Guide to:
17th Edition Consumer Units

Introduction

For well over one hundred years the Wiring Regulations have provided the rules which must be followed to make sure that electrical installations are safe. The introduction of the 17th Edition of the Wiring Regulations on the 1st January 2008 had major implications for all Electrical Contractors, Designers and Consultants.

Installations designed from 1st July 2008 must have complied with this new set of Regulations. Several new regulations have an impact upon circuit design and consumer unit layout.

This guide will help you understand the new Wiring Regulations and current Building Regulations, providing the necessary facts to construct compliant installations including Consumer Units.

If after reading this guide you would like to find out further information regarding the new regulations Hager offer tailored training courses. If you are interested in registering interest in attending one of these courses please visit www.hager.co.uk

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Building Regulations

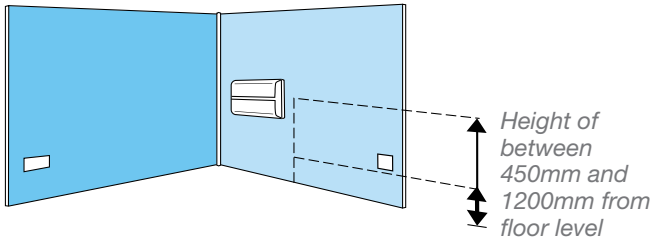
"Consumer Units may need to be easily reachable and be mounted with the devices at a height of between 1350mm & 1450mm above floor level"

Since 2005 the Building regulations for England and Wales have made direct reference to Electrical Installations, increasing the influence on how Electrical Equipment is installed in buildings.

Part P of the building regulations relates to the electrical safety in dwellings. The approved document prescribes that switches, sockets and consumer units in new dwellings should be easy to reach, in accordance with Part M of the building regulations.

Part M recommends that switches, sockets and other equipment should be located between 450mm and 1200mm from finished floor level, it does not specifically mention the consumer unit. However Part P suggests that one way of complying is to mount the consumer unit so that the switches are between 1350mm and 1450mm above floor level.

In addition the consumer unit may need to be in an accessible location and not in a location that would make it difficult to access. Such as in a small under stairs cupboard. Neither should it be placed in a position where there is likely to be damage by impact.



Therefore depending on the layout of the dwelling a flush consumer unit may be considered.

Requirements of 17th Edition Wiring Regulations

This section aims to explain some of the new Regulations contained within the 17th Edition Wiring Regulations, regarding the consumer unit and final circuits.

Firstly however, to fully understand what is required we need to consider some definitions from Part 2 of the Regulations.

Ordinary Person

Someone who is neither skilled or instructed e.g. general public / home owner

Skilled Person

A person with technical knowledge or experience to enable him/her to avoid dangers which electricity may create e.g. qualified electrician

Instructed Person

A person who has been adequately advised or supervised to enable him/her to avoid dangers which electricity may create e.g. facilities manager

"Certain Regulations only apply to installations not under the supervision of a skilled or instructed person i.e. ordinary persons"

Typically commercial installations will be under the control of a Skilled or Instructed Person. However domestic and some commercial installations will not. This is particularly important, as certain Regulations only apply to installations not under the supervision of a Skilled or Instructed Person.

A significant change is the introduction of Regulations requiring additional protection by RCD's.

There are 3 points of consideration

1. Socket Outlets
2. Cables buried in walls
3. Locations containing a bath or shower

Socket Outlets

"Socket outlets for general use in a domestic installation require RCD protection not exceeding 30mA"

The Regulations have introduced new requirements regarding socket outlets, particularly where used by ordinary persons e.g. home owners.

The definitions for persons are important to consider when we look at the requirements for protection of circuits supplying socket outlets.

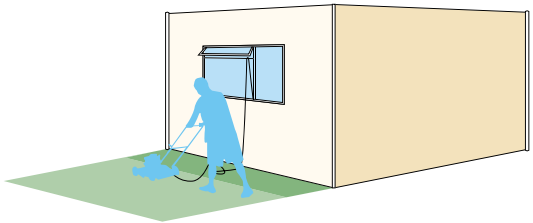
Regulation 411.3.3 requires that an RCD of not exceeding 30mA be provided for:

1. Socket outlets up to 20A that for general use by "ordinary persons".
2. Mobile equipment up to 32A that is for use outdoors.

Exceptions to 411.3.3 are permitted where:

3. Use of socket outlets is under the supervision of someone "skilled" or "instructed".
4. Specifically labelled or otherwise suitably identified socket outlets provided for a particular item of equipment.

This is a change from the 16th Edition that required only socket outlets 'reasonably expected' to supply equipment used outside the equipotential zone to have RCD protection e.g. used for an Electric lawn mower. Now under the requirements of the 17th edition it is likely that every socket outlet in a domestic installation will require RCD protection not exceeding 30mA.



This may also apply to some commercial installations, like small offices or shops etc where there is no control on the use of those socket outlets. Consideration should also be given to areas where free access to socket outlets is available to the general public e.g. airport lounges.

Cables Buried in the Wall

Significant changes affect installations where cables are buried in the wall. This is the normal practice in dwellings.

Here we need to consider Section 522, Selection and erection of wiring systems in relation to external influences. The particular requirements of this section apply to cables which are concealed in a wall or partition at a depth of less than 50mm, or where metal partitions are used.

The definitions for persons are once again important for this section. There are 5 options of installing cables in walls. The cables shall:

1. Incorporate an earthed metal covering which is suitable as a protective conductor. Eg SWA cable.

2. Be enclosed in earthed metal conduit, such that is suitable as a protective conductor.

3. Be enclosed in earthed metal trunking, such that is suitable as a protective conductor.

4. Be protected against damage from penetration by nails or screws.

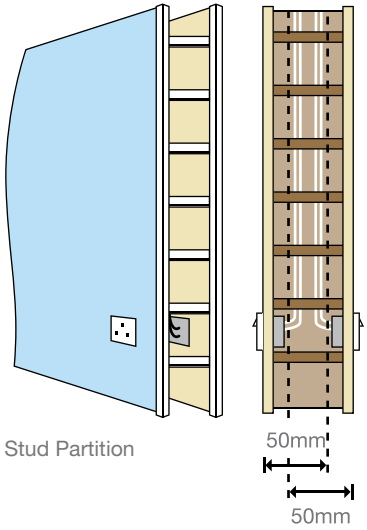
5. Be installed in a safe zone.

This is much the same as the 16th Edition requirements and the usual option is to install cables in a dedicated safe zone. However, where an installation is not under the supervision of someone skilled or instructed, regulation 522.6.7 applies.

In this regulation where (v.) is used then the cable must have additional protection by the use of a RCD not exceeding 30mA. This would apply where thermoplastic (PVC) wiring systems are used, this is typical in most domestic installations and some commercial installations.

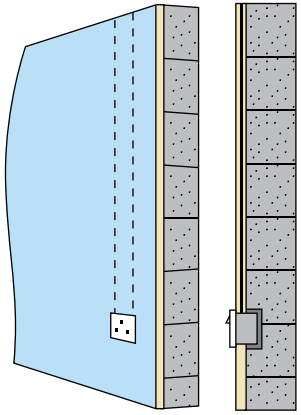
"Where buried cables are not mechanically protected additional protection by an RCD not exceeding 30mA must be provided"

Requires RCD Protection



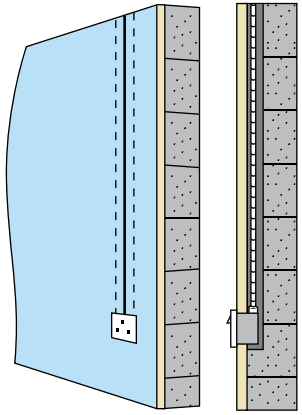
Stud Partition

Requires RCD Protection



Brick / Block or Plaster

Does Not require RCD Protection



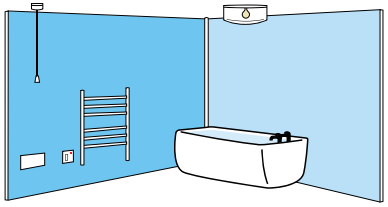
Earthed Metal Condut

Section 701: Locations Containing a Bath or Shower

Significant changes affect installations where cables are buried in the wall. This is the normal practice in dwellings. Although additional regulations relating to bathrooms etc are not new, there are some important changes to consider.

Regulation 701.411.3.3 requires that all circuits within this location shall be additionally protected by an RCD not exceeding 30mA. This would mean 230V lighting, the 230V supply to the source for SELV, a shower circuit and bathroom heater for example will all need RCD protection.

A standard 13A socket outlet is now permitted in this location provided however the socket outlet is more than 3m from the boundary of zone 1.



Circuits in locations containing a bath or shower should be protected by an RCD

The 16th Edition required local supplementary bonding be provided connecting together all exposed and extraneous conductive parts in the zones. This is no longer required in this location provided the following conditions are met:

- All final circuits of the location comply with the automatic disconnection requirements according to regulation 411.3.2.
- All circuits are RCD protected in accordance with 701.411.3.3.
- All extraneous-conductive parts of the location are effectively connected to the protective equipotential bonding according to regulation 411.3.1.2 (Previously termed main equipotential bonding).

"All circuits in locations containing a bath or shower shall be protected by an RCD not exceeding 30mA"

Other Considerations

There are additional Regulations and Codes of Practice that need to be considered during the design of an installation. These will affect the choice of consumer unit.

"All circuits of an installation should not be connected to a single RCD"

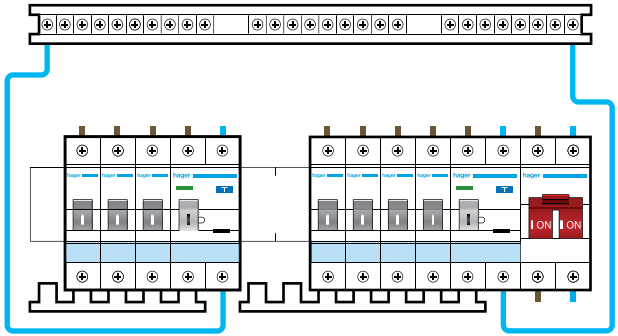
Division of Installation

Section 314 calls for the installation to be so divided to:

a. Avoid hazards and minimize inconvenience in the event of a fault.

b. Reduce the possibility of unwanted tripping of the RCD due to excessive protective conductor currents.

To comply with these requirements the circuits of an installation should not be connected to a single RCD, as this could lead to loss of supply to the entire installation in the event of a fault on one circuit, clearly inconvenient for the user of the building.



BS 5839-6:2004 Fire Detection and Alarm Systems for Buildings

All new dwellings are required to be provided with a fire detection and alarm system. This is a safety service and is covered in chapter 56 of BS7671:2008. However further reference for dwellings is made to BS5839-6:2004 Fire detection and Fire alarm systems for buildings. Consideration needs to be given to the supply for this circuit.

In a standard house, a grade D, category LD3 system is required. This is a mains powered alarm having an integral standby supply. Such a system is required to be either:

a. Permanently wired from an independent circuit at the distribution board, or
b. Be supplied from a local, regularly used lighting circuit. (there being a means of isolating the supply to the alarms without affecting the lighting).

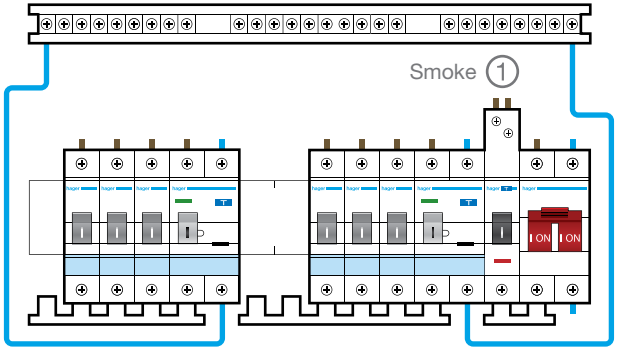
Another consideration is that where, unusually, there is a Grade B* or E** fire alarm and detection system. In this case, account needs to be taken of clauses 15.3(d) and 15.6(c), respectively, of BS 5839 6. Both of these clauses recommend that the circuit serving the fire alarm system should preferably not be protected an RCD, but if RCD protection is required for electrical safety reasons then either:

- The RCD should serve only the circuit supplying the fire detection and alarm system, or
- The RCD protection of the fire detection and alarm system circuit should operate independently of any RCD protection for circuits supplying socket outlets or portable equipment.

* A Grade B fire detection and fire alarm system comprises fire detectors (other than smoke alarms and heat alarms), fire alarm sounders, and control and indicating equipment meeting specified requirements given in BS 5839 6. This may be required for a large house.

** A Grade E fire detection and fire alarm system comprises one or more mains-powered smoke alarms and possibly heat alarms, with no standby supply.

"Where RCD protection is needed for smoke detector circuits one option is to supply that circuit only"

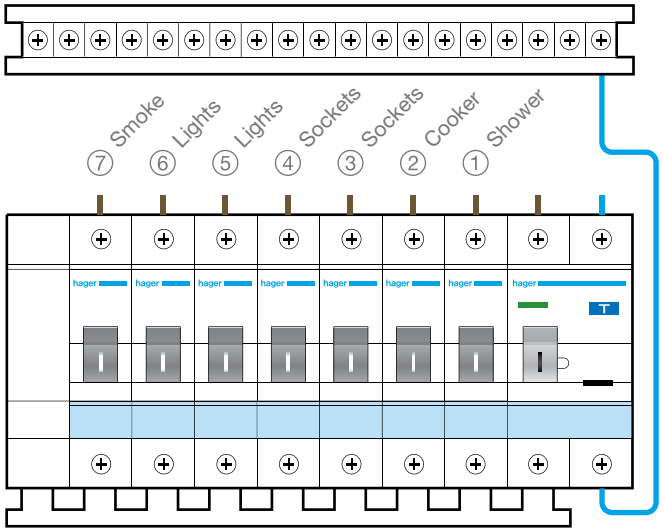


Consumer Unit Arrangements

The following options, each with their own benefits, can be considered by the installation designer.

Not Permitted

A consumer unit with a 30mA RCD main switch is likely to be unsuitable for 3 main reasons:



The Fire detection circuit and the socket outlet circuits share a common RCD. This may reduce the reliability of the mains supply to the Fire detection circuit as appliances and portable equipment are likely causes of RCD tripping.

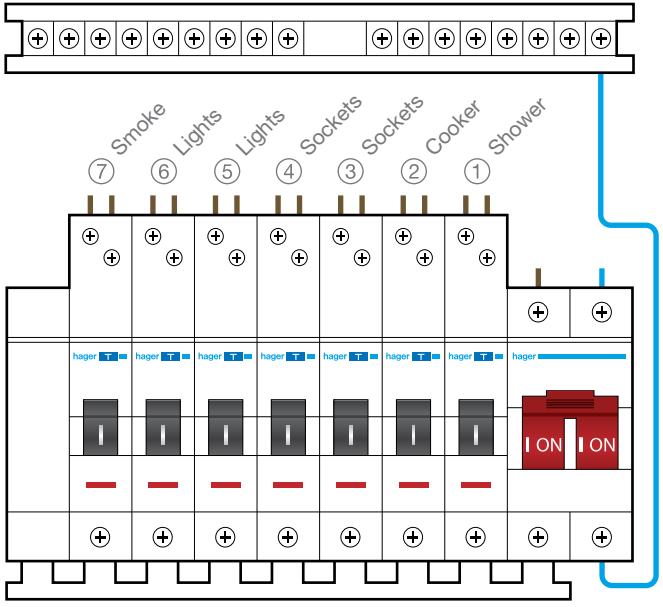
The cumulative effects of electronic equipment in the modern home, is such that some current is likely to flow in the protective conductor. A 30mA RCD will trip between 15-30mA. This could cause unwanted tripping, regulation 314.1 (iv) refers.

Any fault would result in the loss of all the lighting, this could in itself cause a hazard and the lack of power to the fridge / freezer circuit for example would be very inconvenient. Regulation 314.1 (i) asks the designer to consider this eventuality.

"A consumer unit with a 30mA RCD main switch should not be used to protect all the circuits"

Option 1 ✔

Main Switch with RCBO's On All Circuits



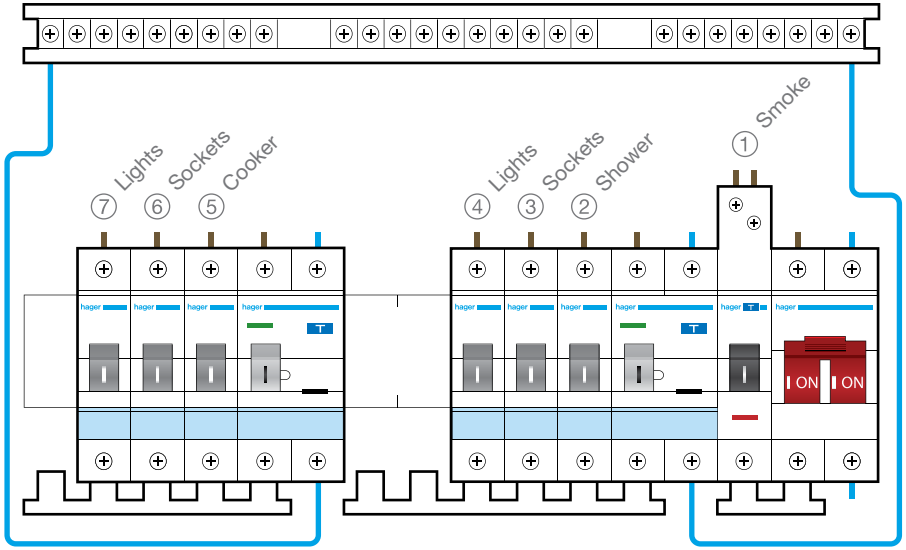
A standard main switch disconnector controlled consumer unit could be used with every circuit having individual RCD protection at 30mA. This could be achieved by selecting RCBO's for every outgoing circuit instead of the usual MCB's. A fault on any circuit would not affect other circuits and hence all relevant regulations would be met by such a design.

"Selecting RCBO's for every outgoing circuit meets all relevant regulations"

"This arrangement provides a dedicated RCBO for the smoke detector circuit"

Option 2 ✔

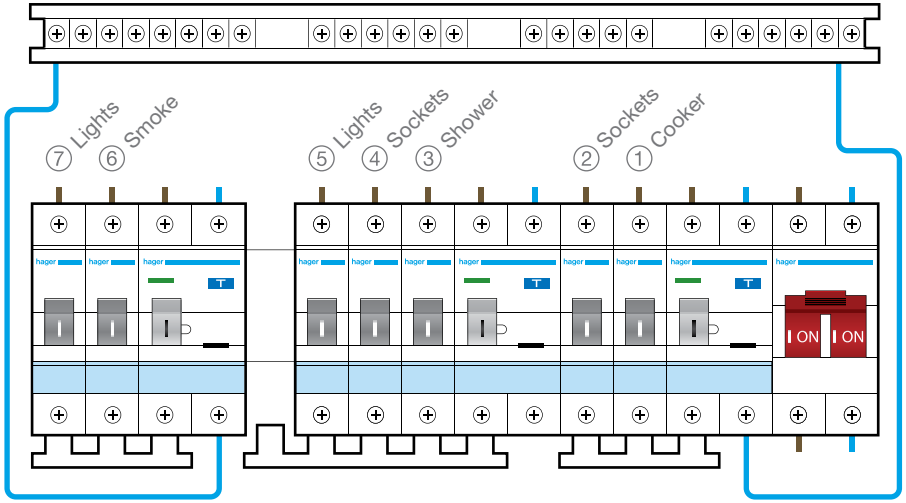
Split Load Twin RCCB plus Dedicated RCBO



This arrangement provides a dedicated 30mA RCBO for the smoke detector circuit, but combines the rest of the circuits across two further 30mA RCCB's. Careful arrangements of the circuits can reduce the likelihood of nuisance tripping, thereby limiting the inconvenience or potential hazards that a loss of supply can cause by limiting the number of circuits affected.

"This arrangement provides an RCD for the smoke detector circuit which could also supply other circuits e.g. lighting"

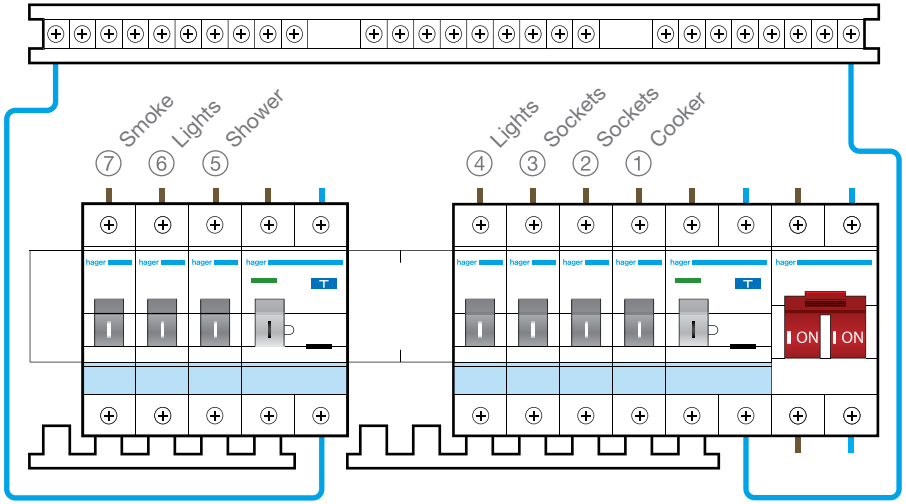
Option 3 ✔ Split Load 3 RCCB Board



This arrangement provides a 30mA RCCB for the smoke detector circuit which could also supply other circuits e.g. lighting, and combines the rest of the circuits across two further 30mA RCCB's. Careful arrangements of the circuits can reduce the likelihood of nuisance tripping, thereby limiting the inconvenience or potential hazards that a loss of supply can cause by reducing the number of circuits affected.

"Careful design of circuits to ensure nuisance tripping is unlikely"

Option 4 ✔ Split Load Twin RCCB

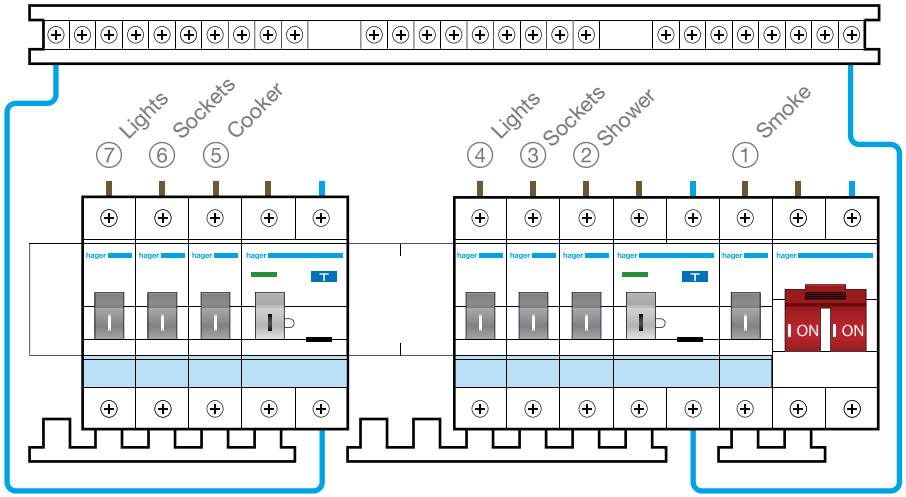


This arrangement provides two separate 30mA RCCBs with the circuits spread across both. The design of the circuit arrangements need to ensure that nuisance tripping is unlikely, thereby limiting the inconvenience or potential hazards that a loss of supply can cause.

However with several circuits being supplied from on RCD, certain compromise must be accepted.

"If the smoke alarm circuit is not to be protected by an RCD it must be installed using a method from (i) to (iv) of regulation 522.6.6"

Option 5 ✔ Split Load Twin RCCB plus Unprotected Circuit



Under the 17th Edition requirements it is still possible to install some circuits in domestic premises that are not fed via an RCD. Different wiring systems would need to be used. The cost of installation could rise considerably if most circuits were installed using armoured cable or earthed metal conduits.

The smoke alarm circuit could be installed in such a way to negate the need for RCD protection, this may be possible by using one of the other wiring methods described in 522.6.6 for the length of run that the cable is in the wall (use of earthed metal conduit for example). Or depending on the layout of the property there maybe an attached garage for example where surface wiring might be possible. The requirements of that regulation are therefore not applicable.

The level of compliance with the Regulations would therefore be the same as option 2 Split Load Twin RCCB plus Dedicated RCBO.

Conclusions

It is clear that domestic installations conforming to the 17th Edition of the Wiring Regulations are likely to require increased use of RCD (Residual Current Devices) and careful consideration from designers and installers is required to meet the requirements of the regulations.

Training Courses

Hager runs an on-going programme of training courses targeted towards wholesale trade partners, specification engineers and installation contractors.

Hager training courses satisfy the 'Continuing Professional Development' - CPD, requirements of the major engineering institutions.

To register yourself on to one of our training courses in your area please visit our website www.hager.co.uk and click on the services section.

Residual Current Devices used in Consumer Units

RCD - Residual Current Device

A generic term for devices providing earth fault protection.

RCBO - Residual Current Operated Circuit-Breaker with Integral Overcurrent Protection

A mechanical switching device designed to make, carry and break currents under normal service conditions and to cause the opening of the contacts when the residual current attains a given value under specified conditions. In addition it is designed to give protection against overloads and/or short circuits and can be used independently of any other overcurrent protective device within its rated short circuit capacity.

RCCB - Residual Current Operated Circuit-Breaker without Integral Overcurrent Protection

A mechanical switching device designed to make, carry and break currents under normal service conditions and to cause the opening of the contacts when the residual current attains a given value under specified conditions. It is not designed to give protection against overloads and/or short circuits and must always be used in conjunction with an overcurrent protective device such as a fuse or circuit-breaker.

Consumer Unit

MCB

RCCB

RCBO

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