L30M12	1000	3	2	F	Tinned	38	85	19

- Standard braid length is 300 mm.
- Nominated current ratings are indoor.
- Braid material is tinned.
- Ferrule tinning is optional.

### Flexible Copper Braids

## Installation Tooling

Catalogue Number	Product Description
MD6-8 MY29-3 BM101	Hand Operated Tool. Crimp range 6 mm <sup>2</sup> to 120 mm <sup>2</sup> Indent Mechanical Tool. Crimp range 16 mm <sup>2</sup> to 120 mm <sup>2</sup> Threaded Rod Cutter. Cuts 8 mm and 10 mm
Y35 Y750 PAT750XT-18V	12 Ton Hydraulic Tool. Crimp range 16 mm <sup>2</sup> to 300 mm <sup>2</sup> 12 Ton Hydraulic Tool. Crimp range 16 mm <sup>2</sup> to 300 mm <sup>2</sup> , wide jaw Battery Actuated 12 Tool Hydraulic Tool. Crimp range 16 mm <sup>2</sup> to 300 mm <sup>2</sup>
Y35BH Y750BH Y46BH Y60BHU RHCC245CUAL EP10-1HP-2 FP10 HP10 PT29901-10 PT29901-15	12 Ton Hydraulic Remote Head. Crimp range 16 mm <sup>2</sup> to 300 mm <sup>2</sup> 12 Ton Hydraulic Remote Head. Crimp range 16 mm <sup>2</sup> to 300 mm <sup>2</sup> 15 Ton Hydraulic Remote Head. Crimp range 16 mm <sup>2</sup> to 630 mm <sup>2</sup> , copper 60 Ton Remote Hydraulic Head. Crimp range 16 mm <sup>2</sup> to 630 mm <sup>2</sup> Hydraulic Cutter, copper & aluminium 240v Electric Hydraulic Pump, 10,000 psi Foot Operated Hydraulic Pump, 10,000 psi Hand Operated Hydraulic Pump, 10,000 psi Hydraulic Hose 10,000 psi, 3 mtr Hydraulic Hose 10,000 psi, 4.5 mtr
U16 U25 U35 U50 U70 U95 U120 U150 U185 U240 U300	Hexagonal die to crimp 16 mm <sup>2</sup> copper connectors Hexagonal die to crimp 25 mm <sup>2</sup> copper connectors Hexagonal die to crimp 35 mm <sup>2</sup> copper connectors Hexagonal die to crimp 50 mm <sup>2</sup> copper connectors Hexagonal die to crimp 70 mm <sup>2</sup> copper connectors Hexagonal die to crimp 95 mm <sup>2</sup> copper connectors Hexagonal die to crimp 120 mm <sup>2</sup> copper connectors Hexagonal die to crimp 150 mm <sup>2</sup> copper connectors Hexagonal die to crimp 185 mm <sup>2</sup> copper connectors Hexagonal die to crimp 240 mm <sup>2</sup> copper connectors Hexagonal die to crimp 300 mm <sup>2</sup> copper connectors
P400 P500 P630 P-UADP	Hexagonal die to crimp 400 mm <sup>2</sup> copper connectors. Suits Y46 Hexagonal die to crimp 500 mm <sup>2</sup> copper connectors. Suits Y46 Hexagonal die to crimp 630 mm <sup>2</sup> copper connectors. Suits Y46 Adaptor allows Y46 to accept U-Dies 16-300 mm <sup>2</sup>
U-C U-O U-997 PU998 U1011	Hyground Die Hyground Die Hyground Die Hyground Die Hyground Die
UA12 UA16 UA21.5 UA27 UA35	Hex Die to crimp aluminium connectors 10-35 mm <sup>2</sup> Hex Die to crimp aluminium connectors 50-70 mm <sup>2</sup> Hex Die to crimp aluminium connectors 95-120 mm <sup>2</sup> Hex Die to crimp aluminium connectors 150-185 mm <sup>2</sup> Hex Die to crimp aluminium connectors 240-300 mm <sup>2</sup>
P8A PEN A-13 PENE-8	Aluminium Jointing Compound 225 ml Aluminium Jointing Compound 225 ml Copper Jointing Compound 225 ml

B1000	1.1	B1358	4.1	B3000 series	2.3
B1000T	1.5	B1359	4.3	B3016	2.4
B1001	1.8	B1376	4.4	B3087	4.10
B1001A	1.8	B1377	4.4	B3300	1.2
B1001B	1.8	B1386	4.6	B3300T	1.6
B1001C	1.8	B1458	4.2	B3301	1.8
B1006 to B1010	2.3	B1546	4.3	B3380	4.7
B1026	4.2	B1796	4.6	B4000 Aluminium	1.3
B1031	4.1	B1941	4.1	B4000 Steel	1.3
B1033	4.2	B1964	4.1	B4000T	1.6
B1036	4.1	B2000 Aluminium	1.2	B4001	1.8
B1037	4.2	B2000 Steel	1.1	B4006 to B4010	2.3
B1038	4.2	B2000T	1.5	B4045	4.3
B1044	4.4	B2001	1.8	B4047	4.3
B1045	4.3	B2072A	4.4	B422J	4.7
B1047	4.3	B2072S1	4.4	B5 series	4.9
B1062	4.1	B2073	4.4	B5500	1.4
B1063	4.1	B2224	4.4	B5500T	1.7
B1064	4.1	B2228	4.4	B5501	1.8
B1065	4.1	B2240	4.7	B5547H	4.5
B1066	4.1	B2324	4.1	B5580	4.7
B1067	4.1	B2346	4.4	B922J	4.7
B1068	4.2	B2377Z	4.7	BC series	4.10
B10745H	3.2	B2452	4.5	BCM series	6.1
B10758H	3.2	B2484	4.2	BCMC series	6.4
B1184	4.7	B2539	4.7	BCMCG	6.3
B1186	4.3	B2600	4.9	BCMCP	6.2
B1220B	4.8	B2675	4.10	BCMCPF	6.2
B1221T	4.8	B2676	4.10	BCMFS	6.4
B1222C	4.8	B2749	4.10	BCMHD	6.4
B1271	4.6	B2750	4.10	BCMHH	6.3
B1272	4.6	B2785	4.6	BCMSB	6.2
B1325	4.2	B2786	4.6	BCMSP	6.2
B1326	4.2	B2815	4.5	BCMT series	6.3
B1347	4.3	B2815D	4.5	BCMWB series	6.4
B1357	4.3	B2855	4.7	BIFS	8.7, 8.15, 8.23

BM101	10.6	DSN2	7.17	LTNUT	5.4, 5.7
BTA series	10.5	DSN2A	8.7	MD6-8	10.6
BTHF	8.14, 8.22	DSN3	7.25	MW series	2.2
BUA series	10.5	DSN3A	8.15	MY29-3	10.6
BUB series	10.5	DSN4	7.34	N1B series	7.3
CB series	9.7	DSN4A	8.23	N1C series	7.5
CC series	9.11	EP10-1HP-2	10.6	N1CCS	7.8
CER series	9.9	FP10	10.6	N1ER series	7.4
CFCT series	9.3	FW series	2.2	N1HDL	7.8
CFLT series	5.8	FW8N	8.6, 8.14, 8.22	N1HSH	7.7
CFN1 series	9.1	HD	7.17, 7.26, 7.34	N1IR series	7.4
CFN2 series	9.2, 9.3	HDA	8.8, 8.16, 8.24	N1L series	7.1
CIR series	9.10	HN series	2.1	N1LHR series	7.6
CL series	3.1	HN8S	8.6, 8.14, 8.22	N1RHR series	7.6
CLB series	3.1	HP10	10.6	N1RL series	7.2
CLD series	3.1	HS series	2.1	N1SBH	7.7
CLHR series	9.13	HS820S	8.6, 8.14, 8.22	N1SH	7.7
CPCT series	9.6	IF8N	8.6	N1SHH	7.9
CPLT series	5.8	LT1	5.1	N1SR series	7.5
CPN1 series	9.4	LT1RLG	5.1	N1T series	7.3
CPN2 series	9.5, 9.6	LT1RPG	5.1	N1VSH	7.7
CRHR series	9.14	LT1SG	5.1	N2B Aluminium series	8.2
CSR series	9.12	LT3	5.2	N2B Steel series	7.12
CT1503 to CT9004	9.8	LT3HD	5.3	N2C Aluminium series	8.4
CT75 to CT600	5.15	LT3RL	5.3	N2C Steel series	7.14
CTB series	5.15	LT3RP	5.4	N2CCAS	8.7
CTT series	5.15	LT3S	5.3	N2CCS	7.17
DB series	2.4	LT3TXH	5.4	N2ER Aluminium series	8.3
DCB series	5.14	LT5	5.5	N2ER Steel series	7.13
DCL series	5.13	LT5HD	5.6	N2HS	7.16
DCT series	5.14	LT5RL	5.6	N2HSA	8.6
DI series	2.4	LT5RP	5.7	N2IR Aluminium series	8.3
DSL series	5.13	LT5S	5.6	N2IR Steel series	7.13
DSL3	5.4	LT5TX	5.6	N2L Aluminium series	8.1
DSL5	5.7	LTBOLT	5.4, 5.7	N2L Steel series	7.10, 7.11
DSN1	7.8	LTCHD	5.3	N2LHR Aluminium series	8.5

N2LHR Steel series	7.15	N3VSA	8.14	P-UADP	10.6
N2RHR Aluminium series	8.5	N4B Aluminium series	8.18	RC series	2.3
N2RHR Steel series	7.15	N4B Steel series	7.29	RHCC245CUAL	10.6
N2S	7.16	N4C Aluminium series	8.20	SA series	1.9
N2SA	8.6	N4C Steel series	7.31	SB	7.16, 7.25
N2SR Aluminium series	8.4	N4CCAS	8.23	SBH	7.33
N2SR Steel series	7.14	N4CCS	7.34	SH10Z	2.4
N2T Aluminium series	8.2	N4ER Aluminium series	8.19	SN	7.16, 7.25
N2T Steel series	7.12	N4ER Steel series	7.30	SNH	7.33
N2VS	7.16	N4HS	7.33	SW series	2.2
N2VSA	8.6	N4HSA	8.22	TR series	2.2
N3B Aluminium series	8.10	N4IR Aluminium series	8.19	U1011	10.6
N3B Steel series	7.20	N4IR Steel series	7.30	U16 to U300	10.6
N3C Aluminium series	8.12	N4L Aluminium series	8.17	U-997	10.6
N3C Steel series	7.22	N4L Steel series	7.27, 7.28	UA12 TO UA35	10.6
N3CCAS	8.15	N4LHR Aluminium series	8.21	U-C	10.6
N3CCS	7.25	N4LHR Steel series	7.32	U-0	10.6
N3ER Aluminium series	8.11	N4RHR Aluminium series	8.21	VH10 series	2.4
N3ER Steel series	7.21	N4RHR Steel series	7.32	WN10Z	2.4
N3HS	7.24	N4S	7.33	Y35	10.6
N3HSA	8.14	N4SA	8.22	Y35BH	10.6
N3IR Aluminium series	8.11	N4SR Aluminium series	8.20	Y46BH	10.6
N3IR Steel series	7.21	N4SR Steel series	7.31	Y60BHU	10.6
N3L Aluminium series	8.9	N4T Aluminium series	8.18	Y750	10.6
N3L Steel series	7.18, 7.19	N4T Steel series	7.29	Y750BH	10.6
N3LHR Aluminium series	8.13	N4VS	7.33	YGHC series	10.2
N3LHR Steel series	7.23	N4VSA	8.22	YGHP	10.2
N3RHR Aluminium series	8.13	P400 to P630	10.6	YGL	10.3
N3RHR Steel series	7.23	P8A	10.6		
N3S	7.24	PAT750XT-18V	10.6		
N3SA	8.14	PC10Z	4.10		
N3SR Aluminium series	8.12	PEN A-13	10.6		
N3SR Steel series	7.22	PENE A-8	10.6		
N3T Aluminium series	8.10	PS series	2.1		
N3T Steel series	7.20	PT29901 series	10.6		
N3VS	7.24	PU998	10.6		

## Queensland

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March 2011

## SECTION 6 CABLING

### 6.1 GENERAL DESCRIPTION

All new cabling was supplied as per specification. Cabling was low amperage and or control.

#### The Cabling was Supplied By:

<b>Name:</b>	Haymans Electrical Wholesalers
<b>Address:</b>	Chester Street, Fortitude Valley
<b>Phone:</b>	0733700333
<b>Facsimile:</b>	0733700355

### 6.2 MANUFACTURER'S PARTS LIST

Description	Size	Cores	Location
Orange Circular	1.5mm <sup>2</sup>	2+earth	Emergency Stops
Orange Circular	1.5mm <sup>2</sup>	3+earth	Drive Motors
Control	1.5mm <sup>2</sup>	6+earth	Controllers
Control	1.5mm <sup>2</sup>	8+earth	Draw Off Actuators
Control	1.5mm <sup>2</sup>	24+earth	Cable Reeler

### 6.3 CABLING BROCHURES

Please refer to attached brochures for illustrations and descriptions on the various outlets and accessories used.






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<b>APPLICATION</b>  For mains, submains and subcircuits unenclosed, enclosed in conduit, buried direct or in underground ducts for buildings and industrial plants where not subject to mechanical damage.  Suitable for glanding.	<table> <tr> <td><b>STANDARD VOLTAGE</b></td><td>AS/NZS 5000.1: 2005 600/1000V</td></tr> <tr> <td><b>CONDUCTOR INSULATION</b></td><td>Copper 1.5 – 150mm<sup>2</sup> PVC, V-90 Red, White, Blue &amp; Green/Yellow</td></tr> <tr> <td><b>SHEATH</b></td><td>PVC, 5V-90 Orange</td></tr> <tr> <td><b>MAX. OPERATING TEMP.</b></td><td>90 °C</td></tr> </table>	<b>STANDARD VOLTAGE</b>	AS/NZS 5000.1: 2005 600/1000V	<b>CONDUCTOR INSULATION</b>	Copper 1.5 – 150mm <sup>2</sup> PVC, V-90 Red, White, Blue & Green/Yellow	<b>SHEATH</b>	PVC, 5V-90 Orange	<b>MAX. OPERATING TEMP.</b>	90 °C
<b>STANDARD VOLTAGE</b>	AS/NZS 5000.1: 2005 600/1000V								
<b>CONDUCTOR INSULATION</b>	Copper 1.5 – 150mm <sup>2</sup> PVC, V-90 Red, White, Blue & Green/Yellow								
<b>SHEATH</b>	PVC, 5V-90 Orange								
<b>MAX. OPERATING TEMP.</b>	90 °C								

Item Number	Conductor		Overall Diameter		Approx. Mass kg/km	Minimum Installed Bending Radius mm	Standard Packing		
	mm <sup>2</sup>	(No./mm)	Minimum mm	Maximum mm			100m	200m	500m
18206131	1.5	7/0.50	10.9	11.6	180	70	✓	✓	✓
18550131	2.5	7/0.67	12.1	12.9	240	75	✓	✓	✓
18918131	4	7/0.85	13.8	14.6	330	90	✓	✓	✓
19038131	6	7/1.04	15.0	15.8	375	95	✓	✓	✓
19127131	10	7/1.35	17.1	17.9	540	105	✓	✓	✓
19220131	16	7/1.70	19.3	20.3	770	120	✓	✓	✓
19277131	25	7/2.14	22.9	24.0	1095	145			✓
61820131	35*	7 strands	24.4	25.5	1425	155			✓
62405131	50*	19 strands	27.8	29.0	1900	175			✓
62710131	70*	19 strands	32.2	33.5	2675	200			✓
62800131	95*	19 strands	36.4	37.8	3575	225			✓
62830131	120*	19 strands	39.9	41.3	4435	250			✓
62836131	150*	19 strands	44.3	45.8	5490	275			✓
62837131	185*	37 strands	49.4	51.1	6935	305			✓
62882131	240*	37 strands	56.3	58.1	9185	350			✓

\*Conductors are circular compacted

CONDUCTOR Nominal Area	CURRENT RATING (a)			ELECTRICAL CHARACTERISTICS			
	Unenclosed In Air 	Non-metallic wiring enclosure in air 	Buried In Ducts 	Maximum DC Resistance @20°C	Maximum AC Resistance @90°C	Equivalent Star Reactance	3 Phase Voltage Drop @90°C
mm <sup>2</sup>	A	A	A	Ω/km	Ω/km	Ω/km	mV/Am (b)
1.5	15	13	19	13.6	17.3	0.111	30.0
2.5	22	18	26	7.41	9.45	0.102	16.4
4	29	24	34	4.61	5.88	0.102	10.2
6	37	31	43	3.08	3.93	0.097	6.80
10	51	42	57	1.83	2.33	0.091	4.05
16	68	56	74	1.15	1.47	0.086	2.55
25	91	79	96	0.73	0.927	0.085	1.61
35	110	92	115	0.52	0.669	0.083	1.17
50	135	110	140	0.39	0.494	0.080	0.87
70	170	140	175	0.27	0.343	0.077	0.61
95	215	165	210	0.20	0.248	0.077	0.45
120	245	195	240	0.15	0.197	0.074	0.37
150	280	225	270	0.12	0.160	0.074	0.31
185	325	260	310	0.10	0.129	0.074	0.26
240	385	305	370	0.08	0.100	0.074	0.22

(a) Based on 40°C ambient air temperature and where applicable, burial depth of 0.5m, soil temperature of 25°C and soil resistivity of 1.2°C.m/W.

(b) For single phase voltage drop, multiply by 1.155.

The above information is from the following sources:

AS/NZS 3008.1.1:1998 (tables 12, 30, 35, 42)

AS/NZS 1125:2001 (table 2.3)

For installation with thermal insulation refer to AS/NZS 3008 for de-rating factors.

Do not put in direct contact with polystyrene, polyurethane or similar thermal insulation materials.

ACTIVE / CONDUCTOR			EARTH CONDUCTOR		
Nominal Area	Nominal Diameter	Minimum Insulation Thickness	Nominal Area	Number & Diameter of Wires	Minimum Insulation Thickness
mm <sup>2</sup>	mm	mm	mm <sup>2</sup>	No/mm	mm
1.5	1.5	0.8	1.5	7/0.50	0.6
2.5	2.0	0.8	2.5	7/0.67	0.7
4	2.5	1.0	2.5	7/0.67	0.7
6	3.1	1.0	2.5	7/0.67	0.7
10	3.9	1.0	4.0	7/0.85	1.0
16	4.9	1.0	6.0	7/1.04	1.0
25	6.4	1.2	6.0	7/1.04	1.0
35	7.0	1.2	10	7/1.35	1.0
50	8.1	1.4	16	7/1.70	1.0
70	9.8	1.4	25	7/2.14	1.2
95	11.4	1.6	25	7/2.14	1.2
120	12.9	1.6	35	7 strands	1.2
150	14.3	1.8	50	19 strands	1.4
185	16.0	2.0	70	19 strands	1.4
240	18.4	2.2	95	19 strands	1.6

#### 4.1.3.3.1.1.5

 **General Cable**  
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<b>APPLICATION</b>  For mains, submains and subcircuits unenclosed, enclosed in conduit, buried direct or in underground ducts for buildings and industrial plants where not subject to mechanical damage.  Suitable for glanding.	<table> <tr> <td><b>STANDARD VOLTAGE</b></td><td>AS/NZS 5000.1: 2005 600/1000V</td></tr> <tr> <td><b>CONDUCTOR INSULATION</b></td><td>Copper 1.5 - 95mm<sup>2</sup> PVC, V-90 Red, Black, &amp; Green/Yellow</td></tr> <tr> <td><b>SHEATH</b></td><td>PVC, 5V-90 Orange</td></tr> <tr> <td><b>MAX. OPERATING TEMP.</b></td><td>90 °C</td></tr> </table>	<b>STANDARD VOLTAGE</b>	AS/NZS 5000.1: 2005 600/1000V	<b>CONDUCTOR INSULATION</b>	Copper 1.5 - 95mm <sup>2</sup> PVC, V-90 Red, Black, & Green/Yellow	<b>SHEATH</b>	PVC, 5V-90 Orange	<b>MAX. OPERATING TEMP.</b>	90 °C
<b>STANDARD VOLTAGE</b>	AS/NZS 5000.1: 2005 600/1000V								
<b>CONDUCTOR INSULATION</b>	Copper 1.5 - 95mm <sup>2</sup> PVC, V-90 Red, Black, & Green/Yellow								
<b>SHEATH</b>	PVC, 5V-90 Orange								
<b>MAX. OPERATING TEMP.</b>	90 °C								

Item Number	Conductor		Overall Diameter		Approx. Mass kg/km	Minimum Installed Bending Radius mm	Standard Packing		
	mm <sup>2</sup>	(No./mm)	Minimum mm	Maximum mm			100m	250m	500m
18203131	1.5	7/0.50	10.0	10.7	150	65	✓	✓	✓
18454131	2.5	7/0.67	11.2	11.8	200	70	✓	✓	✓
18913131	4	7/0.85	12.7	13.4	240	80	✓	✓	✓
19033131	6	7/1.04	13.8	14.5	300	85	✓	✓	✓
19120131	10	7/1.35	15.5	16.3	420	100	✓	✓	✓
19213131	16	7/1.70	17.5	18.4	580	110	✓	✓	✓
19273131	25	7/2.14	21.1	22.1	810	135			✓
19320131	35*	19 strands	22.3	23.3	1060	140			✓
19370131	50*	19 strands	25.3	26.4	1410	160			✓
19420131	70*	19 strands	28.8	29.9	1960	180			✓
19470131	95*	19 strands	32.9	34.1	2560	205			✓

\* Conductors are circular compacted.

CONDUCTOR Nominal Area	CURRENT RATING (a)			ELECTRICAL CHARACTERISTICS			
	Unenclosed In Air	Non-metallic wiring enclosure in air	Buried In Ducts	Maximum DC Resistance @20°C	Maximum AC Resistance @90°C	Equivalent Star Reactance	Single Phase Voltage Drop @90°C
mm <sup>2</sup>	A	A	A	Ω/km	Ω/km	Ω/km	mV/Am
1.5	18	14	22	13.6	17.3	0.111	34.7
2.5	26	20	31	7.41	9.45	0.102	18.9
4	34	26	40	4.61	5.88	0.102	11.8
6	44	34	51	3.08	3.93	0.0967	7.9
10	60	47	68	1.83	2.33	0.0906	4.7
16	80	63	88	1.15	1.47	0.0861	2.9
25	105	88	115	0.73	0.927	0.0853	1.9
35	130	105	140	0.52	0.669	0.0826	1.4
50	160	125	165	0.39	0.494	0.0797	1.0
70	200	155	205	0.27	0.343	0.0770	0.7
95	250	190	250	0.19	0.248	0.0766	0.5

(a) Based on 40°C ambient air temperature and where applicable, burial depth of 0.5m, soil temperature of 25°C and soil resistivity of 1.2°C.m/W.

The above information is from the following sources:

AS/NZS 3008.1.1:1998 (tables 9, 30, 35, 42)

AS/NZS 1125:2001 (table 2.3)

For installation with thermal insulation refer to AS/NZS 3008 for de-rating factors.

Do not put in direct contact with polystyrene, polyurethane or similar thermal insulation materials.

ACTIVE / CONDUCTOR			EARTH CONDUCTOR		
Nominal Area	Nominal Diameter	Minimum Insulation Thickness	Nominal Area	Number & Diameter of Wires	Minimum Insulation Thickness
mm <sup>2</sup>	mm	mm	mm <sup>2</sup>	No/mm	mm
1.5	1.5	0.8	1.5	7/0.50	0.6
2.5	2.0	0.8	2.5	7/0.67	0.7
4	2.5	1.0	2.5	7/0.67	0.7
6	3.1	1.0	2.5	7/0.67	0.7
10	3.9	1.0	4	7/0.85	1.0
16	4.9	1.0	6	7/1.04	1.0
25	6.4	1.2	6	7/1.04	1.0
35	7.0	1.2	10	7/1.35	1.0
50	8.1	1.4	16	7/1.70	1.0
70	9.8	1.4	25	7/2.14	1.2
95	11.4	1.6	25	7/2.14	1.2

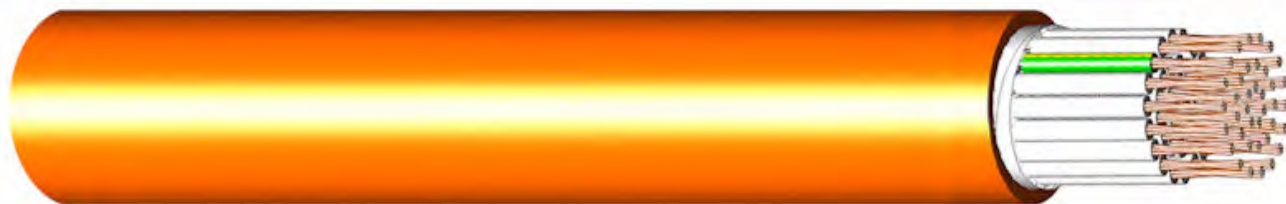
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**CIRCULAR PVC**  
**2-50C + E**  
**1.5mm<sup>2</sup>**



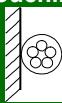


<b>APPLICATION</b>  For control circuits unenclosed, enclosed in conduit, buried direct or in underground ducts for commercial, industrial, mining and electricity authority systems where not subject to mechanical damage.  Suitable for glanding.	<table> <tr> <td><b>STANDARD VOLTAGE</b></td><td>AS/NZS 5000.1 600/1000V</td></tr> <tr> <td><b>CONDUCTOR INSULATION</b></td><td>Copper 1.5mm<sup>2</sup> PVC, V-90 White (with markings) &amp; Green/Yellow</td></tr> <tr> <td><b>SHEATH</b></td><td>PVC, 5V-90 Orange, Black</td></tr> <tr> <td><b>MAX. CONTINUOUS OPERATING TEMP.</b></td><td>75 °C</td></tr> </table>	<b>STANDARD VOLTAGE</b>	AS/NZS 5000.1 600/1000V	<b>CONDUCTOR INSULATION</b>	Copper 1.5mm <sup>2</sup> PVC, V-90 White (with markings) & Green/Yellow	<b>SHEATH</b>	PVC, 5V-90 Orange, Black	<b>MAX. CONTINUOUS OPERATING TEMP.</b>	75 °C
<b>STANDARD VOLTAGE</b>	AS/NZS 5000.1 600/1000V								
<b>CONDUCTOR INSULATION</b>	Copper 1.5mm <sup>2</sup> PVC, V-90 White (with markings) & Green/Yellow								
<b>SHEATH</b>	PVC, 5V-90 Orange, Black								
<b>MAX. CONTINUOUS OPERATING TEMP.</b>	75 °C								

Item Number	Conductor			Overall Diameter		Approx. Mass kg/km	Minimum Installed Bending Radius mm	Standard Packing	
	Number of Cores	mm <sup>2</sup>	(No./mm)	Min mm	Max mm			500m	1000m
15037***	2C + E	1.5	7/0.50	10.3	11.0	130	70	✓	✓
15038***	3C + E	1.5	7/0.50	11.1	11.8	155	75	✓	✓
15039***	4C + E	1.5	7/0.50	12.0	12.8	185	80	✓	✓
15071***	5C + E	1.5	7/0.50	13.0	13.8	210	85	✓	✓
15072***	6C + E	1.5	7/0.50	13.0	13.8	230	85	✓	✓
15074***	7C + E	1.5	7/0.50	13.9	14.8	260	90	✓	✓
15076***	8C + E	1.5	7/0.50	14.9	15.8	285	95	✓	✓
15077***	9C + E	1.5	7/0.50	16.1	17.1	320	105	✓	✓
15073***	10C + E	1.5	7/0.50	16.1	17.1	340	105	✓	✓
15075***	12C + E	1.5	7/0.50	17.3	18.4	390	110	✓	✓
15078***	15C + E	1.5	7/0.50	18.2	19.3	460	120	✓	✓
15084***	20C + E	1.5	7/0.50	20.1	21.3	580	130	✓	✓
15079***	25C + E	1.5	7/0.50	22.7	24.1	700	145	✓	✓
15081***	30C + E	1.5	7/0.50	24.4	25.9	820	155	✓	✓
15082***	40C + E	1.5	7/0.50	27.3	28.8	1050	175	✓	✓
15083***	50C + E	1.5	7/0.50	30.0	31.7	1290	190	✓	✓

**Replace part number suffix "\*\*\*\*" with:**

016 = Black

131 = Orange

CONDUCTOR	CURRENT RATING (a)			ELECTRICAL CHARACTERISTICS			
Number of Cores	Unenclosed Touching	Non-metallic wiring enclosure in air	Buried In Duct	Maximum DC Resistance @20°C	Maximum AC Resistance @75°C	Equivalent Star Reactance	Single Phase Voltage Drop @75°C
				Ω/km	Ω/km	Ω/km	mV/A.m
2C + E	18	14	22	13.6	16.5	0.111	33.0
3 - 50C + E	15	13	19	13.6	16.5	0.111	33.0

(a) Based on 40°C ambient air temperature and where applicable, burial depth of 0.5m, soil temperature of 25°C and soil resistivity of 1.2°C.m/W. Based on 2 to 4 cores fully loaded with the remainder of the cores <35% loaded.

The above information is from the following sources:

AS/NZS 3008.1.1:1998 (tables 12, 30, 35, 42)  
AS/NZS 1125:2001 (table 2.3)

For current ratings using other installation conditions refer to AS/NZS 3008.1.1.

Do not install in direct contact with polystyrene or polyurethane insulation materials.

ACTIVE / CONDUCTOR				EARTH		
Number of Cores	Number & Diameter of Wires	Nominal Diameter	Minimum Insulation Thickness	Nominal Area.	Number & Diameter of Wires	Minimum Insulation Thickness
	No/mm	mm	mm	mm <sup>2</sup>	No/mm	mm
2 - 50C + E	7/0.50	1.5	0.8	1.5	7/0.50	0.6

#### 4.1.7.1.4.1.1.7

 **General Cable**  
General Cable Australia Pty Ltd  
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Fax: 1300 363 382  
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## SECTION 7 TESTING & COMMISSIONING

This section is a review of all testing carried out onsite on completion of works and during the commissioning process.

Energy Correction Options Pty Ltd



## Grounding System Test Certificate

**Site:** Luggage Point WTP – Settling Tank Earthing & Equipotential Bonding

**Customer:** Heyday Group

**Address:** Main Beach Road, Myrtle town, Qld, 4008

**Test Date:** 10/02/12

**Configuration:** 70mm<sup>2</sup> G/Y bonded from Main Earth to structure, bonding with 25x3mm stainless strap.

**Purpose of Grounding System:** Earthing System and Equipotential Bonding

**Test Meter:** AEMC 6470

**Readings:** 3.04 Ohms (Fall of Potential – Earth Resistance Test)  
<0.5 Ohms for all metal components throughout structure

**Soil Conditions:** Average, Rain in recent days

**Comments:** The visual inspection, test results and installed Earthing System, are in accordance with the Australian Standard AS/NZS 3000:2007 Wiring Rules

**Testing Officer:** Trent Brumwell

**Signed:**

Grounding System Test Certificate – Luggage Point WTP Settling Tank

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>2 Of 45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C. T. Algate</u>	Signature: <u>[Signature]</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 145-02.

[illegible]

NCR No:

<u>FINAL ACCEPTANCE:</u>	<i>NAME</i>	<i>SIGNATURE</i>	<i>POSITION</i>	<i>APPROVED (YES/NO)</i>	<i>DATE</i>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

PROJ3010 - ITC - (8) Point to Point

Revision No. 4, 18/01/2012

BVQI CERTIFIED NO. 109186 TO ISO 9001

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client:	EPW	Project Name:	Luggage Point Settling Tanks 1&2	Job No:	QEM14755	Sheet:	3 Of 45
Contract Manager:	Terry Fisher	Project Manager:	Terry Fisher	Site Supervisor:	David Campbell	Date:	
Check Authorised By:		Signature:		Check Delegated To:	C.T. Algate	Signature:	C.T. Algate

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 145-03.

[illegible]

COMMENTS:

NCR No:

<u>FINAL ACCEPTANCE:</u>	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 145-04.

COMMENTS: \_\_\_\_\_

\_\_\_\_\_

NCR No: \_\_\_\_\_

<u>FINAL ACCEPTANCE:</u>	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (If APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 1LS-05.

COMMENTS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

NCR No: \_\_\_\_\_

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 1LS-07

COMMENTS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

NCR No: \_\_\_\_\_

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.



## Heyday Group

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>7</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>CTA Gate</u>	Signature: <u>CTA</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 1LS-08.

[illegible]

COMMENTS:

NCR No:

<b><u>FINAL ACCEPTANCE:</u></b>	<b><u>NAME</u></b>	<b><u>SIGNATURE</u></b>	<b><u>POSITION</u></b>	<b><u>APPROVED (YES/NO)</u></b>	<b><u>DATE</u></b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (If APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>8</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>C.T.</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 145-09.

[illegible]

NCR No:

<u>FINAL ACCEPTANCE:</u>	<i>NAME</i>	<i>SIGNATURE</i>	<i>POSITION</i>	<i>APPROVED (YES/NO)</i>	<i>DATE</i>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>9 Of 45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C2A</u>	Signature: <u>C.T. Algate</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 145-10.

[illegible]

NCR No:

<u>FINAL ACCEPTANCE:</u>	<i>NAME</i>	<i>SIGNATURE</i>	<i>POSITION</i>	<i>APPROVED (YES/NO)</i>	<i>DATE</i>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

PROJ3010 - ITC - (8) Point to Point

BVQI CERTIFIED NO. 109186 TO ISO 9001



## Heyday Group

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>10 Of 46</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>C.T. Algate</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 144-11

[illegible]

COMMENTS:

NCR No:

<u>FINAL ACCEPTANCE:</u>	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.



## Heyday Group

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
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Client:	<u>EPW</u>	Project Name:	<u>Luggage Point Settling Tanks 1&amp;2</u>	Job No:	<u>QEM14755</u>	Sheet:	<u>11 Of 45</u>
Contract Manager:	<u>Terry Fisher</u>	Project Manager:	<u>Terry Fisher</u>	Site Supervisor:	<u>David Campbell</u>	Date:	
Check Authorised By:		Signature:		Check Delegated To:	<u>C.T. Alogoskoufis</u>	Signature:	<u>C.T. Alogoskoufis</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 1M-12

[illegible]

COMMENTS:

NCR No:

<u>FINAL ACCEPTANCE:</u>	<i>NAME</i>	<i>SIGNATURE</i>	<i>POSITION</i>	<i>APPROVED (YES/NO)</i>	<i>DATE</i>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 1M-13.

COMMENTS:

NCR No:

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 1M-14

COMMENTS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

NCR No: \_\_\_\_\_

<u>FINAL ACCEPTANCE:</u>	<i>NAME</i>	<i>SIGNATURE</i>	<i>POSITION</i>	<i>APPROVED (YES/NO)</i>	<i>DATE</i>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
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Heyday Communications  
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INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 1M-15

COMMENTS: \_\_\_\_\_

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
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Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>15 Of 45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C. T. Higate</u>	Signature: <u>[Signature]</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 19.

[illegible]

COMMENTS:

NCR No:

<u>FINAL ACCEPTANCE:</u>	<i>NAME</i>	<i>SIGNATURE</i>	<i>POSITION</i>	<i>APPROVED (YES/NO)</i>	<i>DATE</i>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.



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**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
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Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>16</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. A/gate</u>	Signature: <u>[Signature]</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 20.

[illegible]

COMMENTS:

NCR No:

<u>FINAL ACCEPTANCE:</u>	<i>NAME</i>	<i>SIGNATURE</i>	<i>POSITION</i>	<i>APPROVED (YES/NO)</i>	<i>DATE</i>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.



Heyday Group

# Inspection & Test Checklist ITC : 8 Management (QA) System ISO9001

Heyday Group Pty Ltd  
ABN 82 121 276 168

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ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>17 Of 45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date: _____
Check Authorised By: _____	Signature: _____	Check Delegated To: <u>C.T. Algate.</u>	Signature: <u>[Signature]</u>

## INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 4631**

CORE #	RESISTANCE		INSULATION RESISTANCE		CORRECT LABELLING		CORRECT TERMINATION		FINAL CHECK AND NO DAMAGE	
	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	COMMENT
1	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
2	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
3	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
4	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
5	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
6	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
7	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
8	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
9	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
10	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
11	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
13	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
14	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
15	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
16	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK
17	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	20-1-12	CTA	OK

COMMENTS: \_\_\_\_\_

NCR No: \_\_\_\_\_

FINAL ACCEPTANCE:	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.



## Heyday Group

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>18 Of 45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>CTA/gate</u>	Signature: <u>C2X</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 4631

[illegible]

COMMENTS:

NCR No:

<u>FINAL ACCEPTANCE:</u>	<u>NAME</u>	<u>SIGNATURE</u>	<u>POSITION</u>	<u>APPROVED (YES/NO)</u>	<u>DATE</u>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 1200.**

COMMENTS:

NCR No:

<b><u>FINAL ACCEPTANCE:</u></b>	<b><i>NAME</i></b>	<b><i>SIGNATURE</i></b>	<b><i>POSITION</i></b>	<b><i>APPROVED (YES/NO)</i></b>	<b><i>DATE</i></b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 11

COMMENTS:

NCR No:

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** /

COMMENTS:

NCR No:

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 5**

COMMENTS:

<u>FINAL ACCEPTANCE:</u>	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
ACCEPTANCE CRITERIA					

Page 369 of 394

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 7**

COMMENTS:

NCR No:

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 14**

COMMENTS:

NCR No:

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 12.**

COMMENTS:

<b>FINAL ACCEPTANCE:</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>POSITION</b>	<b>APPROVED (YES/NO)</b>	<b>DATE</b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
<b>ACCEPTANCE CRITERIA:</b>					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>26</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>E. T. Algate</u>	Signature: <u>C286</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 23.**

[illegible]

COMMENTS:

NCR No:

<u>FINAL ACCEPTANCE:</u>	<u>NAME</u>	<u>SIGNATURE</u>	<u>POSITION</u>	<u>APPROVED (YES/NO)</u>	<u>DATE</u>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>27</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>[Signature]</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 25.**

[illegible]

COMMENTS:

NCR No:

<b>FINAL ACCEPTANCE:</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>POSITION</b>	<b>APPROVED (YES/NO)</b>	<b>DATE</b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (If APPLICABLE)					
ACCEPTANCE CRITERIA: AS PER ITR - (1) AS 2000:2000 WIRING RULES (2) COMMUNICATIONS					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>28 Of 45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>C.T. Algate</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 24**

[illegible]

COMMENTS:

NCR No:

<b>FINAL ACCEPTANCE:</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>POSITION</b>	<b>APPROVED (YES/NO)</b>	<b>DATE</b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 29.**

COMMENTS:

FINAL ACCEPTANCE:					
HEYDAY GROUP	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES, (2) SPECIFICATION, (3) APPROVAL					

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>30</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>C.T. Algate</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 10**

[illegible]

COMMENTS:

NCR No:

<b>FINAL ACCEPTANCE:</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>POSITION</b>	<b>APPROVED (YES/NO)</b>	<b>DATE</b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
ACCEPTANCE CRITERIA: AS PER ITR - (1) AS 2000, 2002, WIDING RAIL, etc.					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>31</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C. T. Algate</u>	Signature: <u>C. T. Algate</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 13**

[illegible]

COMMENTS:

NCR No:

FINAL ACCEPTANCE:					ROR No.	
HEYDAY GROUP	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE	
CLIENT (REPRESENTATIVE)						
AUTHORITY (IF APPLICABLE)						
ACCEPTANCE CRITERIA: AS PER ITR = (1) AS 2000:2000 WIDING RULES (2) AS 2000:2000 WIDING RULES						

PRN 13010 - ITC - (R) Point to Point

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>32</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>C.T. Algate</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 8

[illegible]

COMMENTS:

NCR No:

<b>FINAL ACCEPTANCE:</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>POSITION</b>	<b>APPROVED (YES/NO)</b>	<b>DATE</b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
<b>ACCEPTANCE CRITERIA:</b> AS PER ITR - (1) AS 2000-2000 WINDING RULES, IS 9000					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>33</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>C.T. Algate</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 6**

[illegible]

COMMENTS:

NCR No:

<b>FINAL ACCEPTANCE:</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>POSITION</b>	<b>APPROVED (YES/NO)</b>	<b>DATE</b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
<b>ACCEPTANCE CRITERIA:</b> AS PER ITS OWN POLICY					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>34</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C. T. Algate</u>	Signature: <u>C. T. Algate</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 15**[illegible]

COMMENTS:

NCR No:

<b><u>FINAL ACCEPTANCE:</u></b>	<b><i>NAME</i></b>	<b><i>SIGNATURE</i></b>	<b><i>POSITION</i></b>	<b><i>APPROVED (YES/NO)</i></b>	<b><i>DATE</i></b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
ACCEPTANCE CRITERIA					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>35</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. A/gate</u>	Signature: <u>[Signature]</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 16.**

[illegible]

COMMENTS:

NCR No:

<u>FINAL ACCEPTANCE:</u>	<i>NAME</i>	<i>SIGNATURE</i>	<i>POSITION</i>	<i>APPROVED (YES/NO)</i>	<i>DATE</i>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (If APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.



Heyday Group

# Inspection & Test Checklist ITC : 8 Management (QA) System ISO9001

Heyday Group Pty Ltd  
ABN 82 121 276 168

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>36</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>CTA/gate</u>	Signature: <u>ed</u>

## INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 27**

CORE #	RESISTANCE		INSULATION RESISTANCE		CORRECT LABELLING		CORRECT TERMINATION		FINAL CHECK AND NO DAMAGE	
	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	COMMENT
1	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
2	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
3	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
4	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
5	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
6	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
7	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
8	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
9	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
10	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
11	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
13	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
14	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
15	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
16	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
17	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
18	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
19	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
20	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
21	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
22	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
23	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
24	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
25	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
26	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
27	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
28	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
29	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
30	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
31	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
32	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
33	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
34	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
35	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
36	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
37	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
38	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
39	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
40	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
41	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
42	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
43	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
44	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
45	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
46	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
47	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
48	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
49	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK
50	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	21.1.12	CA	OK

COMMENTS:

NCR No:

FINAL ACCEPTANCE:	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 30**

COMMENTS:

FINAL ACCEPTANCE:					NCR NO.	
HEYDAY GROUP	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE	
CLIENT (REPRESENTATIVE)						
AUTHORITY (IF APPLICABLE)						
ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES, (2) SPECIFICATION, (3) LATEST ISSUE OF						

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 28**

COMMENTS:

FINAL ACCEPTANCE:					NCR No:	
HEYDAY GROUP	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE	
CLIENT (REPRESENTATIVE)						
AUTHORITY (IF APPLICABLE)						
ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS						

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>39. Of 45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To:	Signature:

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable # 31**

[illegible]

COMMENTS:

NCR No:

<b>FINAL ACCEPTANCE:</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>POSITION</b>	<b>APPROVED (YES/NO)</b>	<b>DATE</b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
ACCEPTANCE CRITERIA: AS PER ITC (1) 2008 AND ITC (2) 2008					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** PIT LEVRA ①

COMMENTS:

NCR No:

Page 387 of 394

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>41</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>C.T. Algate</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** *PIT LEV 2.*

[illegible]

COMMENTS:

NCR No:

FINAL ACCEPTANCE:					
HEYDAY GROUP	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES, (2) SPECIFICATION, (3) MATERIALS					

PRO 13010 - ITC - (R) Point to Point

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** 1464TS

COMMENTS:

<b>FINAL ACCEPTANCE:</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>POSITION</b>	<b>APPROVED (YES/NO)</b>	<b>DATE</b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES, (2) SPECIFICATION, (3) APPROVAL					

Page 389 of 394

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>43</u> Of <u>45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>C2</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** *SUMP PUMP 1.*

[illegible]

COMMENTS:

NCR No:

<b>FINAL ACCEPTANCE:</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>POSITION</b>	<b>APPROVED (YES/NO)</b>	<b>DATE</b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
ACCEPTANCE CRITERIA:					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

**Inspection & Test Checklist**  
**ITC : 8**  
**Management (QA) System ISO9001**

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>44 Of 45</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>C28</u>

INSPECTION AND TEST CHECKLIST FOR: **Point to Point Testing - Cable #** SUMP PUMP 2

[illegible]

COMMENTS:

NCR No:

<b>FINAL ACCEPTANCE:</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>POSITION</b>	<b>APPROVED (YES/NO)</b>	<b>DATE</b>
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					
ACCEPTANCE CRITERIA: AS PER ITR - (4) 123000 2000 WIRING RULES, 1992					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.



Heyday Group

# Inspection & Test Checklist ITC : 8 Management (QA) System ISO9001

Heyday Group Pty Ltd  
ABN 82 121 276 168

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>1 Of 3</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>CTA gate</u>	Signature: <u>CTA</u>

## INSPECTION AND TEST CHECKLIST FOR: **ELECTRICAL EQUIPMENT / ACCESSORIES**

ITEM	CORRECT TYPE / COLOUR		CORRECT ALIGNMENT LOCATION		CORRECT FIXING AND MADE SAFE		CORRECT LABELLING		CORRECT TERMINATION		CORRECT EARTHING		CORRECT IP RATING		CORRECT CLASSIFICATION		FINAL CHECK AND NO DAMAGE	
	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE
<u>BRIDGE</u>																		
<u>CONTROL PANEL</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>7/CABLES BOX</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>E/STOP</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>S/N#1 O/T LIMIT</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>S/2 O/T LIMIT</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>S/1 RAISE LIMIT</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>S/1 LOWER LIMIT</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>S/2 RAISE LIMIT</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>S/2 LOWER LIMIT</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>FORWARD LIMIT</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>REVERSE LIMIT</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>CABLE REARMOTOR</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>S/1 MOTOR</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>S/2 MOTOR</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>BRIDGE DRIVE MOTOR</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>REV LIMIT FIXED</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>
<u>FWD LIMIT FIXED</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>	<u>CA</u>	<u>14.2.12</u>

COMMENTS:

NCR No:

FINAL ACCEPTANCE:	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.



Heyday Group

# Inspection & Test Checklist ITC : 8 Management (QA) System ISO9001

Heyday Group Pty Ltd  
ABN 82 121 276 168

Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client: <u>EPW</u>	Project Name: <u>Luggage Point Settling Tanks 1&amp;2</u>	Job No: <u>QEM14755</u>	Sheet: <u>2 Of 3</u>
Contract Manager: <u>Terry Fisher</u>	Project Manager: <u>Terry Fisher</u>	Site Supervisor: <u>David Campbell</u>	Date:
Check Authorised By:	Signature:	Check Delegated To: <u>C.T. Algate</u>	Signature: <u>C.T. Algate</u>

## INSPECTION AND TEST CHECKLIST FOR: **ELECTRICAL EQUIPMENT / ACCESSORIES**

ITEM	CORRECT TYPE / COLOUR		CORRECT ALIGNMENT LOCATION		CORRECT FIXING AND MADE SAFE		CORRECT LABELLING		CORRECT TERMINATION		CORRECT EARTHING		CORRECT IP RATING		CORRECT CLASSIFICATION		FINAL CHECK AND NO DAMAGE	
	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE	CHECK BY	DATE
SHUNT SW.	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
S/S I F/R SW.	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
S/S I MOTOR.	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
S/S I FWD LIMIT.	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
S/S I REV LIMIT.	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
1A CONTROL	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
1B CONTROL	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
1C CONTROL	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
1A MOTOR.	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
1B MOTOR	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
1C MOTOR	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
RAIDAL 1	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
LIGHT 1	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
2A CONTROL	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
2B CONTROL	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
2C CONTROL	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12
RAIDAL 2	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12	CA	14.2.12

COMMENTS:

NCR No:

FINAL ACCEPTANCE:	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					

ACCEPTANCE CRITERIA: AS PER ITP = (1) AS3000:2000 WIRING RULES. (2) SPECIFICATION. (3) LATEST ISSUE OF DRAWINGS.

# Inspection & Test Checklist

## ITC : 8

### Management (QA) System ISO9001

Heyday Group Pty Ltd  
ABN 82 121 276 168  
Heyday Electrics  
ACC Technologies  
Heyday Communications  
Heyday Fire Technologies

Client:	<u>EPW</u>		Project Name:	<u>Luggage Point Settling Tanks 1&amp;2</u>		Job No:	<u>QEM14755</u>	Sheet:	<u>3 Of 3</u>
Contract Manager:	<u>Terry Fisher</u>		Project Manager:	<u>Terry Fisher</u>		Site Supervisor:	<u>David Campbell</u>	Date:	
Check Authorised By:			Signature:			Check Delegated To:	<u>C.T. Algate</u>	Signature:	<u>C.T. Algate</u>

INSPECTION AND TEST CHECKLIST FOR: **ELECTRICAL EQUIPMENT / ACCESSORIES**

[illegible]

NCR No:

FINAL ACCEPTANCE:	NAME	SIGNATURE	POSITION	APPROVED (YES/NO)	DATE
HEYDAY GROUP					
CLIENT (REPRESENTATIVE)					
AUTHORITY (IF APPLICABLE)					