



Hager's product guide to the 4th Edition



Introduction

Since 2000, the 3rd Edition wiring regulations have provided the rules that must be followed to ensure that electrical installations are safe in Ireland. The ETCI have responded to CENELEC HD60384 and are implementing a new set of wiring regulations aimed at making installations even safer for installers and end users. The introduction of the 4th Edition of the Wiring Regulations on the 1st October 2009 will have a major impact on Electricians, Electrical Contractors, Architects and Consultants.

Installations designed from 1st October 2009 must comply with this new set of Regulations, several of which will have implications on circuit design.

Hager's Product Guide to the 4th Edition is designed to highlight the impact of the new Wiring Regulations on Hager products, and provide advice on which product to choose in order to be compliant.

Hager is offering tailored training sessions throughout 2009 for anybody interested in finding out more about the new Regulations. Please log on to www.hager.ie or contact us for more details.



Objectives

One of the obvious objectives of the 4th Edition Regulations is protection against electrical accidents. Some of the terminology has been updated in Part 1 as follows:

- 131.2.1 – Basic Protection (protection against direct contact)
- 131.2.2 – Fault Protection (protection against indirect contact)
 - Protection against voltage disturbances (overvoltage, undervoltage, electromagnetic emissions generated within installation)
- 131.7 – Protection against power supply interruption

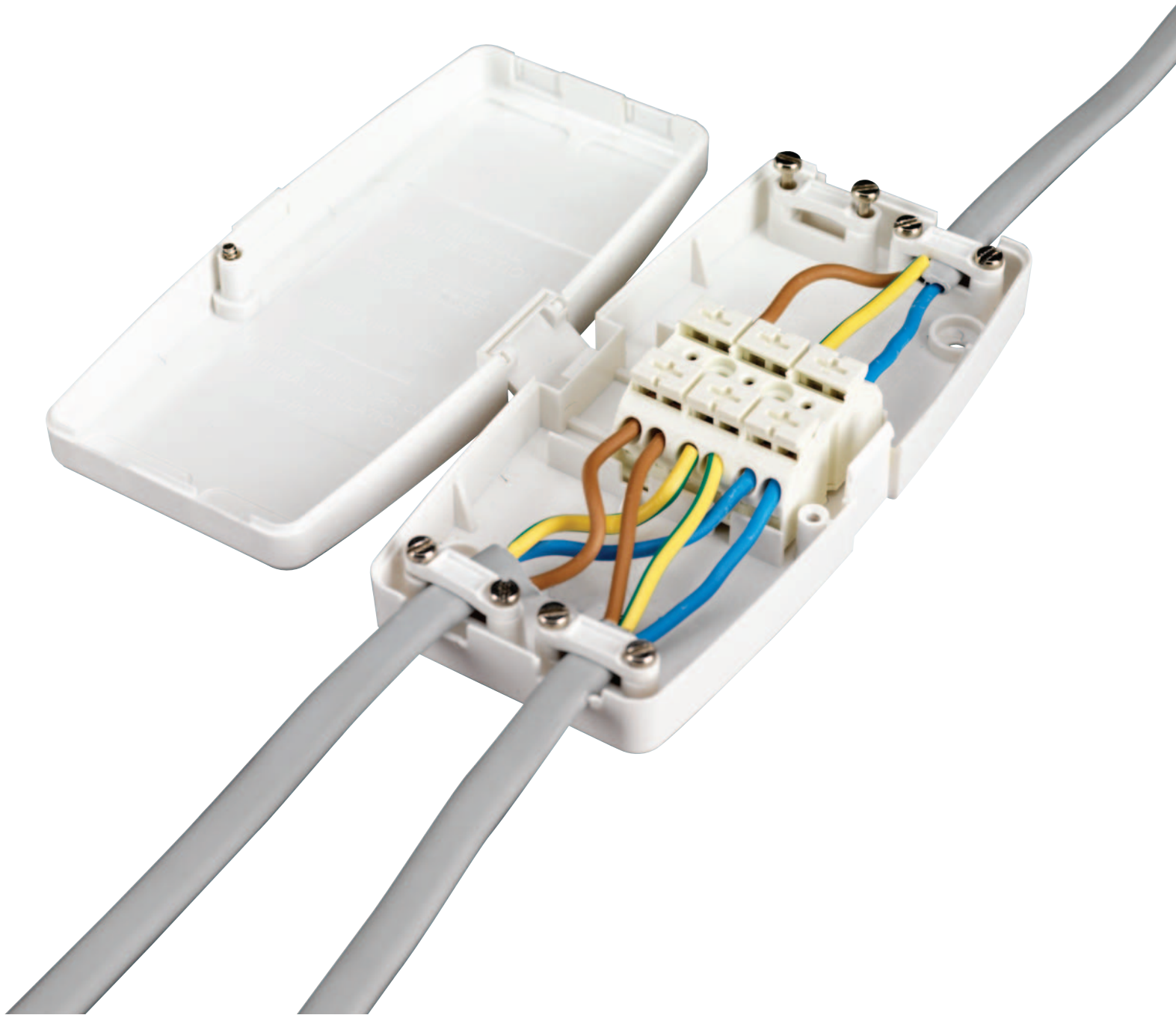
The new regulations are shaped around providing the highest level of protection in each of these situations, and throughout this booklet you will find the corresponding compliant Hager products.



Scope

In Part 1, Chapter 11 of the 4th Edition Wiring Regulations, the list on the right of applicable installations has been extended. Contractors and planners must make sure that products being installed in any of these installations are compliant with the new regulations.

1. Marinas
2. Medical Locations
3. Exhibitions / Fairs
4. Photovoltaic Systems
5. ELV Lighting
6. Mobile Installations
7. Wall/Ceiling Heating
8. Caravans
9. Temporary Installations



Cable Joints & Connections

Part 5, Chapter 13 of the regulations recognise that electrical joints are a potential source of overheating and if not securely made could ultimately cause a fire. For this reason there are several regulations relating to electrical connections.

Regulation 134.1.4 states that “connections between conductors and other electrical equipment shall be made in such a way that safe and reliable contact is ensured”.

Issues with traditional connections

The wiring method illustrated (right) is a common cause of non-compliance particularly with lighting circuits and the connections to downlighters in particular.

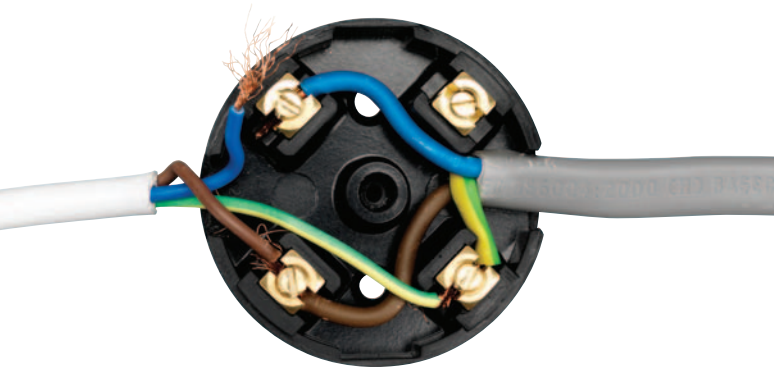
It can be seen that the sheath of the flex is not enclosed. This is due to the junction box connection method not facilitating an easy means of enclosing the outer sheath, a non-compliance with regulation 526.5.3

Another problem is that during installation and maintenance, mechanical strain may be placed on the terminations of the conductors within the junction box. This is due to a lack of a clamping method for the cable, a non-compliance with regulation 522.8.5



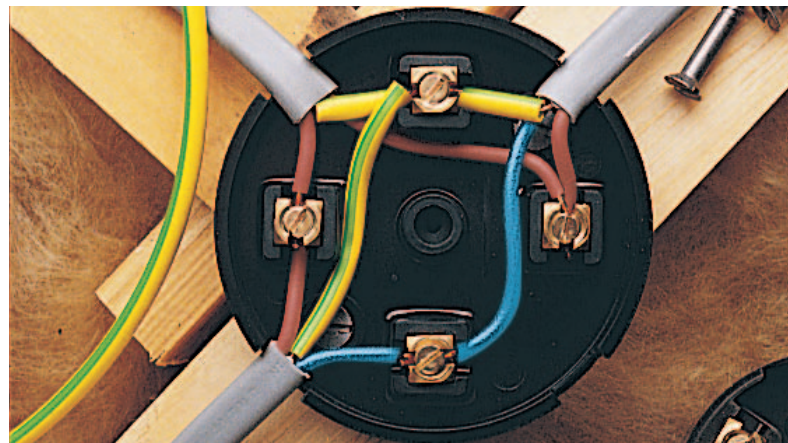
A further potential problem can be found within the junction box (left) concerning the type of conductors that are typically terminated. It is often the case in domestic installations that solid twin & cpc cables will be used for the fixed wiring with the conductor to the light fitting (or transformer if the lighting is ELV) being a flexible conductor.

Care must be taken to ensure the strands of the flexible cable are secured adequately in the terminal and have not been damaged to ensure compliance with regulation 526.2.1. Also, as can be seen in this illustration, when the conductor was removed for inspection it is clear that some of the strands have been damaged during termination.



As we have discussed, unless using a solution such as maintenance free terminals, the access to electrical connections should be adequate for their safe and proper inspection, testing and maintenance. In this respect, connections should be in a location where they can reasonably be reached and where there is adequate working space.

Where connections are made in roof spaces and inter-floor-spaces the enclosures containing the connections should normally be fixed and provision must be made for their access. Providing these two constraints are complied with, then the continued use of standard circular junction boxes remains acceptable. The requirement for accessibility applies equally to the situation where, because of damage to an existing cable, a repair is effected by the introduction of a joint. The joint must be accessible; alternatively the joint may be made by an appropriate method, a maintenance free terminal for example.



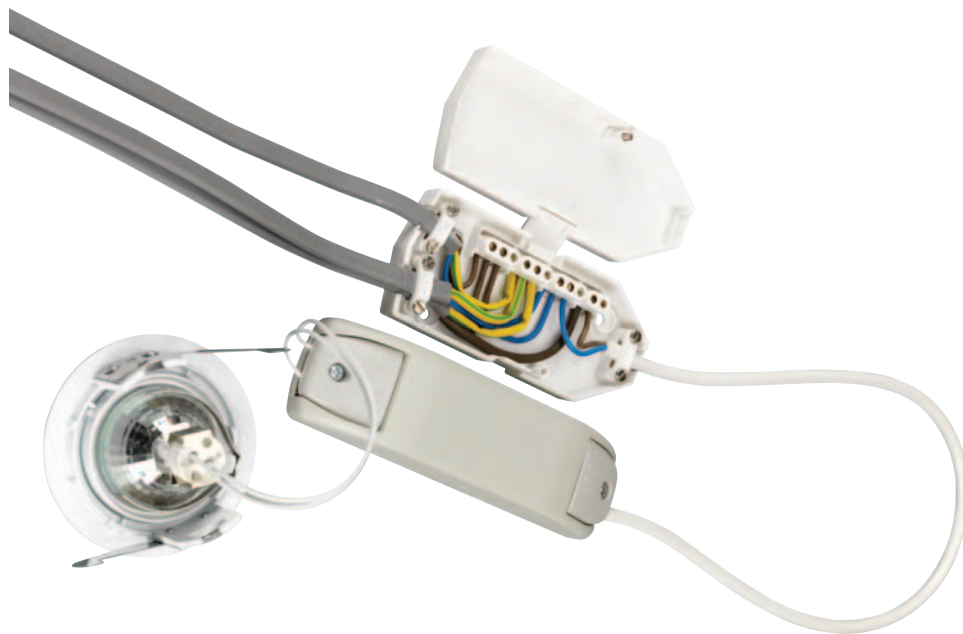
Maintenance free connections

Regulation 526.3.4 states that: “Connections that are not accessible shall be made by special means that prevent loosening, such as brazing, welding, exothermal heating or crimping”

Junction boxes are commonly used during alterations and additions to an installation. With certain exceptions regulation 526.3 requires that every connection shall be accessible for inspection, testing and maintenance. Unless provision is made for access, where boarding, carpet or other similar covering is laid over a junction box with screw terminals, it may not be considered accessible and maintenance free terminals should be used. This is made clear in Regulation 526.3.4, which states that:

“Connections that are not accessible shall be made by special means that prevent loosening, such as brazing, welding, exothermal heating or crimping”

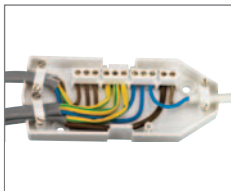
Designers and installers must make the right choice when selecting junction boxes in order to comply with the new regulations. See the hager chart below, which should aid in the selection for future installations.



Description	N° of Terminals	Terminal Rating	Reference	Benefits/ Considerations
Downlighter Junction Box	3 x 3 x 1,5mm ²	16 A	J501	Provided with cable clamps and separate terminals for flex
	1 x 2 x 1,5mm ²	32 A	J501	
Maintenance Free Junction Box	3 x 4 x (0,5 - 4,0mm ²)	20 A	J803	Suitable for use in inaccessible locations
	4 x 4 x (0,5 - 4,0mm ²)	20 A	J804	
Traditional Junction Box	4	20 A	J201	Acceptable for locations which are accessible
	4	20 A	J301	
	3	30 A	J401	
	6	20 A	J601	

hager solutions

1



Downlighter Solution

When fitting recessed downlighters the following method would overcome all the issues raised previously. It can be seen here that the sheath of both solid conductors and flexible conductors for the light fitting can be secured as they enter the enclosure. This enables compliance with regulation 522.8.5 in particular where it states that there shall be no undue mechanical strain on the terminations of the conductors.

Also regulation 526.5.3, which requires the cores of sheathed cables from which the sheath has been removed to be enclosed, can be seen to be complied with.

Regulation 526.2 is complied with where the method of connection shall take account of the number and shape of wires forming the conductor. In this junction box solid conductors and flexible conductors can be terminated separately by means of the unique three plate style terminal arrangement.

2



Maintenance Free Solution

Maintenance free terminals provide one solution where accessibility is an issue. Tests, including long term vibration, shock test, long term connection test, pull out, voltage drop, temperature rise and exposure to corrosive atmospheres validate the suitability of these terminals. Equally suitable are solutions such as a 'joint made by a compression tool'. Maintenance free terminals have the additional advantages of allowing the direct insertion of solid, stranded or flexible conductors, and allowing the connection of up to four conductors from 0.5mm² to 4.0mm².



Location of consumer units

“A distribution board shall be located in a location where it is readily accessible. A wallmounting distribution board shall be mounted at a height not exceeding 2.25m measured from the floor to the top surface of the board or 1.4m measured from the floor to the bottom of the board (530.5.3)”

This is illustrated on the picture above. The reason for the inclusion of this Regulation is again primarily an accessibility issue. It is firstly important for an end user to be able to readily see which devices have deactivated in the case of a fault, but due to the awkward nature of traditional locations for distribution boards, it may be dangerous for any persons to gain access by extreme means – climbing, stretching, etc. By making a distribution board more easily accessible general safety is increased and access to the distribution board is improved.

1. Location Concerns

Hager has anticipated inconveniences that may arise from this Regulation however, in that the lower distribution board may:

- Interfere with the aesthetic appearance or design of a room
- Cause obstruction through smaller or narrower areas where the board is installed
- Cables may have to run down a wall from the ceiling in order to reach the consumer unit



2. Volta Flush Solution

A practical solution for installers who discover that the location of the distribution board under the new regulations will cause such inconvenience would be to use a flush mounting distribution board. Hager can provide various sizes of flush boards, with standard or special device configuration built in to suit most domestic or commercial applications. Domestic flush consumer units also have a wide variety of door finishes, which have the potential to contribute positively to a particular design of a room.

3. Gamma Trunking Solution

There may however be cases where using a surface mounted consumer unit is unavoidable. This may mean that cables will have to run down the wall to reach the top of the unit, which can appear untidy. A good solution is to use cable trunking, which will block any cables from view, while ensuring the cables are not dangerous.

Hager's standard surface consumer unit uses the design award winning Gamma type enclosures. The stylish trunking for this can be seen in the pictures - full details available upon request.

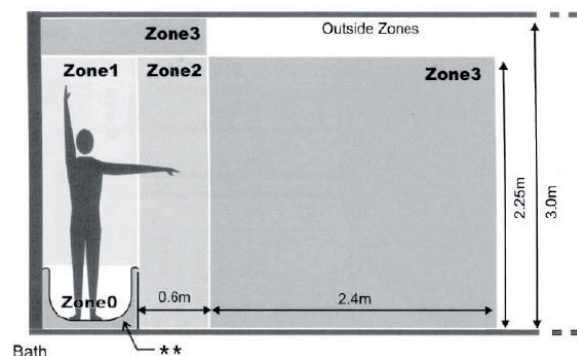




Water Heating and Bathroom applications

The Regulation have expressed the need for extra RCD / RCBO protection when installing in certain situations. In this section it deals with requirements for installing water heating appliances, (such as a shower unit or immersion heater), and also for electrical equipment in rooms with baths and/or shower basins.

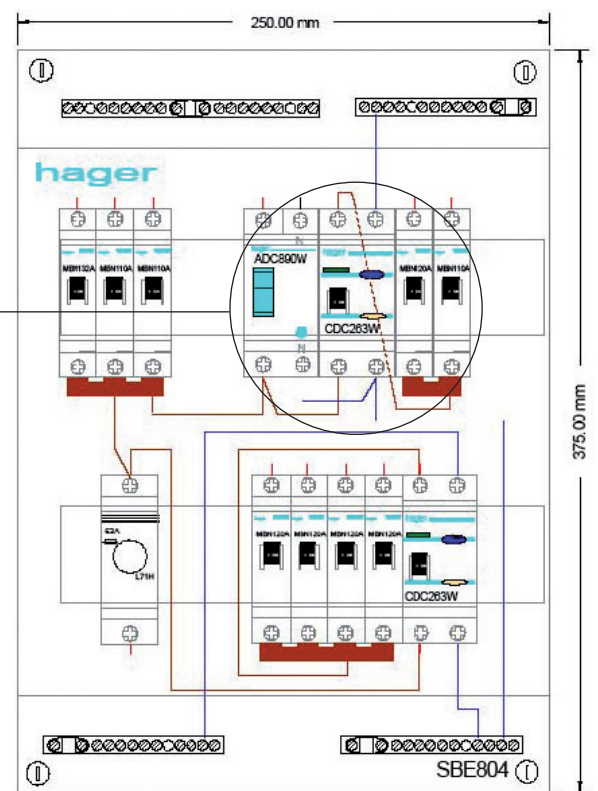
The diagram on the right shows the zoning set out for bathrooms. Regulation 701.416.1 outlines the requirements for RCDs in bathrooms: "In all zones of a room containing a bath or a shower, every circuit shall be protected by an RCD having a rated residual operating current not exceeding 30mA, except circuits protected by Safety Extra Low Voltage (SELV)"
All Hager RCDs can be found on pages 18 and 19.



Water Heating Appliances

It may be common practice in Ireland at the moment for installers to protect a shower circuit with a Residual Current Device (RCD). In Part 5, Chapter 55, Regulation 555.3.1 states that any circuit supplying a water heating appliance e.g. a shower unit or an immersion heater, shall be protected by an RCD having a rated residual operating current not exceeding 30mA. It is important to note that a separate RCD or RCBO shall be provided for each water heating appliance circuit.

Furthermore, Regulation 555.3.2 states that a circuit supplying auxiliary equipment associated with water services and water systems (e.g. pumps) shall be protected by an RCD having a rated residual operating current not exceeding 30mA. Examples of this may include pumps for rural group water schemes or agricultural irrigation systems.



Shown above is the SBE804, the Hager standard consumer unit solution for water heating appliances applications. The standard 2 row consumer unit has an extra 40A RCBO, 63A RCD and 2 MCBs, ensuring separate RCD protection for a shower unit and immersion heater for example.

Hager can supply this or any other configuration in a wide variety of enclosures such as flush or IP65 applications. The 4th edition rules also apply to commercial installations, for which Hager has a wide range of metal and polyester solutions.

Protection of “meter tails”

The new 4th Edition Regulations take into account the fact that often the cables running from the ESB supply meter to the consumer unit in a premises are not protected with any device. The Regulations now state that all such cables, if longer than 3m, must be protected with no less than a 63A protective device.



Positioning

In order to comply with 533.35 installers will have to ensure that the main current device, not less than 63A, must be located in the standard ESB meter cabinet, in an enclosure rated at least IP55 and constructed of a non-conducting material. The location of this enclosure must be in the bottom right corner of the meter box (as shown on the left) to allow for fitting of subsequent additional equipment.

Hager provides the solution to this new requirement. The MCU63 (pictured opposite) is an IP65 enclosure, containing a single pole 63A circuit breaker, which can be mounted neatly in the bottom right of the ESB Cabinet, ensuring sufficient protection for the cables running through the installation to the distribution board.



1

“430.3 position of main device
A main current protective device shall be provided in every installation as follows
At the main supply point in accordance with 533.3.5; or

2

Within 3m of the supply point provided the conductors upstream of the device:-
- are installed in such a manner as to reduce the risk of a short circuit to a minimum e.g. by suitable protection, and
- are installed in such a manner as to reduce to a minimum the risk of fire or danger to persons e.g. by ensuring they are not placed near combustible material, and
- have no branch connections ”





Surge Protection

Part 4 covers the area of surge protection. Different types of companies rely on a constant supply of electricity in order to keep machines or equipment running. Even slight or brief surges of electricity in circuits can often lead to machinery or equipment being damaged, which can have adverse effects, for business owners or end users. Such installations, which depend greatly on the smooth running of equipment, are recommended to have extra protection for electrical surges, which will minimise damage to equipment or machinery.

The installer in relation to the following must evaluate the need for protection against over-voltage in an installation:

- Consequence for human life e.g. safety services, medical equipment in hospitals etc.
- Loss of services in places of public resort e.g. IT centres, museums, art galleries etc.
- Consequences for industrial, commercial or agricultural activity and equipment.

Hager's wide range of Surge Protection Devices (SPDs) protect sensitive and often expensive equipment against transients, originating from lightning, switching of motors, transformers and lighting.

These devices are strongly recommended in the 4th Edition Wiring Regulations on installations that are exposed to these transients in order to protect equipment such as PCs, alarms, TVs and a wide range of commercial and industrial machines. The choice of SPD depends on a number of criteria such as:

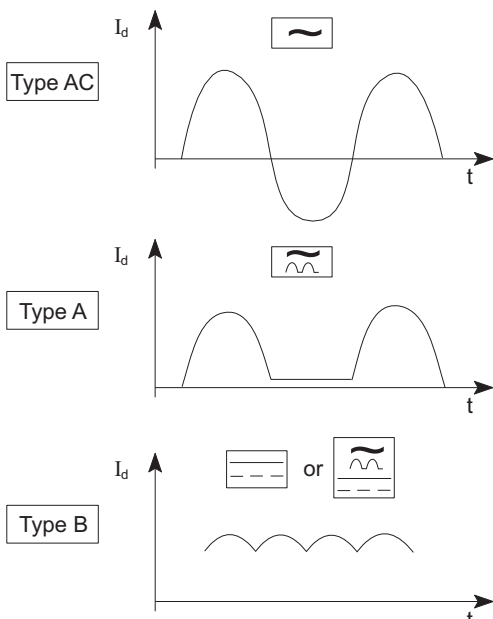
- The exposure of the installation to transients
- The sensitivity, value and social importance of the equipment that requires protection
- Earthing system
- Level of protection

Device Selection

1. Curve Types

Regulation 533.3.4 states that MCBs and RCBOs shall have type B overcurrent characteristics except in the following cases:

- On circuits where high inrush currents of the order of $5 - 10I_n$ may occur (e.g. motors) – in this case Type C devices will be used
- On circuits where very high inrush currents of the order of $10 - 20I_n$ may occur (e.g. transformers) – in this case Type D devices will be used



2. DC Sensitivity

Residual Current Devices (RCDs) and Residual Current Breaker with Overcurrent Protection (RCBOs) must be chosen according to application. The time to choose something other than an A.C. type device is when the possibility exists of the presence of D.C. components in a circuit. 531.2.1.3 of the 4th Edition Regulations states

“Account shall be taken of the possible presence of D.C. components in a circuit protected by an RCD that could affect the operation of the RCD, and a suitable type should be chosen.

3. Making the right choice

For all new installations the right type of protection device must be chosen according to the 4th Edition Regulations on curve types and sensitivity as described above.

Hager’s range of protection devices makes it easy for the installer to choose the right equipment for the installation, ensuring excellent quality and compliance with the Regulations. See our full listing on pages 18 and 19.





Special Installations

The 4th Edition Regulations have also provided for extra measures ensuring safety on special installations or locations.

Depending on the type of installation, Part 7 of the Regulations sets out to ensure that circuits have the necessary RCD sensitivity and in turn that the devices are housed in the correct enclosure type.

Hager provides the solutions to the new requirements for special installations with its wide range of RCDs and RCBOs (see overleaf) and Orion Plus polyester Enclosures, available in a suitable variety of sizes. While it is up to the installer to decide what equipment will be used for each situation, Hager is always happy to help with selection of the right product. Browse our Website for more information or call our Technical Helpline on 1890 551 502



Special Installations or locations



704 - Construction & Demolition Site Installations

Regulation 704.410.01 & 704.410.02

- Final circuits feeding sockets up to 32A - RCD $I_{\text{dn}} \leq 30\text{mA}$
- Circuits feeding socket outlets rated over 32A should have RCD $I_{\text{dn}} \leq 500\text{mA}$

Regulation 704.530.5.04

- Enclosures containing the supply authority's equipment shall be made of non-conductive material and shall have a degree of protection of IP55

705 - Agricultural & Horticultural premises

Regulation 705.41.3.01 – automatic disconnection of supply

- Final circuits feeding sockets up to 32A - RCD $I_{\text{dn}} \leq 30\text{mA}$
- Circuits feeding socket outlets rated over 32A - RCD $I_{\text{dn}} \leq 100\text{mA}$
- All other circuits - RCD $I_{\text{dn}} \leq 300\text{mA}$

Regulation 705.56 Safety Services

- Backup supplies considered if necessary for life support of livestock

711 - Exhibitions, Shows and Stands

Regulation 711.411.3.01

- Cables supplying temporary structures protected by RCD rated up to 300mA (S type for time discrimination with downstream RCD)

Regulation 711.411.3.02

- Additional protection required for all final circuits rated up to 32A by 30mA RCD.

740 - Fairgrounds amusement parks and circuses

Regulation 740.411.3.01

- Automatic disconnection of the supply to the temporary structures shall be provided at the origin of the installation by RCDs with a rated residual operating current not exceeding 300mA. Such RCDs shall incorporate a time-delay or be of the S type, ensure discrimination with RCDs protecting final circuits, and shall comply with 531.2.

Regulation 740.416.1.01

- Final circuits for lighting, socket-outlets rated up to, and including, 32A and portable equipment connected by means of a flexible cable or cord with a current-carrying capacity not exceeding 32A shall be provided with additional protection by an RCD having a rated residual operating current not exceeding 30mA

Regulation 740.530.5.02

- 740.530.5.02 Switchgear enclosures containing the DSO equipment shall be made of non-conductive material and shall have a minimum degree of protection IP55



CDC440W

Type AC sensitive

Suggested application	Current Rating	Sensitivity	2 Pole	4 Pole
Standard domestic and commercial	16 A	10mA	CCC216U	
Standard domestic and commercial	25 A	30mA	CDC225W	CDC425W
Standard domestic and commercial	40 A	30mA	CDC240W	CDC440W
Standard domestic and commercial	63 A	30mA	CDC263W	CDC463W
Standard domestic and commercial	80 A	30mA	CDC280W	CDC480W
Standard domestic and commercial	100A	30mA	CDC284W	CDC484W
Agricultural & Horticultural	25 A	100mA	CEC225W	CEC425W
Agricultural & Horticultural	40 A	100mA	CEC240W	CEC440W
Agricultural & Horticultural	63 A	100mA	CEC263W	CEC463W
Agricultural & Horticultural	80 A	100mA	CEC280W	CEC480W
Agricultural & Horticultural	100 A	100mA	CEC284W	CEC484W
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	25 A	300mA	CFC225W	CFC425W
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	40 A	300mA	CFC240W	CFC440W
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	63 A	300mA	CFC263W	CFC463W
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	80 A	300mA	CFC280W	CFC480W
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	100 A	300mA	CFC284W	CFC484W



CN284W

Time delayed Type S

Suggested application	Current Rating	Sensitivity	2 Pole	4 Pole
Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	100 A	100mA	CN284W	CN484W
Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	100 A	300mA	CP284U	CN484U



CGC440F

Type A DC sensitive

Suggested application	Current Rating	Sensitivity	2 Pole	4 Pole
Equipment producing pulsating DC currents	16 A	10mA	CCA216U	
Equipment producing pulsating DC currents	25 A	30mA	CCA225U	CDA425U
Equipment producing pulsating DC currents	40 A	30mA	CCA240U	CDA440U
Equipment producing pulsating DC currents	63A	30mA	CCA263U	CDA463U
Construction & Demolition sites	25 A	500mA	CGC225F	CGC425F
Construction & Demolition sites	40 A	500mA	CGC240F	CGC440F
Construction & Demolition sites	63 A	500mA	CGC263F	CGC463F



CDB440F

Type B DC sensitive

Suggested application	Current Rating	Sensitivity	2 Pole	4 Pole
Equipment producing smooth DC currents	40 A	30mA		CDB440F
Equipment producing smooth DC currents	63 A	30mA		CDB463F
Equipment producing smooth DC currents	40 A	300mA		CDB440F
Equipment producing smooth DC currents	63 A	300mA		CDB463F



ADC870W

Type AC sensitive

Suggested application	Current Rating	Sensitivity	Curve type B	Curve type C
Standard domestic and commercial	6 A	30mA	ADC856W	ADC806W
Standard domestic and commercial	10 A	30mA	ADC860W	ADC810W
Standard domestic and commercial	16 A	30mA	ADC866W	ADC816W
Standard domestic and commercial	20 A	30mA	ADC870W	ADC820W
Standard domestic and commercial	25 A	30mA	ADC875W	ADC825W
Standard domestic and commercial	32 A	30mA	ADC882W	ADC832W
Standard domestic and commercial	40 A	30mA	ADC890W	ADC840W
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	6 A	300mA		AF956B
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	10 A	300mA		AF960B
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	16 A	300mA		AF966B
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	20 A	300mA		AF970B
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	25 A	300mA		AF975B
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	32 A	300mA		AF982B
Agricultural & Horticultural, Exhibitions, Shows, Stads, Fairgrounds, Amusement parks, Circuses	40 A	300mA		AF990B



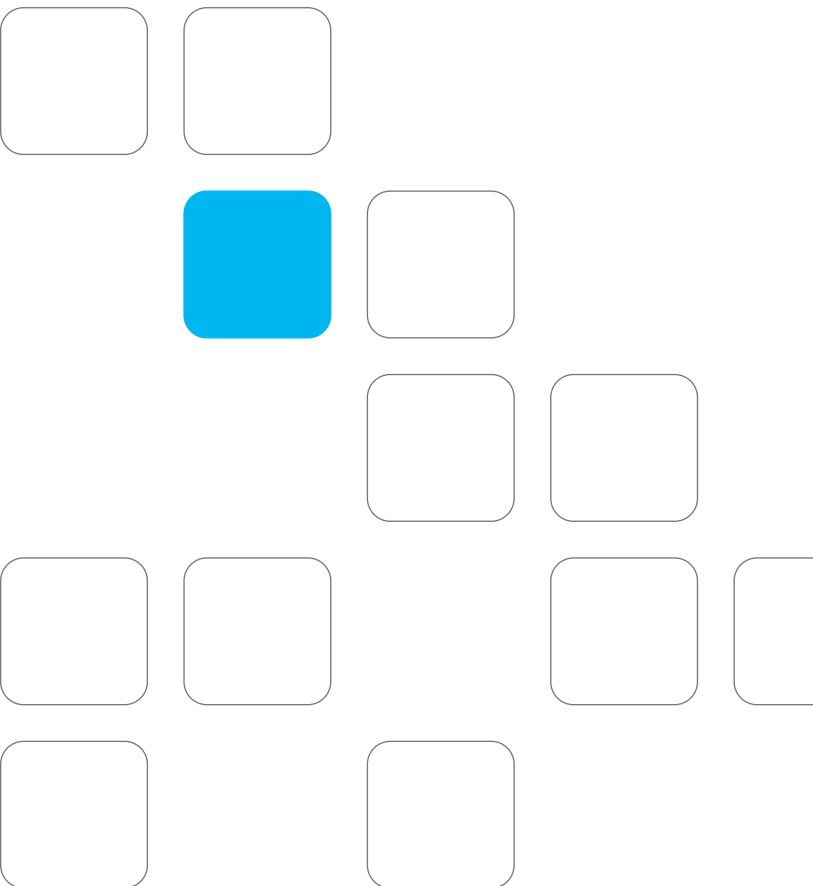
ADA916D

Type A DC sensitive

Suggested application	Current Rating	Sensitivity	Curve type B	Curve type C
Equipment producing pulsating DC currents	6 A	30mA	ADA506D	ADA556D
Equipment producing pulsating DC currents	10 A	30mA	ADA510D	ADA560D
Equipment producing pulsating DC currents	16 A	30mA	ADA516D	ADA566D
Equipment producing pulsating DC currents	20 A	30mA	ADA520D	ADA570D
Equipment producing pulsating DC currents	25 A	30mA	ADA525D	ADA575D
Equipment producing pulsating DC currents	32A	30mA	ADA532D	ADA582D
Equipment producing pulsating DC currents	40 A	30mA	AD940J	AD990J
Equipment producing pulsating DC currents	6 A	300mA		AF956J
Equipment producing pulsating DC currents	10 A	300mA		AF960J
Equipment producing pulsating DC currents	16 A	300mA		AF966J
Equipment producing pulsating DC currents	20 A	300mA		AF970J
Equipment producing pulsating DC currents	25 A	300mA		AF975J
Equipment producing pulsating DC currents	32 A	300mA		AF982J
Equipment producing pulsating DC currents	40 A	300mA		AF990J

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