Switchgear

# HomeSafe

## Residential Catalogue

Consumer Units
Integrated Surge Protection
Integrated MID Approved Meters
Protective Devices

HAVELLS

# Hello

## The new Brand for Circuit Protection and Control for the UK

Havells is a global manufacturer of Electrical and Power Distribution Equipment, with a focus on Industrial & Domestic Circuit Protection, Switchgear, Cables & Wires, Motors, Fans, Power Capacitors, CFL Lamps and Luminaires for Domestic, Commercial & Industrial applications. With sales over $1Bn and serving customers in over 50 countries, Havells is well placed to deliver UK market optimised solutions to meet local standards and regulatory requirements.

In the UK, Havells Switchgear brings a local market focus to its customers, with UK specific solutions, addressing the real challenges in creating optimised, compliant and cost effective Electrical Distribution solutions.

# Contents

# Domestic Consumer Units

The IET (Institution of Engineering and Technology) published the wiring regulations BS 7671 : 2008, which is the national standard to which all Industrial and Domestic wiring must now confirm.

The regulation had its first amendment finalised in July 2011. The current regulation contains major changes from the previous 16th edition regulation. BS 7671: 2008 has led to a significant increase in the use of RCD protection devices in Domestic Consumer units. For domestic applications, a number of alternative technical approaches are available to meet the expectations of the regulations.


The basic choice is the use of ‘group protected’ MCBs using two RCDs, or individual RCBOs on all circuits requiring earth fault protection. A third option is a hybrid of the two, having two RCDs, plus space to accommodate additional RCBOs or MCBs. The group protected solutions using two RCDs generally provide the lowest cost solution, whilst individual RCBOs on each circuit, ensure that only the circuit affected ‘trip’ due to an Earth fault, causing the least level of disturbance to the domestic accommodation in the event of a fault. In addition, the individual RCBO approach potentially makes fault finding of the Earth fault a lot easier for the electrician.

Havells offer a number of alternative Consumer Unit formats and associated devices to help designers and installers meet the needs of the new regulations.

In addition to standard products, Havells can also offer customised solutions on request.

## Under the 17th edition wiring regulations:

- All socket outlets should be protected by 30 mA RCD whether on the ground floor of a house or the top floor of a high rise apartment block*
- All circuits in a room with a fixed bath or shower should be protected by one or more 30 mA RCDs**
- All cables buried beneath the plaster surface of a wall or partition (at less than 50 mm) should be protected by 30 mA RCDs***
- All cables concealed in metal stud partitions (common in new builds) should be protected by 30 mA RCDs***
- Installations should be divided up into circuits so as to take account of danger and inconvenience caused by a single fault - e.g. such as a lighting circuit ****
- Installations should be designed and arranged so as to prevent unwanted tripping of RCDs****
- Safety services such as smoke alarms should be on independent circuits*****
- Sensitive electrical equipment installed in the home may require protection against overvoltages (surges), where these overvoltages would exceed the equipment's with stand voltage

## Summary Table

| Regulation | Relating to | Examples | Additional Protection |
|---|---|---|---|
| 411.3.3 | Sockets up to 20A rating for general use by ordinary persons | Upstairs Sockets, Downstairs Sockets, Kitchen Sockets, Cooker outlet with integral 13A socket, Garage Sockets, Plus any other sockets up to 20A rated | 30 mA RCD |
| 701.411.3.3 | All circuits in a room with a fixed bath or shower | Shower circuit, Lighting circuit, Heating circuit Ventilation circuit, Shaver Socket, Plus other circuits | 30 mA RCD |
| 522.6.6<br>522.6.7<br>522.6.8 | All circuits buried in a wall or partition at less than 50 mm and without mechanical protection | Downstairs Lighting, Upstairs Lighting, Immersion Heater, Burglar Alarm, Smoke Alarms, plus any other circuits | 30 mA RCD |

Note: Each circuit may have more than one reason for additional protection by 30 mA RCD eg: firstly because of the equipment a socket outlet and secondly because of the cable installation method. Additional protection is provided as additional protection. It does not obviate the need for circuit protection by circuit breakers or fuses.

* Regulation 411.3.3 socket outlets with a rated current not exceeding 20 A that are for general use by ordinary persons (exemption may be permitted).

** Regulation 701.411.3.3 additional protection shall be provided for all circuits of the location by use of one or more 30 mA RCD.

*** Regulations 522.6.6 522.6.7 522.6.8 cables concealed in a wall or partition at less than 50 mm depth and without earthed mechanical protection e.g. conduit.

**** Regulation 314.1 Every installation shall be divided into circuits as necessary to avoid danger and inconvenience in the event of a fault, take account of danger that may arise from the failure of a single circuit such as a lighting circuit, reduce the possibility of unwanted tripping of RCDs etc.

**** Regulation 314.2 Separate circuits to be provided for parts of the installation that need to be separately controlled in such a way that those circuits are not affected by the failure of other circuits.

***** Regulation 560.7.1 Chapter 56 circuits for safety services shall be independent of other circuits.

****** Regulation 443 Risk assessment for control of transient overvoltages (surges) and where appropriate, selection and installation of surge protectors (in accordance with Section 534).

In addition Chapter 51 requires designers/installers to take account of all relevant British Standards and manufacturers instructions. For example BS 5839 Part 6 is the British Standard for fire detection and alarm systems in dwellings. It states that power supplies to Grade D smoke alarms should be an independent circuit at the consumer unit, or a separately electrically protected local lighting circuit.

**British Standards and IET regulations are subject to change and amendments. This guide to Havells consumer units is not a substitute for the regulations which should always be used for all types of electrical installation design and installation work.**

## Safety First

At a UK Electrical safely council seminar in 2011, London Fire Brigade highlighted an increase in the number of house fires where a consumer unit was thought to have been the starting point of the fire. It was reported that poor installation or maintenance rather than product quality resulted in a fire in the consumer unit.

The current IEC product standard does not currently mandate the enclosure material fire rating properties. In more recent studies it is clear that many consumer unit brands do not offer such fire rated material technology as standard. In the cases highlighted by London Fire Brigade, the enclosure becomes a fuel source for the fire.

Havells consumer units are manufactured using 960ºC fire rated material. Given the potential location in a home and knowing that it is difficult to ensure that every consumer unit is correctly maintained, a high specification fire retardant material solution is used on consumer units and modular enclosures.

## Surge Protection

The Havells HomeSafe solution combines high quality consumer units with best-in-class Furse SPDs designed to deliver optimal, long lasting protection for all electrical equipment in the home.

This document certifies that the Furse MMP 2C275 SPD has been installed on a Havells HomeSafe consumer unit in accordance with best practice principles to IET Wiring Regulations 17th Edition, BS 7671:2008(+A1:2011) and tested to achieve the voltage protection levels ($U_p$) shown below.

| **Transient specification (at SPD terminals)** | |
|---|---|
| Voltage protection level $U_p$ at $U_{oc}$ of 6 kV 1.2/50 µs and $I_{sc}$ of 3 kA 8/20 µs (per mode) | 0.9 kV[1] |

[1] The maximum transient overvoltage let¬through the SPD throughout the test (±5%), phase to neutral, phase to earth and neutral to earth.

| **Transient specification (installed performance – SPD to HomeSafe unit)** | |
|---|---|
| Target voltage protection level Up: (Withstand voltage, Category I equipment to BS 7671) | 1.5 kV |
| L-N: Voltage protection level $U_p$ at $U_{oc}$ of 6 kV 1.2/50 µs and $I_{sc}$ of 3 kA 8/20 µs (per mode) | 1.09 kV[2] |
| L-PE: Voltage protection level $U_p$ at $U_{oc}$ of 6 kV 1.2/50 µs and $I_{sc}$ of 3 kA 8/20 µs (per mode) | 1.18 V[2] |
| N-PE: Voltage protection level $U_p$ at $U_{oc}$ of 6 kV 1.2/50 µs and $I_{sc}$ of 3 kA 8/20 µs (per mode) | 796 V[2] |

All testing performed in accordance with IEC 61643-11 Class III test 6 kV (1.2 µs voltage) 3 kA (8/20 µs current) for verifying SPD transient overvoltage protective performance at terminal equipment level.

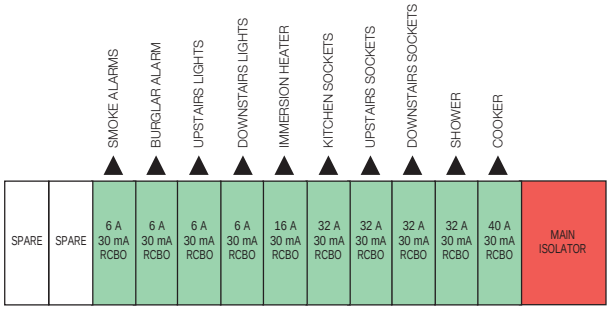
[2] Typical values, subject to manufacturing component tolerances. Essential detail relates to voltage protection level Up <1.5 kV for effective protection of the immunity withstand of Category I equipment (as defined by BS 7671 Section 443, Tables 44.3 & 44.4).

Sensitive electrical equipment in the home may require protection against transient overvoltages (surges) due to atmospheric origin where these overvoltages would exceed the withstand voltage of the equipment, as defined by the IET Wiring Regulations 17th Edition, BS 7671:2008(+A1:2011), and Lightning Protection standard, BS EN/IEC 62305.

## Havells Main Switch – All Independent Circuits

Utilising RCBOs throughout would provide a secure dedicated 30 mA protected supply to every circuit.

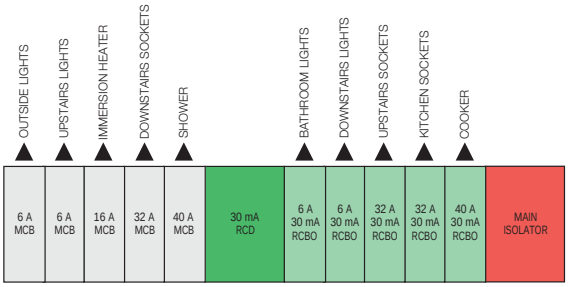
HS12




## Havells Split Load Units – Half Independent Circuits

Split Load consumer unit with a small group of circuits on the RCD and all others on independent devices (RCBO).

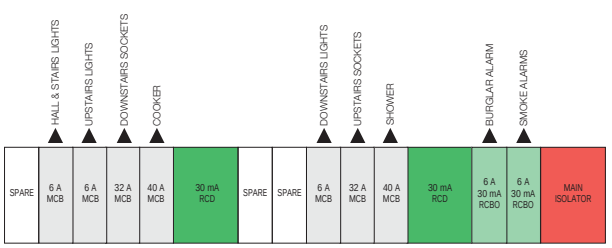
HSSL10




## Havells High Integrity Units – Some Independent Circuits

Uses two RCD protected sections and a number of ways for dedicated (High Integrity Circuits) using 30 mA RCBOs.

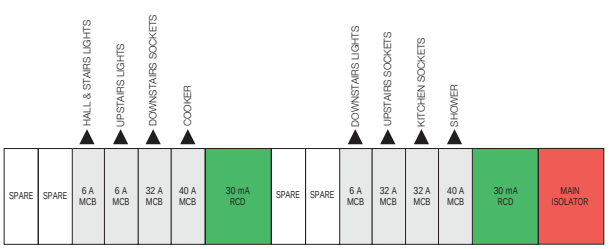
HSHI12




## Havells Dual RCD Units – No Independent Circuits

Dual RCD unit with two sections – each protected by a 30 mA RCD. Suitable for smaller dwellings.

HSDRCD12



# Insulated Consumer Units

HS12

## 100A main incomer

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| 6 way consumer unit | 100A | 6 | HS06 |
| 8 way consumer unit | 100A | 8 | HS08 |
| 12 way consumer unit | 100A | 12 | HS12 |
| 16 way consumer unit | 100A | 16 | HS16 |
| 20 way consumer unit | 100A | 20 | HS20 |

HSSL10

## Split Load –

100A main incomer/63A RCD

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| 6 way split load consumer unit | 100A | 6 | HSSL06 |
| 10 way split load consumer unit | 100A | 10 | HSSL10 |
| 14 way split load consumer unit | 100A | 14 | HSSL14 |

HSHI12

## High integrity – 17th edition

100A main incomer/63A RCD x2

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| 12 way high integrity consumer unit | 100A | 10 + 2 | HSHI12 |
| 16 way high integrity consumer unit | 100A | 14 + 2 | HSHI16 |

HSDRCD12

## Dual RCD – 17th edition

100A main incomer/63A RCD x 2

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| 8 way dual RCD consumer unit | 100A | 8 | HSDRCD08 |
| 12 way dual RCD consumer unit | 100A | 12 | HSDRCD12 |
| 16 way dual RCD consumer unit | 100A | 16 | HSDRCD16 |

HSRCD12

## Single RCD Controlled

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| 6 way single RCD consumer unit | 63A | 6 | HSRCD06 |
| 8 way single RCD consumer unit | 63A | 8 | HSRCD08 |
| 12 way single RCD consumer unit | 80A | 12 | HSRCD12 |
| 16 way single RCD consumer unit | 80A | 16 | HSRCD16 |

# Populated Consumer Units

HSHI12P10

## Populated High Integrity Consumer Units – 17th Edition

Fitted with 100A main switch, 2 x 63A RCD, 10 MCBs (3x6A, 2x16A, 4x32A, 1x40A)

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| 12 way High Integrity | 100A | 12 | HSHI12P10 |

HSDRCD12P8

HSDRCD16P12

## Fully Populated Dual RCD Boards

8 Way fitted with 100A main switch, 2 x 63A RCD, 8 MCBs (3x6A, 2x16A, 3x32A)
12 Way fitted with 100A main switch, 2 x 63A RCD, 12 MCBs (4x6A, 2x16A, 5x32A, 1x40A)
16 Way fitted with 100A main switch, 2x63A RCD, 16 MCBs (5x6A, 3x16A, 7 x32A, 1x40A)

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| 8 way Dual RCD Populated | 100A | 8 | HSDRCD12P8 |
| 12 way Dual RCD Populated | 100A | 12 | HSDRCD16P12 |
| 16 way Dual RCD Populated | 100A | 16 | HSDRCD20P16 |

HS3IP55SU/HS4IP55GU

## Populated IP55 Units

Garage Unit fitted with 40A RCD, 2 MCBs (1x6A, 1x32A)
Shower Unit fiited with 63A RCD, 1 MCB (40A)

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| IP55 Populated Garage Unit | 40A | 2 | HS4IP55GU |
| IP55 Populated Shower Unit | 63A | 1 | HS3IP55SU |

# Enclosures, RCCBs and Devices

HS3IP55/HS4IP55

## IP55 Modular Enclosure

| Description | No. Ways | Part No. |
|---|---|---|
| 3 way IP55 modular enclosure | 3 | HS3IP55 |
| 4 way IP55 modular enclosure | 5 | HS4IP55 |

HS240R30

## RCCB Double Pole ‘A’ Type

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| Double Pole RCCB module | 25A | 30 mA | HS225R30 |
| Double Pole RCCB module | 40A | 30 mA | HS240R30 |
| Double Pole RCCB module | 63A | 30 mA | HS263R30 |
| Double Pole RCCB module | 80A | 30 mA | HS280RC30 |

NOTE: Above RCCBs are only suitable for IP55 modular enclosures

## RCCB Double Pole ‘AC’ Type

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| Double Pole RCCB module | 40A | 30 mA | HSC240R30 |
| Double Pole RCCB module | 63A | 30 mA | HSC263R30 |

HSL106B

## Outgoing devices – MCBs – 6 kA, Single Pole

| Description | Current (A) | Type B | Type C |
|---|---|---|---|
| Miniature Circuit Breaker 6 kA | 6A | HSL106B | HSL106C |
| Miniature Circuit Breaker 6 kA | 10A | HSL110B | HSL110C |
| Miniature Circuit Breaker 6 kA | 16A | HSL116B | HSL116C |
| Miniature Circuit Breaker 6 kA | 20A | HSL120B | HSL120C |
| Miniature Circuit Breaker 6 kA | 25A | HSL125B | HSL125C |
| Miniature Circuit Breaker 6 kA | 32A | HSL132B | HSL132C |
| Miniature Circuit Breaker 6 kA | 40A | HSL140B | HSL140C |
| Miniature Circuit Breaker 6 kA | 50A | HSL150B | HSL150C |
| Miniature Circuit Breaker 6 kA | 63A | HSL163B | HSL163C |

HSL106BR30

## Outgoing devices – RCBOs – 6 kA, Single Pole 30 mA

| Description | Current (A) | Type B | Type C |
|---|---|---|---|
| RCBO 6 kA | 6A | HSL106BR30 | HSL106CR30 |
| RCBO 6 kA | 10A | HSL110BR30 | HSL110CR30 |
| RCBO 6 kA | 16A | HSL116BR30 | HSL116CR30 |
| RCBO 6 kA | 20A | HSL120BR30 | HSL120CR30 |
| RCBO 6 kA | 32A | HSL132BR30 | HSL132CR30 |
| RCBO 6 kA | 40A | HSL140BR30 | HSL140CR30 |
| RCBO 6 kA | 50A | HSL150BR30 | HSL150CR30 |

## General Accessories

| Description | Part No. |
|---|---|
| Unused Ways Blanking Strip | HSBS |
| 100A Main Incomer | HSCS1001N |

## Consumer Units with Integrated Surge Protection

Electrical equipment in the home provides a significant benefit to daily life, in terms of safety, convenience and entertainment, and represents a considerable investment to many household budgets.

Local authorities, hotel proprietors also have a vested and moral interest in ensuring both people and equipment are protected throughout residential and commercial building where consumer unit type products are installed. The use of a tested and validated offer from Havells in partnership with Furse reduces installation variables to guarantee optimum and best in class performance reducing the risk of damage to equipment and fires caused by over voltages.

BS 7671 recommends assessment of electrical installations against risk of surges (Section 443), and where necessary, installation of suitable surge protection (Section 534).

Havells HomeSafe consumer units now offer the option to include a compact Furse surge protector, tested to BS EN 616343 product standard, which when installed at the consumer unit will protect all downstream electrical circuits.

This approach optimises surge protection by covering all circuits, including those responsible for heating, lighting, burglar and smoke alarms as well as those serving valuable consumer electronics, without the need to install multiple plug-in devices (often not tested to BS EN 61643) throughout residential applications.

## Dual RCD Consumer Units with integrated SPD – 17th Edition

Fitted with 100A main switch, 2 x 63A RCD, 1 x 40A Type C MCB and Furse Surge Protector

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| 10 way Dual RCD Consumer unit with SPD | 100A | 10 | HSDRCD10SPD |
| 14 way Dual RCD Consumer unit with SPD | 100A | 14 | HSDRCD14SPD |

## Accessories

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| Surge Protection Device with consumer unit cable kit* | 275V | – | HSMMC275CK |
| *40A Type C -HSL140C is required to protect SPD (sold separately) | | | |

# Insulated Consumer Units with Integrated MID Approved Meters

For billing applications it is a legal requirement to use either meters that are MID approved, or approved under UK National legislation.

In some consumer unit applications where the landlord or building owner is billing a tenant for electricity e.g. student accommodation, key worker accommodation or social housing etc, it can be convenient to meter the tenants supply at the consumer unit. This meter can either be read locally and/or the information collected remotely via a communication link. A number of communication options from simple pulsed output of kWh information, to Modbus or M bus are available.

Havells offer a number of consumer unit options with integrated MID approved meters already fitted, making installation simple. The consumer unit function and meter / communication module are contained in a single enclosure solution.

## 80A MID Approved Meter with Isolator Incomer

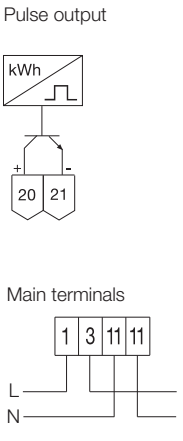
Meters have pulsed output as standard. For serial communication see below.

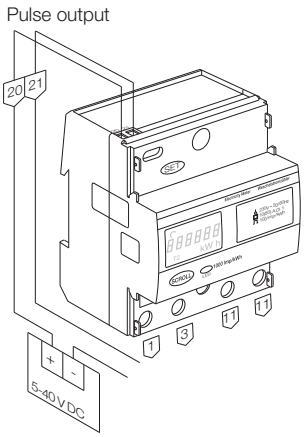
| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| 6 way consumer unit | 63A | 6 | HS06MID63 |
| 10 way consumer unit | 63A | 10 | HS10MID63 |
| 12 way consumer unit | 80A | 12 | HS12MID |
| 16 way consumer unit | 80A | 16 | HS16MID |

## Modbus Infrared Communication Module – 2 Module Unit

| Description | Rating | No. Ways | Part No. |
|---|---|---|---|
| Modbus Infrared Communication Module* | | | PSMCOMM |
| *Communication module reduces board capacity by 2 ways | | | |

Wiring Diagram



# Technical Data

Insulated Consumer Unit range – BS EN/IEC 60439-3

Switch-Disconnector Incomer (Isolator) – IEC 60947-3

RCCB devices – IEC 61008

MCB devices – IEC 60898-1

RCBO devices – IEC61009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# Insulated Consumer Units

## 100A main incomer/Single RCD Incomer

| Cat No. | width | height | depth | a | b | c | d | e | f |
|---|---|---|---|---|---|---|---|---|---|
| HS06 / HSRCD06 | 222 | 245 | 121 | 132 | 40 | 11 | 195 | 179 | 163 |
| HS08 / HSRCD08 | 258 | 245 | 121 | 132 | 40 | 11 | 231 | 179 | 198 |
| HS12 / HSRCD12 | 331 | 245 | 121 | 132 | 40 | 11 | 302 | 179 | 273 |
| HS16 / HSRCD16 / HS12MID | 400 | 245 | 121 | 132 | 40 | 11 | 374 | 179 | 341 |
| HS20 / HS16MID | 472 | 245 | 121 | 132 | 40 | 11 | 446 | 179 | 414 |

## Split Load - 100A main incomer/63A RCD

| Cat No. | width | height | depth | a | b | c | d | e | f |
|---|---|---|---|---|---|---|---|---|---|
| HSSL06 | 258 | 245 | 121 | 132 | 40 | 11 | 231 | 179 | 198 |
| HSSL10 | 331 | 245 | 121 | 132 | 40 | 11 | 303 | 179 | 273 |
| HSSL14 | 400 | 245 | 121 | 132 | 40 | 11 | 374 | 179 | 341 |

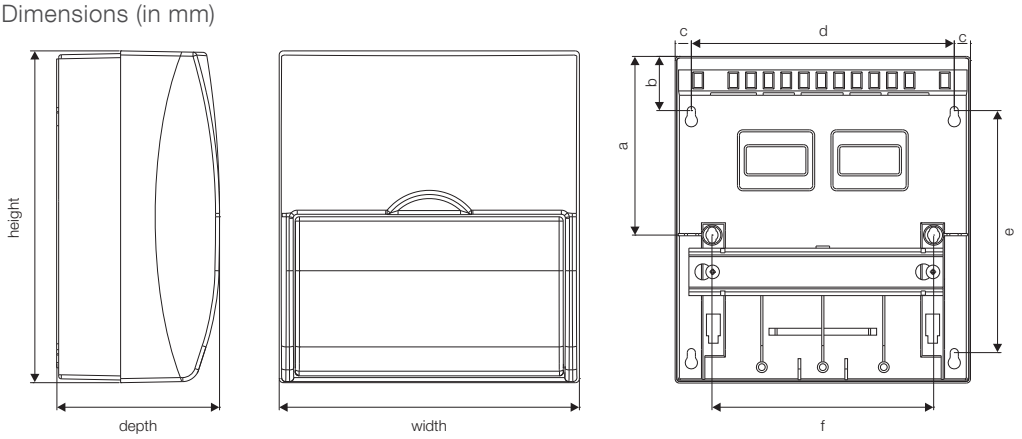
## High integrity 17th edition - 100A main incomer/63A RCD x2

| Cat No. | width | height | depth | a | b | c | d | e | f |
|---|---|---|---|---|---|---|---|---|---|
| HSHI12 | 400 | 245 | 121 | 132 | 40 | 11 | 374 | 179 | 341 |
| HSHI16 | 472 | 245 | 121 | 132 | 40 | 11 | 446 | 179 | 414 |

## Dual RCD 17th edition - 100A main incomer/63A RCD x 2

| Cat No. | width | height | depth | a | b | c | d | e | f |
|---|---|---|---|---|---|---|---|---|---|
| HSDRCD08 | 331 | 245 | 121 | 132 | 40 | 11 | 303 | 179 | 273 |
| HSDRCD12 / HSDRCD10SPD | 400 | 245 | 121 | 132 | 40 | 11 | 374 | 179 | 341 |
| HSDRCD16 / HSDRCD14SPD | 472 | 245 | 121 | 132 | 40 | 11 | 446 | 179 | 414 |

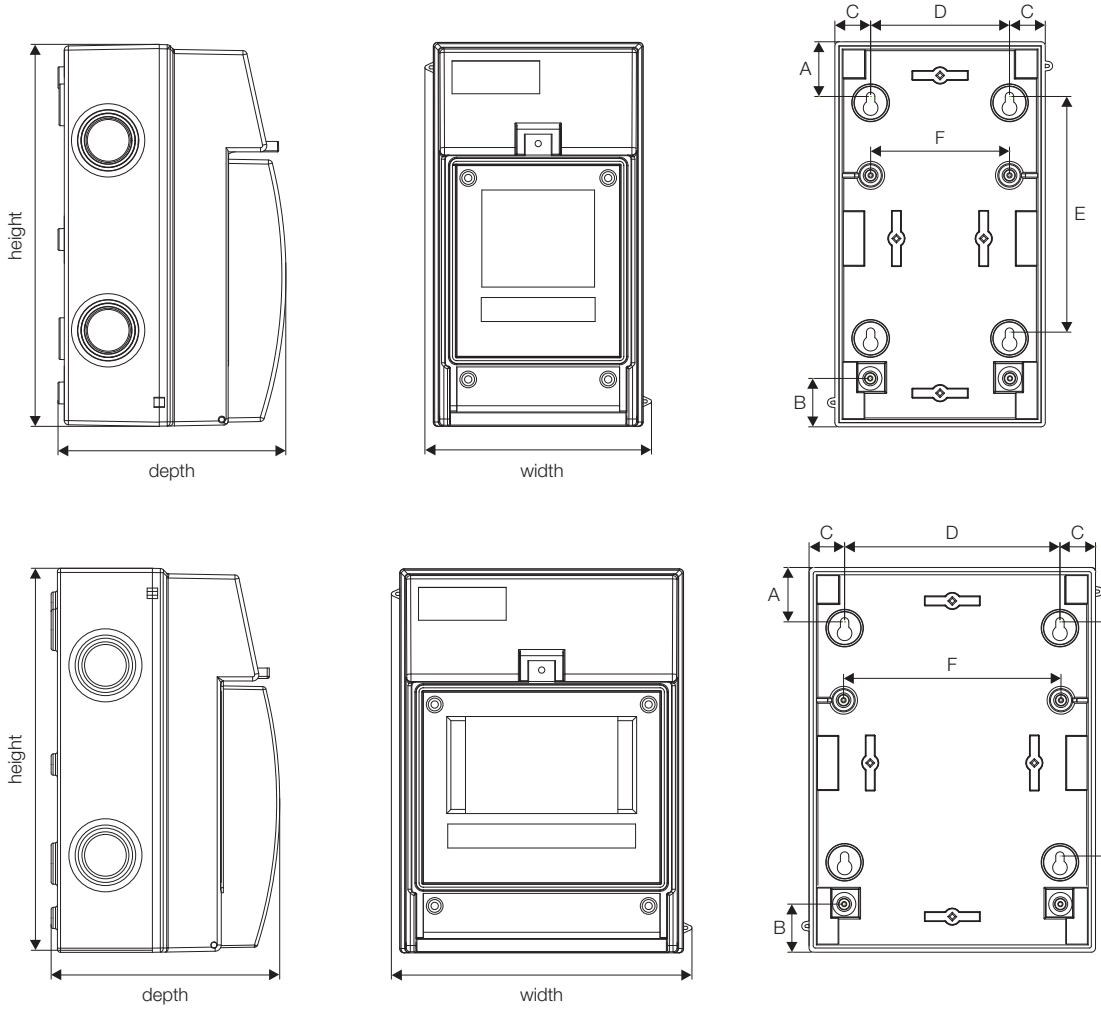
Dimensions (in mm)



# IP55 Modular Enclosures

| Cat No. | width | height | depth | a | b | c | d | e | f |
|---|---|---|---|---|---|---|---|---|---|
| HS3IP55 | 107 | 184 | 109 | 26 | 23 | 17 | 66 | 112 | 66 |
| HS4IP55 | 145 | 184 | 109 | 26 | 23 | 17 | 103 | 112 | 104 |

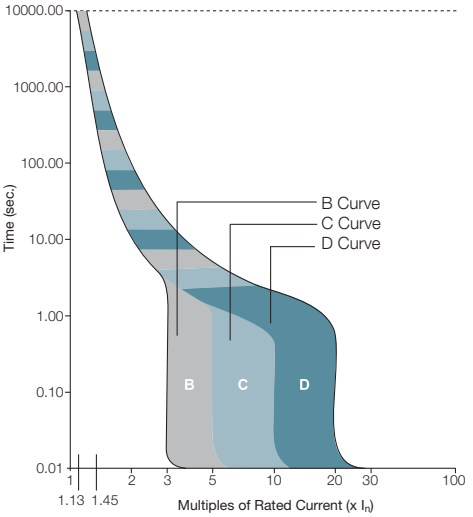
Dimensions (in mm)



# MCB

## Characteristics curves

| As per | Thermal Tripping | | | Magnetic Tripping | | |
|---|---|---|---|---|---|---|
| | No tripping | Tripping | Time | Hold | Trip | Time |
| IS / IEC 60898-1 | Current | Current | Limits | Current | Current | Limits |
| | $I_1$ | $I_2$ | t | $I_4$ | $I_5$ | t |
| B Curve | 1.13 x $I_n$ | | ≥1h | 3 x $I_n$ | | ≥0.1s |
| | | 1.45 x $I_n$ | <1h | | 5 x $I_n$ | <0.1s |
| C Curve | 1.13 x $I_n$ | | ≥1h | 5 x $I_n$ | | ≥0.1s |
| | | 1.45 x $I_n$ | <1h | | 10 x $I_n$ | <0.1s |
| D Curve | 1.13 x $I_n$ | | ≥1h | 10 x $I_n$ | | ≥0.1s |
| | | 1.45 x $I_n$ | <1h | | 20 x $I_n$ | <0.1s |
| $I_3$ = 2.55 x $I_N$ | 1s < t < 60s for $I_n$ < 32 A<br>1s < t < 120s for $I_n$ > 32 A | | | | | |




* s = second

## Tripping characteristics

Based on the Tripping Characteristics, MCBs are available in 'B', 'C' and 'D' curve to suit different types of applications.

**'B' Curve:** for protection of electrical circuits with equipment that does not cause surge current (lighting and distribution circuits). Short circuit release is set to (3-5) In

**'C' Curve:** for protection of electrical circuits with equipment that causes surge current (inductive loads and motor circuits).

Short circuit release is set to (5 - 10) In

**'D' Curve:** for protection of electrical circuits which causes high inrush current, typically 12-15 times the thermal rated current (transformers, X-ray machines etc.) Short circuit release is set to (10 - 20) In

## Current limiting design

In a current limiting breaker, the tripping & arc control mechanism are designed so that under short circuit conditions, the contacts are physically separated and the electrodynamic forces generated by fault current, assist with the extinction in less than half cycle.

The figure shows the current limiting effect of circuit breakers.

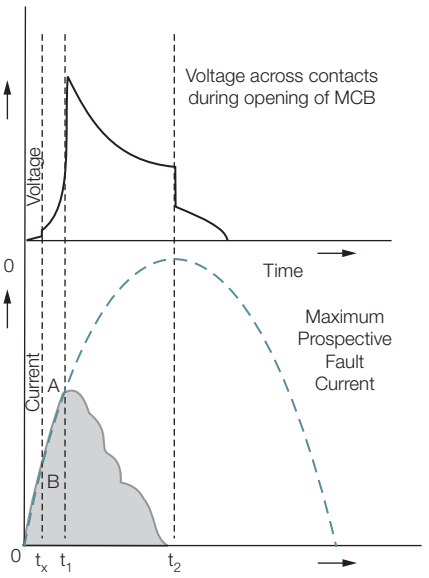
Fault Traces for Voltage & Current

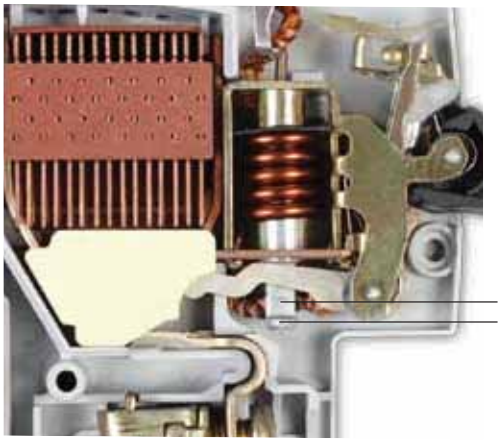
0 = Point of fault initiation

$t_x$ = Contact opening time (i.e. creation of arc)

$t_1$ = Current / Voltage peak (i.e. current limitation)

$t_2$ = Time to total extinction of arc (i.e. complete shutdown of fault current)





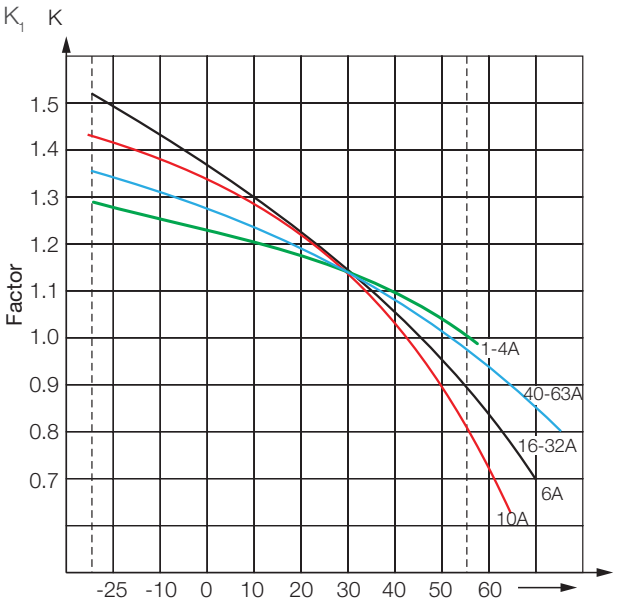

## Hammer trip mechanism

Current Limiting design in itself may not fulfill the requirement of quick breaking (instantaneous action) mainly due to inertia of the Latch mechanism and interconnected sequence of operations.

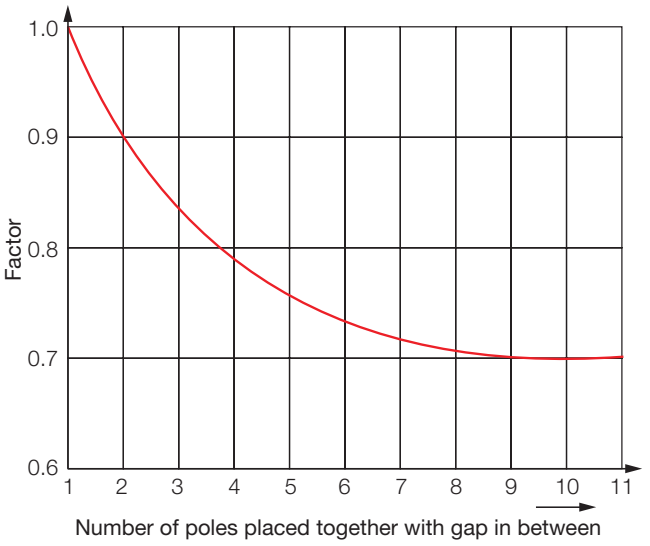
A Hammer directly connected to the plunger strikes the moving contact arm with a force proportional to the peak current there by forcibly separating the moving contact from the fixed contact much before the latch mechanism operates. This further reduces the opening time of the circuit breaker.

## Ambient temperature compensation/diversity factor chart

Maximum Permissible Rated Current ($K_1$ Factor) **Graph 1**




Diversity Factor ($K_2$ Factor) **Graph 2**




**Calculation** $I_n$ / MCB = $K_1$ x $K_2$ x $I_n$

**Example** 4 MCBs with $I_n$ = 10 A, and the amb. temp. is 50 ˚C kept with no gap in between

**Solution** K1 = 0.89 (from graph 1)
K2 = 0.78 (from graph 2)|
$I_n$ / pole = 0.89 x 0.78 x 10 = 6.94 A

## Effect of frequency variation

MCBs are designed to operate at AC frequency 50/60 Hz. However, MCBs specially suitable for DC applications and for frequencies up to 400 Hz can be supplied on request.

These can be used on different frequencies in supply from 16 2/3 - 60 Hz without any deration.

For higher frequencies, normal MCBs can be used with a multiplication factor which shall only affect its magnetic trip current.

| Supply | AC | | | DC |
|---|---|---|---|---|
| Frequency | 100 Hz | 200 Hz | 400 Hz | |
| Multiplication Factor | 1.1 | 1.2 | 1.5 | 1.5 |

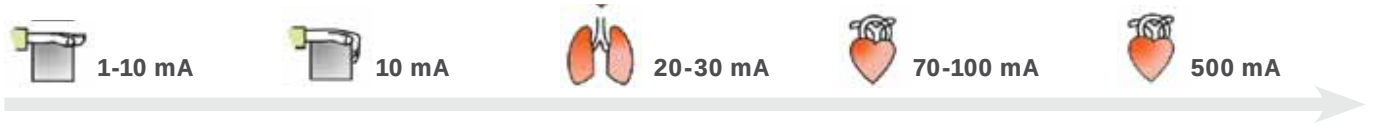
# RCCB

The use of exposed, substandard, badly wired, wrongly connected or damaged equipment as well as frayed or badly repaired cables reduces the safety of an installation and increases the risk of person receiving an electric shock.

Electrocution is a passage of current through the human body, which is dangerous. The flow of current through the human body effects vital functions.

1. Breathing
2. Heartbeat

A correctly chosen RCCB can detect small currents flowing to earth and reduces the risk of electrocution. The effect of electric current through the human body has been well researched and the following chart summarises the results:




| Prickling sensations | Muscle contraction: the person remains "stuck" to the conductor | Muscle contraction can cause respiratory paralysis | Cardiac fibrillation; the heart begins to vibrate and no longer beats at a steady rate. This situation is dangerous since it is irreversible | Immediate cardiac arrest resulting in death |
|---|---|---|---|---|

However, electrocution should not be viewed in terms of "current" alone, but in terms of "contact voltage". A person gets electrocuted by coming in contact with an object that has a different potential from his/her own. The difference in potential causes the current to flow through the body.

The human body has known limits:

- Under normal dry conditions, voltage limit = 50 V
- In damp surroundings, voltage limit = 25 V

## Against Indirect Contact

Over current protection devices like MCB are unable to act promptly on small earth leakage currents. To comply with wiring regulations, the earth fault loop impedance in Ohms, multiplied by the rated tripping current of the RCD in amperes must not exceed 50.

## Example

For an RCD with a rated tripping current of 30 mA, the maximum permissible earth fault loop impedance is calculated as follows: Zs (max) = 50/In = 50/0.03 = 1,666

## Against Fire

The majority of fires which occur as a result of faulty wiring are started by current flowing to earth. Fire can be started by fault current of less than 1 amp.

The normal domestic overload protective device such as a fuse or MCB will not detect such a small current. A correctly chosen RCD will detect this fault current and interrupt the supply, hence, reducing the risk of a fire starting.

| Rated Tripping Current of the RCD | 10mA | 30 mA | 100 mA | 300 mA |
|---|---|---|---|---|
| Maximum permissible earth fault loop impedance in Ohms | 5,000 | 1,666 | 500 | 166 |

## Technical Information

| Standard Conformity | | IS 12640-1: IEC 61008-1 |
|---|---|---|
| Rated Current (In) | A | 25, 40, 63 |
| Sensitivity (In) | mA | 30 |
| Rated Voltage (Un) | Vac | 240 |
| Rated Insulation Voltage (Ui) | V | 660 |
| Rated Frequency | Hz | 50 |
| Short circuit Withstand Capacity | kA | 6 |
| Residual Making Breaking Capacity | A | 500 A or 10 In whichever is greater |
| Ambient Temperature | oC | -25°C to + 55°C |
| Shock Resistance | | 40 mm free fall |
| Vibration Resistance | g | 3 |
| Electrical /Mechanical operations | | 10000 |
| Mounting | | Din Rail (35 x 7.5) mm |
| Degree of Protection | | IP 20 |
| Terminal Capacity (max) | mm2 | 25 |

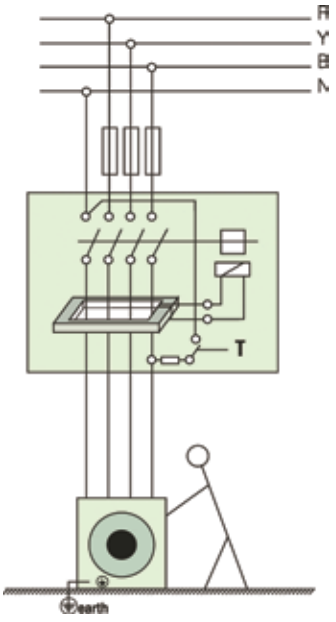
*500 mA is available on request

Two Pole

## Working principle

The RCCB works on the current balance principle. The supply conductors, i.e. the phases and the neutral, are passed through a toroid and form the primary windings of a current transformer. Its secondary winding is connected to a highly sensitive electromagnetic trip relay, which operates the trip mechanism.

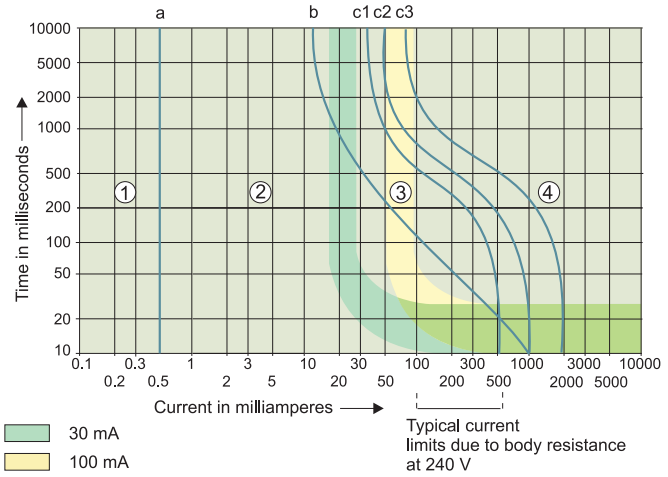
In a healthy circuit, the sum of the currents in phases, is equal to the current in the neutral and the vector sum of all currents is equal to zero. If there is any insulation fault in the current and leakage current flows to earth, the currents do not balance and their vector sum is not equal to zero. This imbalance is detected by the core balanced current transformer, the RCCB is tripped and supply to load is interrupted. The trip mechanism is operated at a residual current between 50-100 % of its rated tripping current.



## Selection

### 30 mA

A 30 mA RCD will provide a high degree of protection against electrocution in an accidental shock hazard situation. The current flowing through human body could be between 80 mA and 240 mA depending on the resistance of the human body and the voltage across it.




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

To be within zone of the IEC curve as shown. It is necessary for the RCD to operate within 50 ms at 240 mA and 150ms at 80 mA. Both these conditions are satisfied by 30 mA RCD.

For households, individual outlets, wet areas and temporary installations, RCD with sensitivity not exceeding 30 mA is advisable.

### 100 mA

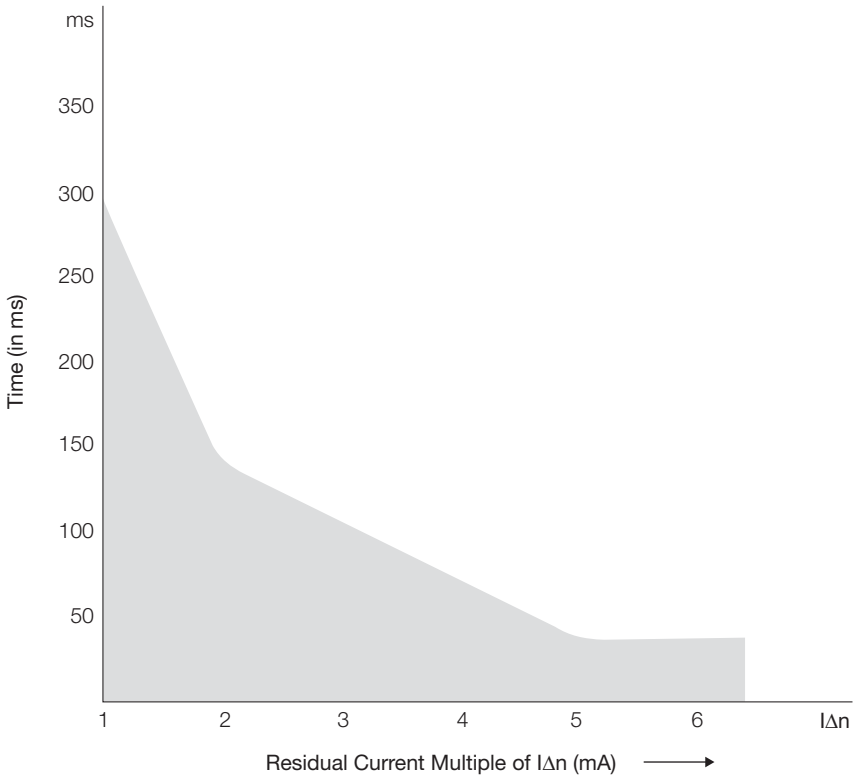
A 100 mA RCD will normally give a high degree of protection against electrocution but there is a possibility that the shock current could fall below the tripping level of RCD. This could occur if additional resistances to that of human body are included in the earth path.

The 100 mA RCCB protects against leakage currents and indirect contact with earth loop impedance up to 500 Ohms.

### 300/500 mA

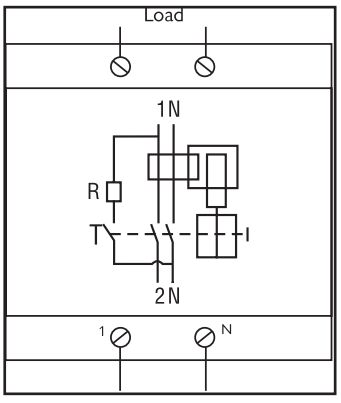
A 300/500 mA RCD may be used where only fire protection is required. eg., on lighting circuits, where the risk of electric shock is small. 300/500 mA RCD will not give any protection against electrocution.

## Actuation time characteristics



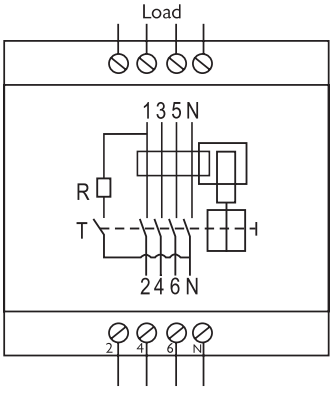

## Wiring diagram

For Single Phase -
2 Wire connections



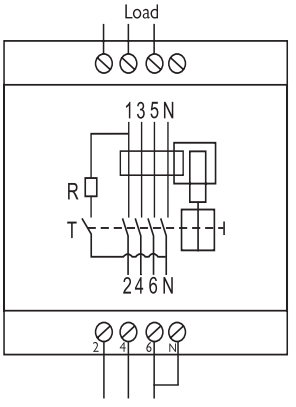

Line

For Three Phase -
4 Wire connections




Line

For Three Phase -
3 Wire connections




Line

The Havells range of four pole RCCBs can be used to provide residual current protection in 3 phase, 3 wire circuits (no neutral), however a link from the neutral to an incoming should be made on the supply side of the RCCB, to enable the operation of the RCCB.

# Meter Technical Specification

| | |
|---|---|
| **Voltage (V)** | |
| Voltage AC | 230 |
| Voltage range | -23 % to + 20 % of nominal voltage |
| **Current (A)** | |
| - base | 10 |
| - max | 80 |
| Starting current (mA) | 25 |
| Power consumption of current circuits (VA) | <1.3 |
| **General data** | |
| Frequency (Hz) | 50/60 (±5 %) |
| Accuracy class | B (Cl. 1) |
| **Standards** | IEC 62052-11, IEC 62053-21 (IEC 61036) EN 50470-1, EN 50470-3 |
| **Memory back-up** | EEprom |
| **Clock back-up** | Super Cap. 168 hours back-up at +20 ˚C, min 48 hours over operating temperature |
| **Clock accuracy range** | IEC 62052-21, IEC 62054-21 |
| **Temperature range** | (˚C) |
| • Operating | -40 to +55 |
| • Storing | -40 to +70 |
| **Environment** | According to IEC 60695-2-1: |
| Resistance to heat and fire | • Terminal 960 ˚C |
| | • Cover 650 ˚C |
| **Enclosure material** | |
| Upper | Polycarbonate |
| Lower | Polycarbonate/glass fibre |

| | |
|---|---|
| **Humidity** | 75 % yearly average, 95 % on 30 days/year |
| **Connection area, main terminals** | |
| • Flexible 1 x mm² | 4 - 25 |
| • Solid 1 x mm² | 4 - 25 |
| **Protection against penetration of dust and water** | According to IEC 60529:<br>• IP20 on terminal block without protective enclosure*) |
| **Pulse output** | |
| Connection area, main terminals | |
| • Flexible 1 x mm² | 0 - 2.5 |
| • Solid 1 x mm² | 0 - 2.5 |
| External pulse voltage (V) DC | 5 - 40 (transistor output) |
| Max. current (mA) 100 | |
| Pulse length (ms) | 100 |
| Pulse frequency (imp/kWh) | 100 |
| Standard | IEC 62053-1 (SO) |
| **LED** | |
| Pulse frequency (imp/kWh) | 1000 |
| Pulse length (ms) | 40 |
| Display of energy | LCD with 6 digits, height 6 mm |
| **Dimensions** | |
| Width (mm) | 72 |
| Height (mm) | 95 |
| Depth (mm) | 63.6 |
| DIN modules | 4 |

# Surge Protection Specifications

## Specification

- Compact Type 2 (Class II / Class C) protector
- Imax = 40 kA / 40 kA 8/20 µs (MOV / GDT)

## Application

Use on single phase mains supplies and power distribution systems for protection against indirect lightning strikes.

## Installation

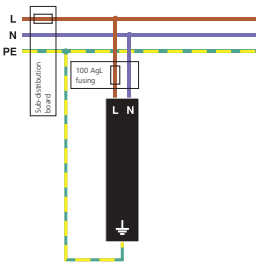
Should be installed in a sub-distribution panel or as close as possible to the equipment to be protected. The protector's base is suitable for attachment to a 35 mm top hat DIN rail.

## Features and benefits

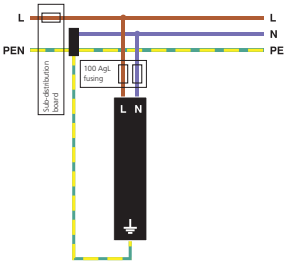
- The varistor based design eliminates the high follow current (If) associated with spark gap based surge protection
- A red indicator shows when the protector requires replacement (replacement module part no. MMP 2C275 or MMP 2C275TT)
- This indication can also trigger a remote signal contact to interface with a building management system. Please use '/S' after the part no. to order the remote indication (change-over) contact version

## Wiring diagrams

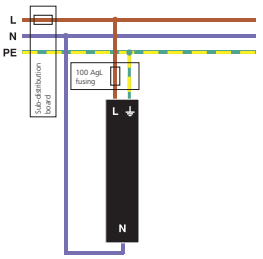
The diagrams below illustrate how to wire the appropriate MMP protector according to your chosen electrical system.




TN-C




TN-C-S




TT

MMP 2C275

| Electrical Specification | MMP 2C275/2 | MMP 2C275/1+1T |
|---|---|---|
| **Installation** | TN-S / TN-C-S | TT |
| **Nominal voltage (Uo)** | 220-240 VRMS | 220-240 VRMS |
| **Nominal frequency range** | 47-63 Hz | 47-63 Hz |
| **Maximum continuous operatingvoltage (Uc)** | 275 Vac / 350 Vdc | 275 Vac / 350 Vdc |
| **Maximum back up fuse** | 100 AgL | 100 AgL |
| **Short circuit capability** | 25 kA / 50 Hz | 25 kA / 50 Hz |
| **Signal contact ratings** | 250 VRMS / 0.5 A | 250 VRMS / 0.5 A |
| Signal contact module part no. | MMP 2C275/1/S | MMP 2C275/1+1/S |
| Replacement module part no. | MMP 2C275 | MMP 2C275/TT |

| Transient Specification | MMP 2C275/2 | MMP 2C275/1+1T |
|---|---|---|
| **Arrester classification[1]** | | |
| EN | 2 | 2 |
| IEC | II | II |
| E DIN VDE 0675 | C | C |
| **Let-through voltage (Up)[2]** | | |
| at 5 kA (8/20 µs) | < 0.9 kV | < 0.9 kV |
| at *I*n (8/20 µs) | < 1.5 kV | < 1.5 kV |
| **Nominal discharge current** | | |
| *I*n (8/20 µs) | 20 kA | 20 kA / 20 kA (N-E) |
| **Maximum discharge current** | | |
| *I*max (8/20 µs) | 40 kA | 40 kA / 40 kA (N-E) |

[1] Tested to BS EN/IEC-61643
[2] Values stated are per pole

| Mechanical Specification | MMP 2C275/2 | MMP 2C275/1+1T |
|---|---|---|
| **Temperature range** | -40 to +80 °C | |
| **Connection type** | | |
| for power (upper terminals) | 6 mm2 solid conductor, 4 mm2 stranded conductor | |
| for signal (lower terminals) | 35 mm2 solid conductor, 25 mm2 stranded conductor | |
| for signal (remote contact) | 1.5 mm2 conductor (/S option) | |
| **Mounting** | Indoor, 35mm top hat DIN rail | |
| **Degree of protection** | IP20 | |
| **Case material** | Thermoplastic, UL 94 V-0 | |
| **Dimensions** | | |
| **Mechanical specification** | MMP 2C275/2 | MMP 2C275/1+1T |
| for /2 & /1+1 versions to DIN 43880 | 90 x 68 x 17.5 mm (1TE) | 90 x 68 x 17.5 mm (1TE) |
| | Units with the remote signal contact terminals (removable) are 100 mm high | |
| **Enclosure dimensions** | | |
| for up to /4 versions (4TE) | 170 x 98 x 105 mm (MMP ENC4) | |

HAVELLS

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