# 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 and subsequent amendments have had major implications for all Electrical Contractors, Designers and Consultants.

Several regulations have an impact upon circuit design, consumer unit layout and even the construction of the consumer unit itself.

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

# Contents

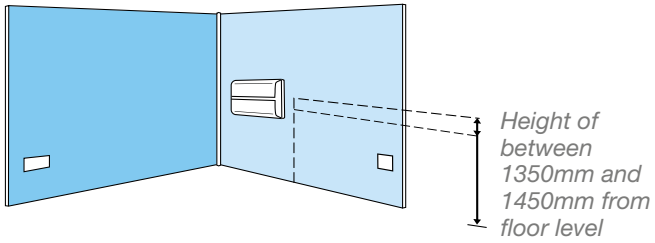
# Building Regulations

"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.

Approved Document M recommends that in new dwellings, switches, sockets and other equipment should be located between 450mm and 1200mm from finished floor level, it also suggests that consumer units are mounted so that the switches are between 1350mm and 1450mm above floor level.




In the case of multi-row consumer units, the bottom row of switches should be between 1350 and 1450mm so that they are out of reach of young children.

Depending on the layout of the dwelling and position of the consumer unit, a flush consumer unit may be considered.

# Requirements of 17th Edition Wiring Regulations inc. Amd 3

The third amendment to BS 7671 :2008 has introduced a requirement for enhanced functionality of the consumer unit. The Regulation states:

421.1.201 Within domestic (household) premises, consumer units and similar switchgear assemblies shall comply with BS EN 61439-3 and shall:

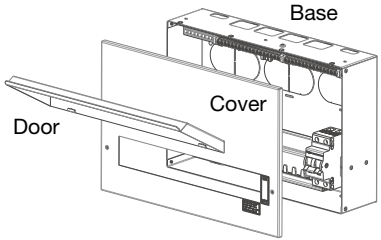
1. Have their enclosures manufactured from non-combustible material, or
2. Be enclosed in a cabinet or enclosure constructed of non-combustible material and complying with Regulation 132.12.

Note 1: Ferrous metal e.g. steel, is deemed to be an example of a non-combustible material.

Note 2:The implementation date for this regulation is the 1st January 2016, but does not preclude compliance with the regulation prior to this date

The intent of this regulation is considered to be, as far as is reasonably practicable, to contain any fire which may have started, mainly as a result of poorly installed connections within the enclosure, and to minimise flames from escaping.

The enclosure is considered to be the entire unit which includes the base, cover and the door or lid. All the devices and blanks must be contained within this non-combustible enclosure.




"The consumer unit enclosure should be made of non-combustible material"

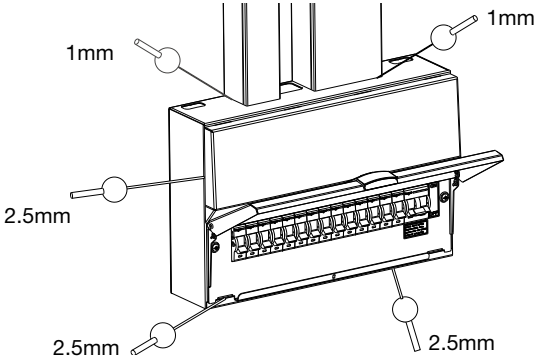
The installer would of course require access to this enclosure for cable entry. It is important that any holes made for cable entry are no larger than they need be. The cable installation entry method shall, as far as is reasonably practicable, maintain the fire containment of the enclosure. It is essential that account is taken of the manufacturer's instructions, if any.

This can generally be achieved by the installer ensuring that cable access holes they make in the enclosure do not to leave gaps greater than:

- 1.0 mm for the horizontal top surface and
- 2.5 mm for all other surfaces of the enclosure that are accessible after installation.

The installer could for example, select as they deem appropriate; trunking, conduit, cable gland or cable entry accessories to minimise the opening around the cables. For rear cable access, the minimum number of rear knockout(s) shall be removed to accommodate the cable(s).

There is no specific requirement in regulation 421.1.201 for fire-rated cable glands or intumescent sealant to be used however, this does not preclude the installer using these or other methods, should they be considered necessary.




"Openings around cable entry should be minimized, use of trunking is one option"

# Other Enclosures

As previously stated, regulation 421.1.201 includes for consumer units AND similar switchgear. In a larger dwelling there may be a requirement for a 3 phase supply. The distribution board in this instance would be required to meet the same non-combustibility requirements as a single phase consumer unit.

It is important the specifier obtains information from the manufacturer of the 3 phase TP&N enclosure that this requirement is satisfied. It may not simply be the case of using a TP&N enclosure which is normally used in commercial applications as there may be some plastic components which will not meet the non-combustable criteria.

Likewise this could include for:-

- Enclosures for building automation systems such as KNX devices
- One way consumer units (a double pole main switch and one outgoing way)
- Shower Units
- Garage Units
- Distribution Boards (with circuit breakers or fuses)
- Photo-voltaic combiner boxes
- Voltage optimisation units

"TP&N enclosures and other similar switchgear will also be required to be non-combustable"

# Socket Outlets

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

The Regulations prescribe  requirements regarding the use and protection of socket outlets,

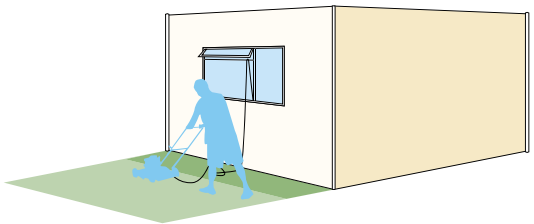
Regulation 411.3.3 requires that an RCD  not exceeding 30mA be provided for:

1. Socket outlets having a rated current  up to 20A
2. Mobile equipment up to 32A that is for use outdoors.

Exceptions to item 1 are permitted :

a. where, other than for a dwelling, a documented risk assessment determines that RCD protection is not necessary
b.  Specifically labelled or otherwise suitably identified socket outlets provided for a particular item of equipment.

It is likely then that every socket outlet in a domestic installation will require protection by an RCD not exceeding 30mA.



# Cables Buried in the Wall

It is usual practice with domestic installations to install cables within the wall structure. We need therefore 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.

There are a number of options of installing cables within the wall:

1. They should be installed within designated safe zones, generally vertically or horizontally from the point, accessory or switchgear or 150mm from the top or adjoining part of the wall, or
2. Comply with 522.6.204

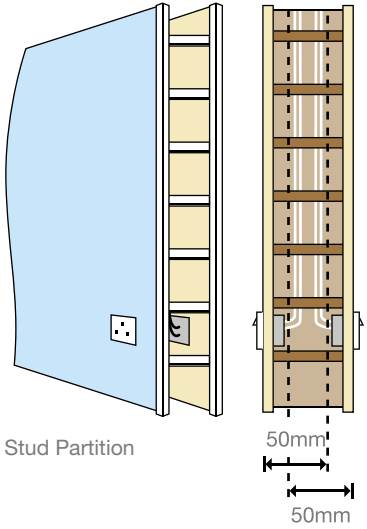
522.6.204 allows for the cable to:

i) Incorporate an earthed metal covering which is suitable as a protective conductor. Eg SWA cable.
ii) Be enclosed in earthed metal conduit, such that is suitable as a protective conductor.
iii) Be enclosed in earthed metal trunking, such that is suitable as a protective conductor.
iv) Be protected against damage from penetration by nails or screws.
v) Form part of a SELV or PELV circuit

However, where none of the items in 522.6.204 apply, then additional protection by an RCD not exceeding 30mA is required. This now applies to commercial installations as well as domestic.

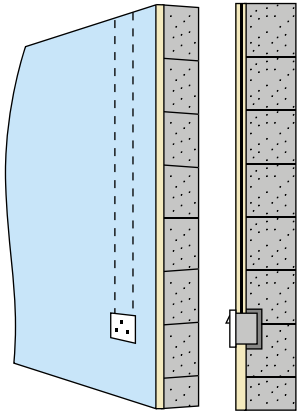
"Where buried cables are not mechanically protected additional protection by an RCD not exceeding 30mA must be provided"

**Requires RCD Protection**



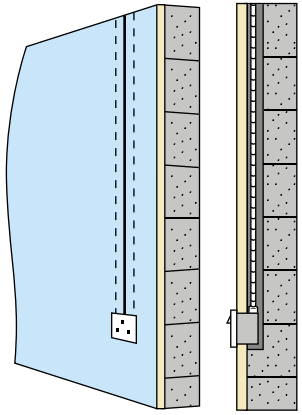

Stud Partition

**Requires RCD Protection**



Brick / Block or Plaster

**Does Not require RCD Protection**



Earthed Metal Condut

# Special Locations: Locations Containing a Bath or Shower

There are additional requirements to consider for the bath or shower room of the dwelling. Regulation 701.411.3.3 requires that all low voltage circuits within this location shall be additionally protected by an RCD not exceeding 30mA. This would mean 230V lighting, a shower circuit and bathroom heater or towel rail for example will all need RCD protection. An additional requirement in the 3rd amendment is the requirement to protect the circuit with an RCD not exceeding 30mA should the cable pass through and not feed equipment within the zones.

It is important to remember the definition of 'Low voltage' and not get it confused with 'Extra low voltage'. Low voltage exceeds 50V and can be as high as 1000V by definition.

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

Earlier editions of the regulations 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 in the location 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.

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

# Swimming Pools, Saunas & Underfloor Heating Systems

Should a dwelling contain a swimming pool, sauna or have an electric underfloor heating system then these are other special locations that need to be considered by the installation designer with respect to the of the layout of the circuits within the consumer unit and the protection requirements.

## Swimming pools

Any socket outlets or switches in zone 2 of a swimming pool location which do not meet the requirements of SELV and that are not electrically separated need to be protected by an RCD rated at 30mA or less.

## Saunas

All circuits are required to be protected by an RCD rated at 30mA or less with the exception of the sauna heater itself unless of course this protection is recommended by the sauna heater manufacturer.

## Underfloor heating systems

An RCD rated at 30mA or less is required to protect the heating units of such equipment. Values of leakage capacitance may need to be obtained from the manufacturer of the heating system in order to avoid unwanted tripping

# 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.

## Division of Installation

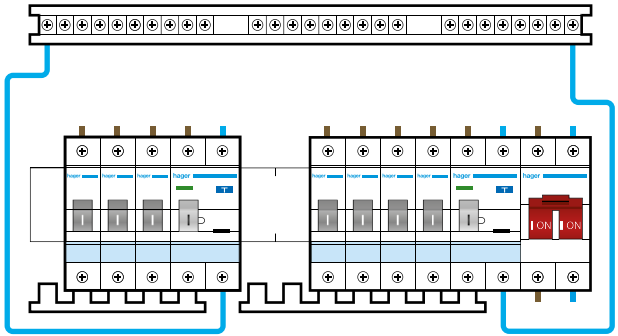
Section 314 calls for the installation to be so divided to:

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 installation designer should consider which circuits are connected to a single RCD. For instance it probably not be suitable to connect all the lighting to a single RCD as any fault on any circuit connected to this RCD would lead to the loss of all the lighting circuits, clearly inconvenient for the user of the building

"Careful consideration of which circuits are connected to a single RCD is required"



## Consumer Unit Standards

A consumer unit by definition in BS 7671 is:

*"A particular type of distribution board comprising a type-tested and co-ordinated assembly for the control and distribution of electrical energy, principally in domestic premises, incorporating manual means of double-pole isolation on the incoming circuit(s) and an assembly of one or more fuses, circuit-breakers, residual current operated devices or signalling and other devices proven during the type-test of the assembly as suitable for such use."*

The standard for a consumer unit suitable for use in the UK is BS EN 61439-3 including Annex ZB. This standard prescribes the consumer unit is tested by the manufacturer using specific devices which would usually be from the same manufacturer. It is critical therefore to understand, that any modifications and installation of devices / components other than those approved by the original Consumer Unit manufacturer (including installing devices e.g. MCBs of a different brand from the Consumer Unit), invalidates any testing, certification and warranty.

"Devices within the consumer unit must be approved by the manufacturer"

# 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).

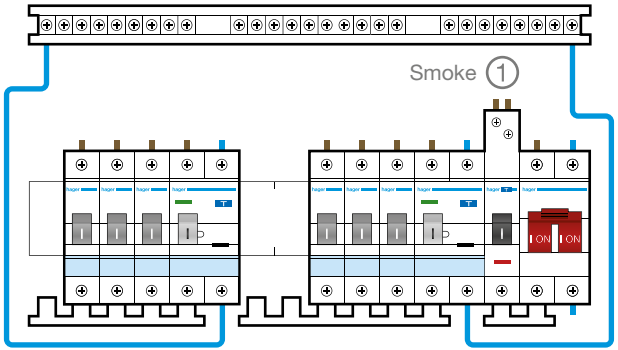
Another consideration is that where, unusually, there is a Grade B* or E** fire alarm and detection system. In this case, account needs to be taken of clauses 15.3(d) and 15.6(c), respectively, of BS 5839 - 6. Both of these clauses recommend that the circuit serving the fire alarm system should preferably 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.

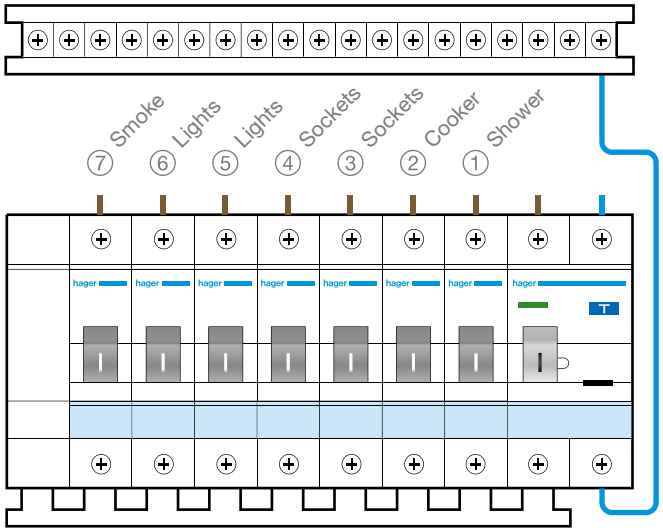
"Where RCD protection is needed for smoke detector circuits one option is to supply that circuit only"



# Consumer Unit Arrangements

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

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



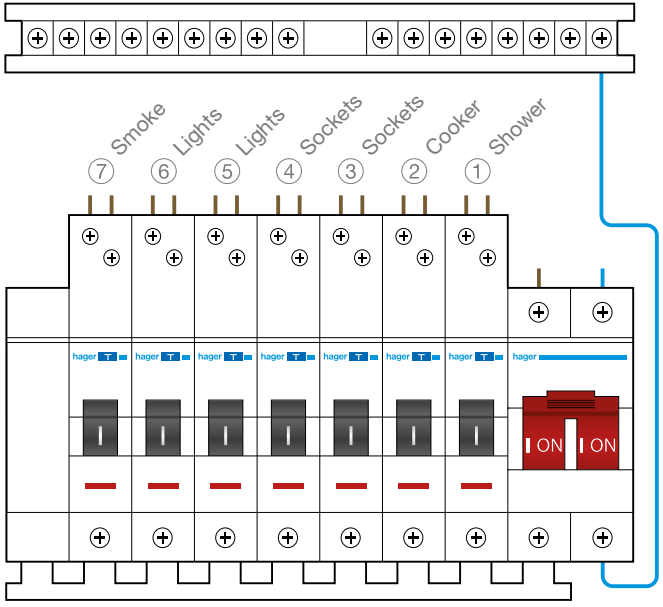

The cumulative effects of electronic equipment in the modern home, is such that some current is likely to flow in the protective conductor. A 30mA RCD will trip between 15-30mA. This could cause unwanted tripping, regulation 314.1 (iv) refers.

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 is unlikely to be suitable 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.

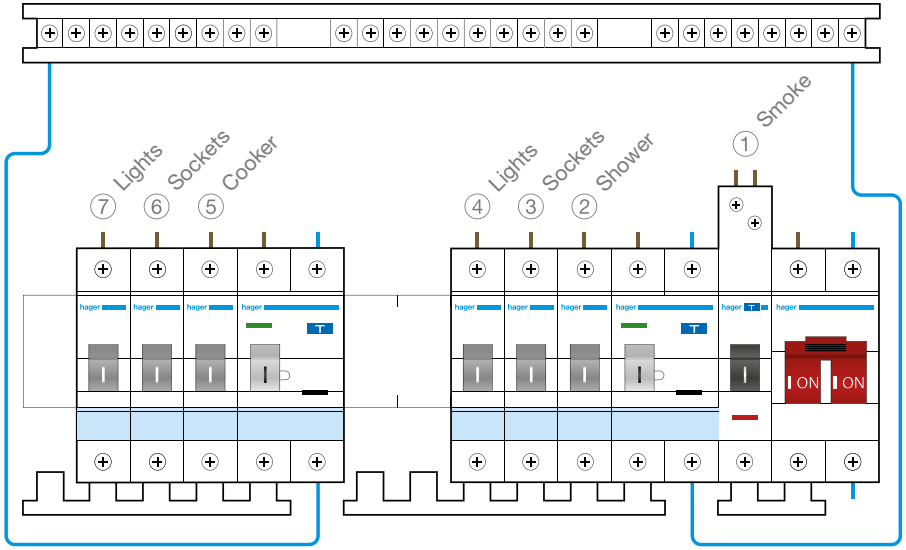
This arrangement is particularly suitable for installations connected to a TT earthing system.

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

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

# Option 2 ✔

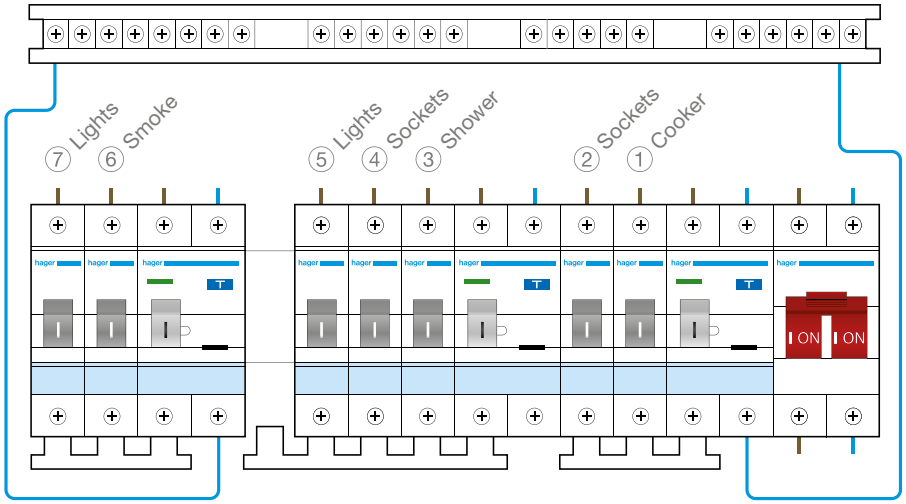
Split Load Twin RCCB plus Dedicated RCBO




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"

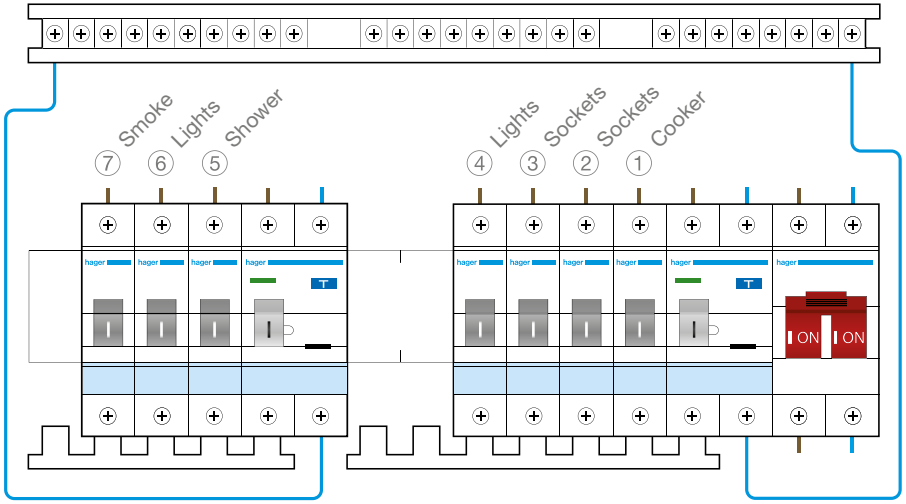
# Option 3 ✔ Split Load 3 RCCB Board




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 unwanted 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

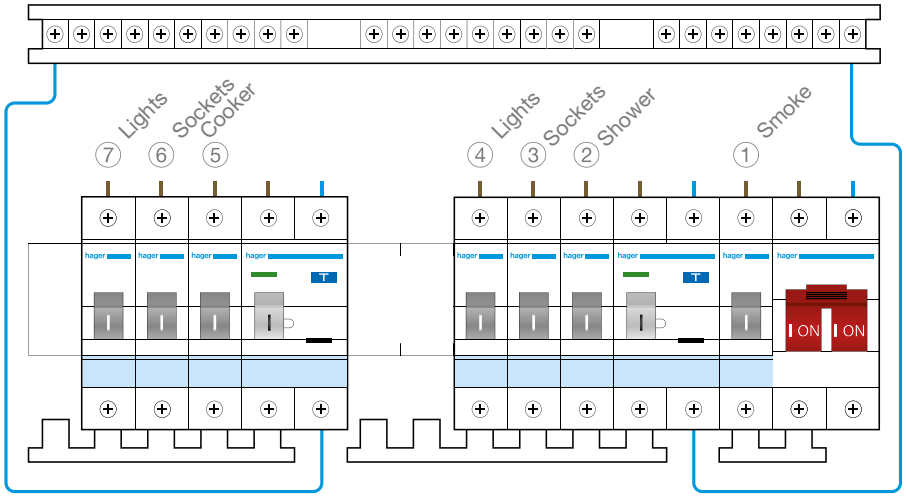



This arrangement provides two separate 30mA RCCBs with the circuits spread across both. The design of the circuit arrangements need to ensure that unwanted tripping is unlikely, thereby limiting the inconvenience or potential hazards that a loss of supply can cause.

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 522.6.204"

# 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 wiring methods described in 522.6.204 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

Hager Ltd.
Hortonwood 50
Telford
Shropshire
TF1 7FT

Internal Sales Hotline: 01952 675612
Internal Sales Faxline: 01952 675645

Technical Helpline: 01952 675689
Technical Faxline: 01952 675557
**www.hager.co.uk**
**technical@hager.co.uk**

Hager Ltd.
Unit M2
Furry Park Industrial Estate
Swords Road
Santry
Dublin 9
Ireland

Northern Ireland Tel: 028 9077 3310
Northern Ireland Fax: 028 9073 3572

Republic of Ireland Tel: 1890 551 502
Republic of Ireland Fax: 1890 551 503
**www.hager.ie**