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Day by DIN

An ABB technical journal
for Enclosures and
DIN rail Products users

News and know-how for informed professionals

Parking garage in Rome managed by ABB Intelligent Building Control
Highly technological and multi-storey, the garage on Corso d'Italia in Rome is one of the first in Italy to be completely lit by LEDs.

The truth about eMobility
Plugs and socket-outlets for charging electric vehicles.
Many models, minimum incompatibility.

Power and productivity
for a better world™

Can we make energy count?

Definitely.

In any industrial situation, time is money. Recent trends in the low voltage panel board market point towards bigger industrial complexes. The new MNS panel boards, with the AF contactor range implemented has had its energy losses reduced by as much as 28% while increasing functionality and service life. To stay efficient, you need Control. Connect to Control. **www.abb.com/connecttocontrol**

Power and productivity
for a better world™

ABB

Parking garage in Rome managed by ABB Intelligent Building Control. (66)

Day by DIN 2|13

Emanuele Tosatti
Product Marketing Manager
DIN Rail Products

Dear readers,
it was April 2012 when the first issue of Day by DIN was printed. Four issues, three hundred pages and two years after we, at Day by DIN, still have plenty of stories and topics to share, from our readers to our readers. To please your interest, this time more than ever, we prepared technical articles about circuit breakers coordination, breaking capacity, safety in bathrooms, surge protective devices' lifetime, transformers application, plus technical insight about isolation and neutral conductor dimensioning.

We also like to see the edge of innovation in low voltage electricity, as you will see in our articles about energy saving lighting and electric mobility. Finally we visited for you two smart installations, a crossing-edge logistic hub and an intelligent parking building. As I said, if you like Day by DIN it's because professionals contribute with their inputs and questions to make it colorful and helpful. Don't be shy and remember that we need you: contribute by sending us your ideas, thoughts and questions to mail.daybydin@abb.com.

Enjoy reading!

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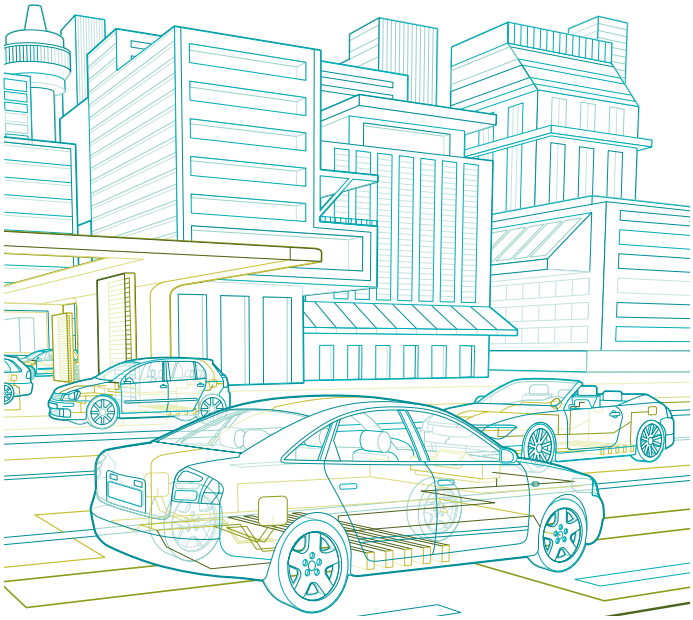


News and facts

The expert answers

Doktor Wise

Case History

Report

82 **Energy efficiency and sustainability in buildings: LEED® certification**
LEED® is the world's most widespread building certification system: to date, there are approximately 13,600 certified buildings throughout the world and some 26,500 are about to be certified.

Technical

Curiosity

Time to relax

Jump in the box

ABB's newest products and solutions from Enclosures and DIN Rail Products world! In this issue new consumer units, KNX products, measurement devices and fuse holders.

Intelligent Building Control

ABB i-bus® KNX Power Supplies

Reliable power supply and advanced diagnosis

The new ABB i-bus KNX Power Supplies are equipped with an advanced LED display indicating the current bus load and offering a rapid diagnosis of the bus state. The state values are also provided via communication objects to the KNX system. Additionally, the ABB i-bus Tool enables a detailed analysis of actual values. The connection to the KNX is established via a bus connection terminal. All other connections are made via terminals equipped with a universal head screw.
Two devices are available:

– SV/S 30.320.2.1: Power Supply for small and medium installations with a bus load up to 320 mA.
– SV/S 30.640.5.1: Power Supply for larger installations with a bus load up to 640 mA. The device is equipped with an additional output without choke.

Order Code: 2CDG110145R0011

Order Code: 2CDG110146R0011

Benefits

– Rapid and enhanced diagnosis via LED display and ABB i-bus Tool
– State values of the power supply also available via bus communication objects
– Wide-range voltage input from 85 to 265 V AC at 50/60 Hz for worldwide usage

Intelligent Building Control

ABB i-bus® KNX Switch Actuators 6 A

New range with manual operation and contact position indication

ABB now offers a new range of 6 A Switch Actuators with manual operation. The new devices complete ABB's existing KNX Binary Output range by offering Switch Actuators with an additional manual operation and position indication of contacts. The new Switch Actuators 6 A SA/S x.6.2.1 are designed e.g. for switching small loads in home applications or in retail stores. A further application is the control of main contactors in non-residential buildings. The Switch Actuators are available as 2, 4, 8 and 12 fold devices and offer a manual operation of each 6 A output.
The manual operation facilitates a quick contact position indication and simplifies the commissioning on the construction site. Thus the connected loads can be tested and switched independently from prior ETS programming and KNX bus supply voltage.

Benefits

- One housing and harmonized look within whole ABB Switch Actuator product portfolio
- Large terminal opening for simplified installation
- 2, 4, 8 or 12 floating contacts for switching up to 6 A loads
- Switching of outputs via KNX or manual operation
- Contact position indication via manual operation slider
- Same extensive application software as in whole ABB Switch Actuator range

Intelligent Building Control

ABB i-bus® KNX Radio Time Switch FW/S 8.2.1

Easy handling of time switch programs

The new ABB i-bus KNX Radio Time Switch FW/S 8.2.1 offers a new backlighted, text-based display greatly simplifying the adjusting of time programs directly on the device. Furthermore an astronomical function is available for defining switching times in relation to sunrise and sunset. With the appropriate sensors (available as accessories) it is also possible to synchronize time via GPS and DCF signal.

Order Code: 2CDG120039R0011

Benefits

- Time synchronization via GPS or DCF signal for worldwide usage
- Backlighted display with text-based user guidance
- Astronomical function for automatic calculation of sunrise and sunset
- 8 independent logical channels
- PC programming of time programs via OBELISK memory card

Intelligent Building Control

ABB i-bus® KNX Outside Light Sensor Interface HS/S 4.2.1

Advanced brightness sensing

ABB's Outside Light Sensor Interface HS/S 4.2.1 measures the daylight brightness value and can be used as twilight sensor as well due to its very wide sensor range. It also offers a manual operation via a backlighted, text-based display, simplifying commissioning. One Outside Light Sensor LFO/A 1.1, which is required for measurement, is supplied with the device and up to 3 light sensors can be connected.

Order Code: 2CDG120044R0011

- Very wide sensor range can thus be used as twilight switch (1 ... 100 lux) or as light value switch (100 ... 20.000 lux)
- Up to 3 Outside Brightness Sensors LFO/A can be connected, with separate or common evaluation (maximum value)
- Extensive evaluation functions of the sensor values
- Backlighted display and text oriented user menu

Enclosures

System pro *E* Comfort MISTRAL65

Transparency, depth, space. The ABB's most innovative series of IP65 rated consumer units.

MISTRAL65 is the IP65 rated series of System pro *E* Comfort: the new generation of ABB's consumer units where versatility and efficiency are combined with a unique, elegant and unmistakable design.
MISTRAL65 has been designed to reduce cabling times as well as allow total integration between modular DIN-rail MCBs, MCCBs and devices installed in the front of the panel.

Technical catalogue: 1SLC801010D0202

Benefits

- The widest range on the market, suitable for industrial applications: from 4 up to 72 mod.
- Made in thermoplastic material and available with 2 different self-extinguishing degrees and cable entries: GWT 650°C (with smooth surfaces) and GWT 750°C (with knock-outs)
- Halogen free (version GWT 650°C)
- Available with terminals pre-installed in various configurations
- Door available in 2 different finishing: blind (opaque) or the exclusive transparent blue petrol.
- Door completely reversible and with opening up to180°
- High mechanical strenght: IK10
- High protection degree: IP65
- High thermal resistance: BTP 70°C
- Elegant and unique design
- Wide range of accesories suitable for several applications (protection, control, monitoring, measurement, safety, energy efficiency and distribution systems).
- Adjustable DIN Rail distance at 125mm or 150mm to optimize space and comply with International Standards.
- Several anchoring points for cable ties to optimize and make wiring easier.
- Extractable DIN-Rail frame for an easier cabling on bench-work.
- Dedicated ranges of screwable and screwless terminals (the new N/PE Quick) easy to install thanks to plug-in technology.

Measurement Devices

M2M

The measure of efficiency

The new M2M network analyser, thanks to its advanced functions, is the perfect solution for the effective measurement of the main single-phase or three-phase electrical parameters. Fitted to low and medium-voltage electrical panels, M2M allows the measurement and analysis in real time of electrical parameters while it keeps the system's consumption under control, also verifying the quality of the energy thanks to THD measurement. Aside from optimising the use of loads, real time measurement helps to keep low both environmental and budgetary impact. All information gathered by the analyser can be transmitted quickly to remote locations through the most used communications protocols. Interaction with control and supervision systems is possible via different inputs and outputs, all programmable.

Brochure: 2CSC445021B0202

Benefits

- Reduced depth: only 57 mm inside the panel for easy installation even in limited spaces
- Intuitive and easy-to-use front keypad for navigating screens and configuring the device
- Bidirectional reading allows to keep track of produced and consumed (and their balance) active and reactive energy.
- Real time display of energy consumption in Euros and saved CO_2 kg.
- Communication without limits thanks to the availability of different protocols: Modbus RTU, Modbus TCP/IP and Profibus DP.
- Multilingual backlit display with two lines of scrolling text
- Digital inputs allow pulse acquisition from other energy counters or users.
- Digital and relay outputs to remote for control of active and reactive energy consumption; programmable as threshold alarms

RCDs

DS201 T 1P+N

DS201 T 1P+N RCBO for railway rolling stock installations

In the DS201 T range of RCBOs for traction, specific plastic materials are used that are classified I2-F3 according the NF F 16-101/102 (“Railway Rolling Stock Fire Behavior-Choice of Materials„ and “Railway Rolling Stock Fire Behavior-Choice of Materials, Application to Electrical Equipment„) thus responding to Exigence 3. Therefore, DS201 T can be used in rolling stock and specifically in those areas where there are more stringent requirements, like passenger area and staff area.

Product note: 2CSC422028L0201

Benefits

- Exigence 3 according to NF F 16-101/102 (I2-F3)
- Tested according to IEC 61373 - 2010 - 05 Edition 2.0 considering Category 1, Class A and Class B.
- Laser printed informations on the device
- Bi-directional cylindrical terminals
- Differential trip indicator
- Contact position indicator (CPI)
- Label carrier
- System pro *M* compact® accessories

Protection

E 90/30 CC fuseholders

Fuseholders for CC fuses - NAM market

E 90/30 CC range has been designed to comply with North American market regulations and to enable worldwide manufacturers to sell their equipment in conformity with safety requirements also in these countries.
E 90/30 CC fuseholders can be used in any applications where you need to ensure electrical protection and isolation. The technology solutions applied to reduce power dissipation help to minimize module heating.

Technical Catalogue: 2CSC444003B0202

Benefits

- Rejection member to allow just the insertion of a class CC fuse
- Rated Current 30 A
- Rated Voltage 600 V AC/DC
- Versions 1, 1N, 2, 3, 3N, 4 poles
- Blown fuse indicator for all multipolarity versions
- UL Listed according to UL 4248-1 and UL 4248-4

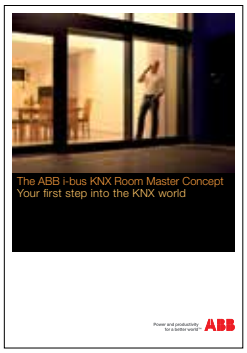
In the news

Distribution and measurement, disconnection and protection: lots of new documents by ABB for people operating in the electrical business, helping them in their work. Documents and softwares can be downloaded from http://www.abb.com/abblibrary/DownloadCenter/

Intelligent Building Control

The ABB i-bus® KNX Room Master Concept

Your first step into the KNX world



The chance to start installing electrical systems. With the ABB Room Master it is simple to enter the KNX world, conveniently from your office. Room Master devices are combined units with input and output functions – the right device for every application.
Our new brochure visualizes the easy steps to commission and install Room Master devices. Furthermore the realization of additional applications like dimmering and security is shown.

Brochure: 2CDC514097B0201

Protection

S800/S500

The High Performance MCBs

ABB high performance miniature circuit breakers are an everlasting worldwide success, thanks to continuous innovation and development of new products and accessories for selected segments like wind, solar power and process automation.
The new edition of S800/S500 technical catalogue features all new products introduced in the last year plus a new technical chapter regarding derating. Check it out!

Technical catalogue: 2CCC413003C0203

Protection

E 90 fuse disconnectors and fuse holders for USA and Canada.

The protection speaks North American!

In this brochure you can find a complete range of Fuseholders totally compliant to NAM approvals: UR, UL and CSA.
UR Fuseholders for midget fuses, UL Fuseholders for class CC fuses/ fuseholders and PV fuseholders for photovoltaic application to be used with gPV fuses.

Brochure: 2CSC444003B0202

Distribution

Enclosures for Automation

A new catalogue, about a wide range for all your needs.

The new technical catalogue contains the complete ABB range of metal structures for Automation such as:

– cabinets for typical automation applications with back mounting plate, inner counterdoor, glazed door, etc..
– cabinets for DIN-rail devices with dedicated uprights and front panels
– cabinets for control applications using the PC or Console ranges.
– cabinets for MCC with fixed drawers made with compartments and segregated cubicles.
– cabinets for Industrial Computing and Networking using the new Swivel or Fixed 19” Rack Frame
– multipurpose Switchboards made in thermoplastic material with an innovative technology and suitable for Automation and Distribution applications

All the series of metal enclosures for Automation contained in the catalogue, such as SR2, AM2 and IS2, have been enriched with several new accessories. In particular, the IS2 has got a swivel Rack frame completly renewed and other brand new accessories. All of them are also available and suitable for the new range of stainless steel enclosures for automation (SRX, AMX, ISX)

Technical catalogue: 1STC804013D0203

Protection

E 90 range of fuse disconnectors and fuseholders

Uncompromising performance

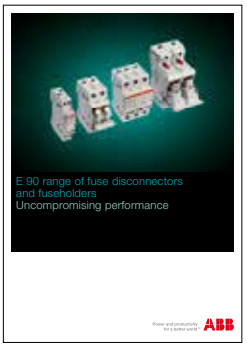


ABB has dedicated its designers’ passion, competence and creativity to the development of E 90 range of disconnectors and fuseholders.
The result is the first AC-22B fuse disconnector, certified up to 32 A by the most outstanding marks and approvals all over the world and fuseholders up to 125A for midget, class CC and gPV fuses, available with local and remote indication of fuse blown.

Brochure: 2CSC444002B0202

Measurement Devices

M2M

The measure of efficiency

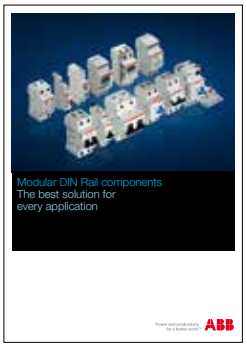
The brochure of the new network analyzer M2M presents and describes all the main technical features and benefits derived by the installation of the new analyzer.
Inside the brochure you will find information regarding main applications, ordination codes wiring diagrams, examples of data visualization on the display and a detailed list of technical data.
Furthermore is included the QR code to download directly on your smartphone the complete instruction manuals in English.
The brochure is an ideal tool to promote the great advantages of installing M2M.

Brochure: 2CSC445021B0202

DIN Rail product

DIN Rail Panorama

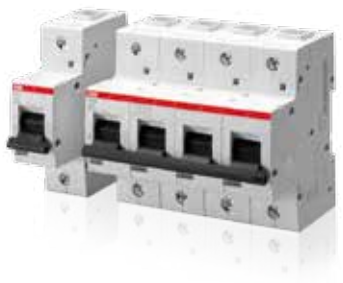
A small leaflet for a huge offer



With this simple but effective tool, an overview of all the DIN Rail ABB offer is provided in a 6 pages leaflet. The panorama is designed and successfully used to promote ABB offer, especially through wholesalers and distributors, but it could be even distributed during fairs, trainings and customers events.

Leaflet: 2CSC400080B0201

S 800 B. High performance miniature circuit-breakers. Simply innovative. Safety has never been easier



Limit downtime in industrial electrical systems while ensuring maximum safety for operators and ease of access to devices: S 800 B high performance circuit-breakers, that complete S 800 range, are efficient products at a reasonable cost and designed for overload and short-circuit protection in distribution systems with 16 kA breaking capacity. They comply with Standard CEI EN 60947-2 and feature 80 to 125 A rated current values with B, C, D and K characteristic curves. S 800 B high performance circuit-breakers thanks to a red/green signal, showing the position of internal moving contacts, and to a switch lever, that stops in the middle position in case of thermal or magnetic tripping, show to the user why the tripping occurred at a glance, enabling prompt maintenance to be performed. Performance similar to moulded case circuit-breakers but with the advantage of the compact dimension, S 800 B are available from 1 to 4 poles versions. **http://www.abb.com/lowvoltage**

Power and productivity
for a better world™

ABB

Top 9

ABB's solutions allow you to obtain credits for LEED® certification (Leadership in Energy and Environmental Design) and testify our commitment towards energy efficiency and protection of the environment.

Night lighting control

LEED Protocol	Credit	Points
Site sustainability		
LEED for new constructions and renovations	SSc8 - Light pollution reduction	1 point
LEED for existing buildings	SSc8 - Light pollution reduction	1 point

ABB i-bus KNX range helps to reduce nighttime lighting pollution. Timers, presence sensors and twilight switches control the switch actuators that automatically turn off the indoor or outdoor lights or adjust them by means of a dimmer to a lower value than the one used during the day. They also control the shutter actuators to automatically lower any type of motor-operated screening, thereby preventing light from being transmitted outdoors during the night.

Water use monitoring

LEED Protocol	Credit	Points
Water management		
LEED for existing buildings	WEc1 – Water use monitoring	2 points
LEED for existing buildings	WEc4 – Cooling tower water management	1-2 points

Water usage can be monitored by meters or sub-metering facilities that can be interfaced with standard KNX systems thanks to ABB's Binary Inputs, i.e. BE/S and Universal Interface US/U. Monitored values such as water flow rate, conductivity and field sensor measurement of the water supplied to the cooling towers in an installation are transferred to the KNX system via analog inputs and/or specific gateways. Organized by supervision software and displayed on a touch panel, these data guarantee constant monitoring, facilitate the location of inefficiency and waste and allow the effectiveness of efficiency-improving corrective actions to be verified.

Efficient irrigation water management

LEED Protocol	Credit	Points
Water management		
LEED for new constructions and renovations	WEc1 – Efficient irrigation water management	2-4 points
LEED for existing buildings	WEc3 – Efficient irrigation water management	1-5 points

ABB i-bus KNX range helps to meet the requirements of this credit through integrated management, centralization and monitoring of various different applications. More importantly, waste is reduced thanks to an automated irrigation system that functions at set times and depending on the weather conditions (no rain or snow) detected by dedicated sensors. The ABB i-bus KNX Weather Stations (WZ/S, along with multi-sensor WES/A, and WS/S, which handles up to 4 sensors) monitor the outdoor weather conditions and transmit the relative signals to the actuators, which control the irrigation system.

Constant adjustment of indoor light intensity

LEED Protocol	Credit	Points
Energy and atmosphere		
LEED for building and commercial interior design	EAC1.2 – optimize energy efficiency performance – lighting control	3 points

ABB i-bus KNX range can measure sunlight intensity, perform presence detection and, as a consequence, turn the lights on and off in different rooms or dim them, all in a fully automatic way. More important, the ABB i-bus KNX Presence Detectors and Light Controllers (also available as a gateway for DALI protocol management) achieve the utmost energy efficiency by automatically adjusting the intensity of artificial lights depending on the degree of natural light outdoors. The intention is to guarantee a maximum level of energy efficiency and to reduce waste, but without forgoing comfort.

Control of shutters and glare reduction

LEED Protocol	Credit	Points
Indoor environmental quality		
LEED for new constructions and renovations	EQc8.1 – Daylight and views	1 point
LEED existing buildings	EQc2.4 – Daylight and views	2 points

Automatic control of screening elements is guaranteed by ABB i-bus KNX range. The Shutter Control Unit JSB/S can automatically implement the glare-reduction function in each individual room by activating dedicated actuators in the appropriate way. This allows occupants to fully benefit from natural light in the rooms but without being dazzled. The effect is achieved by automatically tilting the blind slat during the day, depending on the position and height of the sun.

Control of indoor air quality

LEED Protocol	Credit	Points
Indoor environmental quality		
LEED for new constructions and renovations	EQc1 – Outdoor air delivery monitoring	1 point
LEED for building and commercial interior design	EQc1 – Outdoor air delivery monitoring	1 point
LEED existing buildings	EQp1 – Minimum standards for indoor air quality	require-ment
LEED existing buildings	EQc1.2 – Outdoor air delivery monitoring	1 point

Not only does the ABB i-bus KNX Air Quality Sensor measure the CO_2 concentration, but also the temperature and degree of humidity of the air. If the values exceed predefined configurable thresholds, the sensor can generate alarms displayed via supervision software or a touch panel (and directly on the device by LEDs) and even implement corrective actions, such as automatic operation of a KNX actuator so as to open a motor-operated window or shutter and allow fresh outdoor air to enter.

Reduce environmental impact by using alternative transportation

LEED Protocol	Credit	Points
Site sustainability		
LEED for new constructions and renovations	SSc4.3 – Alternative transportation: low emitting and fuel-efficient vehicles	1 point

ABB offers a range of charging systems for cars and electric drive vehicles in general:
- wallbox AC charging stations
- 22 kW AC charging posts
- 50 kW DC Terra 53 multistandard charging station

Monitoring of energy usage

LEED Protocol	Credit	Points
Energy and atmosphere		
LEED for new constructions and renovations	EAp2 – Minimum energy performance	require-ment
LEED for new constructions and renovations	EAc5 – Measurement and verification	3 points
LEED for building and commercial interior design	EAp2 – Minimum energy performance	require-ment
LEED for building and commercial interior design	EAc5 – Measurement and verification	5 points
LEED existing buildings	EAp2 – Minimum energy performance	require-ment
LEED existing buildings	EAc1 – Optimization of energy performance	1-18 points
LEED existing buildings	EAp2 – Measurement of energy performance: monitoring of systems	2 points

ABB's range of meters can monitor the energy usage of all the installations in a building (lighting, heating/cooling systems, ventilation/conditioning systems).
The data can be easily exported to an external management system thanks to the different interfaces available (KNX, MODBUS, Ethernet). For example, all the energy usage data metered can be acquired by supervision software and displayed on a touch panel so as to guarantee constant monitoring, facilitate the location of inefficiency and waste and allow building management and the effectiveness of efficiency-improving corrective actions to be verified.

Individual control of lighting and shutters

LEED Protocol	Credit	Points
Indoor environmental quality		
LEED for new constructions and renovations	EQc6.1 – Controllability of systems: lighting	1 point
LEED for new constructions and renovations	EQc6.2 – Controllability of systems: thermal comfort	1 point
LEED for existing buildings	EQc2.2 – Controllability of systems: lighting	1 point
LEED for existing buildings	EQc2.3 – Controllability of systems: thermal comfort monitoring	1 point
LEED for building and commercial interior design	EQc6.1 – Controllability of systems: lighting	1 point
LEED for building and commercial interior design	EQc6.2 – Controllability of systems: thermal comfort	1 point

KNX control elements and, more generally, all conventional operating mechanisms interfaced with the KNX system via binary inputs, allow individual adjustment of the lighting system and multi-scenario planning able to adapt to the requirements of common areas. Advanced control of lighting requirements is achieved by switch actuators and dimmers.
Individual adjustment of the temperature regulation system can also be obtained thanks to the wide range of thermostats conforming to KNX standards available. For example, ABB's range of ABB i-bus KNX actuators can control the valves of heating/conditioning systems or fan-coils, when installed. Each room can be equipped with a thermostat that can be regulated by the occupants to suit the temperature conditions required in each individual environment regardless of those in the other parts of a building.

Good morning DIN Rail

ABB answers to the many questions posted to our experts through email. Send your technical questions to mail. daybydin@abb.com, the most interesting ones will be published and answered on next issues of Day by DIN.

Roberto Vanetti: *Product Manager - DIN Rail Products*

The DS201-DS202C range is available in 1P+N and 2P versions.
The 1P+N RCBO's are the most commonly used. However the 2P protection is required in certain cases and applications. Let's see when and why.

At home

Electrical power sometime could be supplied by means of a two-phase distribution system with 230 V line-to-line voltage; it happens, for example, in the center of Rome, the capital of Italy. In this case it's mandatory the protection of both phases and the DS202C 2P RCBO represent the best solution to ensure the complete protection against earth fault and overcurrents in only two modules width, up to 32 A.

RCBO: ABB solutions for the protection of people and lines in only two modules

Protection of final distribution lines	Thermal magnetic and residual-current protection
230V 1P+N network with phase indication	DS201 2 modules, up to 40 A
230V 1P+N network without phase indication. 230 V two-phase network.	DS202C 2 modules, up to 32 A

In hospitals or other places with IT distribution systems

Line-to-line and line-to-neutral protection in IT distribution systems must be provided with 2P protection. In the first case, because the system is two-phase, as explained previously. In the second case because a double fault in two outgoing final circuits can lead to a short circuit towards the line and neutral conductors of two separate lines.

On holiday

The connection of your caravan to a power socket is another application where 2P protection is used. Even though

Two examples of ABB's APR range of RCDs, a DS201L and a DS202CM

230 V line-neutral electricity is distributed, it is not always possible for every conductor to be recognized, as power socket are not always polarized. This means that 2P protection must be assured downstream the socket to protect the line in all cases.

How many fluorescent bulbs and computers can be connected simultaneously if a 30mA APR type RCD is installed?
APR RCDs are characterised by their high resistance to line overvoltages of atmospheric origin, grid interference and leakage currents. One of the main factors concerning the origin of leakage currents is the connection of numerous computers and fluorescent bulbs with electronic ballast at the same time. APR RCDs, thanks to their anti-interference characteristics, reduce the risks of unwanted tripping, significantly improving operational continuity for numerous applications (offices, supermarkets, datacenters, schools etc.).
The most critical aspect for dimensioning lines supplying fluorescent lights or computers is undoubtedly the interference these devices emit.
Today it is impossible to give exact indications on how many bulbs and computers may be connected, as this is variable and depends on the connected load. Despite this, we can try, as we have done in the table below, to give a general indication which can help facilitate dimensioning of these lines.

Send us your questions:
mail.daybydin@abb.com

RCD type	Number of electronic ballasts	Number of workstations (computer / printer)
Standard	20	2
APR type	50	5

The long life of Surge Protective Devices

Nominal discharge current I_n is a measure of the electrical endurance of the SPD. Let's discover why!

Bertrand Berges: *Product Manager - DIN Rail Products*

We all (or nearly all) know it: a Surge Protective Device (SPD) is not a fuse, that needs to be changed at the first tripping, nor a switch, that can be reclosed infinitely once the risk has been eliminated. This small in-depth technical examination aims to give practical tips on how to foresee the duration of a SPD according to its performances.

The IEC 61643-1 standard is describing test method for SPDs. The SPDs, type 1 and type 2, shall withstand 15 impulses of 8/20 current impulses at the maximum value (corresponding to Imp) for the test class I and at the nominal current (I_n) for test class II. Then, additional test are done for Type 1 with current impulses up to limp. What does this mean in terms of lifespan of the SPD?

Let's have a look at an example: let's assume that the lightning collective area of a building (Am) is 1km², and that the lightning density per km² per year (Ng) of the region where this building is located is 4. We will also assume that the maximum expected surge current at this location is 20kA. In this specific case, theoretically the life expectancy of the SPD type 2 with Imax 20kA and I_n 5kA, would be:

$$\frac{\text{Max. surge current}}{A_m\ (km^2) \times N_g} = \frac{20}{1 \times 4} = 5\ years$$

ABB Type 2 SPD	Nominal current (I_n) - kA	Maximum discharge current (I_{max}) - kA
	30	70
	20	40
	5	20

Table 1

Maximum discharge current of a Type 2 SPD (kA)	Discharge current expected at the location							
	70	40	20	15	10	5	2	1
70	1	3	20	50	150	400	2.500	9.000
40		1	5	20	40	200	1.000	3.000
20				1	2	20	150	1.000

Table 2

It is evident that a SPD type 2 with I_n = 5kA, while fully complying with regulations, might have a low life expectancy, if compared to the expected life of the building to which it is connected.

We could estimate that the I_n value that best fits the cost of the SPD with the cost of the equipment to be protected is in around 15-20kA.

We now have the elements to respond to the initial question. Let's assume that all the discharges that affect the building in its life are equal to 5 kA. So the average number of discharges that an SPD type 2 with I_n 5kA and Imax 20kA is able to withstand is shown in table 2, next to the blue column.

A standard type 2 SPD with I_n 20kA (Imax 40kA) for protection, will last an average of 200 strikes, presumably more than the average duration of the electrical system in which it is installed!

Glossary

Transient overvoltage
Consequence of an atmospheric discharge that falls in the vicinity of a building.

SPD
Surge Protective Device, definition of low voltage surge protection according to International Standards.

Class II test
Test method used by the IEC 61643-11 carried out with nominal discharge current (I_n).

Nominal discharge current In
Nominal discharge current for Class II tests. Peak current value for SPDs with current wave shape of 8/20µs. Used for SPD preconditioning in the Class I tests.

8/20 µs wave
Current impulse used to simulate transient overvoltage. The current front time is 8µs and the time to half the value is 20µs.

Doktor Wise
The expert answers

The reliability of ABB's experience in its responses to every need arising from the work of professionals of the sector. In this section ABB experts respond to the most frequently asked questions regarding the use of DIN rail and front panel products, to solve problems and propose the most suitable solutions for every application.

Lighting control

Valentina Surini: *Product Manager - DIN Rail Products*

Some tips on choosing the best device to control a lighting system.

As opposed to a traditional twilight switch with a probe, the astronomical model does not use external sensors for its functioning.

The use of an astronomical switch, therefore, is required mainly when:

- the length of the connection between the device and the sensor exceeds 100 metres;
- the connection is too complicated (for example, if the switchgear is installed in the cellar);
- it is impossible to install the sensor far from sources of bright light (amusement parks, campsites, etc.);
- external agents - like pollution or vandalism, for example - can compromise the correct functioning of the probe.

When is it better to use a digital clock in place of an electromechanical one?

Firstly digital time switches, thanks to the electronic technology used, are more precise, have a lower switching time, and offer more programming possibilities (impulse, cyclic, random, holiday, etc.) compared to electromechanical time switches.

Furthermore, the absence of moving mechanical parts allows a greater autonomy (in the range of years, rather than hours). In all the applications that involve numerous operations, frequent and different ones (daily, weekly or annual), the D Line series time switches allow better performances, with a minimal difference in price.

Power transformers

In a control appliance, can I use the two secondary outputs of a single phase transformer to feed two different auxilliary currents?

It is possible to simultaneously use both the secondary outputs of an ABB transformer to supply two different low-voltage circuits.

To feed safety extra-low-voltage security circuits (SELV), what type of transformer is needed?

To realize a SELV circuit it is necessary to use a safety transformer which conforms to Standard IEC 61558-2-6, that guarantees both the separation between the systems by means of double insulation, and the extra-low voltage required (12÷24 V ±5%).

Is it possible to connect the secondary outputs of two or more single-phase ABB transformers in parallel?

Up to a maximum of 3 ABB transformers of equal power can be connected in parallel, keeping in mind that the total power which can be drawn will be equal to 90% of the sum of the individual powers.

It is necessary to pay maximum attention to the connection of the terminals and, if necessary, test the circuit first in series then in parallel.

In a devices supplied by 24 V a.c., is it possible to supply a cooling fan with a rated voltage of 230 V a.c., supplying the transformers from the secondaries?

It is possible to supply the transformers on the secondary side, but due to the nature of their manufacturing, the voltage output from the primary may vary by 10-30% relative to the nominal voltage.

How can I quickly size the power of a transformer?

Using the formula

$P = 0,8 (\sum Pm + \sum Pr + Pa)$

where:

$\sum Pm$ = the sum of all continuous power consumptions of contactors

$\sum Pr$ = the sum of all the resistive powers

Pa = the inrush power of the largest contactor

Did you know that?

DIN rail socket outlets are also available in various colours

The coloured DIN rail socket outlets allow you to signal a specific use of the plug, for example:
- green to signal an upstream dedicated protective device;
- red to signal a continuity group, that allows the use of the socket even in the absence of the mains supply.

There is also a black version, for the connection of industrial and automation devices.

Send us your questions:
mail.daybydin@abb.com

Miniature Circuit Breakers

Joachim Becker: *Product Manager - DIN Rail Products*

Test and use of single pole miniature circuit breakers in three phase systems according IEC/EN 60898-1

Miniature circuit breakers are classified according to several criteria. These criteria are described in the standards IEC/EN 60898-1 and IEC/EN 60947-2. Among others two criteria are the number of poles and the rated operational voltage. It is generally known to use single pole MCBs in single phase systems and three pole MCBs in three phase systems. This includes single phase and three phase systems with a neutral wire where the neutral wire is not protected.

But what about the use of single pole MCBs in a multi-pole system? For this we have to look closer into the standard IEC/EN 60898-1. In table 1 the IEC/EN 60898-1 shows the preferred values of the rated voltage.

In column two the circuit supplying the miniature circuit breaker is defined. For the rated voltage of the miniature circuit breaker we look at column three. The explanations apply accordingly for column four. A single pole miniature circuit breaker with a rated voltage of 230 V can be used in a single phase system with an installation phase to neutral or phase to phase and in three phase systems when the rated voltage of the system does not exceed 230 V. This is shown in the table in row one and row two. But if we look at row four we see the rated voltage value 230/400 V of the MCB. A miniature circuit breaker with this voltage description can be used in single phase (phase to neutral) or in three phase systems (3-wire or 4-wire) using three single-pole miniature circuit breakers. To verify the suitability for the use of single-pole circuit breakers in a three phase system a special short circuit test is described in the IEC/EN 60898-1.

Circuit breakers	Circuit supplying the circuit breakers	Rated voltage of circuit breakers for use in systems 230 V, 230/240 V, 400 V	Rated voltage of circuit breakers for use in systems 120/240 V, 240 V
Single pole	Single phase (phase to neutral or phase to phase)	230	
	Three-phase (4-wire)	230	
	Single phase (phase to earthed middle conductor, or phase to neutral)		120
	Single phase (phase to neutral) or three-phase, using three single-pole circuit breakers (3-wire or 4-wire)	230/240	
Two-pole	Single phase (phase to neutral or phase to phase)	230	
	Single phase (phase to phase)	400	240
	Single phase (phase to phase, 3-wire)		120/240
	Three-phase (4-wire)	230	
Three-pole	Three-phase (3-wire or 4-wire)	400	240
Four-pole	Three-phase (4-wire)	400	

Note 1 In IEC 60038 the network voltage value of 230/240 V has been standardized. This value should progressively supersede the values of 220/380 V and 240/415 V.
Note 2 Wherever in this standard there is a reference to 230 V or 400 V, they may be read as 220 V or 240 V, 380 V or 415 V, respectively.
Note 3 Wherever in this standard there is a reference to 120 V or 120/240 V, they may be read as 100 V or 100/200 V, respectively.

Table 1: Preferred values of rated voltage according to IEC/EN 60898-1

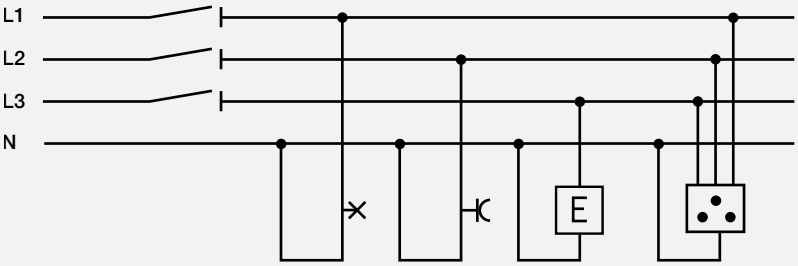
The test circuit for Icn is the same as for three-pole circuit breaker. The three circuit breakers are inserted in each phase of the test circuit. The test procedure is shown in the table below. First a common O operation is performed. For the second shot the first circuit breaker is closed and the second circuit breaker will be switched on to the short circuit. After this operation the first circuit breaker is replaced by the fourth sample. This sample is closed and the third circuit breaker will be switched on to the short circuit.

If the short circuit occurs between two phases with the rated voltage 400 V two circuit breakers are in series. At a short circuit between phase and neutral or ground the voltage is 230 V and one circuit breaker will trip.

Here an example for an application in practice. In a standard residential installation most loads like lighting or sockets are single phase but there are also three-phase loads like electric cooker. An typical installation is shown in picture 1.

Operation	Sample			
	1	2	3	4
1	O	O	O	–
2	O	CO	–	–
3	–	–	CO	–

Table 2: Test procedure for three-phase tests for single-pole circuit breakers of rated voltage 230/400 V



Picture 1: Electrical installation

Joachim Becker
Product Manager - DIN Rail Products

The electric cooker is protected by three single pole circuit breakers. The reason for this is that if a fault occurs in one phase only one hotplate is out of work and the others could be used further. If a short circuit between two phases occurs, two single pole circuit breakers will trip.
All ABB single pole MCBs can be used in three phase systems as described above. This is approved by testing the MCBs according to the test procedure described in IEC/EN 60898-1.

Picture 2 shows the printing of a ABB single pole MCB with the voltage level 230/400V.

Picture 2: Printing on MCB according to IEC/EN 60898-1

Send us your questions:
mail.daybydin@abb.com

Residual Current Devices

Marco Gallo: *Product Manager - DIN Rail Products*

Is it possible to use F204 residual current devices in three-phase systems without neutral?

In three-phase systems without neutral, as there is no phase/neutral voltage, attention must be paid to the effectiveness of the RCDs' test function.

The test button circuit on F 200 RCDs is connected inside the device, between terminals 5/6 and 7/8/N, as shown in figure 1, and is designed for an operating voltage between 110 and 254 V.

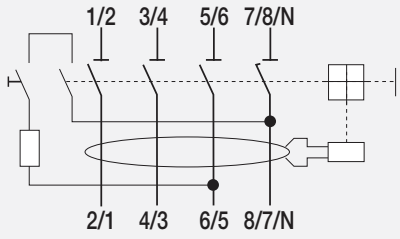


Figure 1

When these RCDs are installed in three-phase networks without neutral, if the linked voltage between the phases is between 110 and 254 V, there are two possible solutions for correct operation of the test button:

1) Connect the three input phases to terminals 3/4, 5/6, 7/8/N and the outputs to terminals 4/3, 6/5, 8/7/N
2) Connect the phases normally (inputs to terminals 1/2, 3/4, 5/6 and outputs to terminals 2/1, 4/3, 6/5) and bridge terminals 1/2 and 7/8/N, in order to bring the first phase potential to terminal 7/8/N. In this manner, the test button circuit is at the line voltage of the three phases.

If the circuit has line voltage between the three phases of more than 254 V, as normally is the case in three-pole low-voltage networks where the line voltage between phases is 400 V (and the voltage between phase and neutral is 230 V), these types of connections cannot be made, as the test button would find itself at 400 V and the test button circuit would be damaged.

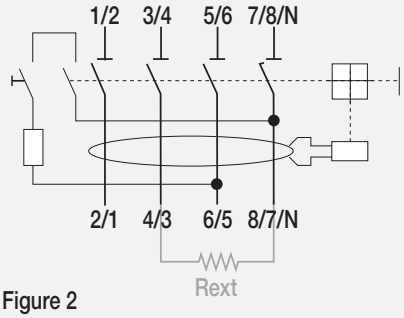


Figure 2

To permit operation of the test button also for three-phase networks without neutral with line voltage of 400 V between the three phases, the phases must be connected normally (inputs to terminals 1/2, 3/4, 5/6 and outputs to terminals 2/1, 4/3, 6/5), and insert a resistor between terminals 4/3 and 8/7/N of the RCD, as shown in figure 2, the value of which is given in table 1 (based on the RCD sensitivity).

Table 1

IΔn [A]	Rext [Ω]
0,03	3300
0,1	1000
0,3	330
0,5	200

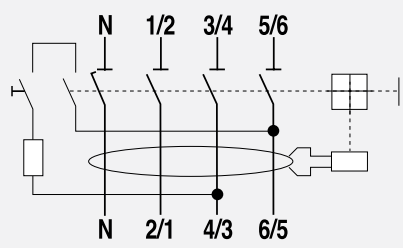


Figure 3

In this way, when the test button is pressed, a voltage of 400 V is applied to the circuit, but in case of a $I_{\Delta n}$ = 0.03 A RCD, it finds the R_{ext} 3,3 kΩ resistor in series with the resistance of the test circuit. This causes a voltage drop, leaving a voltage of no more than 254 V on the test circuit resistance. The resistor R_{ext} must have power dissipation greater than 4 W. In a normal operating situation (that is, without pressing the test button) the resistor R_{ext} is not powered, and therefore causes no dissipation.

What does ABB offer?

ABB offers RCDs with neutral on the left, in the F 200 series, in which the test button is wired inside the device between terminals 3/4 and 5/6, as shown in the diagram (Figure 3), calibrated for service voltages between 195 V and 440 V. In the case of three-phase systems without neutral with line voltage between the phase of 230 V or 400 V, it is sufficient to wire up the phases normally (inputs to terminals 1/2, 3/4, 5/6 and outputs to terminals 2/1, 4/3, 6/5), without having to add a jumper or bridge.


F204 RCD with neutral on left

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An oil depot left here only pollution until Conad, an Italian leading supermarket chain, opened its hub for distribution in the north west of the Country. A demanding yet effective reclaim which led to a brand new buiding on the edge of energy efficiency and distribution technology.
A great story of innovation, entrepreneurial spirit and forward thinking which gives hope for an efficient and low-impact future.

Guido Buttarelli: *Technical Consultant Winning Associati* - Alessandro Roccatagliata: *Sales Representative LP Division - Genoa Office*

When revamping really means investing. The New Conad Logistics Centre

A lethal cocktail of asbestos and hydrocarbons, spread around the town of Vado Ligure, was the inconvenient and undesired legacy of a coastal oil depot which was operating here until the 1990s. Now, following repeated and intensive reclaim operations over the last few years, a radical and virtuous change is finally complete.

The new Nordiconad Distribution Centre has indeed recently been inaugurated in the same area, an imposing and innovative warehouse with a low environmental impact, next to a vast reclaimed public green space. The project, requiring investment of 35 million Euros, was implemented by GF Group (Orsero group), which gave a long-term lease of the complex to Nordiconad. The total area is around 40,000 square metres, of which 7,600 is refrigerated space with low-energy systems. The new hub was built in record time and delivered two months before the two-year timeframe initially envisaged. The multiple factors which allowed this speed included a correct initial drafting of the project which avoided the need to request dispensation to deviate from the specification with consequent delays. Within the project, the decision to use Konnex twisted-pair building-management system allowed wiring times to be significantly shorter than normal, making installation of the office systems much quicker. Another factor which is not less important was the availability of all critical components in the allotted times.

The location minimises transport costs and pollution

Strategically located with respect to existing stores, the hub increases the efficiency of the distribution chain, supplying over 130 supermarkets (Conad, Margherita, SuperStore Conad and Leclerc Conad hypermarket brands) in Piedmont, the Aosta Valley and Liguria, with compound turnover of 500 million Euros. Concentration of warehousing, which was previously spread over multiple locations, is a very positive choice also from an environmental point of view. Reducing the number of transports significantly reduces pollution and improves both scale economies and organisational efficiency. Finally, but not secondary in the current economic climate, is the effect on employment and satellite

01

industries as well as the port activities in the immediate area. There are 182 workers in the warehouse (half of whom are new employees), predicted to increase up to 200 due to the opening of the Conad centre in the new Juventus Stadium in Turin, the supermarket at the ex Metalmetron in Savona and another 5 supermarkets and 2 hypermarkets in Piedmont. The investment has also generated positive effects for local business: Ferrania Solis, for example, supplied all the PV solar panels.

The 1.5 MW photovoltaic installation on the building's roof ensures energy self supply with renewable sources

The PV system is among the largest roof installations in the region, rated at approximately 1.5 MW, and is able to meet the hub's electrical requirements. During the day the system ensures complete self-sufficiency of the electrical system, even when the refrigeration units are running at full power (over 400 kVA consumption), with an energy surplus of 40% which is put back into the grid. Power is taken from the grid at night, on the other hand, when the system cannot count on energy from the sun. The PV modules installed on the roof, connected together in a hierarchy of strings, interface with their respective inverters via the ABB DC circuit breakers installed in the switchboards designed and manufactured by Tesla.

The ABB interface between the PV panels and the grid was implemented by installing an energy meter for the electricity produced on the low-voltage side directly on the output of each interface panel. This way the energy is measured net of the losses from the transformers which connect the system to the medium-voltage network.

Three ABB interface switchboards are located inside the warehouse, managing the three 500 kVA PV sections.

02

Professionals

Electric distribution design
Studio Pazzaglia
Guido Pazzaglia
Savona

Panel builder
Tesla srl
Luca Zaccone *(on the right in the picture)*
Cairo Montenotte

System installation
Sie Impianti srl
Alessandro and Luca Nobolo
Genoa

Building automation design
Domotica Labs srl
Eng. Ivo Panero
Genola (CN)

Wholesales
Demo spa
Casale Monferrato headquarters
Genoa Ayroli branch
Andrea Moraci

ABB Sales Engineer - Genova
Alessandro Roccatagliata
(on the left in the picture)

Building automation control of lighting with ABB i-bus® KNX

Intelligent and centralised management of the whole building's lighting system was implemented using ABB i-bus KNX products, with significant advantages in many areas: lower installation costs, extreme versatility, remote control from any point and energy savings:

– The significant reduction in installation costs is due to the simpler wiring. It was, indeed, possible to avoid individual supply for the 400 light circuits from the switchboard and the consequent crowding in the wiring ducts. A collective supply was taken to the groups of devices and then distributed
– In terms of versatility, the user's requirement to be able to change the lighting control configuration on their own when their requirements change, without the need of specialised external technicians, was fully satisfied
– The personal computers across the site allow the electrical installation to be managed via the network by logging on to the graphical pages hosted on an ABB web-server. This allows constant monitoring of the status of the panels (more than 200, installed on the lighting busbars at hardly accessible heights) in order to immediately detect any problems and control the switching of the different circuits in the internal and exterior lighting systems
– Finally, the integration of external lighting (car parks, perimeter, electric signs, emergency exits) in the building automation management leads to significant energy savings thanks to the automatic twilight sensors.

01 Concentration of storage, previously distributed between multiple warehouses, leads to a reduction in transfers, resulting in less pollution and optimised organisational efficiency
02 Forklift fleet charging their batteries

03

03 To make the best use of the available space, the power centre was designed in an L-shape, with a total of 14 linear metres
04 To best manage RCD selectivity when setting up the plant, ABB earth leakage relays were chosen

The heart of the electrical installation

The heart of the electrical installation is the substation which represented the project's most demanding challenge where using ABB products made all the difference. It should be remembered that the position and size of the plant room for the transformer cabin was chosen by the customer and was a binding requirement for the planner, who studied the functional solutions to obtain the required performance within the tight space available. This was anything but a simple challenge, considering the substation required the following:

- the main circuit breaker and the medium-voltage protections for two transformers;
- two 1250 kVA transformers, each one supplying a single part of the system;
- the UPS systems for the IT system and the lighting and service installations;
- the two power factor correction units;
- the auxiliary switchboard.

An L-shaped structure to optimise space

The substation cabin also called for a power centre able to hold:

- the main low voltage circuit breakers for the two transformers which, due to a project requirement, are always powered;
- a busbar connection device, allowing one of the transformers to go offline and still have its equipment powered by the other;
- the parallel grid connection of the three sections of the PV system;
- the connections for the two different power factor correction units and for the sub distribution boards;
- all circuit breakers and control devices for ordinary lighting and two separate dedicated busbar systems, each powered by a dedicated UPS and fitted with automatic transfer switch, to provide power to the emergency lighting and emergency exits signalling systems;

04

OVR T1, OVR T2 and OVR PV

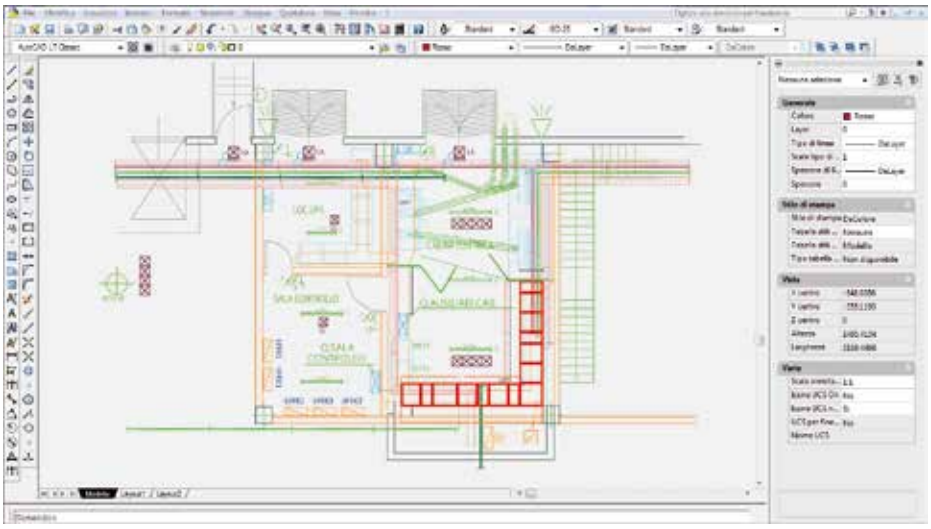
The whole range of ABB SPDs was used in this project, making full use of their particular characteristics: the solidity of the Class 1 series OVR T1 SPDs found an application in the power centre installed in the substation; the reliability and reduced size of the OVR T2 Class 2 was exploited in all the system's distribution switchgear and finally, the OVR PV series, specifically for PV installations, protects the solar power system's strings.

– three busbar systems supplied by a dedicated UPS and fitted with automatic transfer switches, dedicated to specific power supplies: substation and control room circuit breakers, refrigeration system service switchboard, connections for the site's IT system.

To make the best use of the available space, the power centre was designed in an L-shape, with a total length of 14 linear metres.

Space saving with the most suitable components

The use of SACE TMax T8 motorised automatic moulded case circuit breakers, with custom installation kit, allowed a considerable reduction in costs and space compared to solutions from other manufacturers. The OT series switch disconnector is another ABB product which allowed major simplification of the mechanical structure and a significant reduction in the size of the power centre. Thanks to its modular shape and compact size, it was possible to avoid the use of traditional switch disconnectors which, requiring back plate installation, would have required up to 8 times more space and much more complicated wiring. The level of complexity of the installation, its particular operational continuity requirements and the presence of a large number of electrical appliances required great effort in the choice and coordination of the components of the surge protection system in the design stage.



05

05 The heart of the electrical installation is the substation which represented the project's most demanding challenge where using ABB products made all the difference

The ideal solution was provided by the use of ABB OVR series SPDs, Class 1 at the low voltage side of the transformers and Class 2 downstream to the sub distribution boards.

Low voltage switchgear

The low voltage switchboards were installed near the appliances:

- five to supply services in the offices: heat pumps, hand driers, changing rooms, bathrooms, shutters. All the switchboards have a dual power supply: normal and UPS. All services therefore enjoy guaranteed operational continuity, while in general UPS protection is reserved exclusively for the most important systems
- one for the 300 m^2 sorting area, dedicated to parked fork-lift battery charging;
- one for the auxiliaries of the transformer management cabin, from which the medium-voltage switchboard controls and their ventilation are powered;
- one for the control-room switchboard

Electronic residual current relays, programmable for time and current

In combination with the circuit breakers above, 100 A ABB RD 196 panel mounted residual current relays were used to best manage the network's selectivity when setting up the installation. For the smaller circuits, on the other hand, 36 DIN rail residual current relays from the new RD3P series were chosen due to their innovative characteristic of being able to calibrate the delay time and current. The RD3P residual current relays were therefore calibrated on-site to ensure complete selectivity of the installation, in conformity with the user's specific requirements.

RD3P

The residual current relays RD3P range is the ideal solution for all levels of low-voltage installation, from main distribution to the single load. They guarantee a reduction in unwanted tripping and the possibility to implement a high level of selectivity between the residual current protective devices installed in the building. Auxiliary power supply, flexibility of installation, compact size, high measurement precision and frequency filtering are the particular characteristics for which this product was chosen as residual current protection for connections from the power centre installed in the substation .

ABB i-bus® KNX Room Master. Your first step into the KNX world

Bridging the gap between conventional electrical installations and KNX world, Room Master devices offer electrical connections and control features required in defined functional areas like apartments, hotel rooms, schools or retail stores. With the internal connection of inputs and outputs, done by ETS software, planning, installation and putting into operation new electrical installations are substantially facilitated. The Room Master concept opens the door to KNX Intelligent Building Control with flexible, project specific expendabilities for residential and commercial properties. www.abb.com/knx

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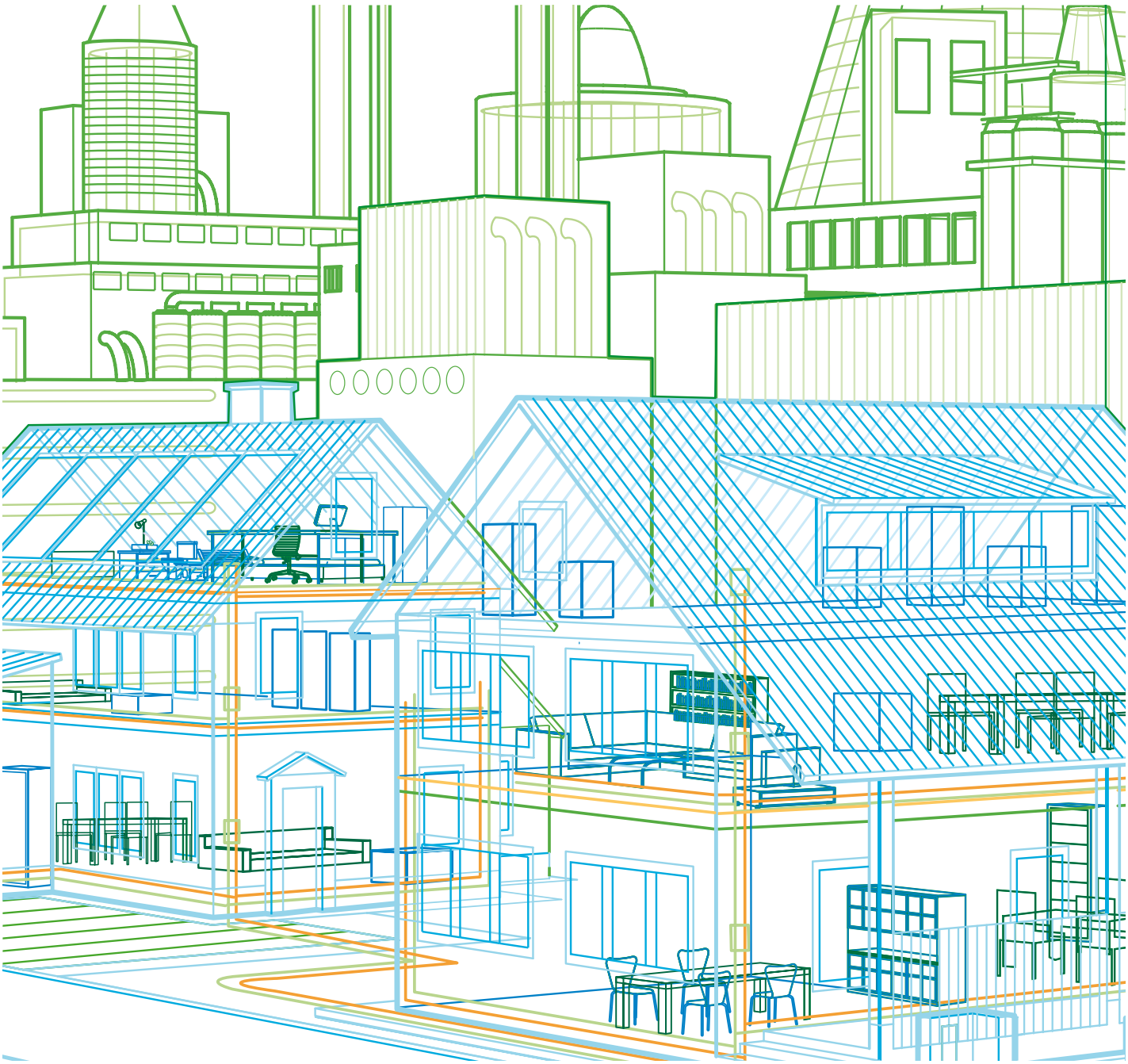


The sectioning of the electrical system into zones has a dual benefit: isolating the zone with the failure, ensuring operational continuity in other areas and allowing the installer to operate on the failure in complete safety.

Valentina Surini: *Product Manager - DIN Rail Products*

Disconnection is synonymous with safety and savings

Disconnection is the operation that enables the voltage to be removed from a system or a part thereof, allowing people to operate on the active parts in total safety. Standard EN 60947-3, in fact, defines disconnection as a “function that contributes to guaranteeing the safety of the personnel appointed to carry out works, repairs, locating of faults or substitution of electrical components, on or in the vicinity of active parts”

Attention is often focused on respecting Standards and much is made when it is necessary to isolate, neglecting numerous equally important operating aspects, such as, for example, operational continuity.

Isolator typologies

If it is true that the isolator is primarily a device oriented towards the safety of the personnel who intervene in the case of system maintenance, it can equally not be discounted that the isolator can be used to carry out a manoeuvre, or the opening of the contacts at the end of the isolating. Standard EN 60947-3 (change-over switches, switch disconnectors, circuit breakers, and units combined with fuses), in fact, defines various macro typologies of disconnecting switches, each with a different way of employment and, therefore, different applications (table 01); let us see what these are:

– **change-over switch**: a mechanical device that allows determined currents in conditions of normal use or temporary overload to be conducted or interrupted; it does not, however, guarantee the electric isolation of the circuit in open position;
– **switch**: a mechanical switching device that, in open position, satisfies the prescriptions specified for the isolating function of international Standard EN 60947-3. The opening of a switch disconnector ensures that the downstream circuit is electrically isolated from the upstream circuit. This condition is necessary whenever an intervention must be made on a component of the network as, for example, in the case of maintenance. According to Standard IEC HD 60364, it is forbidden to proceed with the maintenance of the system if the circuits have not been isolated;

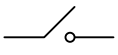
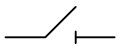
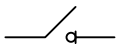
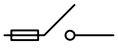
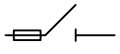
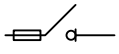
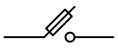
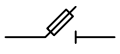
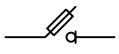
Function					
Making and breaking current		**Isolating**		**Making, breaking and isolating**	
Switch 2.1		Disconnector 2.2		Switch-disconnector 2.3	
Fuse combination unit 2.4					
Switch-fuse 2.5		Disconnector-fuse 2.7		Switch-disconnector-fuse 2.9	
Fuse-switch 2.6		Fuse-disconnector 2.8		Fuse-switch-disconnector 2.10	

Table 01
Summary of device functions EN 60947-3

Note:
1) All of the apparatus may have simple or multiple breaks.
2) The numbers refer to the articles of the standard with the corresponding definitions.
3) The symbols are taken from IEC 60617-7
4) The fuses can be on one or two sides of the apparatus contacts or in a position fixed between the apparatus contacts.

Type of current	Utilization category		Common applications
	Category A	Category B	
Alternating current	AC-20A*	AC-20B*	No-load closing and opening
	AC-21A	AC-21B	Switch of resistive loads with modest overloading
	AC-22A	AC-22B	Switch of mixed loads, resistive and inductive with modest overloads
	AC-23A	AC-23B	Switch of motors or other highly inductive loads
Direct current	DC-20A*	DC-20B*	No-load closing and opening
	DC-21A	DC-21B	Switch of resistive loads with modest overloading
	DC-22A	DC-22B	Switch of mixed loads, resistive and inductive with modest loads (for example, motors in derivation)
	DC-23A	DC-23B	Switch of motors or other highly inductive loads (for example, motors in series)

* The use of this utilization category is not permitted in the United States
The AC-23 category includes the occasional switch of single motors.
The manoeuvre of condensators or tungsten halogen lamps is subject to agreement between the manufacturer and the user.

Table 02 - Utilization category

– **switch disconnector**:
an isolator which allows switching under load. Not all isolators allow these types of operation: in order to be considered a switch disconnector a device must have a utilization category equal to or above AC-21B.

Furthermore, the same Standard EN 60347-3 introduces the concept of utilization category, a very important parameter in the isolating operation (table 02).

The utilization category precisely specifies the characteristics of the isolator and restricts its use, supplying a wide range wide of information: the type of current (alternating or direct), the typology of the load to be isolated (resistive, mixed or rather resistive and weakly inductive, mixed or rather resistive and highly inductive) and, finally, the manoeuvre frequency (infrequent or frequent).

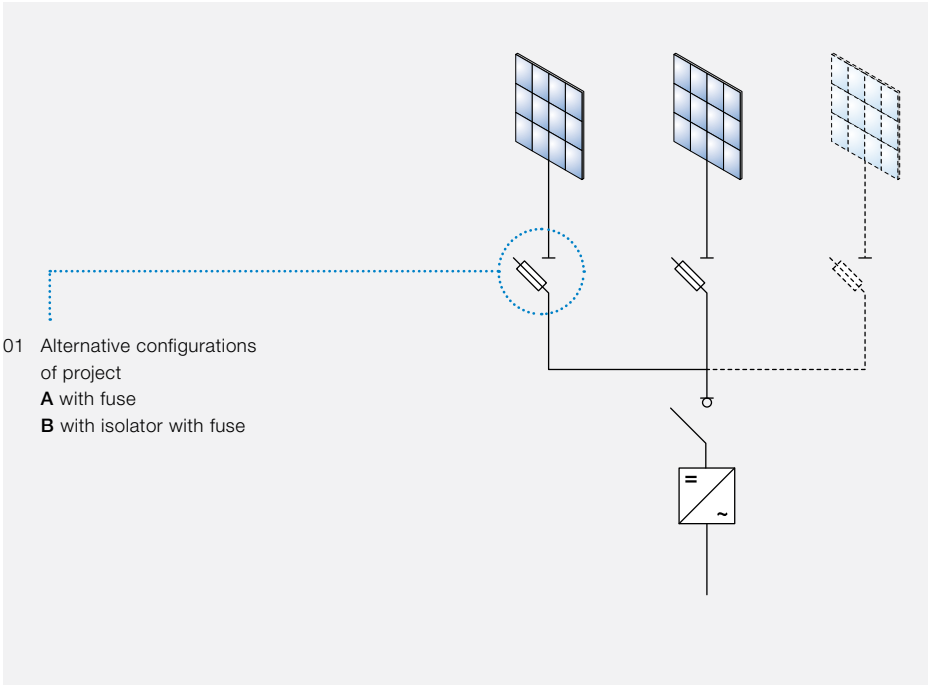
The choice of the most suitable isolator cannot, however, disregard a considered appraisal connected to economic aspects: the cost of the disconnection and the cost of the system being down.

We shall carefully evaluate the following two alternative configurations of the project taking, as an example, a photovoltaic system of N strings, an application in which the return of the investment is directly correlated to the hours of operation of the system itself (figure 01).

Let us consider only the disconnection of the line on the direct current side of the system. Keeping in mind the legal obligations, it will be necessary to isolate the system upstream to ensure

01

01 Project configurations



01 Alternative configurations of project
A with fuse
B with isolator with fuse

Plant values				
Number of strings	N°.	10		
String instant power	Pi	2.1	kW	
Plant operating time	T	1,800	h/year	225 days/year
Plant down time	Tb	24	h/year	

Note: The isolator transitory is negligible for the purposes of the system productivity

Calculation for a year of activity				
Theoretic expected power	E	37,800	kWh/year	
Configuration A expected energy	E_{b1}	37,296	kWh/year	
Configuration B expected energy	E_{b2}	37,750	kWh/year	
% power lost for configuration A		-1.33%		
% power lost for configuration B		-0.13%		
Delta configuration B vs configuration A		1.20%		

Note: A = configuration with fuse
B = configuration with isolator and fuse

Table 03

safe maintenance works: in this case, however, the isolator alone is insufficient because it is necessary to carry out the manoeuvre, meaning the opening of the device contacts, under load. It is, therefore, necessary to select a circuit breaker of at least DC-21B utilization category.

At this point the disconnection is guaranteed but the technical solution cannot be considered acceptable yet because it would mean the system would be completely stopped at each maintenance operation. It is also necessary to provide an isolator at the level of each string to allow local maintenance and guarantee operational continuity to all the remaining strings in parallel.

In this case, the provision of a device of utilization category DC-21B or above will not be binding since we have the possibility of carrying out the disconnection under load through the general isolator and subsequently opening the protected device of the string. Closing the general isolator again will place the entire system under voltage except the string involved in the failure.

Let us assess the net benefits which are obtained by installing isolators at string level with a numeric example (table 03).

It can be seen immediately how configuration B assures over 1.2% of the extra productivity at each maintenance which can be immediately translated into economic terms. Furthermore, the net benefit of this type of configuration is directly proportional to the number of strings (or the number of panels for each string).

Glossary

Disconnection
Operation that allows voltage to be removed from a system or one of its parts, allowing people to operate on the active parts in total safety.

Switch
Mechanical device that allows determined currents in conditions of normal use or temporary overload to be conducted or interrupted; it does not guarantee the electric disconnection of the circuit in open position.

Isolator
Mechanical switching device which, in open position, satisfies the prescriptions specified for the disconnecting function by International Standard EN 60947-3.

Switch disconnector
Isolator which allows switching under load.

Utilization category
Precisely defines the characteristics of the isolator and restricts its use.

Sizing the neutral conductor in occurrence of harmonics

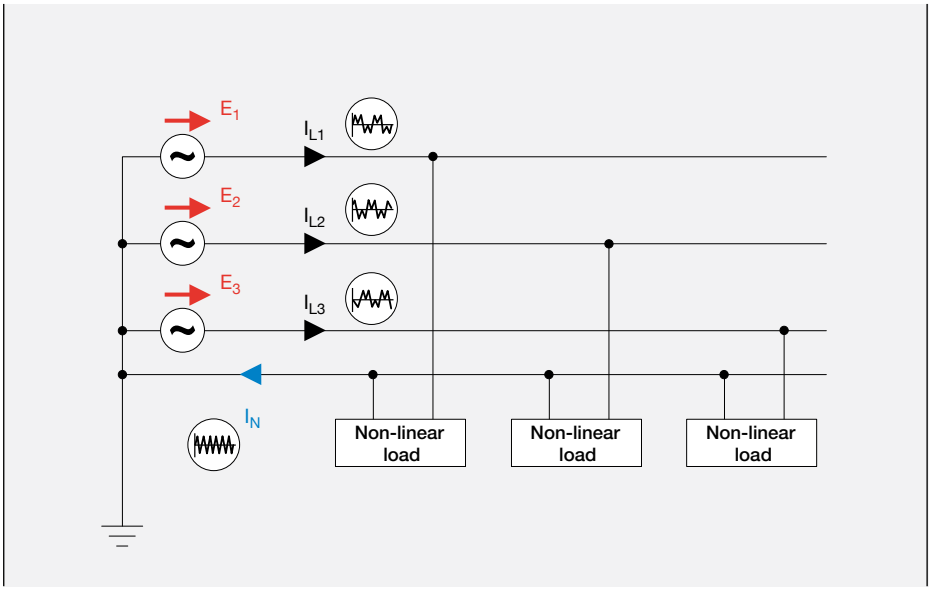
Claudio Amadori: *R&D - LP Division*

As known, the presence of non-linear current creates harmonic currents in the line conductors[1)]:

$$I_L = \sqrt{I_1^2 + I_3^2 + I_5^2 + \ldots}\ .$$

In three-phase circuits with neutral, the third harmonic and the odd multiples of three add arithmetically in the neutral conductor and do not delete each other (i.e. homopolar harmonics: the third, ninth, fifteenth,….). In the case of balanced loads on the three phases, the current that flows through the neutral conductor is given by the formula:

$$I_N = 3 \times \sqrt{I_3^2 + I_9^2 + I_{15}^2 + \ldots}\ .$$



Neutral current in the case of non-linear balanced loads

The most significant homopolar harmonic is normally the third, while the others can be neglected. The situation becomes more complicated if the loads are unbalanced, since the unbalance current's contribution adds to the neutral current while the contribution of the homopolar harmonics diminishes.

Besides assessing the neutral current, another aspect to consider is the reduced capacity of the conductors (line and neutral) owing to heating due to the Joule effect of the neutral conductor itself. In the absence of harmonics, this latter is either not loaded or is compensated by a corresponding current reduction of at least one phase. The conductor capacities given in the IEC 60364-5-52 tables refer to two or three conductors loaded per circuit but not four and must therefore be corrected with a ≤ 1 k factor.

Generally speaking, it is rather complicated to describe all these aspects in detail. Certain simplified rules given in the current edition of standard IEC 60364-5-52, are able to deal with the more widespread

cases. There are three main situtions, depending on the homopolar harmonic factor with respect to the fundamental.

Case 1. The homopolar harmonic factor is no more than 15% of the fundamental (harmonics either absent or negligible).

If the loads are fairly balanced, the current on the neutral conductor will not exceed $0.45 \times I_B$, since I_B is the usage current of the phases[2]. The neutral provides a limited contribution towards circuit heating.

In the presence of the following conditions:
- line conductor section at least 16 mm²,
- load substantially balanced on the three phases,

the section of the neutral conductor can be reduced down to a minimum 16 mm² [3].

However, when the section of the neutral conductor is reduced, the Standard requires the current on the neutral to be measured so as to protect against overcurrent, with a tripping current suited to the section itself.
Neutral protection can only be omitted when the maximum current is clearly less than the capacity (e.g. if the loads supplied between each phase and the neutral are negligible).

Usually, the neutral section used is half that of the line.
In this case, total heating of the circuit does not exceed 113% of total heating in the absence of harmonics[4], without a significant decrease in the current carrying capacity of the conductors.

Case 2. The homopolar harmonic factor is between 15% and 33% of the fundamental (a typical case is fluorescent or gas discharge lamps).

The neutral current is more or less the same as the line current I_B. In this case, the section of the neutral conductor can never be less than that of the line conductor.

[1] Consult "Detection of harmonics and neutral overload" in Day by DIN 3|11.

[2] Since the line current is $I_B = \sqrt{I_1^2 + (I_{3\%} \times I_1)^2 + \dots}$, if the third harmonic $I_{3\%}$ is small, one can assume $I_N \simeq 3 \times I_{3\%} \times I_B$.

[3] We refer to copper conductors. If they are made of aluminium, consider a 25 mm² section instead of 16 mm² here, and in the following text.

[4] In the presence of a third harmonic of 15% of the fundamental, the total thermal dissipation of the conductors is given by $3 \times I_B^2 + 2 \times (0{,}45 \times I_B)^2$ which is 13% more than dissipation in the absence of harmonics $(3 \times I_B^2)$.

[5] In effect $4\times(0,86\times I_B)^2 = 3\times I_B^2$.

[6] There is an alternative method for single-core cables. Considering, from a thermal point of view, the bundle of four loaded cables as though they were two circuits side by side, apply coefficient k = 0.8 to the current-carrying capacity envisaged for circuits with two loaded conductors (0.8 is the k_2 reduction coefficient given for groups of two circuits); the result is rather higher current-carrying capacities.

[7] The formula $I_N = 3\times I_{3\%}\times I_B$ can be used in the case of balanced loads and negligible harmonics, and can result in smaller sections.

[8] Only the current-carrying capacities of the cables are considered in the examples and not other aspects, like voltage drops and thermal stress in the case of short circuits.

ANR panel-mounted network analyzer, ideal for monitoring voltage and current signals and relative harmonic contributions thanks to measurement of total harmonic distortion THD.

However, thermal dissipation of the neutral conductor is no longer negligible and the reduction in the current-carrying capacity of the conductors must be taken into account by means of a correction coefficient k. Four conductors with the same section routed side by side that convey the same current flow, produce the same quantity of heat as three conductors with the same section, if the current is decreased by factor 0.86[5]. Thus k = 0.86 is the factor by which the current-carrying capacity with three loaded conductors must be multiplied to obtain the current-carrying capacity with four loaded conductors[6].

Measurement of neutral conductor current is not explicitly requested for the purposes of protection against overload. However, the neutral current must be measured when it could exceed the line current (e.g. non-negligible presence of homopolar harmonics beyond the third). Protection against overload can be achieved with a rated current device I_n having taken into account the reduced current-carrying capacity of the conductors: $I_n \le k\times I_Z$.

Case 3. The homopolar harmonic factor exceeds 33% of the fundamental (this, for example, is the case of feeders for computer equipment and phase cutting regulators).

In this case, the neutral current can exceed the line current and, in theory, the section of the neutral conductor should be larger than that of the line conductor. This should be established on the basis of the neutral current which, according to standard in the absence of other information is conventionally considered to be $I_N = 1{,}45\times I_B$ [7]. However, it is usual practice to use the same section for the line conductors, which will therefore be oversized.

To take into account the k correction of the current-carrying capacity of the cables owing to the effect of four loaded conductors instead of three, consider the following matters in relation to the third harmonic factor:

– correction coefficient k = 0.86 is applied to the current-carrying capacity I_Z with three loaded conductors if the third harmonic factor is more than 33% but less than 45%, i.e. it must be $1.45\times I_B \le 0.86\times I_Z$.
– on the other hand, if the third harmonic factor is more than 45%, the correction coefficient is not applied to the current-carrying capacity I_Z since the three line conductors, which have the same section as the neutral conductor, are sufficiently oversized and thermal compensation is allowed between the line and neutral conductors (k=1). Thus, it is sufficient for it to be $1.45\times I_B \le I_Z$ where I_Z is again the current-carrying capacity of the cable with three loaded conductors.

To ensure protection against overload, the neutral current must also be measured as it is greater than the line current, and the rated current I_n of the protection device must be sufficient to ensure that $I_n \le k\times I_Z$.

Examples

1) Supposing that the line current I_B of a circuit is 24 A with 20% third harmonic factor.

If a four-pole cable with PVC sheath and four conductors of equal section routed in a tube built into a wall is used, reference should be made to the corresponding current-carrying capacity with three loaded conductors multiplied by 0.86. The 6 mm² section is sufficient because the 24.9 A current-carrying capacity is correct (0.86×29 A)[8]. However, it may be necessary to opt for the 10 mm² section with a correct current-carrying capacity of 33.5 A (0.86×39 A)[8] in order to use a circuit breaker with I_n = 32 A for protection against overload.

2) Supposing that the line current I_B of a circuit is 24 A with 40% third harmonic factor.

Sizing should now be based on 34.8 A estimated neutral current (1.45×24 A).

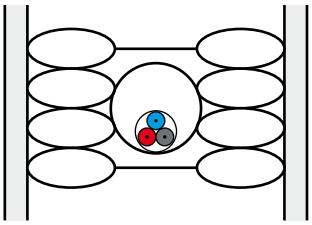
If a four-pole cable with PVC sheath routed in a tube built into a wall is used, reference is made to the corresponding current-carrying capacity multiplied by k=0.86. A 10 mm² section cable with 33.5 A correct current-carrying capacity (0.86×39 A) is insufficient, thus the 16 mm² section (44.7 A = 0.86×52 A) must be used.

3) Lastly, supposing that the line current I_B of a circuit is 24 A with 55% third harmonic factor.

The neutral current to consider is still 34.8 A (1.45×24 A). In this case, the cable current carrying-capacity reduction factors are not applied since the three line conductors are fairly oversized and thermally compensate the neutral.

A 10 mm² section is sufficient with a PVC-sheathed multicore cable since the current-carrying capacity is 39 A with three loaded conductors, while a 6 mm² section would be insufficient. However, it may be necessary to use a larger section for sizing overload protection for the neutral.

Multicore cables

Typical installation method	Type of insulation	Number of loaded cond.	Current-carrying capacity (A)							
			Section (mm²)							
			1	1.5	2.5	4	6	10	16	25
 Multi-core cable in conduit in a wall	PVC	2	–	14	18.5	25	32	43	57	75
		3	–	13	17.5	23	29	39	52	68
	XLPE EPR	2	–	18.5	25	33	42	57	76	99
		3	–	16.5	22	30	38	51	68	89

Extract from IEC 60364-5-52

Summary

The cases examined in the text can be outlined in the following table. The information is valid in the following conditions:

- circuits formed by four (or five) conductors in the same material
- section of the neutral conductor never larger than that of the line conductor

Third harmonic factor $I_{3\%}$	Section of neutral conductor	Calculation of minimum section of line conductor
from 0% to 15%	if S_F>16 mm², balanced loads and protected neutral: $S_N \geq 16$ mm²	$I_B \leq I_{Z\ \text{THREE LOADED COND.}}$
	in the other cases: $S_N = S_F$	
from 15% to 33%	S_F	$I_B \leq 0{,}86 \times I_{Z\ \text{THREE LOADED COND.}}$
from 33% to 45%	S_F	$1{,}45 \times I_B \leq 0{,}86 \times I_{Z\ \text{THREE LOADED COND.}}$
over 45%	S_F	$1{,}45 \times I_B \leq I_{Z\ \text{THREE LOADED COND.}}$


Bahn

Always in time with your requirements

D Line: digital time switches range remote synchronization

Valentina Surini: *Product Manager - DIN Rail Products*

The digital time switches are suitable for applications in environments and situations in which you wish to manage the loads with a time dependent programming, flexible enough to foresee or exclude the activation depending on the hour, the day, the week or the month.

ABB D Line series of time switches has its own embedded time reference, a quartz oscillator, that ensures an accuracy of 1 second per day in normal environmental conditions.

There are, however, situations in which the operating accuracy of the time switch is not sufficient, for example in public systems or in panels which are not constantly supervised, where it is not possible to frequently reset the exact hour, but a good time synchronisation is required. Typical example: the bell of a school, the apartment block boiler or the lighting of a monument.

In these cases it is useful to maintain the synchronisation of the time switch through a standard time signal receiving antenna.

Innovations for the radio controlled time switches

A time switch can be radio-controlled, meaning that it is equipped with an antenna that allows it to be synchronised through the reference radio signals issued by special stations.

The antenna model D DCF77 receives radio signal sent from a terrestrial station close to Mainflingen, in Germany (50° 01' N, 09° 00' E), with 50 kW of power.

The transmission has a range of approximately 2.000÷2.500 km, modulating on 77,5 kHz an impulsive signal that contains, in 60 second, the information on time of the following minute. Usually the signal reaches an elevated accuracy, dependent however on electromagnetic noise and variations of the radio propagation conditions. In fact, sometimes it is obscured by atmospheric perturbations and occasionally the transmitter is suspended for maintenance or during local storms; the signal is then, therefore, received in a discontinuous manner. Moreover, not all localities can be covered due to shadow zones caused by the presence of some obstacles such as high voltage pylons on the territory, large buildings or disturbances such as the switching on and off of electrical equipment, lightnings, etc., above all in countries which are far from the issuer.

Finally, a large part of the electronic equipment can be the source of such radio frequency disturbances which can completely inhibit the reception of the signal.

When receivers are used, therefore, the orientation of the receiver must be taken into consideration and the installation zone removed from any electronic equipment. The DCF77 signal is definitely present in Italy, France, Germany, Spain, Poland and has been successfully tested in England with a good reception.

For those who wish, instead, a global cover without risks of signal interruption,

Glossary

Radio controlled timer
A time switch can be radio-controlled, meaning that it is equipped with an antenna that allows it to be synchronised through the reference radio signals issued by special stations.

Antenna DCF77
Receives the DCF77 radio synchronisation signal transmitted from the atomic clock installed at Mainflingen, near Frankfurt (Germany).

Antenna GPS
Receives the radio time signal from the Global Positioning System (GPS), positioning system on satelllite with global and continuous cover.

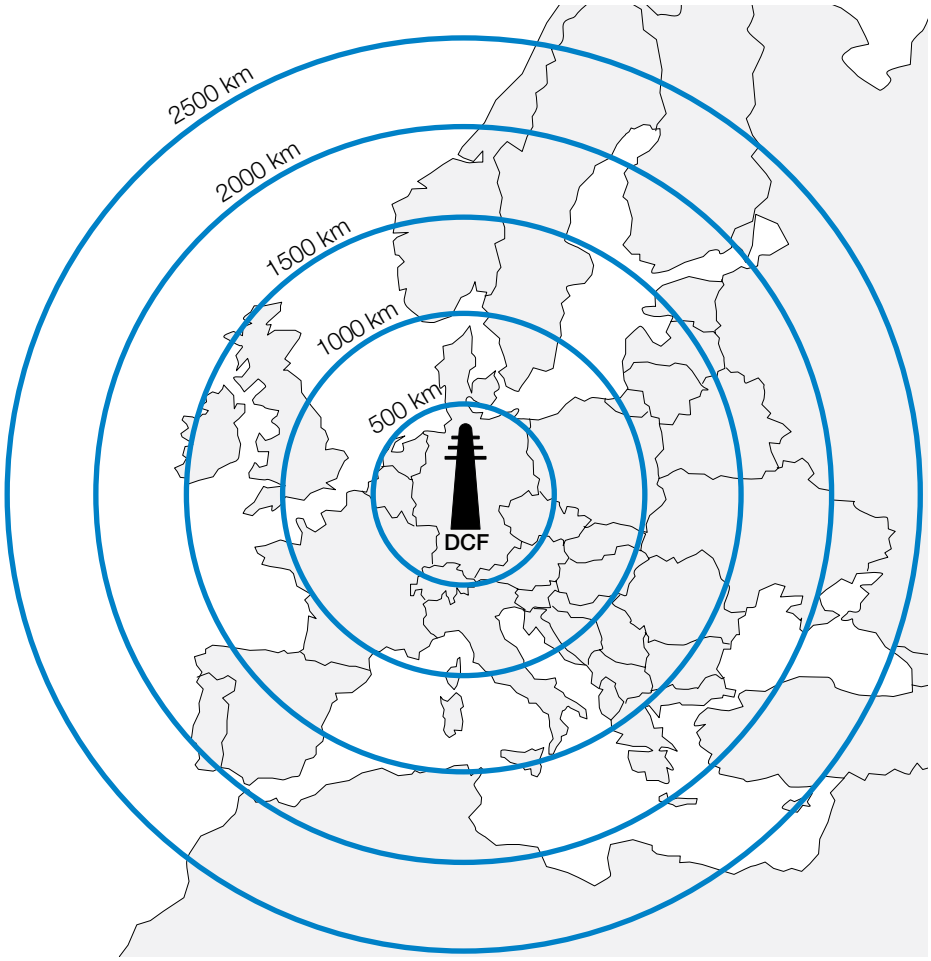
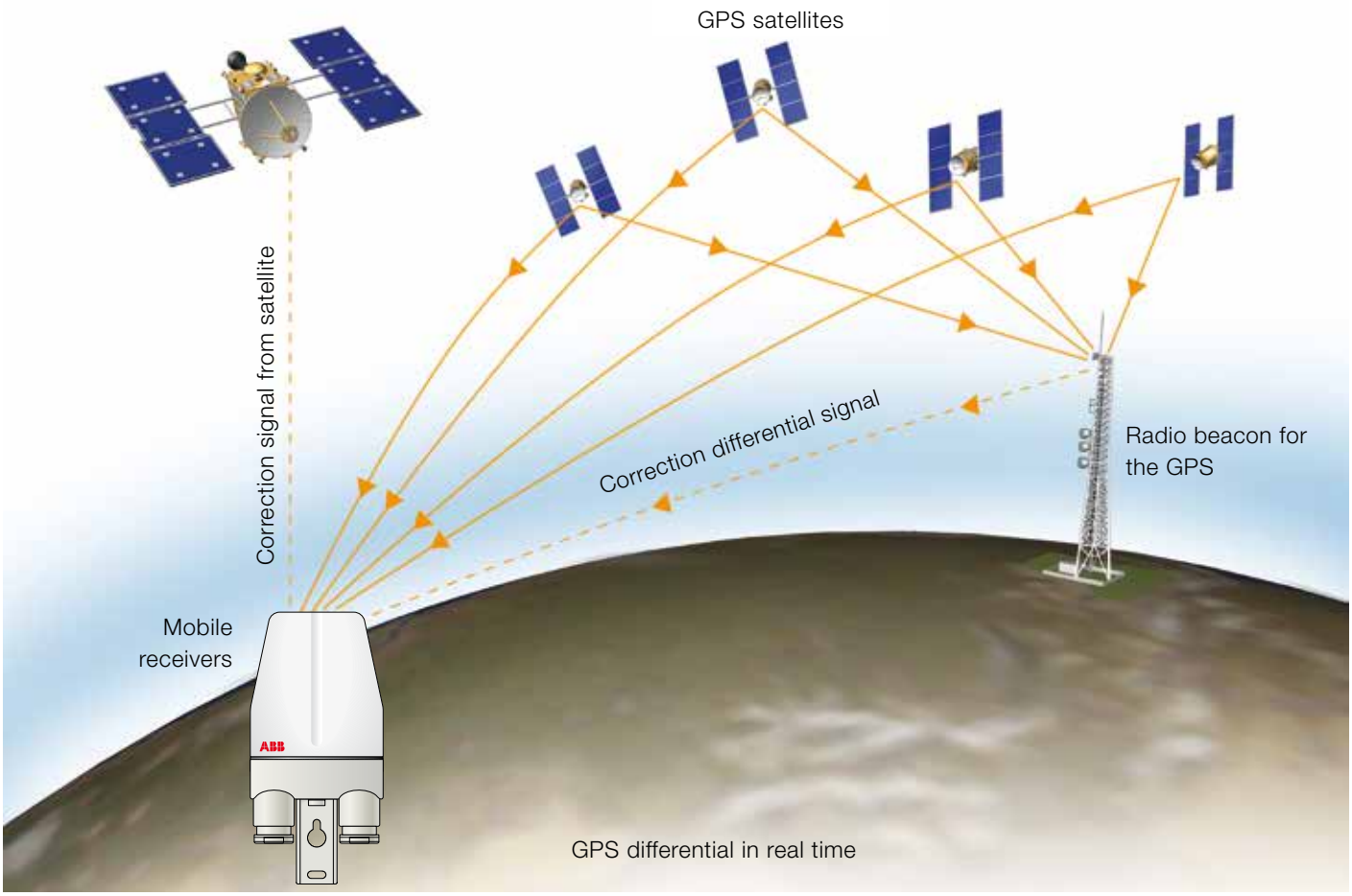


ABB proposes the new D GPS antenna, which uses the signal coming from the Global Positioning System and offers a more precise value compared to the terrestrial transmissions.

The GPS system combines the time supplied from various atomic clocks installed on the edge of system satellites, whilst a net of terrestrial stations determines and corrects the errors, compensating the prorogation delays.

The GPS signal is almost disturbance proof, thanks to the high transmission frequency of 1,575 GHz. The incoming data from at least 4 satellites are used for the calculation of the 3D position. On average 7÷9 satellites are visible if the antenna has a clear view towards the horizion. This means that the time information is available 100%. Even if half of the horizon is covered, availability reaches 90÷95%.

Thanks to the absence of disturbances, the extreme precision, the complete cover and the rapid and diffused worldwide development, in the next few years the GPS will completely replace the DCF77 signal in all industrial fields. The GPS system could not, moreover, be removed without being adequately replaced within the next 20÷30 years.



Main differences between the DCF77 and GPS signals

	GPS	DCF77
Diffusion	worldwide	in a range of 2500 km from Frankfurt
Immunity to interferences	The high frequency and the phase modulation of the signal ensure high immunity to disturbances due to electronic noise.	Due to the low frequency and the amplitude modulation of the signal the DCF77 is susceptible to many interferences, such as atmospheric perturbations, magnetic and electric fields.
Accuracy	Short term good accuracy at ±1 µs	Short term scarse accuracy, usually between ±5÷±25 ms

Valentina Surini
Product Manager
DIN Rail Products

GPS antenna application

The standard application, for which the GPS antenna is used together with the digital clock, is the synchronisation of the time of one or more time switches installed in various zones, often not supervised.
A typical example can be given by the various subsidiaries of a bank that require, for example, the relative lighting systems to be switched on at the same time, or the company that has to sound the siren at the same moment in its various yards, etc. In other words, where there exists the necessity of commutating one or more relays at the same precise moment, even if these are installed in various distant places, thousands of kilometres one from the other.

Photovoltaic standards: a protection always more complete

The safety of SPDs for photovoltaics and ABB commitment

Bertrand Berges: *Product Marketing Manager - DIN Rail Products*

One of the requirements that characterises any SPD is safety. The SPD, once reached the end of its operating life, usually after tens or hundreds of discharges, will not burn or damage other devices present in the panel. For this, the manufacturers usually provide SPD characterised by an end-of-life in short circuit - typically all those based on varistor technology - with a backup protection, fuse or circuit breaker. The issue becomes even more important on the direct current side of a photovoltaic system, for two main reasons: the short circuit current is close to the rated current and the high voltage in direct current requires suitable and coordinated short circuit interruption devices.

Finally a guide for photovoltaic SPD

Till now, the only technical reference for safety protection of the SPD in photovoltaic application was the UTE C 15-712 technical guide on photovoltaic installations.

The new UTE[(1)] C 61-740-51, then followed by the EN50539-11, was applied in 2011, the first guide in the world to introduce surge protection criteria which take into accout the specificity of the photovoltaic generators.

The new standard defines test and safety criteria for surge protective devices used in photovoltaic systems; given their peculiar characteristics of high voltage and low short circuit currents in direct current, it introduces the principle of verifying the behaviour of the end of life of photovoltaic SPD, when a SPD completes its operating effectiveness and endangers the safety of the system.

In order to comply with the UTE standard, the SPDs manufacturer must supply the following information:

- "PV" symbol on the product;
- voltage U_{cpv}, that is maximum continuative voltage in a photovoltaic environment;
- Rated discharge current (I_n)
- maximum discharge or impulse current, I_{imp} or I_{max}, according to the SPD, respectively, of Class 1 or Class 2;
- protection level U_p;
- short circuit whithstands current in direct current I_{scwpv}.

Glossary

SPD
Surge Protective Device, definition of low voltage surge protection according to the International standards.

Type 2 surge protective device
Surge protective device designed to discharge the energy associated with an indirect lightning strike or a manoeuvre on the network. The test parameter is the discharge current with waveshape 8/20 µs (Test Class II).

Nominal discharge current (I_n)
Nominal discharge current for Class II tests. peak current value for SPDs with current wave shape of 8/20µs. Used for SPD preconditioning in the Class I tests.

Protection level U_p
It characterises the ability of the surge protective device to limit the voltage between its terminals in the presence of a surge; the value of the protection level, selected from a list of preferential values, is greater than the highest residual voltages measured in the Test Class I or II.

SPD verified in...photovoltaics!

According to UTE, only the SPD in conformity with the UTE C 61-740-51 guide and which have the performances listed above can be used in photovoltaic systems. Amongst the requirements of the new standard, the manufacturer must verify the end of life behaviour of the SPD photovoltaics and ensure that, in presence of the short circuit current I_{scwpv}, to the voltage U_{cpv}, the SPD does not reach an overtemperature which involves a risk of fire or damage to the equipment.

OVR PV the first in safety, always!

ABB has always promoted attention to the safety of the SPDs of photovoltaic systems. The OVR PV range is specifically designed for the protection of overvoltage in photovoltaic systems, is equipped with an exclusive thermal disconnector with performances in direct current and its technical documentation has always certified the way of protection from end of life short circuit, a long time before these data became required by the CEI 82.25 guide and, subsequently, the UTE.

OVR PV SPDs comply with the requirements of the UTE C 61 740-51 and EN50539-11 standard at the time it was applied.

Note:
1) UTE: l'Union Technique de l'Electricité et de la Communication is the French electrotechnical committee and is a member of the International Electrotechnical commission (IEC) and the European committe of Electrotechnical normalisation (CENELEC).

– Operating principle of the SPD when it has not reached the end of life

At the end of life, opening of the thermal disconnector and ignition of an electric arc in direct current

Extinction of the electric arc with the intervention of the patented device

Bertrand Berges
Product Marketing Manager
DIN Rail Products

OVR PV thermal disconnector

OVR PV photovoltaic surge protective devices contain varistors which are subject to degradation at each electric discharge. After many years of use, their electric resistance reduces considerably and allows a current flow that becomes dangerous. This causes overheating which damages the product. This is called the end of life of the SPD, which must be disconnected from the network supply to prevent the risk of fire. Given the difficulty in opening an electric arc in direct current, ABB has developed and patented a thermal disconnector able to safely disconnect the PV SPD in case of end-of-life.

The operating of the thermal disconnector on the OVR PV is explained in the figure above.

How long is an electric arc?

An electric arc can spark between two electrodes because of the voltage present at their edges. The extinction of the arc is more complex in direct current than in alternating current because the current never crosses zero.

Difference between an electric arc in alternating or direct current, indicative values for a current of 10 A:

	Minimum distance between the electrodes to switch off the arc
400V alternating current	
600V direct current	
1000V direct current	

- Switching off may take place at smaller distances, for example by quickly separating two electrodes.
- The thermal disconnector contained in OVR PV photovoltaic SPDs is able to extinguish the electric arc thanks to the fast opening of the contact and the isolation of the parts with the use of a plastic component in the path of the arc.

Quiz
This product is for...

Sometimes we think that the application of some DIN rail products is obvious but we make mistakes or do not know some of the amazing functions of the products that we use every day. We have prepared a Quiz to have some fun: think and… watch out for the tricks!

1. Command switch 2NA 16A E211-16-20...

	TRUE	FALSE
- Controls the lights working directly on the power circuit of the lights.	☐	☐
- Isolates an electric circuit in an industrial environment	☐	☐
- Isolates an electric circuit in a residential environment	☐	☐

2. The TM15/12 bell transformer allows to...

- Supply a reduced power load in a continuous supply	☐	☐
- Supply an alarm in the bathroom	☐	☐
- Supply the MCB motor command devices	☐	☐

3. The OVR T2 surge protective device...

- Protects against direct strike on the lightning rod on the roof of an house	☐	☐
- Protects against overvoltage caused by electromagnetic fields during atmospheric surges	☐	☐
- Reduces the risk of damages to the system's electric and electronic equipment.	☐	☐

4. The fuse-switch disconnector for photovoltaics E 92/32 PVs...

- Supplies a luminous LED signal when the fuse is blown	☐	☐
- Allows the disconnection of single strings in a photovoltaic system	☐	☐
- May be operated under load up to 1000V d.c.	☐	☐

5. A TW2-10K twilight switch can be used for...

- Switching on the lights when it is dark outside	☐	☐
- Switching on the boiler when it is cold outside	☐	☐
- Lower the blinds or the curtains when the sun is too strong outside	☐	☐

6. To signal a lack of voltage with a clean contact or a black out, the following can be used ...

- A RLV minimum voltage relay	☐	☐
- A digital multimeter with two digital outputs	☐	☐
- A E 259 installation relay	☐	☐
- A E 250 latching relay	☐	☐

The solutions will be published in the next issue of Day by DIN.

Unwanted flickering of new-generation light bulbs.

Causes and solutions for a common problem

Claudio Amadori: *R&D - LP Division*

The use of fluorescent lights, both CFLs and traditional tubes, is increasingly widespread, also due to the progressive phasing out of old-style incandescent bulbs across Europe for energy-efficiency reasons. New-generation light bulbs offer many advantages in terms of reducing power consumption, but they also have a common and widespread problem.

When they are turned off, indeed, these light bulbs can emit a weak intermittent glow, noticeable above all in the dark. Aside from causing disturbance, this unwanted flashing can cause a rapid and significant reduction in the life of fluorescent bulbs. The same issue can also plague the more recently introduced LED bulbs. Apparently incomprehensible, in reality this is an easily explained phenomenon which can be solved by some simple installation measures.

Switches with warning light

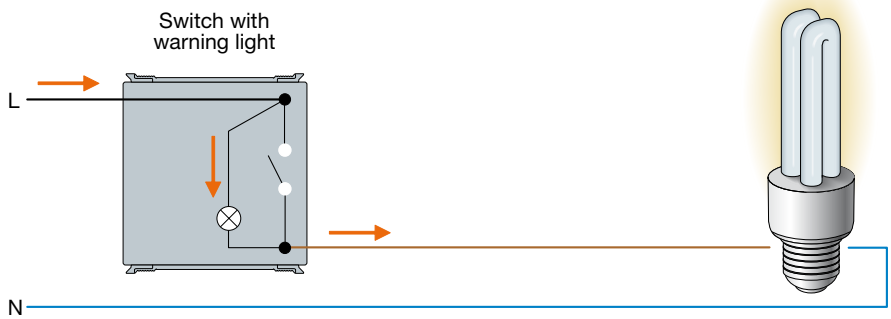
A first case of unwanted flashing can occur when the bulb is fed from a switch fitted with a warning light wired in parallel to the switch itself, and consequently in series with the bulb when the switch is open. These warning lights serve to indicate the location of the switch in the dark.

When the bulb is off, a very small current, just enough to power the warning light, still flows through the bulb. In the case of traditional incandescent bulbs (including halogen), this weak current should not cause any problems, but with fluorescent lights it is enough to charge the capacitors present in the bulb's electronic starter circuit, creating this annoying flashing effect (Figure 01).

The solution is simple. All that is required is to wire the warning light in parallel with the bulb and not in series. To do this it is necessary to bring a neutral conductor into the back-box where the switch is installed as well; this means the warning light will always remain on, but this is not a real problem given its extremely low power draw (Figure 02).

01 The current drawn by the warning light charges the capacitors in the fluorescent bulb's starter circuit, causing it to flash.
02 By connecting the warning light directly between the circuit phase and neutral, the current drawn by the warning light no longer affects the fluorescent bulb and it will no longer flash as a result.

01



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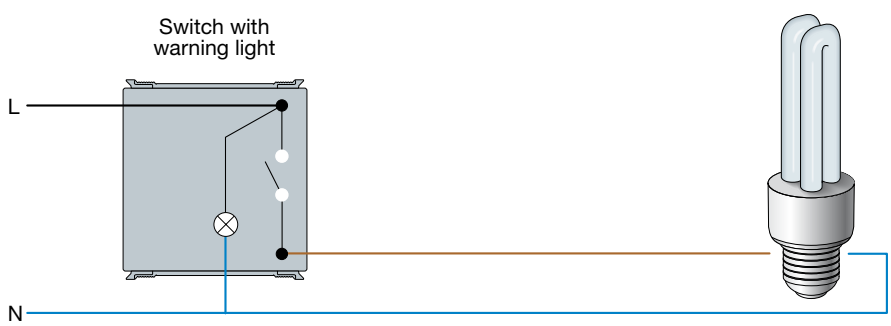


Two-way switches

The other common situation of unwanted flashing is when they are wired via two-way switches, in a typical scheme.

The explanation, in this case, is due to the capacitive currents. When the circuit is open, that is when the bulb should be off, a very weak current flows regardless due to the capacitance between the two switched conductors which form a long capacitor.

The greater the length of the switched conductors and the more they are compressed in the conduit, the more evident the flashing effect will be. This explains why this effect is not always clearly evident: it varies from installation to installation and from bulb to bulb (Figure 03).

The simplest solution is to replace the first two-way switch (the one connected to the power supply) with a reversing (intermediate) switch connected to neutral as shown in the diagram (Figure 04).

The effective capacitance between the switched conductors will still be present, but the weak capacitive current, instead of flowing through the fluorescent bulb, will flow back to neutral due to the lower impedance (as if it were a very weak short circuit).

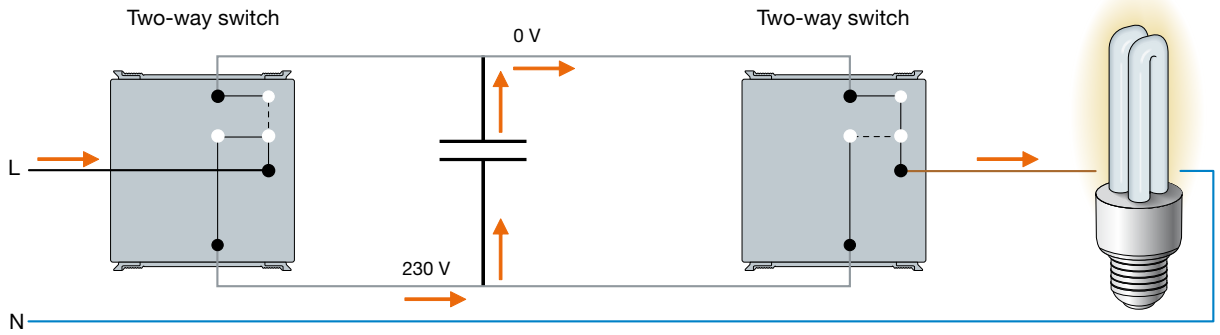
This can extend to three or more switches: instead of using two two-way switches and one or more intermediate switches like in a traditional set-up, only one two-way switch must be used, at the light-bulb end, with intermediate switches in all the other positions.

Alternatively, there is always the possibility to use relay switches: this is the most convenient configuration when many switches are to be used.

03 The capacitive current of the two conductors which make up the control circuit with two two-way switches charges the fluorescent bulb's starter circuit, causing it to flash.

04 Replacing the first two-way switch in the circuit with a reversing (intermediate) switch connected to neutral, the capacitive current between the conductors flows back to neutral, stopping the fluorescent bulb from flashing.

03



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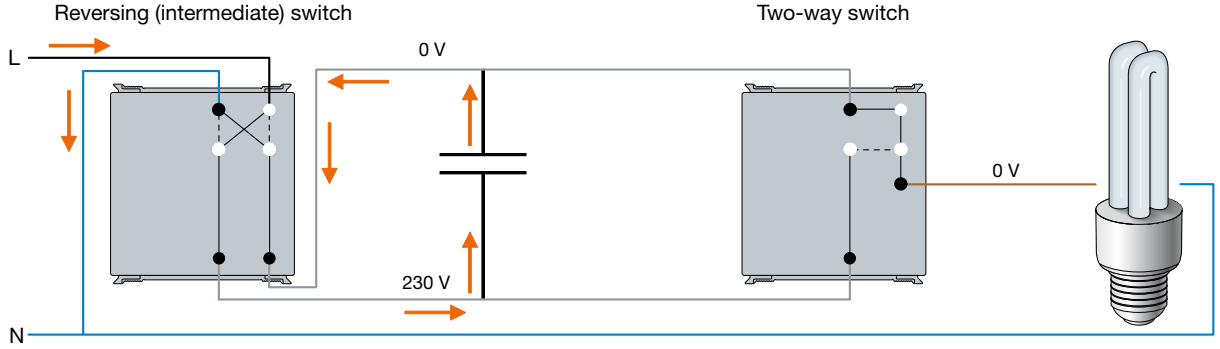


05 When the switch is incorrectly wired to switch the neutral conductor, a capacitive current can be established between the open neutral and another conductor in the system, causing the fluorescent bulb to flash.
06 More rarely, the capacitive current causing the flashing can form between the open conductor from a one-way switch and other live conductors in the system.
07 The solution in this case, too, consists of closing the capacitive current to neutral by replacing the circuit's switch with a two-way switch.

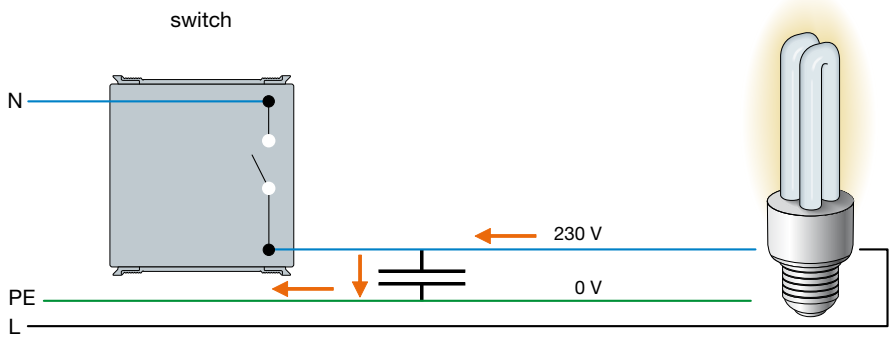
Switched neutral

Another, quite common case, occurs when the switch is incorrectly wired to switch neutral instead of live. The open neutral conductor finds itself at phase potential: capacitive coupling with a protective conductor (or with another, non-interrupted neutral conductor) is enough to cause the bothersome phenomenon (Figure 05). Obviously, the solution is correct installation of the switch to switch the phase conductor, as already required by regulations.

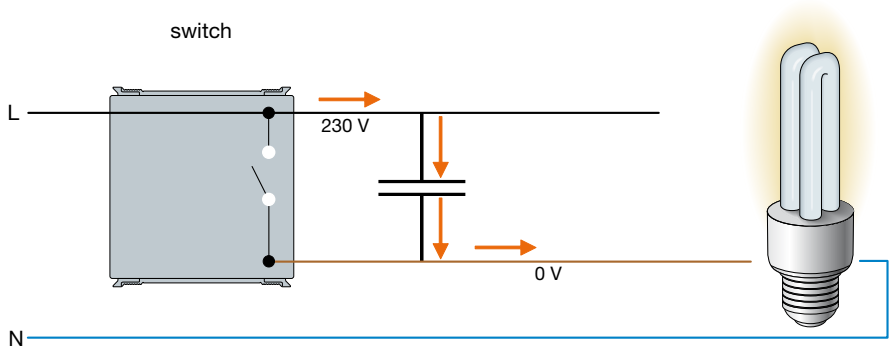
Simple switch

Unwanted flashing can also occur with simple, one-way switches correctly wired to switch the live conductor. The phenomenon is rarer in this case. The explanation consists in the capacitive coupling of the open power conductor sharing a conduit with an uninterrupted phase conductor (Figure 06). The solution, which should now be clear, is to replace the switch with a two-way switch connected to neutral (Figure 07).

05



06



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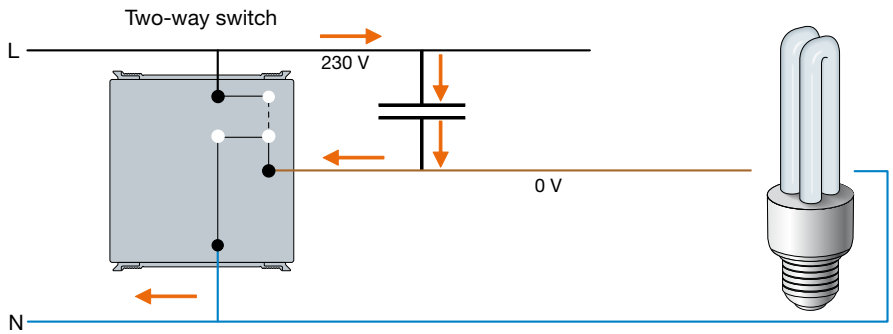

Mylos Integrated System

ABB Italy now offers Mylos, a new Home&Building Automation integrated system concept developed to satisfy your needs, designed to be faster to install, with simple, flexible technology and attractive design which reaches out to all customers. For example, the devices can be illuminated simply by LED. When lit, the LED creates a fade-in effect which adapts itself harmoniously with the plate design. When off, it is completely invisible. The design is minimalistic, but the devices know how to make themselves stand out.

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Versatility, efficiency and a unique, elegant, unmistakable design. Mistral65 is ABB's new, pioneering series of consumer units with IP65 protection class. The range includes versions with fully reversible blank, or transparent doors in the exclusive petrol blue colour that open through 180 degrees. The spacious interior is easy to access and has been designed to speed up the wiring operations plus total integration among modular circuit-breakers of the DIN rail, moulded-case and switchgear front type. Mistral65 includes a wide range of sizes, with 4 to 72 modules, and is thus ideal both for residential and industrial installations.

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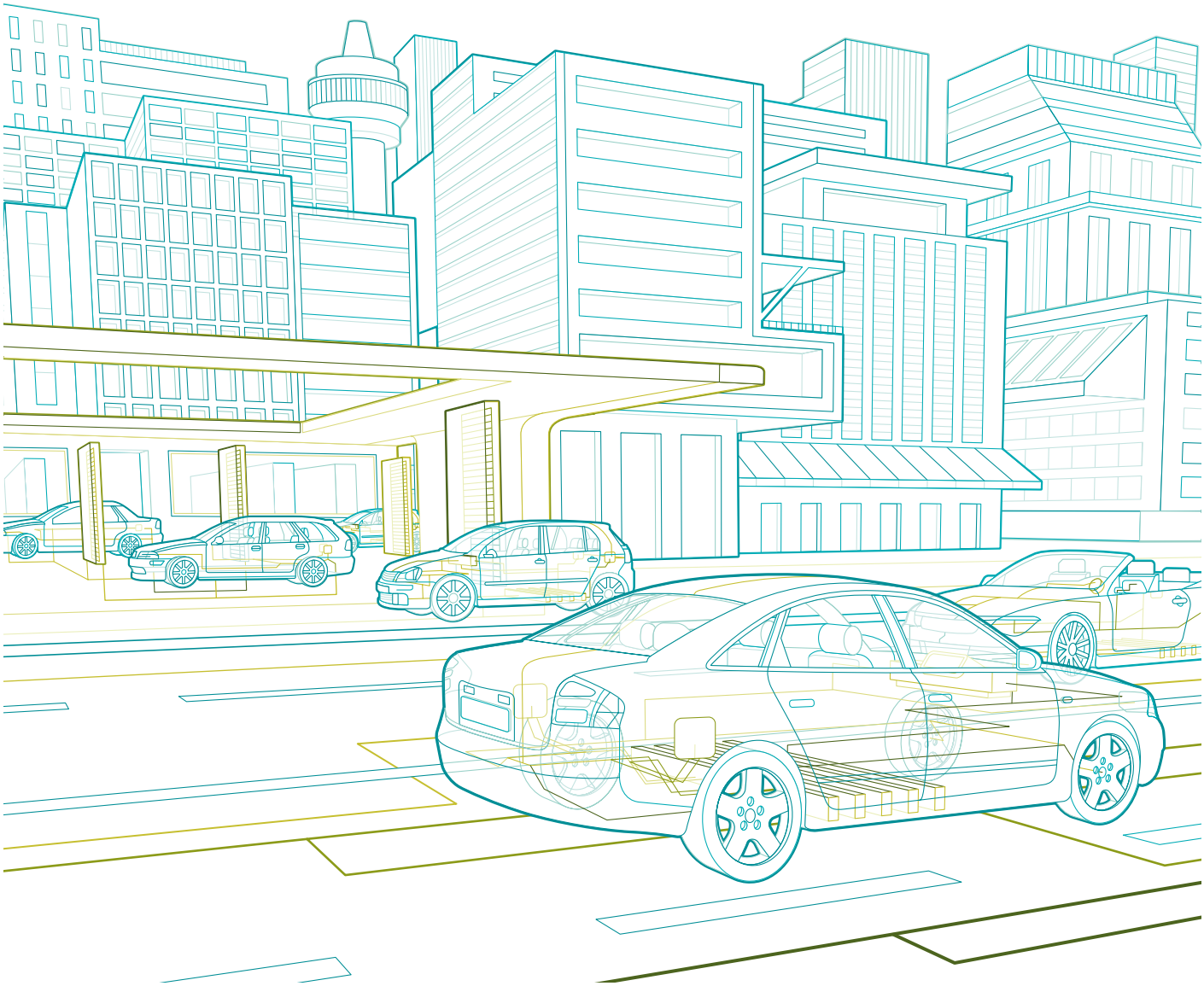
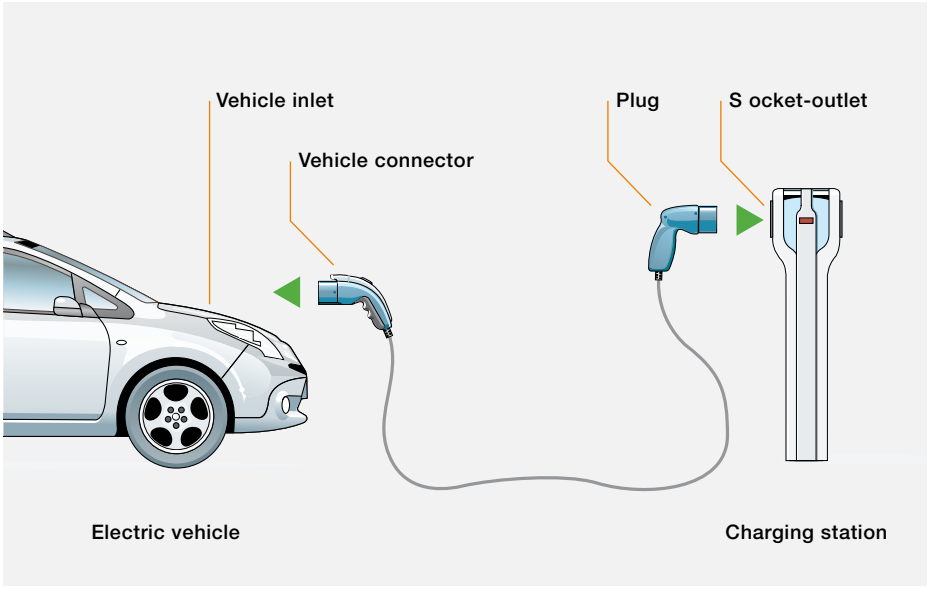


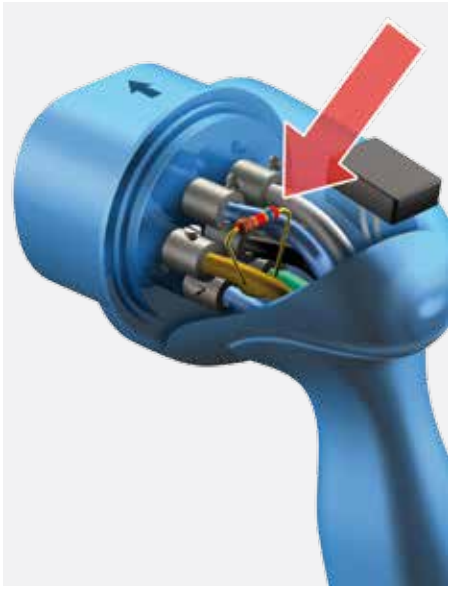
The truth about eMobility

Plugs and socket-outlets for charging electric vehicles. Many models, minimum incompatibility.

Claudio Amadori: *R&D - LP Division*



01



02

Some electric vehicles – mainly scooters and mini vehicles - can be charged using a common electrical plug. The charging power available through this type of connector is limited to quite modest values. As such, different types of dedicated connectors have been developed for charging electric vehicles, suitable not only for higher power levels when charging, but also with additional protection and regulation features required by the most modern and safest charging system (charging modes 3 and 4).[1)]

The wide variety of charging plugs and systems, often poorly presented overall, can create confusion in those who are approaching the world of electric vehicles for the first time. In reality, the situation is a lot less complicated than it might seem, and the risks of not being able to charge due to incompatibility are small. A summary of the different charging systems which exist and their connectors is given below, with particular reference to those used in Europe.

Alternating current charging systems (mode 3 “PWM”)

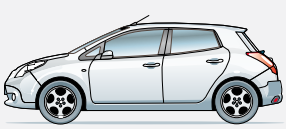
This is the most widespread charging system, used by almost all modern electric vehicles (with the exception of essentially only the light vehicles). It is based on the “PWM” protocol defined in IEC/EN 61851-1/Annex A, which handles the dialogue between the vehicle and the fixed charging system. This system uses three different forms of connector, all defined in IEC 62196-2: type 1, type 2 and type 3C. One of these (type 2), is available both as fixed connector on the vehicle (inlet) and fixed connector on the charging column (socket-outlet). The other two are used only on the vehicle side (type 1), or only on the charging station side (type 3C). Figure 01 gives the terminology for the different connector types.

Due to connecting cables with very different cross sections using the same connectors, IEC/EN 61851-1/Annex A specifies a resistor be inserted on the connectors, between an auxiliary contact and the protective conductor (power indicator resistor), whose value identifies the cable capacity and allows the charging station and the vehicle to not generate overloads (see figure 02).

Aside from charging stations fitted with socket-oulets, there are also those with permanently connected connecting cables with mobile connectors for the vehicle (a solution which is always used for quick charging). In private environments, there is also the possibility to recharge using a normal socket (domestic or industrial), using a cable supplied with an integrated protection device (mode 2), but in this case the charging power available is limited.

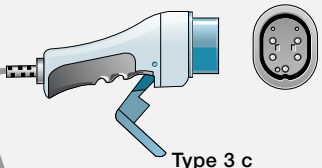
01 Terminology for the different connectors for electric vehicle charging
02 Resistor indicating the cable capacity

1) For an introduction to electric vehicles and charging modes, see “The new age of electric mobility” in Day by Din 1|12.

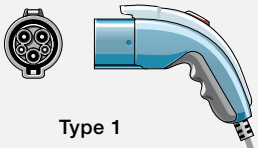


Charging station

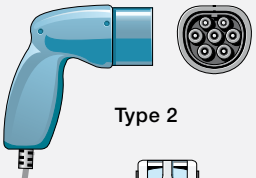
Vehicle side			
Connector type	Voltage	Max. current	Max. power
Type 1	230 Vc.a.	32 A	7,4 kW
Type 2	230/400 Vc.a.	70 A (single-phase) 63 A	43 kW



Type 3 c



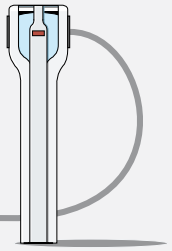
Type 1



Type 2

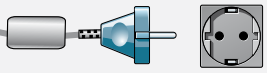
Type 2

connection cable



Tethered cable

Charging station side			
Connector type	Voltage	Max. current	Max. power
Type 2	230/400 Vc.a.	32 A	22 kW
Type 3c	230/400 Vc.a.	32 A	22 kW
Tethered cable	230/400 Vc.a.	70 A (single-phase) 63 A	43 kW
domestic or industrial	230/240 Vc.a.	depending on the socket-outlet	



domestic or industrial

03

The different connections possible for mode 3 with PWM between the fixed infrastructure and electric vehicle are summarised in figure 03.[2)]

Type 1 connector (see figure 04a) as per IEC 62196-2 (also corresponding to SAE J1772). It is used only on the vehicle side. This is today one of the most common electric vehicle connectors in the world. The type 1 connector is suitable for charging at 32 A/230 V (single-phase), corresponding to 7.4 kW of maximum charge power[3)]. It has five poles: two for the active conductors, one for the earth, and two auxiliary for control functions.

Type 2 connector (see figure 04b) as per IEC 62196-2 (corresponding to VDE-AR-E 2623-2-2). This connector is in use both on charging stations and on vehicles. It is also, unlike the type 1 connector, usable with three-phase 400 V, particularly suitable in Europe, where three-phase power is widespread (this connector therefore has seven contacts in total).

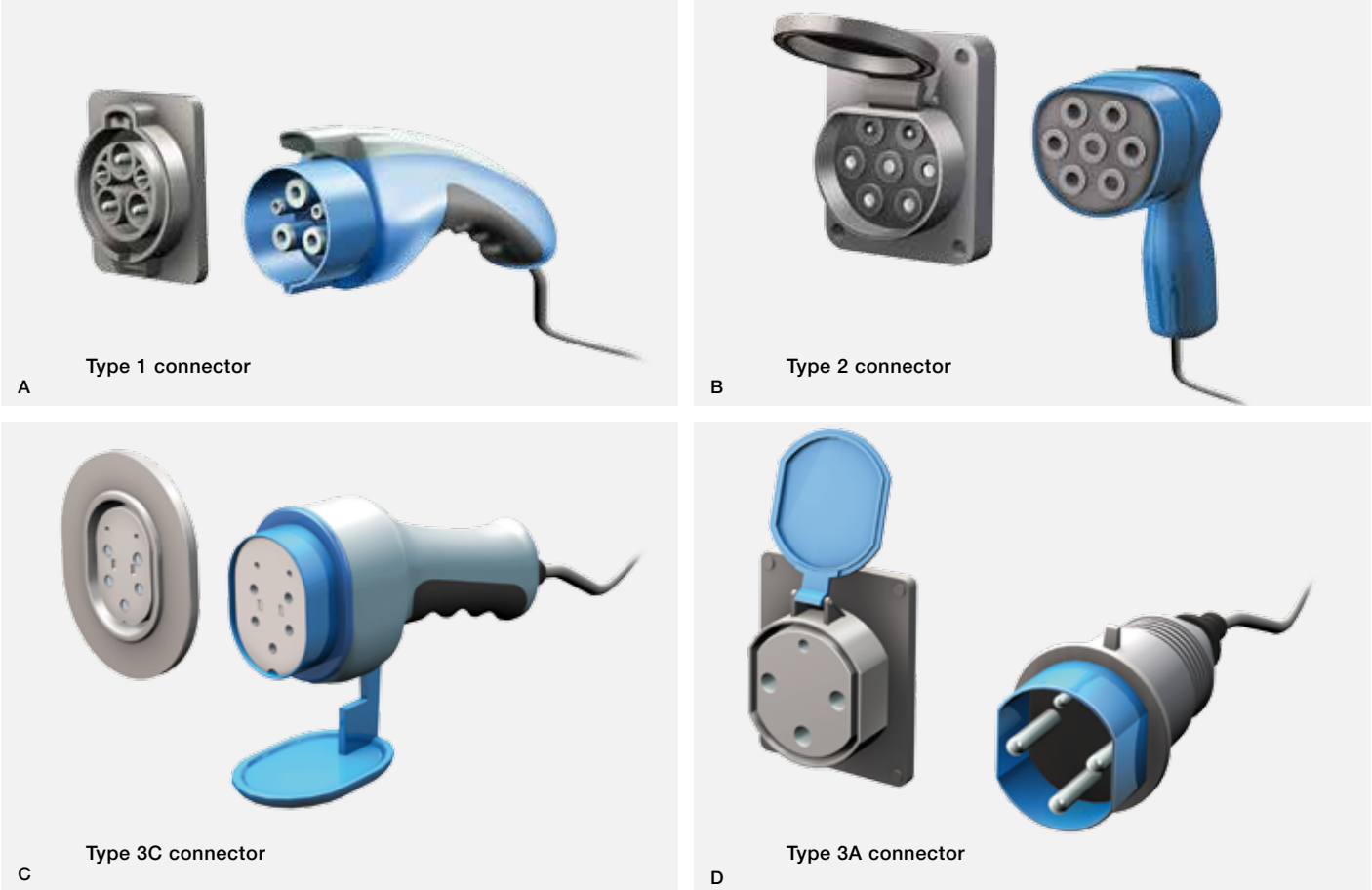
The type 2 connector allows relatively high charging power to be obtained: up to 43 kW with a permanently attached cable (63 A/400 V “fast AC”), up to 22 kW with a removable cable (32 A/400 V)[4)]. The type 2 connector (together with its combo-2 extension, which is described later) is the one officially recommended by the ACEA[5)]. The type 2 connector is widely used across Europe as a socket-outlet on charging stations, with the exception of France. To end uncertainty in the market, on 24th January 2013 the European Commission announced the use of the type 2 plug as the common standard for the whole of Europe. As regards the vehicles, they are progressively moving to type 2 connectors on new models as they are introduced on the European market.

2) The charging power given indicates the maximum possible with the corresponding type of connection. The actual charging power depends on the characteristics of the vehicle and charging station, the grid availability etc.

3) In the United States type 1 connectors are also used for 80/240 V (19.2 kW).

4) The type 2 connector, with a different configuration of the contacts, can also be used for DC charging in compatible vehicles (“DC over type 2”). This, however, is a currently unused functionality: passing from AC to DC will happen automatically and will be transparent to the user

5) European Automobile Manufacturers’ Association. Position and Recommendations for the standardisation of the charging of electrically chargeable vehicles, ACEA position paper, 4 May 2012, Brussels.



A Type 1 connector

B Type 2 connector

C Type 3C connector

D Type 3A connector

04

Type 3C connector (see figure 04c) as per IEC 62196-2. In use as socket-outlet fr charging stations mainly in France. Its characteristics are similar to those of the type 2 socket, but it is mechanically incompatible with this.

The three connectors, type 1, 2 and 3C, even though they are mechanically different, are mutually interoperable and can be combined on connection cables, as they use the same communications protocol between the charging column and the vehicle, specified in IEC/EN 61851-1/ Annex A[6].

The contemporary use of the two different connectors, type 1 and type 2, on vehicles, means that public charging stations which will handle different vehicles must not use fixed cables and instead use socket-outlets which each user will connect their own cable to.

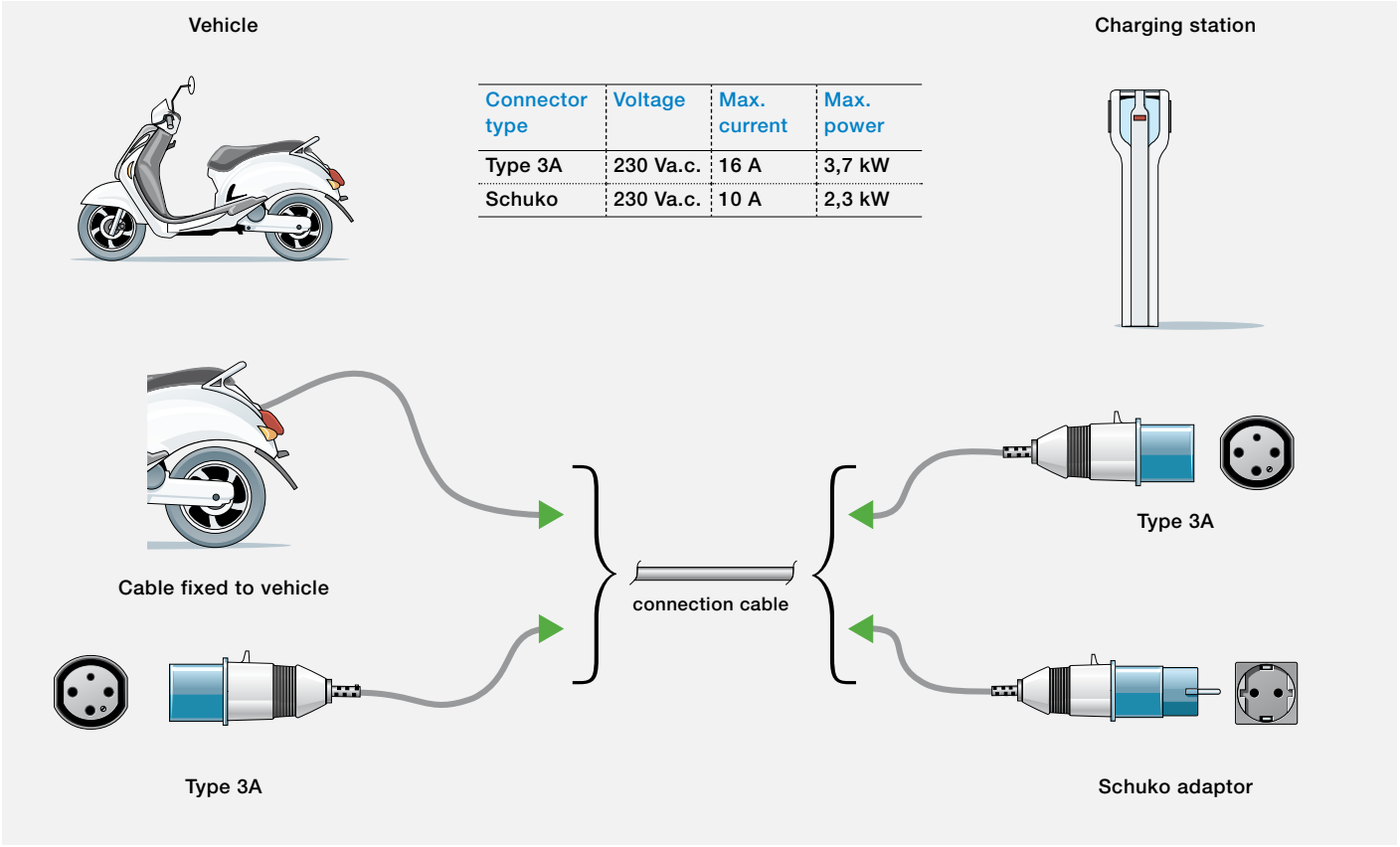
Home charging stations, on the other hand, will be able to use tethered cables fitted with the appropriate mobile connector for the vehicle (if the user changes the vehicle, it will not be a problem for a technician to swap out the cable).

In terms of the difference between the two types of socket-outlets which can be found in charging stations, type 2 and type 3C, we are waiting for the European unification, leaving us in a similar situation to domestic sockets, where various different plug formats coexist (British, Schuko, French, Italian...). It is therefore a good idea to find out about the type of socket-outlets used in the charging stations you intend to use and, if necessary, obtain a second connecting cable (there are also charging stations equipped with both type 2 and type 3C socket-outlets).

03 The different possible connector combinations for mode 3 “PWM” charging

04 Fixed and mobile connectors
A: Type 1; B Type 2; C Type 3C; D: Type 3A

[6] There are therefore four possible combinations of connectors on removable connection cables: type 1-type 2, type 2-type 2, type 1-type 3C, type 2-type 3C. In the case of vehicles fitted with type 1 connectors, charging can obviously only be single phase, even if the charging station is equipped for three-phase charging.



05

05 Simplified mode 3 charging for light vehicles
06 Charging of vehicles fitted with CHAdeMO system and Type 1 connectors
07 CHAdeMO system fixed and mobile connectors (JEVS G105)

Systems for AC charging of light vehicles (simplified mode 3 without PWM)

A system used i mainly in Italy for low-power charging of light vehicles (scooters and mini vehicles) is simplified mode 3 without PWM[7], based on plug type 3A. This is a 3-pole 16 A/250 V single-phase connector with a single pilot contact. In the most common case, vehicles fitted with a type 3A plug (see figure 04d) have the connection cable fixed permanently to them and housed in a dedicated compartment when not in use. Vehicles supplied with this plug can also be charged by a domestic socket using an adaptor normally supplied with the vehicle (charging mode 1). On the contrary, vehicles fitted only with domestic plug, need a modification performed by a technician in order to be able to use public charging points with type 3A sockets (See figure 05).

Systems for fast DC charging of vehicles (mode 4)

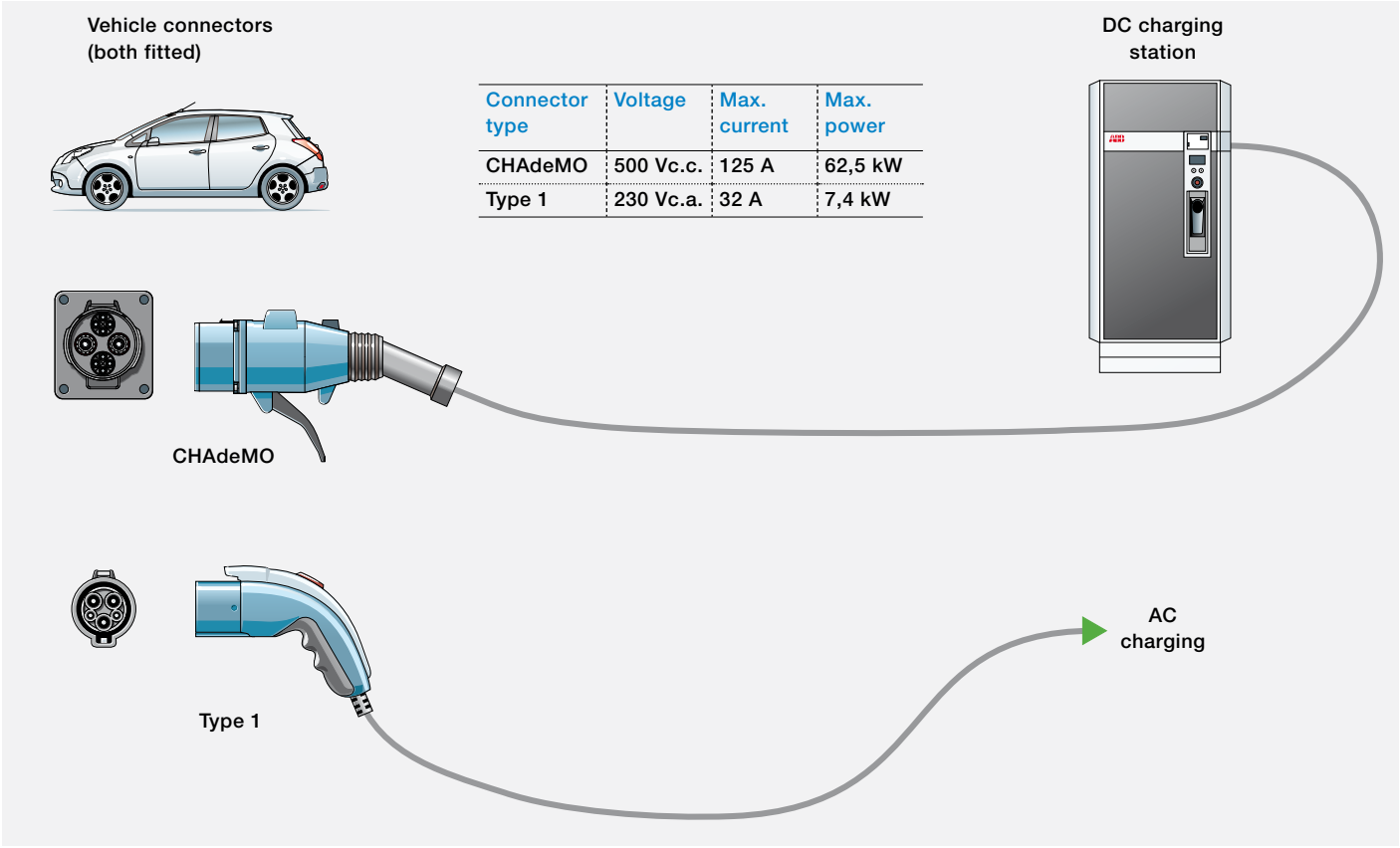
While there is a single system for AC charging of vehicles (albeit based on different yet interoperable connectors), in terms of fast or very fast DC charging (mode 4), that is full vehicle charging in 20 or 30 minutes, car manufacturers are adopting two different charging systems with specific connectors[8]:

– CHAdeMO, today the most widespread DC charging system in the world
– Combined Charging System, based on the combo-2 connector, suitable both for AC charging and DC charging.

In both cases, the cable is permanently fixed to the charging station.

The CHAdeMO system (JEVS G105 connector) is the main system currently in use for rapid DC charging, suitable up to 62.5 kW. The connector is fitted with two power contacts (600 V/200 A), a functional earth contact and another five auxiliary contacts. Seeing as this connector is used only for DC charging, vehicles are also fitted with type 1 connector to ensure it is possible for them to charge at an AC charging station, or even a standard domestic socket-outlet, using one of the methods illustrated above (see figures 06 and 07).

[7] That is, without charging power regulation via the PWM signal, but with the other safety functions specified for mode 3.
[8] To this we must add fast AC charging (43 kW), described above, which uses the type 2 connector.



Connector type	Voltage	Max. current	Max. power
CHAdeMO	500 Vc.c.	125 A	62,5 kW
Type 1	230 Vc.a.	32 A	7,4 kW

06

07

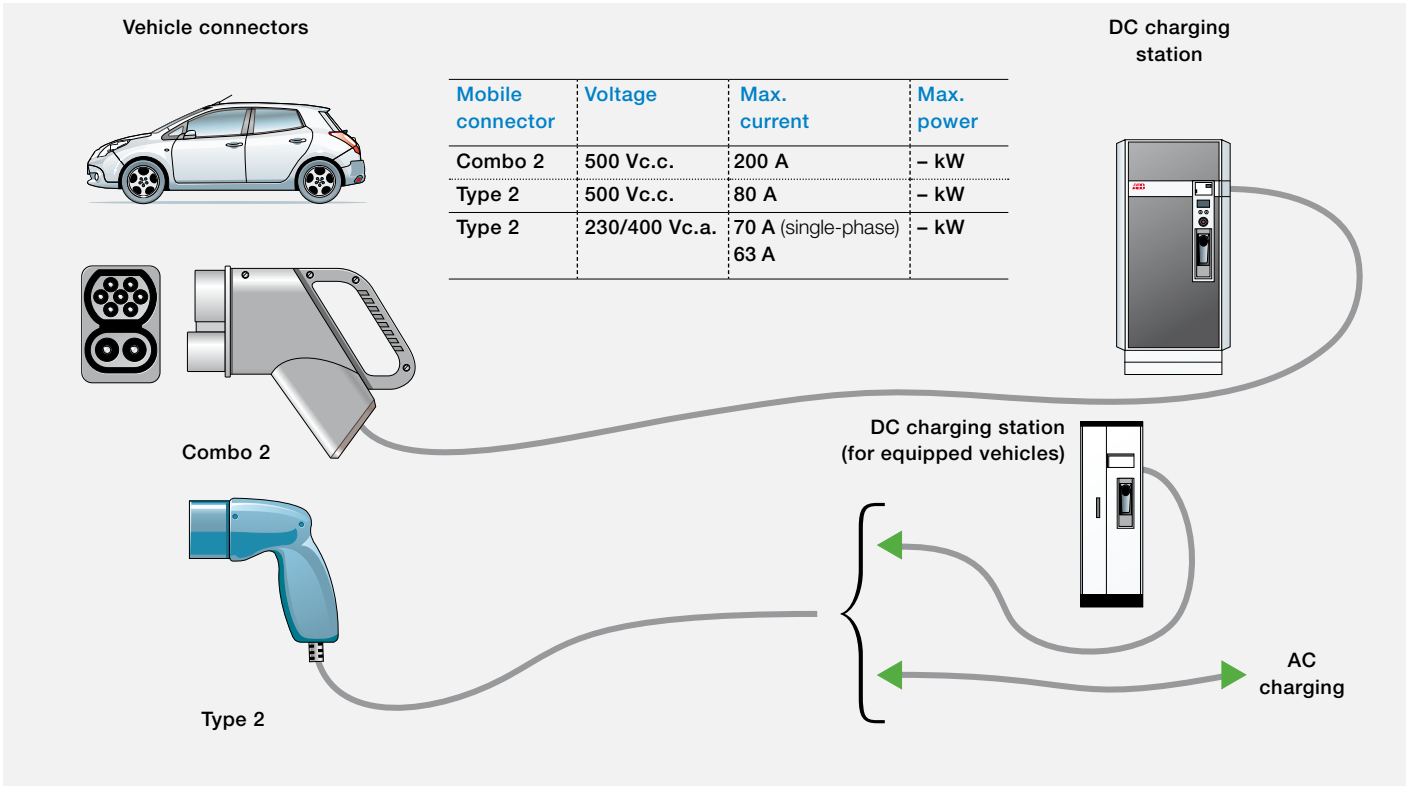
Combined Charging System (combo-2 connector) this is the system developed by eight large car manufacturers, just come onto the market. The combo-2 inlet on the vehicle can accept both the corresponding mobile combo-2 connector and the mobile type 2 connector allowing AC charging. The combo-2 connector is, indeed, an extension of the type 2 connector, created by adding two dedicated power contacts for ultra-fast DC charging (850 V/200 A)[9]. It is, therefore, a “universal” connector, suitable both for AC and DC charging, from slow to ultra-fast charging modes[10] (see figure 08).

Fast DC charging stations are specific to one of these two systems and are fitted with the corresponding connector[11]. In any case, it should be highlighted that all vehicles are compatible with the AC PWM charging system described earlier. This therefore avoids the risk of not being able to charge due to incompatibility. (see figure 09).

[9] Some vehicles can also accept the mobile type 2 connector even in DC configuration (“DC over type 2”).

[10] On the other side of the Atlantic, the Combined Charging System is based on an equivalent combo-1 connector derived from the type 1 connector. The two combo-2 and combo-1 connectors have a similar profile to facilitate production of vehicles in the two versions for Europe and America.

[11] Connectors for DC charging will be defined by IEC 62196-3, which is currently being prepared.



08

09

08 Charging vehicles fitted with Combo 2 inlet
09 Combo 2 inlet and vehicle connector

Connection safety

The high currents and voltages at play and the outdoor public location require connections for charging electric vehicles (mode 3 and 4) to have stronger safety features than those used for typical residential or even industrial plugs and sockets. The principal minimum safety requirements identified by current standards can be summarised as follows:

- Fixed and mobile sockets are not live unless the vehicle is present and correctly connected, closing a pilot circuit;
- Mobile sockets, even without the plug inserted, are IPXXB rated (impenetrable to test finger);
- Plugs and sockets, when coupled, are IPXXD protected (impenetrability to test wire);
- Fixed charging station sockets, even without the plug inserted, must be IPXXD protected (or protected with equivalent mean);
- Mobile plugs and sockets must stand up to being driven over by a car;
- Coupled plugs and sockets for external use are protected with IP44 rating (splashing water from all directions);
- In case of DC charging, the mobile connector is interlocked to the vehicle to avoid it being removed during charging.

These requirements ensure a high level of safety, even for those unskilled users who could perform incorrect operations when charging.

Is it possible to switch off AC / DC?

Certainly.

The S 200 M UC impresses with its performance range and the accordingly large amount of approvals. Its high inbuilt short circuit breaking capacity across the entire model line, its flexible application for both direct and alternating currents and its approval and compliance in accordance with all major international and local standards make it truly unique. The miniature circuit breaker is a valuable addition to the existing System pro M compact® range which allows all known components to be combined effortlessly with the new model line. Whether warehousing and project engineering, planning and installation or maintaining your equipment, the S 200 M UC is a simple and flexible solution. For more information, see **www.abb.com/lowvoltage**

Power and productivity
for a better world™

ABB

Did you know? The truth about… breaking capacity

Roberto Vanetti: *Product Manager - DIN Rail Products*

Short circuits are certainly the worst cause of damage for an electrical installation. Short circuits create extreme conditions for installations with the evident risk of fire outbreaks and injuries to people. To always be on the safe side, each power circuit must be equipped with a device that protects it both from short circuits and overload (e.g. a circuit breaker). Each circuit breaker features different breaking capacity values. Let's find out why, and how to choose the right value for each application.

One product, four breaking capacity values

Depending on the reference standard and the way it acts after a fault, each circuit breaker can feature four breaking capacity values.

Moreover, the circuit breakers must comply with different conformity specifications, depending on the type of switchgear user:

– if the switchgear is used by unskilled personnel, the circuit breakers must comply with standard IEC EN 60898. This is typical of residential use.
– on the other hand, if the switchgear is used by trained personnel, the circuit breakers must comply with standard IEC EN 60947-2. This is typical of industrial applications.

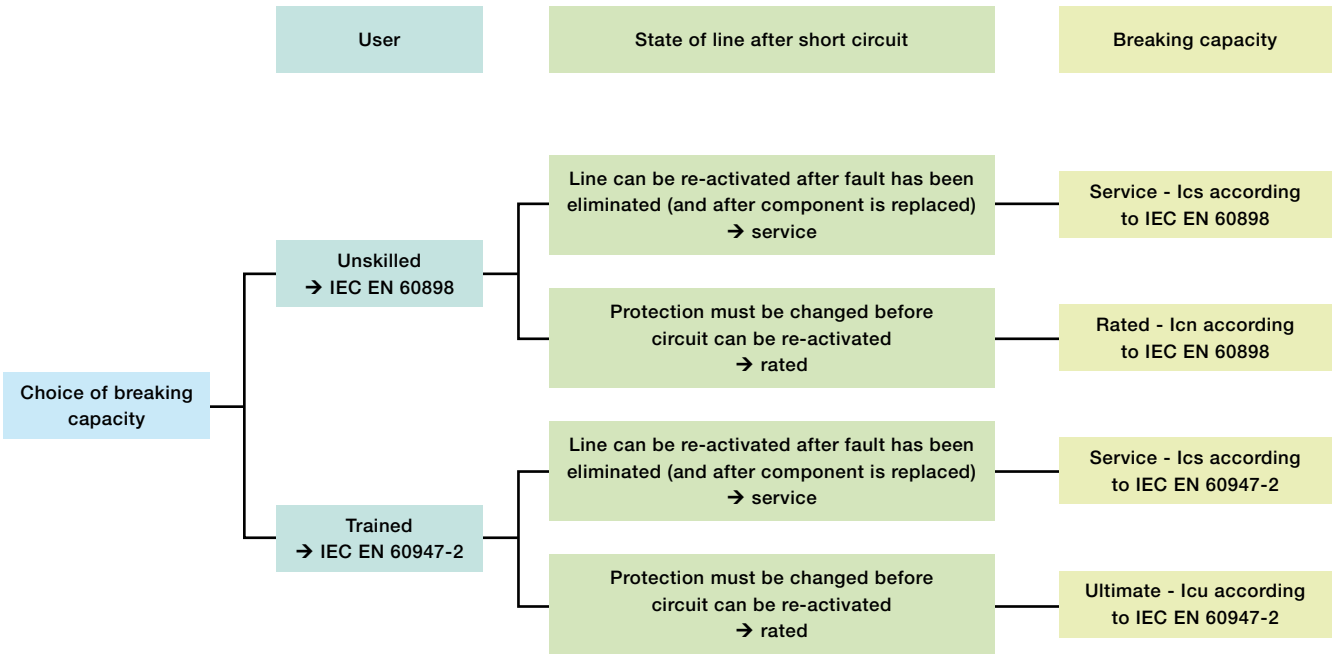


Table 1

Product	Breaking capacities	
Circuit breaker S 202 M – C16 – 2 poles – 16 A rated current – C characteristic – 230/400 V operating voltage	According to IEC EN 60898 (unskilled user) – Service Ics = 7.5 kA – Rated Icn = 10 kA	According to IEC EN 60947-2 (trained user) – Service Ics_{230V} = 18,7 kA – Ultimate Icu_{230V} = 25 kA – Service Ics_{400V} = 11.2 kA – Ultimate Icu_{400V} = 15 kA

Each reference standard, which includes specific tests, is thus bound to the type of customer who uses the installation.

Behaviour after a fault

Each one of the above mentioned standards define two breaking capacity values, which differ in the way the product is tested. Thus, there are “service”, “rated or ultimate” types, depending on circuit breaker performance after the short circuit.

– The “service” breaking capacity is the value of the short circuit current for which the product guarantees minimum performance after the fault. By considering this value as a reference when the installation is calculated, you ensure that, if a short circuit occurs, you will be able to go on using the line after the fault has been eliminated (and until the circuit breaker is replaced, which always has to be done after a short circuit).
– The “rated or ultimate” breaking capacity is the maximum short circuit current that the circuit breaker can interrupt. Service from the line is not guaranteed after interruption. If this value is used as a reference for calculating the installation, use of the line is not guaranteed after a short circuit.

This means that it's better to opt for the “service” breaking capacity value when continuity of service is important, while the “ultimate” value can be used when a more economical solution is required.

A practical example

Table 1 gives the different breaking capacity values for a commonly used circuit breaker and shows how the breaking capacities change depending on the end user and service-after-fault requirement. The breaking capacity that provides the right compromise between performance and continuity of service can be chosen for each application, always preserving top-level safety for the users.

All the technical specifications of the circuit breakers are given in technical catalogue System Pro *M* compact® 2CSC400002D0210

Breaking capacity

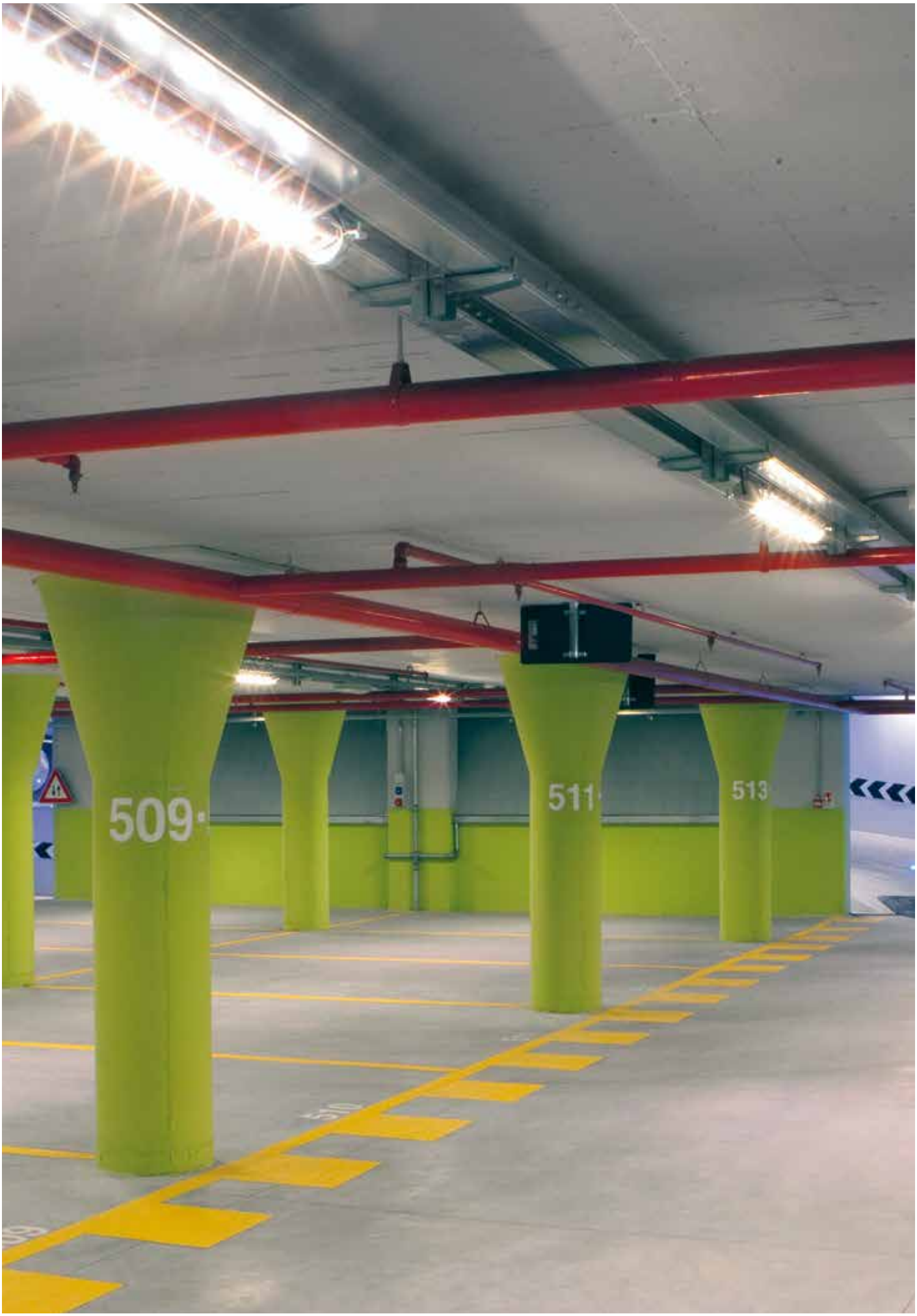
To what does breaking capacity Icn_1 refer?

Icn_1 is the rated short circuit breaking capacity according to standard IEC EN 60898, considering a single pole of a multi-pole circuit breaker (including 1P+N versions). When the value of Icn1 is not indicated, its value is the same as Icn.

To which breaking capacity does the backup characteristic between two circuit breakers refer?

The backup table between two circuit breakers indicates ultimate breaking capacity Icu according to standard IEC EN 60947-2 reached by the circuit breaker on the load side thanks to coordination with a circuit breaker on the supply side.

For example, circuit breaker S 200 M, which has value Icu=15kA, can be installed in circuits with 50kA short circuit current thanks to the backup performance with the S800S .


509
511
513

Parking garage in Rome managed by ABB Intelligent Building Control

Use of ABB i-bus KNX in a prestigious Rome parking garage has allowed lighting management to be rationalised, offering greater security to users and a 50% reduction in power consumption. Highly technological and multi-storey, the garage on Corso d'Italia in Rome is one of the first in Italy to be completely lit by LEDs.

Thomas Rodenbusch-Mohr: *Product Marketing - KNX Intelligent Building Control*

The choice of LED illumination and building automation management efficiently summarises the key aim of real-estate management: combining environmental aesthetics – each storey has a different colour – with technological efficiency.

Rationalise management of lighting and save 50%

The parking garage is set over six storeys with a total area of 5,600 m^2, with alarm, control and equipment status indications given on two *ComfortTouch*® panels installed in reception and in the porter's lodge.

The parking garage on Corso d'Italia in Rome is amongst the first to be completely lit by LEDs. More than 400 light fixtures, primarily sealed at the trunkings on the ceiling, each fitted with 12 LEDs, were used.

Evidence of the installation's extremely innovative nature is given by the fact that the LED units were specifically created for this project in order to meet the particular requirements about protection (IP67) and even diffusion of the lighting.

100 Lux are achieved, even more than the 70 Lux required, furthermore an uniform light diffusion has been realized. They also offer energy savings of 50%, which equates to around 7,500 Wh for this parking garage. Even considering the increased purchase price, they should provide a return on investment in just two-three years.

The LED light fixtures also lack integrated power supplies.

The Building Automation system supplied by ABB i-bus KNX effectively manages activation and deactivation of the lighting, according to pre-set scenarios and motion detector readings. At night, lighting is reduced to a minimum, with full lighting only being provided when vehicles are detected.

The KNX system activates groups of LEDs in sequence, differing the combination each time so as to equilibrate the overall usage time (and therefore the wear) of each fixture, resulting in significantly improved reliability.

Opportune combination of power supply units and loads

The KNX system performs an important monitoring function for the approximately 120 switching power supplies powering the various groups of LEDs, keeping not only the output voltage values but also the operating temperature under control. When the temperature sensors installed in the switchboards connected to the KNX system exceed their limits, they generate signals to immediately activate ventilation. In the case of many vehicles entering or leaving the garage one after the other, however, the temperature increases rapidly and ventilation alone is not sufficient. To prevent the power supplies from overheating, the Building Automation system switches the load to other banks of power supplies, spread over the floors, to ensure favourable temperatures.

ABB Home and Building Automation solutions ensure improved brightness and energy savings to a prestigious parking garage in Rome

01

The management via KNX of the power supply groups therefore extends their lifetime as well as increasing their energy efficiency, ensuring optimum operation.

This ability to assign different loads as appropriate to the various groups of power supplies (active redundancy) is fundamental in emergencies. For example, if the power supplies on one floor are damaged by fire, lighting can still be kept active by using the unaffected elements on the other floors.

Customisation of building-automation functions

Particularly interesting is the use of two elegant *ComfortTouch*® panels, ABB's control and communication interface for Home and Building Automation.

The *ComfortTouch*® touchscreen was preferred to traditional PCs for centralised control of the system, primarily due to the simplicity of the user interface, much more accessible to the garage staff. The use of a pre-programmed terminal indeed avoids the complications generated by the infinite options available when using a PC, and speeds up handling of emergency situations.

The *ComfortTouch*® functions, originally designed for Home Automation, and those for residential climate control, used in this case to control the temperatures in the electrical switchboards, were customised in order to offer these advantages.

Centralised control of all functions from the touchscreen

The *ComfortTouch*® units are fitted with an immediate interactive menu, its sections ordered by function. These dedicated screens allow all operations managed via the Building Automation system to be controlled with ease. Each system can be managed globally, or by individual storey.

Here is an overview of the functions managed via the touchscreen:

- automatic lighting management inside (floors and stairwells) and outside (access ramps and garden) with direct control by the operator
- management of high-temperature alarms on the electrical switchboards
- display of status and location of devices (relays activated) in the 25 electrical switchboards
- automatic management of the grid/electricity-generating unit exchange
- display of UPS and emergency power unit alarms

02

03

- management of seven dome IP cameras used for general monitoring
- management of voice announcements to garage users
- management of disabled bathrooms alarms
- display of reception intrusion alarms on the caretaker's lodge *ComfortTouch*®
- UPS routine testing
- interfacing with the fire station
- intercom connection between the two *ComfortTouch*® units.

Control from two locations, 24/7

The use of two *ComfortTouch*® units allows operation and monitoring of the situation both from reception and from the caretaker's residence. It allows prompt action to be taken when required, including cutting the power supply, activating emergency lighting or controlling the power generation units.

Complete and effective 24/7 operation is particularly important as the garage is not just used during the day, but also by residents at night when it is unguarded.

The voice and sound system present on in each floor and connected to the KNX system allows the operator to issue communications even at night, directly from his home, reassuring and assisting users in an emergency, if any. During the day, this type of communication is performed via the audio system connected to the traditional workstation.

01 Parking garage entry and exit ramp.
02 Control room for all parking areas. It is possible to control and manage all installed building-automation services from the ComfortTouch® touch-panel.
03 Main switchboard located on the first floor, connected to the peripheral boards on other floors.

Professionals

Technological Partners

Electrical systems and special systems design
Franco Di Stefano
Rome

Execution and installation of the electrical and building-automation systems
Nova Srl
Marco Maria D'Ottavi
Rome

Wholesaler
Gruppo C.E.T. Srl
Marco Terradura
Rome

LED lighting systems consultancy and lighting equipment customisation
3MP Design Srl
Massimiliano Palmieri
Rome

Sales representative

ABB S.p.A. – LP Division
Rome Office
Giancarlo Iamurri

04

The audio signal is transmitted via the LAN from the caretaker's post to the second *ComfortTouch*® in the garage itself, and from here to the loudspeakers via the audio output, originally designed for distributing music in home or office environments. The flexibility of the KNX system leaves the possibility open to install and connect a third *ComfortTouch*® in another parking garage. In this case, the systems can be connected via ADSL.

Alarm detection and countermeasures

All alarm systems, like the smoke detectors for example, are interfaced to the KNX system with centralised indication on the *ComfortTouch*® screens via pop-up windows which cannot be dismissed by the user. Each alarm triggers appropriate measures: for example, the KNX system will cut power to floors involved in a fire.

At fire alarm level one (pre-alarm) the Building Automation system switches off the main lighting of the floor concerned and activates emergency lighting which is not hazardous even if hydrants are used, being battery powered. In the case of a general alarm (signals from more than one sensor) or manual activation of an alarm, the KNX system will cut the main power to the whole parking garage, turn on the emergency lighting, start the generator and connect it, in this case, only to the fire pumps.

The possibility to choose the device to connect to the power unit is a further example of the system's versatility. In traditional systems, the electrical connection between the switchboard and the power unit is fixed, representing a potential hazard in case of fire. With the KNX-managed solution, this connection can instead be interrupted in order to supply the system required by the situation (the pumps), which will then be activated by the fire-suppression system.

Finally, every 2 weeks the *ComfortTouch*® completes the monthly manual maintenance of the power unit required by law, with an automatic on and off test.

Centralised monitoring and test assignment

The emergency lighting system, like the fire-suppression system, also runs autotest routines on each component (lamps, batteries), sending any alarm signals to the *ComfortTouch*® system via the KNX system.

In the same way, the UPS units, which power the garage management components (access barriers etc.) and all the IT systems, run functional tests and resulting corrective actions are automatical.

The KNX-based solution therefore offers the advantage of centralising monitoring of the status of the entire system via *ComfortTouch*®.

05

Thomas Rodenbusch-Mohr
Product Marketing
KNX Intelligent Building Control

04 General view of the floors, differentiated through different colours used for the walls and columns.
05 Switchboard to control building-automation services.

The auto-test procedures remain, however, totally assigned to the installation's sub-systems, thus avoiding the risk that any problems with the centralised structure (*ComfortTouch*® or KNX bus) could block self-diagnostics and endanger overall functionality.

In short, we can assume two possible emergency situations.

1. If the centralised structure (KNX and *ComfortTouch*®) has problems, the peripheral parts of the system nevertheless remain fully operational and able to perform self-diagnostic routines. The typical example is the UPS units, which turn on autonomously in case of a grid outage.
2. If, on the other hand, one of the peripheral parts of the system has a fault, the *ComfortTouch*® units immediately detects this and immediately activates the appropriate measures.

The choice of ensuring safety which exceeds required standards

LEDs were chosen for the two lift stairwells instead of emergency lighting, in order to offer a higher level of protection and safety as required by law. This ensures greater brightness on the stairs, helping orientation and preventing panic in an evacuation.

This decision made it necessary to use emergency power supplies (redundant electronics UPS) in order to meet regulations for emergency lighting power supplies. As they are connected via KNX, the backup power supplies are continuously monitored, as required by law. The electrical wiring connected to the back-up power supplies also meet the most stringent legal requirements.

These are, indeed, separated from the other systems and, aside from being flame-resistant up to 110°C, are also housed in galvanised steel conduits.

Low-voltage ABB switchboards

Various ABB switchboards were used in this project, implemented in collaboration with Franco Di Stefano and installed by Nova Srl in Rome:

– Main, connected to the individual floor switchboards, with protection devices and meters
– For building-automation services
– To control services outside of the parking areas (lights, irrigation, common access, UPS control).

Selectivity and backup: two opportunities for the electrical installation

An in-depth look to explain how to read the selectivity and backup tables and what we mean when we talk about these two principles which, although applied to the same devices, are opposites.

Roberto Vanetti: *Product Manager - DIN Rail Products*

Normally, in an electrical system, the line current and short circuit current decrease going away from the power supply and reach their minimum value in correspondence to the load circuits. Similarly, going downstream, the number of circuits increases and their cross-section decreases and, consequently, their capacity.

To ensure protection of the circuits, it is therefore necessary to create a hierarchy of protective devices with decreasing tripping thresholds. This allows the energy to be distributed safely and effectively, but it creates problems in terms of operational continuity. Indeed, in the case of a fault on one of the circuits on the load side, it is possible that, as well as the line's specific circuit breaker, the ones located upstream will also trip, compromising the regular operation of the undamaged circuits.

Why selectivity?

The protection system of an electrical installation, composed of a hierarchy of circuit breakers, must protect the electrical installation by switching off faulty circuits while maintaining power supply to the healthy sections as far as possible.

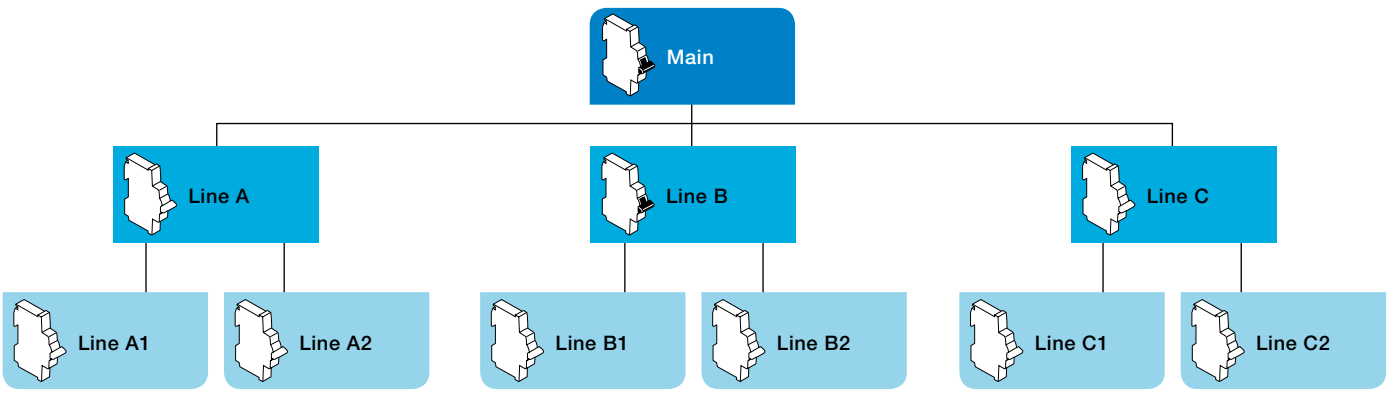
For example, in the case of a fault on the line B2, the ideal solution is that only the circuit breaker on line B2 trips. This implies that upstream protection (main switch and branch B switch) let the fault current pass for the whole time necessary for protective device B2 to open. In this case, we talk about selectivity between B2 and the circuit breakers upstream.

Selectivity between two circuit breakers is verified according to two types of operation:

- thermal tripping due to overload: the rated current of the upstream circuit breaker must be at least 1.3 times that of the downstream one when using C characteristic (for other curves, see the technical catalogue).
- tripping due to short circuit: the co-ordination tables supplied by ABB indicate how to ensure selectivity in the case of a short circuit.

Selectivity can be total or partial.

- total selectivity: selectivity guaranteed for all short circuit current values up to a maximum value corresponding to the minimum breaking capacity between the two breakers.



S290 - SN @ 230/240 V

Down-stream	Upstream Features	Icu [kA]	In [A]	S290 C 80	C 100	C 125	D 80	D 100
						15		
SN201L	B,C	6	2	**T**	**T**	**T**	**T**	**T**
			4	5	**T**	**T**	**T**	**T**
			6	4,5	5	**T**	5,5	**T**
			10	4	4,5	5	5	5
			16	2,5	3,5	3,5	4	4,5
			20	1,5	2,5	2,5	3	4,5
			25	0,5	0,5	1,5	2	4
			32	0,5	0,5	0,5	1,5	3,5
			40	0,5	0,5	0,5	1,5	3,5

T = Total selectivity

– partial selectivity: selectivity guaranteed up to a certain level of short circuit current. If the short circuit current in the point where the downstream circuit breaker is installed is lower than this value, selectivity is guaranteed; otherwise, it is not possible to ensure that, in the case of a short circuit, only the downstream circuit breaker will trip.

How to read selectivity tables

1- Find the upstream circuit breaker in one of the columns (in blue in the image) and select the curve and the rated current.
2- Find the downstream device in one of the rows (red box in the image) and select the curve and the rated current.
3- Read the selectivity values at the intersection (in green in the image).

Example: selectivity characteristics with S290 upstream and SN201L downstream. In this case ABB declares that, between the S290 C characteristic 125 A rated current and the SN201L downstream:

– total selectivity is guaranteed for SN201L with rated current up to 6 A
– selectivity is partial if the rated current of the SN201L is greater than 6 A. In this case it is necessary to compare the value indicated in the table with the short circuit current in the installation point of the SN201L. For example, if the rated SN201L current is 10 A, selectivity is guaranteed for installations with short circuit currents up to 5kA (at the installation point of the SN201L).

Roberto Vanetti
Product Manager - DIN Rail Products

ABB products used in the example: SN201L and S290 MCBs.

MCB - MCB @ 240 V (Two poles)

		Upstream		S200	S200M	S200P		S280	S290
Down-stream	Features			B,C	B,C	B,C		B,C	C,D
		Icu [kA]		20	25	40	25	10	25
			In [A]	0,5…63	0,5…63	0,5…25	32…63	80,100	80,125
SN201L	B,C	6	2…40	20	25	40	25	10	15
SN201	B,C,D	10	2…40	20	25	40	25		15
SN201M	B,C	10	2…40	20	25	40	25		15
S200	B,C,K,Z	20	0,5…63		25	40	25		
S200M	B,C	25	0,5…63			40			

Why backup?

In case of a short circuit, circuit breakers are able to open a certain current value. The greater this current, the greater the size and the cost of the breaker. The MCB's breaking capacity must therefore be chosen based on the short circuit current in the installation point which, as seen earlier, decreases as we move from the power-supply source to the loads.

The characteristic of backup is the ability of a breaker located upstream to help the breaker downstream to open a short circuit, thus virtually increasing its breaking capacity.

This feature allows us to reduce the size of the downstream breaker and consequently the overall cost of the system while maintaining an optimum level of safety.

Backup characteristics for breakers are supplied by ABB.

How to read backup tables

1- Find the upstream protective device in one of the columns (in blue in the image). Check that the curve and the rated current of the protective device correspond.
2- Find the downstream protective device in one of the rows (in red in the image). Check that the curve and the rated current of the protective device correspond.
3- Read the backup characteristic at the intersection (in green in the image).

Example: backup characteristics with S290 upstream and SN201L downstream.

ABB declares that the upstream protective device increases the breaking capacity of the downstream protective device from 6kA to 15kA. In other words, the SN201L circuit breaker, with 6kA breaking capacity, can be installed to protect a line with short circuit current up to 15kA, if an S290 is installed upstream.

Is it possible to combine selectivity and backup?

The principles of selectivity and backup, although applied to the same devices, are opposite.

Selectivity implies that the product downstream will open first in the case of a fault, in other words that the product upstream is less "sensitive". To guarantee selectivity, the upstream protection will not trip.

Backup implies that the device upstream helps the device downstream to break, increasing its breaking power. With backup, the upstream protective device actively intervenes in protecting the line.

It is therefore clear that backup and selectivity cannot be combined between two protective devices, but that each one offers a given advantage.

– Selectivity: ensuring operational continuity in the non-faulty lines if another line should trip out.
– Backup: containing the overall cost of the system by using protective devices with reduced breaking capacity.

System pro *M* compact®

Catalogue: 2CSC400002D0210

From electrician to marketer!

E-mail Marketing

Federico Mai: *Marketing Communication Account - LP Division*

Products, technical specifications, performance, functions and examples of applications are all essential knowledge for electrical installers. It is, however, equally clear that in an ever-more competitive market such as today's, it is more important than ever to acquire skills in non-technical fields in order to differentiate yourself from competitors and thus increase turnover. For this reason, you will find a small list of tips in this section that we think will help you to better understand marketing and communications theory, practice and apply them to your work. These things often make the difference when approaching a customer (as services, products and prices offered are often very similar), stimulating the creation of new ideas and solutions or simply helping get past the questions "Where do we start?" or "How do we do this?".

E-mail marketing

E-mail marketing is a type of direct marketing where e-mail messages are used as the medium for transmitting business (and other) information to the public.

Broadly speaking, any e-mail sent to a customer (or potential customer) could be considered as e-mail marketing. However, this term is generally used to indicate:

- e-mail messages sent with the intention of raising the level of relations between a company and its previous or current customers and to encourage customer loyalty;
- e-mail messages sent with the intention of acquiring new customers, or to persuade already acquired customers to purchase something immediately;
- the addition of advertising information to e-mail messages sent by other companies to their customers.

Companies in the United States, Europe and the emerging economies are investing increasing resources in e-mail marketing, which is often used also by public and non-profit organizations.

Over the past few years, integration of e-mail marketing with other management systems (e.g. CRM – Customer Relationship Management) and communication systems (e.g. Social Media) has been given growing attention. Recent developments have concentrated on the quality of the contacts (name proliferation, care dedicated to customer satisfaction) with respect to the massive transmissions that characterized e-mail marketing at the outset.

Advantages

Companies like e-mail marketing because:

- It costs less than direct marketing on paper.
- If the work is done well, the Return on Investment (ROI) is usually very high.
- It's instantaneous, especially if compared to hard copy mail: an e-mail reaches its destination in seconds or minutes.
- It allows advertisers to "force" their message on the public, unlike a website, that "waits" for its visitors.
- It's easy to trace. Advertisers can trace the users via web bug, bounce messages, unsubscrptions, read receipts, click-throughs, etc. These can be used to trace the e-mail opening rates, positive or negative feedback and sales acquired through communication activities.
- Advertisers can acquire a large number of registered users who wish to receive information via e-mail about subjects of their interest.
- Over half the web users send or read e-mail messages in any typical day.
- The e-mail message allows users to establish a "one-to-one" relationship, i.e. the message can be customized to suit the recipient, who'll receive that specific communication.
- It allows texts to be performed to find out which type of message achieves the best results with its target public.

Electrical system “Hygiene”

Although an electrical installation meets the highest standard and is made with top quality components, electrical risk factors could be low but never completely avoided.

Claudio Amadori: *R&D - LP Division*

In order to avoid any residual risk, it is necessary for the user of the electrical system to follow some elementary electrical “hygiene” rules, rules which should be well known to everyone from an early age.

Electricity and water

Electricity and water, as we all know, don’t mix. It is not by chance that most electrocutions at home happen in the bathroom or outside with wet floors. Wet skin and floors, indeed, have reduced impedance and therefore increase the risk if a person comes into contact with live parts. Electrical equipment falling into water is extremely dangerous, and the greatest danger exists when the person’s body is inside that water.

The wiring regulations typically provide prescriptions for rooms containing bath tubs, showers or installations with swimming pools, fountains etc.

Even if these installations measures eliminate large part of the risks, it is nonetheless necessary that the user respect the following elementary safety rules:

- never use or leave electrical appliances like hairdryers, radios etc. where they could fall into water (basin, tube etc.);
- never use electrical appliances when taking a bath or shower, or when you are wet;
- if an appliance accidentally falls into water, turn off the socket and unplug it immediately, before removing it;
- electric bathroom heaters must be fastened to a wall, far from the bath and areas liable to splashes of water;
- never use extension leads in the bathroom, as this would allow the appliance to be taken dangerously close to the bath or shower;
- the greatest safety is obtained for hairdryers when using wall-mounted devices with only the hot-air tube hanging freely; in this case, if it falls in the basin there is no risk;
- never use mobile electrical equipment outdoors if it is raining or the ground is wet;
- switch off and unplug steam irons and similar equipment before filling them with water;
- switch off and unplug refrigerators before drying them after defrosting or before adjusting washing machine water/drainage connections; if the socket is inaccessible, turn off the breaker for that ring-main or socket in the consumer unit;
- never leave extension cords outside.

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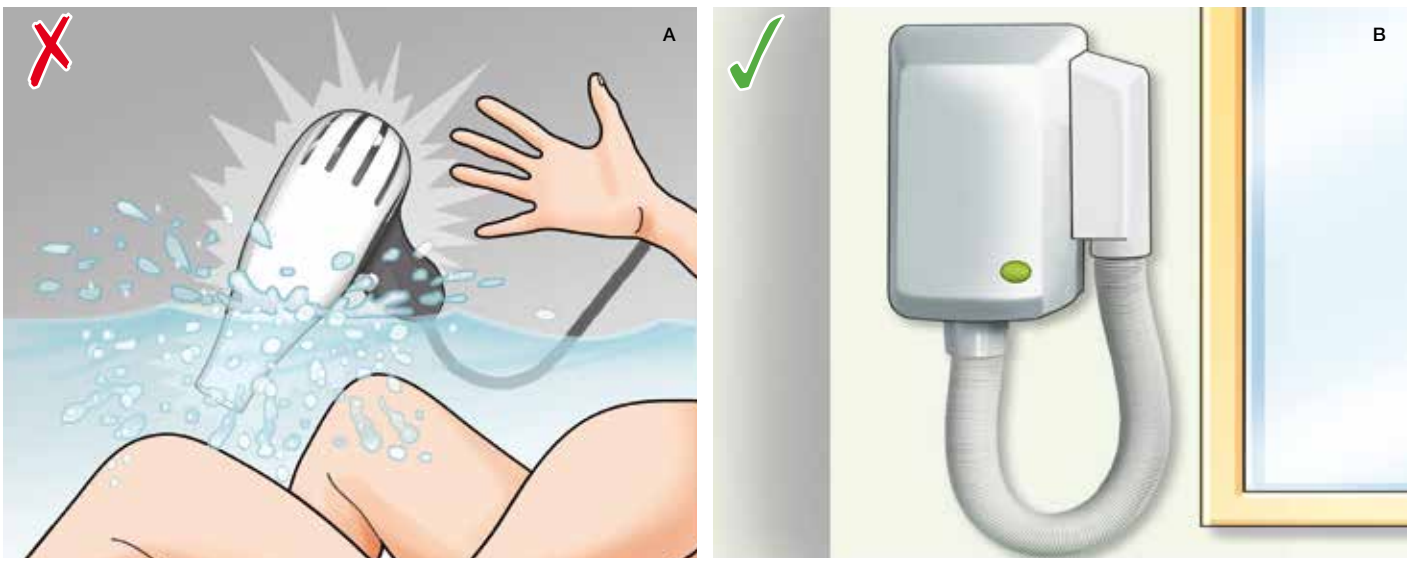


A further tip to increase safety is to install a 10 mA RCD for bathroom sockets and whirpools or similar. This can also be done for sockets which will be used for kitchen or garden appliances.

Changing a light bulb

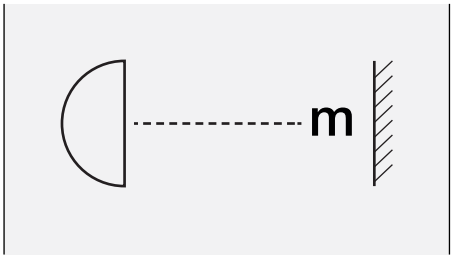
Changing a burned-out light bulb is a simple operation, during which, however, protection against direct contact is reduced, as it is possible to touch the live parts of the bayonet or screw fitting. Aside from the direct risk of electric shock, there are also indirect risks, for example falling off a ladder.

To avoid any electric shocks, the only effective measure is to cut off the power before changing the bulb:

– for lamps, by unplugging them from the wall socket;
– for ceiling lights, by turning off the lighting circuit by means of the breaker in the consumer unit. It is important that the electrical system is suitably divided into separate circuits and that these are clearly labelled; if there is any doubt, the main switch must be turned off;
– never leave a light fitting without a bulb in.

01 A) Never use electrical appliances which could fall into the bath
B) Wall-mounted hairdryers offer greater safety
02 A) Avoid placing electric heaters near water
B) Fixed installations are preferable

2



3

03 Symbol indicating the minimum distance from the bulb from lit objects or surfaces
04 A) Switch off and unplug the iron before refilling it with water
B) Remove the plug to ensure complete safety
05 A) Keeping extension leads coiled during use can lead to overheating
B) Fully unwind extension leads when using them

Extension leads, gang sockets and adaptors

Another source of risk is excessive and improper use of accessories such as extension leads, gang sockets and adaptors. These devices should only be used occasionally, and, in any case, only with low power devices. In particular:

– do not exceed the total maximum power indicated on the accessory itself (e.g. “MAX … W”);
– do not chain adaptors or gang sockets;
– fully unwind extension leads when using them.

Fire risk from overheating

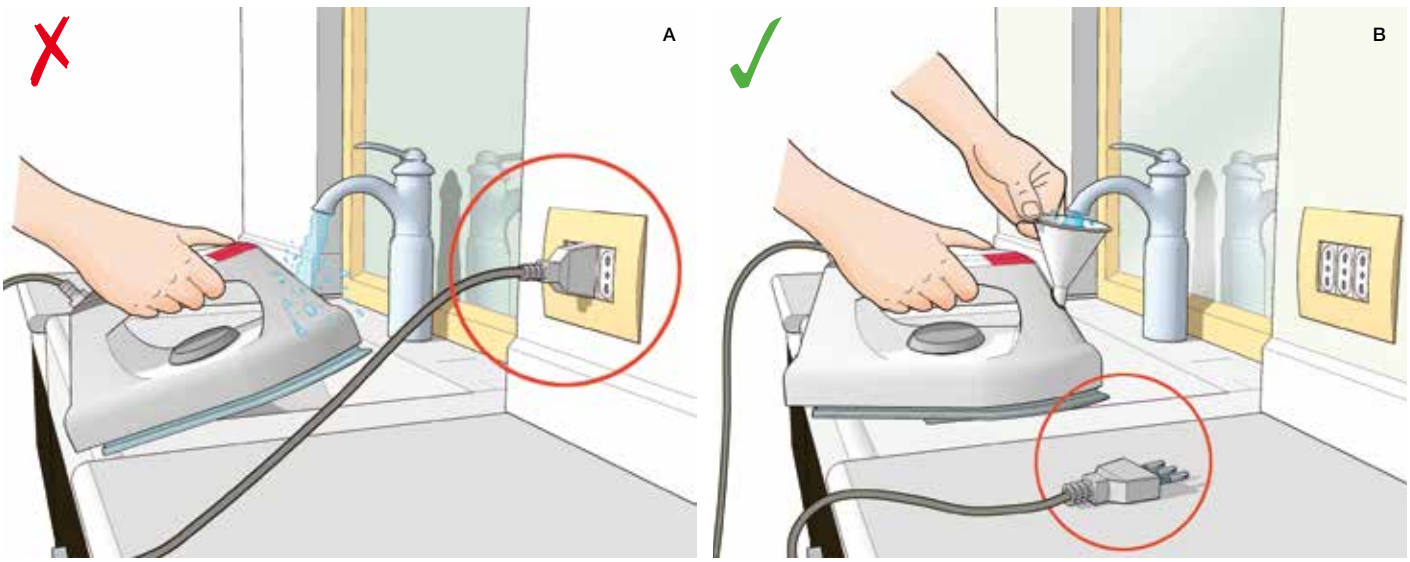
Certain number of fires are caused by electrical equipment which, during its normal operation, generates a large amount of heat, either as a desired effect (for example, electric heater), or undesired (light bulb). The risk of fire from overheating can be prevented with the following measures:

– avoid covering appliances with materials such as curtains, paper, tablecloths etc. (in particular on ventilation openings);
– follow instructions and leave space around the appliance free of furniture or walls in order to allow adequate air circulation;
– never install light bulbs with power ratings above those indicated on the lamp/fitting (for example, “n x MAX... W”, where n is the total number of bulbs);
– in the case of concentrated light bulbs, respect the minimum distance from objects or surfaces indicated on the bulb label (Figure 3).

RCD test buttons

The high level of safety of modern electrical installations is in large part due to the presence of residual current devices (RCDs). Despite the high level of reliability of these products, their effectiveness is so important that product standards require they are equipped with a “test button”. This allows the end user to quickly test if the RCD is working, with no need for any other equipment; this button must be pressed periodically, for example every six months; the RCD must trip. If the RCD does not trip when the button is pressed, or if it is not possible to reactivate it afterwards, this means that the RCD is defective and an electrician must be called immediately.

4



GREENLIGHT with RCD autotest

Manual testing of RCDs with the test button is rarely performed by users of electrical installations.
For this reason, ABB decided to incorporate the test function in the Greenlight auto-reclosing device to make this periodic check automatic: in this way the user has only to call an electrician if the test fails.
Greenlight with autotest, aside from offering all the functionality of an auto-reclosing device (it recloses the RCD after tripping not due to a real earth fault), ensures that the RCD is always in good working order and that that residual-current protection is always ensured.
Greenlight with Autotest (F2C-ARH-T) is compatible with two-pole RCDs of the F202 range, with rated currents up to 63 A and 30 mA (F2C-ARH-T) or 100 mA sensitivities (F2C-ARH-T100).

Turning off the power when going out

It was always recommended in the past to turn off the water, electricity and gas before going away on holiday. Now, thanks to improved electrical appliances, turning off the power is less important. Moreover, the requirements of modern life, such as always leaving the fridge running and the burglar alarm powered, make it difficult to completely turn off the power.

In any case, to play it safe, it is a good idea to cut the power to any appliances which will remain off in our absence. This is easy to do if, when the electrical system is designed, one or more dedicated circuits or sockets are foreseen from the consumer unit for appliances which will always remain on, such as the refrigerator and burglar alarm.

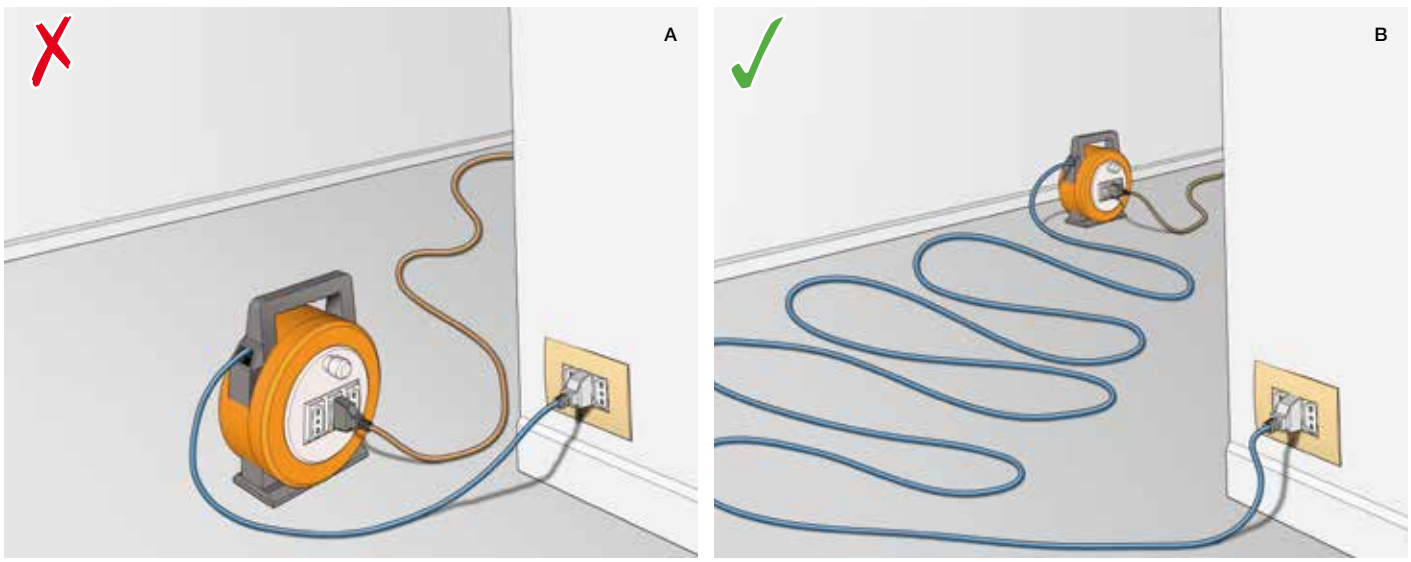
In this case, power can be cut to the whole system with the exception of these devices when leaving home. This allows hidden loads, such as appliances on “stand by” and chargers plugged in sockets, to be turned off, with a positive effect on electricity consumption.

Maintenance of electrical appliances

Electrical appliances must be treated with care, taking particular care not to break their cases (for example after a fall), spill liquids on them or damage their power cords. Any damage of this sort must be repaired by a technician as soon as it is noticed, avoiding rough and ready repairs (such as insulation tape), or the appliance must be replaced.

In particular, you must take care:
- not to squash the power lead, for example, under furniture;
- not to unplug the appliance by pulling on its cord;
- not to wrap the cord around a hot iron, in order to avoid damaging it;
- always switch off and unplug appliances when cleaning or servicing them, for example when replacing filters.

5



Requirements for disconnection and isolation

In this edition, we explore the different utilization categories for switch disconnectors, isolators, switch disconnector isolators and units combined with fuses according to IEC EN 60947-3.

Valentina Surini: *Product Manager - DIN Rail Products*

The IEC EN 60947-3 standard establishes the requirements for a device to ensure if it is suitable for isolation and disconnecting. We will explore the terminology, definitions and some useful examples to better understand the indications in this standard.

Disconnector

A disconnector is a mechanical switching device which, in open position, satisfies the prescriptions specified for the isolating function by international Standard IEC EN 60947-3. Opening a disconnector ensures that the circuit downstream is electrically isolated from the upstream circuit. This condition is necessary whenever work must be performed on a component of the network as, for example, in the case of maintenance.

Disconnector-fuse

This is a fuse holder which also performs isolation. Not all fuse holders are isolators: to be defined as such, they must satisfy the requirements and pass the tests laid out in IEC EN 60947-3.

Switch-disconnector-fuse

This is the definition which IEC EN 60947-3 gives to a switch-fuse which allows disconnection under load. Not all switch-fuse allow this type of operation: a device, to be considered a switch-disconnector-fuse, must have a utilisation capacity of AC-21B or greater.

Utilization categories

Not all disconnection devices have the same performance. The type of manoeuvre permitted depends on a parameter which specifically defines the mode of use, known as the utilisation category, which identifies:

a) the type of network (AC/DC)
b) the type of switching allowed (no-load, for resistive loads, for strongly inductive loads etc.)
c) the switching frequency.

Did you know that?

E 90* E 90 PV**

Which loads can be switched with a product with utilisation category AC-22B?
Utilisation category AC-22B allows occasional switching of mixed resistive and inductive AC loads, including moderate overloads. Examples of mixed loads are: transformers, motors with power factor correction, capacitor banks, discharge lamps, heating etc.

Which loads can be switched with a product with utilisation category AC-20B?
Utilisation category AC-20B does not allow switching under load. Connecting and disconnecting is only possible by first isolating the load with a switch disconnector.

***E 90 fuse-switch-disconnector have AC-22B utilisation category.**
****E 90 PV fuse-switch-disconnector have DC-20B utilisation category.**

Current type	Utilisation category		Common applications
	A	B	
Alternating current	AC-20A	AC-20B	Connecting and disconnecting under no-load conditions
	AC-21A	AC-21B	Switching of resistive loads, including modest overloads
	AC-22A	AC-22B*	Switching of mixed resistive and inductive loads, including moderate overloads
	AC-23A	AC-23B	Switching of motors or other highly inductive loads
Direct Current	DC-20A	DC-20B**	Connecting and disconnecting under no-load conditions
	DC-21A	DC-21B	Switching of resistive loads, including modest overloads
	DC-22A	DC-22B	Switching of mixed resistive and inductive loads, including moderate overloads (i.e. shunt motors)
	DC-23A	DC-23B	Switching of highly inductive loads (i.e. series motors)

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Born from the experience of ABB, the first to launch them on a market which continues to choose them, OVR PV photovoltaic SPD ensure absolute protection in the photovoltaic systems. OVR PV SPDs are equipped with a patented thermal disconnector, with d.c. short circuit interruption performances, specifically designed in order to prevent the risks of overheating and fires in photovoltaic systems up to 1000 V. Thanks to this innovative technology, OVR PV SPDs are self-protected from the end of life short circuit up to 100 d.c without the necessity of back up protection. This performance is guaranteed by the conformity to the UTE C61-740-51 guide.
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Energy efficiency and sustainability in buildings: LEED® certification

Erika Endrizzi: *Manager of the Product Mapping Service and greenmap.it - Habitech website contact person*

LEED® – Leadership in Energy and Environmental Design

The LEED® (Leadership in Energy and Environmental Design) energy and environmental design protocol for buildings is a voluntary standard that governs the management, design and construction of buildings that are sustainable from the social, environmental, economic and occupant well-being aspects. Established in the United States in 1993 by the US Green Building Council, the standard covers all building design issues: from the choice of the site on which the building is to be erected to management of the construction site, efficiency of the building enclosure and systems, use of renewable energy sources and sustainable materials, through to the quality and comfort of the indoor environments.

It is a voluntary standard widely recognized by the market. An open, transparent tool backed by a vast technical-scientific community that's continually evolving since it is periodically updated.

LEED® focuses and outlines the "best practices" for principals and professionals involved in integrated design, soon to become guidelines for all third-party certification authorities.

Whether they are professionals or enterprises, the competitive advantages of those who opt for LEED® for their buildings are the certifications issued by third-party authorities (considered essential if a positive response is to be obtained from the market) and the certainty of having built with care and attention to environmental issues. Certification provides the market with a shared definition of quality, thus of an internationally recognized value of the building. By embracing the entire process, from design to construction and including everything the building comprises, LEED® works towards a holistic view of sustainability and does all in its power to reduce the environmental impact and harmful emissions of buildings as they are under construction.

LEED® is the world's most widespread building certification system: to date, there are approximately 13,600 certified buildings throughout the world and some 26,500 are about to be certified.

Italy numbers 28 certified buildings, while certification is pending for 101 projects. The statistics published in the website of the Green Building Certification Institute (www.gbci.org) are constantly updated. The Institute is an independent organization that manages the LEED® certification program, the technical audits and assesses the projects to establish whether they comply with credit requirements.

The LEED® assessment system is based on a score awarded after "credits" have been obtained in different areas. The score obtained for each individual credit is awarded when the project and/or building complies with the specific requirements involved. The level of certification achieved depends on the total score obtained: Certified, Silver, Gold and Platinum.

Certified
(40-49 points)

Silver
(50-59 points)

Gold
(60-79 points)

Platinum
(80 points and above)

The system is flexible, detailed and, while maintaining the same sort of general approach for the various areas, includes differentiated specifications for new constructions and commercial interiors (NC, New Construction and Major Renovations; CS, Core & Shell; ID, Interior Design), for existing buildings (EBO&M, Existing Buildings Operations & Maintenance), for schools (LEED® for Schools)
and for homes (LEED® for Homes).

The LEED® certification standard was introduced in Italy by Habitech which, in 2008, established the Green Building Council Italia, the association that promotes the LEED® standard nationwide.
There are other U.S. LEED® standards:
– LEED® for Healthcare;
– LEED® for Retail;
– LEED® for Neighborhood Development;

On 14 April 2010, GBC Italia launched LEED® 2009 Italia for New Constructions and Renovations, thereby implementing the principles and criteria of the American version and incorporating them into the Italian and European regulations.

LEED® certification for New Constructions & Major Renovations is based on a framework of credits that include seven thematic areas:
1. Sustainable Sites (SS)
2. Water Efficiency (WE)
3. Energy & Atmosphere (EA)
4. Materials & Resources (MR)
5. Indoor Environmental Quality (IEQ)
6. Innovation in Design (ID)
7. Regional Priority (RP)

The credits are divided amongst: prerequisites, central credits and credits for innovation. Projects under certification must meet all the required prerequisites, which are obligatory, while the credits are ascribed on the basis of the level reached by the requirements considered and assessed in accordance with established criteria.

Habitech – Trentino Technological District

Habitech is the enterprise that introduced LEED® certification in Italy where it is sector leader with a comprehensive and reliable package of services for all certification procedures. It handles the largest share of the domestic LEED® market and the highest number of LEED® AP, auditors and trainers in Italy. Habitech enjoys a position of leadership with regard to LEED® in Italy: it has assisted the certification of 14 of the 28 buildings certified to date in Italy and is supervising 22 new projects under certification. It also guided Europe's first LEED® certification of a school building and in Italy, the first three LEED® EB:O&M certifications (among which the third and fourth in Europe) of existing buildings, the first LEED® Commercial Interiors certification and the second LEED® NC Platinum certification.

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IL DISTRETTO ENERGIA AMBIENTE

Mapping Your Green Products
greenmap

The final score is obtained by adding all the points acquired within each thematic area. This establishes the certification level obtained.

LEED® certification for Commercial Interiors is the system used for the high performance certification of indoor environments that are healthy workplaces, less costly to manage and maintain, and with low environmental impact. LEED® for Commercial Interiors allows sustainable decisions to be taken by design engineers and lessees, who are not always in control of the operations that take place in the entire building.

LEED® certification for Existing Buildings: Operation & Maintenance (EB: O&M) helps to optimize the energy efficiency of buildings by reducing environmental impact.

This standard encourages the proprietors of existing buildings to implement sustainable practices and reduce the environmental impact of the buildings by means of operation and maintenance methods such as:

- Building enclosure maintenance programs
- Energy and water usage
- Preference for use of sustainable products to clean the building
- Sustainable product purchasing policies
- Waste management
- Quality of the indoor environment

In 2011, GBC Italia created a second tool mainly designed for the residential market. It's the GBC HOME manual, a publication based on LEED® FOR HOMES, but specifically developed to suit the housing characteristics and diversities of the Italian construction market.

The intention with GBC HOME is to promote healthfulness, durability, economy and the best environmental practices for building design and construction. The GBC HOME building sustainability assessment system is a voluntary method based on the common consensus of the members and a market-driven approach.

LEED® and products: the Habitech Product Mapping Service

LEED® certification refers to buildings. It cannot be obtained for a material, a building product or a system since the credit requisites concern the characteristics and performance of the materials used in a building as a whole, and not of an individual product.

What products can do is to contribute or conform to the requirements of the prerequisites or credits.

So long as they conform, all the products installed and chosen for the project can help to meet the credit requirements.

Those who design and construct a building in accordance with LEED® criteria need partner-suppliers able to provide products that comply with the parameters required. They must also be able to provide all the information, documentation and certificates attesting to the performance of the products they supply. Habitech offers a Product Mapping Service to help enterprises to comply with these requirements.

Habitech Distretto Tecnologico Trentino S.c.a.r.l implements a project dedicated to enterprises and manufacturers for the purpose of providing assistance when their products are assessed with respect to the LEED® certification protocol.

To date, Habitech has mapped over 750 products and has created Greenmap, the first European marketplace for building products and systems that contribute towards the requirements of the LEED® credits, which can be consulted in the website www.greenmap.it.
Greenmap is a showcase of products fit for LEED® certification that design engineers, principals, administrations and enterprises can consult free of charge, depending on the credits they need for their projects.

ABB solutions to help you obtain LEED® credits

ABB solutions that contribute towards the credit requirements of the LEED® rating system are illustrated on pages 16, 17 and 18. Visit the www.greenmap.it website (Italian only) and register free of charge, then browse and discover all the ABB solutions in detail.

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The modern two-way

Continuous evolution of lighting control switches

Guido Tronconi: *Product Manager – Wiring Accessories*

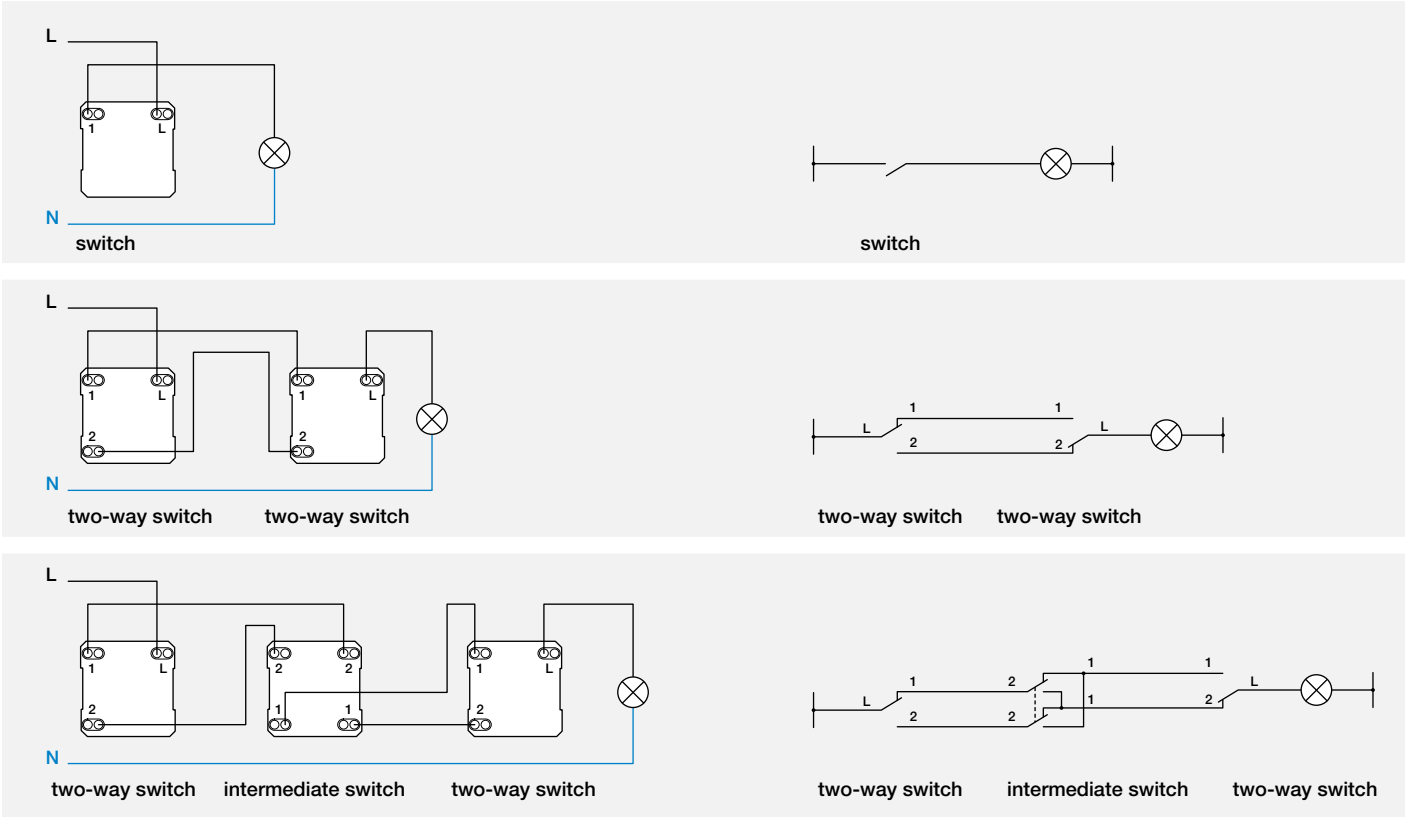
Switch, two-way switch, intermediate switch. These three devices, in their apparent simplicity, form the ABC of electricians' daily work and allow the main functionality of residential installations, turning lights on and off from different points in the house, to be implemented economically.

Once installed in the back box, the three switch modules are visually and functionally identical; the look, size and mechanical behaviour of toggle switches are absolutely the same, to the point that most users do not suspect that there is a difference between one switch and another.

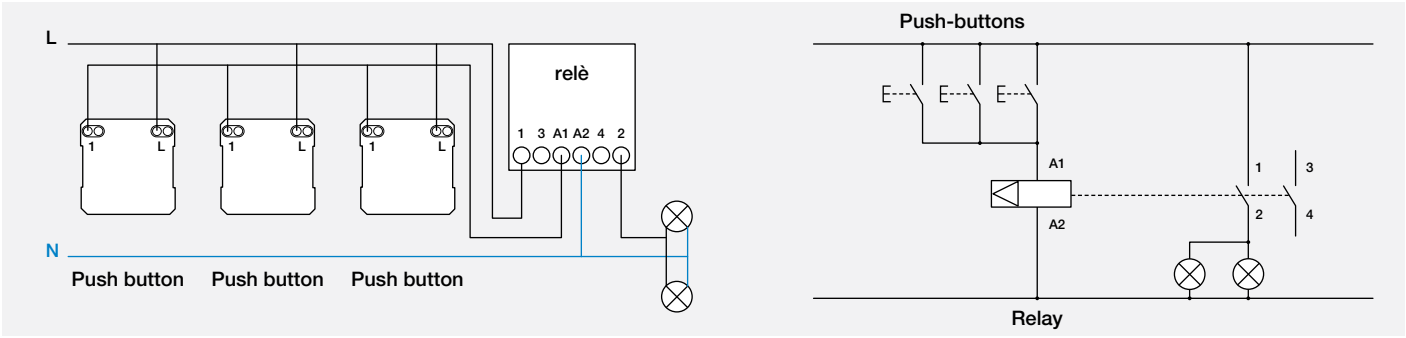
The contacts and terminals contained in each device ensure their operation inside a rigid but reliable connection scheme. By following simple wiring rules it is possible to control lights from 1, 2 or 3 points. (figure 01)

While knowledge of just three schemes allows almost all lighting circuits to be implemented in the cheapest way (rarely do houses have lights controlled from more than three light points), no space is left for creativity. An error in connection or a faulty device indeed prejudices control of the load, the number of cables used grows with the number of switch points and implementing 4 or more control points becomes a real head scratcher.

A solution which is certainly more flexible and logical in its connection structure and represented by relay and push-button circuits, which is the most effective solution for controlling loads from multiple light points. (figure 02)



01



02

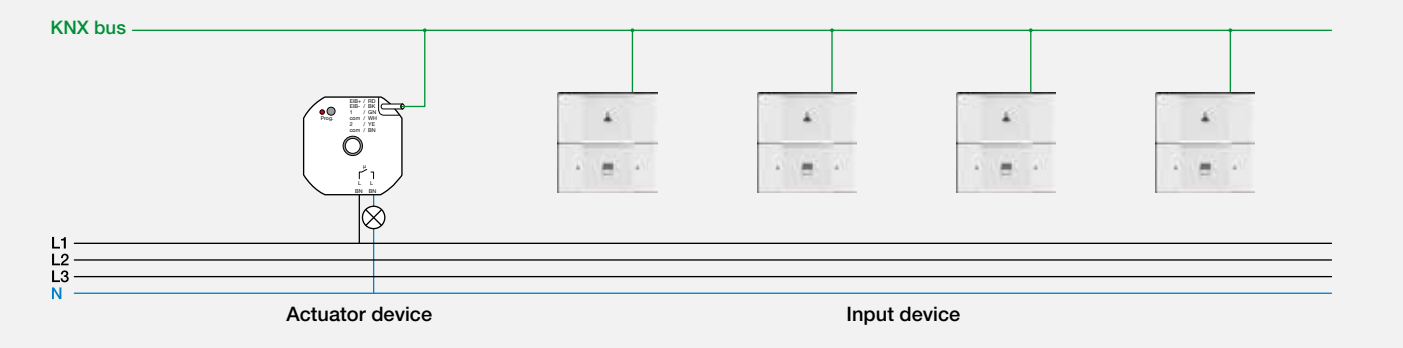
Unlike two-way and intermediate switches, push-buttons are all identical (monostable) and, when electrically connected in parallel, serve only to excite the relay coil via a control signal. Switching of the load is therefore performed indirectly via the relay contact (bistable).

This scheme has the undeniable advantage of always being unchanged, independently of the number of control points (buttons) installed. Furthermore, the presence of relays, in other words a component specifically dedicated to controlling the load, allows significant flexibility when choosing the most suitable product for the application being considered. There are, indeed, many types of relay, which differ in their electrical characteristics (coil voltage, contact rating etc.) or their installation characteristics (modular, flush-mounted etc.).

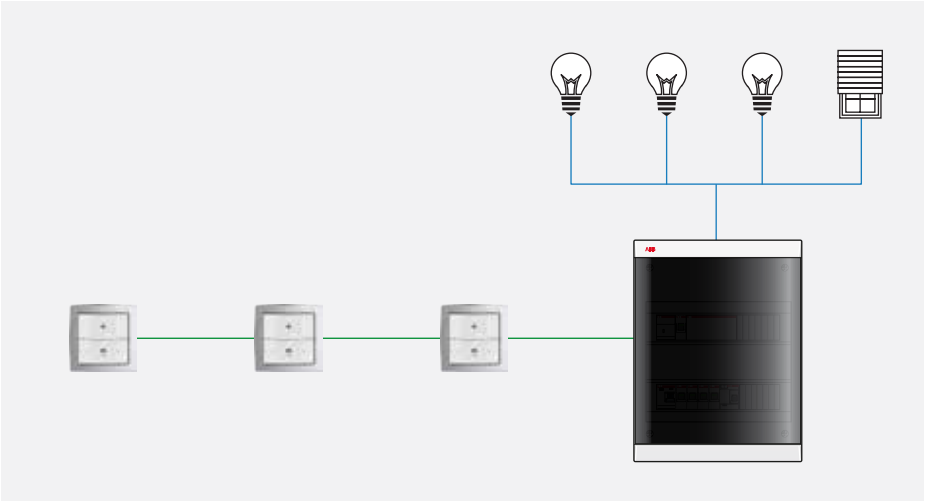
In the case considered above we nevertheless find ourselves faced with an electromechanical situation: it is difficult to manage more advanced functions than turning lights on and off with this system. Modern bus-based automation solutions take advantage of the same operational principles as relay circuits, but benefit from the greater potential offered by electronics by every device comprising the system. Traditional electrical wiring is reduced and replaced in a large part by the bus cable, which links the devices and allows them to communicate via a single, coded low-voltage signal.

01 Controlling a light from 1,2 and 3 points using switches, two-way switches and intermediate switches.

02 Controlling lights from more than 3 points using a circuit with push-buttons and relays.



03



04

03 Controlling lighting from multiple points via decentralised KNX installation.

04 Distribution of centralised system over KNX bus system.

The input devices, like push-buttons, allow instructions to be sent over the bus; the actuators (actually containing one or more relays) are, on the other hand, designed to interprete these signals and translate them to control the load they are electrically connected to.

The link between the input devices and actuators must be defined via an addressing or programming procedure, whose method depends on the bus system being used. Correct wiring is therefore no longer sufficient to guarantee the required functionality, but in this manner a significantly greater level of flexibility can be reached: once the programming is understood, the same rules can be used to control multiple lights, a dimmer, shutters or, indeed, any type of actuator. It is also possible to change the system's operation by changing its programming at any point in time.

The wiring diagram above (figure 03) shows a light being controlled from multiple points with the KNX Intelligent Building Control system. In principle, the structure is similar to the solution shown in figure 02. The main difference is that a bus cable is used to connect the KNX input devices with the KNX actuator.

The actuator device shown in figure 03 is a flush-mounted device which can be mounted into standard back box modules, offering a decentralised installation solution which is also very similar to traditional system. ABB offers several flush mounted KNX actuators for different applications such as switching of lighting, blind and heating control. This decentralized approach is especially suitable for the renovation of an existing conventional electrical installation.

By exploiting the possibility offered by bus systems to separate input devices and actuator devices, it is possible to implement centralised wiring solutions. In this case, actuation is generally implemented entirely in the electrical panel (generally using modular devices), while input devices (usually flush-mounted) are delocalised, connected only to the bus cable. An example of this solution implemented with the KNX bus system is represented in figure 04.

As you can see, we find ourselves faced with an extremely rational solution, but which is also onerous in terms of wiring installation (all live runs back to the electrical panel). Using this solution is therefore difficult when performing renovations, while it is certainly very beneficial for new installations, especially if they are of a large size.

Over the years, many solutions have been developed for managing light switching from multiple points in a more functional, flexible and evolved manner.

Behind that "switch", there is already an entire world of possible choices …

And you? What do you think the next step will be? Let us know your opinion.

New DS202C. A type of protection that is not afraid of size

Thanks to the width of only 2 modules the DS202C RCBO series allow a saving of 50% of the space occupied in the switchgears compared to the traditional solution in 4 modules. Available in an advanced and complete technological range, the DS202C can be applied in the commercial sector, large scale industrial plants and naval applications. The new series fits in perfectly with the System pro M compact® modular range, starting with the identical form, that ensures the installation has an aesthetically coordinated appearance. And maximum protection in just 2 modules.
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Spectacular electrical effects

Las Vegas lights up the stars
The most brightly illuminated city in the world is always a pioneer when it comes to creating new ways of attracting crowds of visitors. Protagonist of this never-ending competition among numberless luxury hotels, the Luxor Las Vegas, one of the city's largest buildings, has installed 39 floodlights totalling a 273 kW power rating, on the tip of its pyramid structure. This powerful lighting is directed straight towards the sky and symbolizes the unrestrained search for fortune common to gamblers worldwide who also dream of touching the stars.
The luminous flux is so powerful that Day by DIN could be read at a height of some 16 km!

Reference: National Geographic

Photo by Joe McNally

Dancing lights among the skyscrapers
Hong Kong offers its inhabitants and visitors an unforgettable show at night. It's difficult to pass through the Victory Harbour district without admiring the spectacle that, since 2004, begins each day at 8 p.m. It lasts 13 minutes accompanied by specially composed music and an amazing array of lights of different colours and intensity emitted by 2000 light sources affixed to more than thirty skyscrapers. “Symphony of light” is the name of this unparalleled initiative created by the Hong Kong government to underscore the beauty of the city's skyscrapers. Those who are not near enough to hear the music but wish to enjoy the view from a distance without losing any part of the splendid choreography of sound and light need merely tune into the radio.

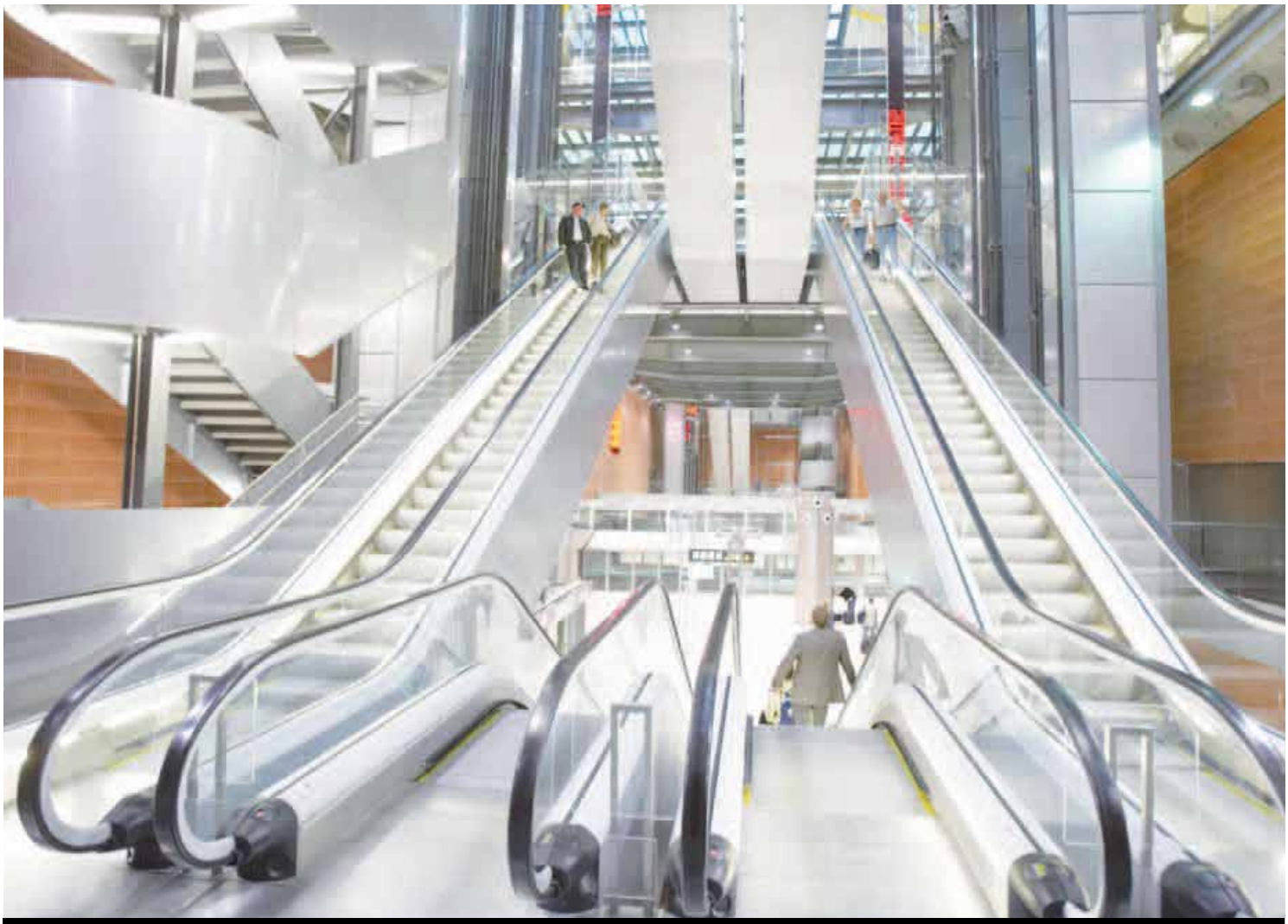
Reference: http://www.guinnessworldrecords.com/records-4000/largest-permanent-light-and-sound-show/

DINside View

A watchful eye on the Tomb of the Unknown Soldier thanks to ABB video door entry system

Giorgio Cecchini (F.C. Automazioni, Rome - Italy) created the video door entry system installed at the Vittoriano monument of Rome, so as to protect the Tomb of the Unknown Soldier and allow the sentries to communicate with each other. Use of the 2Line intercom and videodoor entry system was mandatory since there were only two conductors in the pre-existing UTP cable.

Send a photo of an application you have created using ABB DIN rail and switchgear front products to this email address: mail.daybydin@abb.com. We'll publish the most interesting ones.



E 90 range. Designed by ABB for the most demanding customers

Disconnecting and switching suitability, efficient dissipation of heat and certified according to several International Standards are essential requirements to satisfy the expectations of the most demanding clients.
ABB has dedicated the passion, skill and creativity of its designers to the development of a new range of E 90 fuse switch disconnectors and fuse holders.
The result is the first fuse switch disconnector AC-22B IMQ and UR up to 32 A and 690 V.
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