



Circuit Protection
Including Factory Built
Assemblies



Crabtree



Utilising leading edge computer-based costing and drawing systems, Crabtree provide Quotations and Tenders for main switchgear and sub-distribution systems.

Crabtree switchboards and sub-distribution panels can utilise MCCB or combination Fused-Switch circuit protection. Plug-in devices are available.

Power Factor correction, surge protection, and mains/standby generator changeover systems can be incorporated.

Cubicle switchboards are available to Form 4 type 7, with Fault Rated, Type Tested Busbars.

Ingress protection can be provided up to IP54.



Every Crabtree product is rigorously tested before being dispatched to the customer. This excellence is reinforced by the company's registration of compliance with ISO 9002: 1994 which ensures that these procedures are maintained at the highest level.

Crabtree's product ranges are developed with flexibility in mind, and with the evolution of more modular ranges, customers can be confident of obtaining the right product for each application.

The same attention to detail can be seen in the company's commitment to customer service. With up-to-the minute technology at the heart of its management information systems, the company is able to manufacture and despatch in the shortest possible time, whilst a communications network in it's Central Sales Office ensures that customer enquiries are dealt with speedily and effectively.

The company's commitment does not end there. Specifying Crabtree products ensures not only a first class product, but also the benefit of a wide range of support services. For example, comprehensive product and technical literature, a highly qualified sales force and extensive wholesaler training. Crabtree's Technical Services Department is able to offer expert advice on technical issues, and the preparation of individual quotes.



All Crabtree products comply with the applicable British Standard specification and should be installed by suitably qualified personnel in accordance with the requirements of relevant legislation, regulations (including IEE Wiring Regulations) and the accepted practice in the industry. For ease of product selection, the catalogue is divided into sections. Each has its own introduction and contains relevant product information. It is the practice of the Electrium Group of companies to protect new ideas by seeking patent protection, and to protect new designs by seeking registered design protection, and the products listed or described in this publication may in consequence be protected by one or more patents, and/or registered designs and/or applications.

A full list of patents, registered designs and applications may be obtained from the Company Secretary of Electrium Limited.



POLESTAR

16 kA CIRCUIT PROTECTION

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LOADSTAR

18mm MODULAR MCB PROTECTION

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DIN RAIL MOUNTED CONTROL DEVICES

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FUSESTAR

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POWERSTAR

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FACTORY BUILT ASSEMBLIES

CUSTOM BUILT LV SWITCHGEAR

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C50

MAGNETIC HYDRAULIC MCBs

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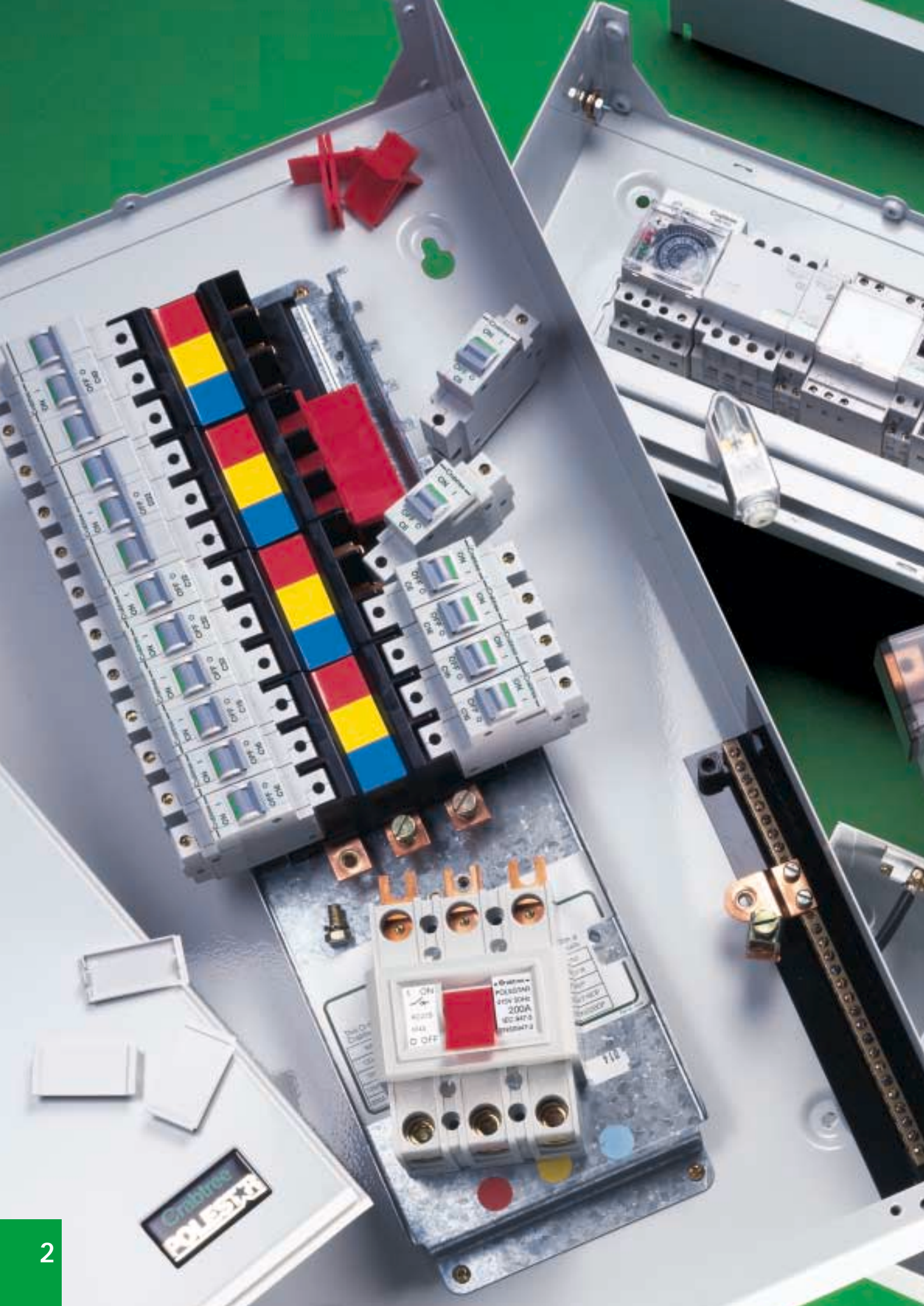
TECHNICAL DATA & DIMENSIONS

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NUMERIC INDEX

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Please Note: For assistance with project enquiries and quotations, please contact Electrium on the following telephone number: 01543 455200



TECHNICAL FEATURES

Industrial strength final circuit protection from Crabtree. Peace of mind from concept through implementation to lifelong service. Suitable for use in the most demanding industrial and commercial applications.

MCBs

- 16KA unconditional short circuit breaking capacity across the range.
- Energy limiting, high performance Industrial strength design.
- 25mm MCB module size eases cabling, especially for larger cables and circuit changes.
- Switched neutral RCBO for increased safety, discrimination and fire protection.
- Tested for use on DC circuits.
- Fully tested and compliant with BS EN 60898.

ENCLOSURES

- Styled to unobtrusively blend into any commercial or industrial environment.
- Unique easy fit MCB mounting rail holds MCB in position even when large cables are fitted.
- Custom-built special designs available to customer requirements combining standard modules.
- Fully tested and compliant with BS EN 60439-3.

Paint finished in light grey RAL 7035 epoxy powder coating.





1608/OB



1613/COB



1600/M



1600/MSB

PRIMARY DISTRIBUTION BOARDS

Triple Pole MCB ways	Surface	Flush
4	1604/OB	1604/OBF
6	1606/OB	1606/OBF
8	1608/OB	1608/OBF
10	1610/OB	1610/OBF
12	1612/OB	1612/OBF
16	1616/OB	1616/OBF
20	1620/OB	1620/OBF
24	1624/OB	1624/OBF

- Primary board readily accepts any of nine main incoming devices providing complete range flexibility
- All distribution boards rated at 200A
- Includes all phase, neutral and earth busbars

IMPORTANT

Under no circumstances should cable connections be made direct to the phase busbars. A suitable main incoming device must be fitted to ensure adequate busbar support.

CONTROL MODULE ENCLOSURE

Control Module ways	LIST No
13	1613/COB

- Specifically designed for Polestar TP & N distribution boards
- 13 module ways (18mm)
- Mount to either top or bottom of distribution board
- Additional capacity can be achieved by stacking control module enclosures
- Control modules protected behind full length door/cover assembly
- For extra security fit barrel lock (see accessories – page 11)

INCOMING ENCLOSURE MODULES

- Specifically designed for use with standard Polestar primary TP & N distribution boards
- Order separately choice of main incoming device and accessories

Description	LIST No
MCCB enclosure for use with Powerstar MCCBs	1600/M
<i>Select MCCBs from page 44 or 45.</i>	
Contactor enclosure for use with CEICON contactors types C43 to C63 (75A to 85A AC1 duty)	1600/C
<i>See separate catalogue.</i>	
Main switch and contactor enclosure for use with CEICON contactors types C43 to C63 (75A to 85A AC1 duty)	1600/MSB
<i>See separate catalogue. For other ratings please contact Crabtree.</i>	
Spreader box for use where larger incoming cables are required	1600/SB

1600/MSB not available flush.

Dimensions available on enquiry.

DIRECT CABLE CONNECTION

MCB ways	LIST No
6	1606/1A
9	1609/1A
13	1613/1A

- Supplied as a busbar connected unit where isolation is provided outside of board
- Distribution board rating 100A



1609/1A

MAIN SWITCH DISCONNECTOR

MCB ways	LIST No
6	1606/21A
9	1609/21A
13	1613/21A
18	1618/21A
26	1626/21A

- 100A double pole main switch control for all MCB ways
- 18 and 26 way distribution boards supplied in 2 bank format



1613/31A

1618/21A

MAIN INCOMING RCCB

MCB ways	RCCB rating	type	LIST No
6	80A 30mA	AC	1606/33A
9	80A 30mA	AC	1609/33A
13	80A 30mA	AC	1613/33A
6	80A 100mA	AC	1606/31A
9	80A 100mA	AC	1609/31A
13	80A 100mA	AC	1613/31A

- 80A double pole RCCB control for all MCB ways
- RCCB type A pulsating dc sensitivity to IEC 1008 to order



1606/21A

SINGLE RCCB SPLIT-LOAD

Total MCB ways	RCCB ways	RCCB rating	RCCB type	LIST No
11	7	80A 30mA	AC	1611/S43A
11	6	80A 30mA	AC	1611/S53A
11	4	80A 30mA	AC	1611/S73A
11	7	80A 100mA	AC	1611/S41A
11	6	80A 100mA	AC	1611/S51A
11	4	80A 100mA	AC	1611/S71A

- 100A double pole main switch control for all MCB ways
- Type A pulsating dc sensitivity to IEC1008 to order



1611/S43A

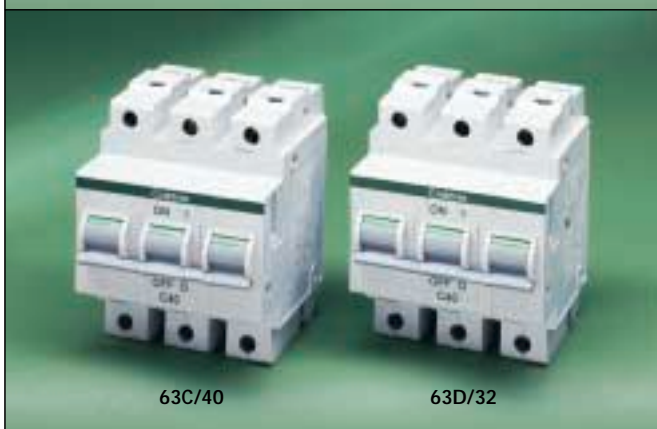
DUAL RCCB SPLIT-LOAD

Total MCB ways	RCCB ways	RCCB rating	RCCB type	LIST No
8	3+5	63A 100mA & 80A 30mA	AC	1608/S313A
8	4+4	63A 100mA & 63A 30mA	AC	1608/S413A
8	5+3	80A 100mA & 63A 30mA	AC	1608/S513A

- 100A double pole main switch control for all MCB ways
- Type A pulsating dc sensitivity to IEC 1008 to order



1608/S513A



MINIATURE CIRCUIT BREAKERS (MCB)

Single Pole

Current rating (A)	Type B LIST No	Type C LIST No	Type D LIST No
6	60B/06	60C/06	60D/06
10	60B/10	60C/10	60D/10
16	60B/16	60C/16	60D/16
20	60B/20	60C/20	60D/20
32	60B/32	60C/32	60D/32
40	60B/40	60C/40	60D/40
50	60B/50	60C/50	60D/50
63	60B/63	60C/63	60D/63

Double Pole

Current rating (A)	Type B LIST No	Type C LIST No	Type D LIST No
6	62B/06	62C/06	62D/06
10	62B/10	62C/10	62D/10
16	62B/16	62C/16	62D/16
20	62B/20	62C/20	62D/20
32	62B/32	62C/32	62D/32
40	62B/40	62C/40	62D/40
50	62B/50	62C/50	62D/50
63	62B/63	62C/63	62D/63

Triple Pole

Current rating (A)	Type B LIST No	Type C LIST No	Type D LIST No
6	63B/06	63C/06	63D/06
10	63B/10	63C/10	63D/10
16	63B/16	63C/16	63D/16
20	63B/20	63C/20	63D/20
32	63B/32	63C/32	63D/32
40	63B/40	63C/40	63D/40
50	63B/50	63C/50	63D/50
63	63B/63	63C/63	63D/63

- BSEN 60898
- 25A SP Type C available to special order. Order reference 60C/25
- Type B (3–5In), C (5–10In), D (10–20In) classification
- Short circuit duty rating: Type B/C 16000A 240V/415V 50Hz
Type D 10000A 240V/415V 50Hz
- Terminal capacity up to 25mm² cable
- 25mm modular width

RESIDUAL CURRENT CIRCUIT BREAKERS WITH OVERCURRENT PROTECTION (RCBO)

Double Pole

MCB Type C

RCD

Type AC

normal ac sensitivity

LIST No

RCD

Type A

pulsating dc sensitivity

LIST No

Current rating (A)

6	602C/063	602C/A063
10	602C/103	602C/A103
16	602C/163	602C/A163
20	602C/203	602C/A203
32	602C/323	602C/A323
40	602C/403	602C/A403

RCBOs with MCB element type B (3–5In) overcurrent protection to order.

- Type A pulsating dc sensitivity to IEC 1009
- Standard compliance BSEN 61009; IEC 1009
- Short circuit duty rating 10000A 240V 50Hz
- Electromechanical RCD, 30mA. Double pole operation
- Terminal capacity up to 25mm² cable
- 10mA and 300mA sensitivity available to special order

Dimensions – see page 71.

BUSBAR CONNECTING ASSEMBLY

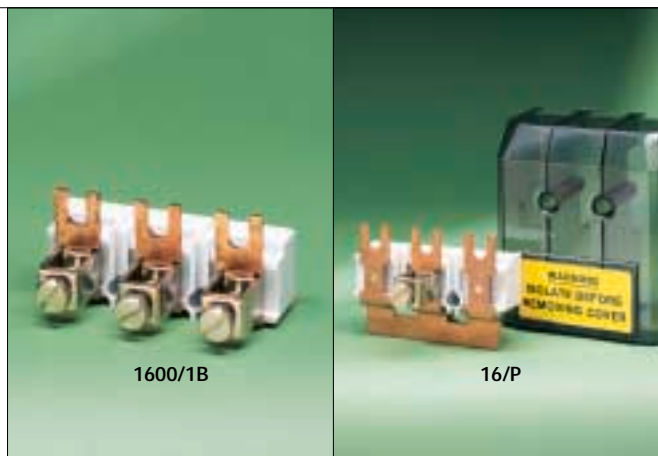
	LIST No
Busbar connecting assembly	1600/1B

- Direct cable termination assembly
- Busbar connecting assembly terminals accept up to 120mm² cable
- Complete with terminal shroud

BUSBAR PARALLELING ASSEMBLY

Description	Application	LIST No
Busbar paralleling assembly	Converts TP & N board to SP & N operation	16/P

- Suitable for busbar connection, where isolation is provided outside of distribution board



SWITCH DISCONNECTORS

Single Phase & Switched Neutral

Specifically designed to provide integrated conversion and disconnection of three phase distribution board to single phase supply.

	LIST No
125A single phase & neutral switch disconnecter	125/21BDP
200A single phase & neutral switch disconnecter	200/22BDP

Triple Pole

	LIST No
125A Modular triple pole switch disconnecter	125/21BA
125A Heavy duty triple pole switch disconnecter	125/21B
200A Triple pole switch disconnecter	200/22B

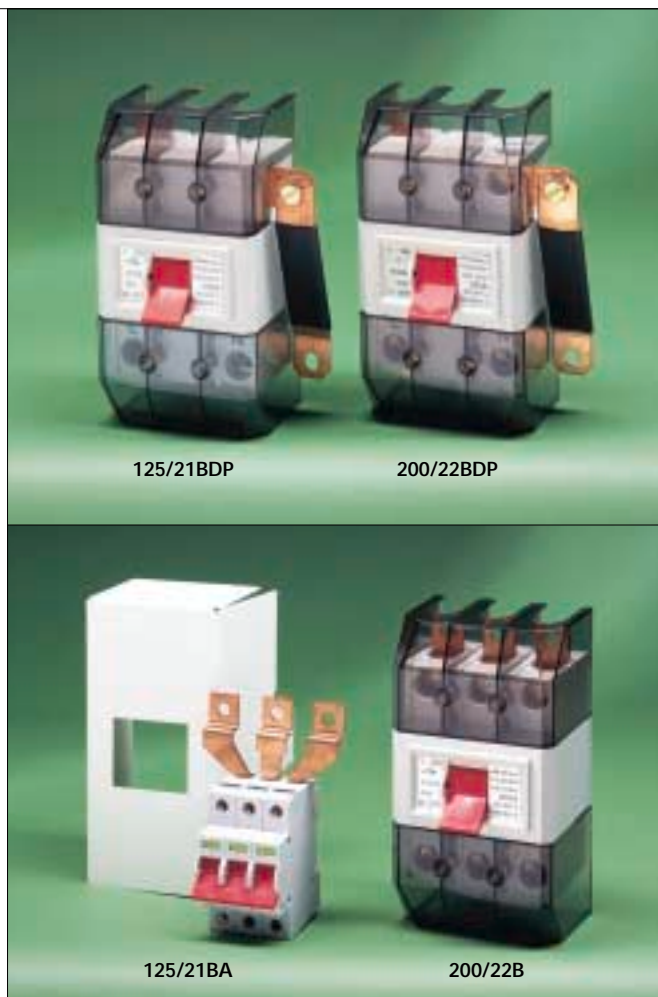
- BS EN 60947-3
- Utilisation category AC22B
- Current rating (A)

125 modular	125 (BDP)	200
-------------	-----------	-----
- Rated voltage

240/415V ac	240/415V ac	240/415V ac
-------------	-------------	-------------
- Rated frequency (Hz)

50	50	50
----	----	----
- Terminal capacity (mm²)

50	50	120
----	----	-----
- Complete with supply and load side terminal shrouds
- 200A fitted with Allen headed terminal bolts to afford incoming cables to be effectively secured (Allen key supplied)
- Captive switch mounting screws make for speedy assembly into distribution boards
- Locking facility enables main switches to be locked in either 'on' or 'off' position
- Single phase and switched neutral switch disconnecter includes all warning and circuit breaker way conversion labels



100A TRIPLE POLE & NEUTRAL RCCBs

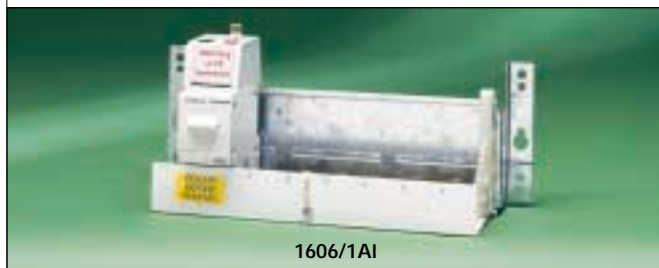
Sensitivity (mA)	Rating (A)	LIST No
100	100	641/100B
30	100	641/030B

- Type A: pulsating dc sensitivity to BSEN61008 IEC1008
- Complete with load side terminal shrouds
- 100mA sensitivity affords a high level of fire risk protection
- 30mA sensitivity affords a high level of personal protection
- Terminals accept up to 50mm² cable





1606/FA



1606/1AI

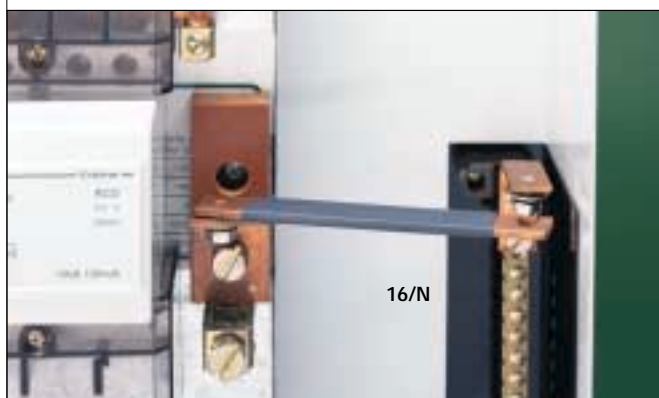


1609/21AI



1604/OBI

1604/OBIS
+1600/1B



16/N

FLUSH-FRAME CONVERSION TYPE A

For converting surface SP & N distribution boards and consumer units to flush-mounting.

SP & N Distribution board and Consumer unit LIST Nos	Appropriate Flush-frame LIST No
1606/1A 1606/33A	1606/21A 1606/31A
1609/1A 1609/33A	1609/21A 1609/31A
1613/_ series 1608/S_13A 1611/S__A	1613/FA

- Adjustable depth alignment
- Simple to fit picture-frame design
- Complete with all necessary fixing screws and instructions

BACKPLATES

For use in customers' individual enclosures. Complete with live, neutral and earth busbars.

Direct Cable Connection

MCB ways	LIST No
6	1606/1AI
9	1609/1AI
13	1613/1AI

Main Switch Disconnecter

MCB ways	LIST No
6	1606/21AI
9	1609/21AI
13	1613/21AI

- 100A double pole main switch control.

PRIMARY BACKPLATE ASSEMBLIES

Triple Pole MCB ways	Standard	Short
4	1604/OBI	1604/OBIS
6	1606/OBI	1606/OBIS
8	1608/OBI	1608/OBIS
10	1610/OBI	1610/OBIS
12	1612/OBI	1612/OBIS
16	1616/OBI	1616/OBIS

- For use in customers own enclosures
- Complete with 200A rated three phase busbars
- Neutral and earth busbar assemblies included

Important

Under no circumstances should cable connections be made direct to the phase busbars. A suitable mains incoming device must be fitted to ensure adequate busbar support.

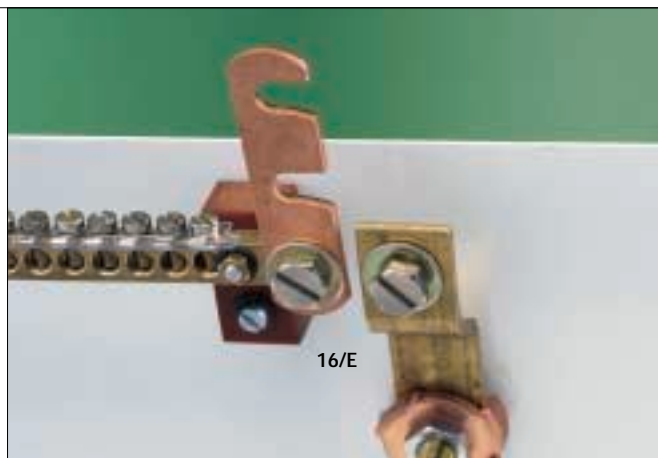
NEUTRAL LINK

Description	Application	LIST No
Neutral link	Affords ready disconnection of the neutral bar for test purposes	16/N

Dimensions – see page 70 & 71 MCBs not included – see page 6.

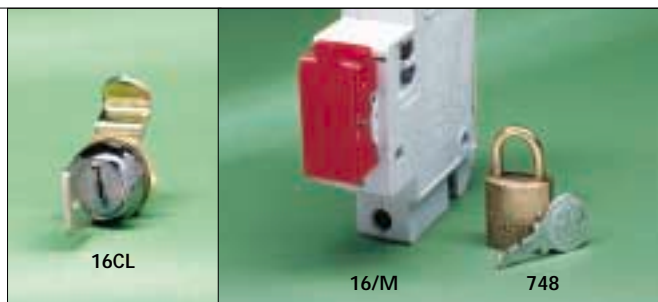
EARTH LINK

Description	Application	LIST No
Earth link	Affords ready disconnection of the earth bar for test purposes	16/E



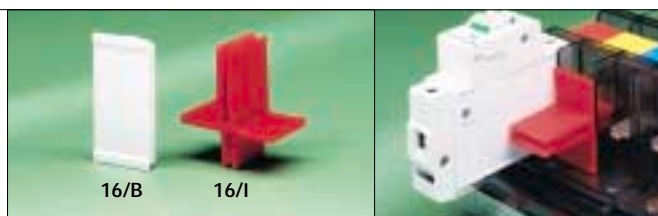
LOCKING DEVICES

Description	Application	LIST No
Door locking assembly	User fitted barrel lock 2 keys	16CL
Handle locking assembly	Enables MCB handle to be padlocked in either 'on' or 'off' position	16/M
Padlock & 2 keys	For use with MCB handle locking device	748



WAY BLANKING PLATE (MOULDED) & INSULATING TAG

Description	Application	LIST No
Way blanking plate	Covers one (SP) MCB way	16/B
Insulating tag	Insulates spare (SP) MCB way on line busbar	16/I



SWITCH DISCONNECTORS

	LIST No
125A TP Switch disconnecter	125SW3
125A TP Switch disconnecter heavy duty	125/3MS
200A TP Switch disconnecter	200/3MS

- BS EN60947-3
- Switch disconnectors suitable for individual and panel mounting applications
- Complete with terminal shrouds
- Maximum cable capacities 125A – 50mm²
200A – 120mm²
- 200A fitted with Allen headed terminals enabling incoming cable to be more effectively secured (Allen key supplied)



ENCLOSURES

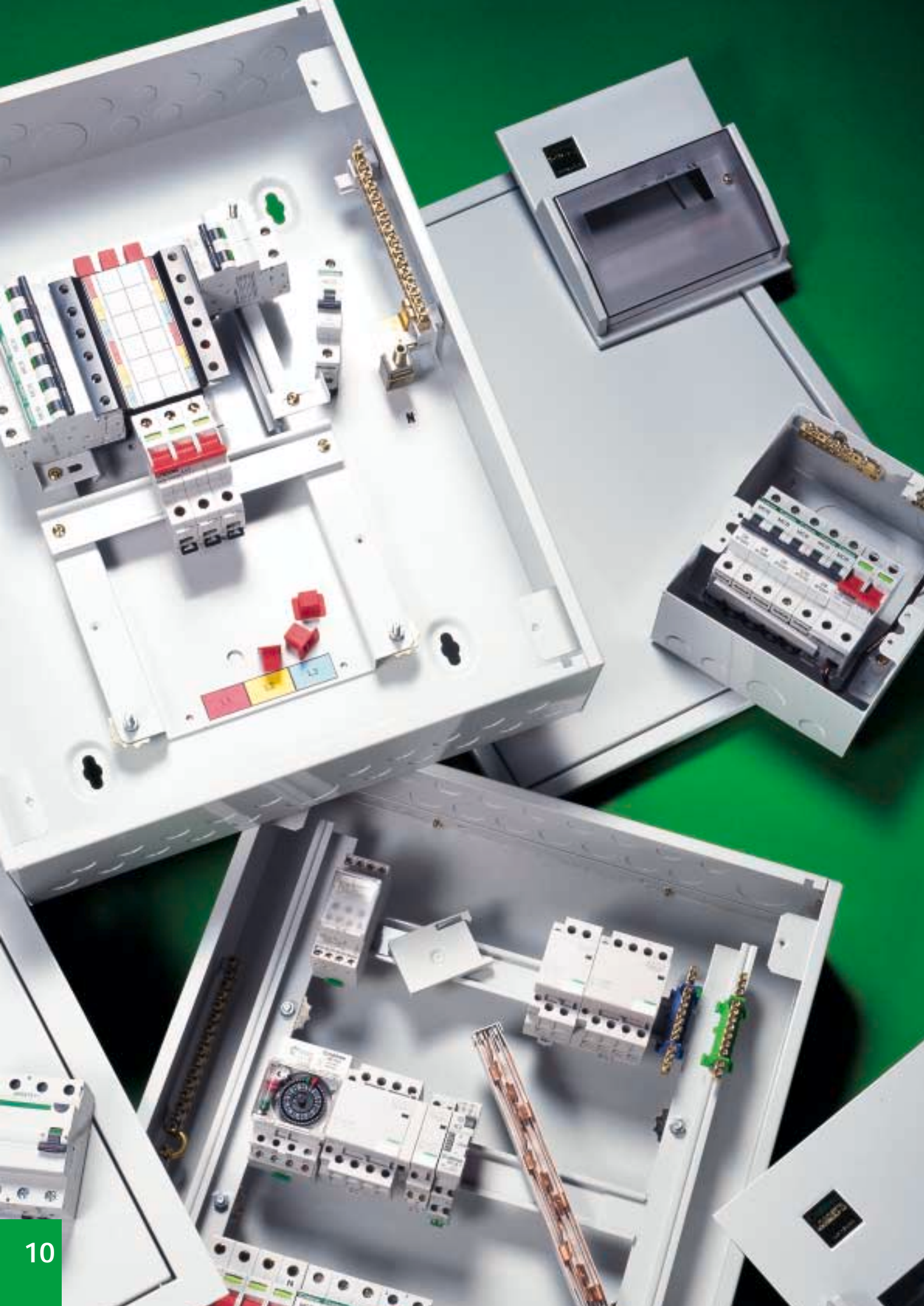
	LIST No
General purpose (3 x 18mm module) enclosure	1603/MSE
General purpose (3 x 25mm module) no neutral	1603/HSE

- Mounting space for 3 25mm MCBs only

Polestar switch disconnecter enclosure	EN200
Control module (13 x 18mm) enclosure	1613/MSE

- For separate mounting of MCBs, switch disconnectors & control modules
- Control module enclosure accepts 13 x 18mm modules
- Fitted with Earth & neutral bar as standard





LOADSTAR

Designed and manufactured in Europe to international standards and requirements, the Loadstar range has built in flexibility without compromise.

Loadstar is equipped with a complete range of MCBs, RCDs, single and two module RCBOs with complimentary modular control and instrumentation devices.

The enclosure system includes true flush and surface designs with stackable options further increasing the ability of the range to meet project specifications and design requirements.

Protection Devices

- 6kA AND 10kA BSEN 60898, IEC 898
15kA Icu BSEN 60947-2, IEC 947-2
- Types B,C,D, 6A - 63A.
230/400V 50 Hz, SP DP & TP configurations.
- Energy limiting, high performance design.
- MCBs 35mm terminal capacity
- Single and two module RCBOs available
- Full range of RCCBs.

Enclosure Systems

- BS EN 60439-3 and IEC 439-3.
- Exceptional range of incoming supply switching/ isolating options.
- Type B and row enclosures can be stacked together or in combination.
- True Flush and Surface designs even when stacked, incomer housed under common door, Interchangeable covers and pan assemblies.
- Full range of link kits available including split protection arrangements.
- Special design variants available including contactor controlled versions up to 200 Amps

Paint finished in light grey RAL 7035 epoxy powder coating.





18LS04

MODULAR ISOLATOR OR RCCB INCOMER

TP MCB WAYS	Surface	Flush
4	18LS04	18LF04
6	18LS06	18LF06
8	18LS08	18LF08
12	18LS12	18LF12
16	18LS16	18LF16
20	18LS20	18LF20
24	18LS24	18LF24

INCOMER OPTIONS

63-125A 3 Pole Modular Isolator
63-125A 4 Pole Modular Isolator
40-100A 4 Pole RCCB
Direct connection terminal kit
See page 14 for selection.

CONNECTION KITS

(Not Required for 3 Pole Modular Isolator)

18C4LRA
18DC35 or 18DC150



18GF04

G FRAME MCCB, OR 200A HEAVY DUTY ISOLATOR

TP MCB WAYS	Surface	Flush
4	18GS04	18GF04
6	18GS06	18GF06
8	18GS08	18GF08
12	18GS12	18GF12
16	18GS16	18GF16
20	18GS20	18GF20
24	18GS24	18GF24

INCOMER OPTIONS

25-125A G Frame MCCB
200A Heavy Duty Isolator
See page 14 for selection.

CONNECTION KITS

18G125
18H200



18SAA04

J FRAME MCCB INCOMER

TP MCB WAYS	Surface	Flush
4	18SAA04	18FAA04
6	18SAA06	18FAA06
8	18SAA08	18FAA08
12	18SAA12	18FAA12
16	18SAA16	18FAA16
20	18SAA20	18FAA20
24	18SAA24	18FAA24

INCOMER OPTIONS

25-200A J Frame MCCB
See page 14 for selection.

CONNECTION KIT

18AA250



18LF306

SPLIT PROTECTION BOARDS

TP MCB WAYS	Surface	Flush
TWO SPLIT		
2+2	18LS204	18LF204
4+2	18LS206	18LF206
4+4	18LS208	18LF208
6+6	18LS212	18LF212
8+8	18LS216	18LF216
12+12	18LS224	18LF224
THREE SPLIT		
2+1+2	18LS306	18LF306
4+1+2	18LS308	18LF308
4+3+4	18LS312	18LF312
6+5+4	18LS316	18LF316
8+8+7	18LS324	18LF324

INCOMER OPTIONS

Two Split - 1x Modular Isolator 1x RCD
Two Split - 1x Modular Isolator 2x RCD
Three Split - 1x Modular Isolator 3x RCD

CONNECTION KITS

See page 15 for selection

Type B and Row Boards: All Distribution Boards complete with Neutral & Earth Bars.
Order incoming and outgoing devices separately, pages 14, 16 & 17.
Order incomer connection/mounting kits separately, page 14.
SP strap kit available.

ROW TYPE DIN RAIL BOARDS

Rows	Surface	Flush	Terminal capacity	
			Earth	Neutral
1	18AS1	18AF1	10x25mm ²	6x25mm ²
2	18AS2	18AF2	20x25mm ²	6x25mm ²
3	18AS3	18AF3	26x25mm ²	6x25mm ²
4	18AS4	18AF4	38x25mm ²	6x25mm ²
5	18AS5	18AF5	50x25mm ²	6x25mm ²

1 ROW = 16x18mm DIN Modules.

- Stackable with type B and Row Boards
- Horizontal 35mm DIN rail with 10mm Vertical Side Rails for clip on N/E bars (See page 15)



18AF3

DIRECT EXTENSION TYPE B BOARDS

TP MCB Ways	Surface	Flush
6	18MS06	18MF06
12	18MS12	18MF12
INCOMER OPTIONS	CONNECTION KITS	
Type B board	18CK200	
See pages 2, 6		



18MF06

DIRECT EXTENSION ROW BOARDS

Rows	Surface	Flush
1	18MAS1	18MAF1
2	18MAS2	18MAF2

Extension boards stack directly with type B or Row boards. Stacking adaptor boxes not required.

Flush types maintain flush appearance. See page 72 for typical configurations

STACKING ADAPTORS

	Surface	Flush
	18BS1	18BF1

Stacking adaptor boxes can be used in applications where direct extension boards do not allow sufficient flexibility or outgoing ways. They allow any combination of Type B and/or Row Boards to be stacked together.

Surface and flush types cannot be mixed.

- Flush version maintains flush appearance with concealed cover fixing screws



18BS1

18BF1

TYPE A SP&N BOARDS

SP MCB Ways	Surface	Flush
2	18PS2	18PF2
5	18PS5	18PF5
8	18PS8	18PF8
11	18PS11	18PF11
14	18PS14	18PF14
17	18PS17	18PF17
19	18PS19	18PF19

Normally supplied with a 100A two pole Modular Isolator.
Other options include RCCB Incomer to special order.



18PF5

18PS5

TYPE A SP&N SPLIT LOAD BOARDS

Protected	Unprotected	Surface	Flush
3	6	18PRSL09	18PRFL09
3	9	18PRSL12	18PRFL12
3	12	18PRSL15	18PRFL15
3	14	18PRSL17	18PRFL17

Normally supplied with a 100A two pole Modular Isolator and 63A 30mA RCD.
Other variants possible.



18PRSL09



ISOLATORS

MODULAR RATING	2 POLE	3 POLE	4 POLE
40A	40SW2	40SW3	40SW4
63A	63SW2	63SW3	63SW4
100A	100SW2	100SW3	100SW4
125A	125SW2	125SW3	125SW4

HEAVY DUTY RATING

200A (For use with DB's)	200/22B
200A (For general use & GP box)	200/3MS

Maximum Cable Capacity - Modular 50mm² - Heavy Duty 120mm².



RCCBs

RATING	DOUBLE POLE	FOUR POLE
25A, 30mA	18R25/30/2	
40A, 30mA	18R40/30/2	18R40/30/4
40A, 100mA	18R40/100/2	18R40/100/4
63A, 30mA	18R63/30/2	18R63/30/4
63A, 100mA	18R63/100/2	18R63/100/4
63A, 300mA	18R63/300/2	18R63/300/4
100A, 30mA	18R100/30/2	18R100/30/4
100A, 100mA	18R100/100/2	18R100/100/4
100A, 300mA	-	18R100/300/4

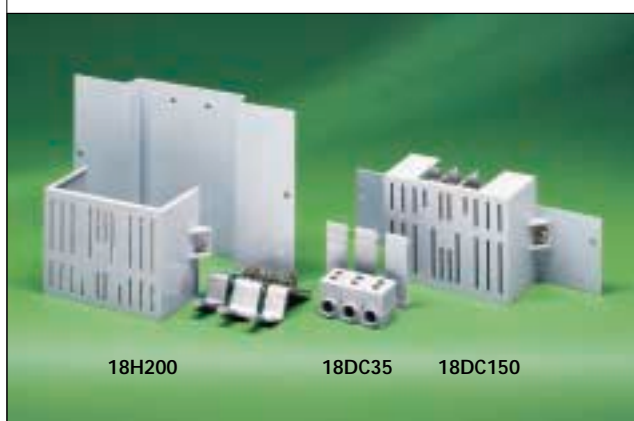
Type AC, maximum Cable Capacity 50mm Stranded. Type A available to special order.



POWERSTAR MCCB

RATING	G FRAME MCCB	J FRAME MCCB
40A	7PBG340	7PBJ340
63A	7PBG363	7PBJ363
80A	7PBG380	7PBJ380
100A	7PBG3100	7PBJ3100
125A	7PBG3125	7PBJ3125
160A		7PBJ3160
200A		7PBJ3200
200A magnetic only MCCB		7PDJ3200

For full Range see pages 31 and 44 .



INCOMER MOUNTING AND CONNECTION KITS

DEVICE TYPE	LIST No
4 P Modular Isolator	18C4LRA
4 P RCCB	18C4LRA
G Frame MCCB	18G125
J Frame MCCB	18AA250
Heavy Duty Isolator	18H200
TP&N to SP&N Converter (125A Modular)	18CTPS
TP&N to SP&N Converter (200A 200/22 BDP)	18CTPS/200

DIRECT CONNECTION KITS	LIST No
35mm ² Max Direct cable connection	18DC35
150mm ² Max Direct cable connection	18DC150



TYPE B PANEL ASSEMBLIES

TP WAYS	Standard	Short
4	18LP04	18LPM04
6	18LP06	18LPM06
8	18LP08	18LPM08
12	18LP12	18LPM12
16	18LP16	18LPM16
20	18LP20	18LPM20
24	18LP24	18LPM24

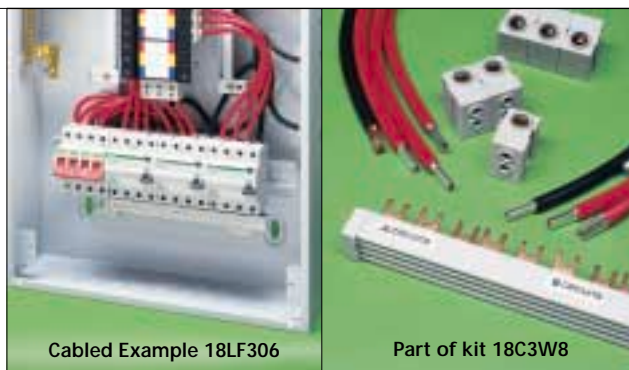
Neutral & Earth bars not included.

Standard (Modular Isolator/RCCB version) as fitted to type B Distribution Boards
Short version (not shown) does not include incomer mounting section.

SPLIT LOAD LINK KITS

TP WAYS	RCCB	ISOLATOR	LIST No
4-8	1	1	18C1W8
12-16	1	1	18C1W16
16-24	1	1	18C1W24
4-8	2	1	18C2W8
12-16	2	1	18C2W16
16-24	2	1	18C2W24
4-8	3	1	18C3W8
12-16	3	1	18C3W16
16-24	3	1	18C3W24

Kits supplied with Multi-stranded flexible cable and connection blocks.



Cabled Example 18LF306

Part of kit 18C3W8

TYPE B DIRECT EXTENSION BOARD LINK KITS

	LIST No
3 Phase	18CK200

Neutral and Earth bars not included.

For use with Type B extension boards, page 13.

Not for use with Stacked Boards using adaptor boxes on page 13.

- Solid plated links with Insulating Shroud



18CK200

OPTIONAL ACCESSORIES

PRODUCT	LIST No
End Plate Plain	18EP0
End Plate Pattern 1	18EP1
End Plate Pattern 2	18EP2
Incoming Neutral/Earth Clamp (150mm ²)	18CNE1
Insulated Terminal Bar 12x10mm ² (Supplied with self tapping fixing screws)	18CTB12

18EP1 Knockouts- 1x 40mm², 2x26mm², 2x20mm²

18EP2 Knockouts- 2x 40mm², 7x26mm², 8x20mm²

DIN Rail (35mm/10mm Rail) Neutral & Earth Bars

Terminals	Neutral	Earth
7	CLNB07	CLEB07
12	CLNB12	CLEB12
15	CLNB15	CLEB15

The above clip-on Neutral/Earth bars can be attached to standard DIN rail or the additional 10mm vertical DIN rail provided in Row type enclosures.
Terminal size 16mm²

Cylinder Door Lock	16CL
Padlockable Cylinder Door Lock	16PL
MCB Dolly Locking Device	MCBLD
Padlock and Keys	748



18EP0 18EP1 18EP2

CLNB12 CLEB12

16CL

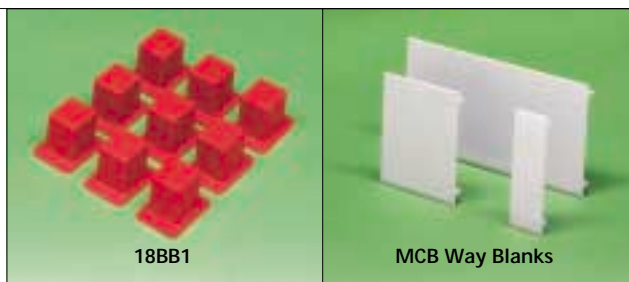
16PL

MCBLD

748

MCB BLANK PIECES AND BUSBAR INSULATORS

MCB MODULES	PACK QTY	LIST No
1	6	18CB1
3	4	18CB3
4	4	18CB4
6	4	18CB6
12	2	18CB12
Busbar Insulators Pack (9)	9	18BB1



18BB1

MCB Way Blanks

GENERAL PURPOSE ENCLOSURES

Modular Enclosures			
Modules	Type	IP	LIST No
2	Insulated	IP20	18GP2S
4	Insulated	IP20	18GP4S
2	Metal	IP40	18GP2M
4	Metal	IP40	18GP4M



18GP4S

18GP2S

18GP2M



6KA SINGLE POLE MCB

RATING AMPS	B TYPE	CTYPE	D TYPE
6A	6FS06B	6FS06C	6FS06D
10A	6FS10B	6FS10C	6FS10D
16A	6FS16B	6FS16C	6FS16D
20A	6FS20B	6FS20C	6FS20D
25A	6FS25B	6FS25C	6FS25D
32A	6FS32B	6FS32C	6FS32D
40A	6FS40B	6FS40C	6FS40D
50A	6FS50B	6FS50C	6FS50D
63A	6FS63B	6FS63C	6FS63D

Maximum Cable Capacity 35mm Stranded.

- 6kA BSEN 80898, IEC898
- 15kA Icu BSEN 947-2, IEC947-2



6KA DOUBLE POLE MCB

RATING AMPS	B TYPE	CTYPE	D TYPE
6A	6FD06B	6FD06C	6FD06D
10A	6FD10B	6FD10C	6FD10D
16A	6FD16B	6FD16C	6FD16D
20A	6FD20B	6FD20C	6FD20D
25A	6FD25B	6FD25C	6FD25D
32A	6FD32B	6FD32C	6FD32D
40A	6FD40B	6FD40C	6FD40D
50A	6FD50B	6FD50C	6FD50D
63A	6FD63B	6FD63C	6FD63D

Maximum Cable Capacity 35mm Stranded.

- 6kA BSEN 80898, IEC898
- 15kA Icu BSEN 947-2, IEC947-2



6KA TRIPLE POLE MCB

RATING AMPS	B TYPE	CTYPE	D TYPE
6A	6FT06B	6FT06C	6FT06D
10A	6FT10B	6FT10C	6FT10D
16A	6FT16B	6FT16C	6FT16D
20A	6FT20B	6FT20C	6FT20D
25A	6FT25B	6FT25C	6FT25D
32A	6FT32B	6FT32C	6FT32D
40A	6FT40B	6FT40C	6FT40D
50A	6FT50B	6FT50C	6FT50D
63A	6FT63B	6FT63C	6FT63D

Maximum Cable Capacity 35mm Stranded.

- 6kA BSEN 80898, IEC898
- 15kA Icu BSEN 947-2, IEC947-2



6KA RCBOs

RATING	SINGLE MODULE	DOUBLE MODULE
6A	6FSR06/30C	6FDR06/30C
10A	6FSR10/30C	6FDR10/30C
16A	6FSR16/30C	6FDR16/30C
20A	6FSR20/30C	6FDR20/30C
32A	6FSR32/30C	6FDR32/30C
40A	6FSR40/30C	6FDR40/30C

Maximum Cable Capacity 35mm Stranded.

- 6kA BSEN 80898, IEC898
- RCBO sensitivity 30mA
- Single module-single pole switching with functional earth connection

Full range of 3kA MCB's available.

10KA SINGLE POLE MCB

RATING AMPS	B TYPE	CTYPE	D TYPE
6A	6HS06B	6HS06C	6HS06D
10A	6HS10B	6HS10C	6HS10D
16A	6HS16B	6HS16C	6HS16D
20A	6HS20B	6HS20C	6HS20D
25A	6HS25B	6HS25C	6HS25D
32A	6HS32B	6HS32C	6HS32D
40A	6HS40B	6HS40C	6HS40D
50A	6HS50B	6HS50C	6HS50D
63A	6HS63B	6HS63C	6HS63D

Maximum Cable Capacity 35mm Stranded.

- 10kA BSEN 80898, IEC898
- 15kA Icu BSEN 947-2, IEC947-2



10KA DOUBLE POLE MCB

RATING AMPS	10KA MCB B TYPE	CTYPE	D TYPE
6A	6HD06B	6HD06C	6HD06D
10A	6HD10B	6HD10C	6HD10D
16A	6HD16B	6HD16C	6HD16D
20A	6HD20B	6HD20C	6HD20D
25A	6HD25B	6HD25C	6HD25D
32A	6HD32B	6HD32C	6HD32D
40A	6HD40B	6HD40C	6HD40D
50A	6HD50B	6HD50C	6HD50D
63A	6HD63B	6HD63C	6HD63D

Maximum Cable Capacity 35mm Stranded.

- 10kA BSEN 80898, IEC898
- 15kA Icu BSEN 947-2, IEC947-2



10KA TRIPLE POLE MCB

RATING AMPS	B TYPE	CTYPE	D TYPE
6A	6HT06B	6HT06C	6HT06D
10A	6HT10B	6HT10C	6HT10D
16A	6HT16B	6HT16C	6HT16D
20A	6HT20B	6HT20C	6HT20D
25A	6HT25B	6HT25C	6HT25D
32A	6HT32B	6HT32C	6HT32D
40A	6HT40B	6HT40C	6HT40D
50A	6HT50B	6HT50C	6HT50D
63A	6HT63B	6HT63C	6HT63D

Maximum Cable Capacity 35mm Stranded.

- 10kA BSEN 80898, IEC898
- 15kA Icu BSEN 947-2, IEC947-2



10KA RCBOs

RATING	SINGLE MODULE	DOUBLE MODULE
6A	6HSR06/30C	6HDR06/30C
10A	6HSR10/30C	6HDR10/30C
16A	6HSR16/30C	6HDR16/30C
20A	6HSR20/30C	6HDR20/30C
32A	6HSR32/30C	6HDR32/30C
40A	6HSR40/30C	6HDR40/30C

Maximum Cable Capacity 35mm Stranded.

- 10kA BSEN 80898, IEC898
- RCBO sensitivity 30mA
- Single module-single pole switching with functional earth connection



CONTROL MODULES

Control Module devices integrate with MCB distribution boards utilizing add-on DIN rail enclosures to provide combined circuit protection and control solutions.

- Switching devices up to 100A AC1
- Multi-function kWh meters
- Based on 18mm standard modules

Comb Bus Bars enable special circuit protection and control assemblies to be built within row type DIN rail enclosures (see page 13).



SYSTEM MONITOR PLUS

	Modules	LIST No
Display only	6	CM-PLUS
Pulsed output 1Pulse/kWh	6	CM-PLUS P

Current transformers

	Modules	LIST No
200A		CM-CT2
400A		CM-CT4
800A		CM-CT8
1600A		CM-CT16

- Complies with IEC 1036
- DIN rail mounted
- 6 mod wide unit
- kWh
- kVAh
- Volts Phase-Neutral 3 Phase
- Amps Phase 3 Phase
- Power Factor

CONTROL MODULES

Description

Timeswitches	Modules	List No.
1 channel 7 day 24hr digital	2	302/TD1
2 channel 7 day 24hr digital	2	302/TD2
24hr analogue synchronous	3	303/TS24
24hr analogue quartz	3	303/TQ24
7 day analogue quartz	3	303/TQ7
1-7min staircase	1	301/S7

- Power reserve: 150Hr – quartz timers; 250Hr – digital timers
- Contact rating 240V, 16A AC1 duty

Contactors

	Main pole configuration	Modules	List No.
16A double pole	(2NO)	1	301/C16DP
25A double pole	(2NO)	1	301/C25DP
40A double pole	(2NO)	3	302/C40DP
25A triple pole	(3NO)	2	302/C25TP
40A triple pole	(3NO)	3	303/C40TP
63A triple pole	(3NO+1NC)	3	303/C63TP
25A four pole	(4NO)	2	302/C25FP
63A four pole	(4NO)	3	303/C63FP
100A four pole	(4NO)	3	303/C100FP
9mm ventilation module		0.5	301/CS

- Ventilation module **301/CS** must be fitted every 2 contactors when mounting contactors side by side

Impulse relays

	Main pole configuration	Modules	List No.
16A single pole*	(1NO)	1	301/I161
16A double pole*	(2NO)	1	301/I162
16A single pole*	(1NO+1NC)	1	301/I16CO

* With manual override facility

Bell transformer

	Modules	List No.
(6, 8, 12V)	2	303/B12

Twilight switch IP54

2-2000 lux c/w sensor	3	303/P2
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COMB BUSBARS

TYPE	End fed (A)	Ctr fed (A)	Ways	Length	List No.
SP fork	110	220	56	998	CMCB1056
DP fork	65	130	29	1035	CMCB2029
TP fork	65	130	20	1065	CMCB3020
35mm Feeder block (set of 3)					18DC35
End Caps Three Phase & Two Phase					CMCBEC3



CM-PLUS



303/TS24

302/TD1

301/S7



301/C16DP

301/C25DP

303/63TP

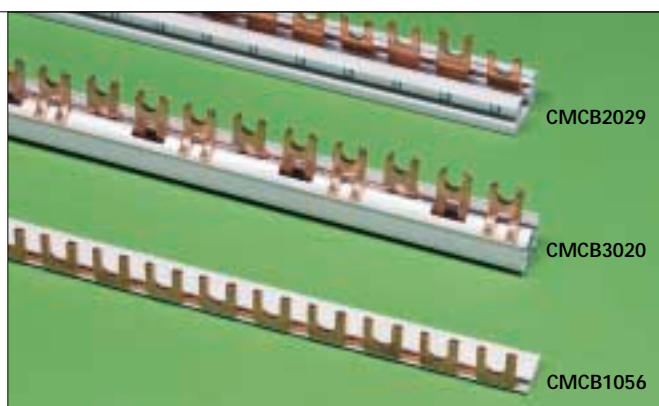
301/CS



301/I16CO

301/I162

303/P2



CMCB2029

CMCB3020

CMCB1056



FUSESTAR

FUSE-COMBINATION UNITS

Fusestar has been designed to exceed the requirements of EN 60947-3 and IEC 947-3, to ensure quality and competitiveness. Suitable for isolation of circuits, with a utilisation category AC23A and a Fused short-circuit capacity of 80kA. With the installer in mind, Fusestar combines convenience with practical solutions for circuit protection.

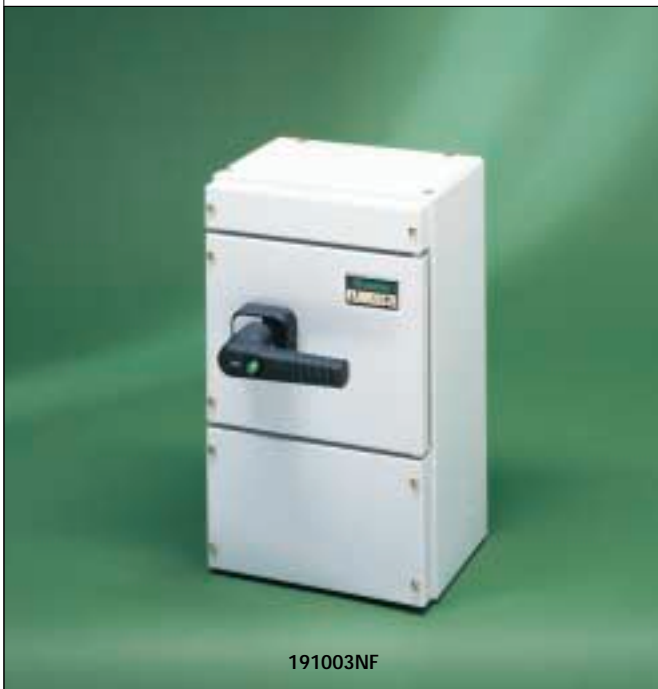
- Robust steel enclosures with cable glanding plate supplied top and bottom
- Current rating marked on exterior
- Removable door opens through 180° for ease of access
- Easy access fuse link fixings
- Fully rated neutral
- Fully shrouded terminals
- Handle padlocking facility locks switch & door in off position
- Option of Castell Interlock
- Large cable terminal capacity
- Ingress protection to IP4X
- Positive indication of On and Off
- Reversible enclosure
- Modular sizes

Paint finished in light grey RAL 7035 epoxy powder coating.

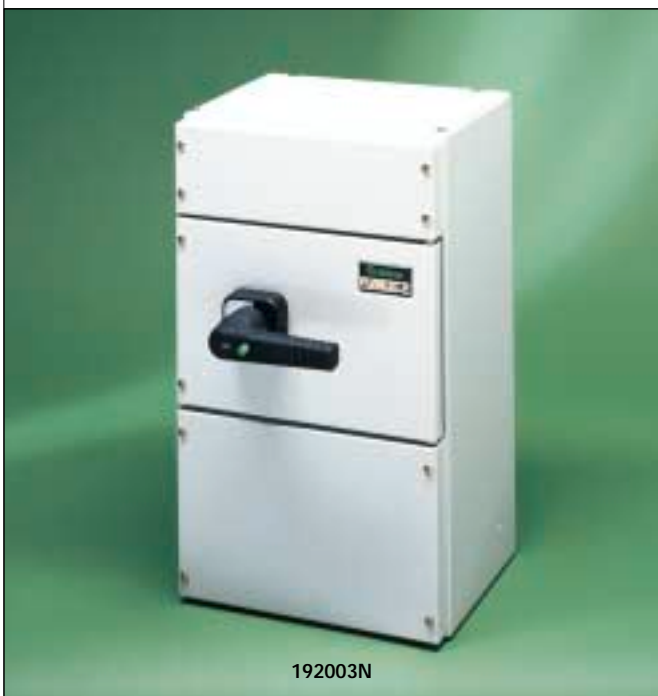




190323NF



191003NF



192003N

HOUSED FUSE COMBINATION UNIT 20A-32A

20A	SP&N TP TP&N 4P	supplied with 20A fuses	190201NF 190203F 190203NF 190204F	
32A	SP&N TP TP&N 4P	supplied with 32A fuses	190321NF 190323F 190323NF 190324F	
Accessories	Cable Spreader Box Copper Isolator Link Each Castell Lock (factory fitted)		19032CSB 19L32 Add suffix CLK	
Modular width			4	
Terminals	20A–32A	10mm ² Max	Clamp Type	
Spreading room up to 10mm ² 4 Core *				
Dimension	H	W	D	D inc. handle
Housed unit	210	210	105	191
Cable spreader	105	210	105	
Knockouts	2x20mm	1x25mm	Both Ends	

FUSE COMBINATION UNIT 63A-125A

63A	SP&N TP TP&N 4P	supplied with 63A fuses	190631NF 190633F 190633NF 190634F	
100A	SP&N TP TP&N 4P	supplied with 100A fuses	191001NF 191003F 191003NF 191004F	
125A	SP&N TP TP&N 4P	supplied with 125A fuses	191251NF 191253F 191253NF 191254F	
Accessories	Cable Spreader Box Copper Isolator Link Each Castell Lock (factory fitted)		19125CSB 19L200 Add suffix CLK	
Modular width			5	
Terminals	63A–125A		M8	
Spreading room		up to 70mm ² 4 Core *		
Cable lug palm size		22mm wide Maximum		
Dimension	H	W	D	D inc. handle
Housed unit	420	262.5	157.5	243
Spreader box	105	262.5	157.5	
Knockouts	1x25mm	1x32mm	1x40mm	Both Ends

FUSE COMBINATION UNIT 160A-200A

160A	SP&N	no	191601N	
	TP	fuses	191603	
	TP&N	supplied	191603N	
	4P		191604	
200A	SP&N	no	192001N	
	TP	fuses	192003	
	TP&N	supplied	192003N	
	4P		192004	
Accessories	Cable Spreader Box		19200CSB	
	Copper Isolator Link Each		19L200	
	Castell Lock (factory fitted)		Add suffix CLK	
Modular width			6	
Terminals	160A–200A		M8	
Spreading room		up to 150mm ² 4 Core *		
Cable lug palm size		22mm wide Maximum		
Dimension	H	W	D	D inc. handle
Housed unit	525	315	210	296
Spreader box	105	315	210	

Technical Specification

EN 60947-3	IEC 947-3
80kA RMS Fused Short Circuit Capacity	AC23A Utilisation Category
415V ac Rated Voltage	Full Uninterrupted Duty

* Spreading Room is allowed for at one end only. To fit a 4 core cable at both ends an additional Cable spreader box will be required. Above 22mmV cable lugs terminal interphase barriers are required. 1 Module = 52.5mm

FUSE COMBINATION UNIT 315A-400A

315A	TP TP&N 4P	no fuses supplied	193153 193153N 193154
400A	TP TP&N 4P	no fuses supplied	194003 194003N 194004
Accessories	Cable Spreader Box Copper Isolator Link Each Castell Lock (factory fitted)		19400CSB 19L400 Add suffix CLK
Modular width			8
Terminals		315A-400A	M12
Spreading room		315A up to 240mm ² 4 Core * 400A up to 300mm ² 4 Core *	
Cable lug palm size		315A 35mm wide Maximum 400A 50mm wide Maximum	
Dimension	H	W	D
Housed unit	735	420	210
Spreader box	210	420	210



FUSE COMBINATION UNIT 630A-800A

630A	TP TP&N 4P	no fuses supplied	196303 196303N 196304
800A	TP TP&N 4P	no fuses supplied	198003 198003N 198004
Accessories	Cable Spreader Box Copper Isolator Link Each Brass Gland Plate Castell Lock (factory fitted)		19800CSB 19L800 19800BGP Add suffix CLK
Modular width			12
Terminals		630A-800A	4 x M8 1 x M16
Spreading room		up to 630mm ² 4 Core *	
Cable lug palm size		80mm wide Maximum see Page 7 for details	
Dimension	H	W	D
Housed unit	840	620	262.5
	210	620	262.5

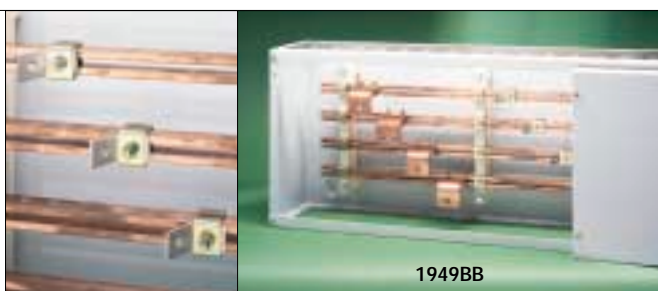
Technical Specification

EN 60947-3	IEC 947-3
80kA RMS Fused Short Circuit Capacity	AC23A Utilisation Category
415V ac Rated Voltage	Full Uninterrupted Duty



BUS BAR CHAMBER

400A	TP&N		1949BB
Dimension	H	W	D
	367.5	840	189.5
Modular width			16
Terminals	4 x 400A Maximum Supplied 4 x 250A Maximum Supplied		M8 M8
Fault rated			31.5kA 1Sec



SWITCH MOUNTING PLATES

20A-32A	4 MOD	1932MTG
63A-125A	5 MOD	19125MTG
160A-200A	6 MOD	19200MTG
315A-400A	8 MOD	19400MTG

BLANK FILLER PLATES

1 Mod	191BL
2 Mod	192BL
4 Mod	194BL
8 Mod (Not Shown)	198BL

Note: Bus Bar chamber supplied with 1 - Mod = 52.5
2 x 4 Mod, 2 x 2 Mod & 2 x 1 Mod Blank Filler Plates

250A	Bus Bar Terminal Each	19TMBB
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* Spreading Room is allowed for at one end only. To fit a 4 core cable at both ends an additional Cable spreader box will be required.

1 Module = 52.5mm



FUSESTAR

ISOLATION

Crabtree Fusestar Isolation Insulated and Steel Enclosed Switches provide secure isolation for a range of commercial and Industrial applications.

- High electrical endurance with AC 23 and AC 22 ratings
- Rated for load make and break
- Padlockable off as standard
- All insulated enclosures to IP65 and steel versions to IP4X
- Steel enclosures conform to fusestar modular sizes

Colour RAL7035, steel enclosures epoxy powder paint finish



HOUSED SWITCHES STEEL ENCLOSURE

Rating (A)	Box Size	TP/DP	TP&N/SP&N	TP&SWN
20	1	190203SW1	190203NSW1	190204SW1
32	1	190323SW1	190323NSW1	190324SW1
40	1	190403SW1	190403NSW1	190404SW1
63*	1	190633SW1	190633NSW1	190634SW1
63*	2	190633SW2	190633NSW2	190634SW2
100	2	191003SW2	191003NSW2	191004SW2
125	2	191253SW2	191253NSW2	191254SW2



19020NSW1

190633NSW2

FUSE COMBINATION UNITS

Rating (A)	Box Size	TP/DP	TP&N/SP&N	TP&SWN
20	2	19203SFF	19203NSFF	19204SFF
32	2	19323SFF	19323NSFF	19324SFF



19203NSFF

19323NSFF

INSULATED SWITCHES (TP&N)

Rating (A)	Box Size	Yellow/Red Handle	Black/Grey Handle
16	A	15416/11	15416/12
25	A	15425/11	15425/12
32	B	15432/11	15432/12
40	B	15440/11	15440/12
63	C	15463/11	15463/12
80	D	15480/11	15480/12
100	D	154100/11	154100/12
125	E	154125/11	154125/12

- Switches are TP & Neutral link
 - Gland Fixings are Metric sizes
 - Optional Switched Neutral
- 15416/11 & 15416/12 have Non-Interlocked handles.



ACCESSORIES

Description	LIST No.
Neutral Link 63amp	19963
125amp	199125
Auxiliary Switch 10amp	19701

Terminal Shrouds

SP	16-63amps (set of 2)	19811
TP	16-63amps (set of 2)	19813
SP	63-125amps (set of 2)	19821
TP	63-125amps (set of 2)	19823

Switched 4th Pole

16A	198164
32A	198324
40A	198404
63A	198634
80A	198804
100A	1981004
125A	1981254

- Add on 4th Pole. Match rating to Switch Rating

* For 500V supplies and above use box size 2, 63A switches give highest ratings, see technical page 80 for details. Box size 2 has increased cable spreading space.
One Fusestar module = 52.5mm





POWERSTAR 125

Powerstar 125 MCCB Panel Boards offer 250A or 400A fault rated, fully shrouded busbar systems in a modular enclosure system.

The 630mm wide enclosure system combined with Powerstar G Frame MCCB's and a wide range of optional modular accessory housings, provides a competent flexible main or sub-main distribution board.

MCCBs

Powerstar G Frame moulded case circuit breakers are double insulated and are designed for high performance circuit protection in main and sub-main distribution systems.

- 25kA fault breaking capacity
- 25A - 125A ratings in single and triple pole
- 70mm² cable clamp terminals or 10mm flat bar
- Full range of accessories including sealable terminal covers
- Tested and fully compliant with BSEN 60947-2

ENCLOSURES

- Fault rated 25kA 1 sec 250A/400A bus bars
- Fully shrouded bus bars
- Excellent access to N/E bars for cabling
- Optional MCB and modular device enclosures with 200A outgoing circuit module
- 630mm wide with full or partial lockable doors
- Fully conforms with BSEN 60943-1 form 2

Paint finished in light grey RAL 7035 epoxy powder coating.





17G2508SW

250A SWITCH-DISCONNECTOR CONTROLLED

	Outgoing ways	Modular Height	Height (mm)	LIST No
250A	6	17	902.5	17G2506SW
	8	17	902.5	17G2508SW
	12	20	1060	17G2512SW
	16	23	1217.5	17G2516SW

- BSEN 60439
- 250A Busbars
- Busbar fault rated 25kA–1 sec
- IP31 (41 with door) Ingress Protection
- Earth and neutral terminals for each SP way
- 630mm wide x 165mm deep
- 120 mm² 4 Core Max on Incoming Terminals
- 70 mm² 4 Core Max on Outgoing Terminals



17G2008MB

200A MCCB CONTROLLED

	Outgoing ways	Modular Height	Height (mm)	LIST No
200A	6	17	902.5	17G2006MB
	8	17	9002.5	17G2008MB
	12	20	1060	17G2012MB
	16	23	1217.5	17G2016MB

- BSEN 60439
- 250A Busbars
- Busbar fault rated 25kA–1 sec
- IP31 (41 with door) Ingress Protection
- Earth and neutral terminals for each SP way
- 630mm wide x 165mm deep
- 120 mm² 4 Core Max on Incoming Terminals
- 70 mm² 4 Core Max on Outgoing Terminals



17G2508DC

250A DIRECT CONNECTION/FUSE-SWITCH

	Outgoing ways	Modular Height	Height (mm)	LIST No
250A	6	17	902.5	17G2506DC
	8	17	902.5	17G2508DC
	12	20	1060	17G2512DC
	16	23	1217.5	17G2516DC

Fuse-Switch Connection unit

200A **17G25FS**

200A TP&N Housed Fuse-Switch

192003N

200A 4P Housed Fuse-Switch

192004

See page 22 & 23 for complete range of Fuse Combination units

- Conforms to BSEN 60439
- 250A Busbars
- Busbar fault rated 25kA–1 sec
- IP31 (41 with door) Ingress Protection
- Earth and neutral terminals for each SP way
- 630mm wide x 165mm deep
- 120 mm² 4 Core Max on Incoming Terminals
- 70 mm² 4 Core Max on Outgoing Terminals

All Powerstar 125 enclosures are 630mm wide x 165mm deep x modular height
1 Module = 52.5mm.

400A SWITCH-DISCONNECTOR CONTROLLED

	Outgoing ways	Modular Height	Height (mm)	LIST No
400A	6	20	1060	17G4006SW
	8	20	1060	17G4008SW
	12	23	1217.5	17G4012SW
	16	26	1375	17G4016SW

- BSEN 60439
- 400A Busbars
- Busbar fault rated 25kA–1 sec
- IP31 (41 with door) Ingress Protection
- Earth and neutral terminals for each SP way
- 630mm wide x 165mm deep
- 240mm² 4 Core Max on Incoming Terminals
- 70 mm² 4 Core Max on Outgoing Terminals



17G4008SW

400A MCCB CONTROLLED

	Outgoing ways	Modular Height	Height (mm)	LIST No
400A	6	20	1060	17G4006MB
	8	20	1060	17G4008MB
	12	23	1217.5	17G4012MB
	16	26	1375	17G4016MB

- Conforms to BSEN 60439
- 400A Busbars
- Busbar fault rated 25kA–1 sec
- IP31 (41 with door) Ingress Protection
- Earth and neutral terminals for each SP way
- 630mm wide x 165mm deep
- 240mm² 4 Core Max on Incoming Terminals
- 70 mm² 4 Core Max on Outgoing Terminals



17G4008MB

400A DIRECT CONNECTION/FUSE-SWITCH

	Outgoing ways	Modular Height	Height (mm)	LIST No
400A	6	20	1060	17G4006DC
	8	20	1060	17G4008DC
	12	23	1217.5	17G4012DC
	16	26	1375	17G4016DC

Fuse-Switch Connection kit

400A	17G40FS
400A TP&N Housed Fuse-Switch	194003N
400A 4P Housed Fuse-Switch	194004

See page 22 & 23 for complete range of Fuse Combination units

- Conforms to BSEN 60439
- 400A Busbars
- Busbar fault rated 25kA–1 sec
- IP31 (41 with door) Ingress Protection
- Earth and neutral terminals for each SP way
- 630mm wide x 165mm deep
- 240mm² 4 Core Max on Incoming Terminals
- 70 mm² 4 Core Max on Outgoing Terminals



17G4008DC

All Powerstar 125 enclosures are 630mm wide x 165mm deep x modular height
1 Module = 52.5mm.

**17G13DB****MCB DISTRIBUTION BOARD/MODULE ENCLOSURE****Single Pole Distribution Board**

Outgoing 1P ways	Modular Height	Height (mm)	LIST No
13	4	210	17G13DB

- BSEN 60947-2
- 125A Busbar
- Accepts all Polestar MCBs, see page 6
- 630mm wide x 165mm deep

Control Module Enclosure

18mm modules	Modular Height	Height (mm)	LIST No
24	4	210	17G24SS

- Accepts all DIN rail mounted devices (see page 19)

Cable spreader box

	Modular Height	Height (mm)	LIST No
	4	210	17GCSB

- For larger cables up to 300mm² 4 Core on 400A unit

**17G200MB1****MCCB OUTGOING HOUSING**

Rating (A)	Height	(mm)	LIST No
200	8	420	17G200MB1

- Includes all interconnections
- Accepts J/JM Frame MCCBs up to 200A
- Fits above all panel boards
- IP31
- 630mm wide x 165mm deep

J/MJ FRAME MCCB

Rating (A)	J3 Pole LIST No	JM 3 Pole LIST No
125	7PBJN3125	7PBJN3M125
160	7PBJN3160	7PBJN3M160
200	7PBJN3200	7PBJN3M200

**16PL****16CL****17BP****POWERSTAR 125 ACCESSORIES**

Description	LIST No
Door kits with catch	
4 mod	17G04DR
8 mod	17G08DR
9 mod	17G09DR
11 mod	17G11DR
12 mod	17G12DR
15 mod	17G15DR
17 mod	17G17DR
20 mod	17G20DR
Door Cylinder lock	16CL
Door Padlock device	16PL
Blanking Kit 3 x TP ways	17BP

Overall doors available up to 20 mod.
 2 doors can be used for 23 and 26 mod units.
 To cover 250A Incomer section 8 mod door required.
 To cover 400A Incomer section 11 mod door required.
 To cover Outgoers only, subtract respective Incomer module size from overall modular height.

1 POLE G FRAME MCCBs

- Conforms to BSEN 60947-2
- 16kA Icu at 240V ac
- Fixed magnetic
- Fixed thermal
- Double insulated
- Terminal Capacity 70mm²

Rating (A)	LIST No
25	7PBGB125
32	7PBGB132
40	7PBGB140
50	7PBGB150
63	7PBGB163
80	7PBGB180
100	7PBGB1100
125	7PBGB1125

**3 POLE G FRAME MCCBs**

- Conforms to BSEN 60947-2
- 25kA Icu at 415V ac
- Fixed magnetic
- Fixed thermal
- Double insulated
- Large range of accessories
- Terminal Capacity 70mm²

Rating (A)	LIST No
25	7PBGN325
32	7PBGN332
40	7PBGN340
50	7PBGN350
63	7PBGN363
80	7PBGN380
100	7PBGN3100
125	7PBGN3125

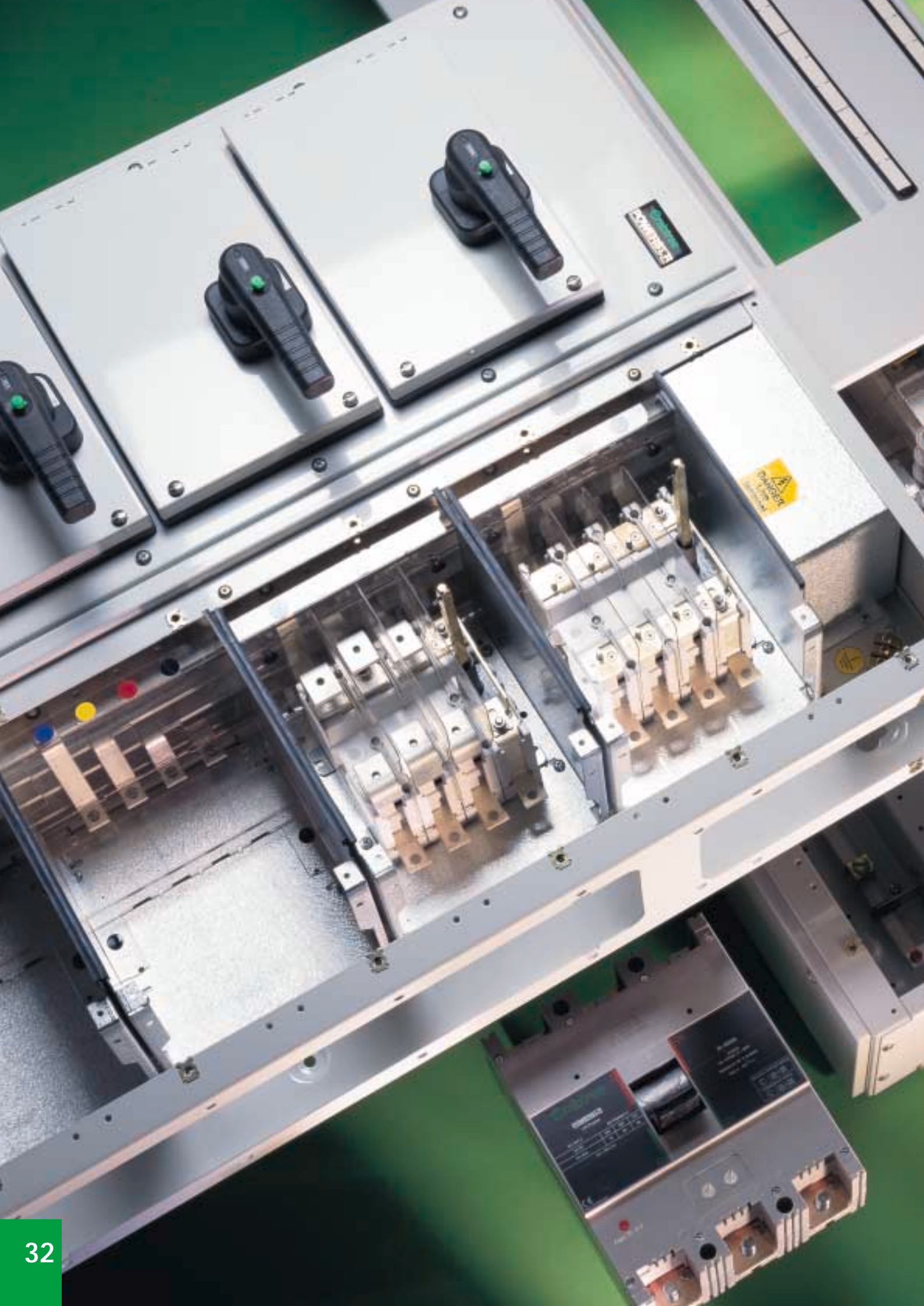
**POWERSTAR G FRAME MCCBs ACCESSORIES**

Description	LIST No
Dolly and padlocking facility	17SPF
Padlock to fit	748
1P Terminal Shroud	7PAGS1
3P Terminal Shroud	7PAGS3
AUXILIARY EQUIPMENT*	
Auxiliary Contacts	
1 x 1 n.o./n.c. Volt Free	7PAGA1
2 x 1 n.o./n.c. Volt Free	7PAGA2
Shunt Release and Auxiliary Contact	
24V dc	7PAGT024
115V ac	7PAGT115
230V ac	7PAGT230

Auxiliary equipment can only be fitted within triple pole devices.
7PAGA1 or 7PAGA2 cannot be fitted if shunt release is installed.



* 16kA version available. Please contact Crabtree



POWERSTAR

POWERSTAR 200

Based on high performance MCCBs, combination Fuse Switches and modular enclosures, Powerstar offers flexible circuit protection systems.

Complete Panel Boards for commercial and industrial applications can quickly be self assembled, or factory assembled for immediate installation on delivery.

For supplies above 800 Amps the Powerstar 200 factory assembled range is available. With main horizontal busbars up to 1200 Amps, factory-built 200mm deep multi section switchboards are available for higher load requirements.

Powerstar technology complies with all relevant British & European Standards. Crabtree's technical services, and team of national sales engineers will be pleased to advise on the most effective solution for your application.



POWERSTAR 200

Designed for wall or floor mounting in 200 mm deep standard modules. Powerstar 200 offers a flexible comprehensive range of self assembly panel boards, for incoming supplies up to 800 Amps.

Main and sub-main switchboards can be constructed from standard modules. Included in the range are options for integral MCB boards, instruments and general purpose enclosures.

There are incoming options for MCCB's, Fuse Combination Units or Direct Connect up to 300mm² cable. For small panels one busbar mounted device can be used for the incoming supply.

Cabling options are maximised by the use of add on cableways for cables above 70 mm². Removable plates on cableway modules provides excellent cabling access.

Form 2 and form 4 enclosures are available. Dependant on selection, up to 200A (J Frame & Fuse Switch), or 250A (F Frame MCCB), outgoing circuits are available in the self assembly range.

Conforming with BSEN 60439, enclosures are finished in Epoxy polyester powder coat process colour light grey RAL 7035.



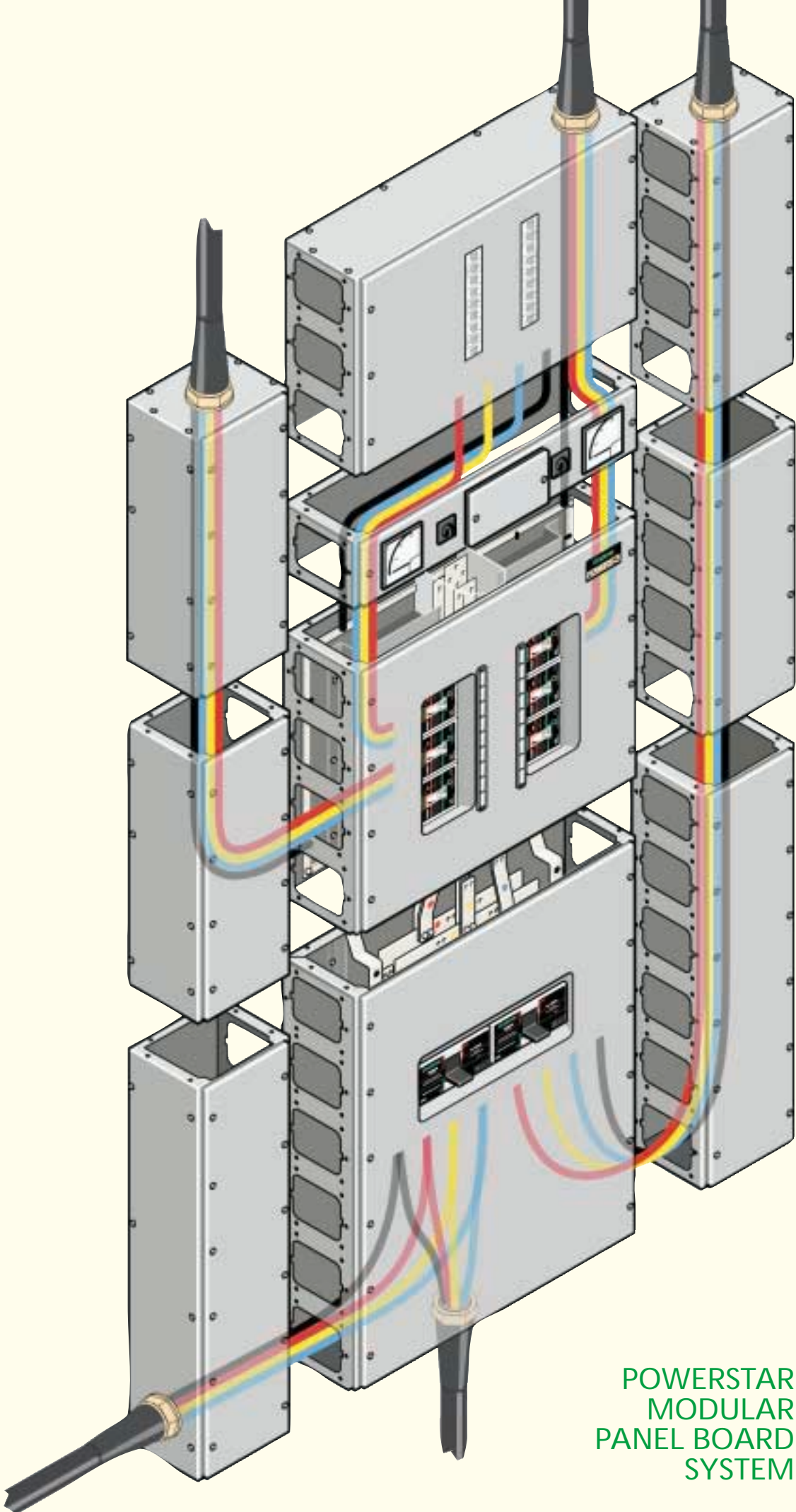
POWERSTAR 200 FUSE COMBINATION SYSTEM

- 800A, 50kA for 1 sec 4 Pole busbars fully shielded
- Outgoing fuse combination units of 63, 100, 125, 160 and 200 Amp
- TP, TPN and 4P switches can be fitted
- Additional modules can be added later

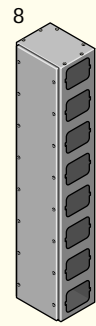
POWERSTAR 200 MCCB SYSTEM

- Designed to accommodate J & JM frame MCCB's to 200 Amp rating
- 3 Pole and single pole MCCB's from 25 – 200A can be fitted with optional modules for circuits up to 800 Amps
- Dual Incomer options available for mains/ generator setups
- Cable entry can be top, bottom or side
- F Frame version up to 250A and 50kA

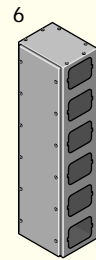




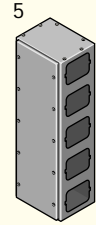
POWERSTAR
MODULAR
PANEL BOARD
SYSTEM



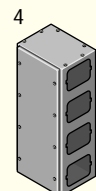
17CK8
14kg



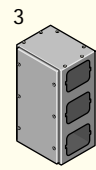
17CK6
12kg



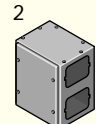
17CK5
10kg



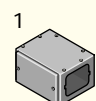
17CK4
8kg



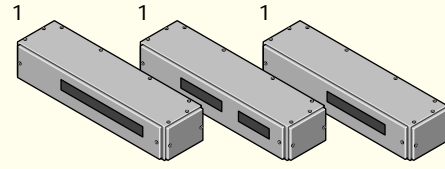
17CK3
6kg



17CK2
4kg

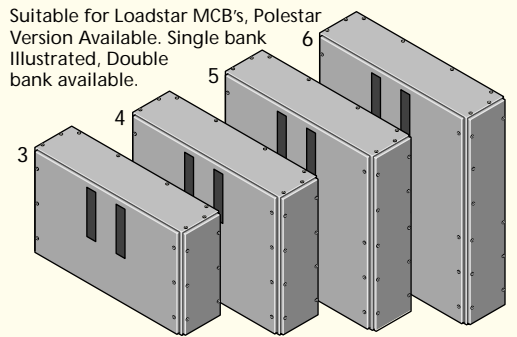


17CK1
2kg

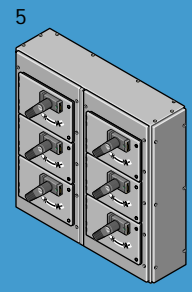
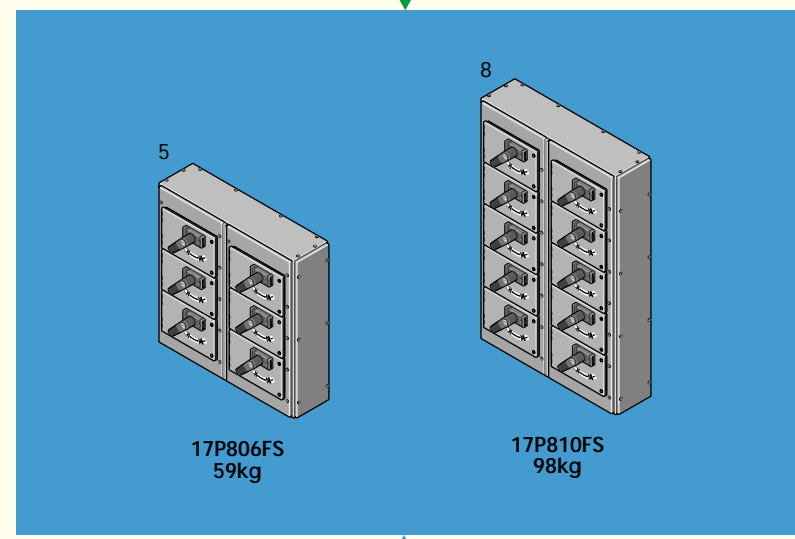


17DS24 15kg 17DS1012 10kg 17DS17 11kg

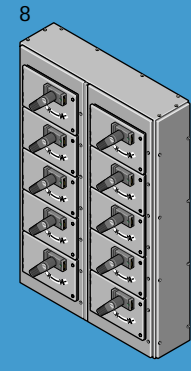
Suitable for Loadstar MCB's, Polestar Version Available. Single bank Illustrated, Double bank available.



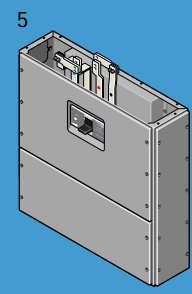
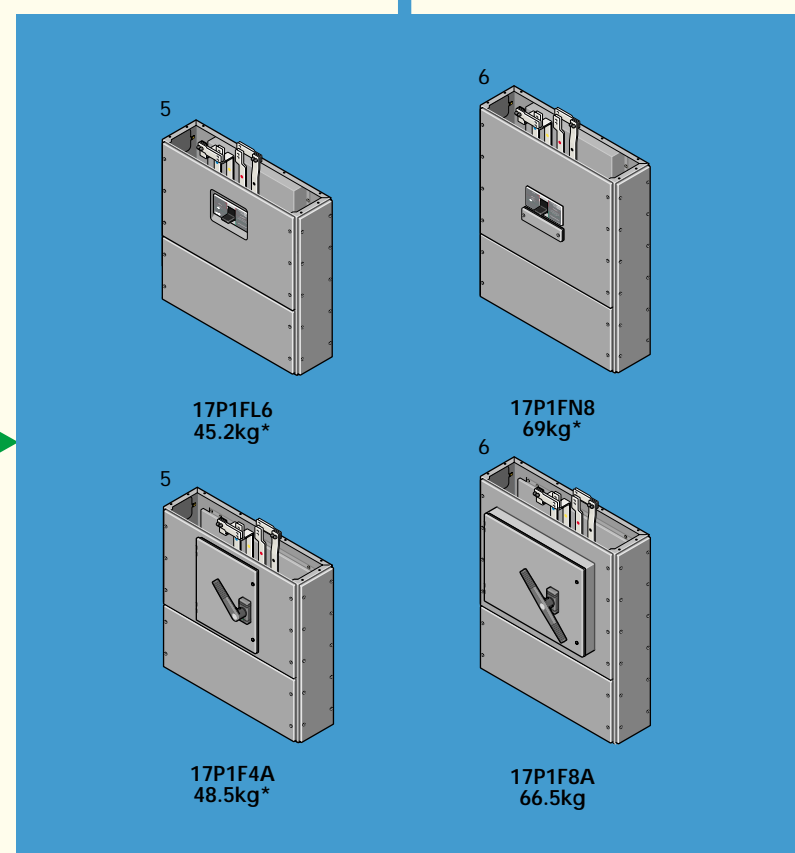
17DT106 23kg 17DT108 28kg 17DT112 30kg 17DT116 34kg



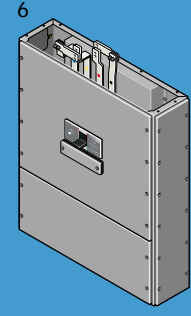
17P806FS
59kg



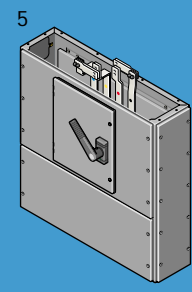
17P810FS
98kg



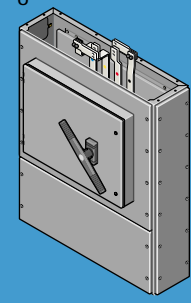
17P1FL6
45.2kg*



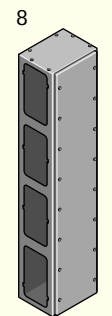
17P1FN8
69kg*



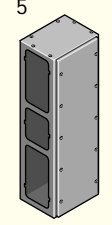
17P1F4A
48.5kg*



17P1F8A
66.5kg



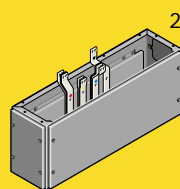
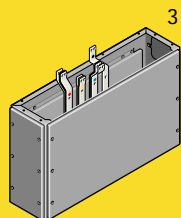
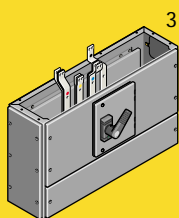
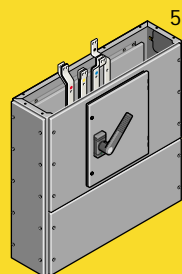
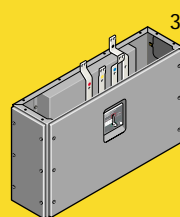
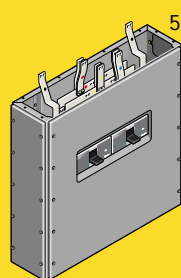
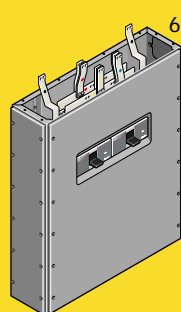
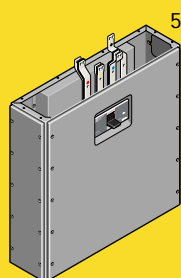
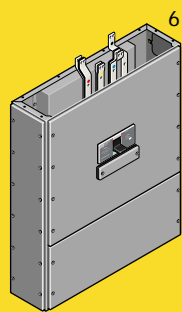
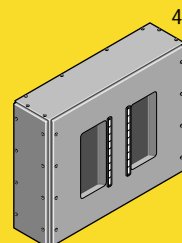
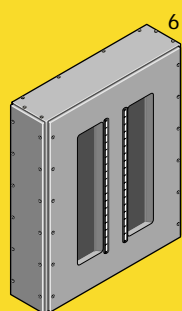
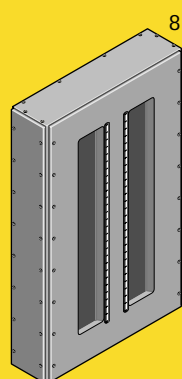
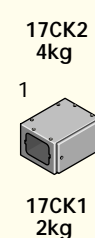
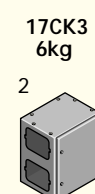
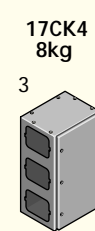
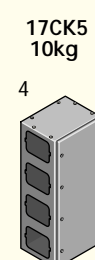
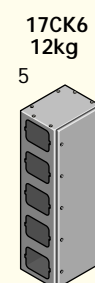
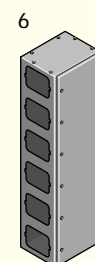
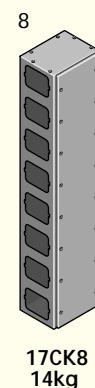
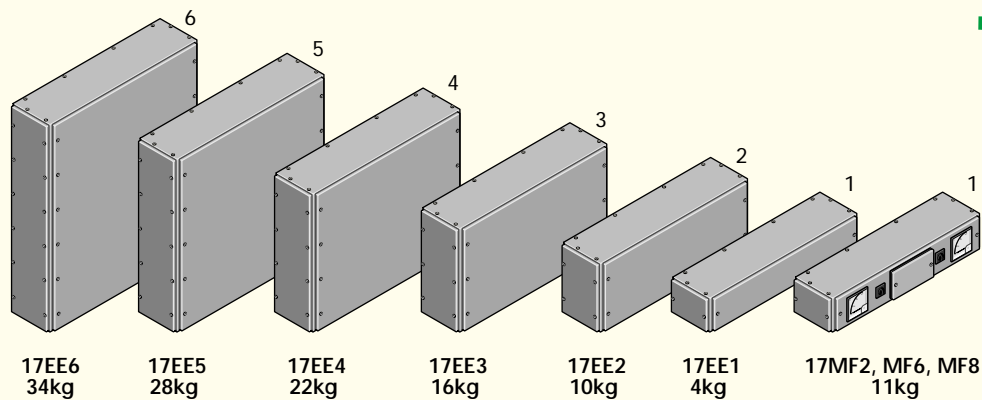
17CK8FS
14kg



17CK5FS
8kg

Powerstar 200
This diagram outlines how standard modules integrate to build a simple or complex powerstar panel board.

For full product details, accessories and doors see following pages.



*Devices not included

F Frame MCCB version not Illustrated



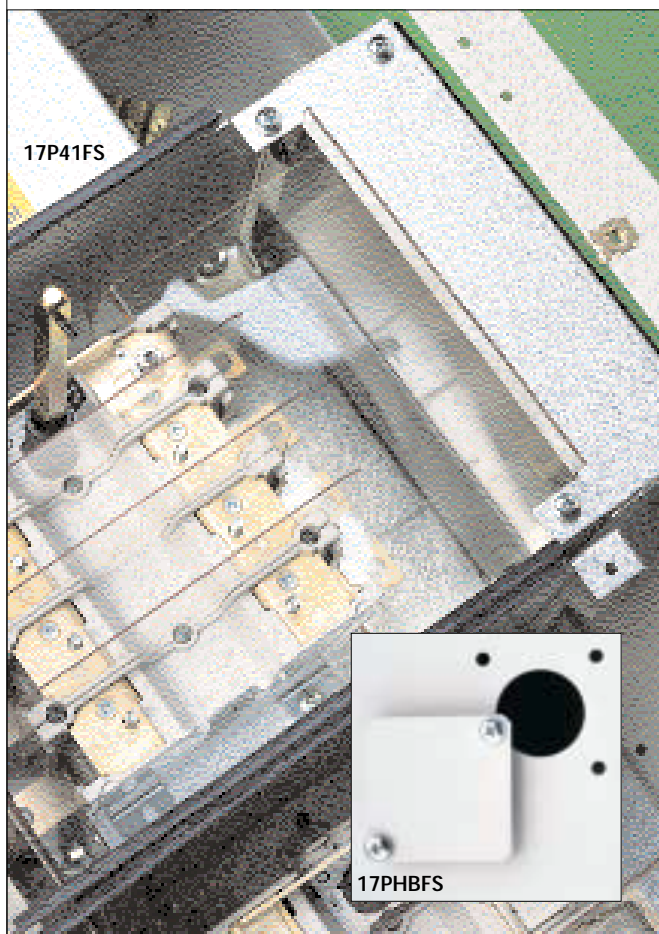
17P810FS

17P806FS



17P1F8A

17P1FL6



17P41FS

17PHBFS

FUSE-SWITCH PANEL BOARDS

	Outgoing ways	Modular Height	Height (mm)	LIST No
800A	6	5	762	17P806FS
	10	8	1219	17P810FS

- Conforms to BS EN 60439
- 800A Busbars
- Busbars fault rated 50kA–1 sec
- Neutral fully rated
- Form 2 as standard with optional Form 4 shielding
- IP31 Ingress Protection

For selection of outgoing devices see page 39

If outgoing cables are larger than 70mm² Add-on cable way units are recommended.

ADD-ON INCOMING UNITS

	Maximum Rating (A)	Modular Height	Height (mm)	LIST No
Fuse Switch	400	5	762	17P1F4A
	800	6	914	17P1F8A
MCCB LS/LH N	630†	5	762	17P1FL6
	800	6	914	17P1FN8

- Supplied with all necessary copper connections
- Incoming terminations fully shrouded
- IP31 Ingress Protection

Fuse-switch device see page 39

MCCB device see page 46

†Top Cable Entry must be used for LS/LH MCCBs above 32kA.

GENERAL ACCESSORIES

Description	LIST No
Interconnection Vertical connection kit for 400A panel board	17PVKFS
Shields Blank cover plate for fuse-switch handle	17PHBFS
Form 4 shield for outgoing cables 70mm ² max.	17P41FS
Form 4 shield for outgoing cables 150mm ² max.	17P42FS

If 17P41FS or 17P42FS shield is used, a Cableway is recommended.

All Powerstar 200 enclosures are 750mm wide (plus 7mm for each side plate and screw heads) x 200mm deep x modular height.
1 module = 152mm.

FUSESTAR FUSE COMBINATION UNITS 63A – 200A

	Poles	LIST No
63A	3P+N	19S0633N
	4P	19S0634
100A	3P+N	19S1003N
	4P	19S1004
125A	3P+N	19S1253N
	4P	19S1254
160A	3P+N	19S1603N
	4P	19S1604
200A	3P+N	19S2003N
	4P	19S2004

Accessories

Solid link 63A/200A each	19L200
Castell lock mounting kit	19CLK
Castell lock with key (symbol DS1)	19FS2

Terminals	63A – 200A	M8
-----------	------------	----

Cable lug palm size	22mm wide maximum
---------------------	-------------------

- Conforms to BS EN 60947-3
- 80kA RMS Fused Short Circuit Capacity
- 415V ac Rated Voltage
- AC23A Utilisation Category
- Full Uninterrupted Duty



19S1003N

FUSESTAR FUSE COMBINATION UNITS – 400A

	Poles	LIST No
400A	3P+N	19S4003N
	4P	19S4004

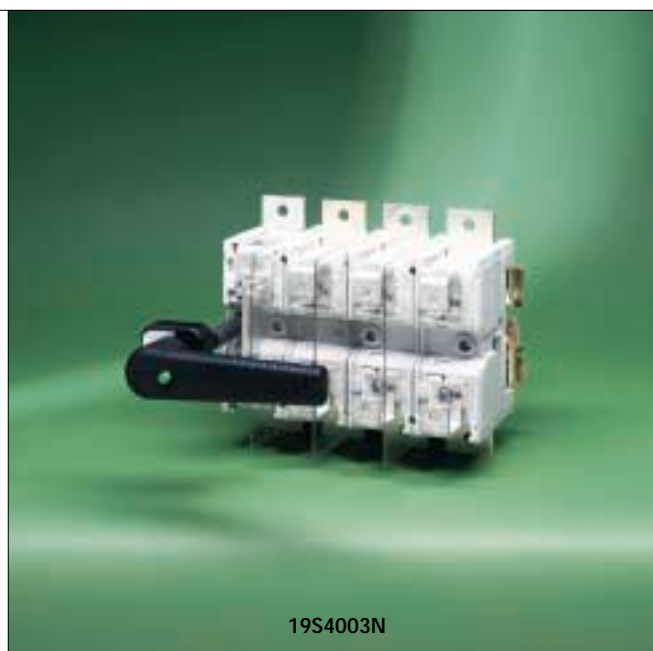
Accessories

Solid link 400A each	19L400
Castell lock mounting kit	19CLK
Castell lock with key (symbol DS1)	19FS2

Terminals	M8
-----------	----

Cable lug palm size	50mm wide maximum
---------------------	-------------------

- Conforms to BS EN 60947-3
- 80kA RMS Fused Short Circuit Capacity
- 415V ac Rated Voltage
- AC23A Utilisation Category
- Full Uninterrupted Duty



19S4003N

FUSESTAR FUSE COMBINATION UNITS 630A – 800A

- Conforms to BS EN 60947-3
- 80kA RMS Fused Short Circuit Capacity
- 415V ac Rated Voltage
- AC23A Utilisation Category
- Full Uninterrupted Duty

	Poles	LIST No
630A	3P+N	19S6303N
	4P	19S6304
800A	3P+N	19S8003N
	4P	19S8004

Accessories

Solid link 800A each	19L800
*Castell lock mounting kit	19CLK
*Castell lock with key (symbol DS1)	19FS2

Terminals	1 – M16 or 4 x M8
-----------	-------------------

Cable lug palm size	80mm wide maximum
---------------------	-------------------

- Conforms to BS EN 60947-3
- 80kA RMS Fused Short Circuit Capacity
- 415V ac Rated Voltage
- AC23A Utilisation Category
- Full Uninterrupted Duty



19S6303N

If Fusestar Combination Unit is mounted in the left hand side of Powerstar Panel Board, Castell interlock can not be installed. Castell interlock is only available for right hand side fitment.



J FRAME MCCB PANEL BOARDS (FORM 2)

	Outgoing ways	Modular Height	Height (mm)	LIST No
400A	6	4	609	17P406
	12	6	914	17P412
	18	8	1219	17P418
800A	6	4	609	17P806
	12	6	914	17P812
	18	8	1219	17P818
Door kits	6	4	–	17PD06
	12	6	–	17PD12
	18	8	–	17PD18

- Conforms to BS EN 60439
- Fully Shielded Busbars
- IP31 Ingress Protection
- Accommodates SP + TP J Frame MCCBs up to 200A
- 750mm wide x 200mm deep

See page 44 for selection of J Frame MCCBs.
Above panelboards only accept 1P & 3P J/JM Frame MCCBs



F FRAME PANEL BOARDS (FORM 2)

	Outgoing Ways	Modular Height	Height (mm)	LIST No	DOOR KITS
400A	6	4	609	17P406F	17PD06
	12	6	914	17P412F	17PD12
	18	8	1219	17P418F	17PD18
800A	6	4	609	17P806F	17PD06
	12	6	914	17P812F	17PD12
	18	8	1219	17P818F	17PD18

DOOR LOCKING

Cylinder lock/key kit for door kits	16CL	-
Padlocking kit for door kits	16PL	-
Padlock	748	-

FRONT SHIELD BLANKING PIECE 3 Pole MCCB	17BBPF	-
--	---------------	---

PANEL BOARD STACKING KIT

Vertical connection kit for 400A panelboard	17LK4	-
Vertical connection kit for 800A panelboard	17LK8	-

BUSBAR TERMINALS

Busbar 'flag' extensions with shield	17SKE	-
(Required if connecting housing units to both ends of busbar).		

See page 45 for selection of F Frame MCCBs.



F FRAME PANEL BOARDS (FORM 4)

	Outgoing Ways	Modular Height	Height (mm)	LIST No	DOOR KITS
800A	6	5	762	17P4406F	17PD06
	10	8	1219	17P4810F	17PD10

FORM 4 SHIELDS

Suitable for outgoing cables up to 70mm ²	17S41F	-
Suitable for outgoing cables up to 150mm ²	17S42F	-

DOOR LOCKING

Cylinder lock/key kit for door kits	16CL	-
Padlocking kit for door kits	16PL	-
Padlock	748	-

FRONT SHIELD BLANKING PIECE 3 Pole MCCB	17BBPF	-
--	---------------	---

PANEL BOARD STACKING KIT

Vertical connection kit for 800A panelboard	17FLK4	-
---	---------------	---

NEUTRAL TERMINALS

Neutral Terminal supplied in each outgoing compartment accepts cables up to 50mm ² by utilising MCCB cable clamps.		
Removable neutral link option.	17FNL	-

- To achieve separation to Form 4 according to BS EN 60439-1, Form 4 shielding as detailed above must be ordered separately
- See page 45 for selection of F Frame MCCBs.

INCOMING OPTIONS MCCB

MCCB Housing	Maximum Rating (A)	Modular Height	Height (mm)	LIST No
J Frame	200	3	457	171J2
L Frame	630†	5	762	171L6
N Frame	800	6	914	171N8
L Frame (x 2)	400	5	762	172L4
L Frame (x 2)	630†	6	914	172L6

See pages 34 - 36 for MCCBs.

All incoming devices to be ordered separately.

† Top cable entry must be used for L Frame MCCBs above 32kA fault levels.



172L4

171J2

INCOMING OPTIONS FUSE SWITCH

Fuse-Switch Housing	Maximum Rating (A)	Modular Height	Height (mm)	LIST No
200	200	3	23	17FS2
400	400	5	38	17FS4

See pages 22 - 23 for Fusestar Fuse-switch units.

Adaptor kit to enable housed Fusestar units to feed MCCB panel board

Kit including connections, to fit 192003N

17FSK2

Kit including connections, to fit 194003N

17FSK4

See pages 22 - 23 for Housed Fusestar units.



17FSK4

17400D

Direct connection	400	2	305	17400D
	800	3	457	17800D

- Supplied with all necessary copper connections
- IP31 Ingress Protection

ACCESSORIES

Description	LIST No
Door Locking	
Cylinder lock/key kit for door kits	16CL
Padlocking kit for door kits	16PL
Padlock	748
MCCB Terminal shroud kits	
1 Pole	17TS1100
3 Pole	17TS3100
Fixed terminal shroud	
1 Pole MCCB	17BOS
Blanking piece	
1 Pole MCCB	17BBP
Interconnection (Bus Bar Links)	
Vertical linking kit for 400A panel board	17LK4
Vertical linking kit for 800A panel board	17LK8
Busbar extensions with shield	17SKE
(Required if connecting to both ends of busbar)	



16PL

16CL

17TS1100

17TS3100



17BOS

17BBP



17LK4

17LK8



GENERAL PURPOSE AND MCCB ADD-ON CABLEWAY UNITS

	Width	Modular Height	Height (mm)	LIST No
Cableway Units	250	1	152	17CK1
	250	2	305	17CK2
	250	3	457	17CK3
	250	4	609	17CK4
	250	5	762	17CK5
	250	6	914	17CK6
	250	8	1219	17CK8
Vertical insulation kits		5	–	17IP5
		6	–	17IP6
		8	–	17IP8
Accessories				
Brass End Plate				17CB
Alum (4mm) End Plate				17GCA

- IP31 Ingress Protection
- Recommended for cables above 70mm²

FORM 4 & FUSE-SWITCH ADD-ON CABLEWAY UNITS

	Outgoing ways	Modular Height	Height (mm)	LIST No
Cableway Units	6	5	762	17CK5FS
	10	8	1219	17CK8FS
Accessories				
Brass End Plate				17CB
Aluminium (4mm) End Plate				17GCA

- 250mm wide
- IP31 Ingress Protection

GENERAL PURPOSE ENCLOSURES

	Modular Height	Height (mm)	LIST No
Empty enclosures (Complete with front plate)	1	152	17EE1
	2	305	17EE2
	3	457	17EE3
	4	609	17EE4
	5	762	17EE5
	6	914	17EE6
Accessories			
Horizontal insulation kit			17EPK
Brass end plate			17EB
Aluminium (4mm) end plate			17GEA

- Wide range of modular sizes
- IP31 Ingress Protection

All Powerstar 200 enclosures are 750mm wide (plus 7mm for each side plate and screw heads) x 200mm deep x modular height.
1 module = 152mm

MCB DISTRIBUTION BOARDS (Polestar MCBs)

	Modular Height	Height (mm)	Enclosure LIST No	Door Kit LIST No
TP + N Distribution boards				
TP Ways				
(Single units)				
6	3	456	17TB06	17TDR06
8	4	608	17TB08	17TDR08
10	4	608	17TB10	17TDR10
12	5	760	17TB12	17TDR12
16	6	912	17TB16	17TDR16
(Double units)				
6 x 2	3	456	17T2B6	17T2DR6
8 x 2	4	608	17T2B8	17T2DR8
10 x 2	5	760	17T2B10	17T2DR10
12 x 2	5	760	17T2B12	17T2DR12
SP+N Distribution boards				
SP Ways				
6	1	152	17A6	-
9	1	152	17A9	-
13	1	152	17A13	-
Service Centres DIN (18mm)				
24	1	152	17TDR01	-
Door lock/key kit for above	-	-	-	16CL
Door Padlock Device	-	-	-	16PL

- Conforms to BS EN 60439-3
- Fully shielded busbars and interconnections
- IP41 (with door fitted)
- Accepts all Polestar MCBs



17A13

MCB DISTRIBUTION BOARDS (Loadstar MCBs)

	Modular Height	Height (mm)	Enclosure LIST No	Door Kit LIST No
SP + N Distribution boards				
17 MCB ways	1	152	17DS17	17D1DS
TP+N Distribution boards				
6 TP MCB ways	2	305	17DT106	17D1D06
12 TP MCB ways	3	457	17DT112	17D1D12
16 TP MCB ways	4	609	17DT116	17D1D16
2 x 4 TP MCB ways	2	305	17DT204	17D2D04
2 x 8 TP MCB ways	3	457	17DT208	17D2D08
2 x 12 TP MCB ways	4	609	17DT212	17D2D12
Door lock/key kit for above	-	-	-	16CL
Door Padlock Device	-	-	-	16PL

- Conforms to BS EN 60439-3
- Fully shielded busbars and interconnections
- Space saving 'Twin' distribution board option
- IP41 (with door fitted)

A one module general purpose enclosure 17EE1 will assist in cabling



AMMETER/VOLTMETER ENCLOSURES

	Modular Height	Height (mm)		LIST No
Ammeter/Voltmeter				
(Complete with Meters,	1	152	250/5A CT	17MF2
switch and 3 loose CTs)	1	152	630/5A CT	17MF6
	1	152	800/5A	17MF8
Accessories				
Horizontal insulation kit				17EPK
Brass end plate				17EB
Aluminium (4mm) end plate				17GEA
Back up fuse enclosures				
1 Set HRC fuse carriers (160A max.)				17DU1
2 Sets HRC fuse carriers (160A max.)				17DU2

- Supplied complete with meters, selector switches and CTs
- Pre wired
- Compact modular construction
- IP41



17MF2



J FRAME MCCBs

Current Rating (A)	Minimum Setting (A)	1 Pole LIST No	3 Pole LIST No	3 P SwN LIST No
25	17.5	7PBJN125	7PBJN325	7PBJN3N25
32	22.5	7PBJN132	7PBJN332	7PBJN3N32
40	28	7PBJN140	7PBJN340	7PBJN3N40
50	35	7PBJN150	7PBJN350	7PBJN3N50
63	44	7PBJN163	7PBJN363	7PBJN3N63
80	56	7PBJN180	7PBJN380	7PBJN3N80
100	70	7PBJN1100	7PBJN3100	7PBJN3N100
125	88	7PBJN1125	7PBJN3125	7PBJN3N125
160	112	7PBJN1160	7PBJN3160	7PBJN3N160
200	140	7PBJN1200	7PBJN3200	7PBJN3N200
Switch Disconnector		7PDJ1200	7PDJ3200	7PDJ3N200



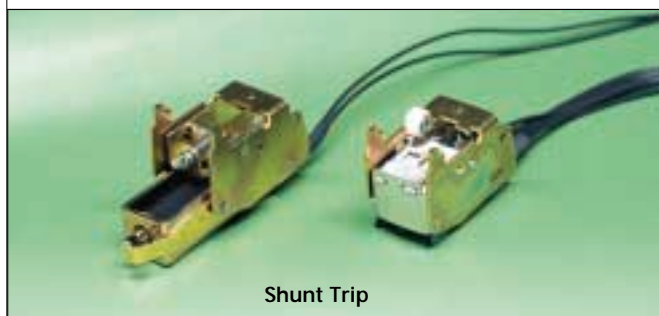
JM FRAME MOTOR DUTY MCCBs

Current Rating (A)	Minimum Setting (A)	3 Pole LIST No
50	35	7PBJN3M50
63	44	7PBJN3M63
80	56	7PBJN3M80
100	70	7PBJN3M100
125	88	7PBJN3M125
160	112	7PBJN3M160
200	140	7PBJN3M200
Switch Disconnector		7PDJN3M200

- Conforms to BS EN 60947-2
- Magnetic fixed
- 25kA Icu at 415V ac
- Thermal adjustable 70 – 100%

See page 93 for kW/HP selection data.

*Switched neutral fitted on left hand side as standard, unless right hand side requested.



J/JM FRAME MCCB ACCESSORIES

Description	Rating (V ac)	Rating (V dc)	LIST No
Auxiliary equipment			
Under voltage release	220/240	–	7PAJU240
UVR (dual rating)	110/120 & 380/415		7PAJU415
Shunt trip	18/30	12/36	7PAJT30
	31/63	37/51	7PAJT63
	61/169	52/69	7PAJT169
	170/299	70/99	7PAJT299
	300/443	100/179	7PAJT443
	444/550	180/250	7PAJT550
Aux Switch (pair, c.o.)	480	250	7PAJA2
Rotary handles			
Direct mounting	including padlocking facility including cylinder lock including Castell lock		7PAJHP 7PAJHL 7PAJHC
Accessories			
Dolly padlocking device			7PAJPD
Padlock for dolly locking device			7PAJPP



Shunt Trips are supplied with 2 auxiliary switches, but utilise only 1, leaving 1 free.

UVRs are supplied with an external power pack (10VA).

3 POLE F FRAME MCCBs

Current Rating (A)	LIST No 35 kA	LIST No 50 kA
25	7PBFS325	7PBFH325
32	7PBFS332	7PBFH332
40	7PBFS340	7PBFH340
50	7PBFS350	7PBFH350
63	7PBFS363	7PBFH363
80	7PBFS380	7PBFH380
100	7PBFS3100	7PBFH3100
125	7PBFS3125	7PBFH3125
160	7PBFS3160	7PBFH3160
200	7PBFS3200	7PBFH3200
250	7PBFS3250	7PBFH3250
Magnetic Trip Only		
250	7PDFS3250	7PDFH3250

- Conforms to BSEN 60947-2
- 35/50 kA Icu at 415 V ac
- Fixed Magnetic
- Fixed Thermal
- Double Insulated
- Large range of accessories
- Terminal capacity 185mm²



POWERSYSTEM MCCB ACCESSORIES

Auxiliary Equipment	Rating	LIST No
Under Voltage Release	110 V ac	7PAFU110
	240 V ac	7PAFU240
	415 V ac	7PAFU415
Shunt Trip	24 V dc	7PAFT024
	110 V ac	7PAFT110
	240 V ac	7PAFT240
	415 V ac	7PAFT415
Auxiliary Switches	1 x 1 n.o./n.c.	7PAFA1
	2 x 1 n.o./n.c.	7PAFA2
Trip Indicator Switch	1 x 1 n.o./n.c.	7PAFT1
Rotary Handle		
Remote mounting (270mm panel depth) and door interlock		7PAFHR270
Accessories		
3 Pole terminal shroud		7PAFS1
Dolly padlocking facility		7PAFPD
Padlock		748
3 Cable Clamps		7PAFCC

- Undervoltage releases and shunt trips, please check availability with Crabtree Technical.





LS FRAME MCCBs

Current Rating (A)	Minimum Setting (A)	3 Pole LIST No	3 P SwN LIST No
250	175	7PBL33250	7PBL3N250
315	221	7PBL33315	7PBL3N315
400	280	7PBL3400	7PBL3N400
500	350	7PBL3500	7PBL3N500
630	441	7PBL3630	7PBL3N630
800	560	7PBL3800	7PBL3N800

- Conforms to BS EN 60947-2
- 32kA Icu at 415V ac
- Magnetic adjustable 5 – 10 rated current 250A – 315A
- Magnetic adjustable 4 – 10 rated current 400A – 800A
- Thermal adjustable 70 – 100% rated current

Switch neutral fitted on left hand side unless requested right hand side.



LH FRAME MCCBs

Current Rating (A)	Minimum Setting (A)	3 Pole LIST No	3 P SwN LIST No
250	175	7PBLH3250	7PBLH3N250
315	221	7PBLH3315	7PBLH3N315
400	280	7PBLH3400	7PBLH3N400
500	350	7PBLH3500	7PBLH3N500
630	441	7PBLH3630	7PBLH3N630
800	560	7PBLH3800	7PBLH3N800

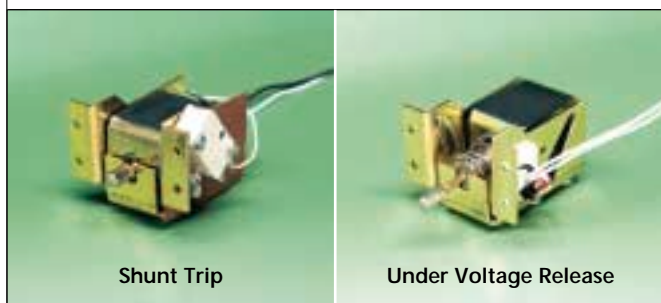
LH Frame Switch Disconnectors

Current Rating (A)	Minimum Setting (A)	3 Pole LIST No	3 P SwN LIST No
400	–	7PDLH3400	7PDLH3N400
630	–	7PDLH3630	7PDLH3N630
800	–	7PDLH3800	7PDLH3N800

- Conforms to BS EN 60947-2
- 50kA Icu at 415V ac
- Magnetic adjustable 5 – 10 rated current 250A – 315A
- Magnetic adjustable 4 – 10 rated current 400A – 800A
- Thermal adjustable 70 – 100% rated current

LH Frame Load connections (bottom), and Line connections (top) must be observed to obtain 50kA rating.

Switch neutral fitted on left hand side unless requested right hand side.



LS/LH FRAME MCCB ACCESSORIES

Description	Rating (V ac)	Rating (V dc)	LIST No
Auxiliary equipment			
Under voltage release	110	–	7PALU110
	240	–	7PALU240
	415	–	7PALU415
Shunt trip	100/110	–	7PALT110
	200/240	–	7PALT240
	380/415	–	7PALT415
	–	24/36	7PALT36
Aux Switch (pair, c.o.)	480	250	7PALA2
Rotary handles			
Direct mounting	including padlocking facility including cylinder lock including Castell lock		7PALNH 7PALNHL 7PALNHC
Accessories			
Dolly padlocking device			7PALNHPD
Padlock for dolly locking device			7PALNHPP
Dolly extension			7PANDE



Shunt Trips are supplied with and utilise 1 auxiliary switch as a cut off to the coil supply.

N FRAME MCCBs

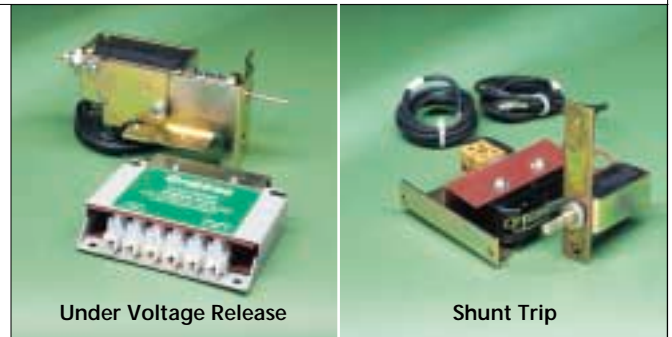
	3 Pole with Front Terminals
Current Rating (A)	LIST No
600	7PBNH3600FF
800	7PBNH3800FF
1000	7PBNH31000FF
1250	7PBNH31250FF
1600	7PBNH31600FF
Switch Disconnectors	
1250 Amp	7PDN31250FF
1600 Amp	7PDN31600FF
	3 Pole with Rear Terminals
Current Rating (A)	LIST No
600	7PBNH3600TT
800	7PBNH3800TT
1000	7PBNH31000TT
1250	7PBNH31250TT
1600	7PBNH31600TT
Switch Disconnectors	
1250 Amp	7PDN31250TT
1600 Amp	7PDN31600TT
<ul style="list-style-type: none"> • Conforms to BS EN 60947-2 • 50kA Icu at 415V ac • Magnetic adjustable (See chart on page 92) • Thermal adjustable (See chart on page 92) • Front/Back terminal combinations to special order. 	



7PBNH3800FF

N FRAME MCCB ACCESSORIES

Description	Rating (V ac)	Rating (V dc)	LIST No
Auxiliary equipment			
Under voltage release	220/240	–	7PANU240
UVR (dual rating)	110/120 & 380/440		7PANU415
Shunt trip	18/30	12/36	7PANT30
	31/63	37/51	7PANT63
	61/169	52/69	7PANT169
	170/299	70/99	7PANT299
	300/443	100/179	7PANT443
	444/550	180/250	7PANT550
Aux Switch (one pair, c.o.)	480	250	7PANA1
Aux Switch (two pairs, c.o.)	480	250	7PANA4
Rotary handle			
Direct mounting	including padlocking facility		7PALNH
	including cylinder lock		7PALNHL
	including Castell lock		7PALNHC
	Tripped position indicator switch		7PANT1
	Remote handle -300mm shaft and door interlock		7PALNHR300
Accessories			
Padlocking device			7PANPD
Padlock for above device			7PANRPP
Spare dolly extension			7PANDE
Castell interlock (Direct mounting)			7PANC



Under Voltage Release

Shunt Trip



Dolly Padlocking Device



Rotary Handle

Shunt Trips are supplied with and utilise 1 auxiliary switch as a cut off to the coil supply.
 UVRs are supplied with an external power pack (10VA).
 For replacement trip units – please contact technical sales.



17GPJ100

173GPJ100

173GPJ250

17GPL08

POWERSTAR MCCB ENCLOSURES

Current Rating (A)	Frame Size	1 Pole LIST No	3 Pole LIST No	3 P SwN LIST No	Height (mm)	Width (mm)	Depth (mm)
25 - 100	J	17GPJ100	173GPJ100	174GPJ100	380	202	95
125 - 200	J	17GPJ250	173GPJ250	174GPJ250	570	258	115
250 - 800	L	-	17GPL08	174LGPL	975	340	165
600 - 800	N front terms	-	17GPN08	-	975	340	165
1000 - 1600	N rear terms	-	17GPN16	-	1111	762	328

1 Pole and 3 Pole units complete with neutral link.

• IP31 General Purpose enclosures



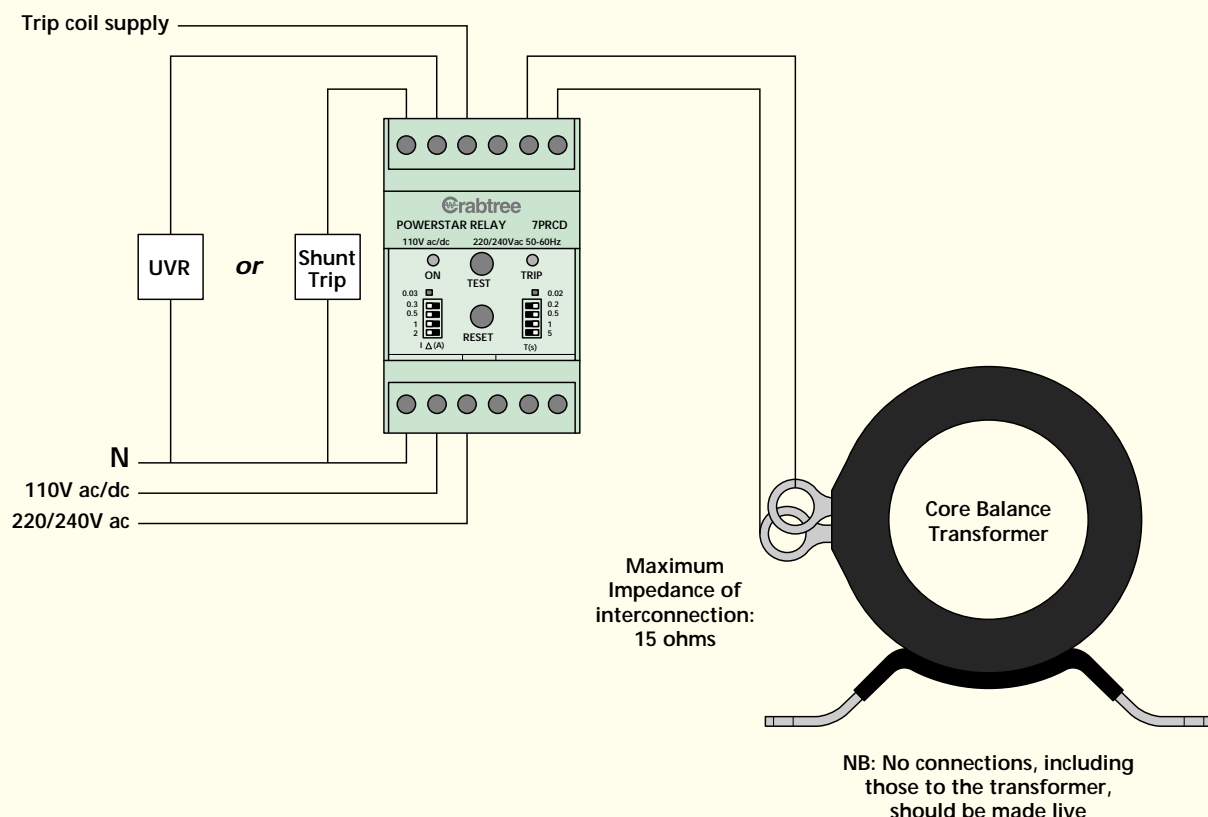
17RJ200

ASSEMBLED EARTH FAULT UNITS

MCCB Current Rating (A)	Frame Size	Type	3 Pole* LIST No	4 Pole LIST No
32	J	MCCB	17RBJ32	17RBJ324
63	J	MCCB	17RBJ63	17RBJ634
100	J	MCCB	17RBJ100	17RBJ1004
160	J	MCCB	17RBJ160	17RBJ1604
200	J	MCCB	17RBJ200	17RBJ2004
200	J	Magnetic only MCCB	17RJD200	17RJD2004
315	LH	MCCB	17RBLH315	17RBLH3154
400	LH	MCCB	17RBLH400	17RBLH4004
500	LH	MCCB	17RBLH500	17RBLH5004
630	LH	MCCB	17RBLH630	17RBLH6304
800	LH	MCCB	17RBLH800	17RBLH8004
800	LH	Magnetic only MCCB	17RDLH800	17RDLH800

- Pre-wired, ready to install
- IP31
- MCCB controlled via 240V shunt trip
- Time delay adjustable 0.02, 0.2, 0.5, 1 Sec & 5 Sec
- Sensitivity adjustable 30mA, 300mA, 500mA, 1A & 2A
- Other ratings to special order

* 3 Pole units include neutral link.



POWERSTAR EARTH FAULT RELAY

- No nuisance tripping
- Adjustable time delay 0.02-5 secs
- Wide range of auxiliary voltages
- DIN Rail Mounting
- Choice of 30mA or 20A Sensitivity
- BS4293 CE123-18 CEE27 DIN43880

EARTH FAULT RELAY SYSTEM

Sensitivity Range (mA)	Primary Circuit Max Rating (A)	CT Aperture Diameter			
		30mm	55mm	90mm	280 x 70mm
30/300/500 (1A/2A)	250	7PRCD+7PCT250	–	–	–
	630	–	7PRCD+7PCT630	–	–
	1000	–	–	7PRCD+7PCT1000	–
300 800 (3A/5A/10A/20A)	–	–	–	7PRCD+7PTC1600	–
	1600	–	–	–	7PRCD+7PT1600

RCD RELAY COMPONENTS

Description	LIST No
Relay System	
RCD Relay	7PRCD
Current Transformers	
250A Toroidal CT	7PCT250
630A Toroidal CT	7PCT630
1000A Toroidal CT	7PCT1000
1600A Toroidal CT	7PCT1600
1600A Stadium Toroidal CT	7PT1600

- Flexible earth fault sensing system suitable for tripping circuit breakers up to 1600A rating fitted with shunt trip or UVR
- Advanced circuitry constantly monitors both the relay CT and the selected sensitivity



7PRCD 7PCT250 7PCT630 7PCT1000 7PCT1600



IP66 ENCLOSURES

Crabtree IP66 Enclosures are available in a range of standard and custom sizes to provide ingress protection for distribution and control systems. Supplied with backplates and reversible lockable doors.

- IP66 ingress protection to IEC529, BSEN 60529
- Internal and door earth studs provided
- Loadstar and Polestar MCB versions available as standard
- Custom built IP66 distribution equipment available
- Stainless steel versions available

Polyester paint finish, providing good resistance to UV and weathering, light textured to colour RAL7035, in a five stage process including iron phosphate undercoat.

IP66 STEEL ENCLOSURES

Height	Width	Depth	LIST No
300	200	150	E66/302015
300	300	150	E66/303015
300	400	150	E66/304015
300	400	210	E66/304021
300	300	210	E66/303021
400	300	150	E66/403015
400	300	210	E66/403021
400	400	210	E66/404021
400	600	210	E66/406021
500	300	210	E66/503021
500	400	210	E66/504021
500	500	210	E66/505021
600	400	210	E66/604021
600	500	210	E66/605021
600	600	210	E66/606021
600	600	300	E66/606030
600	800	300	E66/608030
800	600	300	E66/806030
800	800	300	E66/808030
1000	800	300	E66/1008030
1200	600	300	E66/1206030
1200	800	300	E66/1208030
1200	1000	300	E66/12010030



POLESTAR IP66 STEEL ENCLOSURES

TP Ways	Height	Width	Depth	LIST No
4	800	500	215	IP1604/OB
6	800	500	215	IP1606/OB
8	800	500	215	IP1608/OB
12	1000	500	215	IP1612/OB
16	1200	500	215	IP1616/OB

Please select incoming device from page 7.
MCCB controlled version not available.



LOADSTAR IP66 DISTRIBUTION BOARDS

TP Ways	Height	Width	Depth	LIST No
4	800	500	215	IP18LS04
6	800	500	215	IP18LS06
8	800	500	215	IP18LS08
12	1000	500	215	IP18LS12
16	1200	500	215	IP18LS16

Please select incoming device from page 14.
MCCB controlled version not available.





FACTORY-BUILT ASSEMBLIES

The Crabtree standard product range is complemented by extensive facilities for the design and manufacture of factory-built assemblies.

Made to exacting standards, Crabtree design, engineer and build distribution equipment, from custom MCB boards for specific applications, to modular main switchboards.

Our Technical Services staff will provide advice and quotations for the application of Crabtree products, co-ordinating them with your project requirements.



C50

CIRCUIT PROTECTION

This comprehensive range of distribution equipment has established itself as one of the most reliable distribution systems available.

MCBs

- Magnetic/hydraulic mechanism which is unaffected by temperatures related to extreme climates
- Available in single, double, triple pole and RCBO configurations
- Proven technology

SP & N Consumer Units

- Designed to accept banks of single pole MCBs
- Extensive, flexible range of metal-clad units supplied as separate box and front plate arrangements

TP & N Distribution Boards

- Designed to accept any combination of C50 single, double and triple pole MCBs and RCBOs
- All boards are fitted with phase, neutral and earthing busbars, associated MCB connection straps and phase-identified barriers

MINIATURE CIRCUIT BREAKERS (MCB)

Current rating (A)	Single pole List No	Double pole List No	Triple pole List No
5	50/05	52/05	53/05
7.5	50/075	52/075	53/075
10	50/10	52/10	53/10
15	50/15	52/15	53/15
20	50/20	52/20	53/20
30	50/30	52/30	53/30
40	50/40	–	53/40
50	50/50	52/50	53/50
60	50/60	52/60	53/60

Single pole & neutral MCBs (List Nos. 51/_ _ series) available on enquiry.

Triple pole & neutral MCBs (List Nos. 64/_ _ series) available on enquiry.

MCB ratings 0.75A, 1.0A, 1.5A & 2.5A available on enquiry.

- BS EN 60898
- Type C (5–10In) classification
- Short circuit duty rating – single pole 4500A 240V 50Hz
– multi pole 4500A 240/415V 50Hz
- Nominal operating temperature range 0°C to 60°C



RESIDUAL CURRENT CIRCUIT BREAKERS WITH OVERCURRENT PROTECTION (RCBO)

Type AC: normal ac sensitivity to IEC 1009

Current rating (A)	SENSITIVITY (mA)	LIST No
5	30	5105/030
15	30	5115/030
30	30	5130/030
40	30	5140/030

30mA RCBOs with Type A protection pulsating dc sensitivity to IEC 1009

(List Nos. 51/_ _ A030 series) available to order.

10mA Type AC sensitivity available on enquiry.

CAUTION These devices are electronic units and should be disconnected from the supply during insulation and earth fault loop impedance testing.

- BS EN 61009
- MCB element type C (5–10In) classification
- Single pole and solid neutral
- Busbar mounted in consumer units and distribution boards



MAIN SWITCHES, MOULDED COVERS & METAL ENCLOSURES

Main switches, 100A	No OF POLES	LIST No
Separate mounting DIN rail (Cable in/cable out)	2	100/2MS
C50	1	81
	2	82
	3	83*
Replacement C50 main switches (including busbar connections)		
C50 consumer units	2	80/1
C50 distribution boards	3	Part No. 64986

* List No. 162/18 replacement List No. 83.

	MODULAR WAYS	LIST No
Moulded terminal covers	2	94/2
	3	94/3
Metal Enclosures	3	1/3*
	4	4/1

* Cable size not to exceed 2.5mm for multi pole MCBs.

Additional standard cable clamp & nuts	90
Set of two sealable screws & nuts	96

Ensure cable clamp is fitted on incoming terminal(s) of MCB for cable in/cable out facility.



Dimensions available on enquiry from our Technical Services Department.



ALL-INSULATED CONSUMER UNITS

MCB ways	Mounting Type	LIST No
6	Surface	256

- Wooden frame and deep moulded cover
- 100A double pole main switch control

Accessories

Moulded way blanking plate	190
Set of cover sealing screws (2)	195
Insulated backplate	295

METAL-CASED CONSUMER UNITS

Mounting type	MCB ways	Box assembly List No	+	Front plate List No	=	Consumer unit List No
---------------	----------	----------------------	---	---------------------	---	-----------------------

Without hinged protective cover

Surface	6	6/1	+	30	=	206
	9	9/1	+	31	=	209
	12	12/1	+	32	=	212
Flush	6	6/1	+	30/2	=	206/2
	9	9/1	+	31/2	=	209/2
	12	12/1	+	32/2	=	212/2

With hinged protective cover

	LIST No		SUFFIX
Surface	/1		/1
Flush	/3		/3

- Supplied as separate box assemblies and front plates to facilitate range flexibility
- 100A double pole main switch control

METAL-CASED TWIN-TARIFF CONSUMER UNITS

Mounting type	MCB ways	Box assembly List No	+	Front plate List No	=	Consumer unit List No
---------------	----------	----------------------	---	---------------------	---	-----------------------

Without hinged protective cover

Surface	5+3	25	+	32/5	=	225
	6+6	26	+	2x30	=	226*

With hinged protective cover

Surface	5+3	25	+	32/15	=	225/1
	6+6	26	+	2x30/1	=	226/1*

* Two bank boards can be flush mounted when fitted with frame List No. **33/2**.

If lockable hinged protective cover is required, add **9** to suffix of List No. eg 226/19.

MULTI-BANK PHASE & NEUTRAL DISTRIBUTION BOARDS

Mounting type	MCB ways	Box assembly List No	+	Front plate List No	=	Distribution board List No
---------------	----------	----------------------	---	---------------------	---	----------------------------

Single Phase & Neutral – One bank

Without hinged protective cover

Surface	6	6	+	30	=	106
	9	9	+	31	=	109
	12	12	+	32	=	112
Flush	6	6	+	30/2	=	106/2
	9	9	+	31/2	=	109/2
	12	12	+	32/2	=	112/2

Two Phase & Neutral – Two bank

Without hinged protective cover

Surface	6	6/2	+	2x30	=	126
	9	9/2	+	2x31	=	129
	12	12/2	+	2x32	=	132

Frame

Flush	6	6/2	+	33/2	+	2x30	=	126/2
	9	9/2	+	34/2	+	2x31	=	129/2
	12	12/2	+	35/2	+	2x32	=	132/2

Three Phase & Neutral – Three bank

Without hinged protective cover

Surface	6	6/3	+	3x30	=	176
	9	9/3	+	3x31	=	179
	12	12/3	+	3x32	=	182

Frame

Flush	6	6/3	+	33/3	+	3x30	=	176/2
	9	9/3	+	34/3	+	3x31	=	179/2
	12	12/3	+	35/3	+	3x32	=	182/2

With hinged protective cover

		LIST No	SUFFIX
	Front plate List No		Distribution board List No
Single phase & neutral One bank	Surface	/1	/1
	Flush	/3	/3
Two phase & neutral Two bank	Surface	/1	/1
	Flush	/1	/3
Three phase & neutral Three bank	Surface	/1	/1
	Flush	/1	/3

If lockable hinged protective cover is required, add **9** to suffix of List No. eg 30/19.

MCBs not included – see page 55.

Dimensions available on enquiry from our Technical Department.

TP & N DISTRIBUTION BOARDS TYPE B

Mounting type	Triple pole MCB ways	Box assembly List No	+	Front plate List No	=	Distribution board List No
---------------	----------------------	----------------------	---	---------------------	---	----------------------------

Without main switch

Surface	4	4/4	+	36/1	=	154/1
	6	6/4	+	39/1	=	156/1
	8	8/4	+	37/1	=	158/1
	10	10/4	+	40/1	=	160/1
	12	12/4	+	38/1	=	162/1

With 100A main switch

Surface	4	4/48	+	36/18	=	154/18
	6	6/48	+	39/18	=	156/18
	8	8/48	+	37/18	=	158/18
	10	10/48	+	40/18	=	160/18
	12	supplied complete			=	162/18

With 200A main switch

Surface	4					154/1/200
	6					156/1/200
	8					158/1/200
	10					160/1/200
	12					162/1/200

Flush mounting

LIST No SUFFIX

	Front plate List No	Distribution board List No
	/3	/3

If lockable hinged protective cover is required, add 9 to suffix List No. eg 154/19/200.

- Supplied as separate box assemblies and front plated to facilitate range flexibility
- 200A main switch as complete enclosure (box + cover)

BACKPLATES & BUSBAR ASSEMBLIES SP & N

MCB ways	Metal-cased consumer unit backplate List No	Distribution board backplate List No	Spare line busbar List No	Spare neutral busbar List No	Spare earthing busbar List No
4	291	-	-	-	-
6	292	192	192/2	192/1	196/1
9	293	193	193/2	193/1	197/1
12	294	194	194/2	194/1	198/1

Single bank twin-tariff

5+3 296

NOTE Main switches cannot be added to distribution board backplates. If required, use consumer unit backplates assemblies. Spare line & neutral busbars are only suitable for distribution board arrangements.

- Consumer unit & backplates complete with 100A double pole main switch(es)
- Distribution board backplate complete with line & neutral busbars
- Earthing busbar and fixing screws included with all backplates

BACKPLATE & BUSBAR ASSEMBLIES TYPE B

Triple pole MCB ways	Backplate List No	Earthing busbar List No	Terminal ways
4	290/4	190/4	12
6	290/6	190/6	18
8	290/8	190/8	24 (2x12)
10	290/10	190/10	36 (2x18)
12	290/12	190/12	36 (2x18)

NOTE Earthing busbar not included – available as separate item.

- Neutral busbar assembly included
- Termination design accepts up to 120mm² cable or cable lug connections

MCBs not included – see page 55.

Dimensions available on enquiry from our Technical Department.



ACCESSORIES

Terminals

	MAX CABLE SIZE	LIST No
Standard clamp	16mm ²	90
Heavy duty tunnel clamp	35mm ² (round)	90/1
Stud assemblies for back wiring of MCBs (set of 2)		91

NOTE Stud assemblies to be used with suitable insulated mounting plate.

Spring clip backplates

MODULAR WAYS	LIST No	MODULAR WAYS	LIST No
1	93/1	6	93/6
2	93/2	9	93/9
3	93/3	12	93/12

NOTE Ensure cable clamp is fitted on incoming terminal(s) of MCB for cable in/ cable out facility.

Safety clips & locking devices

	LIST No
MCB handle safety clip	97
MCB handle locking device	97/1*
100A triple pole switch disconnector locking device	97/3
Spare hinged cover lock assembly	99/9
Cover padlocking device	747

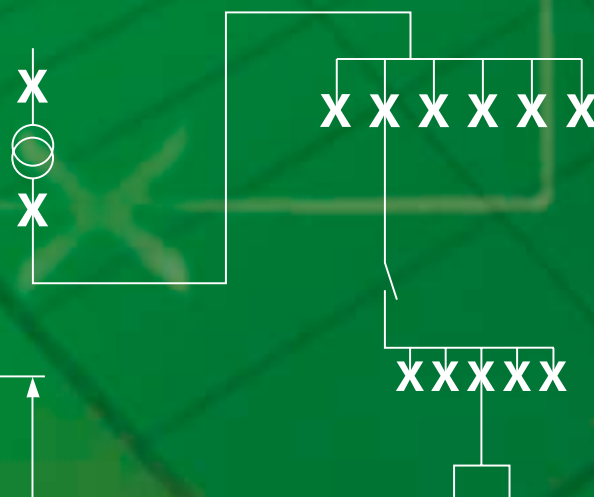
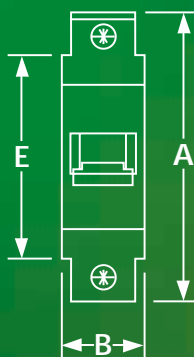
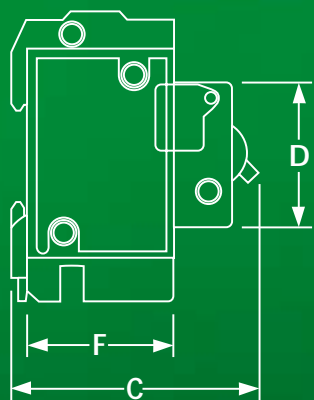
Fits all surface mounting distribution boards and consumer units – simply replaces cover fixing screws.

* If a single pole MCB is locked, neither of any adjacent single pole MCBs can be locked. Hinged covers cannot be closed with lock in position.

Neutral connector & way blanking plates

	LIST No
Neutral connector	98
Metal single way blank plate – Birch Grey	191
Moulded single way blank plate – Brown	191/1

TECHNICAL DATA & DIMENSIONS



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MCBs – GENERAL

Crabtree Polestar MCBs comply fully with BSEN60898 and therefore enable the requirements of BS7671, formerly the IEE Wiring Regulations to be met.

TYPE CLASSIFICATION

BSEN60898 specifies different tripping characteristics for different types of MCB, depending on the level of overload current required to make the MCB trip out in less than 100 milliseconds. Crabtree MCBs are available as types B, C or D, enabling installation designers to choose an MCB with a characteristic closely matched to the circuit requirement.



FAULT LEVELS

Regulation 432–02–01 of BS7671 requires that a device providing protection against overload currents and fault currents shall be capable of breaking any overcurrent up to and including the prospective fault current at the point where the device is installed.

In domestic situations this could be as high as 16kA, in industrial situations it could be even higher.

According to regulation 434–03–01, the prospective fault current can be higher than the breaking capacity of the protective device if another protective device having the necessary breaking capacity is installed on the supply side.

This means that MCBs can be backed up by devices of greater capacity such as HRC fuses.

Crabtree Polestar Type B & C, Type D and C50 MCBs can protect installations with prospective currents up to 16kA, 10kA and 4.5kA respectively without the need for back-up devices.

When providing back-up protection, consideration must be given to discrimination. Discrimination is said to occur when the device nearest the fault operates first.

AMBIENT TEMPERATURE CONSIDERATIONS

Polestar MCBs are calibrated to meet the requirements of BS EN 60898, 30°C Ref Calibration Temperature. At other temperatures the following rating factors should be used:

At 60°C 0.9 At 20°C 1.0 At 0°C 1.1

Adjacent thermal-magnetic MCBs should not be continuously loaded at or near their nominal rated currents when mounted in enclosures. It is good engineering practice to either apply generous de-rating factors or make provision for adequate free air between devices. In common with other manufacturers, we recommend a 66% diversity factor is applied to the MCB nominal rated current where it is intended to load adjacent MCBs continuously (in excess of 1 hour).

INDIRECT SHOCK RISK PROTECTION

BS7671, requires that measures are taken to protect against the risk of electric shock, which can be the result of contact with live parts.

MCBs can be used in conjunction with earthed equipotential bonding to achieve the required disconnection times of 0.4 seconds for 230V socket outlets and 5 seconds for circuits supplying fixed equipment (Regulation 413–02–08). This regulation, together with tables 41B1, 41B2 and 41D, specifies the maximum permissible earth fault loop impedance which is allowed using various protective devices.

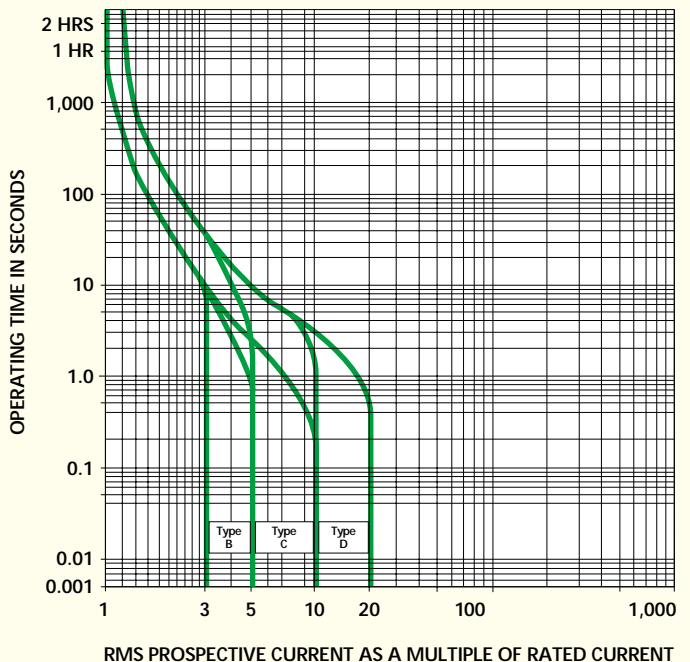
EARTH FAULT LOOP IMPEDANCES (Z_s) TO GIVE COMPLIANCE WITH BS7671 REGULATION 413-02-08 AT 230V

Maximum earth fault loop impedance in ohms for circuits supplying socket outlets (also fixed equipment in bathrooms)

DEVICE	RATINGS							
	5A	10A	15A	20A	30A	40A	45A	50A 60A
Rewireable Fuse BS3036	10.0	2.67	1.85	1.14		0.62		
Cartridge Fuse BS1361	10.9	3.43	1.78	1.20		0.60		
Type C MCB BSEN60898	4.80	2.40	1.60	1.20	0.80	0.60	0.53	0.48 0.40

DEVICE	RENARD SERIES OF RATINGS							
	6A	10A	16A	20A	32A	40A	50A	63A
HRC fuse BS88	8.89	5.33	2.82	1.85	1.09	0.86	0.63	–
Type B MCB BSEN60898	8	4.8	3	2.4	1.5	1.2	0.96	0.76
Type C MCB BSEN60898	4	2.4	1.5	1.2	0.75	0.60	0.48	0.38
Type D MCB BSEN60898	2.0	1.2	0.75	0.6	0.38	0.3	0.24	0.19

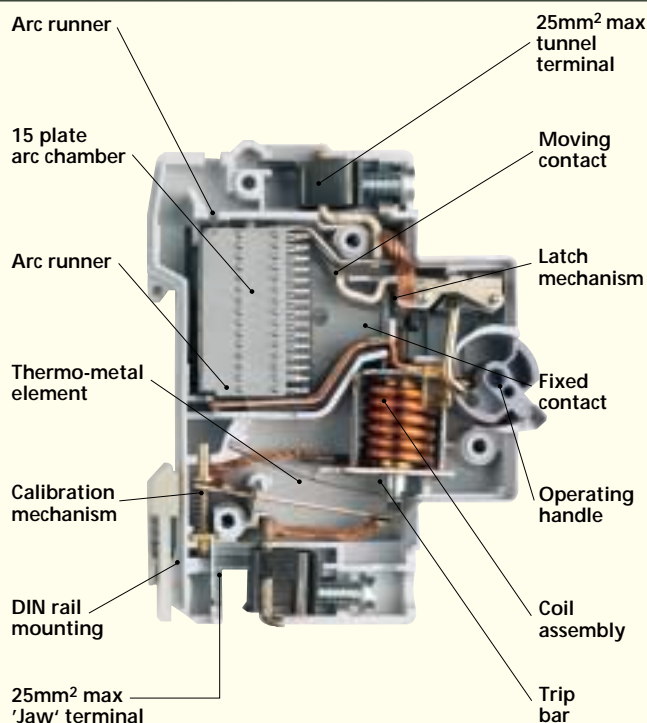
At these values of loop impedance fuses will operate within 0.4 seconds and MCBs will operate in 0.1 second.



MCBs – POLESTAR & C50

METHOD OF OPERATION

POLESTAR



Polestar MCBs are of the thermal-magnetic current limiting type. There are 3 distinct modes of operation:

1 Small overload conditions

Small overload currents are detected by the use of a thermo-metal, which deflects at a rate in proportion to the size of the overload. The thermo-metal moves against a latching system which releases the contacts, allowing them to open under spring pressure.

2 Large overload conditions

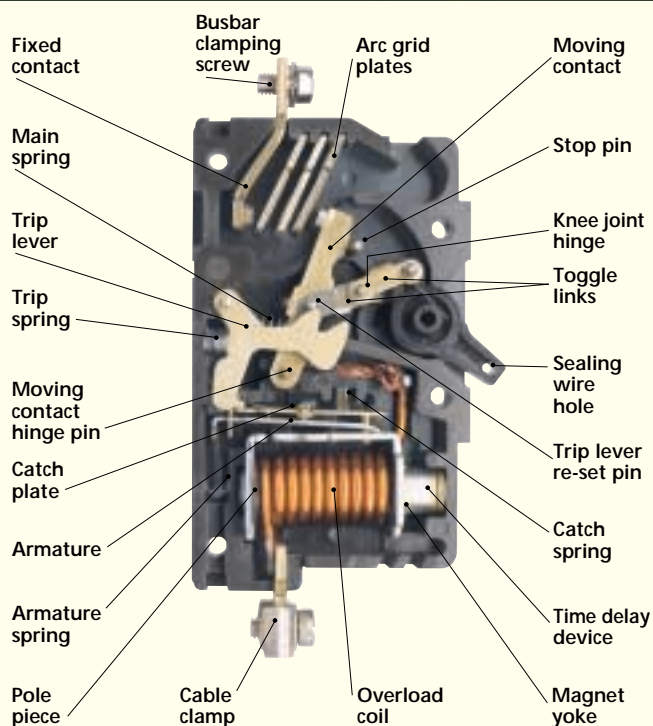
If the overload current reaches a predetermined level (which depends on the current rating and type classification of the MCB), then the current in the coil produces a magnetic field in the solenoid which is strong enough to pull in the armature and operate the latching mechanism. Again the contacts open under spring pressure.

3 Short circuit conditions

If the fault current is of a high enough level, not only does the solenoid trip the mechanism, it forces the contacts apart very rapidly in a process known as 'hammer trip'.

Under these conditions as the contacts separate an arc is drawn between them. The combination of magnetic fields in the MCB and the flow of the current in the arc acts to push the arc along the runners and into the arc chamber where it is quickly extinguished. The rapid opening of the contacts and extinction of the arc give a total operating time that is typically 3.5–5 milliseconds.

C50



The C50 MCB employs the hydraulic/magnetic principle, the heart of which is a hermetically sealed tube filled with silicone fluid and containing a closely-fitting iron slug. In normal load conditions, the magnetic pull from the trip coil is unable to overcome the restoring force of the time delay spring, and the iron slug remains at the far end of the tube.

When an overload occurs, the magnetic field pulls the slug through the tube, the speed of travel being governed by the magnitude of the current. As the slug nears the end of the tube, the gap in the magnetic circuit is reduced, so increasing the pull on the armature until it moves and the breaker is tripped.

If a large overload or short circuit occurs, the magnetic field generated is much greater and the armature moves without having to wait for the slug to reach the end of the tube. In this way instantaneous tripping occurs.

INSTALLATION CONDITIONS

When used in Crabtree distribution boards and consumer units, Polestar and C50 MCBs are mounted on specially-designed rails for ease of installation. Polestar MCBs are also suitable for use in custom built panels, where they should be mounted on standard 35mm top hat rail to BS 5584: 1978 EN50022 giving a projection within the standard 70mm.

RCDs – POLESTAR

SPECIFICATION

- BSEN61008 (Voltage independent)
 - Range of current ratings 16–100A
 - Range of sensitivities 10–300mA
 - Operation General Type A or C
 - Operation Selective Type S (Time Delay)
 - Pole configurations DP and TP&N
 - Voltage ratings DP 230V
 - Voltage ratings TP&N 240V/415V
 - Frequency ratings 50/60Hz
- Other voltage on request

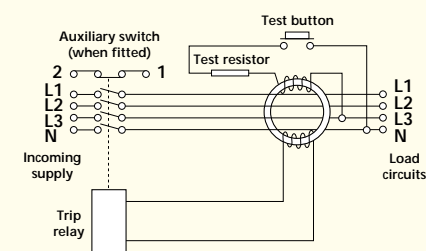


OPERATION

The RCD employs the current balance principle which involves the supply conductors to the load (phase and neutral) being wound onto a common transformer core to form the primary windings. The secondary winding of the current transformer is then connected to the electro-magnetic relay. Under healthy circuit conditions, the current in the phase conductor is equal to the current in the neutral and the vector sum of the current is zero. In the event of an earth fault, an amount of current will flow to earth, creating an out of balance situation in the transformer assembly. This out of balance is detected by the secondary winding of the transformer and at a pre-determined level of out of balance will activate the trip mechanism.

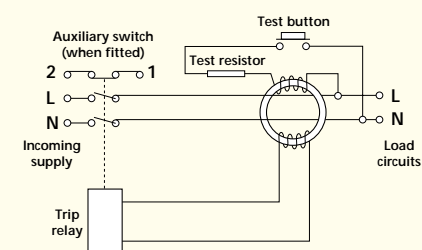
Single phase and neutral or three phase and neutral units (suitable for 3 or 4 wire systems) are available, the latter being suitable for balanced or unbalanced 3 phase loads.

The RCD trip mechanism will operate at a residual current of between 50–100% of its rating tripping current (sensitivity).



Note
Exposed installation
metal work must be
earthed.

RCD circuit diagram (triple pole and neutral)



Note
Exposed installation
metal work must be
earthed.

RCD circuit diagram (double pole)

TEST BUTTON

A test button is provided on all RCDs to enable the operation of the device to be checked.

It is recommended that an RCD is tested at least quarterly. (See BS7671) Regulation 514-12-02).

TERMINAL CAPACITIES

Polestar RCBOS 35mm²
C50 RCBOS 16mm²

APPLICATIONS

Residual Current Devices (RCDs) may be required for one of two main reasons:

(a) to ensure the compliance of an installation with BS7671.

An RCD may be installed to meet the requirements of Regulation 413-02-15 where a high earth fault loop impedance disqualifies the use of overcurrent protection devices as a means of providing protection against indirect contact. To comply with Regulation 413-02-16 the earth fault loop impedance in ohms multiplied by the rated tripping current of the RCD in amperes must not exceed 50. With the RCD having a sensitivity of 30mA, the maximum permissible earth fault loop impedance is calculated as follows:

$$Z_s (\text{max}) = 50 / 0.03 = 1666 \text{ Ohms}$$

Rated tripping current of RCD	Max permissible earth fault loop impedance
30mA	1666 Ohms
100mA	500 Ohms
300mA	166 Ohms

(b) to provide a higher degree of protection than that given by direct earthing, against fire or shock risks caused by earth leakage currents.

Overcurrent protection devices cannot detect earth fault currents below their operating current. If they are the only means of earth fault protection, it is possible for sufficient earth fault current to flow undetected to constitute a fire risk.

By using an RCD, the flow of the sustained earth fault current, above the tripping current of the RCD, is prevented. The shock risk associated with these earth fault currents is also greatly reduced.

To provide complete personnel protection, a high sensitivity RCD with a maximum tripping current of 30mA should be used. This is particularly important with portable appliances where there is a danger of losing earth continuity due to damage or fatigue.

Residual current devices are completely selective in their operation. They are unaffected by parallel earth paths and are thus ideally suitable for the protection of installations in modern high density dwellings or office blocks. They are virtually tamperproof and provide a predetermined level of protection. Even if earthing conditions deteriorate substantially, they will continue to provide a higher degree of protection than would have been given by direct earthing.

SENSITIVITIES

The choice of RCD depends upon the application of the degree of protection required.

300mA provide the means to achieve compliance with the Wiring Regulations in conditions of poor earth loop impedance and also give a good level of fire risk protection.

100mA provide the means to achieve compliance with the Wiring Regulations, a high level of fire risk protection and a degree of indirect shock risk protection.

30mA for use where a higher degree of protection is required, with portable equipment or equipment used in hazardous conditions. BS7671 regulation 471-16-01 indicates that where a socket outlet may reasonably be expected to supply equipment to be used outside the zone, protection shall be afforded by a residual current device having a rated residual operating current not exceeding 30mA.

Regulation 471-16-02 also contains a requirement for circuits supplying portable equipment outdoors supplied other than through a socket outlet.

10mA provide a higher degree of personal protection, for use in sensitive areas such as laboratories, schools and workshops where potential hazards exist from electrical faults caused through misuse, accidental damage or failure of electrical appliances.

TRANSIENT EARTH LEAKAGE CURRENTS

All Crabtree residual current devices incorporate a high degree of immunity to tripping when subjected to transient earth leakage currents.

Such transients can occur when there is a significant level of capacitance to earth as can result from cable capacitance (particularly MICC) or RF filter networks. Crabtree RCDs are therefore less susceptible to nuisance tripping due to transient earth leakage currents.

RCBOs (MCB/RCDs) & RCDs – GENERAL

SPECIFICATION

RCBOs (MCB/RCD)	POLESTAR	C50
● Standards	BSEN61009	BSEN4293/BS3871
● Short circuit breaking capacity	10kA	4.5kA
● Current rating	6 to 40A	5 to 40A
● MCB Type classification	C	C
● RCD Type classification	A & AC	Sinusoidal
● Rated voltage & frequency	240V 50Hz	240V 50Hz
● RCD Tripping principle	Electromechanical	Electronic
● Neutral configuration	Switched	Solid
● Positive contact indication	Yes	Yes

APPLICATIONS

RCBOs provide both earth fault and overcurrent protection. For commercial and industrial applications a Polestar unit should be employed, utilising Type C (5–10In) classification of MCB element. RCBOs with other MCB classifications are available to order.

Polestar RCBOs employ an electromechanical operating principle.

All RCBOs give a high level of protection to individual circuits whilst exhibiting improved immunity to response caused by transients.

Two module switched neutral RCBO's have safety advantages over single module RCBO's and are exclusively used in continental Europe.

ADVANTAGES OF SWITCHED NEUTRAL RCBO'S

If a neutral to earth fault occurs in a circuit fed via an RCBO with a solid neutral which is backed up by an upstream selective RCD, the selectivity or discrimination will be lost and the main RCD will also trip as it will still detect the fault which has not been cleared.

The main requirements of RCD protection are:

- Additional protection against direct contact with live parts
- Protection against direct connection with live parts
- Protection against fire in the case of a fault to earth

If a fault occurs between neutral and earth where a solid neutral RCBO is protecting a circuit, the RCBO will trip. However, as previously stated, the fault will still be in the circuit within the rest of the installation.

As the neutral will be common throughout the installation, it is possible that current could still flow through the fault and lead to a fire hazard. This would mean that the RCBO would not offer full protection against fire and therefore does not comply with one of its main protection requirements.

Testing of outgoing circuits is easier with RCBO's incorporating a switched neutral as an electrician does not have to disconnect terminals before testing. BS7671 requires that the main switch to a TT earthed installation must have a switched neutral.

FAULT CURRENT SENSITIVITY

Semi-conductor devices are now incorporated in equipment used throughout industry, commerce and in the home. Typically, the purpose of these semi-conductor devices is for monitoring and controlling industrial equipment eg speed controls for small motors and temperature controls, along with extensive use in computers, VDUs, printers, washing machines, etc.

As the equipment is fed from the mains electrical supply, in the event of an earth fault the presence of semi-conductors may result in the normal ac waveform being replaced by a non-sinusoidal fault current. In some cases the waveform may be rectified or chopped. These waveforms are said to contain a pulsating dc component which can either partially desensitise or totally disable a standard Type AC RCD.

International standards IEC 1008 (RCCBs) and IEC 1009 (RCBOs) divide RCDs into two performance classes:

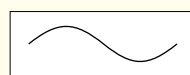
Type AC

RCDs for which tripping is ensured for residual sinusoidal alternating currents, whether suddenly applied or slowly arising.

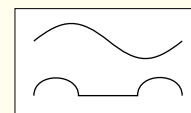
Type A

RCDs for which tripping is ensured for residual sinusoidal alternating currents and residual pulsating direct currents, whether suddenly applied or slowly arising.

To ensure the correct level of protection, check for the following symbols:

**TYPE AC**

normal ac sensitivity

**TYPE A**

pulsating dc sensitivity

Crabtree RCDs are available as both Type AC and Type A devices.

INSTALLATION TESTING – CAUTION

As C50 RCBOs employ electronic components they should be disconnected when carrying out the following tests on the electrical installation:

(a) Earth fault loop impedance test

The load terminals should be disconnected if it is intended to parallel-out the unit for test purposes.

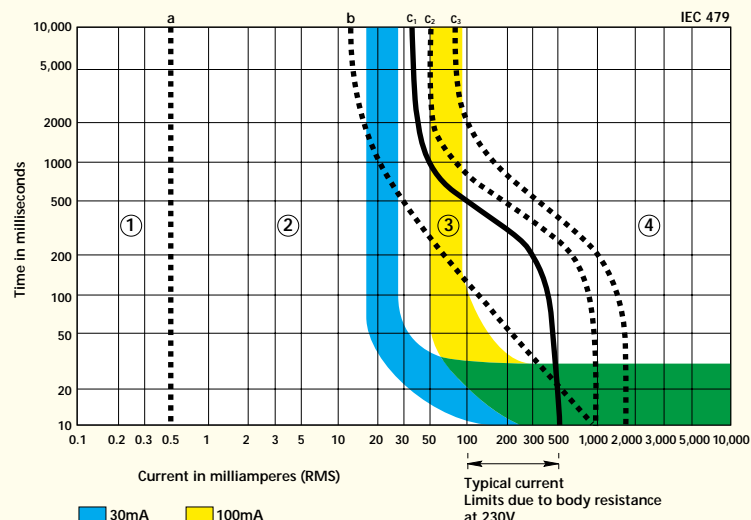
It may incur damage if mains potential is maintained on the load terminals of this unit after the trip mechanism has operated.

(b) Insulation test

Whilst RCBOs can withstand the effects of normal insulation testers without damage, false readings may be given on the test instrument. For this reason it is recommended that the device is disconnected during this test.

IEC PUBLICATION (479) CURVES WITH CRABTREE RCD CHARACTERISTICS SUPERIMPOSED

TIME/CURRENT ZONES OF EFFECTS OF AC CURRENT (15–100Hz) ON PERSONS

**Zone Physiological effects**

- 1 Usually no reaction effects.
- 2 Usually no harmful physiological effects.
- 3 Usually no organic damage to be expected. Likelihood of muscular contraction and difficulty of breathing, reversible disturbances of formation and conduction of impulses in the heart, and transient cardiac arrest without ventricular fibrillation increases with current magnitude and time.
- 4 In addition to the effects of zone 3, probability of ventricular fibrillation increased up to 5% (Curve C2) up to 50% (Curve C3) and above 50% beyond Curve C3. Increasing with magnitude and time, pathophysiological effects such as cardiac arrest, breathing arrest and heavy burns may occur.

STANDARDS COMPLIANCE

POLESTAR

Consumer units	BSEN439-3
Distribution boards	BSEN439-3
Control module enclosure	BSEN439-3
Degree of protection	IP40 (IP30 with door open)
Switch disconnecter	BSEN60947-3, IEC 60947-3
MCB	BSEN60898, IEC 60898
RCBO (MCB/RCD)	BSEN61009, IEC 601009
RCCB	BSEN61008, IEC 601008

Maximum terminal cable capacities

MCB	25mm ²
Switch disconnecter (DP)	50mm ²
Switch disconnecter (TP) 125A	50mm ²
200A	120mm ²
RCCB	50mm ²
Earth busbar	16mm ²
Neutral busbar	16mm ²
Direct busbar connection	120mm ²
Busbar paralleling assembly	120mm ²

C50

Consumer units	BS5486, Part 13: 1989
Distribution boards	BS5486, Part 12: 1989
Degree of protection	IP20
Switch disconnecter (DP)	BSEN60947-3 and IEC 60947-3
Triple pole main switch	BS5419: 1977
MCB	BSEN60898, IEC 60898
RCBO (MCB/RCD)	BS3871/BS4293

Maximum terminal cable capacities

MCB	16mm ²
Switch disconnecter (DP)	50mm ²
Triple pole main switch	50mm ²
Earth busbar	16mm ²
Neutral busbar	16mm ²



SWITCH DISCONNECTORS

A switch disconnecter is defined in BSEN60947-3 as:

“A switch which, in the open position, satisfies the isolating requirements specified for a disconnecter”

IEC 60947-3 also defines a switch and a disconnecter. In general terms the definitions cover a device that is capable of making, carrying and breaking normal circuit currents, and may also be capable of carrying, for a specified time, abnormal loads such as short circuit currents. In the open position, the device will provide isolation and it will indicate reliably the position of the contacts.

All Crabtree switch disconnectors rated in the following table comply with BSEN60947-3 and IEC 60947-3.

LIST No	100SW3 125/21BA	125/3MS125/3MS 125/21B	125/21BDP	200/3MS 200/22B	200/22BDP
Rated current	100A	125A	125A	200A	200A
Utilisation category	AC22a AC23b @63A	AC22b	AC22b	AC22b	AC22b
Rated voltage	240V/415V	415V	240V	415V	240V
Rated frequency	50Hz	50Hz	50Hz	50Hz	50Hz
Rated insulation voltage	500V ac	500V ac	500V ac	500V ac	500V ac
Rated impulse withstand voltage	6kV ac peak	6kV ac peak	6kV ac peak	6kV ac peak	6kV ac peak
Rated duty	Uninterrupted	Uninterrupted	Uninterrupted	Uninterrupted	Uninterrupted
Rated short time withstand current	1.5kA rms for 1 sec	5.5kA rms for 100ms	5.5kA rms for 100ms	5.5kA rms for 100ms	5.5kA rms for 100ms
Rated short circuit making capacity	2.5kA peak	8.0kA peak	8.5kA peak	8.5kA peak	8.5kA peak
Rated conditional short circuit	16.5kA rms (BS1361 100A fuse)	16kA rms (BS88 160A fuse)	16kA rms (BS88 125A fuse)	16kA rms (BS88 200A fuse)	9kA rms (BS88 200A fuse)



TRANSFORMERS

Transformers produce inrush currents when they are switched on, typically 15 times the normal running current.

The tables below show the recommended MCB rating for single phase (230V) and 3 phase (400V) transformers.

SINGLE PHASE 230V AC SUPPLY

TRANSFORMER RATING (VA)	MCB RATING (A)		
	Type B	Type C	Type D
50	6	6	6
100	6	6	6
200	6	6	6
300	10	6	6
400	10	6	6
500	16	10	6
750	16	10	6
1000	32	16	10
2500	63	32	16
5000	–	63	32
7500	–	–	50
10000	–	–	63

THREE PHASE 400V AC SUPPLY

TRANSFORMER RATING (VA)	MCB RATING (A)		
	Type B	Type C	Type D
500	6	6	6
750	6	6	6
1000	10	6	6
2000	16	10	6
3000	32	16	10
4000	32	20	10
5000	40	32	16
7500	63	32	16
10000	–	50	32
15000	–	63	32
20000	–	–	50
25000	–	–	63
30000	–	–	63

The above information applies to MCBs supplying transformers irrespective of the load on the secondary circuit. If the MCBs are on the secondary side of the transformer, they do not see the inrush current and so nuisance tripping does not occur.

LOW VOLTAGE LIGHTING

Low voltage lighting is generally supplied via a transformer. If MCBs are used on the primary (input) side of the transformer, then the information given in the section below left is applicable. If MCBs are used on the secondary (output) side, then no special precautions are necessary.

FLUORESCENT LIGHTING

Fluorescent lighting can also produce high inrush currents, especially when electronic ballasts are used. However, the duration of the inrush current is generally less than 1ms, so that the current may fall to normal levels before the MCBs have had time to react.

It is recommended that fluorescent lighting is protected by type C MCBs, which give a good level of protection whilst avoiding the risk of nuisance tripping.

MCB RATING (A) TYPE C	MAXIMUM NUMBER OF LAMPS AT 230V		
	36W	58W	80W
6	10	6	5
10	16	10	8
16	26	16	13
20	33	20	17
32	53	33	27
40	66	41	34
50	83	51	42
63	105	65	54

HIGH-PRESSURE SODIUM LAMPS

High-pressure sodium lamps draw current of more than 30 times their normal running currents for the first few milliseconds after start up.

MCB RATING (A) TYPE B	MAXIMUM NUMBER OF LAMPS		
	150W	250W	400W
6	–	–	–
10	1	–	–
16	1	1	–
20	2	1	–
32	3	2	1
40	4	2	1
50	5	3	1
63	6	4	2
TYPE C			
6	1	–	–
10	1	1	–
16	2	1	–
20	3	2	1
32	5	3	1
40	6	4	2
50	8	5	2
63	10	7	3
TYPE D			
6	2	1	–
10	3	2	1
16	5	3	1
20	6	4	2
32	10	7	3
40	13	8	4
50	16	11	5
63	21	14	7

It is recommended that type D MCBs are used where possible, as they will give good thermal protection without suffering from nuisance tripping.

POLESTAR MCB APPLICATIONS – MOTOR STARTERS

In general miniature circuit breakers by themselves can only provide short circuit protection for motor loads. Motor start-up currents can be as high as 12 times the normal running current. MCBs in general cannot accommodate this and provide the close thermal protection required by motors. They can, however, be used to protect lightly loaded motors or motors started off load, or they can be used in conjunction with thermal overload relays. In this case the MCB will protect the cable to the motor against short circuit faults, and the motor will be protected by a second thermal device.

RECOMMENDED POLESTAR TYPE D MCB RATINGS for single phase 230/240V ac motors

Motor power HP	Motor power kW	Normal running current (A)	Start-up current (A)	MCB current rating (A)
0.25	0.18	1.5	18	6
0.50	0.37	3.0	36	6
0.75	0.55	4.5	54	6
1.00	0.75	5.5	66	10
1.50	1.1	8.5	102	10
2.00	1.5	10.5	126	16
3.00	2.2	15.5	186	20
4.00	3.0	20.0	240	32
5.00	3.75	24.0	288	32
7.50	5.5	34.0	408	40
10.00	7.5	45.0	540	63

RECOMMENDED POLESTAR TYPE D MCB RATINGS for 3 phase 400/415V ac motors

Motor power HP	Motor power kW	Normal running current (A)	Start-up current (A)	MCB current rating (A)
0.25	0.18	0.7	8.4	6
0.5	0.37	1.35	16.2	6
0.75	0.55	1.55	18.6	6
1.0	0.75	1.93	23.2	6
1.5	1.1	2.5	30.0	6
2.0	1.5	3.5	42.0	6
3.0	2.2	4.8	57.6	6
4.0	3.0	6.4	76.8	10
5.0	3.75	7.8	93.6	10
7.5	5.5	11.0	132.0	16
10.0	7.5	14.4	172.8	20
12.5	9.33	17.3	207.6	32
15.0	11.0	21.0	252.0	32
20.0	15.0	28.0	336.0	40
25.0	18.5	35.0	420.0	50
30.0	22.0	40.0	480.0	50
40.0	30.0	54.0	648.0	63

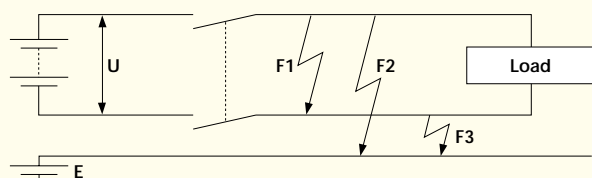
POLESTAR MCB APPLICATIONS – DC SUPPLIES

Crabtree circuit breakers are generally designed for use on ac systems, but can also be used on dc supplies. The selection of the most suitable circuit breaker depends on the following conditions:

- The type of circuit
- The short circuit current
- The circuit time constant
- The circuit voltage

TYPICAL CIRCUITS

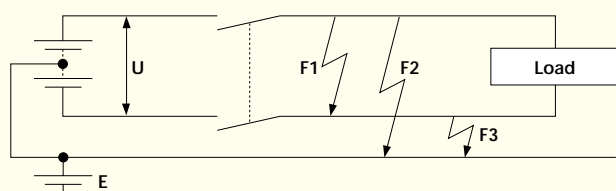
NOT EARTHED



FAULT F1 Will produce the maximum short circuit current with half the supply voltage dropped across each pole

FAULTS F2 & F3 No effect

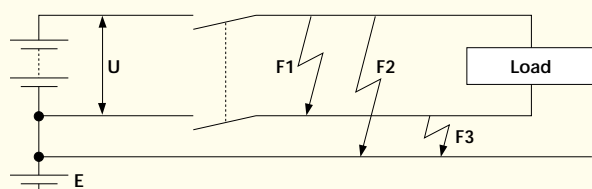
EARTHED AT THE SUPPLY CENTRE POINT



FAULT F1 Will produce the maximum short circuit current with half the supply voltage dropped across each pole

FAULTS F2 & F3 Will produce a short circuit current of less than the maximum. Half the supply voltage will appear across the affected MCB

EARTHED AT ONE OF THE SUPPLY TERMINALS



FAULT F1 Will produce the maximum short circuit current with half the supply voltage dropped across each pole

FAULT F2 Will produce the maximum short circuit current with all of the supply voltage appearing across one pole

FAULT F3 No effect

NORMAL CIRCUIT CURRENTS

The rating and normal running temperature of the MCB are unaffected by dc. The MCB can be selected using the thermal section of the standard time/current curves in the normal manner. Magnetic tripping on dc is different from the equivalent ac by a factor of $\sqrt{2}$.

ie type B ac magnetic range = $3-5I_n$

type B dc magnetic range = $\sqrt{2}(3-5)I_n = 4-7I_n$

type C ac magnetic range = $5-10I_n$

type C dc magnetic range = $\sqrt{2}(5-10)I_n = 7-14I_n$

type D ac magnetic range = $10-20I_n$

type D dc magnetic range = $\sqrt{2}(10-20)I_n = 14-28I_n$

SHORT CIRCUIT CURRENTS

The maximum short circuit current possible on a dc system is determined by the voltage of the battery and the total internal resistance of the cells. It is given by Ohm's law:

$$I_{SC} = \frac{V_b}{R_b} \text{ where } V_b \text{ is the voltage of the battery (with the battery 100\% charged)}$$

$$R_b \text{ is the internal resistance of the battery cells}$$

(this is usually quoted by the manufacturer)

CIRCUIT TIME CONSTANT

The time constant is given by:

$$\frac{L}{R} \text{ where } L \text{ is the inductance of the circuit}$$

$$R \text{ is the resistance of the circuit}$$

The time constant is usually given in milliseconds (ms). Ideally, dc circuits would be mainly resistive (ie a low number), as inductive circuits produce a back emf when the current suddenly falls. This in turn tends to prolong arcing during switching operations, and so reduces contact life.

CIRCUIT VOLTAGE

The voltage of the circuit is dependent upon the power supply. The lower the voltage the easier switching operations will be, but the voltage makes no difference to the normal running of the MCBs.

Contact life can be significantly increased by reducing the voltage drop across each pole. This can be achieved by wiring poles in series. It is also recommended that for frequent switching the voltage across each pole should not exceed 110V dc.

Crabtree Polestar MCBs have been successfully tested on dc and can be used under the following conditions:

Circuit Time Constant L/R 15ms max
Voltage 24-220V
Short circuit breaking capacity 9kA

C50 MCBs are not suitable for use on dc circuits.

TYPE B TYPICAL TRIPPING TIMES

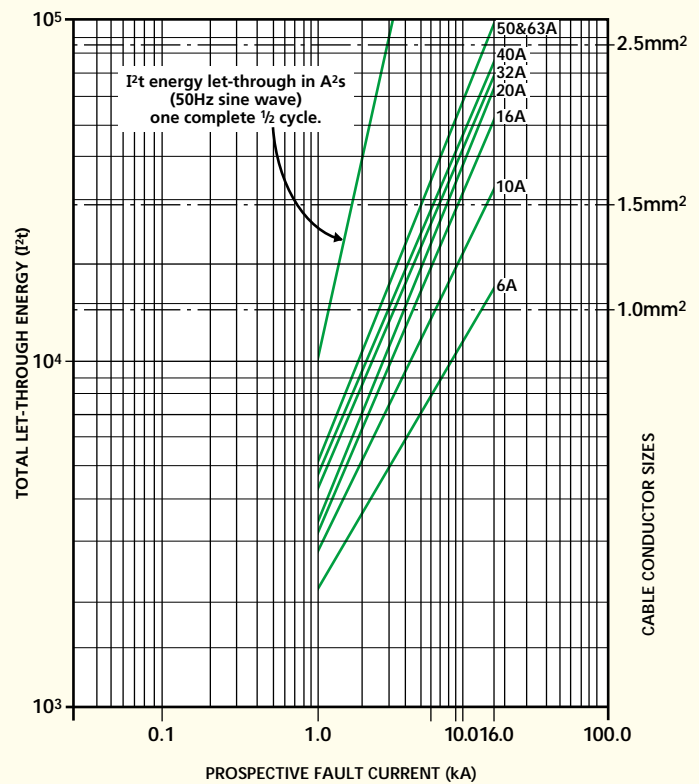
RATING	CURRENT REQUIRED TO OPERATE									
(A)	60s	10s	5s	4s	3s	2s	1s	0.4s	0.1s	0.02s
6	12	23	24	24	24	24	24	24	24	24
10	19	32	40	40	40	40	40	40	40	40
16	30	50	64	64	64	64	64	64	64	64
20	40	68	80	80	80	80	80	80	80	80
32	67	112	128	128	128	128	128	128	128	128
40	80	120	160	160	160	160	160	160	160	160
50	100	160	200	200	200	200	200	200	200	200
63	138	230	252	252	252	252	252	252	252	252

TYPE C TYPICAL TRIPPING TIMES

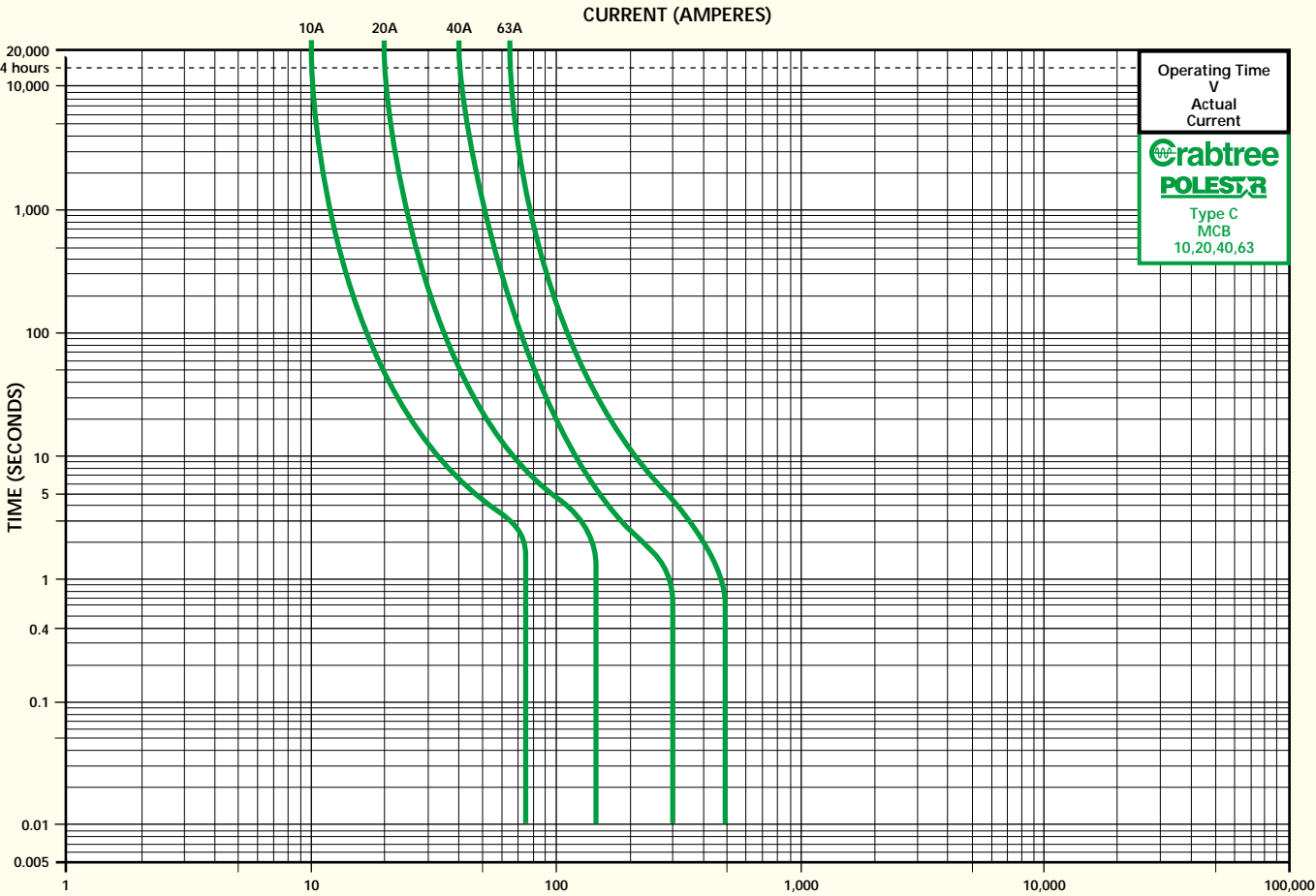
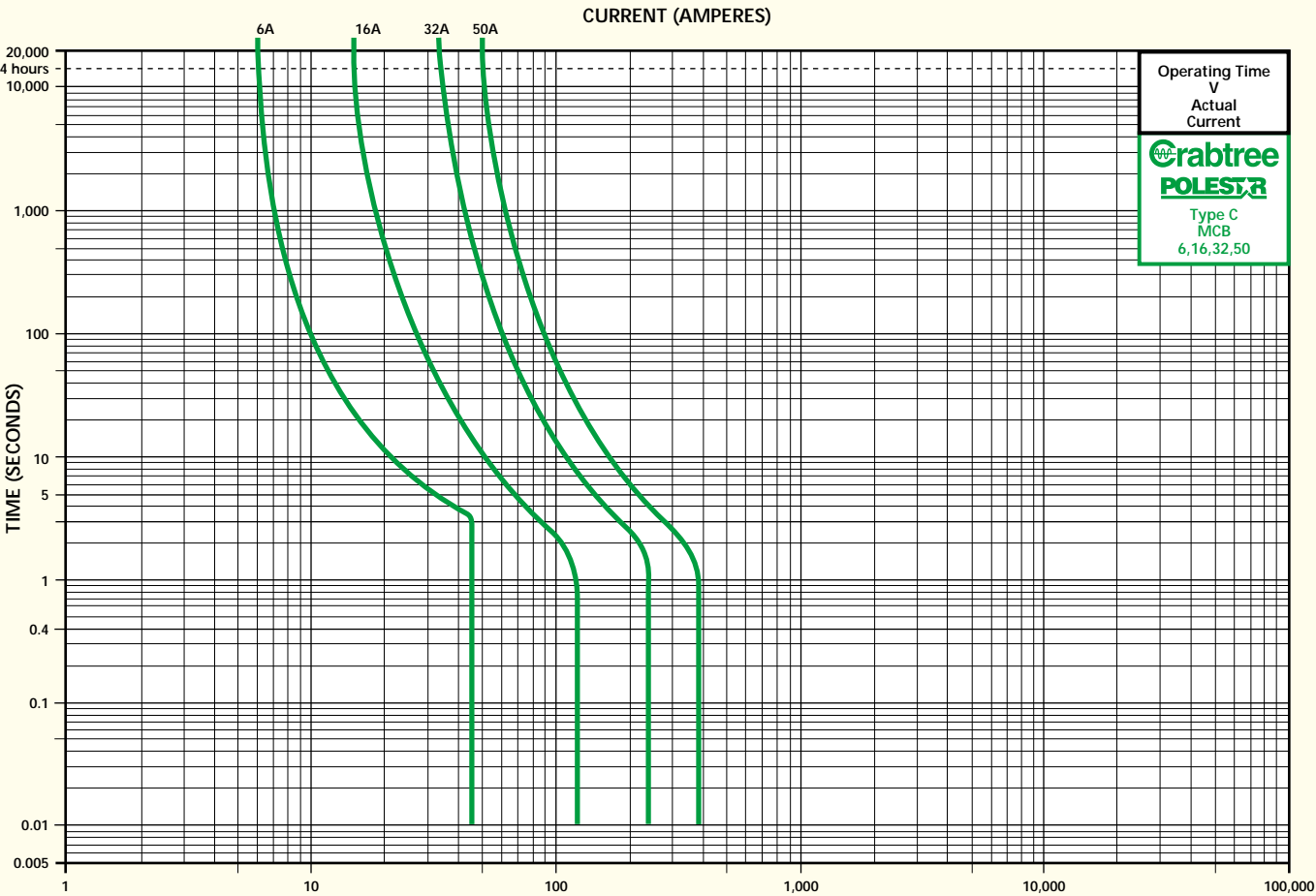
RATING	CURRENT REQUIRED TO OPERATE									
(A)	60s	10s	5s	4s	3s	2s	1s	0.4s	0.1s	0.02s
6	12	23	33	37	44	45	45	45	45	45
10	19	32	48	55	67	75	75	75	75	75
16	30	50	67	72	83	100	120	120	120	120
20	40	68	92	104	120	150	150	150	150	150
32	67	112	144	153	176	208	240	240	240	240
40	80	120	152	168	190	230	300	300	300	300
50	100	160	210	230	260	312	375	375	375	375
63	138	220	283	302	334	397	472	472	472	472

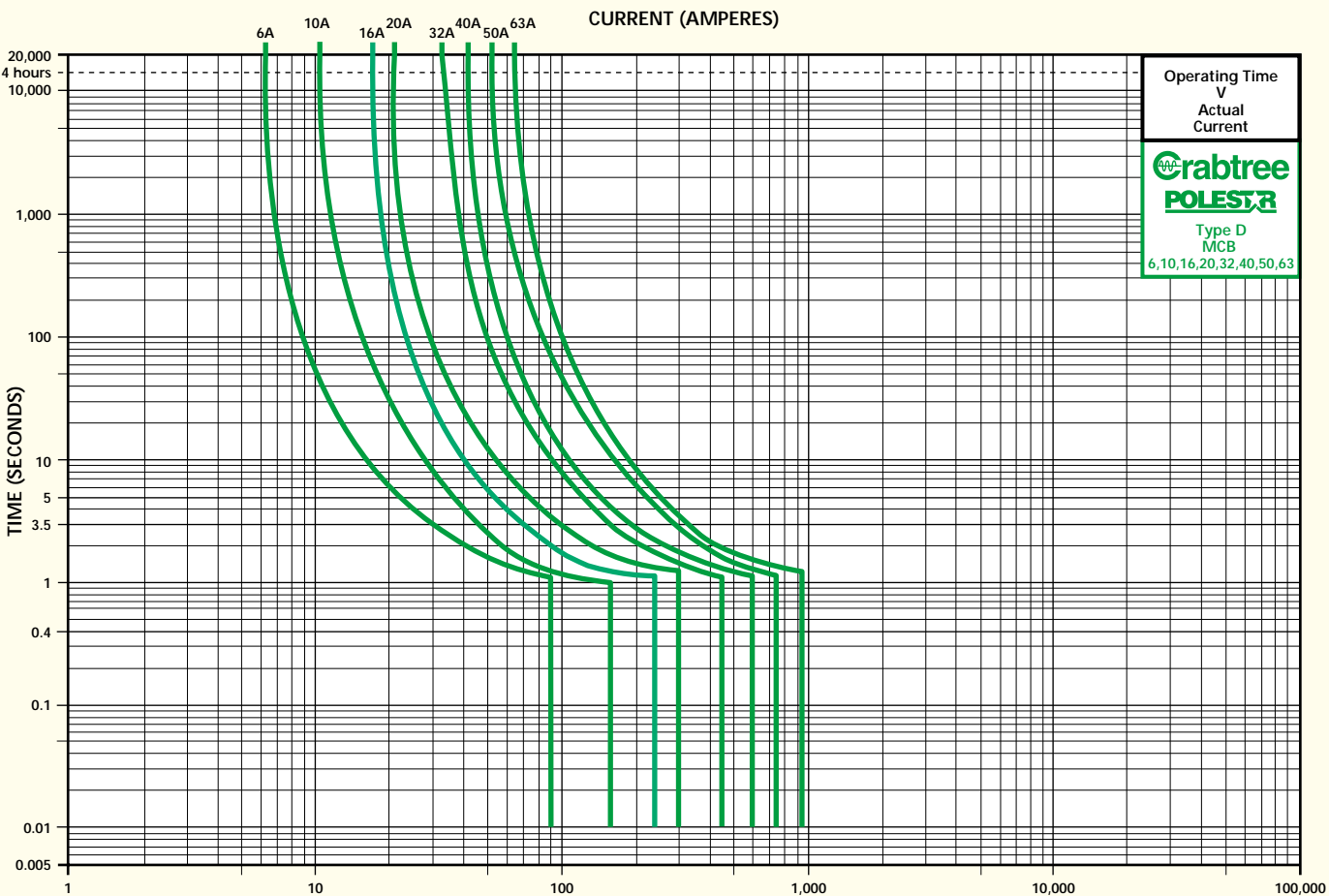
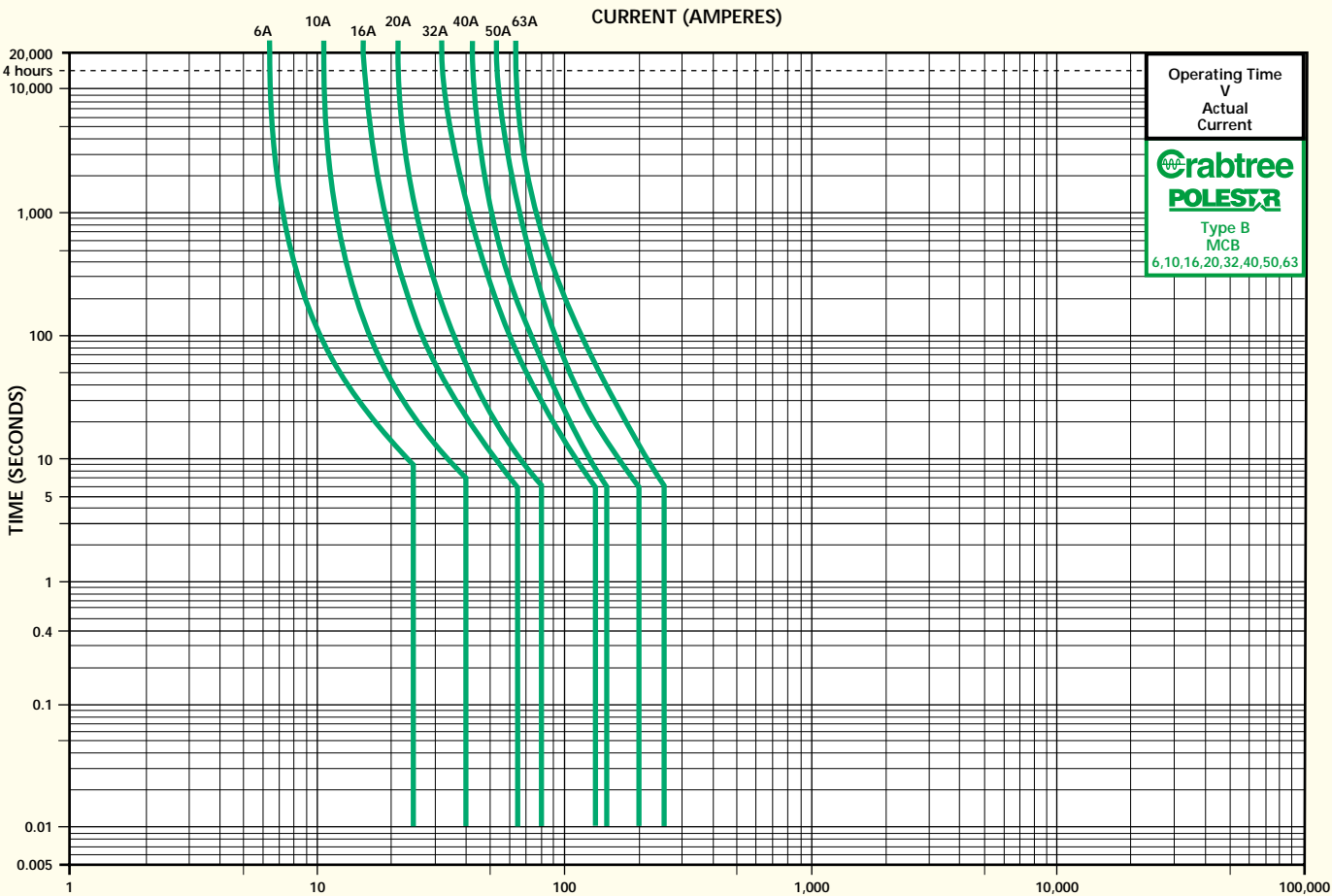
TYPE D TYPICAL TRIPPING TIMES

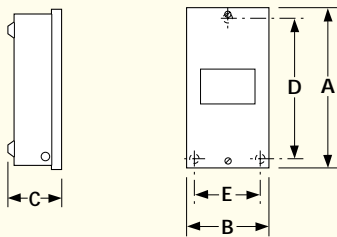
RATING	CURRENT REQUIRED TO OPERATE									
(A)	60s	10s	5s	4s	3s	2s	1s	0.4s	0.1s	0.02s
6	12	23	33	37	44	55	90	90	90	90
10	19	32	48	55	67	93	150	150	150	150
16	30	50	67	72	83	100	147	240	240	240
20	40	68	92	104	120	150	240	300	300	300
32	67	112	144	153	176	208	288	432	480	480
40	80	120	152	168	190	230	340	600	600	600
50	100	160	210	230	260	312	450	750	750	750
63	138	220	283	302	334	397	555	819	945	945

TOTAL I²t LEVELSTYPICAL VALUES OF I²t ENERGY LET-THROUGH FOR POLESTAR MCBs

TOTAL I ² t LET-THROUGH (A² SEC)			
MCB RATING	6kA	10kA	16kA
6	8000	12000	16000
10	15000	25000	34000
16	20000	35000	53000
20	25000	40000	64000
32	28000	50000	70000
40	30000	65000	85000
50	36000	75000	110000
63	36000	75000	110000







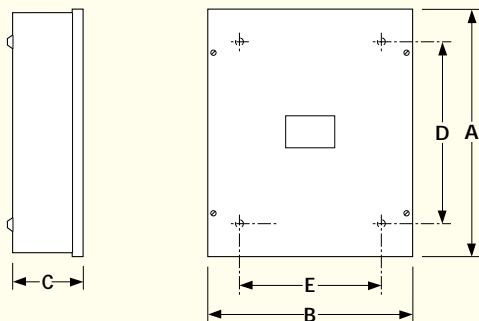
APPROXIMATE DIMENSIONS (mm)

3 MODULE GENERAL PURPOSE ENCLOSURE

LIST No	A	B	C	D	E	F	G	H	J	K	L
1603/MSE	221.5	110.5	74.5	184	73	-	-	-	-	-	-

13 MODULE-CONTROL MODULE ENCLOSURE

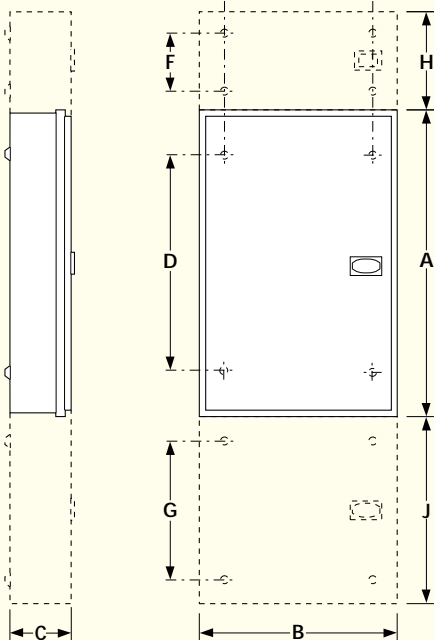
1613/MSE	225	400	86	175	350	-	-	-	-	-	-
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ENCLOSURE FOR 100A TP & N RCCBs & MAIN SWITCHES

LIST No	A	B	C	D	E	F	G	H	J	K	L
EN100	412	340	115	305	229	-	-	-	-	-	-
EN200	541	340	120	432	229	-	-	-	-	-	-

13 way
control
module
enclosure



MCCB
incoming
enclosure

PRIMARY DISTRIBUTION BOARDS TP & N

TYPE	A	B	C	D	E	F	G	H	J	K	L
4 way	600	405	127	420	300	-	-	-	-	-	-
6/8 way	750	405	127	570	300	-	-	-	-	-	-
10/12 way	900	405	127	720	300	-	-	-	-	-	-
16 way	1050	405	127	870	300	-	-	-	-	-	-
20 way	1204	405	138	1020	300	-	-	-	-	-	-
24 way	1355	405	138	1170	300	-	-	-	-	-	-

When fitting flush frames overall dimensions are increased as follows:
A 50mm; B 50mm; C 1mm.

13 MODULE-CONTROL MODULE ENCLOSURE

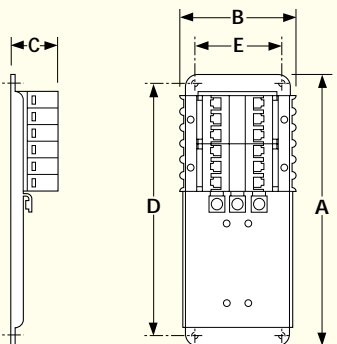
LIST No	A	B	C	D	E	F	G	H	J	K	L
1613/COB	-	400	127	-	300	120	-	230	-	-	-

MCCB INCOMING ENCLOSURE

LIST No	A	B	C	D	E	F	G	H	J	K	L
1600/M	-	400	127	-	-	-	225	-	390	-	-

Note

1600/M can only be fitted to the bottom of TP & N distribution boards.



PRIMARY BACKPLATE ASSEMBLIES TP & N

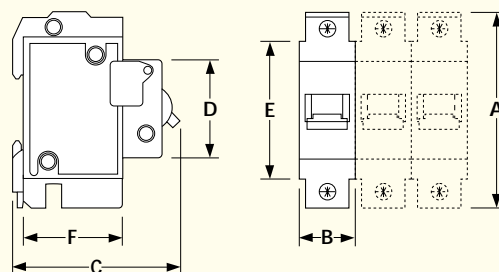
TYPE	A	B	C	D	E	F	G	H	J	K	L
4 way	435	193	96	415	140	-	-	-	-	-	-
6/8 way	585	193	96	565	140	-	-	-	-	-	-
10/12 way	735	193	96	715	140	-	-	-	-	-	-
16 way	885	193	96	865	140	-	-	-	-	-	-

APPROXIMATE DIMENSIONS (mm)

MINIATURE CIRCUIT BREAKERS (MCBs)

TYPE	A	B	C*	D	E	F	G	H	J	K	L
Single pole	90	25	82.5	45	63	44	-	-	-	-	-
Double pole	90	50	82.5	45	63	44	-	-	-	-	-
Triple pole	90	75	82.5	45	63	44	-	-	-	-	-

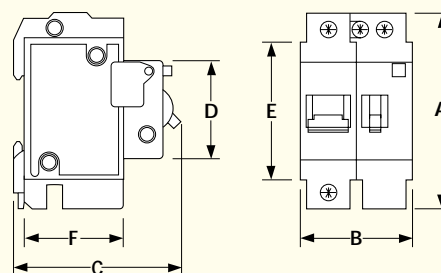
* Allow 4mm for handle clearance



RESIDUAL CURRENT CIRCUIT BREAKERS WITH OVERLOAD PROTECTION (RCBOs)

TYPE	A	B	C*	D	E	F	G	H	J	K	L
RCBO (MCB/RCD)	90	50	82.5	45	63	44	-	-	-	-	-

* Allow 4mm for handle clearance

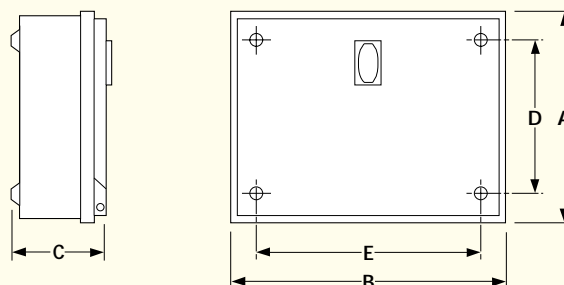


SP & N CONSUMER UNITS

LIST No	A	B	C	D	E	F	G	H	J	K	L
1606/ . series	230	305	105	175	250	-	-	-	-	-	-
1609/ . series	230	405	105	175	350	-	-	-	-	-	-
1613/ . series	230	505	105	175	450	-	-	-	-	-	-

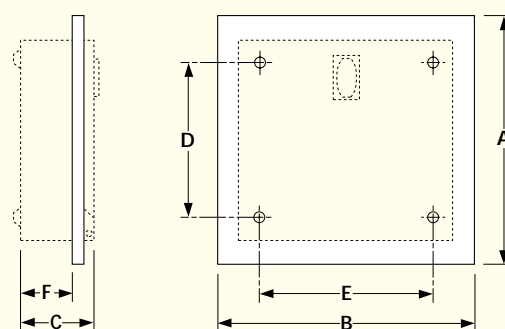
SPLIT-LOAD

LIST No	A	B	C	D	E	F	G	H	J	K	L
1611/ . series	230	505	105	175	450	-	-	-	-	-	-
1608/ . series	230	505	105	175	450	-	-	-	-	-	-



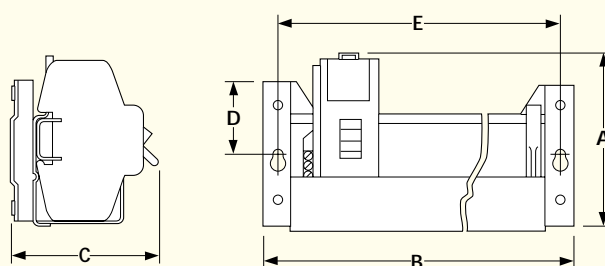
FLUSH FRAME CONVERSION ASSEMBLIES FOR SP & N CONSUMER UNITS

LIST No	A	B	C	D	E	F	G	H	J	K	L
1606/FA	280	355	106	175	250	79	-	-	-	-	-
1609/FA	280	455	106	175	350	79	-	-	-	-	-
1613/FA	280	555	106	175	450	79	-	-	-	-	-



BACKPLATE ASSEMBLIES SP & N

LIST No	A	B	C	D	E	F	G	H	J	K	L
1606/1AI	113	257	89	46	241	-	-	-	-	-	-
1609/1AI	113	333	89	46	317	-	-	-	-	-	-
1613/1AI	113	434	89	46	418	-	-	-	-	-	-
1606/21AI	113	257	95	46	241	-	-	-	-	-	-
1609/21AI	113	333	95	46	317	-	-	-	-	-	-
1613/21AI	113	434	95	46	418	-	-	-	-	-	-



LOADSTAR RANGE

Crabtree Loadstar MCBs comply fully with BSEN60898 and and therefore enable the requirements of BS7671 to be met.

DISTRIBUTION BOARDS

Standards Compliance:	BSEN60439-3 and IEC 60439-3
Rated Voltage:	230/400V, 50/60Hz
Rated Current:	200A (Type B Vertical Boards)
Rated Insulation Voltage:	2kV
Short Circuit Withstand:	16kA Conditional
Protection Degree:	BSEN60529 IP4X (Door Closed) IP3X (Door Open)

MINIATURE CIRCUIT BREAKERS (MCB's)

Standards Compliance:	EN60898 and IEC 60898 IEC 60947-2 (Short Circuit Duty only)
Rated Voltage:	230/400V, 50/60Hz
Short Circuit Capacity:	6kA or 10kA (EN60898 and IEC898). 15kA Icu (EN 60947-2) IEC 60947-2
Tripping Class:	Types B, C and D
Temperature Range:	Maximum Operating Temperature: 55°C
Pole Configuration:	Single Pole, Double Pole, Triple Pole

ISOLATORS & SWITCH DISCONNECTORS

Standards Compliance:	BSEN60947-3 and IEC 60947-3
Rated Voltage:	230/400V, 50/60Hz
Rated Insulation Voltage:	2kV a.c.
Rated Impulse Withstand Voltage:	4kV a.c. peak
Rated Duty:	
63A Modular	AC 23B
100/125A Modular	AC 22A
Heavy Duty	AC 22B

RESIDUAL CURRENT CIRCUIT BREAKERS (RCCB's)

Standards Compliance:	EN61008 and IEC 601008
Rated Voltage:	230/400V, 50/60Hz
Tripping Characteristic:	A and AC

MOULDED CASE CIRCUIT BREAKERS (MCCB's)

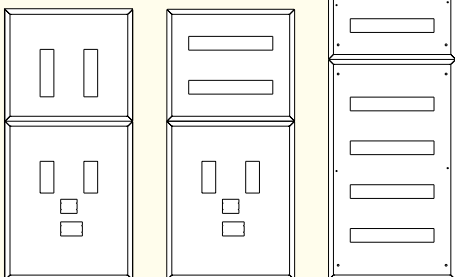
Standards Compliance:	BSEN60947-2 and IEC 60947-2
Rated Voltage:	415V, 50/60Hz
Rated Insulation Voltage:	500V a.c.
Rated Ultimate Short Circuit Capacity (Icu):	25kA (G Frame) 25kA (J Frame)
Rated Service Short Circuit Capacity (Ics):	50% of Icu (G Frame) 75% of Icu (J Frame)

MAXIMUM TERMINAL CAPACITIES

MCB	35mm ²
RCCB	50mm ²
Isolators 63 to 125A	50mm ²
200A Heavy Duty	120mm ²
MCCB 200A Frame	150mm ² (Solid) 120mm ² (Stranded)
125A Frame	70mm ²

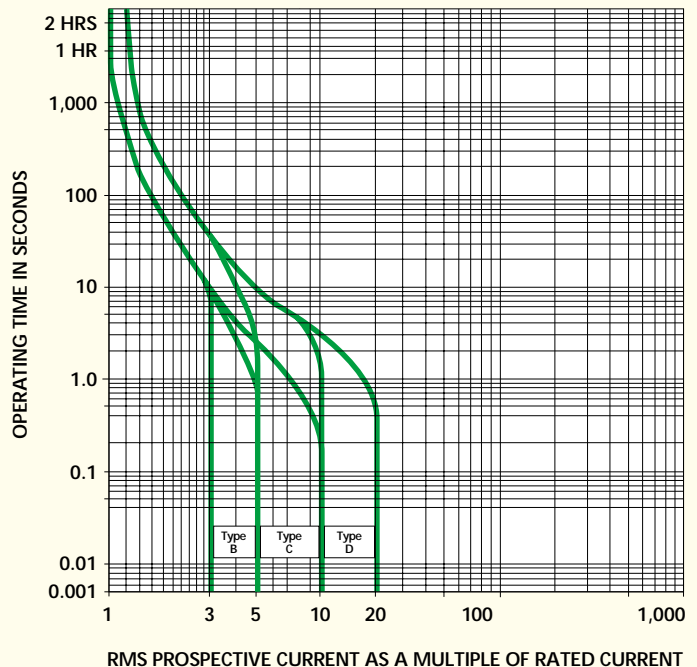
TYPICAL DISTRIBUTION BOARD COMBINATIONS

Typical direct extension board arrangements (See page 3).



TYPE CLASSIFICATION

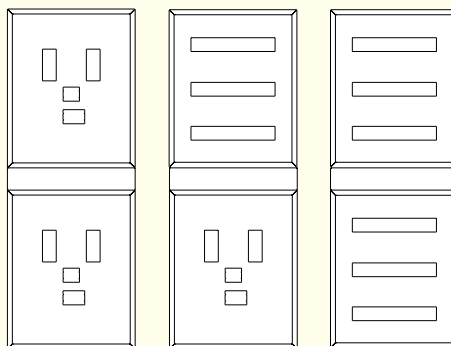
BSEN60898 specifies different tripping characteristics for different types of MCB, depending on the level of overcurrent required to make the MCB trip out in less than 100 milliseconds. Crabtree MCB's are available as types B, C or D, enabling installation designers to choose an MCB with a characteristic closely matched to the circuit requirement.



RCBO'S

Single module	
Standards Compliance:	EN61009, IEC 601009
Rated Voltage:	230V 50Hz
Rated Short Circuit Capacity:	6kA
MCB Tripping:	Type C
RCD Tripping (Electronic):	Type A
Neutral:	Unswitched
Neutral flying lead and functional earth lead provided	

Two module	
Standards Compliance:	EN61009, IEC601009
Rated Voltage:	230V 50Hz
Rated Short Circuit Capacity:	6kA
MCB Tripping:	Type C
RCD Tripping:	Type AC
Neutral flying lead provided	

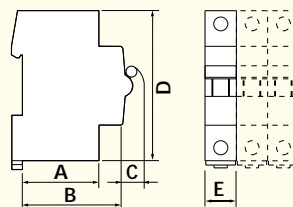


Typical arrangements using adaptor boxes. (See page 3).

APPROXIMATE DIMENSIONS (mm)

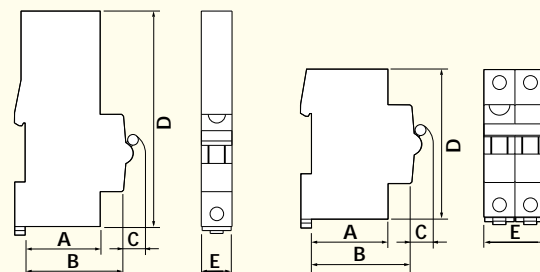
MINIATURE CIRCUIT BREAKERS (MCBs)

	A	B	C	D	E
Single pole	43.8	56.5	13.5	86	18
Double pole	43.8	56.5	13.5	86	36
Triple pole	43.8	56.5	13.5	86	54



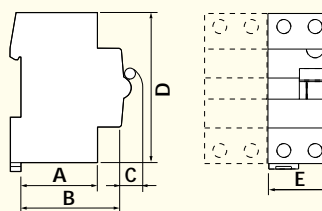
RESIDUAL CURRENT CIRCUIT BREAKERS WITH OVERLOAD PROTECTION (RCBOs)

	A	B	C	D	E
Single module	43.8	56.5	13.5	126	18
Two module	43.8	56.5	13.5	86	36



RESIDUAL CURRENT CIRCUIT BREAKERS (RCCB)

	A	B	C	D	E
2 pole	43.8	56.5	13.5	86	36
4 pole	43.8	56.5	13.5	86	72



TYPE B AND ROW DISTRIBUTION BOARDS

Type B & Row boards	A		B		C	H
Type B standard	Surface	Flush	Surface	Flush	V fxc	Hfxc
4 way	542	560	536	536	376	300
6 way	595	613	589	589	429	300
8 way	645	667	643	643	483	300
12 way	756	773	750	750	590	300
16 way	862	880	856	856	696	300
20 way	969	987	963	963	803	300
24 way	1129	1147	1123	1123	693	300

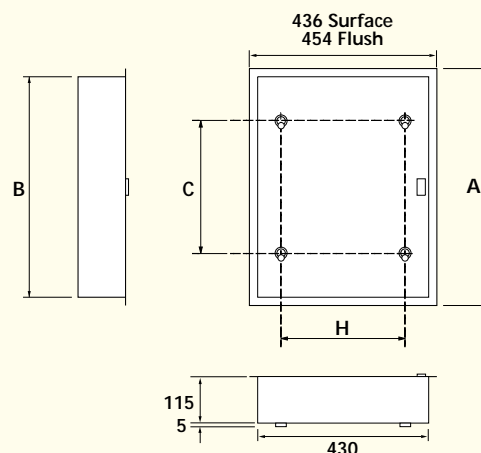
Type B 'J' Frame also G Frame & 200A

4 way	645	667	643	643	483	300
6/8 way	756	773	750	750	590	300
12 way	862	880	856	856	696	300
16 way	969	987	963	963	803	300
20 way	1129	1147	1223	1223	963	300
24 way	1236	1254	1230	1230	1070	300

Type A Row Board

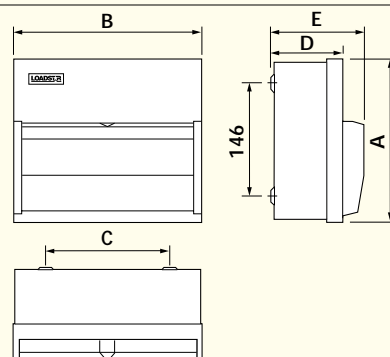
16 way	222	240	216	216	140	280
32 way	382	400	376	376	300	280
48 way	542	560	536	536	150	280
64 way	756	773	750	750	300	280
80 way	862	880	856	856	450	280

Type B Direct Extension Boards	A		B		C		H
	Surface	Flush	Surface	Flush	Surface	Flush	Hfxc
6 way	382	400	382	400	220	244	300
12 way	542	560	542	560	380	404	300



TYPE A SP & N DISTRIBUTION BOARDS

	A	B	C	D	E
2 way	209.5	164	124	65	86
5 way	209.5	188	107	90	117.5
8 way	209.5	241	160	90	117.5
11 way	209.5	292	210	90	117.5
14 way	209.5	353	260	90	117.5
17 way	209.5	394	311	90	117.5
19 way	209.5	438	235.7	90	117.5



For flush version add 16mm to dimensions A and B. For split load versions add 2 ways to total of protected and un-protected ways, then read dimensions from the table above. In addition the above note applies for flush versions.

CONTROL MODULES – GENERAL

IMPULSE RELAYS

Impulse relays are primarily used for lighting installations to streamline wiring, especially when more than two switch points are necessary. They are used as interface relays as the coils are not permanently energised. This reduces the power demand on the electronic outputs and reduces the radiation of heat. Each impulse relay is supplied with manual push button.

CONTACTORS

Modular contactors are designed for switching single and three phase loads up to 63A. Manual override facility enables the temporary setting of the contactor in either its 'on' or 'off' position, in addition to its normal automatic operation.

		16A	20A	20A	40A	63A	IMPULSE RELAY
		1 mod	1 mod	2 mod	3 mod	3 mod	1 mod
Rated operating voltage	V	250	250	400	400	400	250
Rated operating current AC-1	A	16	20	20	40	63	16
Short circuit protection max	A	16	20	40	40	60	16
Electrical life AC-1 (000s)	ops	150	150	100	50	50	100
Mechanical life (000s)	ops	1000	1000	1000	1000	1000	500
Ambient air temperature*	°C	-40 to +60	-40 to +60	-40 to +60	-40 to +60	-40 to +60	-5 to +40
Max cable capacity	mm ²	1 to 4	1 to 4	1 to 4	4 to 25	4 to 25	1 to 4
Standard compliance IEC		158-3	158-3	158-3	158-3	158-3	669-1

*See table on de-rating factors

CONTACTOR DE-RATING FACTORS

De-rating of contactors mounted in modular enclosures is required if the internal enclosure temperature exceeds 40°C.

40°C	50°C	60°C	70°C	CONTACTOR LIST No		
				2 pole	3 pole	4 pole
20A	18A	16A	14A	301/C20DP	302/C20TP	302/C20FP
40A	36A	32A	29A	303/C40DP	303/C40TP	–
63A	57A	50A	46A	–	303/C63TP	303/C63FP

DETERMINATION OF THE CONTACTOR RATING

HEATING V	MAX POWER IN KW DEPENDING ON THE NUMBER OF OPERATING CYCLES/DAY										SINGLE PHASE	3 PHASE	3 PHASE & N			
	25	50	75	100	250	500										
230	4.4 8.5	4.4 8.5	4.4 6.9	3.8 6.0	2.4 3.8	1.7 2.7					301/C20DP 303/C40DP					
400	13.0 25.0 37.0	10.9 17.7 28.3	8.9 14.4 23.0	7.7 12.5 20.0	4.9 7.9 12.6	3.4 5.6 8.9					302/C20TP 303/C40TP	– – 303/C63FP	– – 303/C63FP			
LIGHTING																
	MAX NUMBER OF LAMPS PER POLE															
Fluorescent lamps with starter	Single fitting non-corrected					Single fitting with parallel correction										
	20W	40W	65W	80W	110W	20W	40W	65W	80W	110W	SINGLE PHASE	3 PHASE	3 PHASE & N			
	35	31	20	17	11	82	53	33	26	–	301/C20DP	–	–			
	41	35	22	20	13	94	61	38	30	22	302/C20TP	302/C20TP	302/C20FP			
	82	71	45	40	26	188	123	76	61	44	303/C40DP	303/C40TP	–			
	128	111	71	62	41	294	192	119	96	69	–	303/C63TP	303/C63FP			
	Twin fitting non-corrected					Twin fitting with series correction										
	20W	40W	65W	80W	110W	20W	40W	65W	80W	110W						
	31	17	10	8	6	53	29	17	14	10	301/C20DP	–	–			
	36	19	11	9	7	61	33	20	16	12	302/C20TP	302/C20TP	302/C20FP			
Fluorescent lamps without starter	72	39	23	19	14	92	66	41	33	24	303/C40DP	303/C40TP	–			
	113	61	37	30	22	123	104	64	52	38	–	303/C63TP	303/C63FP			
	Single fitting non-corrected					Single fitting with parallel correction										
	20W	40W	65W	80W	110W	20W	40W	65W	80W	110W						
	31	25	17	14	10	73	48	30	24	–	301/C20DP	–	–			
	36	29	20	16	11	84	55	34	28	20	302/C20TP	302/C20TP	302/C20FP			
	72	58	40	33	22	168	110	69	56	40	303/C40DP	303/C40TP	–			
	113	90	62	52	35	263	172	108	87	63	–	303/C63TP	303/C63FP			
	Twin fitting non-corrected					Twin fitting with series correction										
	20W	40W	65W	80W	110W	20W	40W	65W	80W	110W						
Low pressure sodium vapour lamps	28	14	9	7	5	50	26	16	13	9	301/C20DP	–	–			
	32	17	10	8	6	57	30	18	15	11	302/C20TP	302/C20TP	302/C20FP			
	64	34	21	17	12	114	61	37	30	22	303/C40DP	303/C40TP	–			
	100	53	32	26	19	178	96	58	47	34	–	303/C63TP	303/C63FP			
	non-corrected					corrected										
30W	35W	90W	135W	150W	180W	200W	30W	35W	90W	135W	150W	180W	200W			
8	6	4	3	3	2	2	–	–	–	–	–	–	–	–	–	–
20	15	10	7	7	7	7	80	60	40	–	–	–	–	–	–	–
10	7	5	3	3	3	3	–	–	–	–	–	–	–	–	–	–
11	8	5	4	4	3	3	43	32	21	–	–	–	–	–	–	–
21	16	10	8	8	7	7	86	65	43	–	–	–	–	–	–	–
34	25	17	13	12	12	12	136	102	68	–	–	–	–	–	–	–

DISCRIMINATION MCBs, FUSES & MCCBs

In modern installations it is normal practice for circuits to be protected by more than one protective device. This is due to the division and subdivision of circuits for distribution purposes.

At different points on the distribution network different protective devices will be used. These protective devices may be moulded case circuit breakers (MCCBs), fuses or miniature circuit breakers (MCBs).

When a fault occurs in a circuit, the protective device immediately upstream of the fault should operate and isolate the faulty circuit.

It is desirable that only the upstream device should operate if it is able to clear the fault by itself leaving healthy circuits unaffected. This is known as discrimination. If the fault is greater than the breaking capacity of the upstream device, then the next device in line should operate as well. This is known as back-up protection.

When choosing the upstream device, the circuit designer should aim to choose the minimum rating possible to give discrimination, but the maximum rating possible to give back-up protection. In practice, a compromise has to be reached to give a combination of discrimination and back-up protection. In order to achieve discrimination, it is necessary to compare the total energy let-through (I²t) characteristics of the downstream devices with the pre-arc or unlatch energy let-through characteristics of upstream fuses or circuit breakers.

The table below shows the minimum rating of BS 88 fuses to give discrimination with Polestar MCBs up to 16 kA prospective short circuit current. Due to the rapid opening of both MCBs and MCCBs and in common with other manufacturers, it is generally not possible to discriminate between them up to the full short circuit capacity of the MCB.

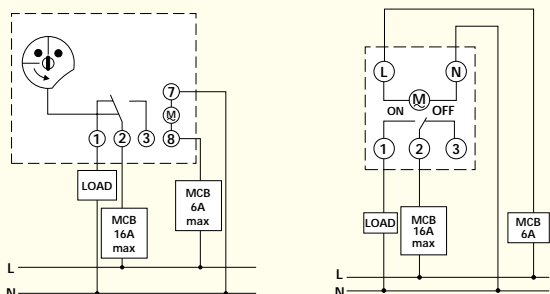
Minimum BS88 Fuse rating for discrimination up to 16kA prospective short circuit current

Polestar MCB (types C & D)	6	10	16	20	32	40	50	63
Min rating of BS 88 fuse	100	160	200	200	200	200	200	200

Recommended maximum back-up fuse rating:

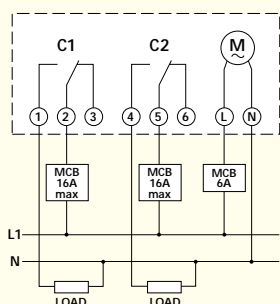
Single phase & Neutral Distribution Boards: GEC Type T 160A
(Some loss of discrimination may occur).

Three phase & Neutral Distribution Boards: GEC Type T 200A

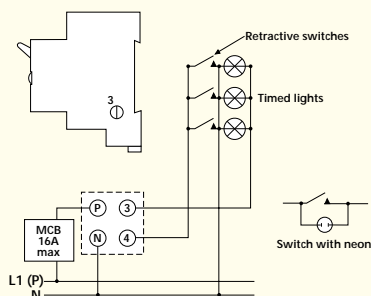


Analogue
Typical wiring diagram

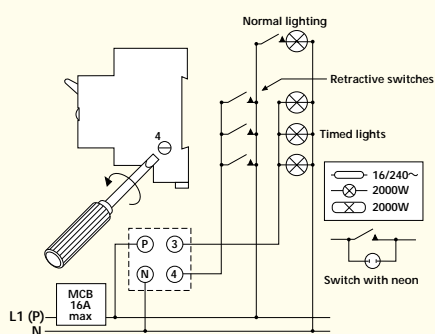
Digital 1 channel
Typical wiring diagram



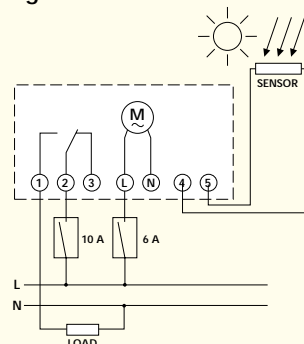
Digital 2 channel
Typical wiring diagram



Staircase 3 wire
Typical wiring diagram



Staircase 4 wire
Typical wiring diagram



Twilight switch
Typical wiring diagram

CONTROL MODULES

ANALOGUE TIME SWITCHES

	LIST Nos 303/TS24	303/TQ24	303/TQ7
Time period	24hr	24hr	7 day
Power reserve	–	150hr	150hr
Setting interval	15 min	15 min	1hr
Minimum switching	30 min	45 min	4hr
Contact rating at 240V ac	16A	16A	16A

- Changeover contacts
- Clear switch position indicator
- Manual override

DIGITAL TIME SWITCHES

	LIST Nos 302/TD1	302/TD2
Channel	1	2
Switching programme	24hr/7 day	24hr/7 day
Power reserve	250hr	250hr
Minimum setting	1 min	1 min
Contact rating resistive at 240V ac	16A	2 x 16A
Accuracy at 20°C	±1 sec/day	±1 sec/day
Power consumption	8.5VA	8.5VA
Holiday programme	1– 45 days	1– 47 days
Standard	VDE0875	VDE0875
Memory locations	42	24
Every day programme switchings per week	294	168
Permissible ambient temperature	-10–+50°C	-10–+45°C

- Permanent 'on/off'
- Summer/Winter time changes
- Manual override
- Daily and weekly programmes
- Changeover contacts

If the timers are used in combination with other devices within a system it is important to check that the entire system does not cause adverse interference. In the event that the ambient temperature exceeds those stated above, temporary fading of the display may occur. This does not affect the time-keeping or switching functions of the device.

STAIRCASE TIME SWITCH

Operating voltage	190–240V
Mains frequency	50–60Hz
Switching capacity	16A resistive, 2000W tungsten, 2000W fluorescent
Connection: 3-lead rising mains	4-lead rising mains
Timed, reswitchable lighting.	Timed, reswitchable lighting. Untimed, standard lighting switches.

- Synchronous motor
- Time range 1–7 minutes
- Glow lamp max 50mA
- Override switch for permanent 'on'
- Pre-selector switch for 3-4 wire connection

BELL TRANSFORMER

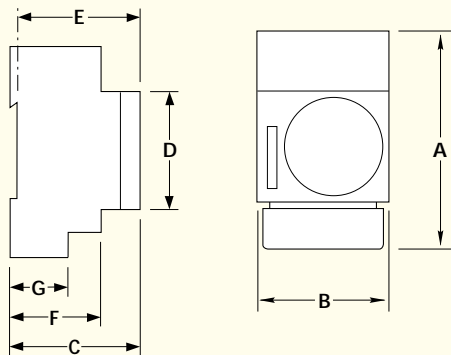
- Operating voltage: Primary 240V 50/60Hz: Secondary 4/8/12V
- Power: 5VA
- Short circuit resistance is in accordance with IEC 742

It is important to note that when this unit is installed with other 240 or 415V equipment, ensure secondary connections use cable with insulation rated for 240/415V duty, or use additional insulation (sleeving etc) to provide appropriate insulation.

TWILIGHT SWITCH

Operating voltage	190–240V
Mains frequency	45–60Hz
Power consumption	2.2VA
Contact rating resistive @ 240V	10A
Incandescent lamp load	1000W
Brightness range	2–2000 lux
Switching delay (on/off)	80 seconds approx
Switching status indication	LED (no delay)
Connection cable for light sensor	2 core cable max length 100m
Permissible ambient temp	-10 to +50°C control unit -40 to +70°C
Protection category	IP20 control unit IP54 light sensor

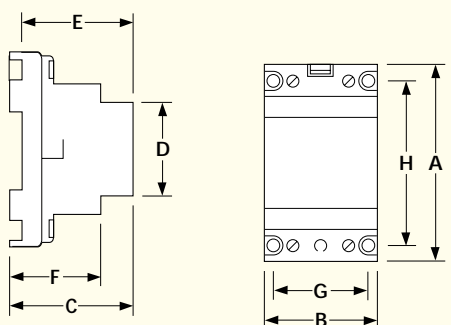
- Can be wired normally open or closed
- Delay 'on/off' eliminates nuisance switching
- Selector switch for adjustment of ranges: range 1 2–35 lux; range 2 35–2000 lux
- Connection of additional timing device will provide facility to override 'switch on' status



APPROXIMATE DIMENSIONS (mm)

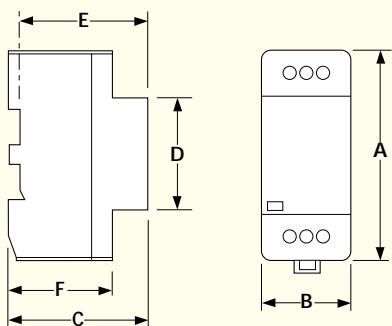
TIME SWITCHES

LIST No	A	B	C	D	E	F	G	H	J	K	L
Analogue											
303/TS24	90	54	66	45	60	46	-	-	-	-	-
303/TQ24	90	54	66	45	60	46	-	-	-	-	-
303/TQ7	90	54	66	45	60	46	-	-	-	-	-
Digital											
302/TD1	86	36	66	45	60	40	-	-	-	-	-
302/TD2	86	36	66	45	60	40	-	-	-	-	-
Staircase											
301/S7	84	18	70	45	60	43	25	-	-	-	-



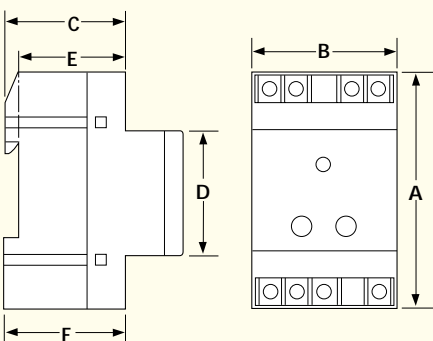
BELL TRANSFORMER

LIST No	A	B	C	D	E	F	G	H	J	K	L
303/B12	90	36	59	45	53	44	45	78	-	-	-



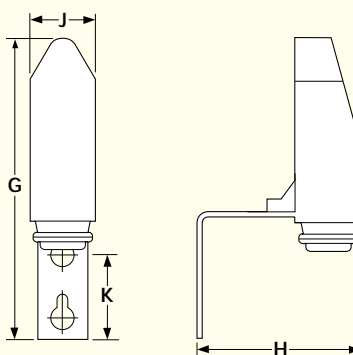
CONTACTORS & IMPULSE RELAYS

LIST No	A	B	C	D	E	F	G	H	J	K	L
301/C16DP	84	18	61	45	55	44	-	-	-	-	-
301/C20DP	84	18	59	45	53	44	-	-	-	-	-
302/C20TP	80	36	61	45	55	44	-	-	-	-	-
302/C20FP	80	36	59	45	53	44	-	-	-	-	-
303/C40DP	84	54	59	45	53	44	-	-	-	-	-
303/C40TP	84	54	59	45	53	44	-	-	-	-	-
303/C63TP	84	54	59	45	53	44	-	-	-	-	-
303/C63FP	84	54	59	45	53	44	-	-	-	-	-
301/I161	84	18	59	45	53	44	-	-	-	-	-
301/I162	84	18	59	45	53	44	-	-	-	-	-
301/I16CO	84	18	59	45	53	44	-	-	-	-	-



TWILIGHT SWITCH

LIST No	A	B	C	D	E	F	G	H	J	K	L
303/P2	86	54	66	45	60	46	116	61	27	25	-



POWERSTAR EARTH FAULT RELAY

Powerstar Earth Fault Relay is a residual current detection system for use with MCBs and MCCBs, consisting of a core balance transformer (CT) coupled to an advanced RCD relay. The relay may be used to trip a circuit breaker via a shunt trip or under-voltage release in the event of an earth fault.

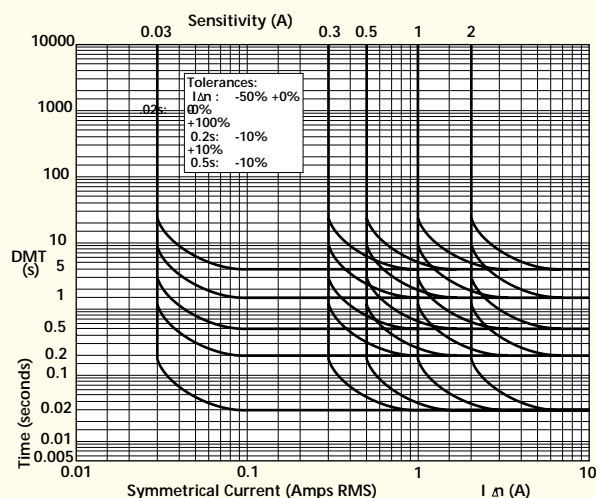
The relay and one of the four available CTs are all that is required for a complete earth fault sensing system suitable for the control of circuit breakers supplying circuits of up to 1600A rating fitted with either a shunt-trip or UVR.

This simple arrangement when coupled with the facility to DIN rail mount and the small number of interconnections necessary ensure that the system is easily selected and installed.

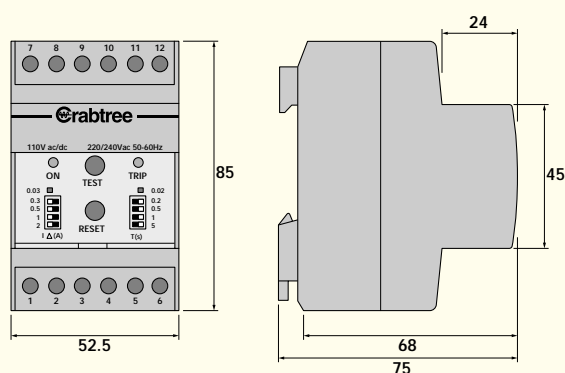
Safety and reliability were key considerations during the development of the technology. Advanced electronic circuitry constantly monitors both the relay-CT interconnection and the selected sensitivity.

Components may be ordered individually or mounted with an MCCB of up to 1600A rating in an individual wall mounting enclosure. The system can be or incorporated in a Crabtree Panel Board with Powerstar MCCB's.

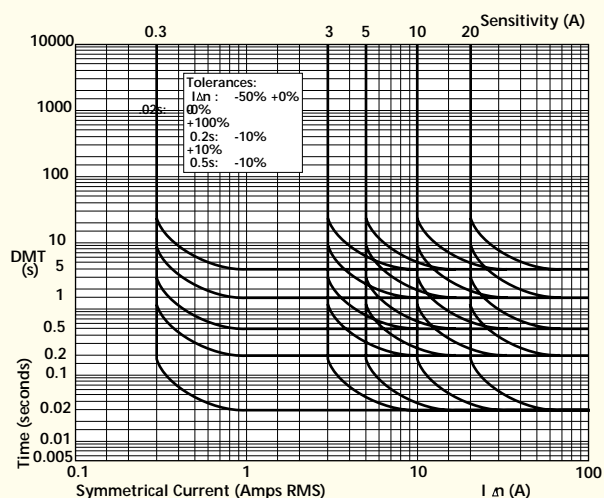
TIME RESIDUAL CURRENT



RELAY DIMENSIONS



TIME RESIDUAL CURRENT

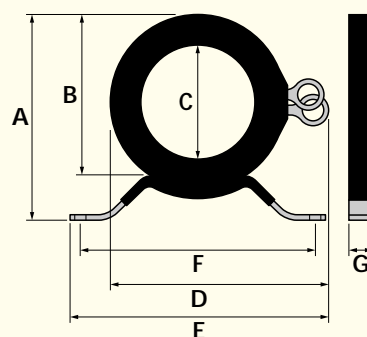
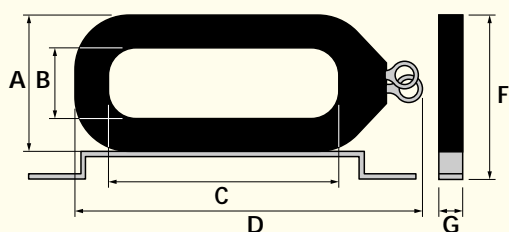


CT DIMENSIONS

CT	A	B	C	D	E	F	G	Mounting
	Max.		Min.	Max.	Max.			Screws
7PCT250	68	60	30	90	90	51	19	2 x M3
7PCT630	115	100	55	128	140	104	19	2 x M6
7PCT1000	150	135	95	165	165	104	19	2 x M6
7PCT1600	N/A	400	360	440	N/A	N/A	30	NONE
7PT1600	130	75	290	385	610	185	42	2 x M5

DIMENSIONS FOR 7PCT250/630/1000/1600

FIXING CENTRE DIMENSIONS FOR 7PT1600



FUSESTAR HOUSED AND SKELETON FUSE COMBINATION UNITS – GENERAL

SPECIFICATION

- BSEN947-3
- Range of ratings 20A -500A in 4 frame sizes
- Pole configurations SP & N, TP, DP and TP & N, and 4 Pole
- Voltage rating 415V ac
- Frequency rating 50/60 Hz
- Fuse type BS88

PRODUCT FEATURES

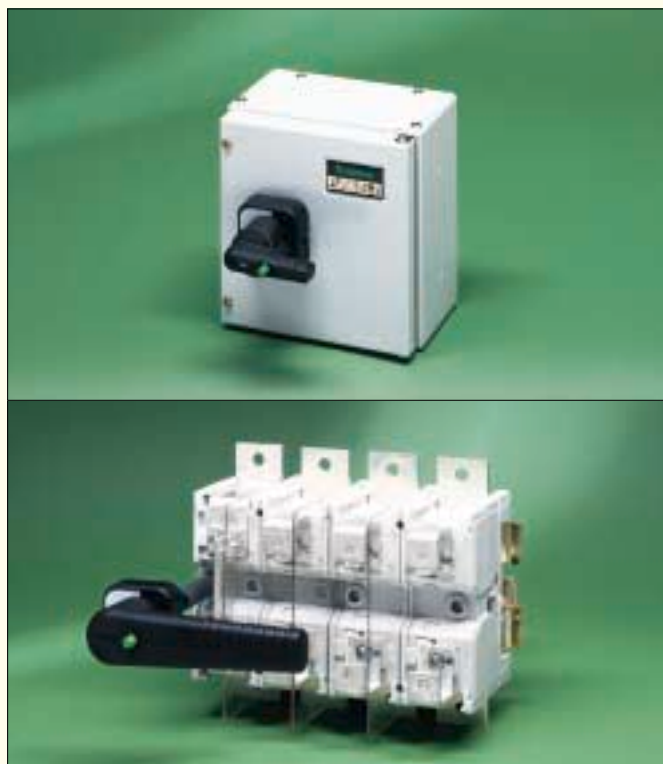
- Switching speed totally operator independent
- Handle padlockable on or off
- Drive shaft padlockable off with or without handle fitted

SKELETON UNITS

- Compact design with all pole configurations accommodated in same body size
- Handle operating arc within body dimensions

HOUSED UNITS

- Modular enclosure design (52.5mm) with inbuilt cable spreader box
- Reversible door which opens 180°

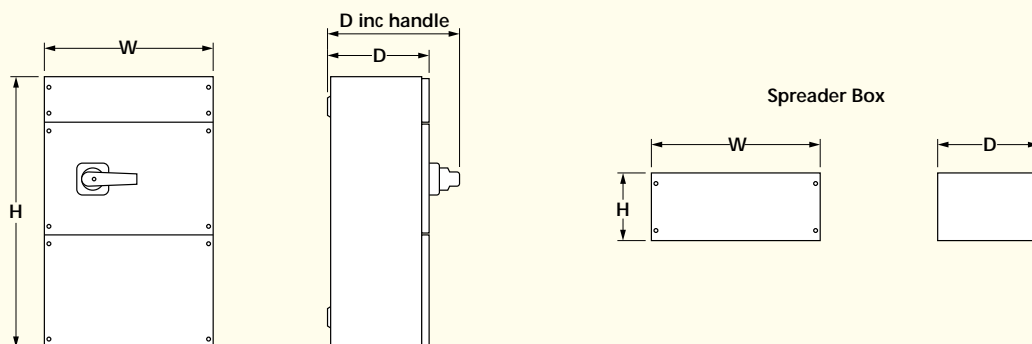


TECHNICAL DATA

	20–32A	63A	100A	125A	160A	200A	315A	400A	630A	800A
Mechanical Endurance	10,000	10,000	10,000	8,000	8,000	8,000	8,000	5,000	5,000	3,000
Fused s/c Current kA RMS	80	80	80	80	80	80	80	80	80	80
Ratings	A kW	A kW	A kW	A kW	A kW	A kW	A kW	A kW	A kW	A kW
415V Ie/pe	32 15	63 30	100 55	125 75	160 90	200 110	315 160	400 230	630 330	800 450
Weights										
Housed Units	3 Kg	6 Kg	6 Kg	6 Kg	12 Kg	12 Kg	21 Kg	21 Kg	36.5 Kg	36.5 Kg
Spreader Box	0.6 Kg	1 Kg	1 Kg	1 Kg	2 Kg	2 Kg	4 Kg	4 Kg	8 Kg	8 Kg
Bus Bar Chamber	-	-	-	-	-	-	-	21Kg	-	-

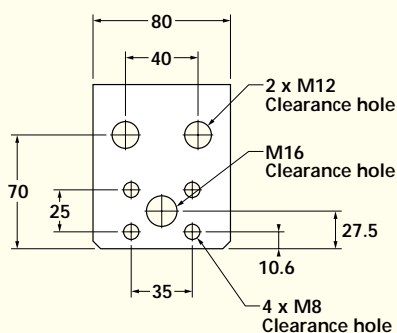
FUSE COMPARISON DATA

Current Rating	BS 88 Reference	Lawson	GEC	Bussman	MEM Paramount
20/32A	A1	NIT	NIT	NITD	SA2
63A	A3, A2	TIS, TIA GTIA	TIS, TIA	BAO, AAO	SB4, SB3
100A	A4 (DIA 33 max)	TCP	-	CEO	SD5
125A	AS A4	TFP	TFP	DEO, CEO	SD6,SD5
160A	AS A4 (DIA 38 max)	TFP	TFP	DEO, CEO	SD6, SD5
200A	AS A4 (DIA 38 max)	TFP	TFP	DEO, CEO	SD6, SD5
315A	B3 (DIA 50 max), B2, B1	TFK, TF	TF	ED, DD, CD	SF7, SF6, SF5
400A	B4, B3, B2, B1	TMF, TFK, TF, TC	TMF, TFK, TF, TC	ED, DD, CD	SF8, SF7, SF6, SF5
630A	C2, C1	TTM, TM	TTM, TM	FF, EF	SH9, SH8
800A	C3, C2, C1	TLM, TTM, TM	TLM, TTM, TM	GF, FF, EF	SH10, SH9, SH8

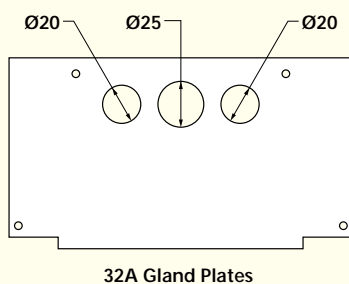


HOUSED UNIT DIMENSIONS (mm)

HOUSED UNIT	H	W	D	D inc. handle		H	W	D
20-32A	210	210	135.5	220.5	SPREADER BOX	105	210	105
63-125A	420	262.5	188	273	SPREADER BOX	105	262.5	157.5
160-200A	525	315	240.5	325.5	SPREADER BOX	105	315	210
315-400A	735	420	240.5	325.5	SPREADER BOX	210	420	210
630-800A	840	620	293	378	SPREADER BOX	210	620	262.5

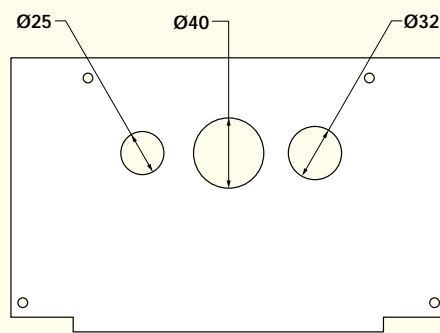


800A Switch terminal

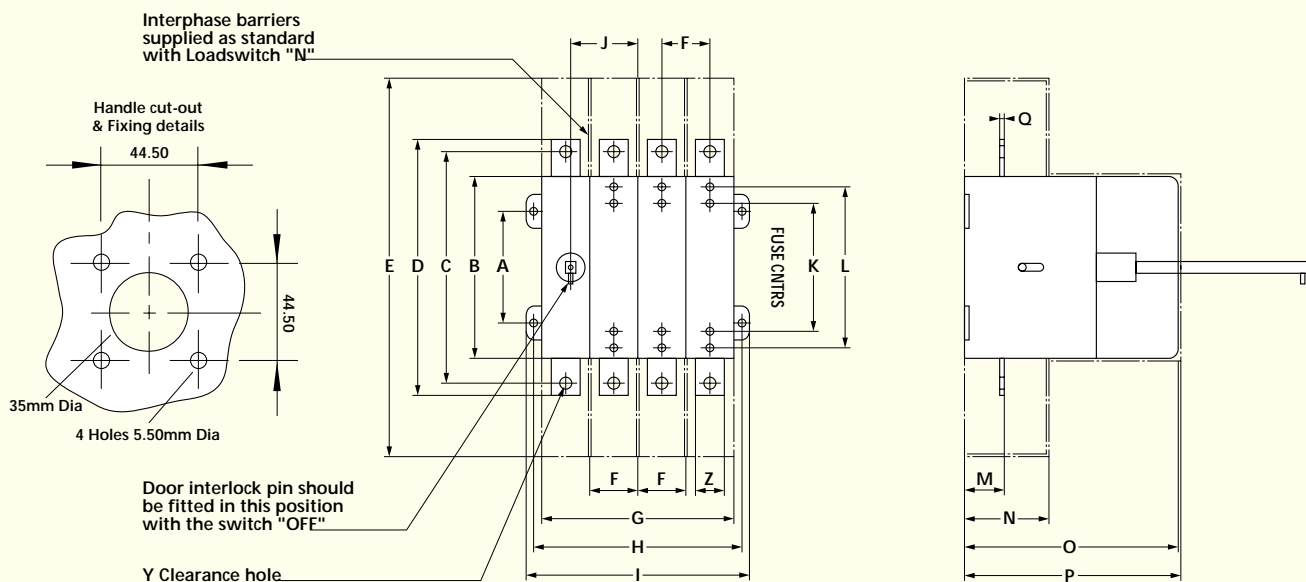


32A Gland Plates

All Dimensions in mm



63-125A Gland Plates



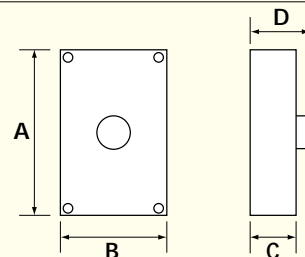
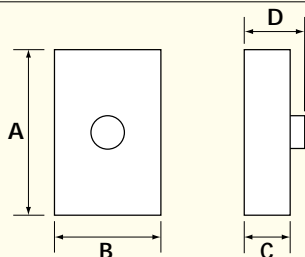
SKELETON SWITCH DIMENSIONS (mm)

Frame	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	X	Y	Z
F 63A	80	135	170	186	270	35	140	155	165	50	73	N/A	30	80	160	161	3	121	150	170	M8	20
F 100-125A	80	135	170	186	270	35	140	155	165	50	94	N/A	30	80	160	161	3	121	150	170	M8	20
F 160-200A	80	135	170	186	300	35	140	155	165	50	94	N/A	30	80	196	197	3	121	150	220	M8	20
L	60	180	220	250	414	70	280	295	305	125	111	N/A	45	87	210	212	5	176	150	220	M12	50
N	100	180	235	255	534	105	420	460	475	195	133	184	60	129	240	242	5	176	150	270	M12	80

TECHNICAL INFORMATION

	Moulded Enclosure								Sheet Steel Enclosure								
RATING IN AMPS	16A	25A	32A	40A	63A	80A	100A	125A	20A	32A	40A	63A	63A*	100A	125A	20A	32A
Rated Insulation Voltage Ui (V)	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Dielectric Strength (kV) 50 Hz 1min	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Shock Resistance Uimp (kV)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8		
OPERATIONAL CURRENT IE (A)																	
415 V AC - AC21A / AC21B	16	25	32	40	63	80	100	125	20	32	40	63	80	100	125	20	32
AC22A / AC22B	16	25	32	40	63	80	100	125	20	32	40	63	80	100	125	20	32
AC23A / AC23B	16	25	32	40	63	80	80	80	20	32	40	63	80	80	80	20	32
500 V AC - AC21A / AC21B	16	25	32	40	63	80	100	125	20	32	40	63	80	100	125	20	32
AC22A / AC22B	16	25	32	40	63	80	100	125	20	32	40	63	80	100	125	20	32
AC23A / AC23B	16	25	32	40	40	63	63	63	20	32	40	40	63	63	63	20	32
690 V AC - AC20A / AC20B	16	25	32	40	63	80	100	125	20	32	40	63	80	100	125	20	32
AC21A / AC21B	16	25	32	40	63	80	100	125	20	32	40	63	80	100	125	20	32
AC22A / AC22B	16	25	32	40	63	80	100	100	20	32	40	63	80	100	100	20	32
AC23A / AC23B	16	25	25	25	25	50	50	50	20	25	25	25	50	50	50	20	25
MOTOR POWER (KW) AC 23																	
415 V AC	7.5	9	11	11	15	22	37	40	7.5	11	11	15	18.5	37	40	7.5	11
500 V AC	7.5	9	11	15	18.5	30	37	37	7.5	11	15	18.5	22	37	37	11	11
690 V AC	11	11	11	18.5	18.5	30	30	30	11	11	18.5	18.5	25	30	30	11	11
FUSE TYPES TO BS88																NS	NS
OVERLOAD CAPACITY																	
Fuse rating gG	16	25	32	40	63/40	80	100	125	20	32	40	63/40	63	100	125	20	32
Short circuit current with fuses (kA Rms)	50	50	50	50	20/50	40	20	15	50	50	50	20/50	50	20	15	50	50
Asymetric short time rating current (kA peak)	6	6	6	6	6	9	9	9	6	6	6	9	9	9	9	6	6
Admissible short time current 1 s. (kA Rms)	1.26	1.26	1.26	1.26	1.26	1.5	1.5	1.5	1.26	1.26	1.26	1.5	1.5	1.5	1.5	1.26	1.26
MAKING & BREAKING CHARACTERISTICS																	
Breaking capacity (A Rms) 415 V AC 23 A	128	200	256	320	504	640	640	640	160	256	320	504	504	640	640	160	256
Making capacity (A Rms) 415 V AC 23 A	160	250	320	400	630	800	800	800	200	320	400	630	630	800	800	200	320
WITHSTAND																	
Mechanical (number of operations) x 1000	100	100	100	100	100	30	30	30	100	100	100	100	30	30	30	100	100
Electrical (number of operations at 415V AC 23A) x 1000	3	3	3	3	3	1.5	1.5	1.5	3	3	3	3	1.5	1.5	1.5	3	3
CONNECTION																	
Maximum Cu cable section (mm²) lth	16	16	16	16	16	50	50	50	16	16	16	16	50	50	50	16	16
using stranded cable (mm²)	25	25	25	25	25												
WEIGHT (KG)																	
3 pole	0.13	0.13	0.13	0.13	0.13	0.26	0.26	0.26	2.00	2.00	2.00	2.00	2.50	2.50	2.50	3	3
4 pole	0.18	0.18	0.18	0.18	0.18	0.34	0.34	0.34	2.00	2.00	2.00	2.00	2.50	2.50	2.50	3	3

DIMENSIONS



STEEL ENCLOSURES

BOX	A	B	C	D
1	220	158	136	172.5
2	325	158	136	172.5

INSULATED ENCLOSURES

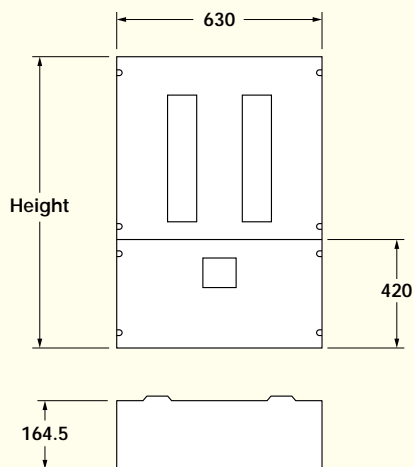
BOX	A	B	C	D
A	130	85	75	105
B	175	125	100	137
C	250	175	100	135
D	310	200	135	170
E	410	200	135	170

* Box size 2 steel enclosed switch.

Dimensions are overhall including screw heads.

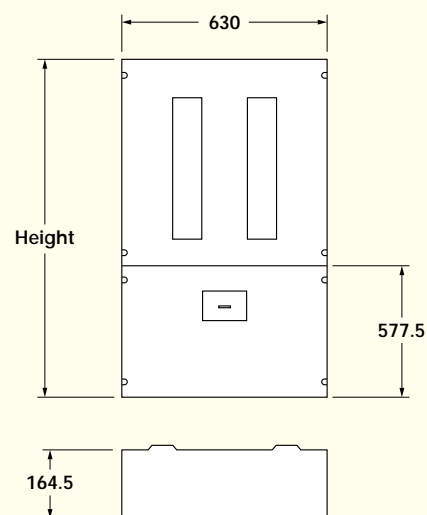
POWERSTAR 125 PANEL BOARDS 250A UNITS

Modular Height	Height (mm)	LIST No
17	896.5	17G2506SW
17	896.5	17B2508SW
20	1054	17B2512SW
23	1211.5	17B2516SW
17	896.5	17B2006MB
17	896.5	17B2008MB
20	1054	17B2012MB
23	1211.5	17B2016MB
17	896.5	17B2506DC
17	896.5	17B2508DC
20	1054	17B2512DC
23	1211.5	17B2516DC



POWERSTAR 125 PANEL BOARDS 400A UNITS

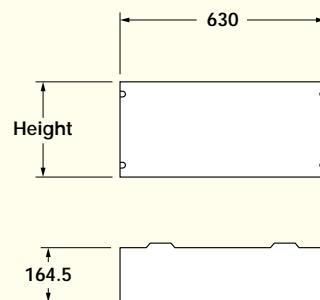
Modular Height	Height (mm)	LIST No
20	1054	17B4006SW
20	1054	17B4008SW
23	1211.5	17B4012SW
26	1526.5	17B4016SW
20	1054	17B4006MB
20	1054	17B4008MB
23	1211.5	17B4012MB
26	1526.5	17B4016MB
20	1054	17B4006DC
20	1054	17B4008DC
23	1211.5	17B4012DC
26	1526.5	17B4016DC



POWERSTAR 125 ACCESSORIES

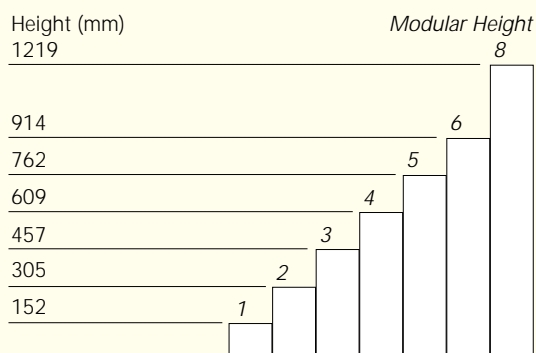
Modular Height	Height (mm)	LIST No
4	*210	17G13DB
4	*210	17G24SS
8	*420	17GCSB

* Dimensions for Accessory boxes do not include end plate dimensions, this is because these 2 boxes are add on units and are supplied without end plates. The end plate is removed from the panel board, that is connected to the add on unit. Then fitted to the top of the add on unit. For example, a 17G2006MB fitted to a 17G13DB would be 896.50 + 210.00 = 1106.50.

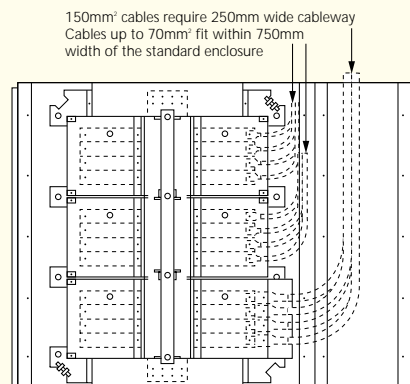


POWERSTAR 200 MODULAR SIZES

* All Enclosures are 750mm wide (plus 7mm for each side plate) x 200mm deep x modular height. All Cableways are 250mm wide x 200mm deep x modular height.



CABLE ACCESS

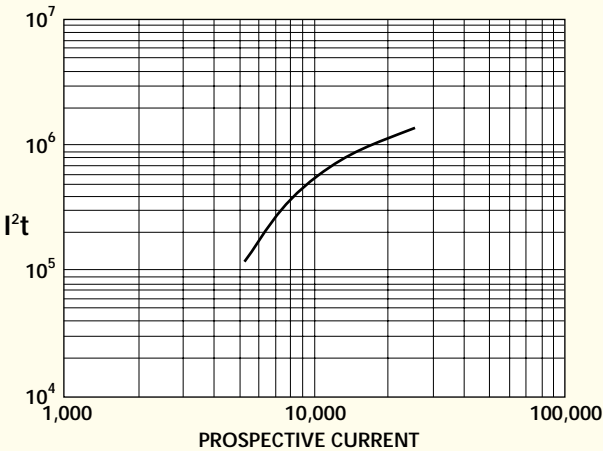


Additional Powerstar 200 Technical Information Pages 32 -43

G FRAME MCCB'S TECHNICAL SPECIFICATION

G FRAME SPECIFICATION

• Specification	BS EN 60947-2
• Current Range	25 – 125A
• Ue Rated Operation Voltage	240V SP 415V TP
• Ui Rated Insulation Voltage	500V AC
• Rated Frequency	50/60Hz
• Release	Thermal Magnetic
• Adjustment	None
• Ambient Range	-20°C to 55°C
• Humidity Range	0 – 90%
• Weight	SP - 0.4kg TP - 0.95kg
• Mechanical Duration	8000 operations



FEATURES

The symmetrical vertical and horizontal axis with a double stepped escutcheon plate, enabling it to fit through either a 46mm or 80mm cut-out. A double insulated compartment located behind the removable escutcheon plate, facilities easy on-site installation of shunt trip and auxiliary switch units.

AVAILABLE OPTIONS

- ST (See Product Section for selection)
- Aux Switches
- Padlocking
- Terminal Shrouds

SHORT CIRCUIT BREAKING CAPACITY

Type	GB	GN
Ue	Icu	Icu
	SP/TP	TP
220 V	30	30
380 V	16	25
415 V	16	25

Ics = 50% Icu

INSTANTANEOUS TRIP BANDS

	SP	TP
25 – 32A	500A	400A
40 – 80A	800A	600A
100 – 125A	1250A	600A
Non-adjustable		±10%

TERMINALS

Front-connected clamps –
25A to 125A – 70mm² cable
– 10mm strip

AUXILIARY EQUIPMENT

G Frame MCCB's

- Shunt Trip & Auxiliary Switch
- Two Auxiliary Switches

(For Shunt Trip with 2 Auxiliary C/O Switches add suffix A to ST List No.).

Shunt Trip

Max on time 1 cycle: 10 seconds

Max on time con. cycle: 6 seconds

24V dc	30W	} Closed Power Consumption 10% Duty Cycle
115V ac	43VA	
230V ac	43VA	

Auxiliary Contact Ratings (A)

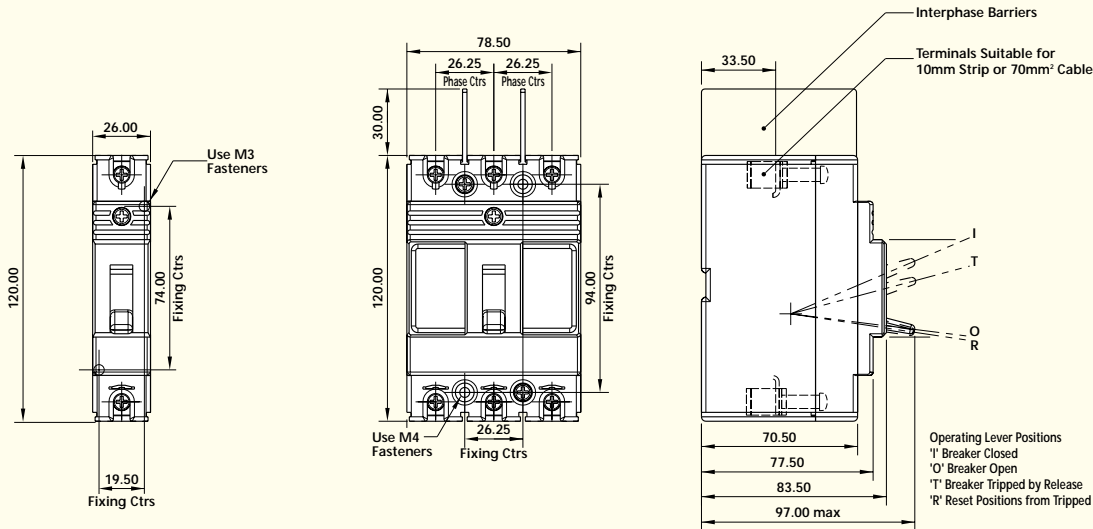
Voltage	Resistive Load (A)	Tungsten Load NC (A)	NO (A)	Inductive Load (A)
AC				
125	3	0.5	0.5	3
250	3	0.5	0.5	3
DC				
30	3	3	0.5	3
50	1	0.7	0.7	1
125	0.5	0.4	0.4	0.05

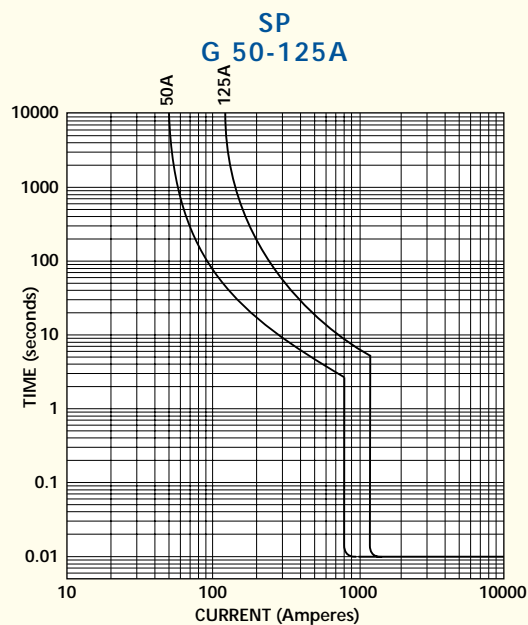
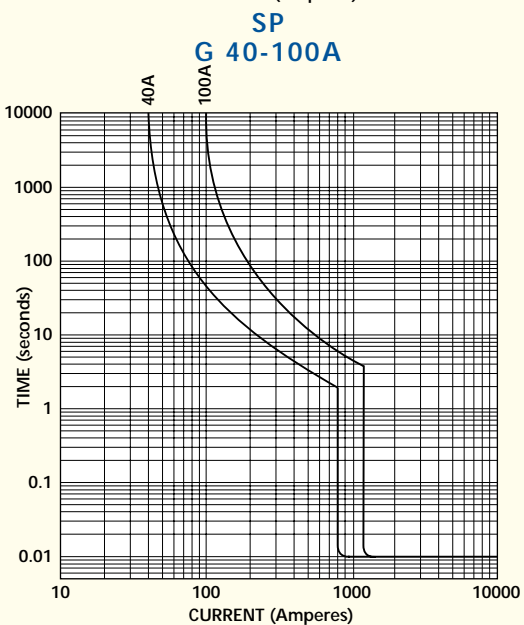
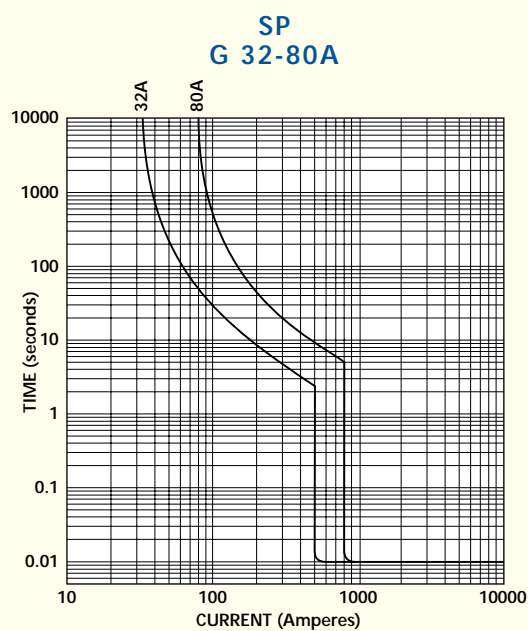
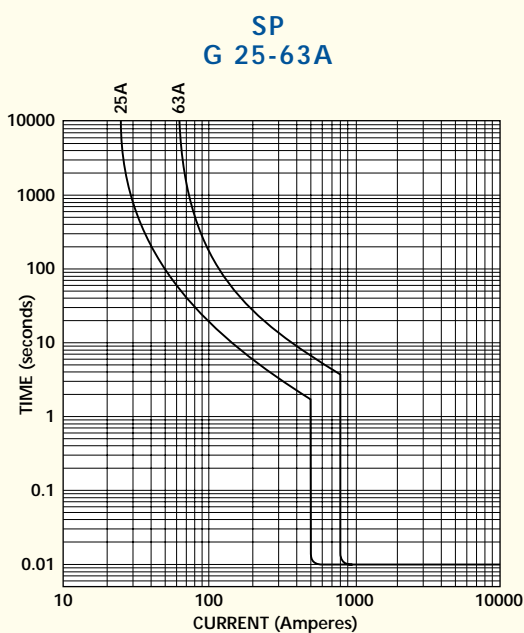
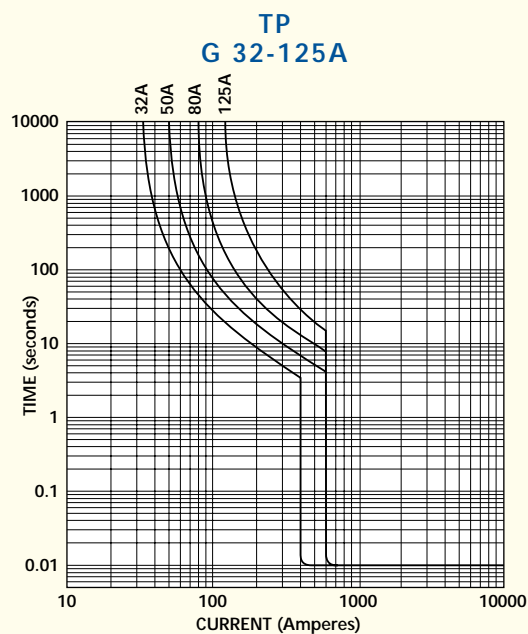
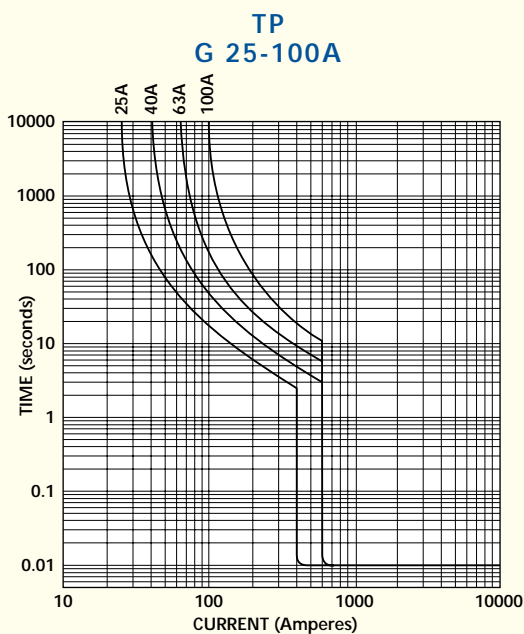
LOADLINE G FRAME MAXIMUM EARTH LOOP IMPEDANCES FOR TRIPLE POLE MCCBS Zs (ohms) for Uo = 240V~

Current Rating (A)	25	32	40	50	63	80	100	125
0.4 Seconds Disconnection Time	0.17Ω	0.17Ω	0.13Ω	0.13Ω	0.13Ω	0.13Ω	0.13Ω	0.13Ω
5.00 Seconds Disconnection Time	0.96Ω	0.75Ω	0.60Ω	0.48Ω	0.38Ω	0.30Ω	0.24Ω	0.19Ω

LOADLINE G FRAME MAXIMUM EARTH LOOP IMPEDANCES FOR SINGLE POLE MCCBS Zs (ohms) for Uo = 240V~

Current Rating (A)	25	32	40	50	63	80	100	125
0.4 Seconds Disconnection Time	0.43Ω	0.43Ω	0.27Ω	0.27Ω	0.27Ω	0.27Ω	0.17Ω	0.17Ω
5.00 Seconds Disconnection Time	0.96Ω	0.75Ω	0.60Ω	0.48Ω	0.38Ω	0.30Ω	0.24Ω	0.19Ω





Tolerance on instantaneous current values $\pm 10\%$.

F FRAME MCCBs TECHNICAL SPECIFICATION

F FRAME SPECIFICATION

Current Range:	25 – 250A
I_n Rated Current:	250A
I_u Rated Uninterrupted Current:	250A
U_e Rated Operation Voltage:	415V
U_i Rated Insulation Voltage:	660V
I_{cm} Rated Short Circuit Making Capacity:	S Type - 73.5kA peak (at 415V) H Type - 105kA peak

Trip Unit Type	
Magnetic trip setting:	(25 - 32A) 500A (40 - 80A) 800A (100 - 125A) 1250A (160 - 250A) 1600A

Rated Ultimate Short Circuit Breaking Capacity

I_{cu} Rated Service Short Circuit Triple Pole:	S Type - 35kA H Type - 50kA
I_{cs} Breaking Capacity:	50% I_{cu}
Mechanical duration:	8,000 operations

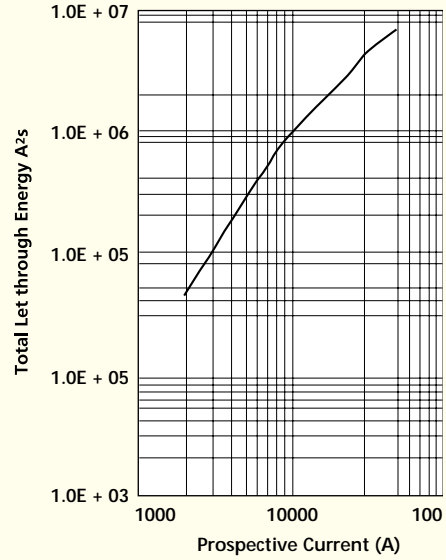
Ambient Temperature Range:	-20 to 55°C
Humidity Range:	0 - 90%
Terminal Type:	M8 Screw
Terminal Capacity:	185mm ² (cable) 22mm wide (strip)

Shunt Release

Max. on time 1 cycle:	10 seconds
Max. on time con. cycle	6 seconds
24V dc	30W
115V ac	43VA
230V ac	43VA
	Closed Power Consumption 10% Duty Cycle

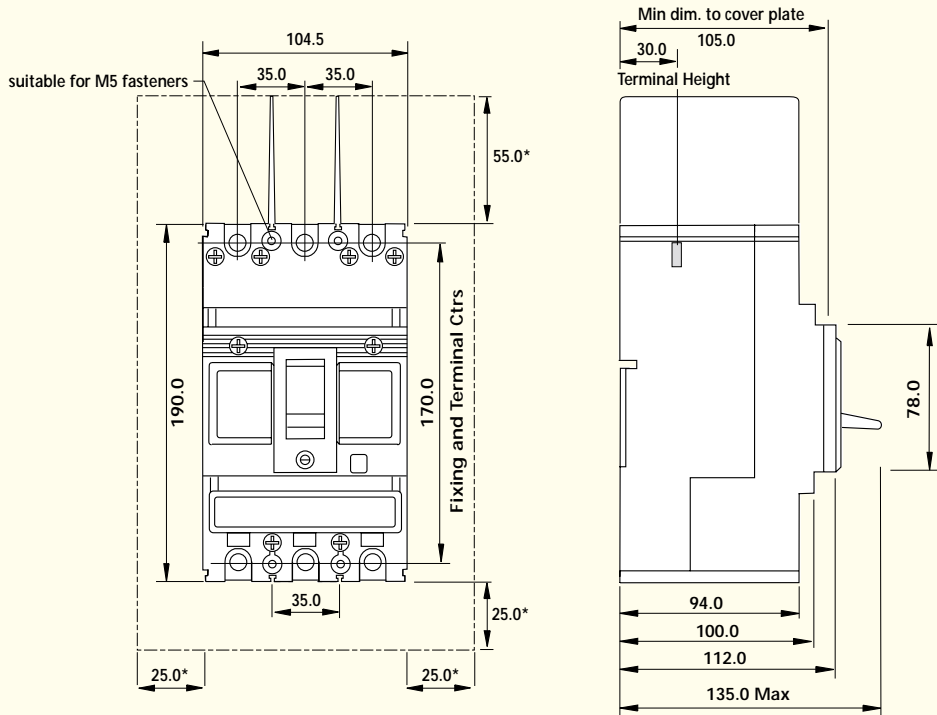
Auxiliary Contacts

	Resistive Load	Inductive Load	Tungsten Lamp Load NC	Tungsten Lamp Load NO
50V dc	3A	2.5A	0.8A	0.8A
125V ac	10A	10A	2A	1A
250V ac	10A	10A	1.5A	1A



F FRAME MAXIMUM EARTH LOOP IMPEDANCES Z_s (ohms) for $U_o = 240V\sim$

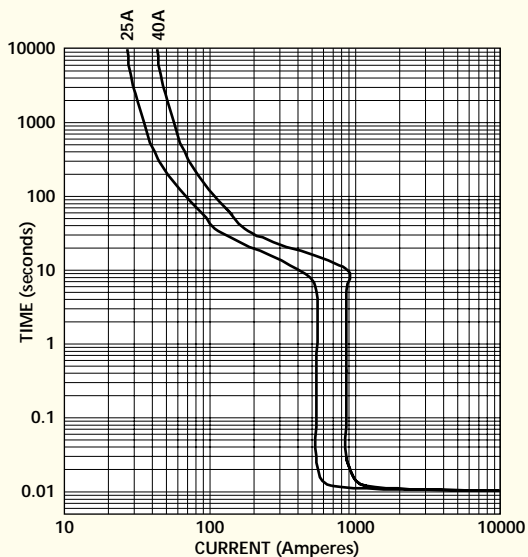
Current Rating (A)	25	32	40	50	63	80	100	125	160	200	250
0.4 Seconds Disconnection Time	0.40Ω	0.40Ω	0.25Ω	0.25Ω	0.25Ω	0.25Ω	0.16Ω	0.16Ω	0.125Ω	0.125Ω	0.125Ω
5.00 Seconds Disconnection Time	0.40Ω	0.40Ω	0.25Ω	0.25Ω	0.25Ω	0.25Ω	0.16Ω	0.16Ω	0.125Ω	0.125Ω	0.125Ω



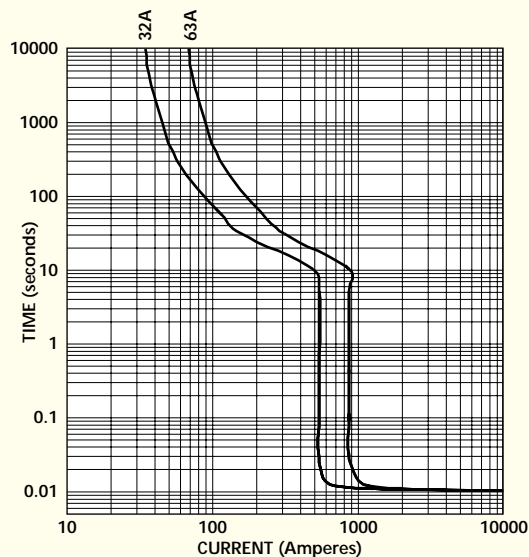
* Denotes Min distance to earthed metal

Panel cutout 105 wide x 80 deep

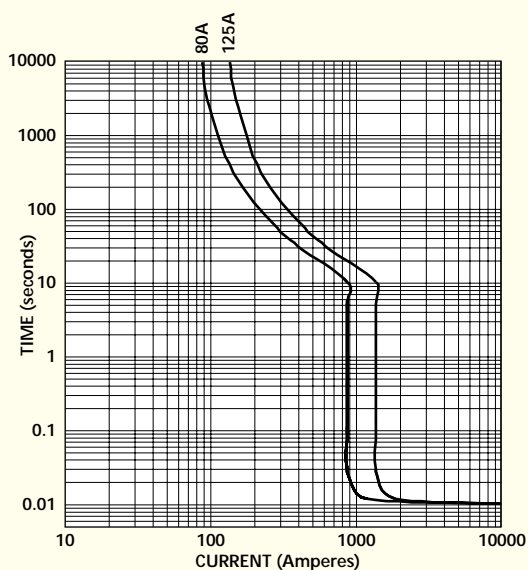
F 25-40 AMP



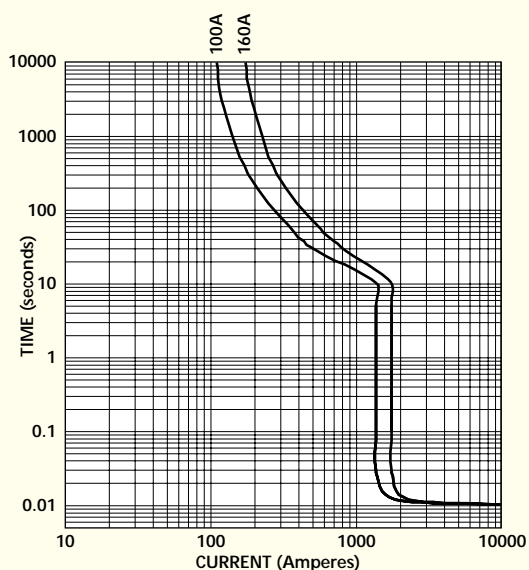
F 32-63 AMP



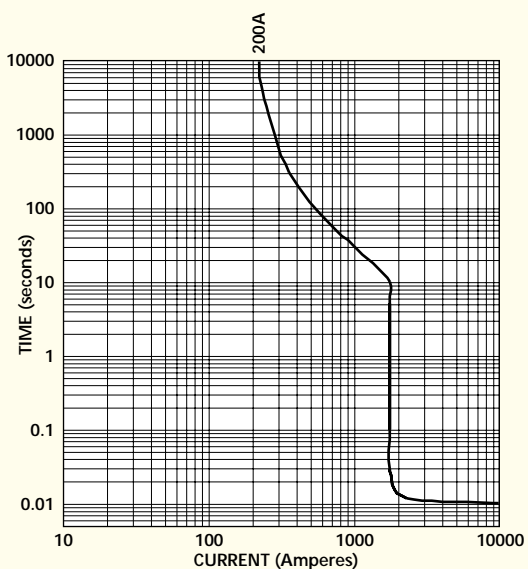
F 80-125 AMP



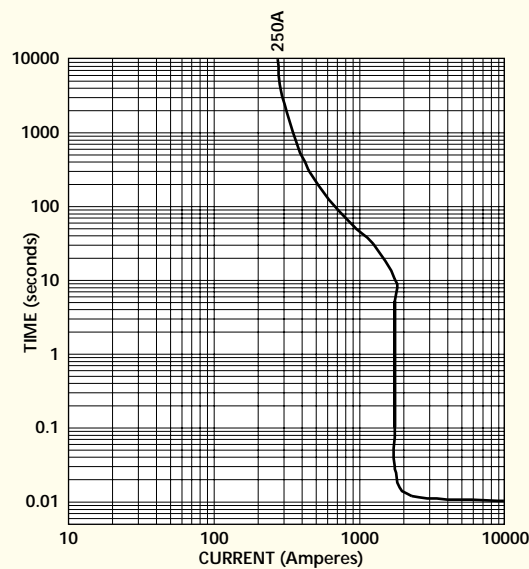
F100-160 AMP



F200 AMP



F250 AMP

Tolerance on Instantaneous Current Values $\pm 10\%$

J & JM FRAME MCCBs TECHNICAL SPECIFICATION

J & JM FRAME SPECIFICATION

• Specification	BSEN60947-2
• Current Range	25 – 200A
• Ue Rated Operation Voltage	240V SP 415V TP
• Ui Rated Insulation Voltage	660V AC
• Rated Frequency	50/60Hz
• Release	Thermal Magnetic
• Thermal Adjustment	0.7 – 1.0 x Rated Current
• Instantaneous Adjustment	Non-adjustable
• Short Circuit Breaking Capacity	Icu at 415V = 25KA, Ics = 75%Icu
• Ambient Range	-20°C to 55°C
• Humidity Range	0 – 90%
• Weight	SP – 0.7Kg TP – 1.8Kg TPSWM – 2.4Kg

FEATURES

From J Frame to N Frame Powerstar MCCBs feature escutcheons of the same height allowing any of the frame sizes to be grouped together in a single panel cutout.

Front adjustable thermal tripping elements.

OPTIONS

- ST UVR
- Aux SW
- Castell Lock Direct Mounting
- Rotary Handle
- Padlocking
- Terminal Shrouds
- Backstuds
- 4th Poles when fitted are left hand side

(See Product Section for selection)

SHORT CIRCUIT BREAKING CAPACITY

Ue	Icu
220 V	50 kA
380 V	32 kA
415 V	25 kA

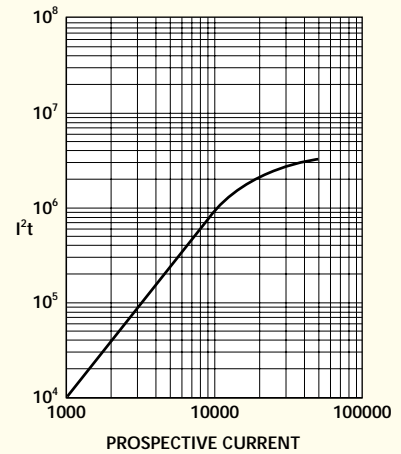
Ics = 75% Icu

INSTANTANEOUS TRIP BANDS

J Frame	JM Frame
25 – 63A = 400A	
80 – 125A = 800A	
160 – 200A = 1600A	50 – 200 = 1600A

TERMINALS

Front-connected clamps –
25A to 100A – 70mm²
125A to 200A – 120mm² solid/150mm² stranded
Backstuds available – M12



AUXILLIARY EQUIPMENT OPTIONS

- UVR & Auxillary Switch
- Shunt Trip & Auxillary Switches
- Two Auxillary Switches each to change over

Shunt Trip Voltage Range 70 – 110%

Under Voltage Release Threshold 70 – 35%

UVR Power Pack 10VA

(110V & 415V units also supplied with transformer additional to Powerpack.).

Auxiliary Contact Ratings

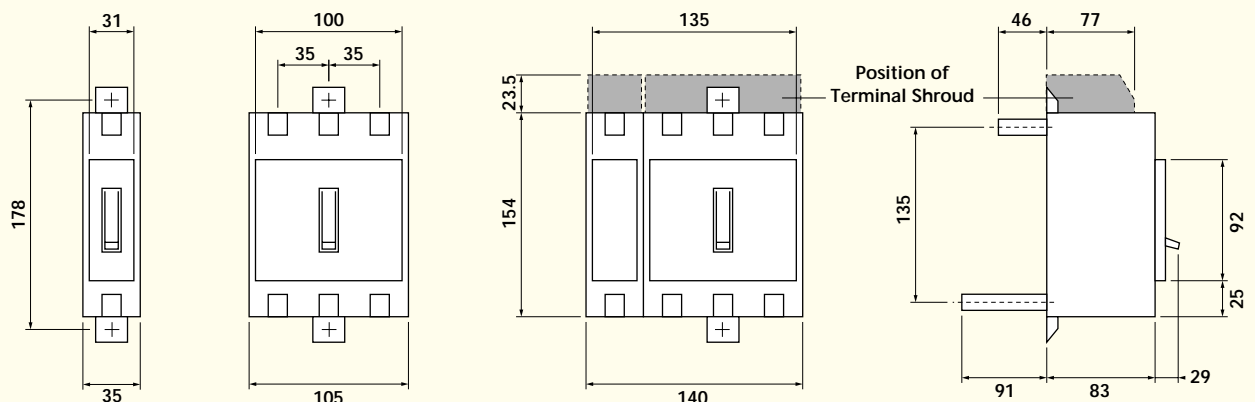
Voltage	Resist' Load (A)	Tungsten NC (A)	Load NO (A)	Induct' Load (A)
AC				
125	10	2	1	10
250	10	1.5	1	10
DC				
30	10	3	1.5	10
50	3	0.8	0.8	2.5
125	0.5	0.5	0.5	0.07

POWERSTAR J FRAME MAXIMUM EARTH LOOP IMPEDANCES Zs (ohms) for Uo = 240V~

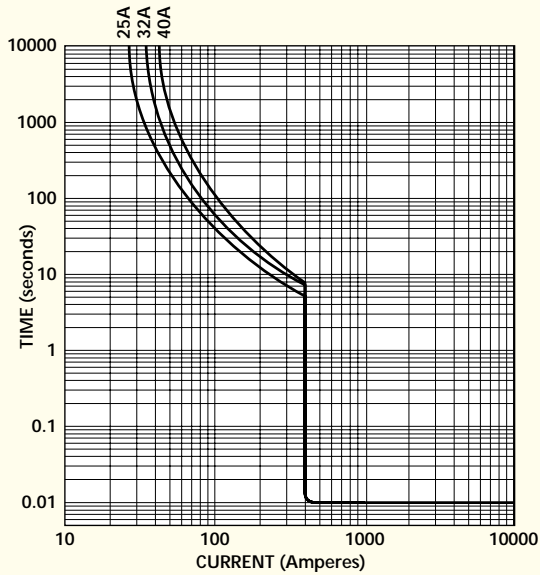
Current Rating (A)	25	32	40	50	63	80	100	125	160	200
0.4 Seconds Disconnection Time	0.500Ω	0.500Ω	0.500Ω	0.500Ω	0.500Ω	0.250Ω	0.250Ω	0.250Ω	0.125Ω	0.125Ω
5.00 Seconds Disconnection Time	0.500Ω	0.500Ω	0.500Ω	0.500Ω	0.500Ω	0.250Ω	0.250Ω	0.250Ω	0.125Ω	0.125Ω

POWERSTAR JM FRAME MAXIMUM EARTH LOOP IMPEDANCES Zs (ohms) for Uo = 240V~

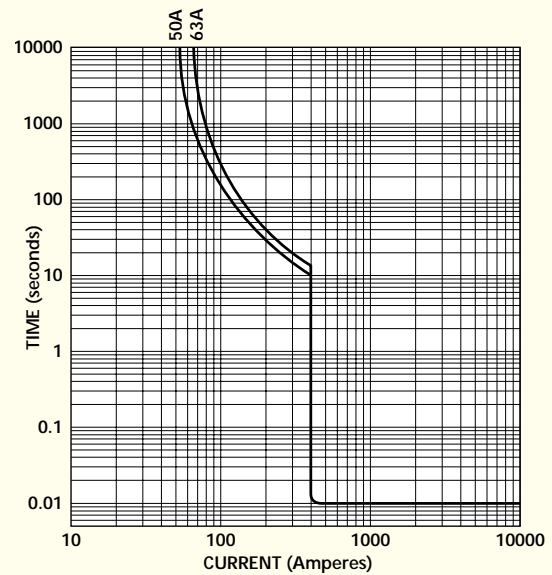
Current Rating (A)	50	63	80	100	125	160	200
0.4 Seconds Disconnection Time	0.125Ω	0.125Ω	0.125Ω	0.125Ω	0.125Ω	0.125Ω	0.125Ω
5.00 Seconds Disconnection Time	0.125Ω	0.125Ω	0.125Ω	0.125Ω	0.125Ω	0.125Ω	0.125Ω



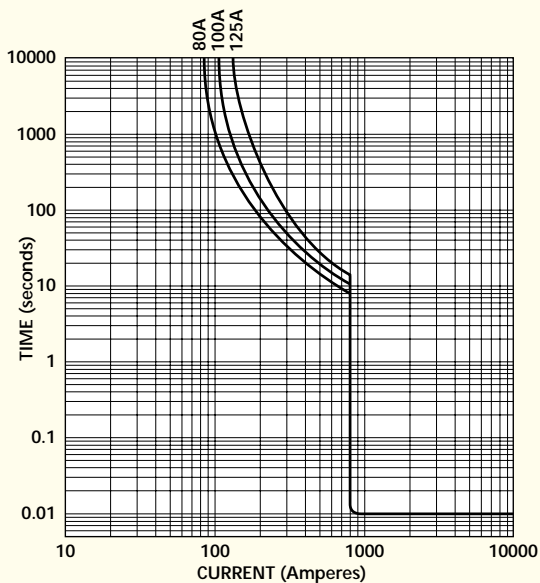
J 25-40 AMP



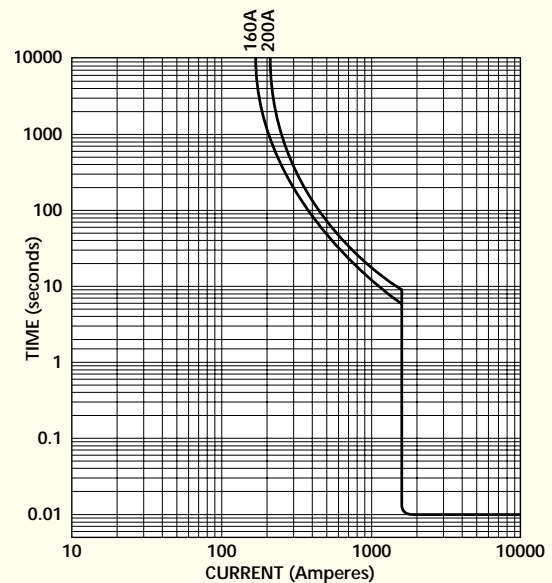
J 50-63 AMP



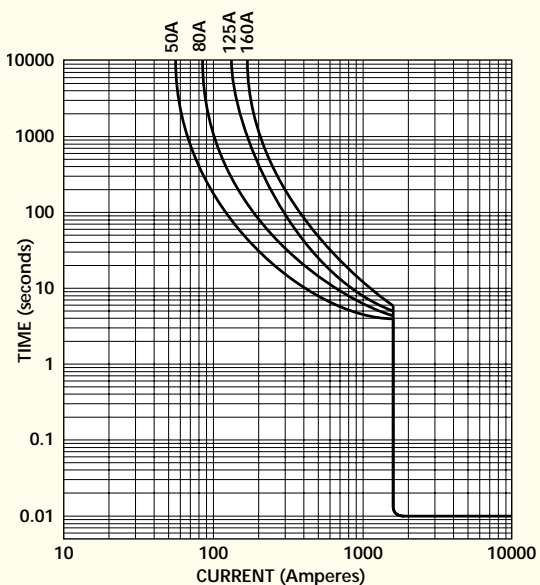
J 80-125 AMP



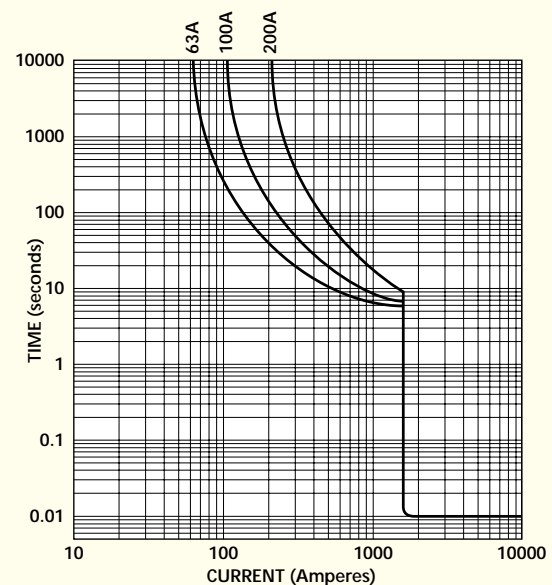
J 160-200 AMP



JM 50-100 AMP



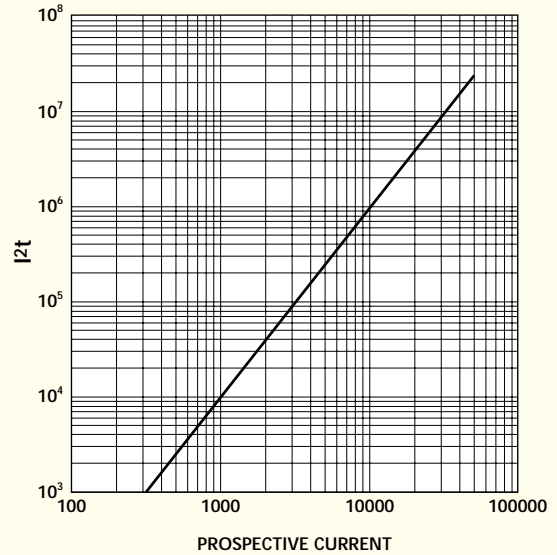
JM 63-200 AMP

Tolerance on Instantaneous Current Values $\pm 10\%$

LS & LH FRAME MCCBs TECHNICAL SPECIFICATION

LS & LH FRAME SPECIFICATION

• Specification	BSEN60947-2
• Current Range	250 – 800Amps
• Ue Rated Operation Voltage	415V
• Ui Rated Insulation Voltage	660V AC
• Rated Frequency	50/60Hz
• Icu (415V) Short Circuit Breaking Capacity	50kA
• Release	Thermal Magnetic
• Thermal Adjustment	70 – 100% Rated Current
• Instantaneous Adjustment	Adjustable – see below
• Ambient Range	-20°C to 55°C
• Humidity Range	0 – 90%
• Weight	TP – 9.2Kg TPSWM – 11.6Kg



LS & LH FRAME FEATURES

From J Frame to N Frame Powerstar MCCB's feature 1600 Amps escutcheons of the same height to simplify switchboard installations. Front adjustable thermal and instantaneous tripping elements

AVAILABLE OPTIONS

- ST UVR
 - Aux SW
 - Castell Lock Direct Mounting
 - Rotary Handle
 - Padlocking
 - Dolly Extension
 - Terminal Shrouds
 - Backstuds
 - 4th Poles when fitted are left hand side
- (See Product Section for selection)

SHORT CIRCUIT BREAKING CAPACITY

Ue	Icu
220 V	70 kA
380 V	50 kA
415 V	50 kA
Ics = 50% Icu	
with correct line 'load' connection	

MAGNETIC TRIP BANDS

Magnetic – (250 – 315A) Adjustable 5 – 10X In
– (400 – 800A) Adjustable 4 – 10X In

TERMINALS

Cranked front connection terminals c/w M12 connection bolts for direct coupling of cable sockets. Supplied with 2 interphase barriers. M16 Backstuds available.

AUXILLIARY EQUIPMENT OPTIONS

L Frame MCCBs

- UVR & Auxilliary Switch
- Shunt Trip & Auxilliary Switches
- Two Auxilliary Switches

Note: All Shunt Trips supplied with coil disconnection Auxilliary Switch.

Shunt Trip Voltage Range 70 – 110%
UVR Power Pack 10VA

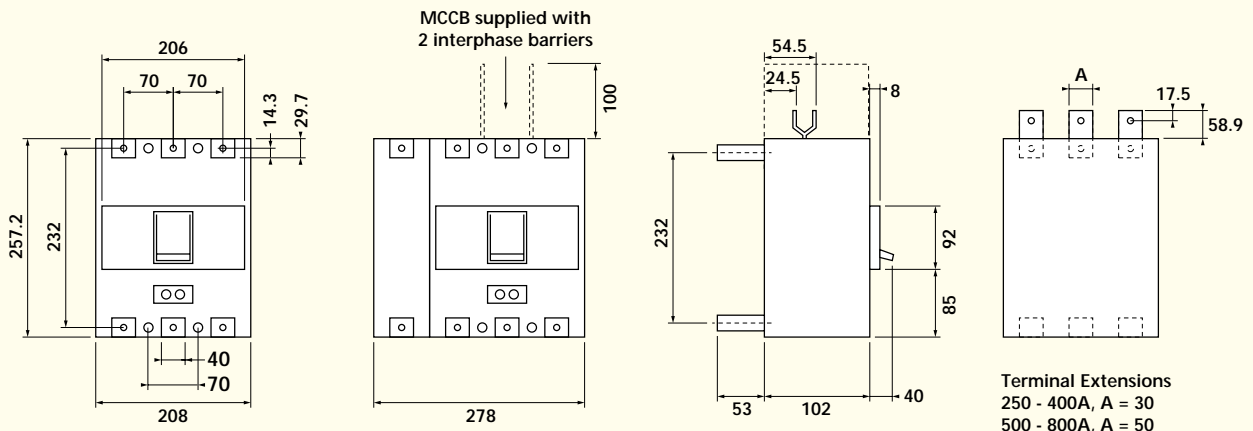
(110V & 415V units supplied with Transformer in addition to Powerpack.).

Auxiliary Contacts

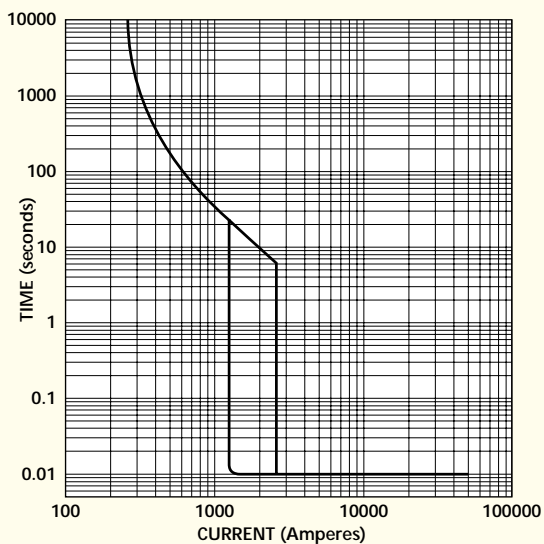
Volts	Resistive Load (A)	Tungsten Load NC (A)	Inductive Load NO (A)	Inductive Load (A)
AC				
125	15	1.5	1.0	5
250	15	0.7	0.5	5
DC				
30	2	3	1.5	1
50	0.7	0.7	0.7	0.5
125	0.5	0.4	0.4	0.03

POWERSTAR LS & LH FRAME MAXIMUM EARTH LOOP IMPEDANCES Zs (ohms) for Uo = 240V~

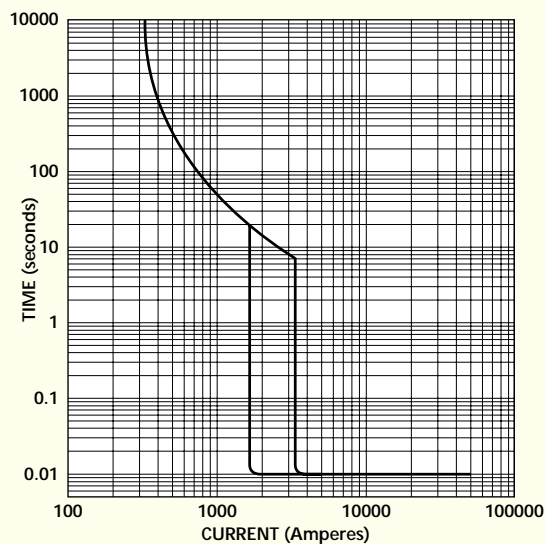
Current Rating (A)	250	315	400	500	630	800	Magnetic Trip Setting
0.4 Seconds Disconnection Time	0.0872Ω	0.0692Ω	0.0545Ω	0.0436Ω	0.0346Ω	0.0272Ω	High
5.00 Seconds Disconnection Time	0.1745Ω	0.1385Ω	0.1363Ω	0.1090Ω	0.0865Ω	0.0681Ω	Low



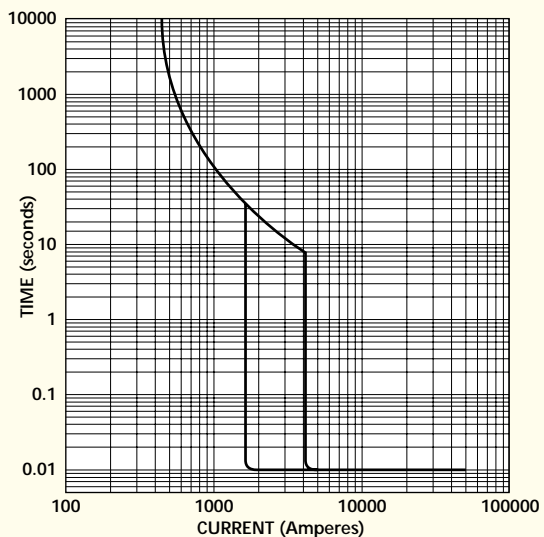
LS/LH 250 AMP



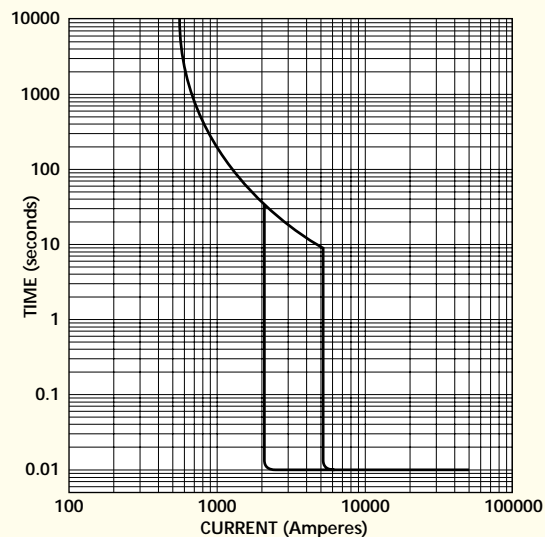
LS/LH 315 AMP



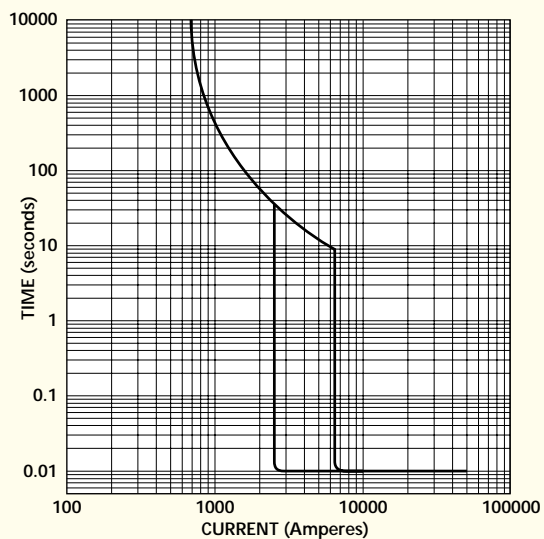
LS/LH 400 AMP



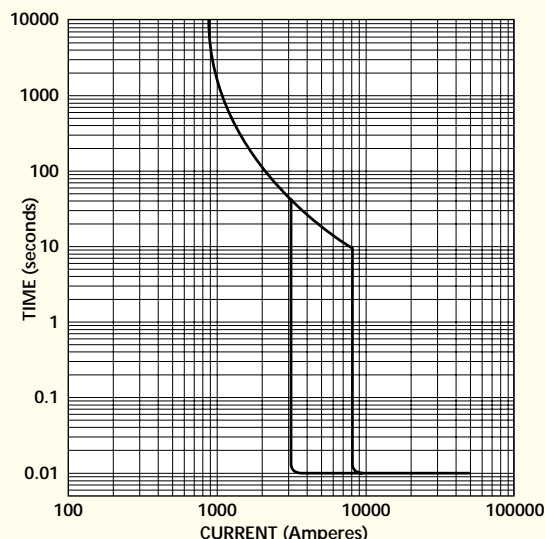
LS/LH 500 AMP



LS/LH 630 AMP



LS/LH 800 AMP



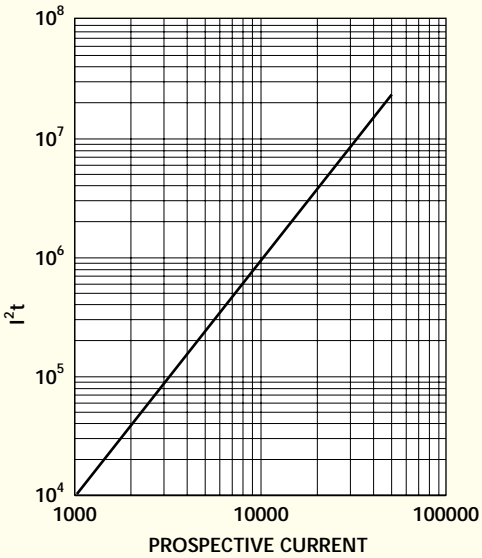
Tolerance on instantaneous current values $\pm 10\%$.

N FRAME MCCBs TECHNICAL SPECIFICATION

N FRAME SPECIFICATION

• Specification	BSEN60947-2
• Current Range	600 – 1600Amps
• Uie Rated Operation Voltage	415V
• Ui Rated Insulation Voltage	660V AC
• Rated Frequency	50/60Hz
• Icu (415V) Short Circuit Breaking Capacity	50kA
• Thermal Adjustment	See Detail Page 92
• Instantaneous Adjustment	See Detail Page 92
• Ambient Range	-20°C to 55°C
• Humidity Range	0 – 90%
• Weight	Rear Terminals 17kg Front Flat 19kg

N Frame MCCB Energy Let Through



N FRAME FEATURES

From J Frame to N Frame Powerstar MCCB's feature escutcheons of the same height to simplify switchboard installations. Front adjustable thermal and instantaneous tripping elements.

AVAILABLE OPTIONS

- ST UVR
- Aux SW
- Castell Lock Direct Mounting
- Rotary Handle
- Padlocking
- Dolly Extension
(See Product Section for selection)

SHORT CIRCUIT BREAKING CAPACITY

Ue	Icu
220 V	70kA
380 V	50kA
415 V	50kA
Ics = 75% Icu	

TERMINALS

Back connected units supplied with 6 tee terminals which can be positioned either vertically or horizontally. Front connected units supplied with 6 front flat terminals. (Other combinations available).

AUXILLIARY EQUIPMENT OPTIONS

- UVR & Auxillary Switch
- ST & Auxillary Switch
- N Frame 3 Auxillary C/O Switches

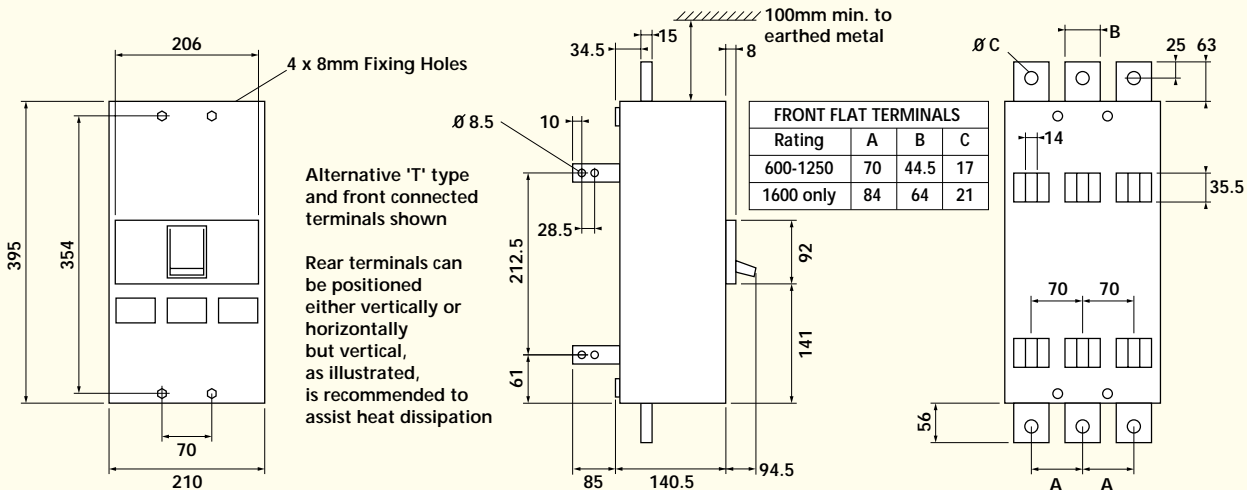
Shunt Trip Voltage Range 70 – 110%
UVR Power Pack 10VA
(110v & 415V units supplied with Transformer in addition to Powerpack.).

Auxillary Contact Ratings

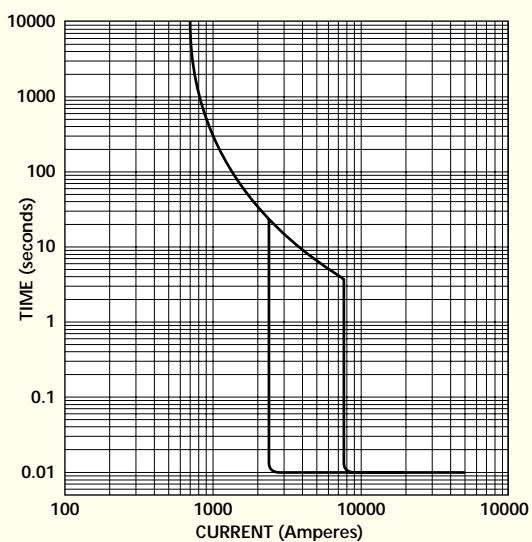
Voltage	Resist' Load (A)	Tungsten Load NC (A)	Induct' Load NO (A)	Induct' Load (A)
AC				
125	3	0.5	0.5	3
250	3	0.5	0.5	3
DC				
30	3	3	0.5	3
50	1	0.7	0.7	1
125	0.5	0.4	0.4	0.05

POWERSTAR N FRAME MAXIMUM EARTH LOOP IMPEDANCES Zs (ohms) for Uo = 240V~

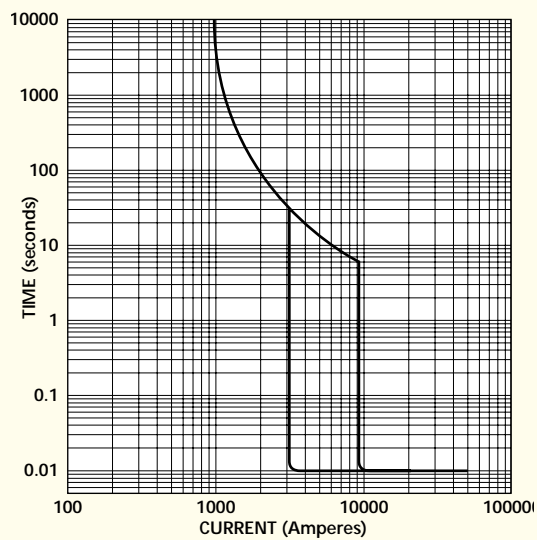
Current Rating (A)	600	800	1000	1250	1600	Magnetic Trip Setting
0.4 Seconds Disconnection Time	0.0272Ω	0.0242Ω	0.0218Ω	0.0218Ω	0.0218Ω	High
5.00 Seconds Disconnection Time	0.0872Ω	0.0727Ω	0.0545Ω	0.0545Ω	0.0545Ω	Low



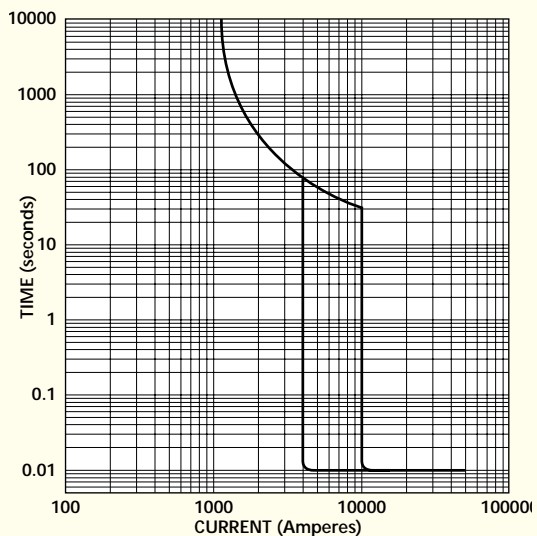
N 600 AMP



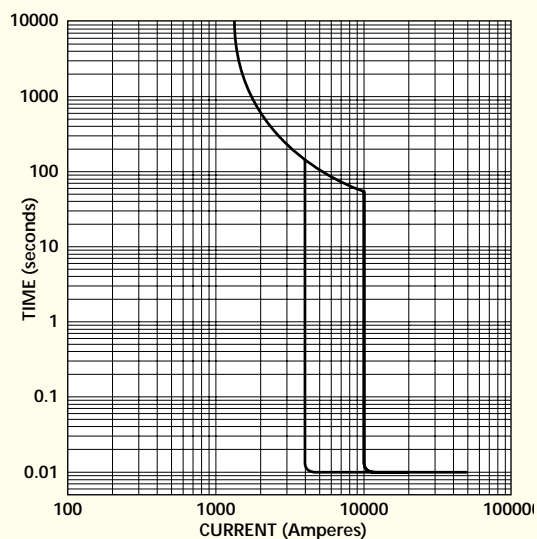
N 800 AMP



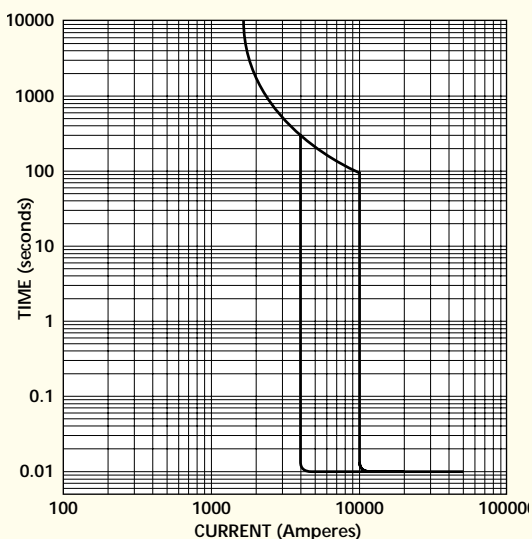
N 1000 AMP



N 1250 AMP



N 1600 AMP



Tolerance on Instantaneous Current Values $\pm 10\%$

N FRAME OVERLOAD SETTINGS Ith @ 50/60Hz

Ambient Rating (A)															
Temp(C°)	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
20				1	1	2	2	2	3	3	4	4	5	5	5
25			1	1	1	2	2	3	3	3	4	4	5	5	
30			1	1	2	2	3	3	3	4	4	5			
35		1	1	2	2	2	3	3	4	4	5	5			
40		1	1	2	2	3	3	4	4	5	5	5			
45	1	1	2	2	3	3	4	4	5	5					
50	1	1	2	2	3	3	4	4	5	5					7PBNH3600

Ambient Rating (A)															
Temp(C°)	750	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450
20			1	1	1	2	2	3	3	3	4	4	5	5	5
25			1	1	2	2	2	3	3	4	4	5	5	5	
30			1	1	2	2	3	3	3	4	4	5	5		
35		1	1	1	2	2	3	3	4	4	4	5	5		
40		1	1	2	2	2	3	3	4	4	5	5			
45		1	1	2	2	3	3	3	4	4	5	5			
50	1	1	2	2	3	3	3	4	4	4	5	5			7PBNH31250

Ambient Rating (A)															
Temp(C°)	450	500	550	600	650	700	750	800	850	900	950				
20				1	2	2	3	3	4	5	5				
25			1	1	2	2	3	4	4	5					
30			1	1	2	3	3	4	5	5					
35			1	2	2	3	4	4	5						
40			1	2	3	3	4	5	5						
45		1	1	2	3	3	4	5	5						
50		1	2	2	3	4	4	5							7PBNH3800

Ambient Rating (A)															
Temp(C°)	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600				
20							1	1	2	2	3				
25						1	1	2	2	3	3				
30					1	1	2	2	3	3	4				
35				1	1	2	2	3	3	4	4				
40			1	1	2	2	3	3	4	4	5				
45		1	1	2	2	3	3	4	4	5					
50	1	1	2	2	3	3	4	4	5						7PBNH31600

Ambient Rating (A)															
Temp(C°)	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200		
20			1	1	2	2	3	3	4	4	5	5			
25			1	1	2	2	3	3	4	4	5	5			
30		1	1	2	2	3	3	4	4	5	5				
35		1	1	2	2	3	3	4	4	5	5				
40		1	1	2	2	3	3	4	5	5					
45		1	1	2	3	3	4	4	5	5					
50		1	1	2	3	3	4	5	5						7PBNH31000

Instantaneous Trip Settings		
Rating (A)	Low (A)	High (A)
600	2500	8000
800	3000	9000
1000	4000	10000
1250	4000	10000
1600	4000	10000

POWERSTAR MCCB Discrimination data

Powerstar MCCB upstream device Instantaneous Trip Set at High																											
Powerstar MCCB, downstream device Instantaneous Trip Set Low	Product	Rating kA@			POWERSTAR J									JM	POWERSTAR LS/LH								POWERSTAR N				
		(A)	415V	25	32	40	50	63	80	100	125	160	200	ALL	250	315	400	500	630	800	600	800	10000	10000	10000		
	POWERSTAR J	25	25						800	800	800	1600	1600	1600	2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
		32	25						800	800	800	1600	1600	1600	2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
		40	25						800	800	80	1600	1600	1600	2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
		50	25						800	800	800	1600	1600	1600	2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
		63	25						800	800	800	1600	1600	1600	2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
		80	25									1600	1600	1600	2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
		100	25									1600	1600	1600	2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
		125	25									1600	1600	1600	2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
		160	25												2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
		200	25												2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
	POWERSTAR JM	ALL	25												2500	3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
	POWERSTAR LS/LH	250	50													3150	4000	5000	6300	8000	8000	9000	10000	10000	10000		
		315	50														4000	5000	6300	8000	8000	9000	10000	10000	10000		
		400	50															5000	6300	8000	8000	9000	10000	10000	10000		
		500	50																6300	8000	8000	9000	10000	10000	10000		
		630	50																	8000	8000	9000	10000	10000	10000		
		800	50																		8000	9000	10000	10000	10000		
	POWERSTAR N	600	50																			9000	10000	10000	10000		
		800	50																				10000	10000	10000		
		1000	50																					10000	10000		
		1250	50																						10000		
		1600	50																								

MOTOR PROTECTION

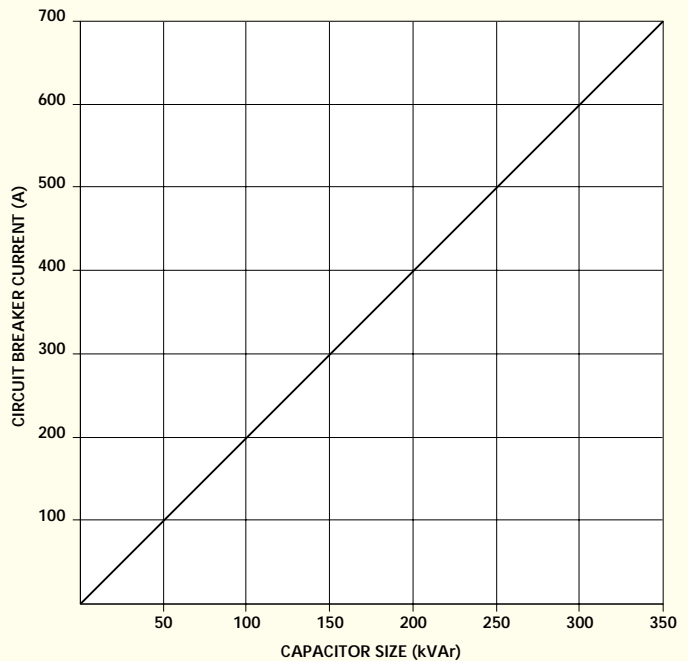
Motor Rating HP	KW	Approx. Full Load Current (A) @ 415V		Direct On Line MCCB Rating/Type				Star/Delta MCCB Rating/Type				N
		G	J	JM	LS/LH	N	G	J	JM	LS/LH	N	
10	7.5	14	25	25	-	-	25	25	-	-	-	-
12.5	9	17	25	25	-	-	25	25	-	-	-	-
15	11	21	25	25	-	-	25	25	-	-	-	-
20	15	28	32	32	-	-	32	32	-	-	-	-
25	19	35	40	-	-	-	40	40	-	-	-	-
30	22	41	50	-	50	-	50	50	50	-	-	-
40	30	52	63	-	63	-	63	63	63	-	-	-
50	37	69	-	-	80	-	-	80	80	-	-	-
60	45	80	-	-	100	-	-	100	100	-	-	-
75	55	97	-	-	125	-	-	125	125	-	-	-
100	75	125	-	-	160	-	-	160	160	-	-	-
125	90	156	-	-	-	250	-	-	-	200	-	-
150	112	190	-	-	-	315	-	-	-	-	250	-
175	130	225	-	-	-	315	-	-	-	-	315	-
200	149	255	-	-	-	315	-	-	-	-	315	-
220	160	275	-	-	-	400	-	-	-	-	400	-
250	186	320	-	-	-	400	-	-	-	-	400	-
300	224	375	-	-	-	500	-	-	-	-	500	-
350	261	449	-	-	-	630	600	-	-	-	630	600
400	298	505	-	-	-	630	600	-	-	-	630	600

The figures shown are based on motor starting conditions.
Direct online 7 x full load current for 5 seconds.
Star/Delta 4 x full load current for 12 seconds.

CAPACITOR CIRCUIT

Circuit breakers are widely used to protect circuits containing capacitors. Because of circuit harmonics and high "in rush" transients associated with capacitor circuits it is necessary to select a circuit breaker with a current rating not less than 1.5 times the capacitor current.

Powerstar circuit breakers are suitable for off load switching of capacitors only.



POWERSTAR Fuse - MCCB discrimination data

BS88 FUSE – UPSTREAM DEVICE														
	Product	Rating (A)	kA @ 415V	BS88: Part 2: 1988										
				80	100	125	160	200	250	315	400	500	630	800
(Low Set) DOWNSTREAM DEVICE	POWERSTAR G	25	25	2300	2600	2900	4100	5000	6000	7000	9100	18000	25000	25000
		32	25	2300	2600	2900	4100	5000	6000	7000	9100	18000	25000	25000
		40	25	450	550	2900	4100	5000	6000	7000	9100	18000	25000	25000
		50	25	380	500	2900	4100	5000	6000	7000	9100	18000	25000	25000
		63	25	350	450	2900	4100	5000	6000	7000	9100	18000	25000	25000
		80	25		400	600	4100	5000	6000	7000	9100	18000	25000	25000
		100	25			550	4100	5000	6000	7000	9100	18000	25000	25000
		125	25				4100	5000	6000	7000	9100	18000	25000	25000
	POWERSTAR J	25	25	1200	1400	1800	2400	3200	4500	5500	8000	12000	14000	25000
		32	25	1200	1400	1800	2400	3200	4500	5500	8000	12000	14000	25000
		40	25	350	1400	1800	2400	3200	4500	5500	8000	12000	14000	25000
		50	25	300	1400	1800	2400	3200	4500	5500	8000	12000	14000	25000
		63	25	250	1400	1800	2400	3200	4500	5500	8000	12000	14000	25000
		80	25		300	450	2400	3200	4500	5500	8000	12000	14000	25000
		100	25			400	650	3200	4500	5500	8000	12000	14000	25000
		125	25				550	3200	4500	5500	8000	12000	14000	25000
	POWERSTAR LS/LH	160	25					650	1300	5500	8000	12000	14000	25000
		200	25						1200	1300	8000	12000	14000	25000
		250	50							1000	8000	12000	14000	23000
		315	50								2000	12000	14000	23000
		400	50									2500	14000	23000
	POWERSTAR N	500	50										3500	23000
		630	50											5500
		600	50											6000

Values shown in the table are for guidance purposes only. Please refer to manufacturer's I²t and time current data.

BSEN60439-1 : 1994 FORMS OF SEPARATION

FORMS OF SEPARATION

Main criteria	Sub criteria	Form	Type of Construction
No separation		Form 1	
Separation of busbars from the functional units.	Terminals for external conductors not separated from busbars.	Form 2	
	Terminals for external conductors separated from busbars.		Type 1 Busbar separation is achieved by insulated coverings, e.g. sleeving, wrapping or coatings Type 2 Busbar separation is by metallic or non-metallic rigid barriers or partitions.
Separation of busbars from the functional units and separation of all functional units from one another. Separation of the terminals for external conductors from the functional units, but not from each other.	Terminals for external conductors not separated from busbars.	Form 3a	
	Terminals for external conductors separated from busbars.	Form 3b	Type 1 Busbar separation is achieved by insulated coverings, e.g. sleeving, wrapping or coatings Type 2 Busbar separation is by metallic or non-metallic rigid barriers or partitions.
Separation of busbars from the functional units and separation of all functional units from one another including the terminals for external conductors which are an integral part of the functional unit.	Terminals for external conductors in the same compartment as the associated functional unit.	Form 4	Type 1 Busbar separation is achieved by insulated coverings, e.g. sleeving, wrapping or coatings Cables may be glanded elsewhere.
			Type 2 Busbar separation is by metallic or non-metallic rigid barriers or partitions. Cables may be glanded elsewhere.
			Type 3 All separation requirements are by metallic or non-metallic rigid barriers or partitions. The termination for each functional unit has its own integral glanding facility.
	Terminals for external conductors not in the same compartment as the associated functional unit. but in individual, separate, enclosed protected spaces or compartments.		Type 4 Busbar separation is achieved by insulated coverings, e.g. sleeving, wrapping or coatings Cables may be glanded elsewhere.
			Type 5 Busbar separation is by metallic or non-metallic rigid barriers or partitions. Terminals may be separated by insulated coverings and glanded in common cabling chamber(s).
			Type 6 All separation requirements are by metallic or non-metallic rigid barriers or partitions. Cables are glanded in common cabling chamber(s).
			Type 7 All separation requirements are by metallic or non-metallic rigid barriers or partitions. The termination for each functional unit has its own integral glanding facility.

FORMS OF SEPARATION

As described in BSEN60439-1 the Forms of Separation comprise four levels as detailed in the above table. The various methods of achieving separation can involve sleeving the busbars inside a separate box or a combination of both methods.

COST EFFECTIVE SPECIFICATION

In order to gain maximum benefit from the standard it is necessary to consider the application for which the switchboard is required and the appropriate level of separation for the environment in which it is to be installed. For example a Form 4 switchboard may be appropriate where general access is permitted to the switch room but where the switchboard is in a locked substation with access restricted to qualified personnel, a lesser degree of separation may be more appropriate.

TYPICAL APPLICATIONS

Form 1 – No separation

Typical applications are places where the switchboard is in a secure location and where failure of the switchboard will cause little or no additional disruption to other areas being fed by the switchboard.

Form 2 – Separation of busbars from functional units.

Applications may well be the same as Form 1 but where it is important that a fault in the switchboard need not affect all functional units being fed from the same busbar system.

Form 3 – Separation of busbars from functional units and the functional units from one another but not their terminations.

Should be applied where it is important to provide protection from internal live parts and where failure of functional units being fed from the same busbar would cause unacceptable disruption.

Form 4 – Separation of busbars from functional units and the functional units from one another but not their terminations.

Should be applied where it is important to provide protection from internal live parts and where failure of functional units being fed from the same busbar would cause unacceptable disruption. Because all the terminations are separated it is possible to isolate and work on a single functional unit.

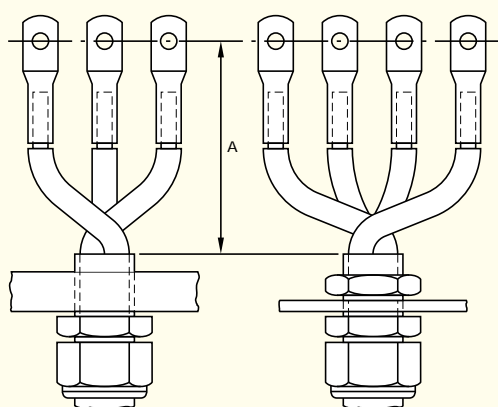
BS5372 : 1997

The scope of this standard relates to dimensions which should be observed in the design of cable terminations, having uninsulated conductor fittings, for external cables on electrical equipment to enable the cables to be connected satisfactorily.

The standard is based upon the use of compression type conductor terminations and allows for the cores to be crossed within the terminal enclosure because this combination requires more space.

The diagram and table below gives the dimensions quoted by this standard.

3 CORE AND 4 CORE TERMINATIONS



Cable Size (mm ²)	Dimension 'A' (mm ²)
16	100
25	115
35	130
50	155
70	180
95	200
120	210
150	230
185	255
240	285
300	325

The standard does not take into account bunching or the difficulties which a contractor may experience in manoeuvring numerous cables, especially the larger sizes, within the confines of a distribution centre enclosure.

To assist the contractor it is our practice to allow for as much space as is practically possible, for the termination of larger conductors.

The diagram above, serves to illustrate the importance of advising the switchboard manufacturer, at the enquiry stage, of incoming and outgoing cable sizes to ensure that adequate provisions for terminating are made.

Information regarding direction of incoming and outgoing cables is also essential to ensure the correct design of switchboard is offered.

BSEN60439-1:1994 clause 7.1.3.2 states:

"In the absence of a special agreement between manufacturer and user, terminals shall be capable of accommodating conductors and cables of copper from the smallest to the largest cross-sectional areas corresponding to the appropriate rated current circuit device".

A summary of the sizes is shown in the table opposite.

If terminations are required for cables outside of these limits the manufacturer may have to allow special cable termination facilities within the switchboard. This could preclude the ability to offer a Form 4, type 2 constructed assembly as this requires the cable to terminate integral to the circuit device compartment, but cable termination to type 7 could be offered.

TERMINATION CAPACITY

Rated Circuit Current (A)	Cable Cross Section (mm ²)	Solid or Stranded Conductors
	Min	Max
25	2.5	6
32	2.5	10
40	4	16
63	6	25
80	10	35
100	16	50
125	25	70
160	35	95
200	50	120
250	70	150
315	95	240

IP RATINGS

The IP (International Protection) rating given to an enclosure states the degree of protection it offers by means of two digits. A summary of these is shown below; for a more detailed definition, see IEC 529: 1989, BS EN 60529: 1992.

FIRST DIGIT

Protection against solid foreign objects and access to hazardous parts

The first digit covers protection against penetration by solid objects, which includes hands and tools such as screwdrivers. At the lowest of seven levels, 0, no protection is offered, either of the equipment itself from damage by intrusion or of a person contacting live or moving parts. At the highest, 6, there shall be no entry of dust.

IP		
0		No protection
1		Protected against solid objects up to 50mm eg accidental touch by hands
2		Protected against solid objects up to 12mm eg fingers
3		Protected against solid objects over 2.5mm eg tools and wires
4		Protected against solid objects over 1mm eg tools, wires and small wires
5		Protected against dust - limited ingress, no harmful deposits
6		Totally protected against dust

SECOND DIGIT

Protection against ingress of water

The second digit covers the degree of protection against the entry of water, on a progressive scale. For example, number 1 indicates that dripping water shall have no harmful effect, and number 6, that water projected in powerful jets against the enclosure from any direction shall have no harmful effects.

IP		
0		No protection
1		Protected against vertically falling drops of water eg condensation
2		Protected against direct sprays of water up to 15° from the vertical
3		Protected against sprays of water up to 60° from the vertical
4		Protected against water splashed from all directions - limited ingress permitted
5		Protected against low pressure jets of water from all directions - limited ingress permitted
6		Protected against strong jets of water eg for use on ship decks - limited ingress permitted

The letter X can be used in place of the first or second digit to indicate that tests have either not been made or are not applicable.

NOTE
In the event of additional holes being drilled/pierced or knockouts removed, suitable measures should be taken to restore the products to the original ratings.

IEC 529, BS EN 60529 does not apply to protection against the risk of explosion or conditions such as humidity, corrosive gases, fungi or vermin.
In certain cases equipment designed to be mounted in an enclosure will contribute towards the stated IP rating (eg pushbuttons mounted in an enclosure).
Different parts of enclosures can have different degrees of protection and still conform to the standard (eg enclosures with pre-drilled conduit entry).

It is important that unused ways in distribution boards are fitted with blanks.

NUMERICAL INDEX

18LS04

6HSR32/30C

6HT63C *190633NF*

7PBFH363

IP18LS04

E66/303021

IP1604/0B

60C/06

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TERMS & CONDITIONS OF SALE OF GOODS

HOME

1 Contract Terms Quotations & Orders

- 1.1 Unless other terms and conditions are expressly accepted by Electrium Sales Ltd. by means of a specific written amendment hereto signed by Electrium Sales Ltd. or a Director of Electrium Sales Ltd. the contract will be on the terms and conditions set out below ("the Contract Terms") to the exclusion of any other terms and conditions (except those implied in favour of a seller which are not inconsistent with the Contract Terms) whether or not the same are endorsed upon, delivered with or referred to in any purchase order or other document delivered or sent by the Customer to Electrium Sales Ltd. or by Electrium Sales Ltd. to the Buyer reference made by Electrium Sales Ltd. to the Customer's order, specification or like document will not be deemed to imply that any terms or conditions endorsed upon, delivered with or referred to in such order, specification or like document will have effect to the exclusion or amendment of the Contract Terms. No variation, addition or modification of the Contract Terms. conditions shall be binding on Electrium Sales Ltd. unless such variation, addition or modification be agreed to in writing under the signature of a Director of Electrium Sales Ltd.
- 1.2 Any quotation is given on the basis that no contract will come into existence until the Customer places an order pursuant thereto. Any quotation is valid for a period of 30 days only from its date provided that Electrium Sales Ltd. has not previously withdrawn it.

2 Price

The price of Goods supplied hereunder ("the Goods") is exclusive of VAT or any successor tax thereto unless otherwise agreed in writing. The price for the Goods shall be (unless otherwise agreed by Electrium Sales Ltd. in writing) the list price of Electrium Sales Ltd. current at the date of despatch and in the case of an order for delivery by instalments the price payable for each instalment shall be Electrium Sales Ltd's list price current at the date of despatch for each instalment. All prices are based on standard pack sizes and quantities and Electrium Sales Ltd. reserves the right to levy an additional charge if such packs must be broken up to fulfil an order. The price of Goods is inclusive of costs of carriage to the Customer's premises in Great Britain and Northern Ireland except on individual orders having a net value calculated by reference to the Company's most recent price list of less than £200 (excluding VAT) which shall be subject to an additional charge of £15.00 (excluding VAT) to cover carriage and packing. The price of Goods is based on the costs of materials, labour, sub-contracts, transport, taxes, duties and currency exchange rates ruling at the date of the quotation. Electrium Sales Ltd. reserves the right to amend the contract price to take account of any variations in these costs or the imposition of any new taxes or duties occurring from whatever cause before delivery of the Goods.

3 Payment

The due date for payment shall be the last day of the month following the month of despatch of Goods supplied by Electrium Sales Ltd. Payment made before the due date for payment shall be subject to a settlement discount of 2.5%. VAT is calculated on the discounted value of the invoice and is not subject to settlement discount. Interest at an annual rate of 3% per month will accrue daily and be calculated on a daily basis on overdue accounts from the date of invoice until payment. Notwithstanding any Contract Term allowing the Customer credit payment shall become due and payable to Electrium Sales Ltd. immediately upon the termination of the contract. The Customer shall not be entitled to exercise any right of set-off or lien or any similar right or claim in connection with the Goods or the price payable therefor.

4 Packing Materials

Packing cases and cartons will be provided free of charge by Electrium Sales Ltd. All pallets used shall remain at all times the property of Electrium Sales Ltd. and are to be returned to Electrium Sales Ltd. on demand in good condition. Electrium Sales Ltd. reserves the right to alter the method of packing without reference to the Customer.

5 Damage or Loss in Transit

Electrium Sales Ltd. will not be liable in respect of any damage or discrepancy, shortage or loss in transit or any claim that the Goods delivered do not otherwise comply with the contract unless the Customer shall have informed the Company in writing, telex or facsimile as follows:

(a) Within three days of delivery in the event of any damage, discrepancy or shortage.

(b) Within seven days of delivery in the event that the Goods do not comply with the contract, and

(c) Within twenty-one days of receipt of the Company's invoice in the event of non-delivery.

Where the Goods are accepted from the Company's carriers they shall be deemed to have been checked by the Purchaser and accepted unless the delivery receipt is signed and endorsed "unexamined" and the packing and its contents are retained for later inspection.

6 Delivery

The place of delivery for Goods shall be the Customer's premises or as otherwise agreed by Electrium Sales Ltd. in writing. The time of delivery will be as agreed between the parties or if no such agreement has been reached will be within a reasonable time and the Company will be entitled to make delivery by instalments. Where the customer requires delivery next day a charge of £13.50 will be made. In no circumstances will Electrium Sales Ltd. be liable for loss or damage of any kind whatsoever caused directly or indirectly by any delay in the delivery of Goods, nor unless such delay exceeds 180 days will any delay entitle the Customer to terminate or rescind the contract. Notwithstanding any other Contract Term, risk in the Goods shall pass to the Buyer when the Goods are delivered to the Customer or its agent.

7 Title of Goods

Until Electrium Sales Ltd. has been paid in full for the Goods comprised in this and/or any other contract between the Customer and Electrium Sales Ltd, the Customer shall hold the Goods in a fiduciary capacity as bailee for Electrium Sales Ltd. and:

(i) the title to, ownership of, and the property in, the Goods shall remain vested in Electrium Sales Ltd. (notwithstanding delivery of the same and parting of the risk therein to the Customer) until payment in full for all Goods comprised in this and every other contract between Electrium Sales Ltd. and the Customer has been received by Electrium Sales Ltd.

(ii) The Customer shall be in possession of the Goods as Electrium Sales Ltd's bailee. If so required the Customer shall store the Goods for Electrium Sales Ltd. without charge to Electrium Sales Ltd. separate from any goods which are the property of the Customer and/or any third party and ensure that they are clearly marked and identified as belonging to Electrium Sales Ltd.

(iii) Electrium Sales Ltd. reserves the right to require the Customer to return the Goods and may recover and sell the same at any time. For that purpose Electrium Sales Ltd's servants and agents together with all necessary and appropriate transport shall be entitled to unrestricted access to the Customer's premises and any other location where the Goods are situated to take possession of the Goods and, if necessary, dismantle the Goods from any article or articles to which they may have been attached and to remove the Goods from the Customer's premises.

(iv) Prior to the property in the Goods passing to the Customer Electrium Sales Ltd. permits the Customer to deliver the Goods to a third party pursuant to a bona fide and arms-length agreement to re-sell the Goods and allows the Customer to convert or incorporate the Goods into or mix the Goods with other goods but such liberty will cease upon the termination of the contract.

(v) Where Electrium Sales Ltd. is unable to determine whether any goods are Electrium Sales Ltd's Goods the Customer shall be deemed to have sold all goods of the kind sold by Electrium Sales Ltd. to the Customer in the order in which they were involved to the Customer.

8 Descriptive Matter

Descriptive matter, illustrations, dimensions and weights issued by Electrium Sales Ltd. are to be regarded as being for guidance only and cannot be held as binding in any way. In pursuance of Electrium Sales Ltd's policy of product improvement Electrium Sales Ltd. reserves the right to alter patterns and designs without prior notice.

9 Guarantee

Electrium Sales Ltd. will make good by replacement (or its option by repair) defects which under proper use appear in the Goods within a period of twelve calendar months after the Goods have been despatched, and which arise solely from faulty design, materials or workmanship provided always that defective Goods have been returned to Electrium Sales Ltd. and Electrium Sales Ltd. was notified of the defect or suspected defect immediately the same became known to the Customer. The cost of carriage on such returned Goods and the cost of re-delivery of the repaired or new Goods to be borne by Electrium Sales Ltd. Save for the Electrium Sales Ltd's control equipment which has been correctly repaired or modified by the use of standard parts supplied by Electrium Sales Ltd. for such purpose, Electrium Sales Ltd. excludes all liability in respect of any Goods which have been re-finished and dismantled or altered in any way or if the Goods were improperly installed or connected or if the Customer fails to observe or perform the requirements of any maintenance procedures relating to the Goods. Any Goods replaced will belong to Electrium Sales Ltd. Any repaired or replacement Goods will be guaranteed on these terms for the unexpired portion of the twelve month period. In addition, the obligations of Electrium Sales Ltd. under this condition will not apply if the Customer is in breach of this or any other contract with Electrium Sales Ltd.. Subject to this condition, all conditions, warranties and representations, whether express or implied (by statute or otherwise) relating to the Goods are hereby excluded insofar as the same can be excluded without such exclusion being void or unenforceable. Electrium Sales Ltd. will be under no liability under the contract for any personal injury, death, loss or damage of any kind whatsoever (other than death or personal injury resulting from Electrium Sales Ltd's negligence) whether consequential or otherwise including but not limited to loss of profits and Electrium Sales Ltd. hereby excludes all conditions, warranties and stipulations express or implied, statutory, customary or otherwise which but for such exclusion would or might subsist in favour of the

Customer except that such exclusion will not apply to any implied condition that Electrium Sales Ltd. has or will have the right to sell the Goods when the property is to pass; or when Electrium Sales Ltd. deals as a consumer (as defined in section 12 of the Unfair Contract Terms Act 1977), any implied term relating to the conformity of the Goods with their description or sample or as to their quality or fitness for a particular purpose. In no circumstances will Electrium Sales Ltd. or its employees, agents or sub-contractors be liable for any loss or damage of any kind whatsoever (other than death or personal injury resulting from Electrium Sales Ltd's negligence) whether consequential or otherwise caused directly or indirectly by any negligence or other tortious act or breach of statutory duty on the part of Electrium Sales Ltd. or on the part of any of its employees, agents or sub-contractors in connection with or arising out of the manufacture or supply of the Goods or in connection with any statement given or made (or advice not given or made) by or on behalf of Electrium Sales Ltd.

10 Patents

Electrium Sales Ltd. will indemnify the Customer against any claim of infringement of letters patent, registered design, trademark or copyright (existing at the date of the contract) arising from the use or sale of any article or materials supplied by Electrium Sales Ltd. to the Customer and against all costs and damages which the Customer may incur in any action for such infringement or for which the Customer may become liable in any such action provided always that this indemnity shall not apply to any infringement which arises in connection with any design or instruction issued or given by the Customer to Electrium Sales Ltd. or to the use of such article or material in a manner or for a purpose outside the UK or to any infringement which is due to the use of such article or material in association or combination with any other article or material not supplied by Electrium Sales Ltd. and provided also that this indemnity is conditional on the Customer making no admission in respect of such alleged infringement and giving Electrium Sales Ltd. the earliest possible notice in writing of any claim being made or action threatened or brought against the Customer and on the Customer permitting Electrium Sales Ltd. at Electrium Sales Ltd's expense to conduct any litigation that may ensue and all negotiations for the settlement of a claim.

The Customer warrants that any design or instruction issued or given by the Customer shall not be such as will cause Electrium Sales Ltd. to infringe any letters patent, registered design, trademark or copyright in the execution of the Customer's order and the Customer agrees to indemnify and keep Electrium Sales Ltd. indemnified against all liability in the event that such warrant is found to be untrue, misleading or breached.

11 Advice

Advice which Electrium Sales Ltd. or its agents may give to the Customer shall be given in good faith but Electrium Sales Ltd. shall not be liable for any loss or damage arising directly or indirectly therefrom or attributable thereto unless contained in any written representation or statement issued directly by Electrium Sales Ltd.

12 Safety

The Customer shall ensure that any modifications whatsoever made to the Goods supplied hereunder comply with the requirements of any applicable Safety Regulations. Plugs supplied hereunder shall be so connected as to ensure that they are safe and in full compliance with any applicable Safety Regulations. The Customer shall ensure that any kits supplied hereunder are so assembled as to ensure that the assembled product is safe and complies with the requirements of any applicable Safety Regulations. Without prejudice to the above provisions, where Electrium Sales Ltd. provides the Customer with information about the use for which Goods are designed and have been tested and about any conditions to ensure that when put to that use they would be safe and without risk to health, the Customer shall use the Goods accordingly and comply with the said conditions. To be properly used the Goods shall be selected, installed, commissioned and maintained in accordance with good engineering practice and under the supervision of suitably qualified personnel.

13 Statutory and other Regulations

If the cost to Electrium Sales Ltd. of performing its obligations under any contract shall be increased or reduced by reason of making or amendment after the date of its quotation of any law or of any other order, regulation or bye-law having the force of law that shall affect the performance of Electrium Sales Ltd's contractual obligations, the amount of such increase or reduction shall be added to or deducted from the contract price as the case may be.

14 Cancellation

If the Customer cancels, extends or delays or purports to cancel, extend or delay the contract or part thereof, or fails to take delivery of any Goods at the time agreed (if any) or if no time is agreed within a reasonable time, then the Customer will be liable (without prejudice to any other rights of Electrium Sales Ltd. to claim damages) to indemnify and keep indemnified Electrium Sales Ltd. against any resulting loss, damage or expense incurred by Electrium Sales Ltd. in connection with the supply or non-supply of the Goods including the cost of any material, used or intended to be used therefor and the cost of labour and other overheads including a percentage in respect of profit. If Electrium Sales Ltd. is unable (whether temporarily or permanently) to procure any services or goods necessary to enable it to supply the Goods or if the supply of the Goods is prevented or hindered by reason of any cause beyond Electrium Sales Ltd's reasonable control which for the avoidance of doubt and without prejudice to the generality of the foregoing shall include governmental action, war, riot, civil commotion, fire, flood, epidemic, labour disputes including labour disputes involving the work force or any part thereof of Electrium Sales Ltd., restraints or delays affecting shipping or carriers, currency restrictions and Act of God, Electrium Sales Ltd. may cancel the contract by notice in writing to the Customer so far as it relates to Goods not then supplied or work not then done and such cancellation shall not give rise to any claims by the Customer provided that the Customer shall remain liable to pay for Goods delivered prior to the date of such cancellation.

15 General

- (a) The headings herein are inserted for convenience only and shall not affect the interpretation of the Contract Terms.
- (b) Should any clause contained in the Contract Terms be held to be invalid such invalidity will not affect the validity of the remaining clauses.
- (c) Any dispute arising out of this contract or the Contract Terms shall be referred in writing to an independent arbitrator who shall be appointed by agreement between Electrium Sales Ltd. and the Customer or in default of agreement by the President for the time being of the Institute of Electrical Engineers whose decision shall be binding on both parties.
- (d) The formation, interpretation and operation of the contract will be subject to English Law and the Customer submits himself to the non-exclusive jurisdiction of the English Courts.
- (e) Electrium Sales Ltd. will be entitled to assign sub-contract or sub-let the contract or any part thereof.
- (f) Failure by Electrium Sales Ltd. to enforce any of the Contract Terms will not be construed as a waiver of any of its rights hereunder.

EXPORT

All Contract Terms set out above apply to overseas transactions (ie sales outside the United Kingdom), where appropriate, except the following:

- 1.2 Any quotation is given on the basis that no contract will come into existence until Electrium Sales Ltd. despatches an acknowledgement of order to the Customer. Any quotation is valid for a period of 30 days only from its date provided that Electrium Sales Ltd. has not previously withdrawn it.

2 Price

The price of Goods includes the cost of packing for shipment FOB British Port or Airport except that orders having a net value of £500 and below shall be subject to an additional charge to cover packing and carriage. No allowance will be made in lieu of transportation if the Customer accepts delivery at the factory, container depot or at any other inland destination or provides his own transportation or where packing of a lesser standard is required.

3 Payment

First orders from overseas Customers should be accompanied by bank references to enable payment terms to be agreed. Unless otherwise agreed in writing, payment is due on delivery. Goods shall be deemed to have been delivered when the invoice has been presented in the United Kingdom accompanied by the appropriate documents of title.

16 Others

The Goods will be sold FOB British Port or Airport and the Seller will be under no obligation to give the Buyer notice as specified in Section 32(3) of the Sale of Goods Act 1979. CIF or C & F arrangements can be made if requested by the Customer, at cost, and Electrium Sales Ltd. will, on receipt of Customer's indemnity, take all reasonable steps to recover from the Underwriters any loss or damage for which they may be liable. The Customer shall be solely responsible for complying with all legislation and regulations governing the importation of the Goods into the country of destination including import and export licences and the payment of duties thereon including but not limited to customs duties and VAT. The Customer shall indemnify Electrium Sales Ltd. against all costs claims and demands arising out of any breach by the Customer of this Agreement.

CONDITIONS OF USE

The products listed in this publication should be installed by suitably qualified personnel in accordance with the requirements of relevant legislation, regulations (including the IEE Wiring Regulations) and the accepted practice in the industry. Any further information which may be required about the use for which any specific product has been designed and tested, or about conditions of use, is available on request. In pursuance of our policy of continuing product improvement, equipment described in this publication is subject to change without notification.



Electrium

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Although every effort has been made to ensure accuracy in the compilation of the technical detail within this publication, specifications and performance data are constantly changing. Latest details can be obtained from Crabtree.

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