

2 | 14

An ABB technical journal
for Enclosures and
DIN-Rail Products users

Day ^{by} DIN



News and know-how for informed professionals

Case History

ABB products play a part at 2014 World Cup

Powering the railways

Overview of main standards concerning railways
application and products requirements



Taking sub-metering to the next level?

Absolutely.



ABB's MID-approved EQ meters offer the same quality as revenue meters, approved meters and verified meters. EQ meters are certified and have verified meter accuracy, which is a critical factor in establishing fairness in cost allocation and distribution among tenants. Many EQ meters are also delivered directly from our factory with first time verification. ABB's EQ meters are high-performance, modular DIN-Rail-mounted electricity meters that are safe, easy to install and can be integrated with existing and future electrical installations. EQ meters are designed to fulfill any type of sub-metering requirement. www.abb.com/lowvoltage

Power and productivity
for a better world™





Powering the railways (50)

Day by DIN 2|14



Valentina Surini
Product Marketing Manager
DIN-Rail Products

Dear readers,
Welcome to Day by DIN 2|14, it is a pleasure and an honor for me to present you for the first time our magazine, having in this way the possibility to reach you directly, so many customers that show us their interest by applying with so many subscriptions. Thank you very much!
Under the magnifying glass in the last period the 2014 FIFA World Cup: also ABB has participated to it, we have been one of the main suppliers of electrical equipment for the Brazilian stadiums, by providing solutions for their applications. One of the solution was the energy efficiency's management: this is a topic that everyday acquires more and more importance worldwide, people care a lot about it for environmental reasons but also for economic savings, inside this issue you will find answers to some questions placed by you about this topic.

Another hot subject that you will find regards railways application and its standards, together with a new brochure "DIN-Rail components for rolling stock applications" developed from ABB to support you technically on your daily business. Hope you enjoy!
Since it's the first time that I have this great chance to speak directly with you, I would be glad to receive your comments, questions and curiosities: please write me to the email address mail.daybydin@abb.com, I will reply to your questions directly or through our section "Goodmorning DIN-Rail" and - even better - I will collect your suggestions to develop articles more and more close to your curiosities and needs. Enjoy Day by DIN and looking forward to receive lot of emails from you!

Would you like to receive all next issues of Day by DIN?

Subscribe now by filling the form that you find at the following link: <http://goo.gl/XXeMg> or by capturing the QR Code beside with your smartphone. You'll receive your personal printed copy of this issue and all the new ones coming in the future.





28

Case History

ABB products play a part at 2014 World Cup



60

Turn off the lights: myth and reality

It is a widely accepted theory that it is cheaper to leave the lights on than turn them off and on again when we return.

News and facts

- 6 **Jump in the box**
Fresh news from ABB for your installation!
- 16 **In the news**
Literature on our latest products
- 58 **From Installer to Marketing Expert**
Customer Satisfaction

The expert answers

- 26 **Good morning DIN-Rail**

Did you know that?

- 27 **How to read accuracy and choose the best measurement device for your application**

Doktor Wise

- 30 **Flexible communication for full integration**
- 31 **Residual current protection devices**
Types of waveforms detected with the residual current devices and classification

Case History

- 28 **ABB products play a part at 2014 World Cup**
Ensuring reliable electric power supply at 2014 soccer world cup.

Curiosity

- 38 **The biggest dams in the world**
Impressive and monumental infrastructures for energy production, but what is their real cost? Energy efficiency remains the only real clean solution.
- 60 **Turn off the lights: myth and reality**
It is a widely accepted theory that it is cheaper to leave the lights on, when we temporarily leave our workplace, than turn them off and on again when we return. A video, broadcast on Discovery Channel, tells us exactly the opposite.



36

Wind power

Why the wind industry should focus on cost and not only on prices

Technical

32 Fast wiring thanks to screwless terminals

An opportunity not to be missed: changing installation habits to gain speed and safety.

34 REACH e RoHS

ABB's care for the environment and the health of its customers and suppliers is ensured by the compliance with the REACH Regulation and the RoHS Directive.

36 Why the wind industry should focus on cost and not only on prices

40 The new energy-saving light bulbs

46 Artificial lighting: consumption data

Artificial lighting is certainly one of the most typical and appreciated electricity applications, especially by people without technical background.

Children often even think of electricity and light as the same thing.

50 Powering the railways

Overview of main standards concerning railways application and products requirements

Time to relax

62 Connect the boxes

Train your brain

Jump in the box

Integration and flexibility are the key words of the ABB new products releases: in the next pages discover the new family of main distribution boards System pro *E* power, together with the high performance SNK PI-Spring terminal blocks, the AC/DC miniature circuit breaker S200M UC and many more.

Protection

S200M UC

A real all-rounder: flexible control of both direct and alternating currents

The S200M UC impresses with its performance range and high number of approvals. Moreover, its flexible application for both DC and AC makes it a valuable addition to the System pro *M* compact® range. Whether warehousing and project engineering, planning and installation or maintaining equipment, the S200M UC is an easy to use and flexible solution.

Brochure: 2CDC002140L0201



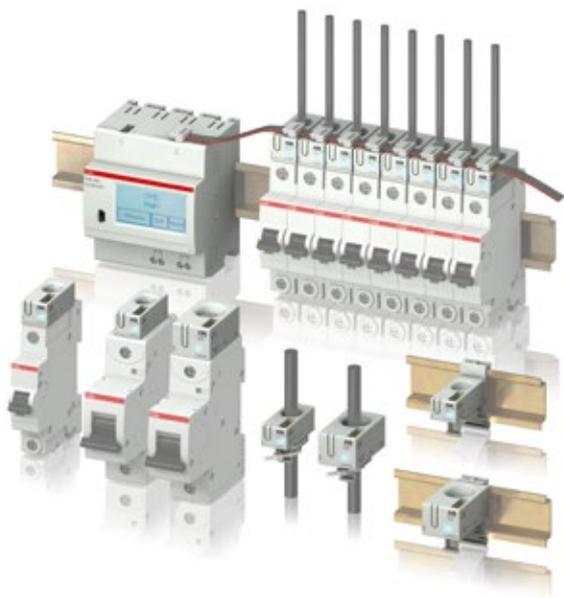
Benefits

- For DC and AC applications
- Improved terminal technology
- Excellent technical data
- Wide range of approvals
- Contact position indication
- One module width even with integrated auxiliary contact
- Fully compatible with System pro *M* compact® accessories

Measurement

Current Measurement System

Available the new CMS sensors for any installation



The Current Measurement System (CMS) is a system for current measurement of electrical lines. CMS sensors are among the most compact and high-performance current sensors on the market. The system consists of a Control Unit and of sensors available with different measurement ranges and mounting possibilities. The sensors are measuring alternating (AC), direct (DC) and mixed currents, always TRMS. Up to 64 sensors could be connected to each Control Unit. The sensors are linked to the Control Unit by a flat cable. The measurement data can be remotely queried by a Modbus system via RS485 Modbus RTU interface on the Control Unit.

Catalogue: 2CCC481002C0201



Benefits

- Due to the compact sizes of the sensors there is no additional space needed in the enclosure. The compactness allows retrofitting in existing installations without rebuilding the enclosure.
- The CMS is freely scalable which means that the user can choose the amount of measurement points he needs for each specific installation.
- All components get linked over one flat cable which saves installation time and leads to an excellent overview in the distribution unit and minimal wiring.
- As the sensors measure AC and DC currents the CMS can be universally used in every type of application
- With the intuitive menu layout and touch screen, commissioning is very fast and user-friendly. Within minutes the system is ready to start measuring

Control

New SNK PI-Spring terminal blocks

High performance terminal blocks using screwless technology

ABB's new PI-Spring terminal blocks are dedicated for both standard and premium industrial applications. The SNK series is now constituted of the new PI-Spring range and the established screw clamp range. These newly designed screwless terminal blocks provide the benefits of both Push-In and Spring technologies.

Further information: www.abb-connecttocontrol.com



+ Benefits

- Smart connection: our connection technology allows a direct one step insertion with rigid and prepared flexible conductors.
- Smart logistics: selection is simplified, stocking is significantly reduced
- Smart Design: asymmetrical design allows immediate visual check in case of reversed terminal blocks

Intelligent Building Control

ABB i-bus KNX EnOcean Gateway

Integration of EnOcean devices in KNX

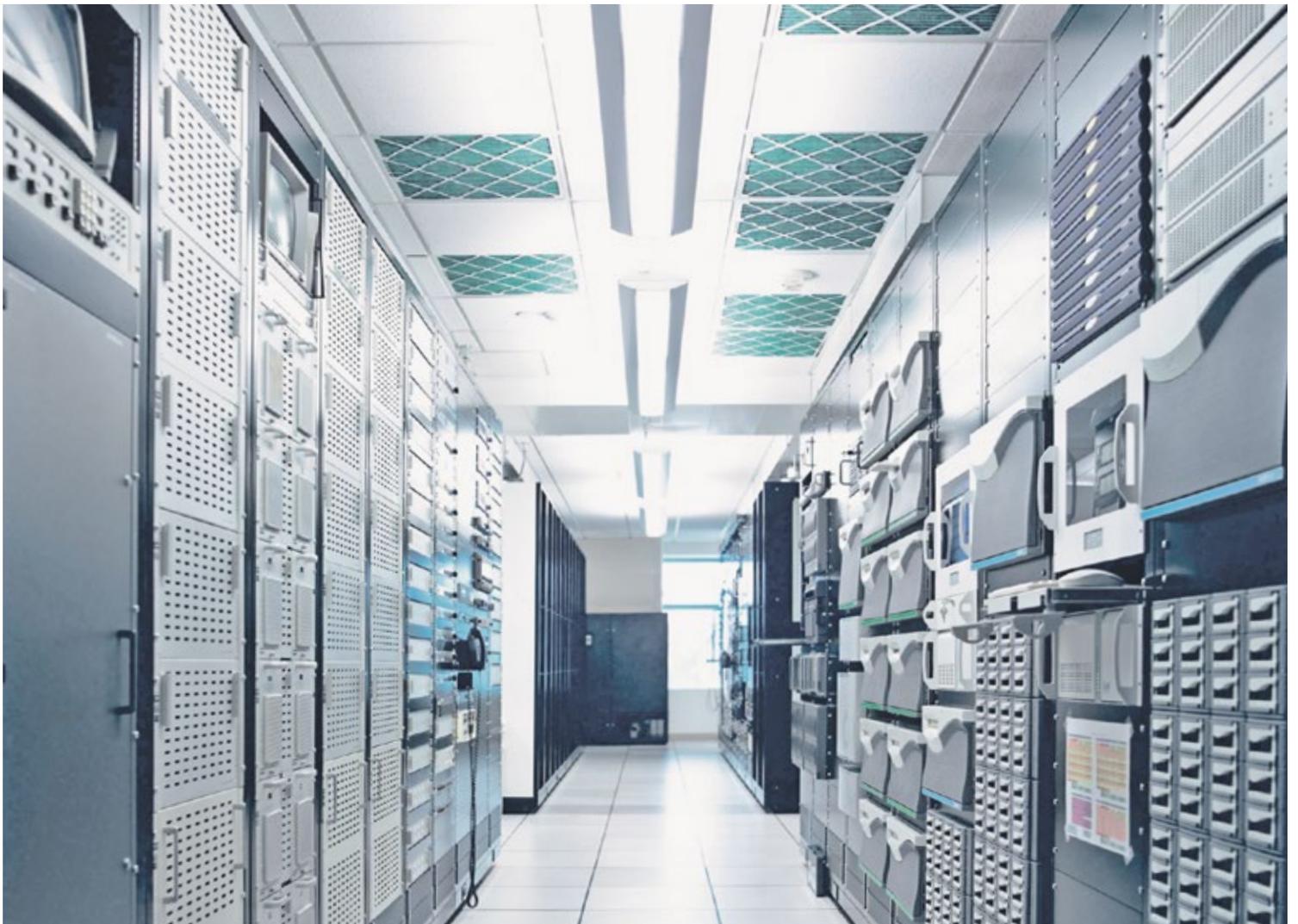


The new ABB i-bus KNX EnOcean Gateway allows the integration of EnOcean devices in KNX networks. The energy harvesting wireless EnOcean technology is used to integrate self-powered wireless switches, sensors and controls in wired KNX installations. The power supply of the gateway is realized via KNX connection. No external power supply is needed. A special feature of the KNX/EnOcean Gateway is the integration in the ABB i-bus Tool for diagnosis and commissioning support.

Further information: www.abb.com/knx

+ Benefits

- Gateway supports up to 253 KNX communication objects
- The signal level of all received EnOcean telegrams can be easily displayed via ABB i-bus Tool
- An additional metering device is not necessary



CMS Current Measurement System. A new level of efficiency and availability.



To minimize energy and downtime costs, CMS offers an unique and highly efficient branch monitoring solution. The ultra-compact CMS sensors can be easily integrated in existing and new installations within power distribution units. This provides an unprecedented transparency of the consumption which increases the energy efficiency and service continuity of the plants. www.abb.com/lowvoltage

Enclosures

System pro *E* power

New family of main distribution boards

The ABB Low Voltage Products Division is proud to present System pro *E* power, a new family of distribution boards. Result of the experience acquired over the years by ABB in the construction of distribution boards, System pro *E* power arises from an innovative project development program in partnership with professionals from the construction and installation fields. The new solution for primary distribution with rated current up to 6300A and short-circuit current up to 120kA is designed to meet all the low-voltage electric distribution network requirements depending on the type of installation, protection level and electrical and mechanical characteristics.

Brochure: 1STC803005B0201



+ Benefits

- Time-saving assembly thanks to new patented quick mounting system
- Just a few part numbers for 120 enclosure sizes
- Uprights with two different surface levels per side so that different kits can be installed
- New busbar systems using the same components: crosspieces, fixing brackets and multifunction insulating supports able to house 5 or 10 mm thick flat or shaped section busbars
- 3 different type of busbars available to select: linear, shaped and “cuponal” (aluminum with copper surface)
- Internal segregation partitions from Form 1 to Form 4b created by simply adding accessories in sequence
- Protection degrees up to IP65 can be obtained for every type of application
- Error-free assembly of the structure, which is perfectly symmetrical
- Scale and linear distribution bars holders allow installing the bars at any position, horizontal or vertical
- Robust stability thanks to the new dual-surface profile of the upright with 13 folds and its new patented jointing system



System pro *E* power. Flexibility is Power.
Your new key resource.



System pro *E* power. The new main distribution switchboard created by ABB to help you work better. System pro *E* power is simple, fast and flexible. Whether it's a standard, or an advanced version up to 6300A, System pro *E* power is incredibly sturdy and extremely quick to assemble. This switchboard houses all ABB's devices to perfection and can be fully accessorized. System pro *E* power, your enterprise has a new key resource. www.abb.com/lowvoltage

Power and productivity
for a better world™ **ABB**

ABB-free@home®

Making home automation easier than ever



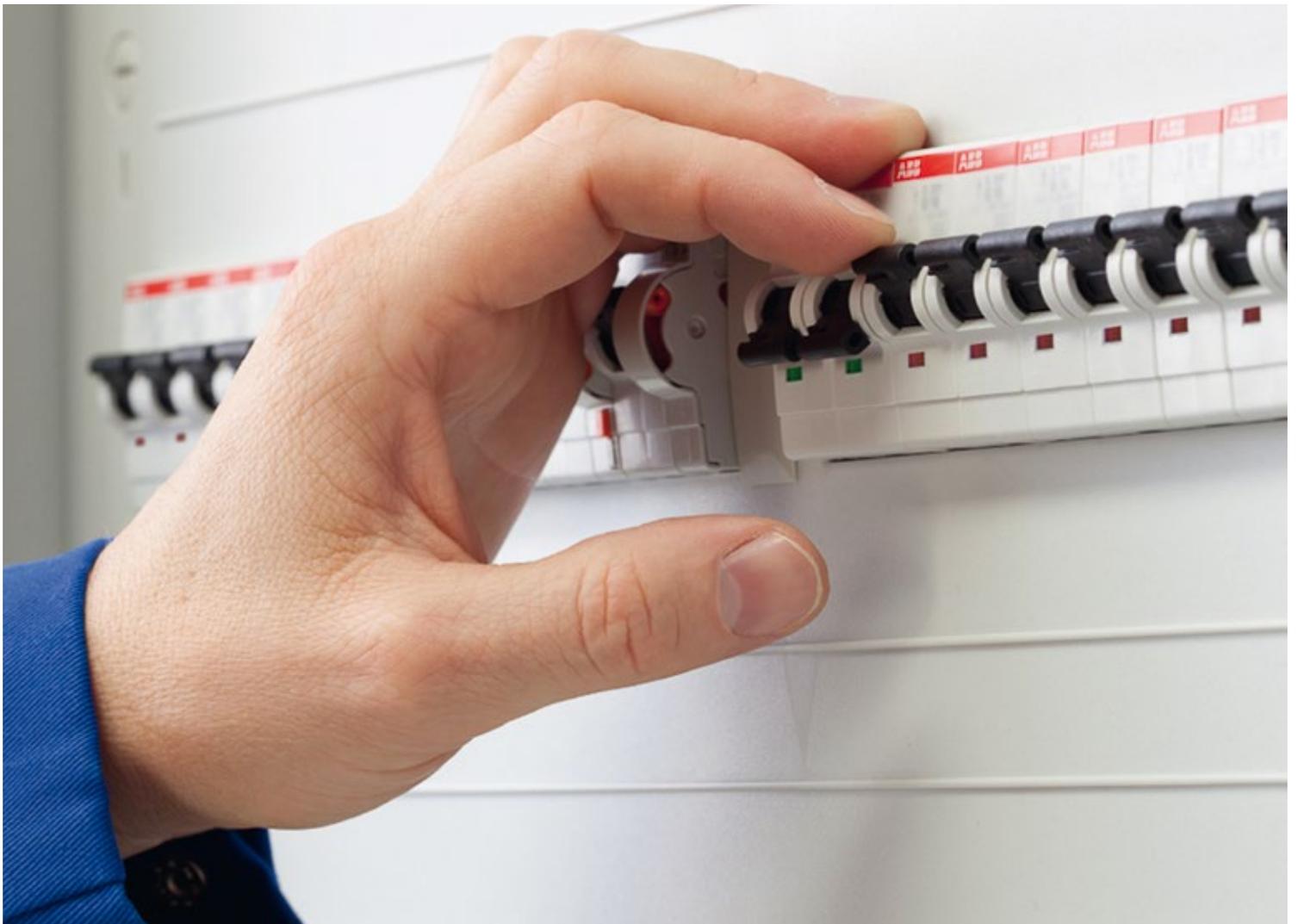
Simply smart. ABB-free@home® transforms the house or the apartment into an intelligent home. Whether blinds, lights, heating, air conditioning, door communication or scenes. Easy to remote control via a switch on the wall, with the laptop or with the smartphone. Very convenient. Extremely comfortable. Very energy efficient. Especially attractive: Only minimal costs are involved when compared with conventional electrical installations.

Further information: www.abb.com/freathome



Benefits

- The especially user-friendly app of ABB-free@home® makes home automation for residents via smartphone or tablet as easy as surfing the Internet
- Configuration via an app
- Fast change of scene(ry)
- ABB-free@home® is manufactured according to the international standard IEC EN 60669 as well as IEC EN 50428
- All devices for ABB-free@home® are manufactured ecologically compatible – according to the RoHS Directive



Is it possible to switch off AC / DC?

Certainly.



The S200M 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 S200M UC is a simple and flexible solution. For more information, see www.abb.com/lowvoltage

Protection

OVR SL

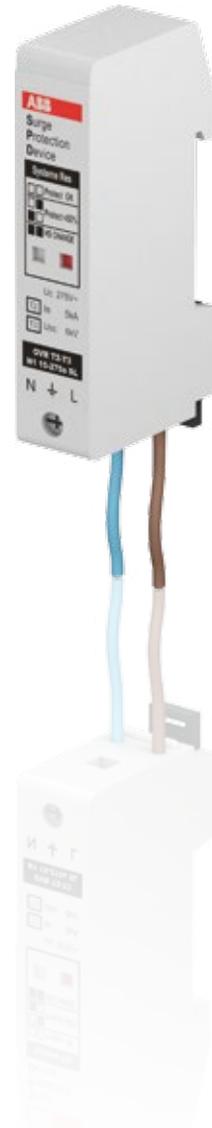
Surge protective devices for street lighting applications

OVR SL is a dedicate SPD for lighting applications, and more specifically to prevent risks related to lightning surges in LED lamp posts. With this new product, ABB is giving a high quality solution for LED lamp post manufacturers and saving hours of maintenance to city councils.

There is in Europe more than 90 millions of lamp post installed and each year there is 10% of these that are renewed, the market is huge! The lighting world is now moving from the traditional bulbs to LED, in 2020 50% of the installation will be LED.

OVR SL is the reliable solution to protect LED drivers in lighting applications.

Leaflet: 1TXH000312B0201

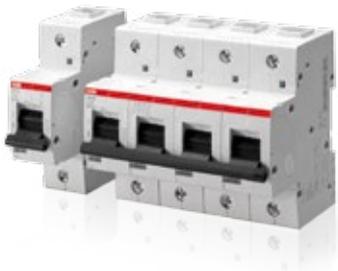


Benefits

- With its compact size (17,5mm) this one can be installed at the bottom of the lamp post for easiest maintenance
- Extreme good protection level for drivers with a low Up value (1,1kV)
- Highest protection thanks to its high level of discharge current ($I_{max} = 15kA$)
- Fitted with a safety system (2 varistors in parrallel) to extend product life



S800 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: S800 B high performance circuit breakers 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. 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, they show why tripping occurred at a glance, enabling prompt maintenance. www.abb.com/lowvoltage

Power and productivity
for a better world™



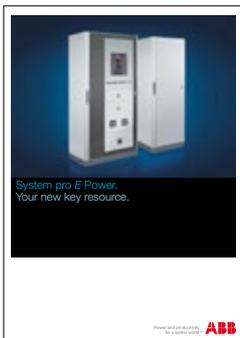
In the news

Many marketing tools, from brochure to video, from smartphone apps to webpages, to provide always new information and documentation for professionals.

Documents and software can be downloaded from <http://www.abb.com/abblibrary/DownloadCenter/>

Enclosures

System pro E power
Your new key resource



New brochure shows principal advantages of new main distribution system. Equipment ensures fulfilment all project implementation for primary distribution in low voltage networks up to 6300A. System pro E power is the market's new benchmark. It redefines the concept of excellence and performance for distribution switchboards. If Flexibility, Velocity and Simplicity are what you're looking for, then this new main distribution switchboard is the right choice for your electrical system.

Brochure: 1STC803005B0201



Intelligent Building Control

Smart Home and Intelligent Building Control 2014

Latest ABB i-bus KNX innovations



In this product news brochure the latest innovations in the field of intelligent building control are showcased. It includes a brief overview of our new range of power supplies, which are available in a standard and premium range, new blower actuators and the KNX EnOcean Gateway. A highlight is the new KNX Security System as a professional alarm panel for the KNX expert.

Brochure: 2CDC500104B0201



Home Automation

ABB-free@home
Easily controlling everything

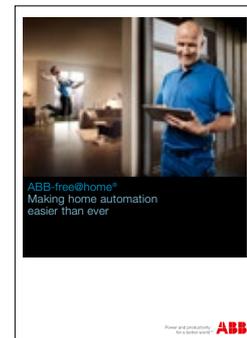


ABB-free@home® transforms the house or the apartment into an intelligent home. Whether blinds, lights, heating, air-conditioning or door communication – comfort, safety and efficiency can finally be remote controlled. Via a switch on the wall or with a smartphone. The new ABB-free@home® brochure contains detailed information about the features, the various applications and the full product range.

Brochure: BJE 0001-0-1412/3.14/0502-D



Wind Segment

ABB Low Voltage products portfolio

Deliveries from A to Z into the wind industry



ABB Low Voltage Products division offer a large portfolio for wind power application. This brochure aims at summarizing in few pages the list of all these products showing in which applications they fit inside the wind turbine as well as the main ABB innovative solutions.

Brochure: 1SFC001012B0201



Wind Segment

Wind Economy

Create the perfect wind economy with every turn



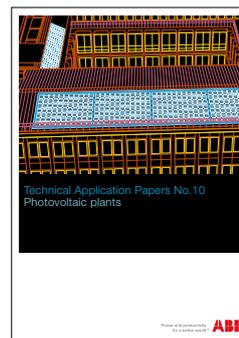
With its 30 years of experience, in-depth know-how, global manufacturing footprint and thorough understanding of both wind turbine applications and power systems, ABB serves wind power customers at every stage of the process. This video presents general value propositions: ABB is the leading supplier to the wind power industry of electrical products and solutions, delivering wind economy in every wind energy project it is involved in.

Video: <http://goo.gl/JJAAYi>

Solar Segment

Technical Application Paper, Photovoltaic plants

New edition of the QT10



This Technical Paper is aimed at analyzing the problems and the basic concepts to be faced when designing a photovoltaic plant, starting from a general description of the ways to exploit solar energy through PV plants. The methods of protection against overcurrents, overvoltages and indirect contacts are described in order to offer the necessary guidelines to ensure the proper choice of control and protection devices for different parts of the plant. A second part of the document describes the solutions offered by ABB for photovoltaic applications including the latest new products available!

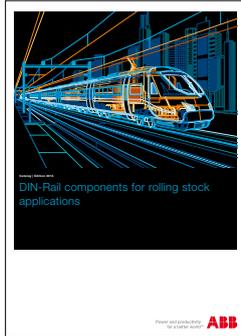
Technical Paper: 1SDC007109G0202



Railway

DIN-Rail components for rolling stock applications

Uncompromised safety



The first edition of ABB DIN-Rail components for rolling stock applications catalog is now available!

Find out ABB DIN-Rail solutions for the traction sector to get the best protection and comfort, using a comprehensive fully integrated range of highly reliable, easy-to-install products.

The breadth of our product portfolio has allowed us to become a market leader in the railway sector, supplying products and services to manufacturers and traction operators in more than 100 countries. In order to offer our best solutions, we created for you the first catalog exclusively dedicated to rolling stock applications.

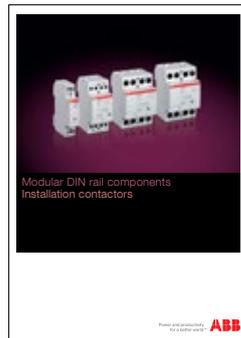
Catalogue: 2CDC002053D0204



Control

ESB and EN Series Installation Contactors

New lamp loads table for ESB installation contactors and new calculation strategies for lightning projects



Light is important for life and wherever people live. At the same time lights are consuming huge amounts of energy. Thus the LED market is emerging and energy saving is a key factor. The new and innovative LED solutions have special requirements on switching and controlling. The ABB Installation contactors (ESB/EN range) with low power consumption are the ideal solution for switching lamp loads in industrial and commercial buildings.

To make it easy for customers ABB developed a new lamp loads table to simplify the selection of lamps and the related contactors.

Brochure: 2CDC103013B0201



Residential

System pro M compact[®] residential

Simply the best



The third edition of ABB System pro M compact[®] residential catalogue for residential and small commercial applications is available!

Thanks to its extensive expertise, ABB offers the best products, systems and services with unique features in terms of versatility, efficiency and safety, developed to guarantee maximum domestic comfort and protection, in any environment or context.

Inside this third edition, you will find a wide ABB DIN-Rail product portfolio for protection, command, alerts, comfort and energy efficiency. There is also a full section of consumer units, distribution boards and junction boxes for residential and small commercial. Find out many application and solution examples to get the best protection and comfort for your customer's home and small commercial business. Discover the reliable, easy-to-use ABB product offer, based on the advanced technology of one of the world's greatest leaders in the residential segment.

Why choosing anything else when you can simply choose the best!

Catalogue: 2CSC400031D0202



Connection

SNK series, PI-Spring terminal blocks brochure

Smart design, smart
logistics, smart
connection



ABB's connection technology allows a direct one step insertion with rigid and prepared flexible conductors. Asymmetrical design allows immediate visual check in case of reversed terminal blocks. Circuit identification is improved thanks to the 20% larger marking area. Save up to 15% space in your cabinet as ABB's compact design saves valuable space between cable trunks. Pre-mark by hand or with label on our flat marking surface and start immediately the wiring, before the final markers mounting.

Brochure: 1SNK160028B0202



Protection

A circuit breaker for all applications

A high performance circuit
breaker for all applications



An interesting document to discover the several technical details and characteristics that make S800 high performance MCB the right choice for a wide range of application: from wind and photovoltaic segment, to the protection of line in standard distribution cabinets.

Flyer: 2CCC413011L0201



Protection

A real all-rounder!

The innovative S200M UC:
flexible control of both
AC and DC



The S200M UC impresses with its performance range and high number of approvals. Moreover, its flexible application for both AC and DC makes it a valuable addition to the System pro M compact® range. Whether warehousing and project engineering, planning and installation or maintaining equipment, the S200M UC is an easy to use and flexible solution.

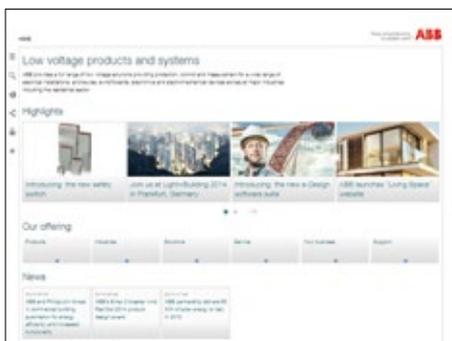
Flyer: 2CDC002140L0201



Webpage

Journey to digital

ABB's new low voltage webpage: appealing design with easy navigation

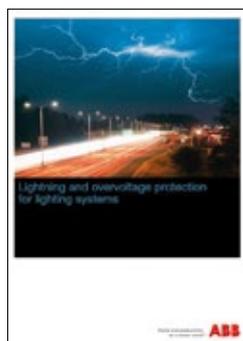


With some 30 million page views every year, ABB web visitors are about to experience a whole new look and feel for low voltage products and services. Moving 3,000+ pages to a new web platform is not a small task, but ABB is determined to make it much easier for customers to find information about our products and services. A strong focus on improved navigation, page layout and content will enable web visitors to find information easier and significantly improve web user experience. The new web platform enables seamless integration with mobile devices as well as some of the latest collaboration and social media tools. Look for the new portal! www.abb.com/lowvoltage

Protection

OVR SL

Surge protective devices for street lighting applications



Leaflet giving all information regarding protection of Street Lighting application in regard to over-voltages coming from lightning surges. Including all type of application that this new SPD T2+3 is able to protect, going from indoor / outdoor lighting in private or public areas (streets, parking lots), light bollards, traffic light, and all street furniture such as bus shelters, billboards or decorative lighting.

Leaflet: 1TXH000312B0201



Measurement

Monitoring of every branch

Current Measurement System

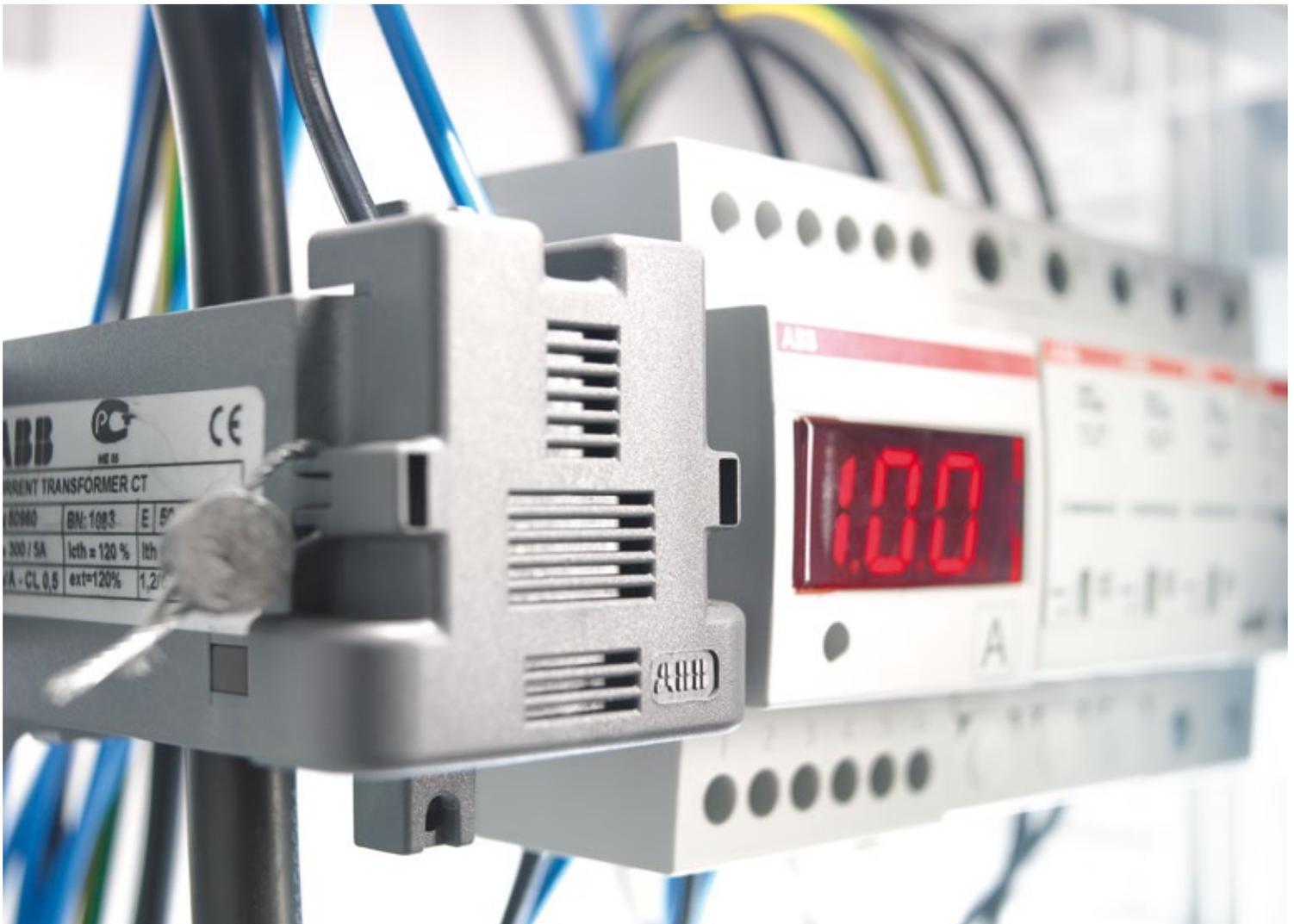


An extended portfolio sensor range for up to 160A (AC/DC/TRMS) it is now possible to install the sensors in every installation environment.

- CMS-Sensors - No space wasted here: everything is built into 18 or 25 mm wide unit to enable exact and effective measurements. This compactness also allows to retrofit into already existing installations.
- CMS Control Unit - The Control Unit (CMS-600) is the communication interface of the system. Up to 64 sensors can be connected to each Control Unit. All the system configurations and measurement functions can be done by the touch display. Special attention was paid to create an intuitive concept for operations when the menu navigation for the CMS-600 was designed.
- Easy installation - Just add the Insulation displacement connectors to link the sensors to the flat cable. The flat cable transfer the data to the control unit - quick, easy and reliable

Catalogue: 2CCC481002C0201





CT PRO XT and CT MAX Current Transformers. Efficient by nature.



Measuring and monitoring the main network parameters are key operations to ensure energy efficiency and cost reduction through consumption monitoring and service continuity. The new CT PRO XT and CT MAX series belong to the wide range of ABB current transformers and are targeted to this field of application. They are cutting-edge products, ideal for primary, secondary and power center sub-distribution panels. Specially designed to ensure very easy installation and maximum performance in terms of accuracy, the CT PRO XT and CT MAX transformers are a guarantee also about safety, thanks to the introduction of the innovative electronic protection circuit of the secondary, integrated in the CT...SELV versions. www.abb.com/lowvoltage

Power and productivity
for a better world™



Smartphone Apps

Electronic Products and Relays app



ABB's Electronic Products and Relays selection app is a user friendly interface available for iOS and Android, which allows selecting the values sought among predefined values. 6 ranges of products are supported by 21 tables of selection covering various applications such as time relays, measuring and monitoring relays, power supplies, etc. 15 000 combinations are managed by the tool for a total of 700 product references. Once the selection is done, you can get a technical datasheet, a dimensional drawing and a connecting diagram.

Smartphone Apps

AF contactor selection tool



ABB's AF contactor selection tool, available for iOS and Android, will help select the right product following a simple step-by-step approach, no matter if you are using a PC or a mobile device. The user-friendly interface enables you to easily navigate to the right contactor using predefined characteristics. Furthermore you can search for a contactor using the order or type code of the product.



Can we keep turnarounds brief?

Definitely.



Until the AF range was installed, voltage sags were affecting MacGregor's deck cranes. Conventional contactors welded shut, leading to several stoppages a week. No longer. Known for superior quality and an ability to operate in the most hostile environments, MacGregor deck cranes enjoy a global reputation for reliability. A small but vital component, the AF contactor helps maintain this reputation. To keep things moving, you need Control.

Connect to Control. www.abb.com/connecttocontrol

Power and productivity
for a better world™ **ABB**

Protection

OVR Infographic

Data and curiosities about lightning protection

Lightning is not uniformly distributed across the Earth. A map showing the distribution of lightning flashes across the Earth has important economic and safety implications. Each year lightning strikes: kill many people, farm animals and wild animals causes thousands of fires and billions of dollars in damage to buildings, communication systems, power lines and electrical systems, also costs airlines billions of dollars in flight rerouting and delays.

It may then be recommended to customers the previous installation of surge arresters Surge Protector (SPD), which deflect the discharge currents to earth preserving the integrity of the equipment: applicable even in existing systems, are easy to size and convenient.

Infographic: 2CSC430002E0201



Lightning protection for electric systems and loads
Protective measures to prevent damage caused by over-voltage

Global lightning strikes

Lightning strikes the Earth **100 times** a second

Up to **30,000°C**

Up to **350,000 A** and hundreds of millions of Volts

Up to **5,000 storms** occur around the world at any given moment

Lightning is not uniformly distributed across the Earth

Much more lightning occurs over land because daily sunshine heats it up faster than the ocean.

More hot air leads to **stronger convection, thunderstorms, and lightning.**

More lightning occurs near the equator because warmer than the poles.

Lightning flashes (per km² per year)

Why are SPDs recommended?

- Shielding** (Faraday cage)
- SPDs**

- ✓ CAN ALSO BE USED IN EXISTING INSTALLATIONS
- ✓ SIMPLE SELECTION
- ✓ REASONABLE COST

What are SPDs and how do they work?

SPDs are protective devices that divert the surge or impulse current and limit over-voltage toward load installed downstream.

They are the most suitable and effective protective devices against direct and indirect lightning strikes in buildings and incoming lines.

Without SPD

Over-voltage reaches the electrical equipment.

If the over-voltage exceeds the impulse withstand voltage of the electric equipment, there is nothing to stop the impulse current from propagating through the device and damaging it.

With SPD

Over-voltage reaches the surge arrester, which diverts the surge current towards earth.

The over-voltage is limited to an acceptable level for the downstream load.

The equipment is protected and damage prevented.

Sources

*Lightning statistics: [1]
 **How to protect an information and data system: [2]
 ***Lightning Map: [3]

*Protective control & measurement: [4] (© of Pflaum & Company)
 **Protective devices and arresters in power systems: [5] Pflaum
 ***Practical guide for protection against surge: [6] (© of Pflaum & Company)

ABB Power and productivity for a better world™



Is there such a thing as easy home automation?

ABB-free@home® is totally uncomplicated – from installation through to configuration via an app on your tablet or laptop. Whether blinds, light, heating, air-conditioning or door communication – at last, comfort, safety and energy efficiency are easy to network. It takes little effort to meet all your customer's home automation needs. This gives electricians a clear competitive advantage.

www.abb.com/freethome

Of course.

Good morning DIN-Rail

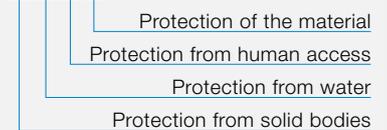
ABB answers to many questions posted to our experts through email. Send your technical questions to mail.daybydin@abb.com, the most interesting ones will be published and answered on next issues of Day by DIN.

What is it and how to read the degree of protection IP?

The IP Code, a classification introduced by IEC standard 60529, classifies and rates the degree of protection provided against the intrusion (including body parts such as hands and fingers), dust, accidental contact, and water by mechanical casings and electrical enclosures.

The code consists of two letters, IP, generally followed by two digits. One can also find two optional letters that complete the code (see next page):

IP XXab



Definition of the protection degree against access of solid bodies and contact with hazardous parts.

Level	Definition	Practical effects
IP0X	No protection	-
IP1X	Protected against solid bodies larger than 50 mm	Protected against access with the back of a hand
IP2X	Protected against solid bodies larger than 12 mm	Protected against access with a finger
IP3X	Protected against solid bodies larger than 2.5 mm	Protected against access with a tool
IP4X	Protected against solid bodies larger than 1 mm	Protected against access with a wire
IP5X	Protected against dust	Protected against access of dust or of a thin wire
IP6X	Totally protected against dust	Totally protected against dust



Federico Radaelli
Product Manager Wiring
Accessories - LP Division

Definition of the protection degree against access of liquids.

Level	Resistance
IPX0	Not protected
IPX1	Protected against water drops falling vertically
IPX2	Protected against water drops with a 15° maximum inclination
IPX3	Protected against rain
IPX4	Protected against splashes
IPX5	Protected against water jets
IPX6	Protected against waves
IPX7	Protected against temporary immersion
IPX8	Protected against constant immersion

Optional letters - Protection against human access

Level	Effects
a	Protected against access with the back of a hand
b	Protected against access with a finger
c	Protected against access with a tool
d	Protected against access with a wire

Optional letters - Protection of the material

Level	Effects
h	High-voltage equipment
m	Tested against harmful effects due to water entry with equipment in motion
s	Tested against harmful effects due to water entry with equipment not in motion
w	Suitable for use in specific ambient conditions

Did you know that?

How to read accuracy and choose the best measurement device for your application

"Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it." - H. James Harrington

Measuring instruments are essential tools for giving people and organizations insight into various conditions of their network. Collecting and monitoring data, retrieved by meters and sensors, enables to avoid wasting of resources and enhance the quality of the systems. However, is it possible to know if these measurements are reliable?

A measurement can be carried out several times on a single sample, simply to be certain of the value, but, due to the margin of error, it is unlikely that it will be exactly the same. This problem raises the need to establish a range of acceptable value for a measurement. In order to meet this need, accuracy classes were introduced in the international measurement system. Accuracy is a measure of the agreement of a particular measurement with the "true" (or "accepted") value of the parameter under set conditions. The specified accuracy for electronic equipment tells the user if a device is sufficient for his or her particular needs. As required by IEC standards, electric instruments are classified according to their accuracy class in the following categories:

0.05 - 0.1 - 0.2 - 0.3 - 0.5 - 1.0 - 1.5 - 2.5 - 5

These numbers represent the absolute errors in relation to nominal capacity and are stated as a percentage of nominal capacity. This means that a 0.5 rated meter with nominal voltage of 200 V must not have at any point of the scale an absolute percentage

error that is greater than $\pm 0.5\%$. In other words, its margin of absolute error is:

$$\epsilon_a = \frac{\pm 0.5 \cdot 200}{100} = \pm 1V$$

Thus, whatever is the voltage value read on the meter, the "true" value must not be more than 1 V higher or lower than the read value.

At this point, a conclusion could be that using instruments with the lowest accuracy rating is the best choice. However, the selection of the best meter depends strictly on its application. For example, if you need a measuring device suitable for billing application it should provide a better accuracy class than one suitable for measuring. The wide ABB DIN-Rail range of digital meters includes single-phase mono-function measurement devices: VLMD for measuring voltage, AMTD for current and FRZ-DIG for frequency, all with an accuracy class of 0.5. Also for DIN-Rail mounting, we offer EQ meters A, B, C series, all with accuracy class 1 (except reactive power class 2), developed to measure energy efficiency and power quality. A and B series also enable the user to monitor the registrations from remote. Instead, for front-panel application, we offer the network analyzers M2M and ANR for single and three-phase connection, both featured with several communication protocols for remote monitoring. These instruments, conceived to analyze and monitor the efficiency of a whole network, can measure up to 34 different parameters with an accuracy class 0.2 for frequency, 0.5 for voltage and current and class 1 for power factor, active power and active energy.

The specified accuracy for electronic equipment tells the user if a device is suitable for his/her particular needs. This information allows accounting for any error that could occur in a system and thus provide the best possible results.





ABB products play a part at 2014 World Cup

Fernando Leonardis: Sales manager - Low Voltage Products - Brazil



The Estádio Mané Garrincha and the Arena Castelão are two of the six stadiums that are equipped with ABB technology

Ensuring reliable electric power supply at 2014 soccer world cup.

Brazil was in the global spotlight this year hosting one of the most important sporting events – the 2014 FIFA World Cup. Millions of soccer fans enjoyed a month-long spectacle of games and ABB was one of the main suppliers of electrical equipment for the stadiums.

To ensure that hundreds of thousands of fans can enjoy uninterrupted play time, ABB products were supplied to six stadiums including transformers, medium and low voltage panels, circuit breakers, surge protectors, contactors, thermal relays, soft starters, switchgears and switchboards.

This sporting event is likely to place huge additional demands on the grid and to boost power capacity and enhance electricity transmission, ABB also supplied compact substations to Brazil's power utility company.

ABB's broad range of technology in protection, control and power products help countries like Brazil strengthen their power infrastructure and ensure a more reliable electricity supply. At the same time, ABB products are certified by some of the most rigorous environmental regulations, helping customers achieve sustainable certification in their ventures.

Doktor Wise

The expert answers

The reliability of ABB 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 enclosures and DIN-Rail products, to solve problems and propose the most suitable solutions for every application.

Sebastiano Paganini: Product Manager Modular Devices - DIN-Rail products

Flexible communication for full integration

Is there a simple way that allows remote monitoring and management of my system's energy consumption?

"You can't manage what you can't control", goes the old saying. Managing energy is to know exactly when, where and how it is used.

To this end, the analysis of consumption trend data is the key in the primary and final stage of works aimed at optimizing the system energy use and the consequential cost savings.

ABB's new energy meters of EQ Meter range are the ideal solution for these applications. With the introduction of the new Ethernet G13 gateway, it becomes even easier to integrate and process the readings of all ABB counters in a remote supervision and management system.

The G13 gateway is the new communication interface between the physical meter and the supervisory system. It makes available, easily and quickly, all information available collected from the various meters located on the site.

The use of the G13 Gateway truly simplifies the communication network structure, making it possible to manage and collect information from up to 32 ABB meters belonging to:

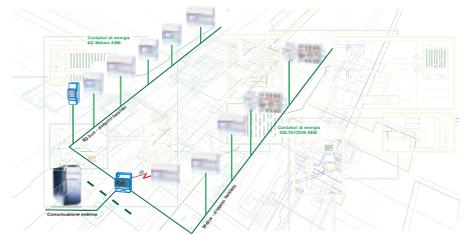
- **the new meters of the EQ Meter range:** communication between the gateway and the meter can be made via the RS-485 serial port directly integrated in the new series of meters, through the EQ Bus proprietary protocol;
- **the previous energy meter ranges (DeltaPlus, ODIN, ODINSingle):** the communication of information is made with M-Bus either via the inbuilt interface, if available, or via the previous M-Bus serial communication adapters.

Communication with supervisory system for remote data acquisition is made over an Ethernet (RJ45) network via the JSON communication protocol, a lightweight data exchange format which is the ideal language for system developers.

The data coming in from the meters connected to the gateway can be read online by using the web server function integrated into the product. This allows, simply by logging on to the local area network via the browser, to view web pages managed directly by the gateway, which are pre-configured and optimized for easy reading of the available data in the meters.

So you can not only view instantly the parameters measured by the meters, but also reconstruct load profiles, past consumption records (through the analysis of data stored in meters equipped with this feature). Added to this is the possibility both to read all the other information related to energy metering, integrated in the new meters of the EQ Meter range (breakdown by tariffs, imported and exported energy consumed or produced by the load, etc.) and to remotely manage the meter's advanced settings.

All this takes place on a SSL connection to the gateway and the EQ bus, which is a proprietary communication protocol based on DLMS/Cosem, between the meters and the gateway.



The Ethernet G13 gateway offers maximum simplicity for the communication system structure.



The web server function of the G13 gateway allows easy remote reading of the information collected from the system meters.



G13 provides easy management of system parameters through the many web pages pre-configured to manage energy consumption.



Sebastiano Paganini
Product Manager Modular Devices
DIN-Rail products

Residual current protection devices

Types of waveforms detected with the residual current devices and classification

Valeria Gaboardi: *Product Manager Modular Devices - DIN-Rail products*

AC-type residual current circuit breakers are suitable for all systems planned to install utilities with potential sine-wave ground fault currents such as those that may occur due to voltage pulses superimposed on the network (e.g, inclusion of fluorescent lamps, X-ray equipment, data processing systems and thyristor controls).

A-type residual current circuit breakers are particularly suitable to protect systems that include electronic devices for rectifying current or for adjustment with phase cutting of a physical quantity (temperature, speed, light intensity, etc.) supplied directly from the network without the interposition of transformers and with Class I isolation (Class II is, by definition, free from ground faults). These devices generate a pulse-form fault current with direct current components that

A-type circuit breakers are able to recognize. These circuit breakers are also suitable in the presence of direct current leakage up to 6 mA.

B-type residual current circuit breakers are recommended for applications with drives and inverters that supply motors for pumps, lifts, textile machinery, machine tools, etc., since they can recognize potential fault currents of any value.

F-type residual current devices were developed to ensure protection against indirect contacts in the presence of loads equipped with single-phase frequency converters. In case of failure, this type of users produces leakage currents with variable frequency that are not detectable by the AC and A types.

F-type residual current circuit breakers are a technically adequate solution to protect single-phase frequency converters, an alternative to the B-type. F-type RCDs feature

high resistance to interferences. Unwanted tripping is avoided thanks to the high resistance to pulse currents combined with the intentional short tripping delay. F-type RCDs are suitable for direct current leakage up to 10 mA.

In short, the choice of an appropriate circuit breaker depends on two different factors:

- 1) The protection type required (Table 01)
- 2) The wave form type of the residual current (Table 02)

RCD type	Protection type		
	Protection against indirect contacts (if $I_{\Delta n}$ coordinated with ground system)	Supplementary protection (if $I_{\Delta n} \leq 30$ mA)	Protection against fire hazard (if $I_{\Delta n} \leq 300$ mA)
AC	■	■	■
A	■	■	■
F	■	■	■
B	■	■	■
A S (selective)	■		■
B S (selective)	■		■

Table 01



F200 RCD and DS200 RCBO

RCD type	Wave form type detected by the residual current circuit breaker					
	Sine-wave alternating current 50/60 Hz	Sine-wave alternating current up to 1000 Hz	Pulse current with direct component	Direct current (without ripple)	Multi-frequency current generated by single-phase inverter	Multi-frequency current generated by three-phase inverter
AC	■					
A	■		■			
F	■		■		■	
B	■	■	■	■	■	■
A S (selective)	■		■			
B S (selective)	■	■	■	■	■	■

Table 02

Fast wiring thanks to screwless terminals

An opportunity not to be missed: changing installation habits to gain speed and safety.

Guido Tronconi: *Product Manager Wiring Accessories - LP Division*

Innovations, in some cases, need time to overcome initial resistance and break set habits. Proposing new or alternative products can almost be seen as an indelicate gesture, in certain situations, even in the world of installation.

In this sense, the figure of a professional electrician is practically indistinguishable from the tools he uses for everyday work and, in particular, from the screwdriver - or the cordless screwdriver, as someone who just attended a professional refreshment course would define it.

Tightening a screw terminal on a circuit breaker, a socket outlet or any other element of an electrical system is, of course, a fundamental action for the execution of connections.

However, it is also true that it is a gesture that is by now part of the daily routine of installers, an habit that, on one hand, beats out their working times and, on the other, provides tangible proof of their labor to a customer's mind. It does not matter if this manual operation requires expenditure of time, energy and, ultimately, economic resources: questioning this, it may give the impression to call an entire professional life into question. That's not the goal, of course, and despite the fact that traditional methods were, perhaps, a foundation for a career full of satisfaction, to insist on remaining tied to them can become, in some cases, counterproductive and prove a useless sacrifice.

Alternative solutions have been offered on the market since years, but they are still uncommon: this is the case of fast wiring devices (also called screwless clamps and other similar names terminals), which replace the traditional screw terminal with a more simple "spring-loaded" one. The advantages are manifold: faster installation, less tools to do the same job - just a pair of scissors to strip the cables - and easy wiring in tight spaces.

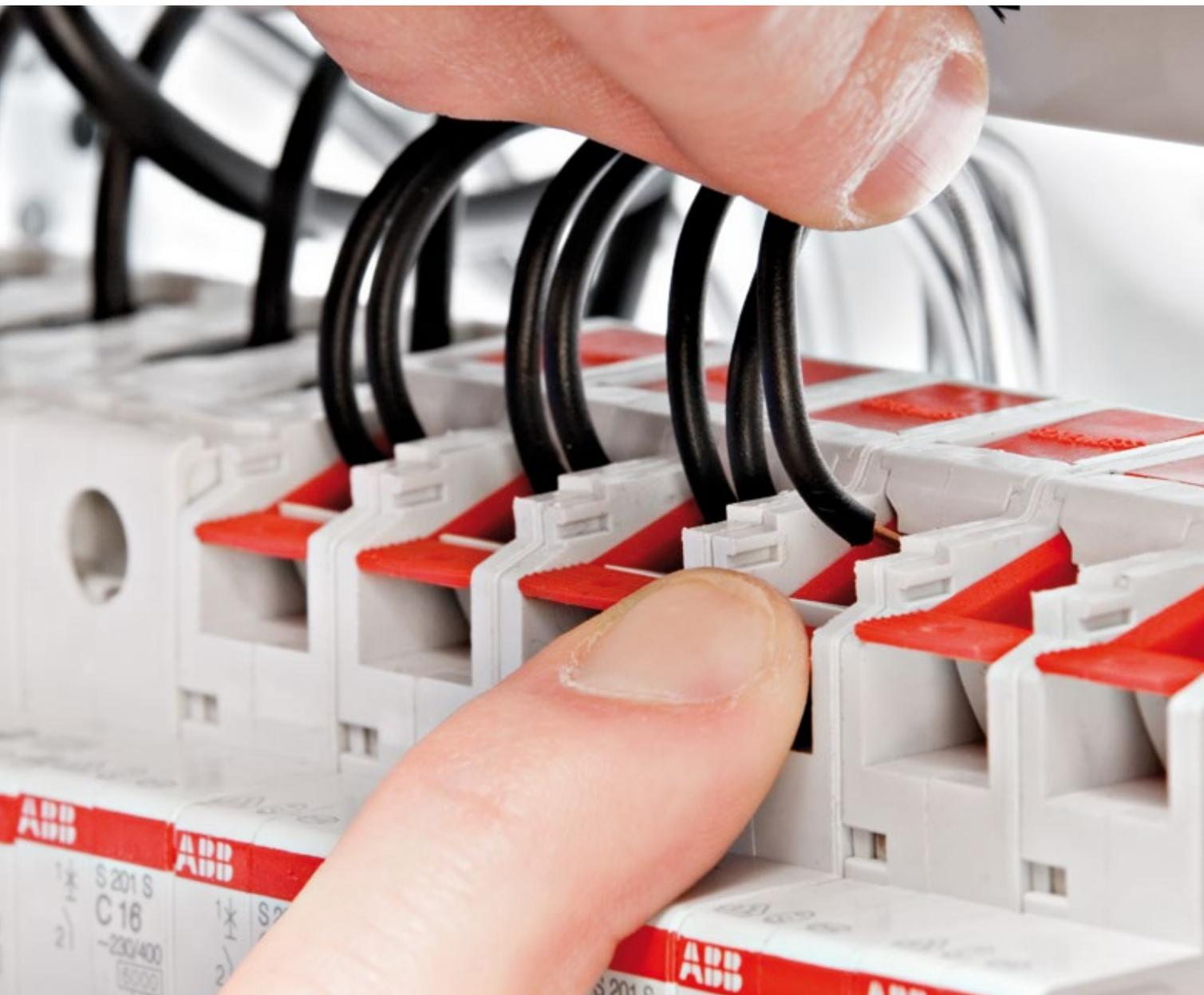
It is no coincidence that the offer of screwless solutions has increased in the catalogs of all major electrical equipment manufacturers in recent years and that, in some countries, their use is even close to become an actual installation standard.

For example in Germany and Spain, to ensure proper wiring of systems, the wiring accessories offer includes, since years, mostly devices with this technology.

In France, instead, miniature circuit breakers with these types of terminals are now a default choice for the majority of professionals. Leaving aside sentimental reasons, are there therefore any particular technical reasons why rapid wiring clamps should not take successfully hold in other markets as well?

The answer is no.





The main qualms and criticisms aired concern an alleged lower mechanical resistance of the “spring-loaded” clamps compared to their respective screw-type clamps. But this objection is not substantiated by facts. It is important to note, in fact, that there is no distinction between the same clamping forces obtained by rapid wiring or traditional wiring versions at a regulatory level. This means that in order to obtain a third party approval the components are subject to the same electrical and mechanical test cycles.

Laboratory tests have verified that a normal clamping force that a device equipped with a spring-loaded clamp is able to counteract a pure traction force applied for one minute of 39.24 N (4 Kg) with cable section of 1.5 mm², and of 49.05 N (5 Kg) with cable section of 2.5 mm². This finding is in line with that of clamping forces with screw clamps that, however, guarantee this perfor-

mance only with optimum terminal tightening - which requires reaching the conductor's compression limit with the consequent risk of “stripping” the screw.

We can therefore state that the performance guaranteed by screwless technology are absolutely comparable or even higher if the wiring is performed correctly.

So what do you think?
Tradition or innovation?

**Send us your opinion to
mail.daybydin@abb.com**

REACH e RoHS

ABB's care for the environment and the health of its customers and suppliers is ensured by the compliance with the REACH Regulation and the RoHS Directive.

Marco Lucca: Local Sustainability Officer ABB S.p.A. - ABB Low Voltage Products Division



The E 90 fuseholders, the F 200 residual current devices and the TM single-phase transformers are some of the ABB products that already comply with the RoHS and REACH Standards

The integrated policy of ABB Low Voltage Products Division, in conformity with the requirements of the international reference standards ISO 9001, ISO 14001, OHSAS 18001, IRIS STANDARD, endorses the principles of Quality, Environment, and Occupational Health and Safety. It forms the basis for planning the objectives, the targets, and the activities for achieving them, reflecting the Management's commitment to constant performance improvement. In particular, applying the ISO 14001 environmental management system, ABB guarantees statutory and regulatory requirements through close attention to the development of products that comply with the REACH Regulation and the RoHS Directive. Let's explore together the contents of these two standards.

The REACH Regulation for managing chemicals

The REACH Regulation requires the creation of a risk management system for chemical substances through:

- registration of substances produced and/or imported into the EU in quantities equal to or greater than 1 ton/year;
- safety assessment of the substances and priority substance taking into consideration the risk;
- authorization of high-concern substances for specific uses;
- system of restrictions;
- establishment of the European Chemicals Agency;
- public access to information;
- unification and simplification of standards.

Additional requirements are to strengthen the protection of human health and of the environment from the harmful effects of chemicals, to provide notification not only of new substances (as stated by the previous legislation), but also of existing substances, and to create a central database on chemicals substances.

ABB designs its products without using any SVHC (Substance of Very High Concern) which is carcinogenic, mutagenic, toxic for reproduction, persistent, bioaccumulative or however likely to impact seriously on human health or the environment.

To ensure compliance of its products, ABB actively implements all necessary actions to guarantee a supply chain continuity, such as: updating of information relating to the evolution of the Directive; search for alternative suppliers; research and development of alternative substances and processes to ensure product continuity, quality and performance.



The RoHS Directive against the use of hazardous substances

The RoHS Directive (Restriction of Hazardous Substances 2011/65/EC), which repeals Directive 2002/95/EC, establishes restrictions on the use of hazardous substances and therefore prohibits the use of certain substances in the manufacture of electrical and electronic equipment (EEE):

- Lead (0.1%)
- Mercury (0.1%)
- Cadmium (0.01%)
- Hexavalent chromium (0.1%)
- Polybrominated biphenyls (PBB) (0.1%)
- Polybrominated diphenyl ether (PBDE) (0.1%).

It applies to the following categories:

1. Large household appliances
2. Small household appliances
3. IT & Telecommunications equipment
4. Consumer equipment
5. Lighting equipment
6. Electronic and electrical tools
7. Toys, leisure, and sports equipment
8. Medical devices
9. Monitoring and control instruments (also industrial)
10. Automatic dispensers
11. Other EEE not included in the categories listed above

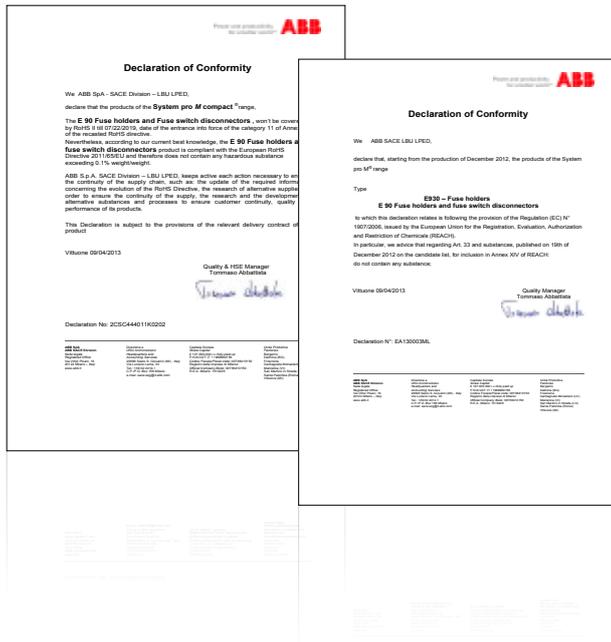
As regards to the conformity of the categories that could impact on products supplied by ABB, the expiration dates are:

- 22 July 2017 (industrial monitoring and control instruments will have to comply with the restrictions on Category 9 substances)
- 22 July 2019 (compliance to Cat.11 field of application, extension to all EEE not explicitly excluded).

With regard to this, ABB has developed a suitable process to verify that the product has been designed and manufactured in accordance with the new requirements of the Directive.

It has been also drew up the technical documentation required to carry out the internal production control, it has been prepared the implementation of all procedures needed to comply with the Directive, and, lastly, it has been ensured traceability by marking all EEE with an identification or a serial number. Furthermore, it is worth to mention the compliance with the obligations to follow specific labeling requirements (CE marking), the decision to adopt corrective measures to make EEE compliant and to handle customer complaints. The measures above will have to be assessed after the national transposition of the Directive.

Some examples of REACH and RoHS declarations issued by ABB





Why the wind industry should focus on cost and not only on prices

Adrien Fournier: *Wind & Solar segments manager, Enclosure and DIN-Rail products*



Today, there should be no doubt that wind onshore is or will be soon at “grid parity”. It does, of course, vary from country to country but we are getting there! The next step for wind power will be to reach the “maturity” stage. It’s about getting rid of incentives schemes such as Feed In Tariff (FIT) or Production Tax Credit (PTC) in the US. Once onshore wind stands on its own two feet, wind power will gain a significant share of the global energy mix!

In order to reach this target the complete wind industry is today focusing on reducing the so called Cost of Energy (CoE)-there is a huge cost pressure on the complete supply chain. It’s challenging for everyone, including for a component supplier like ABB, but it’s necessary to insure the future of this source of electricity production.

However, there is an easy but dangerous short-cut that several players of the wind industry are taking: instead of focusing on reducing the cost of the system they are focusing on reducing the price of each component.

To illustrate the thought, let’s take a concrete example:

ABB has designed and provided solution for the electrical part of wind turbine auxiliary system for over 15 years; they are proven and reliable solutions which are used in several thousands of turbines all over the world. These solutions, which use 690Volts as a nominal voltage, give several important advantages to the system such as: compactness (which results in a smaller and lighter overall solution) high efficiency (by reducing the power lost) or quick and easy maintenance. All of these, you would agree with me, participate in reducing the cost of the overall wind turbine and therefore help to reduce the cost of energy.

But in the name of cost reduction, and very often under the pressure of the purchasing department, some OEMs R&D are considering switching the 690Volts modular solution for a 400Volts traditional one. Sure, if we start comparing the price of each single component that make up the overall solution, the traditional solution seems to show some cost reduction but this approach does

not consider the overall increase of cost.

Passing from 690V to 400V will oblige you to add a transformer which is not only a direct additional cost but also an indirect one since it will introduce into your system permanent power losses of several kW. The switch from a modular to a traditional solution will force you in building a bigger cabinet, which will be not only be more costly but also heavier, resulting in the reduced performance of the complete turbine.

Finally, and this is an increasingly important point nowadays but one which some OEMs don’t consider, the turbine downtime during maintenance will be significantly increased: passing from the modular to the traditional solution will increase by over 25% the time to replace, for example, a simple motor protection. Increasing turbine downtime will again increase the total cost of energy and not reduce it.

That’s why, we need to focus on cost of the complete system to insure the future of the wind power as a global source of energy rather than focus on single component prices.

The biggest dams in the world

Impressive and monumental infrastructures for energy production, but what is their real cost? Energy efficiency remains the only real clean solution.

Federico Radaelli: *Product Manager Wiring Accessories - LP Division*

Mankind's challenge to create great structures has always aroused strong emotions and awakened feelings of pride and competition between nations. These challenges often sparked a technological boost that benefited the whole world; other times, due to a blind and self-serving desire to impress, they led to human and environmental tragedies. One of the most spectacular fields, in which this challenge is played out, is the construction of dams for hydropower generation.

Nowadays, it's estimated that hydropower constitutes the largest part of the renewable energy production exploited on our planet, covering more than 80% of the total renewable energies. Given the steady increase of energy required daily by the world wide population, that is consequence of the spasmodic growth of electrical and electronic consumer devices and of the emerging countries growing economy, during the last decades several countries decided to invest in huge hydroelectric power production plants to meet the growing hunger for electricity without resorting to the expensive and polluting oil or coal.

The plant considered as the largest one in the world, is located in Itaipu along the

Paraná River on the border between Paraguay and Brazil. Completed in 1984, after 14 years of work, it has an energy capacity of 14 GW and a production of 90 TWh per year (enough to meet a quarter of the yearly needs of a country like Italy). The artificial lake that was created contains 29 billion m³ of water with an extension in length of 200 km (the distance between Bruxelles and Amsterdam to give an idea). The dam has a total length of 7.7 km and a height of 196 m at the highest point.

In 2006, instead, the plant with the highest energy capacity was inaugurated: the Three Gorges Dam along the Yangtze River in Hubei province in China, which not coincidentally is also the country whose electricity need has more than doubled over the last ten years. The plant has a capacity of 18.2 GW and ensures a steady electricity production of 104 TWh per year. With its 32 turbines and an over 2-km long concrete structure, it guarantees coverage of 3% of China's energy needs, giving "light" to more than 60 million people.

However, the impact of what is considered as one of the world's cleanest energy, hides some side effects that cannot be ignored: in the construction of the famous Chinese dam a huge area (10,000 km²) - including 116 villages (1.4 million inhabit-

ants transferred) and 1300 archaeological sites - was flooded, without considering the environmental impact that caused the disappearance of a number of plants and animal species wiped out by the artificial lake. The social impact and the allegations raised were strong enough to change the strategies for constructing future dams, abandoning the idea of mega-plants in favor of smaller, localized and less invasive facilities.

Considering that the populations of the new emerging countries will go toward the possibility of pursuing the better quality of life that economic growth promises, and which until now had been the economically developed countries, it is fair to ask whether a really clean energy truly exists or whether, as argued with determination and consistency also by ABB, the real solution is the joint use of renewable energy sources and systems to minimize energy use. Only through the development of new technologies and consumption control through advanced energy efficient systems it will be possible to satisfy the needs of an "energivore" world without leaving an excessive footprint on the ecosystem.



A glimpse of two hydropower production dams: the concept of mega-plants is waning, in favor of smaller, localized and less invasive facilities.



SMISLINE TP. Touch proof system. Power and Safety.



Absolutely safe without protective equipment: SMISLINE TP ensures that load-free devices and components can be snapped on and off under voltage without the need for additional personal protective equipment to guard against electrical hazards. That opens up completely new prospects for you when it comes to installation, operation and flexibility. www.abb.com/lowvoltage

The new energy-saving light bulbs

Claudio Amadori: R&D - LP Division



A small technological revolution has touched stores and homes across Europe. The European Commission Regulation N° 244/2009 has in fact “banned” the conventional incandescent light bulbs, replacing them with new and more modern types, featuring improved energy efficiency and a longer lifespan¹⁾. The market phase-out of incandescent light bulbs started in 2009 and ended in 2012. The old bulbs, no longer manufactured but still widely used in homes, are not very efficient because most of the electricity consumed is not converted into light, but dispersed as heat.

Depending on their operating principle, the new energy-saving light bulbs belong to three basic categories:

- compact fluorescent lamps (CFL)
- improved incandescent lamps (halogen)
- LED

All types are available in different sizes and powers, also with traditional E14 and E27 screw bases, and can easily replace the old bulbs that are no longer available. Each of these technologies has its strengths and weaknesses. Many consumer complaints, such as a much shorter lifespan than promised or the low light level of the new energy-saving light bulbs, are largely attributable to an incorrect choice in relation to their intended use.

Brightness is the proper criterion for comparison

For an objective comparison between the different light bulbs you must refer to their luminous flux, i.e. the total amount of light emitted, measured in lumens (lm) and always indicated on the package²⁾. At equal lumens corresponds a different electricity consumption, measured in watts, depending on the energy efficiency of the various light bulb models (the efficiency of a light bulb is the ratio between the luminous flux emitted and the electrical power



absorbed from the mains). For example, a luminous flux of 750 lm can be achieved with a conventional incandescent bulb that consumes 60 W (with an efficiency of 12 lm/W), with a halogen lamp that consumes 42 W (18 lm/W), with a compact fluorescent lamp that consumes 11 W (68 lm/W) or with a LED that consumes 10 W (75 lm/W)³⁾. So it is misleading to compare the brightness of light bulbs referring to their electrical power expressed in watts as done in the past. However, because of this established habit it is customary to refer to the wattage of a conventional incandescent bulb with an equivalent luminous flux. To assist in the choice of light bulbs, we prepared a correlation table between the lumens and the “watt equivalents” listed on the packaging, which however does not correspond to the actual consumption of the bulb (Table 1).

To help recognize immediately a light bulb’s efficiency, just like appliances they are categorized into seven energy efficiency classes on the packaging: from A (very efficient) to G (not very efficient). On average, CFLs and LEDs fall under Classes A and B, halogen lamps under Classes B and C, all banned light bulbs under the subsequent classes. Starting 2016, with few exceptions, it is expected that also Class C light bulbs will be banned.

Table 1

Luminous flux	Conventional light bulb consumption
120-140 lm	15 W
220-250 lm	25 W
410-470 lm	40 W
700-810 lm	60 W
920-1.060 lm	75 W
1.300-1.500 lm	100 W
2.100-2.500 lm	150 W
3.000-3.500 lm	200 W

¹⁾ This Regulation covers common incandescent light bulbs for domestic use and does not involve special light bulbs: automotive, industrial, decorative, for appliances, etc...

²⁾ Focus light bulbs (spotlights) are characterized also by their luminous intensity, which is measured in candelas (cd) that represent the luminous flux of the light source within the solid angle unit in the direction of the light beam (1 candela = 1 lumen / 1 steradian 1).

³⁾ The performance of the light bulbs shown as an example in this article is merely indicative. For actual values it is necessary to refer to the manufacturer’s data.



Compact fluorescent lamps (CFL)

Compact fluorescent lamps are nothing more than the evolution of the traditional fluorescent “tubes” used in industry and services and they differ essentially only for the bending of the tube and the miniaturization of the power supply circuit (ballast), which is normally incorporated in the bulb itself. On the market for decades, CFLs are considered the energy-saving light bulbs par excellence, but this should not lead us to believe that they are the only ones.

CFLs are made of a glass tube holding a low-pressure mixture of an inert gas with a small amount of mercury. By means of two electrodes placed at the ends of the tube, a discharge current passes through the mixture which excites the mercury to emit invisible ultraviolet radiation. The inner surface of the tube is coated with fluorescent phosphor powders that convert the ultraviolet radiation into visible light of the desired hue.

Fluorescent lamps cannot be connected directly to the mains power supply (as done with incandescent light bulbs), but require a separate power supply circuit that limits the discharge current. It includes a high-frequency electronic inverter to limit the size and losses of the ferrite inductor required to stabilize the current.

Advantages:

- consumption is about 65-80% less than that of conventional light bulbs, with an efficiency of 50-80 lm/W depending on the model (the best performance is obtained with the more linear models: fluorescent tubes exceed 100 lm/W);
- they last about six times longer (estimated lifespan: 6,000 hours);
- they are available in many variations with respect to shape, power, coupling, tone (warm or cold light), and so on.

Disadvantages:

- frequent switching on and off shorten its lifespan, sometimes significantly⁴⁾
- their brightness declines over time; they also require a few minutes before reaching the maximum brightness
- in general, their brightness is not adjustable with dimmers, except for certain models specified as adjustable
- the albeit minimum content of mercury⁵⁾ requires special disposal techniques in accordance to EU legislation.

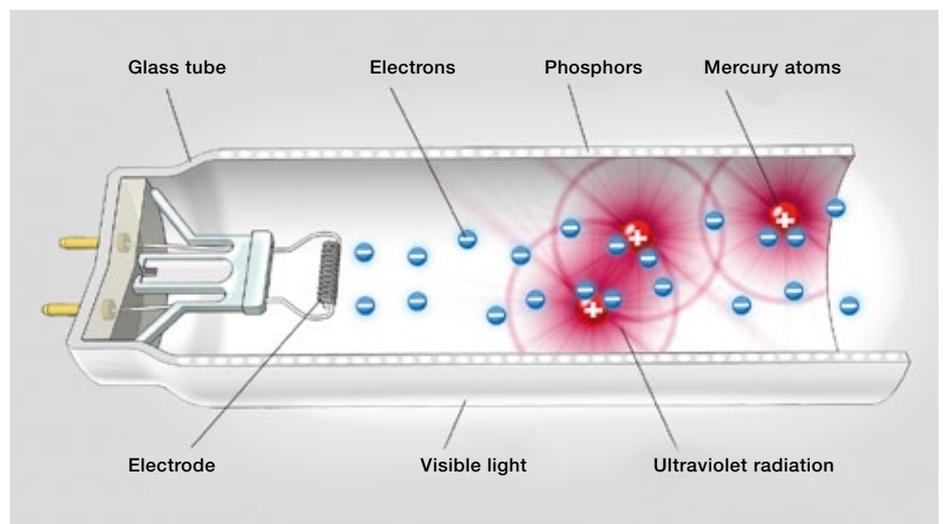
Applications:

- suitable in all cases when they are turned on and left on for a long period (for example, not more than three on/ off switching operations per day).

⁴⁾ The maximum number of on/ off switching is indicated by the manufacturer.

⁵⁾ The currently permitted maximum mercury limit is 2.5 mg compared to 50 mg of a button-cell battery.

CFLs are made of a glass tube holding a low-pressure mixture of an inert gas with a small amount of mercury. A discharge current passes through the mixture which excites the mercury to emit invisible ultraviolet radiation. The fluorescent phosphor powders that coat the inner surface convert the ultraviolet radiation into visible light of the desired hue.



Improved incandescent lamps (halogen)

They are very similar to conventional light bulbs, but more efficient (15-22 lm/W vs. 10-15 lm/W) and longer lasting (about 2,000 hours vs. 1,000 hours). They have the reputation of excessive consumption, but this is due to their use, not to an equal light output. In reality, today they are the replacement whose features are closest to those of conventional bulbs. The Energy Class C halogen lamps currently on the market will be banned as of September 2016: only the new generation models of Energy Class B will be available.

In the glass bulb which contains the tungsten filament and an inert gas, there is a small amount of halogen (usually bromine or iodine). When the lamp is on, the great heat generated causes the tungsten to sublime, detaching it from the filament. Whereas in conventional light bulbs the tungsten detached from the filament is deposited on the inner surface of the glass bulb blackening it, in halogen lamps the tungsten detached from the filament combines with the halogen forming tungsten halide which does not adhere to the glass, but coming in contact with the filament dissociates into halogen and tungsten and so regenerates, at least in part, the filament itself. Thus a dynamic balance is created that prevents the filament from being consumed. Filaments can be sized for work at very high temperatures (2500°C) with a greater energy efficiency. To withstand such high temperatures, the glass bulb must be made of quartz.

Advantages:

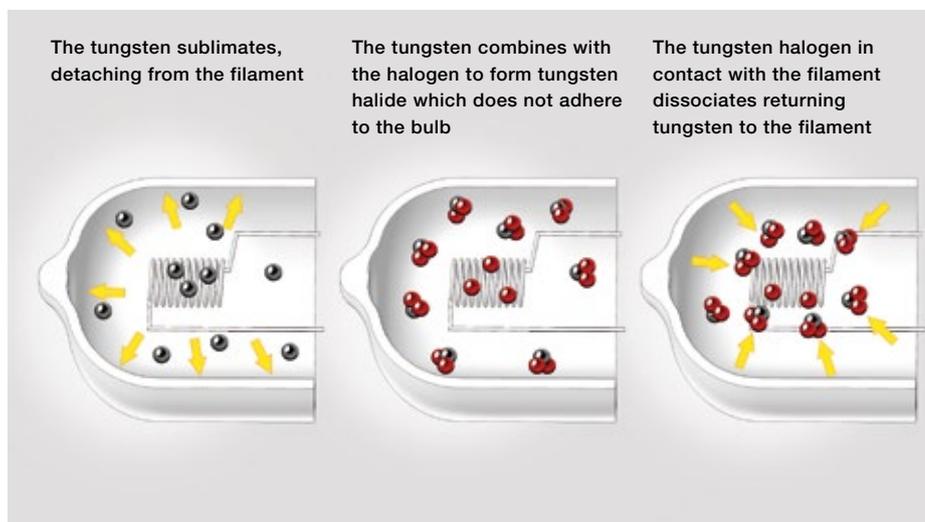
- very bright warm light, similar to that of conventional light bulbs;
- immediate maximum brightness when turned on;
- excellent tolerance to frequent on/off switching;
- dimmer adjustment always possible;
- low purchase cost.

Disadvantages:

- they do not save as much energy as CFLs or LEDs (however, for the Class C halogen lamps there is about a 25% savings compared to conventional light bulbs, which rises to 45% for Class B halogen lamps);
- they last less than other energy-saving light bulbs (though almost twice as conventional bulbs);
- they are not available in matte and this limits their use.

Applications:

- when a warm and bright light typical of conventional bulbs (e.g., for crystal chandeliers) is desired;
- for frequent on/off switching (e.g. lights controlled by occupancy sensors);
- for reduced use (the higher cost would not be amortized);
- use with dimmers.



When the lamp is on, the great heat generated causes the tungsten to sublime, detaching it from the filament. Whereas in conventional light bulbs the tungsten detached from the filament is deposited on the inner surface of the glass bulb blackening it, in halogen lamps the tungsten detached from the filament combines with the halogen forming tungsten halide which does not adhere to the glass, but coming in contact with the filament dissociates into halogen and tungsten. This regenerates, at least in part, the filament itself. A dynamic balance is created that does not consume the filament.



LED lamps

Light-emitting diodes (LED) are optoelectronic devices widely used for decades as indicator lights on appliances, variable message luminous billboards or for decorative purposes. In recent years, technological developments have made it possible to use LEDs in technical lighting fields in place of conventional light sources; their use is expected to grow significantly in the coming years. Today there is already a fair selection of models, which include warm and cold light, opaque and bright versions, with interesting fields of application. The more innovative versions reach an efficiency of 200 lm/W.

LEDs are based on the property of certain semiconductor materials to emit photons when direct current passes through them. Since the light emitted by a LED is essentially monochromatic, to obtain white light in the desired tone, a layer of special phosphors is applied to the LEDs that emit blue or ultraviolet light capable of converting the radiation emitted by the LED into white light. An alternative technology calls for LEDs in the three primary colors - red, green and blue - mixed appropriately to produce white light. An electronic power supply circuit and a reflector or optical diffuser, according to the shape of the bulb, complete the lamp.

Advantages:

- LED lamps consume about 80% less energy for the same light output (50-80 lm/W) than conventional light bulbs;
- their lifespan is about ten times that of the conventional versions (approximately 15,000 hours);
- they turn on immediately;
- they are resistant to frequent on/off switching;
- some (not all) are dimmer-adjustable.

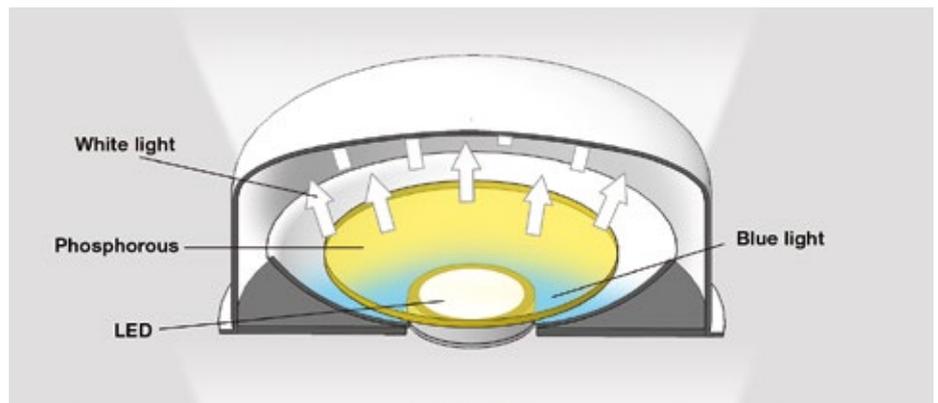
Disadvantages:

- the purchase price is still relatively high;
- current availability only for medium and low brightness (rarely more than 750 lm).

Applications:

- whenever long periods of operation or frequent on/off switching are required, excluding (for the moment) when a high brightness level is needed.

LEDs are based on the property of certain semiconductor materials to emit photons when direct current passes through them. Since the light emitted by a LED is essentially monochromatic, to obtain white light in the desired tone, a layer of special phosphors is applied.



The information on the packaging

The new light bulbs are not all the same and to choose the most appropriate bulbs for one's use it is necessary to carefully read the information on the packaging.

First of all, the label lists the light bulb's luminous flux (in lumens), power consumption (in watts) and energy efficiency class. Another important item of information printed on the packaging is the color of light expressed in Kelvin (K): 2,700 K for warm white; 4,000 K for neutral white; 6,000 K for cold white (daylight). The label also indicates the light bulb's use lifespan in hours (or in years estimating three hours of operation per day), the number of on/off switches and the time required to reach the maximum emission (particularly important information in the case of fluorescent lamps)⁶⁾. Another items of information are the possibility of dimmer adjustment and the size of the bulb to verify that it fits its intended light source device. Lastly, the temperature of use is indicated (the light output of certain CFLs or LEDs is reduced at very low temperatures).

How to dispose of the light bulbs

CFLs and LEDs contain electronic components and phosphors, and in the case of fluorescent lamps also mercury. These are pollutants that can however be recycled. Therefore, at the end of their lifespan, light bulbs of this type must be disposed of in different ways among the WEEE materials. For this reason they must be returned to the seller or delivered to the appropriate municipal recycling centers and never thrown into the glass or undifferentiated waste containers.

There are no particular hazards in the event of accidental breakage of a fluorescent lamp, however, it is best to avoid skin contact with the fragments, to ventilate the premises, to clean any residue with a damp cloth and not to use a vacuum cleaner.

For further information:

1. http://ec.europa.eu/energy/lumen/index_en.htm
2. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:076:0003:0016:EN:PDF>

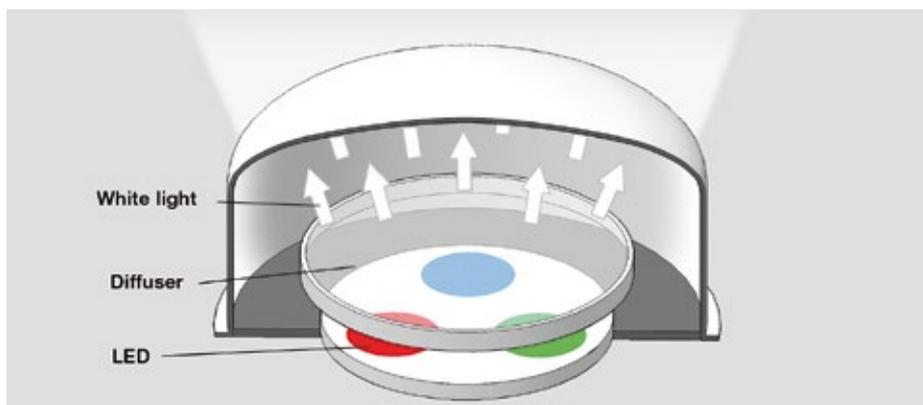


1



2

⁶⁾ These averages are obtained using standard testing procedures carried out on sample light bulb lots.



Alternatively, a diffuser mixes the light from the LEDs in the three colors red, green and blue to obtain white light.



Artificial lighting: consumption data

Artificial lighting is certainly one of the most typical and appreciated electricity applications, especially by people without technical background.

Children often even think of electricity and light as the same thing.

Filippo Negroni: Product Manager Modular Devices - DIN-Rail products

All of us everyday make the most of the unquestionable advantages offered by artificial lighting, but, despite of this, we cannot avoid to mention the numerous technical problems that the realization of a good system brings, both from an economic and an environmental point of views.

Currently, consumption related to the artificial lighting represents a significant percentage of total energy consumption, especially in Western countries in their post-industrial phase.

Only with a particular attention since the planning phase of a project and, above all, with a careful execution of lighting, power supply and control systems, it is possible to combine aesthetic and functional needs with environmental, consumption decrease and cost savings constraints.

Impact of lighting on energy consumption

According to the estimates conducted by the International Energy Agency (IEA), electricity used for lighting accounts for 19% (2,650 TWh/year) of the global electricity consumption.

The tertiary sector has the greatest impact on electricity consumption.

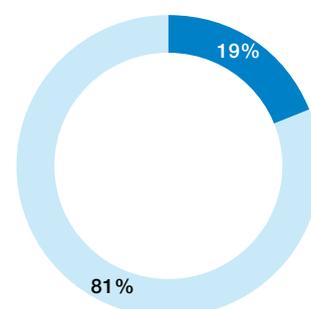
In fact, this sector accounts in average the 34% of total consumption, while the residential lighting accounts for 14% and the outdoor lighting accounts for less than 10%.

Comparison between energy consumption and efficiency of lamps

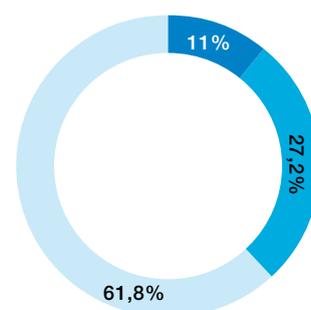
Another IEA study shows that in 1960 lighting systems had an efficiency of about 18 lm/W, whereas in 2005 the average efficiency was equal to 50 lm/W.

The improvement rate was relatively constant at 2.8% per year up to 1985; after this date, the value dropped to 1.3% per year. This decrease seems to be in contrast with the efficiency improvement recorded for other end-uses and sectors.

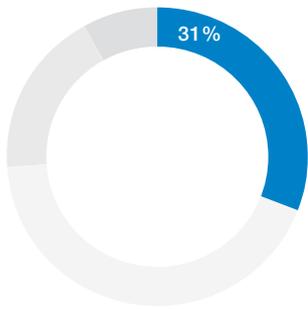
The IEA also provides data on the light share produced by each type of light source per region and sector. These estimates show that incandescent sources represent 11% of the total (14.7 Plmh), high-intensity discharge lamps approximately 27.2% (36.3 Plmh) and fluorescent lamps 61.8% (82.3 Plmh).



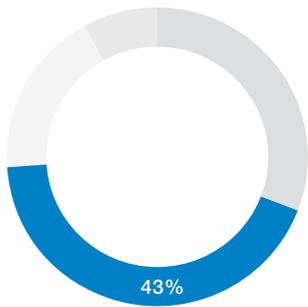
Electricity used for lighting accounts for about 19% (2,650 TWh/year) of global electricity consumption.



Lighting produced per source type: incandescent 11.0% (14.7 Plmh); high-intensity discharge lamps 27.2% (36.3 Plmh); fluorescent sources 61.8% (82.3 Plmh).



Electricity used for residential sector lighting



Electricity used for commercial sector lighting

From this data, it also appears that the less efficient sources - in particular, incandescent lamps, mercury vapor lamps and T12 linear fluorescent lamps - still constitutes major share of global electric lighting (45%).

Residential sector

Globally, an estimated 811 TWh of final electricity was used for residential lighting, equal to approximately 31% of total electricity consumption for lighting and about 18.3% of electricity consumption. This energy was used to provide 17.4 Plmh of light with an average yield of 21.5 lm/W, figure that is far lower than the other end-use lighting sectors.

If we focus on data from the European Union Countries, lighting accounts for 10.5% of residential electricity consumption. The lamp technologies most commonly used in this sector include incandescent lamps, halogen lamps and compact fluorescent lamps with built-in power supply.

The electricity consumption of incandescent lamps represents more than half

(56%) of the overall amount, while halogen bulbs account for approximately 31%.

Tertiary sector

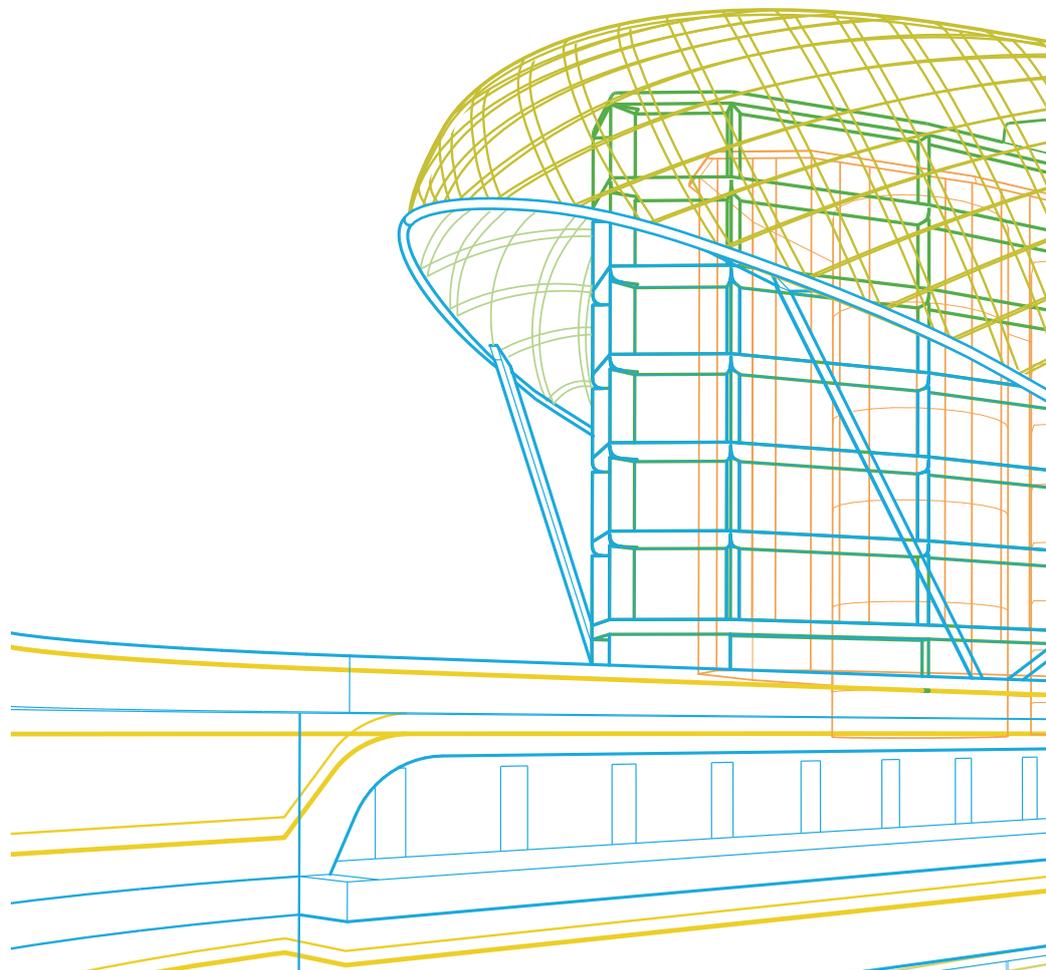
In total, an estimated 1,133 TWh of final electricity was used for lighting, equal to 43% of total electricity consumption for lighting and just over 30% of total electricity consumption in the tertiary sector. This energy was used to provide 59.5 Plmh of light, with an average efficiency of 52.5 lm/W. This figure is far higher than that for residential lighting, but not so high as that relating to outdoor lighting.

Focusing once again on the European continent, lighting represents the highest electricity consumption factor in the tertiary sector, with 21.57%, amounting to about 164 TWh/year. Outdoor lighting accounts for a share of 4.7% of total electricity consumption in the tertiary sector.

Linear fluorescent lamps have the largest market share (16%), followed by compact fluorescent lamps (6%).



Filippo Negroni
Product Manager Modular Devices
DIN-Rail products

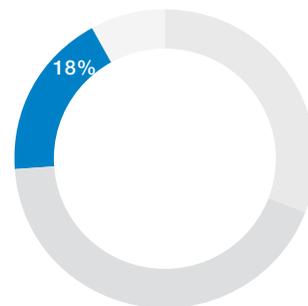


Industrial sector

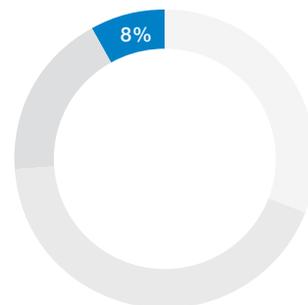
Globally, an estimated 490 TWh of final consumption of electricity was used for lighting in this sector, approximately 18% of total electricity consumption for lighting and around 8.7% of total industrial electricity consumption. This energy was used to provide 38.5 Plmh, with an average efficiency of 79 lm/W. This is the highest figure than any other sector, with the exception of outdoor lighting.

Outdoor lighting

Globally, an estimated 218 TWh of final electricity was used for outdoor lighting, approximately 8% of total electricity consumption for lighting and little more than 8.7% of total industrial electricity consumption. This energy was used to provide 16.1 Plmh, with an average efficiency of 74 lm/W.



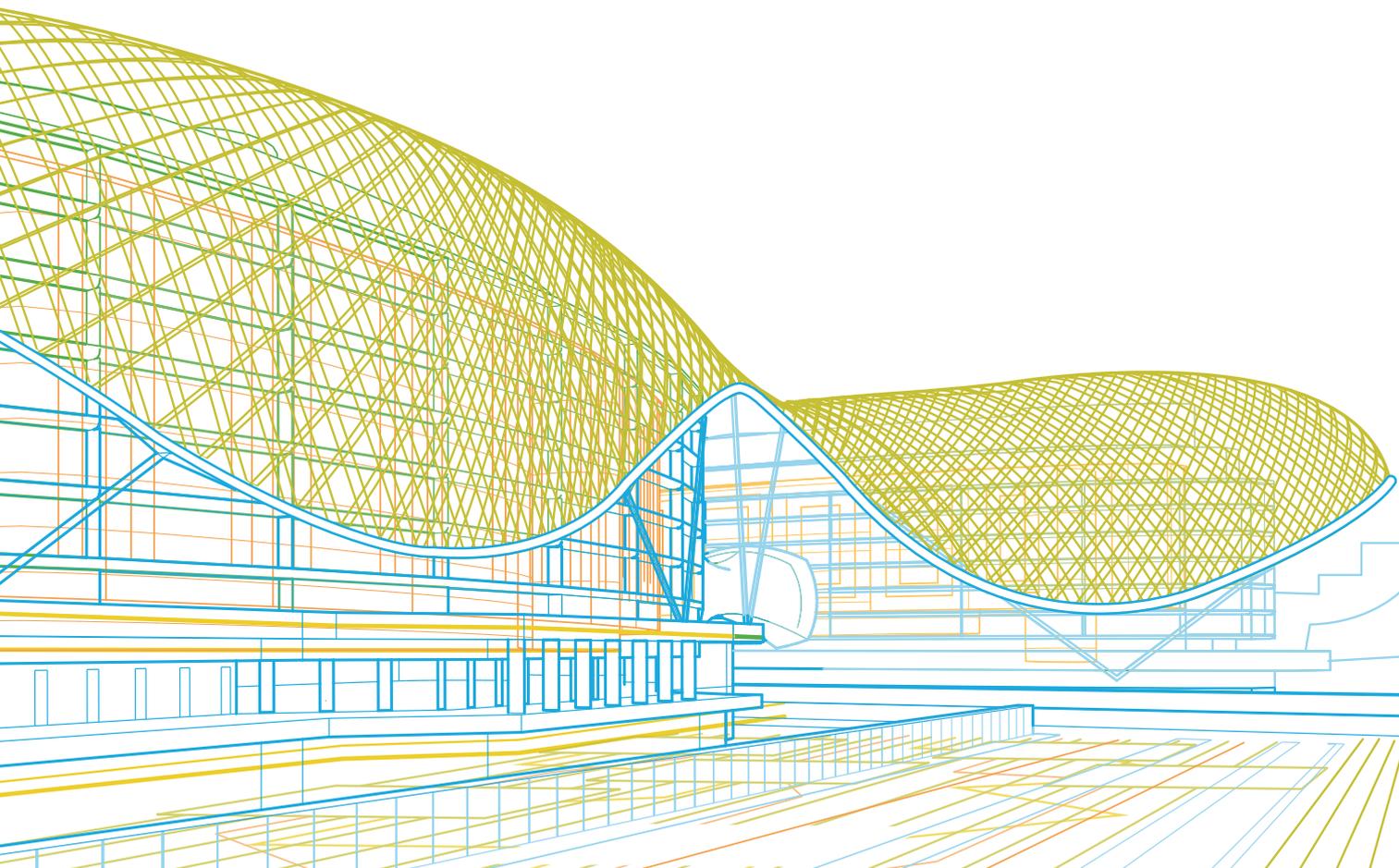
Electricity used for industrial sector lighting



Electricity used worldwide for outdoor lighting

Energy efficiency and savings

In the field of artificial lighting, consumption mainly depends, besides on the type of light sources, on the lamps power and number and on the adjustment options offered by the control system of the electric power supply plant. In fact, for the same service (lighting), the possibility to partialize or at least to turn off a portion of the system when not needed (i.e. when natural light contributes to overall lighting and/or based on presence or absence of people) can impact significantly on overall costs.







Powering the railways

Overview of main standards concerning railways application and products requirements

Francesca Sassi: *Product Marketing Manager - DIN-Rail products*

Anne Heeke: *Marketing Communication Manager - Enclosures and DIN-Rail products*

Trains are such a common sight in many societies that very few people stop to think of the sophisticated infrastructure essential to the smooth running of the service. Even fewer realize how reliant the service is on electrical power. Apart from the obvious ones like the overhead gantries feeding power to electric trains, there is an entire world of other applications on the railway for which electrical power is critical: traffic management systems like control rooms, data centers, computer rooms; automatic train protection systems, such as European Train Control System (ETCS); traffic lights; level crossings; railroad points; video surveillance and communication; ticketing machines, lifts, lights and other station infrastructure; and so on.

The requirements for rolling stock are increasing and will continue to do so. The task is to implement ever faster connections, while also increasing traveler comfort. During their everyday work, the trains are exposed to very high environmental, electrical and mechanical loads. This means a constant stream of new, increased and standardized safety standards for rolling stock.

Even a minor disturbance in the power supply can have a knock-on effect and result in major disruption to the rail net-

work. More importantly, the reliable functioning of the railway infrastructure is not just a matter of convenience – it is also a serious health and safety issue.

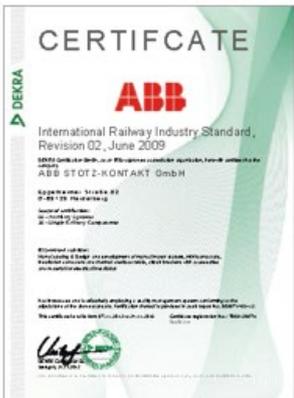
Railway UPS supporting 50 Hz and 16.67 Hz

The rail network poses a particular challenge in that, often, two separate power schemes have to be catered for, e.g., 16.67Hz single-phase and 50 Hz three-phase.

IRIS certification

In 2005, the IRIS Group was established as a UNIFE Group with the goal of securing higher quality in the railway industry. This was to enhance supra-national competition by enabling any railway component supplier to meet globally recognized levels of quality for its railway components. The aim of IRIS is to develop and implement a global system for the evaluation of companies securing a very high quality in the railway industry. The IRIS system defines requirements in content, procedures and evaluation of audits as well as a requirement profile for the certification bodies and auditors.

ABB IRIS certified factories are listed on the IRIS internet portal: <http://www.iris-rail.org/index.php>



Railway reference standards

Fire safety and general requirements

The use of DIN-Rail Product in rolling stock is subject to the highest possible safety standards and thus compliance with special standards. In this regard, the key standards are:

- The fire protection standard EN 45545 “Railway applications – Fire protection on railway vehicles”
- The fire protection standard NF F 16-101: “Rolling stock. Fire behavior. Materials choosing” and NF F 16-102: “Railway rolling stock. Fire behavior. Materials choosing, application for electric equipment”
- Shock and vibration IEC 61373: “Railway applications – Rolling stock equipment – Shock and vibration tests”

Fire and smoke protection standard EN 45545

This standard has been developed from existing fire safety regulations for railway vehicles from the International Union of Railways (UIC) and different European countries and specifies the reaction to fire performance requirements for materials and products used on railway vehicles. The reaction to fire performance requirements of materials and components depend on

their intrinsic nature but also:

- on the location of the materials or components within the design;
 - on the shape and the layout of the materials;
 - on the surface exposed and the relative mass and the thickness of the materials.
- It is on this basis that the listed products have been classified and further differentiated into subgroups as follows:
- their general location (interiors or exteriors);
 - their specific use (furniture, electro technical equipment or mechanical equipment).

DIN-Rail devices are classified, according the table 1.

The set of requirements defines the ability of products to contain fire development to an appropriate degree considering the location, the exposed surfaces, their geometry and general disposition. Requirements for R26 level are described in the table 2.

The design of rolling stock and the products used shall incorporate the aim of limiting fire development in case an ignition event occurs so that an acceptable level of safety is achieved. In the event of a fire, passengers and staff will be able to escape

Table 1

Product No.	Name	Details	Requirements
E	Electrotechnical equipment		
EL10	Small electrotechnical products	Examples include low power circuit breakers, overload relays, contactors, contactor relay, switches, control or signalling switches, terminals, fuses	R26

Table 2

Short name of requirement set (used for)	Test method reference	Parameter Unit	Maximum or Minimum	HL1	HL2	HL3
R26 (EL10)	T17 EN 60695-11-10	Vertical small flame test	Minimum	V0	V0	V0

from the fire unaided and be able to reach a place of safety. The operation and design categories defined in EN 45545-1 are used to establish hazard levels that are used as the basis of a classification system. Hazard levels have been determined according to the operating categories of a train and how the train itself is conceived. The operating conceptions are divided into four different types starting with standard vehicles to trains with sleeping cars. These trains usually operate in different operating environments. According to EN 45545, there are four types of environments depending on the distance a train is travelling inside tunnels. The combination of those two criteria is decisive for the "Classification of the Hazard Level". Below you find a matrix that is indicating the hazard level of the different combinations of operating conceptions in combination with the train type (table 3).

Fire and smoke protection standards NF F 16-101/102

NF F 16-101/102 are French standards representing today the world wide most recognized regulations in the railway business. They serve to classify the non-metallic materials which are used in rolling stock applications with regard to flammability,

smoke development and toxicity in case of fire. The purpose of these standards is to propose a method of classification of materials for rolling stock obtained from the results of standardized tests. In particular:

- NF F 16-101 (Railway rolling stock, fire behavior, choice of materials): establishes rules relating to the choice of materials according to their fire behavior with regard to reaction to fire, opacity of smoke and toxicity of gases emitted. This standard is applicable to all non-metallic materials in defined zones of rolling stocks with the target to protect human live.
- NF F 16-102 (Railway rolling stock, fire behavior, material choosing, and application for electric system): it's complementary to the NF F 16-101 for electrical equipment. This standard specifies the application of NF F 16-101 to electrical system and especially to individual device.

According to these standards, two different tests are needed for electrical materials (table 4):



Francesca Sassi
Product Marketing Manager
DIN-Rail products



Anne Heeke
Marketing Communication Manager
Enclosures and DIN-Rail products

Table 3

Train types	Tunnel lenght km	Operating Conceptions			
		N Standard vehicles	A Automatic vehicles without staff on board	D 2 level vehicles	S Sleeping cars 2 levels or 1 level
1	< 1 km	HL1	HL1	HL1	HL2
2	< 5 km	HL2	HL2	HL2	HL2
3	> 5 km	HL2	HL2	HL2	HL3
4	> 5 km no side evacuation	HL3	HL3	HL3	HL3

Table 4

Parameter	Test required	Classification
Flammability	1. LOI (oxygen index): volume in % of oxygen which is needed to inflame a material 2. Glow wire test:30s connecting time of a glow wire (850/960°C) with the testing sample observing of the performance.	I
Opacity and toxicity of smoke	I.F. (franz. Indice de fumée): is the French name of smoke index	F

The two fire properties “flammability” and “smoke consistency” are hereby put in relation (table 5).

The outcome are exigencies classes 1 – 4 whereby class 4 represent the strictest requirement.

Depending on rolling stock category, installation place and weight of the share of non-metal material used, the electro technical components need to fulfill defined exigencies classes. The table below represents the rolling stock types, classified by the NFF (table 6).

I: Flammability
 F: Opacity and Toxicity of smoke

■ authorized
 ■ not authorized

Exigence 1

	I0	I1	I2	I3	I4	NC
F0	■	■	■	■	■	■
F1	■	■	■	■	■	■
F2	■	■	■	■	■	■
F3	■	■	■	■	■	■
F4	■	■	■	■	■	■
F5	■	■	■	■	■	■

Exigence 2

	I0	I1	I2	I3	I4	NC
F0	■	■	■	■	■	■
F1	■	■	■	■	■	■
F2	■	■	■	■	■	■
F3	■	■	■	■	■	■
F4	■	■	■	■	■	■
F5	■	■	■	■	■	■

Exigence 3

	I0	I1	I2	I3	I4	NC
F0	■	■	■	■	■	■
F1	■	■	■	■	■	■
F2	■	■	■	■	■	■
F3	■	■	■	■	■	■
F4	■	■	■	■	■	■
F5	■	■	■	■	■	■

Exigence 4

	I0	I1	I2	I3	I4	NC
F0	■	■	■	■	■	■
F1	■	■	■	■	■	■
F2	■	■	■	■	■	■
F3	■	■	■	■	■	■
F4	■	■	■	■	■	■
F5	■	■	■	■	■	■

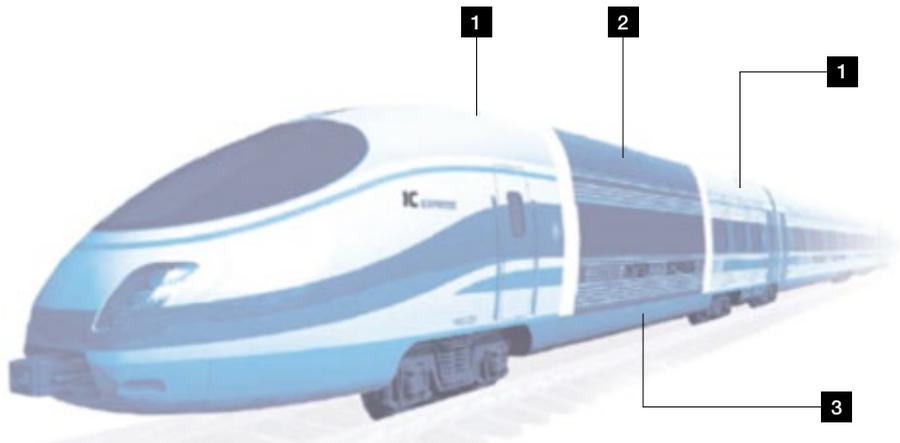
Table 5

Inflammability	Smoke consistency (density and toxicity)
I0 (low)	F0 (favorable)
I1	F1
I2	F2
I3	F3
I4 (high)	F4
NC	F5 (unfavorable)

Table 6

Exigence-Classes		Material Weight	Rail car type		
Installation place			g	A1	A2
Inside rail car	Passanger area and staff area	< 10	0	0	0
		10 < 100	2	2	2
	Engine room	>100	3	3	3
		≤ 300	0	0	0
Outside rail car	> 300	2	2	2	
	≤ 300	0	0	0	
		> 300	2	1	1

- 1. Passanger area and staff area
- 2. Engine room
- 3. Outside rail car



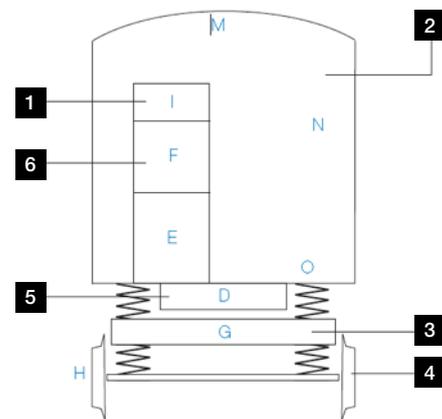
In particular 3 categories are defined:

- A1 Category: all rolling stock, including driver's cab, of which tunnel utilization is frequent
- A2 Category: urban and suburban rolling stock, including driver's cabin, of which tunnel utilization is less frequent, railcar and trailers and long-distance rolling stock ("mainline sleeper cars")

B Category (does not include double level rolling stock): long-distance rolling stock ("main-line sleeper cars") with seating places, including driver's cabin, of which tunnel utilization is less frequent and driving cab of locomotives and light rail motor tractors.

Body mounted; Category 2 – Bogie mounted and Category 3 – Axle mounted). For line protection devices the Category 1 is requested. It can be divided into 2 sub-groups, according to the location of the components:

- Class A: cubicles, subassemblies, equipment and components mounted directly on or under the car body.
- Class B: Anything mounted inside an equipment case which is in turn mounted directly on or under the car body. Category B should be used when it is not clear where the equipment is to be located.



- 1. Inside Cubicle
- 2. Body
- 3. Bogie
- 4. Axle
- 5. Under frame cubicle
- 6. Subassembly

Shock and vibration tests IEC 61373

This International Standard specifies the requirements for testing items of equipment intended for use on railway vehicles which are subsequently subjected to vibrations and shock owing to the nature of railway operational environment. To gain assurance that the quality of the equipment is acceptable, it has to withstand tests of reasonable duration that simulate the service conditions seen throughout its expected life. The test values quoted in this standard have been divided into three categories dependent only upon the equipment's location within the vehicle (Category 1 –

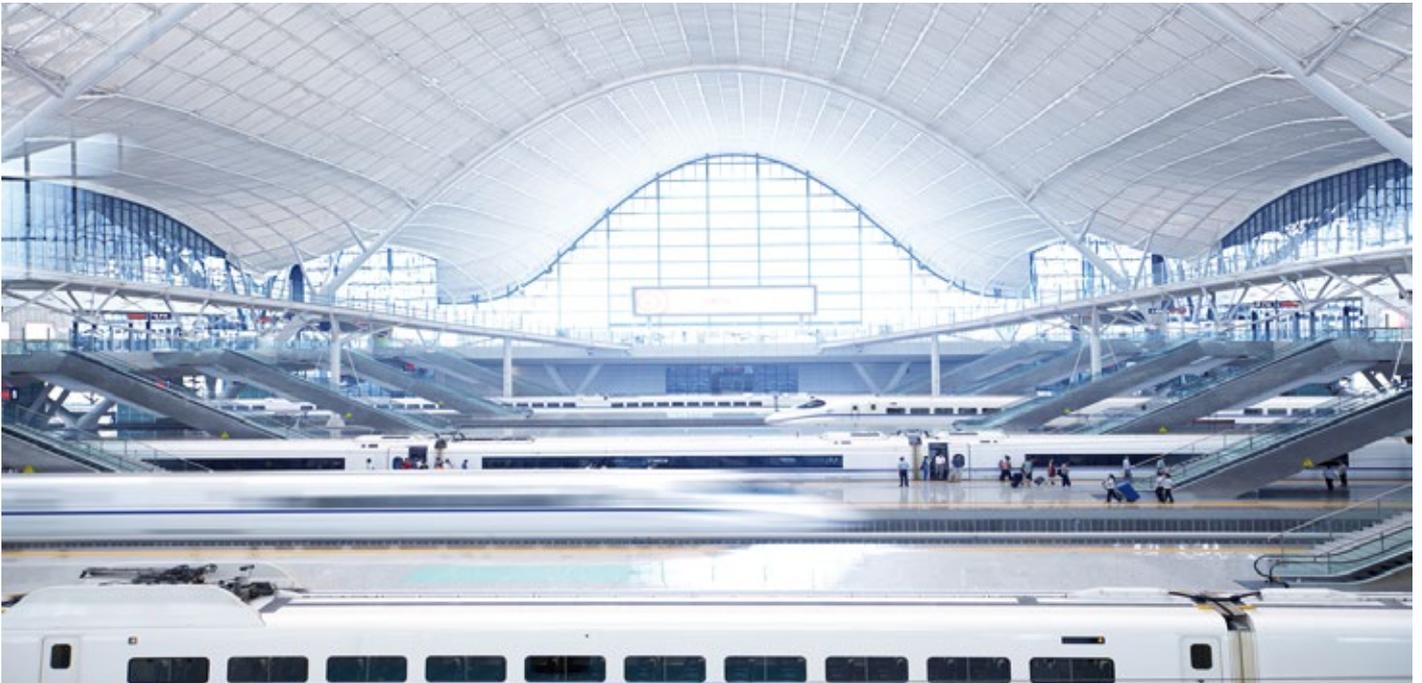
GOST 9219-88 – Electrical Traction Devices – General Requirements

Another important standard for the traction railways sector is the "GOST 9219-88 – Electrical Traction Devices - General Requirements", a local standard for the Russian market. This approval is required for the development of the trains that will travel in Russia. This Standard applies to electrical traction devices designed for operation on rolling stock of rail transport or on trolley buses. It does not apply to electrical traction devices operating in explosive or chemically corrosive environments.

Table 7

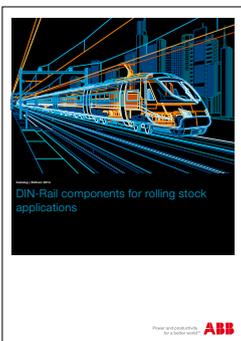
Category	Location	Description of equipment location
1 Class A	M N O I and J	Components which are mounted directly on to or under the car body
1 Class B	D	Components mounted into an underframe internal cubicle which is in turn fixed to the car body
1 Class B	K and E	Components mounted into a large internal cubicle which is in turn fixed to the car body
1 Class B	F	Components mounted into subassemblies which are mounted into a cubicle which is in turn fixed to the car body
2	G	Cubicles, subassemblies, equipment and components which are mounted on the bogie of a railway vehicle
3	H	Subassemblies, equipment and components or assemblies which are mounted on to the axle assembly of a railway vehicle

The figure identifies general location of equipment on railway vehicles:



Following ABB DIN-Rail products are compliant to meets R26 requirements and are classified with the highest hazard level HL3.

Family	Product name	EN 45545	NF F 16 - 101/102	IEC 61373	GOST 9219-88	IEC/EN 60898-1	IEC/EN 60898-2	IEC/EN 60947-2	IEC/EN 61009
Miniature Circuit Breaker	S200 MT	R26/HL3	I2F3	Category 1 - Class A/B	x	x		x	
Miniature Circuit Breaker	S200 MT UC	R26/HL3	I2F3	Category 1 - Class A/B	x		x	x	
Miniature Circuit Breaker	S200M UC	R26/HL3	I3F2	Category 1 - Class A/B	x		x	x	
Miniature Circuit Breaker	S200 P	R26/HL3	I1F1	Category 1 - Class A/B	x	x		x	
Miniature Circuit Breaker	S280 UC	R26/HL3	I1F2	Category 1 - Class A/B	x		x	x	
High Performance MCBs	S800S	R26/HL3	I3F2	Category 1 - Class B	x	x		x	
High performance MCBs	S800S UC	R26/HL3	I3F2	Category 1 - Class B	x			x	
High Performance MCBs	S500 UC	R26/HL3	I2F0	Category 1 - Class A/B	x			x	
High Performance MCBs	S800HV	R26/HL3	I3F2	Category 1 - Class A/B	x			x	
RCBO	DS201T	R26/HL3	I2F3	Category 1 - Class A/B					x



Catalogue:
2CDC002053D0204



Lightning protection specialists?

Absolutely.



Depending where we live, we are not all equal in front of the risk of lightning. For example there is more than 2 million lightning strokes per year on the French territory. They constitute a real risk for all humans and building structures. ABB as lightning protection specialist can offer you a range of lightning air terminals (simple rod or early streamer emission system OPR) in order to protect your facilities and personnel. All these products are developed by the ABB centre of excellence for lightning based in Bagnères de Bigorre - France; they are tested in laboratory as well as in situ to recreate natural conditions in the Pic du Midi (French Pyrenees).

www.abb.com/lowvoltage

Power and productivity
for a better world™



From Installer to Marketing Expert

Federico Mai: *Marketing Communication Account - LP Division*

Customer Satisfaction (CS)

How to improve the quality of products and services offered by your company by identifying the needs and satisfaction level of customers

Part Two (continued from the previous Day by DIN 1|14)

The survey project: how to design a CS survey

To carry out a CS survey, it is useful to develop a research project that should include information on the following variables:

- **analysis of the reference context** in which the survey will be developed;
- **goals** of the survey;
- **survey target subjects:** define the survey target subjects by deciding whether to aim the survey indistinctly to all Customers of the product or service in question, or whether to identify a particular Customer target. In this case, we will implement a segmentation of the Customers that will have an impact on the survey sample design criteria, providing a different key for interpreting the results with respect to the identified segments;
- **survey sample:** define the sample considering its characteristics in relation to the available resources and time. One can involve the entire reference universe in the survey, or carry out a sampling and subsequently project the results on the universe. In this case, one must pay attention to the sample composition criteria so as to ensure adequate levels of reliability and statistical significance of the data obtained and to reduce potential errors;
- **actors involved in the project:** define the work team, considering available resources and skills, inside and outside the company;
- **implementation method:** identify tools, resources and procedures for the operational execution of the survey (e.g. questionnaire, telephone interview, personal interview);
- **procedures for collecting, entering and processing the data:** define the organization of the data collection method. It is necessary to distinguish between the preliminary survey stage, aimed at gathering the basic qualitative information that is used to properly circumscribe the research field and set up the survey correctly (e.g. through tools such as focus groups and interviews), and the actual quantitative survey phase. In this regard, it will also be necessary to define the data entry procedure and the subsequent processing methods (e.g. how many people, computer media type);
- **research phases:** plan the survey development and implementation phases; a useful tool for planning and managing the project could be the GANTT chart, which allows a schematic display of the various project phases, of the assigned responsibilities and of the scheduled implementation timetable, allowing an ongoing monitoring of the proper progress of the activities;
- **survey presentation and publication:** define the tools, channels, methods, timetables and recipients for disseminating the survey and, at its conclusion, the results obtained.

The questionnaire

How to obtain a measurement tool that is consistent with the survey goals

The questionnaire design process comprises three basic steps:

- after having formulated and defined the research hypothesis, and specified the subject matter and purposes of the survey, one can carry out a sampling of the reference population to identify the analysis units;

- next one must identify the type of questionnaire to be used based on the purpose of the research and the results one wants to achieve. The questionnaire can be sent by mail, carried out over the telephone, submitted in electronic format or carried out in person, i.e. compiled by an interviewer. Each type has strengths and weaknesses that need to be taken into account for a proper application;
- the next difficulty is the choice of questions to use to obtain a specific type of reply and information. The questions that can be used in a questionnaire may be either classified or based on the question-answer exchange or based on the content and the objectives that one intends to achieve.

Depending on their technical form, the questions can be classified into:

- **open questions:** they do not call for answers that are pre-defined by the researcher and allow full freedom of expression to the respondent;
- **closed questions:** they provide a range of answers defined a priori by the researcher;
- **scale-based questions:** they involve the use of various kinds of measurement scales for measuring attitudes or opinions

The choice between open, closed or scale-based questions must be made on the basis of a balance between advantages and disadvantages, and in relation to what one wishes to learn and investigate. Depending on the content, instead, the questions may be:

- **basic questions:** questions on the respondent's personal data, gender, occupation, income, etc.;
- **filter questions:** questions that allow one



to decide the topics/issues to ask the respondent;

- structural questions: questions concerning the fundamental attributes of the respondent in relation to the research;
- behavioral questions: questions that relate to concrete facts and experiences of the respondent.

One needs to link the questions and the text parts to a line of reasoning, aggregating the questions related to the same topic in a single set of questions. Avoiding too many questions can help the respondent to focus on specific aspects of the subject matter treated.

Another expedient could be to use a “funnel technique”, i.e. a tactic of progressive approach to the more difficult or delicate topics to reduce misunderstandings, misconceptions, and so on. In order to create a relaxed atmosphere and to facilitate the truthfulness of the answers, it might be helpful to write an introductory phrase to the questionnaire with the compiling instructions and/or a research presentation letter containing the data of the company conducting the survey and a reference to the importance of obtaining the respondent’s answers. This reassures the latter that there are no right or wrong answers, that his or her anonymity will be guaranteed and that his or her answers will be analyzed in a confidential manner.

It should be added that in drafting a questionnaire it could be useful, both in terms of saving time and resources and of the quality of the results, to conduct a pre-test. The pre-test is a test phase of the questionnaire to check all its parts and any critical issues (the wording of the questions, their order, the superfluous questions, etc.).

Based on the notes, comments and findings that emerge from this pre-test, one can

“fix” and modify the questionnaire to obtain its final form.

Some operational measures for a successful CS survey

Parallel to the CS survey implementation process, one should take into account certain important success factors, namely the dimensions to cover with care in order to ensure the project’s success and to foster the long-term impact on the ability and the potential to effectively improve the quality of the services.

Among the success factors, it is worth mentioning the three aspects discussed below.

Attention to internal communication and external communication

Communication is a fundamental aspect for the success of the CS survey, both within the company and towards the public. First of all, internally it contributes to create and disseminate a CS culture, i.e. organizational values based on customer-oriented principles, ongoing improvement, and so on, and to consolidate it over time. Secondly, it helps to motivate the personnel and to involve it in the implementation of the project, which by its nature is cross-sectoral. Finally, it is an indispensable support tool for managing the change that is prefigured by the CS activity. In this case, the internal communication is functional to the creation of a constructive climate and attitude, which aims to research the causes and not the faults of a disservice. Communication towards the public is obviously crucial when it comes to publicizing and disseminating the survey itself and to informing the Customers of the results collected. It is also important for providing information on the measures that the company intends to take to meet the needs identified and to improve the services. Lastly, communication

is yet again fundamental for informing on the improvements actually implemented and the changes introduced.

Linking the findings to the decision-making and management processes

Since CS does not consist exclusively of a cognitive practice, but represents a strategic tool for guiding corporate decisions towards higher levels of efficiency and effectiveness of the services provided, it is necessary to provide the methods and systems to link the CS process and the corporate decision-making and management processes. In particular, it is important for the CS process to be coupled to the evaluation system and the reward system, as a motivation to the personnel towards improving the quality of products/services. The CS process can also be an important source of information to guide the corporate planning and control system, providing indications on the corrective measures to be carried out to bring the goods or services more in tune with the needs and expectations of Customers.

Continuity of data collection

In the spirit of ongoing improvement, the CS survey cannot be a sporadic event. Constant monitoring enables one to effectively understand and interpret the evolving needs of the reference socio-economic context, which in turn allows one to monitor over time the ability of products/services to respond appropriately to such inputs. The picture of the needs and desires of Customers, in fact, changes over time with increasing speed, modifying their set of expectations.

Turn off the lights: myth and reality

It is a widely accepted theory that it is cheaper to leave the lights on, when we temporarily leave our workplace, than turn them off and on again when we return. A video, broadcast on Discovery Channel, tells us exactly the opposite.

Manuel Dias: *Marketing Manager - Low Voltage Products - Portugal*



The Discovery Channel program shows tests carried out on several types of lamps. The lamp with the worst performance (tubular fluorescent) consumes, immediately after the turning on, the equivalent of its consumption during 23 seconds of operation. Therefore, it is concluded that turning off the light in our workplace during lunch time, coffee breaks, meetings, or other

longer absence periods it is clearly cheaper, regardless the type of lamp.

The same program also shows the results of lifespan tests conducted on each lamp when subjected to turn on / off every two minutes of operation. After six weeks - which corresponds to five years of residential normal use - only the LED resisted. Even in this case, the conclusion is that it is always more advantageous to turn off a lamp, regardless the type, when we do not need to use it.

Considering that we work in an increasingly focused-on-energy-efficiency Company whose vision naturally opposes waste, and one of our strategic imperatives (cost and growth) is a fundamental pillar in savings, it could be an interesting exercise to apply the conclusions published by Discovery Channel to our reality.

Consider:

- A tubular fluorescent 36W lamp, during a working day (ten hours of operation), produces an electricity cost of € 0,054 [0,036 kW x 10h x € 0.15 (price per kWh)];
- The consumption of a hundred lamps in a common office area costs € 5.4 per

day (values calculated by default, since the 58 W lamps are often connected for over 10 hours per day, without considering the use of the respective ballast);

- If every day we shut down these hundred bulbs for one hour (lunchtime), we will have an approximate savings of € 0.54 per day, € 11.88 per month (22 workdays) and € 142.56 per year. If we consider the total existing lamps only in two of ABB installations (Oeirás and Perafita), we can easily achieve about € 60 of savings per month, € 720 per year. Note that this result can be achieved turning off the lights just an hour per day!

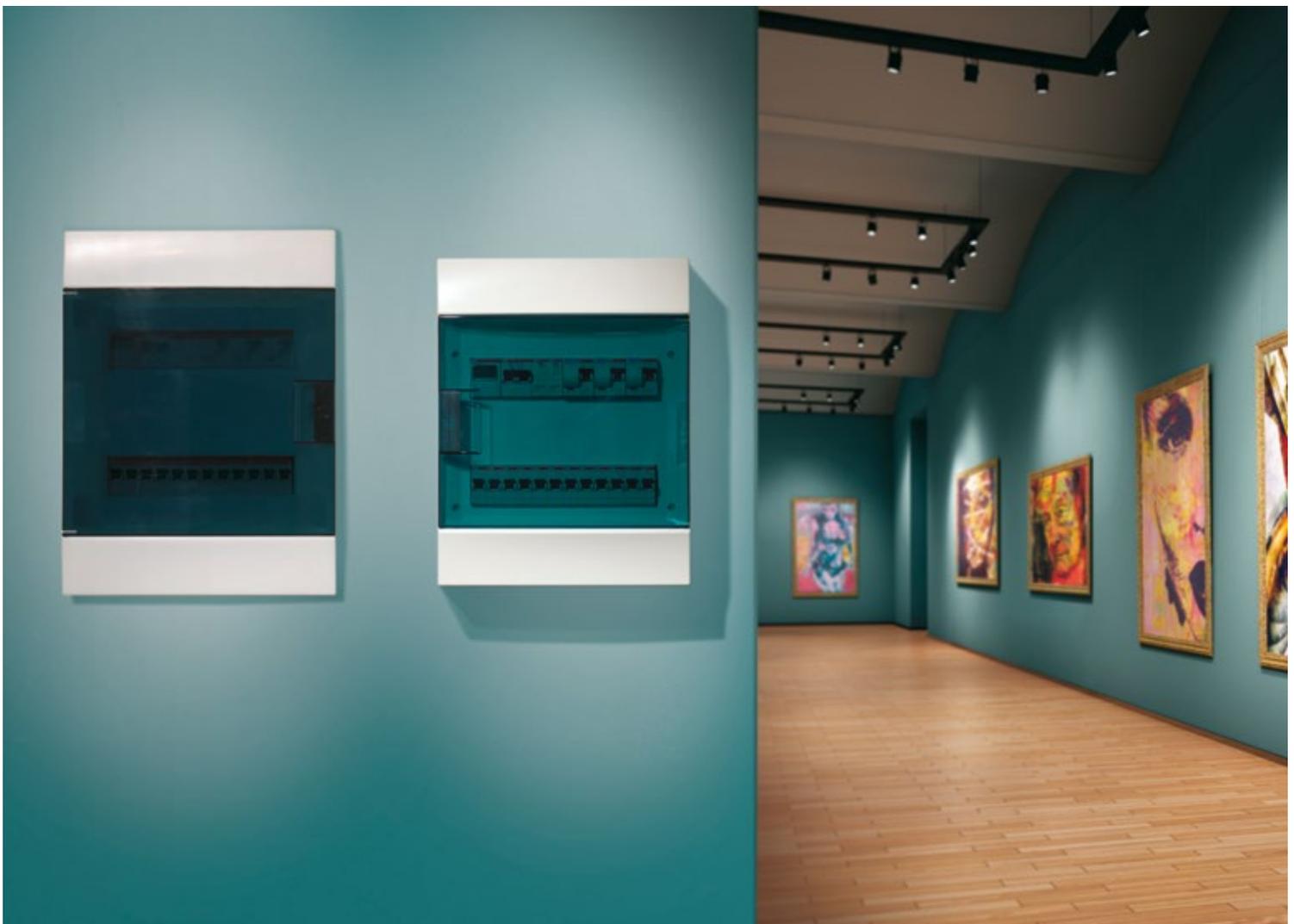
Thus, we can conclude that leaving the lights on because consumption at the turning-on point is very high is an unfounded myth, and in reality, it is more economical to turn off the light when it is not needed. This is the same recommendation we can find on the consumer protection association DECO PROTESTE's website.

Turn off the lights for a better world!

<https://www.youtube.com/watch?v=qgM0N7GD5lc>



Manuel Dias
Marketing Manager
Low Voltage Products - Portugal



System pro *E* comfort MISTRAL41. Create your own masterpiece.



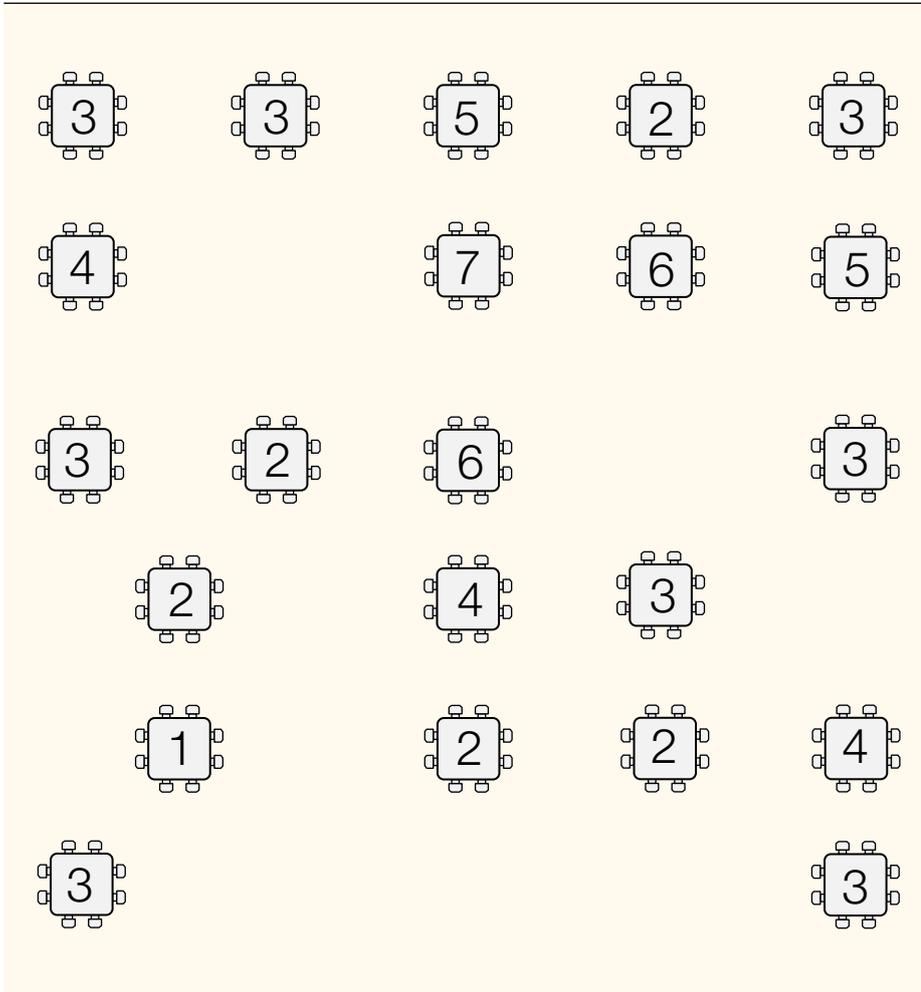
Freedom is an essential factor for innovation, modernization and unlimited possibilities. The new System pro *E* comfort MISTRAL41 series of consumer units offers that freedom in both flush-fit and wall-mounted versions. These IP41-rated units have been designed from scratch to enhance the unique features you've come to expect from ABB. Ample internal space, elegant design and a unified range of accessories give you the freedom and flexibility to create high-quality work you can be proud of. For more information visit www.abb.com/lowvoltage

Power and productivity
for a better world™



Connect the boxes

Train your brain



Task

You must complete an electrical system by connecting junction boxes with cable conduits.

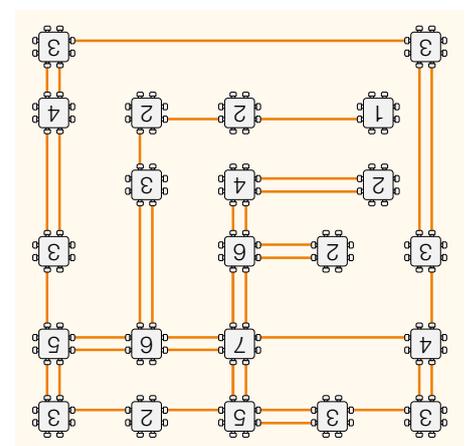
An electrician has already installed all the junction boxes on the wall and laid down the required connections, but then he left the job unfinished without explanation.

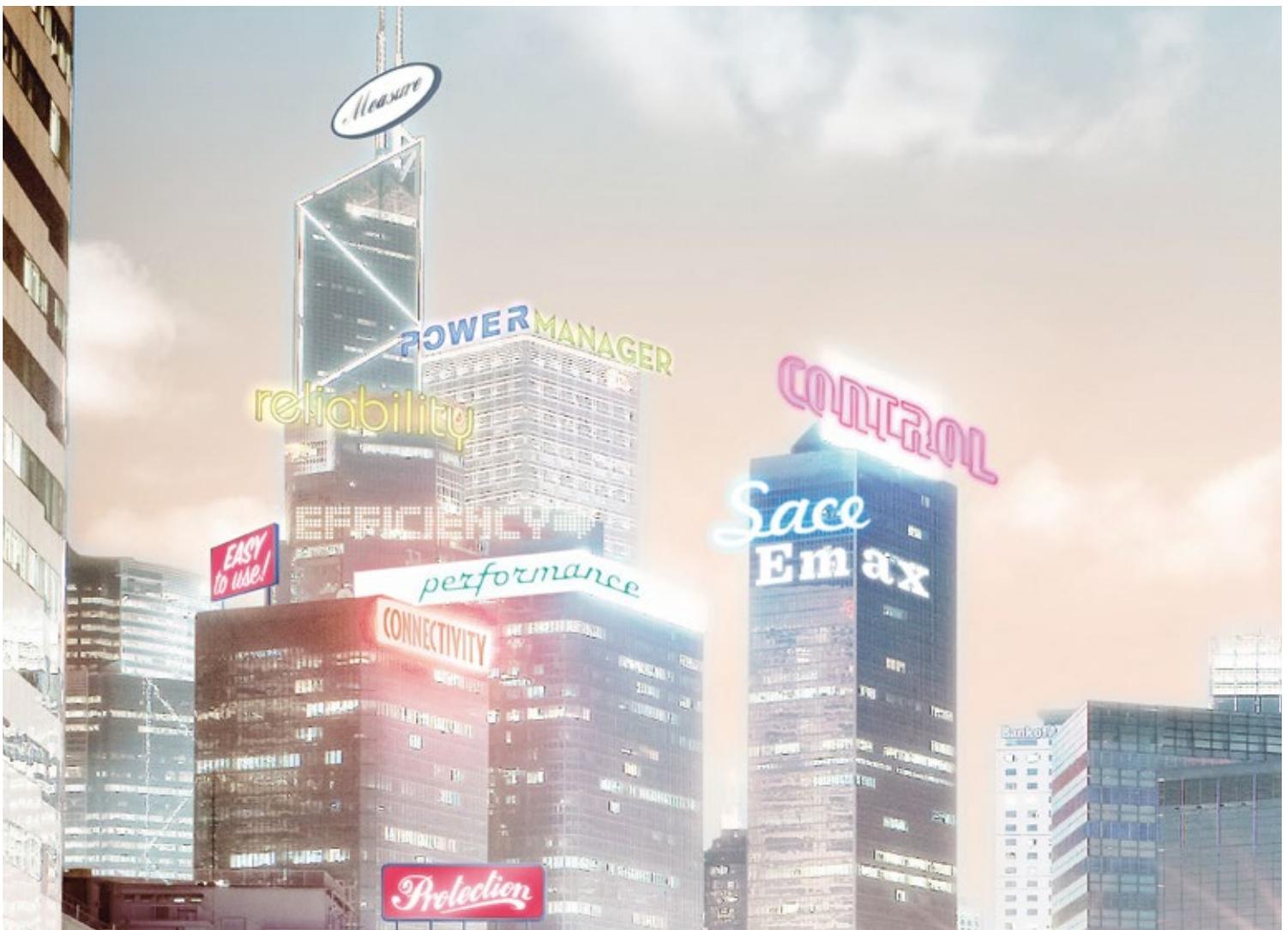
Your task is therefore to connect all of the boxes indicated.

Instructions

- Each box must be connected to the others and the number of connections must correspond to that indicated on the box.
- Two different boxes can be connected with each other, but without exceeding two connections.
- Connections can be made either horizontally or vertically. Cross-connections are not allowed.
- There is only one correct solution and can be found purely by logical reasoning. No specific technical skills are required.

The solutions to Connect the boxes





SACE Emax 2. Managing the power.



Light up the future with the new SACE Emax 2. Not just a circuit-breaker, but a true power manager that controls every electrical system, raising the efficiency.

SACE Emax 2 protects the system, manages loads and generators, measures and analyses energy quality. It is simply integrated into all projects - from standard systems to the most complex automated networks - all with the simplicity and reliability you would expect.

Circuit-breakers switch power. SACE Emax 2 manages it. www.abb.com/lowvoltage

Power and productivity
for a better world™





System pro *E* - ABB's enclosure portfolio All you need for being flexible



As part of the football WorldCup in Brazil 2014, ABB equipped six stadiums with a wide range of low voltage products, such as enclosures. Flexibility was an essential factor. The updated ABB's enclosure portfolio named System pro *E* offers you every flexibility you need. From single family houses, multiple dwellings, industrial constructions like office and administration buildings, stadiums, airports to special products, efficient enclosures and cable systems from ABB are used wherever power is metered and distributed. System pro *E* incorporate all the great features you expect from ABB. For more information visit www.abb.com/lowvoltage

Power and productivity
for a better world™

