

ABB UK Electrification Products Division

Low voltage products and solutions

Rail infrastructure & rolling stock overview

ABB in transportation

Innovative solutions for sustainable mobility



ABB is a world leading supplier of innovative technologies for transportation with a comprehensive range of solutions for rolling stock and infrastructure. We help to keep the world moving with new sustainable approaches that enable customers to use energy effectively, creating a low carbon transportation industry that operates with maximum efficiency and reliability.

ABB has a global network of services for railway providing the possibility to get tailor made and lifecycle services for rolling stock and infrastructure. ABB's broad range of services consists of spare parts, maintenance, upgrades and retrofit (both on and off customer site). A customised bundle of services is available based on the customer's operating needs, on demand when needed or in multi-year service level agreements.

Energy saving

Our innovative products and solutions have been designed to increase efficiency in all installations. Reliable systems are managed with competence for generating productivity and energy saving.

Ensure continuity of services

ABB products have proven their excellent functionalities in daily use under the toughest conditions. Our high performance products allow us to help you to increase the reliability of your equipment.

Easy integration and system optimisation

ABB compact and modular product ranges offer easy integration into all types of switchgear and automation.

ABB supports the high levels of expectations for a safe means of transport

Our knowledge of more than 30 years in the railway industry allows us to offer a wide range of products and solutions for rail applications, which meet the latest international standards and customer's requirements.



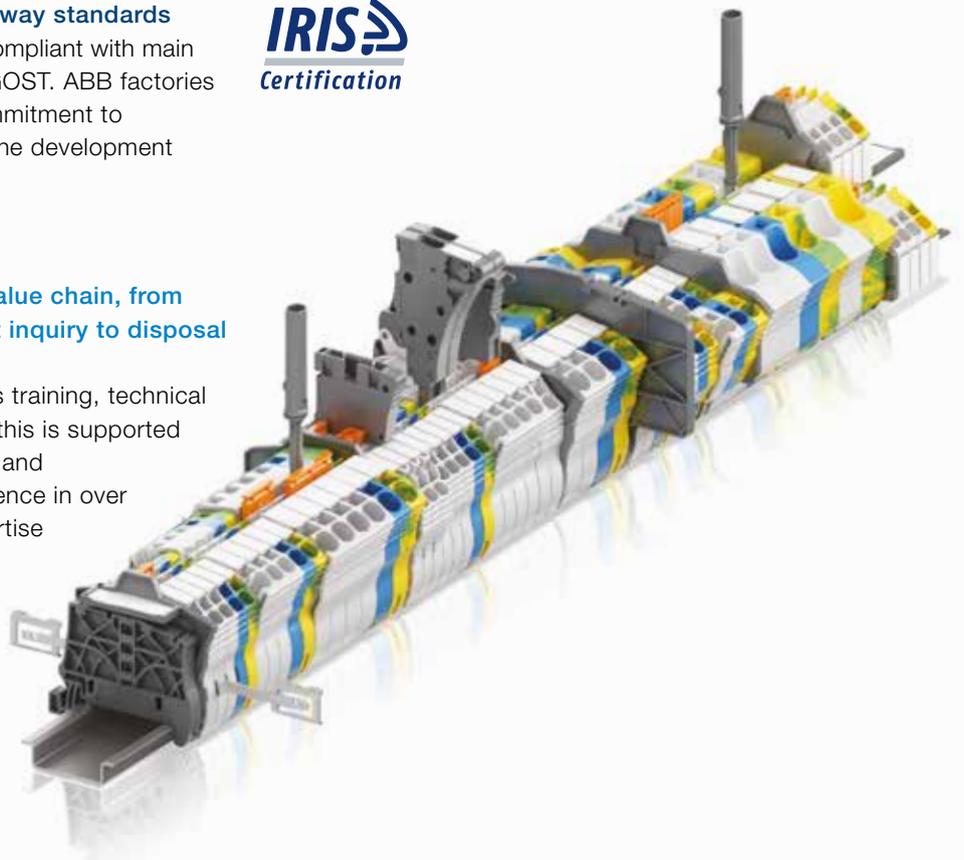
Compliance with main international railway standards

Our products have been designed to be compliant with main international standards EN, NFF, ASTM, GOST. ABB factories are IRIS certified. This is showing our commitment to optimise processes and to participate in the development for a sustainable mobility.



Our service networks span the entire value chain, from the moment a customer makes the first inquiry to disposal and recycling of the product.

Throughout the value chain, ABB provides training, technical support and customised contracts. All of this is supported by one of the most extensive global sales and service networks. Our global market presence in over 100 countries allows us to bring our expertise in close proximity to our customers.



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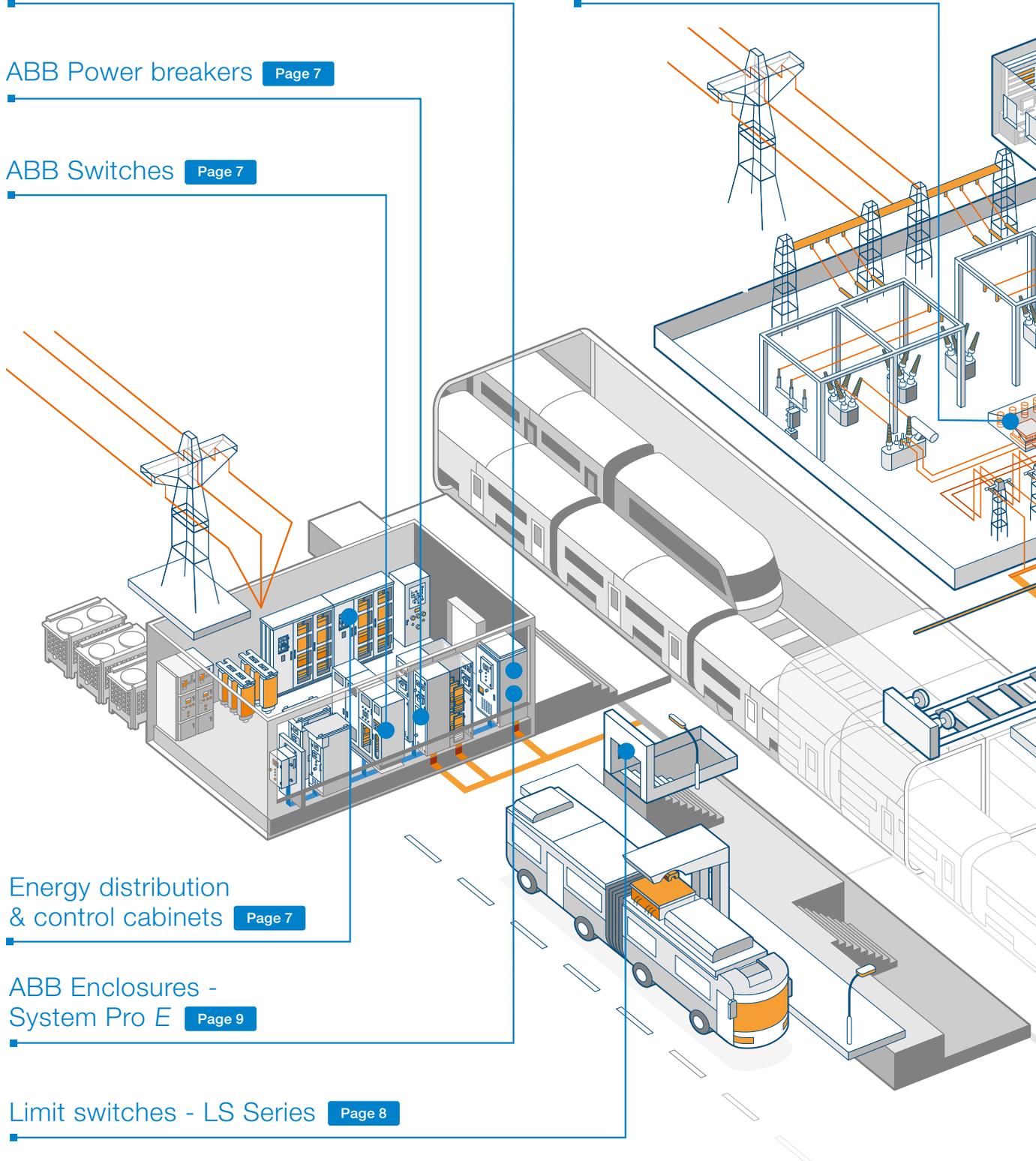
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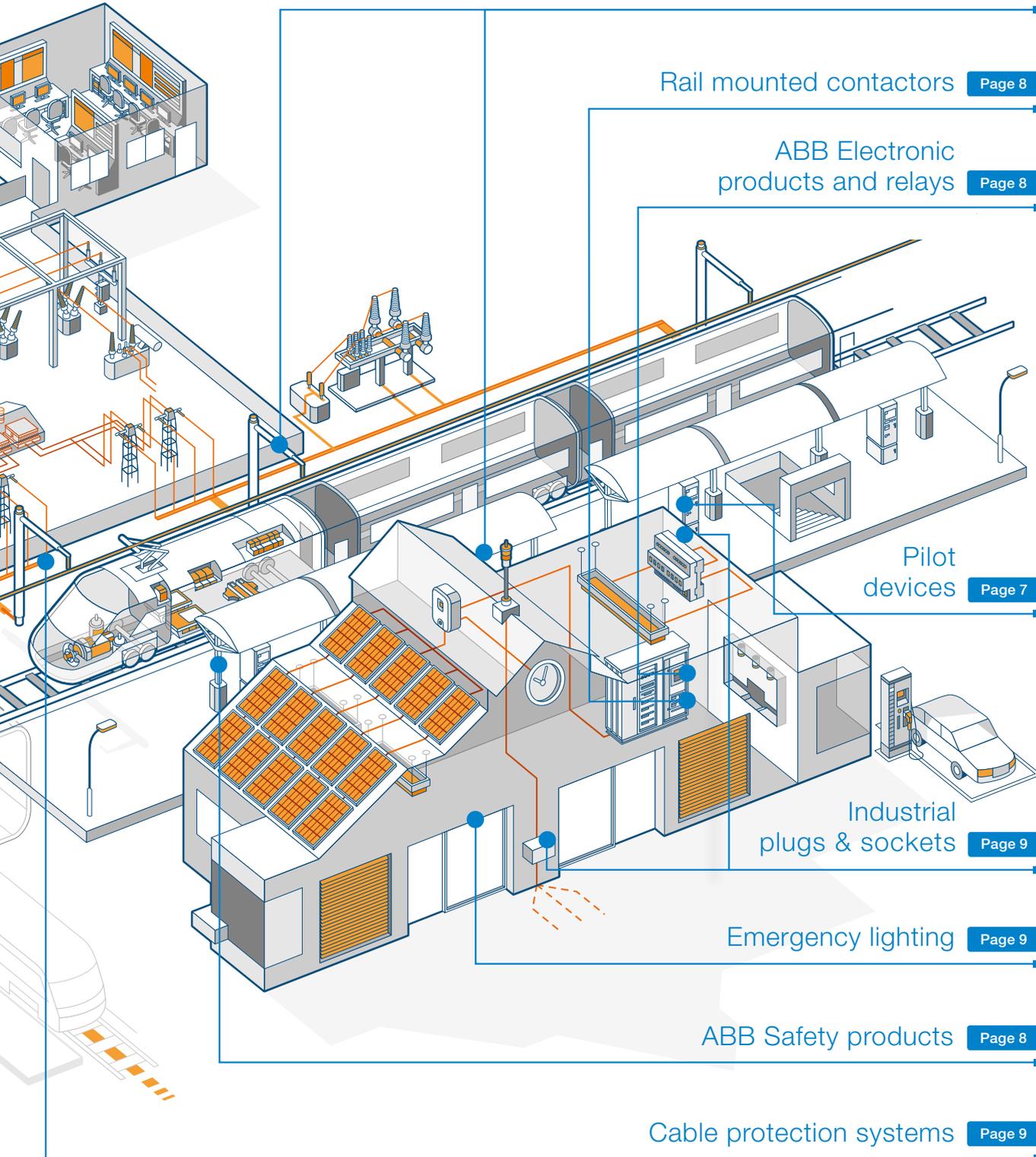
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Infrastructure products

Overview



ABB understands the importance and implications of running imperative railway networks. Our electrification product range provides innovative solutions that protect your infrastructure installations - whether it's to manage, control or to communicate a function or process.

With our wide range of power circuit breakers, switchboards, distribution cabinets or with our KNX intelligent building management solutions or emergency lighting systems, we contribute fully to the successful building and to the performance of your installations.

Low voltage products for infrastructure:

- Traction substations AC or DC, passenger stations, charging stations, buildings, maintenance workshop, etc.
- Control & signaling
- Signal cabins, automation equipment, preconditioning, etc.
- Earthing, lightning & surge protection
- Emergency lighting
- Cable protection systems

Low voltage products and solutions:

- Earthing, lightning & surge protection
- Emergency lighting
- Cable protection systems

Other ABB products:

- Traction substations
- Transformers
- Frequency converters
- Low-medium voltage switchgears
- Energy storage systems, etc.

Infrastructure

Product range overview



Energy distribution & control cabinets

A wide range of ultra-sturdy and safe construction switchgear systems and cabinets for electrical low voltage distribution, control and automation application including System pro E power / System pro E control / System pro E energy. ABB panel boards and the ABB Protecta range also include distribution boards, split load distribution boards and pan assemblies, metering modules and extension boxes.



ABB Arc Guard system - TVOC-2

TVOC-2, ABB's latest Arc Monitor builds on the proven TVOC design. Its new functions and features improve an already great product, putting more focus on reliability, flexibility and simplicity.



ABB Power breakers

The range includes the Emax2 Air Circuit Breaker - from circuit breaker to power manager, and the SACE Emax2 air circuit breakers up to 6300A, which have been designed to increase efficiency and also offer the smallest footprint available in the market today (reduced by about 25%). The Tmax XT - Moulded Case Circuit Breaker and the SACE Tmax XT moulded case circuit breakers guarantee high performance levels while being progressively smaller in size, simple to install and able to provide increasingly better safety. Our range is exhaustive and complete to 3200 Amps.



Contactors & motor protection

Features include, up to 1000A, 690V AC-1 and 540A, 600V general use and only 4 coils cover 24V - 500V AC & 20V - 500V DC and AC/DC coils. Built-in surge suppression, mirror & mechanically linked contacts combine with easy-to-use accessories through snap-to-connect function.



ABB Switches

Our switch family consists of a complete range of manual and motorised switches, including the OT range of switch dis-connectors from 16 to 3200 Amps and the OS switch fuses from 20 to 1250 Amps. Other products available include change-over switches, automatic transfer switches, bypass switches, PV DC, rotary cam switches and fuses. Secure your power supply with ABB's Automatic Transfer Switches (ATS) from 160 to 1600 Amps.



Pilot devices

From the smallest inside component to the outer tough shell, ABB's pilot devices are pieces of engineering ingenuity. Reliable, flexible and available worldwide.

Infrastructure

Product range overview



Modular & DIN rail components - System pro M

ABB offers a wide range of components for protecting and switching from 0.2 to 125 Amps - 6, 10, 25, 36 & 50 Ka and various tripping curves including B, C, D, K & Z with screw and screwless connections. The range also includes monitoring, command control and measuring, lightning conductors and OVR surge protection devices, MID Meters and ABB i-bus KNX - Intelligent building management and control.



Rail mounted contactors

For 'power' applications in fixed installations featuring current up to 5000A and voltage up to 1000V AC or 1500V DC and high making / breaking capacity. Variable no. of poles & adjustable no. of auxiliary contacts and a combination of N.O. & N.C. poles.



ABB Plug-in Modula system - SMISLINE TP

SMISLINE TP is the complete line protection solution for applications with high availability, easy and fast installation and maintenance requirements. Main features include, high power availability - Busbar system, contact rails max. 100A, incoming system with max. 200A, five directly pluggable protection devices, such as MCBs, RCDs, SPDs, Motor starters and switch dis-connectors. Offers excellent safety for maintenance and servicing, world-wide approvals and standards and completely finger-safe IP2XB.

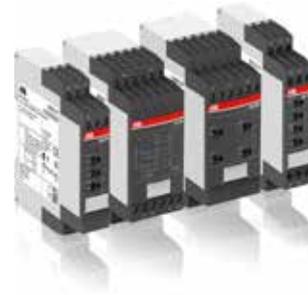


ABB Electronic products and relays

Easy-to-set front-face operating controls and clearly labelled connecting terminals provide a high ease of use and easy handling, making wiring quick and simple. The compact dimensions save space in the distribution panels. Available with screw or screwless connections.



Current and voltage sensors

ABB current and voltage sensors combine accuracy, reliability and robustness to rough environments, including closed loop sensors, CS type sensors from 100 to 2000A, NCS type sensors from 4kA to 40kA and voltage sensors from 50V to 5000V.



ABB Safety products

ABB offers an extensive range of innovative products and solutions for machine safety systems. Our range of safety products are also designed to make your machine safety system easy to build, up to SIL 3 (EN 62061 and EN 61508).



Limit switches - LS Series

Available with Plastic or Metal casing including 30, 40, 60 mm widths and up to IP67 available. Full range of actuators, safety keys, plungers, roller plungers, roller levers, adjustable levers and spring rods.

Infrastructure

Product range overview



Earthing, lightning & surge protection

Furse provide a total solution for earthing, lightning and surge protection. Our extensive range of earthing products, including conductors, earth electrodes, inspection pits and earth bars are PADS approved. While trackside solutions include surge protection devices for cabinets, equipment and control rooms - including our Solid State Interlocking (SSI) range.



Emergency lighting

Providing a comprehensive portfolio of emergency lighting and central power supply systems Emergi-Lite offers solutions for planning, design, installation and operation, including escape route lighting, exit signs and safety post (SOS) signs.



Cable protection systems

Adaptaflex & PMA systems perform in a wide variety of environments, from high temperature to freezing subzero conditions, and our products withstand constant vibrations, water ingress, offer corrosion resistance and are available in halogen free, low smoke and low toxicity materials. Typical Applications include rail stations, signalling, tunnels, surveillance or data and information systems. Additional benefits include exposed locations - high impact resistance, low fire hazard systems, high impact resistance low temperature flexing, EMC protection for safety critical systems and OEM packages.

Industrial plugs and sockets

Where temporary connections need to be made, ABB's Industrial Plugs & Sockets provide highly resistant solutions. Features include IP67 Watertight or IP44 Splashproof, 16 - 125A, 50 - 690V AC, IEC 60 309-1, IEC 60 309-2 & IEC 60 309-4. All external screws are made of stainless steel.

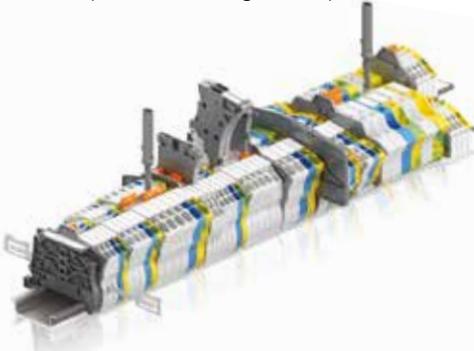


ABB Terminal blocks and connection systems

ABB SNK range is available with Screw Clamp, PI-Spring and pluggable technologies with common accessories. Qualified for worldwide applications and severe environments such as hazardous locations, railways, marine and solar applications. ABB SNA range is available in screw clamp and stud technologies with a large choice of sections and colour variants. Qualified for standard and power applications up to 300mm².

ABB Enclosures - System Pro E

ABB enclosures are ideal for commercial buildings, infrastructures and industrial applications in compliance with international standards and sectorial norms. The System pro E portfolio from ABB is preferred by professionals wherever electrical energy needs to be metered, controlled and distributed.

Electrification products

For rolling stock equipment

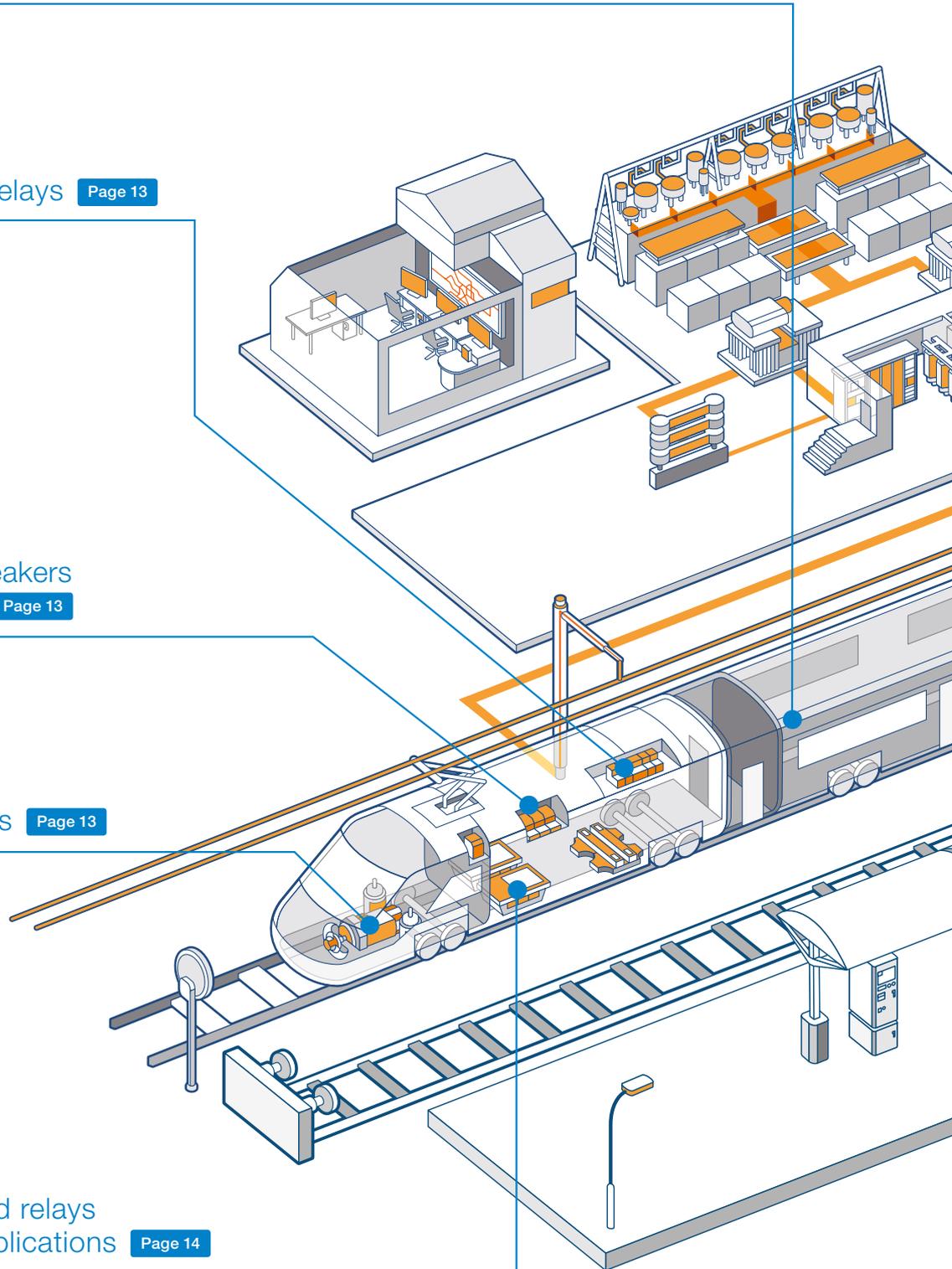
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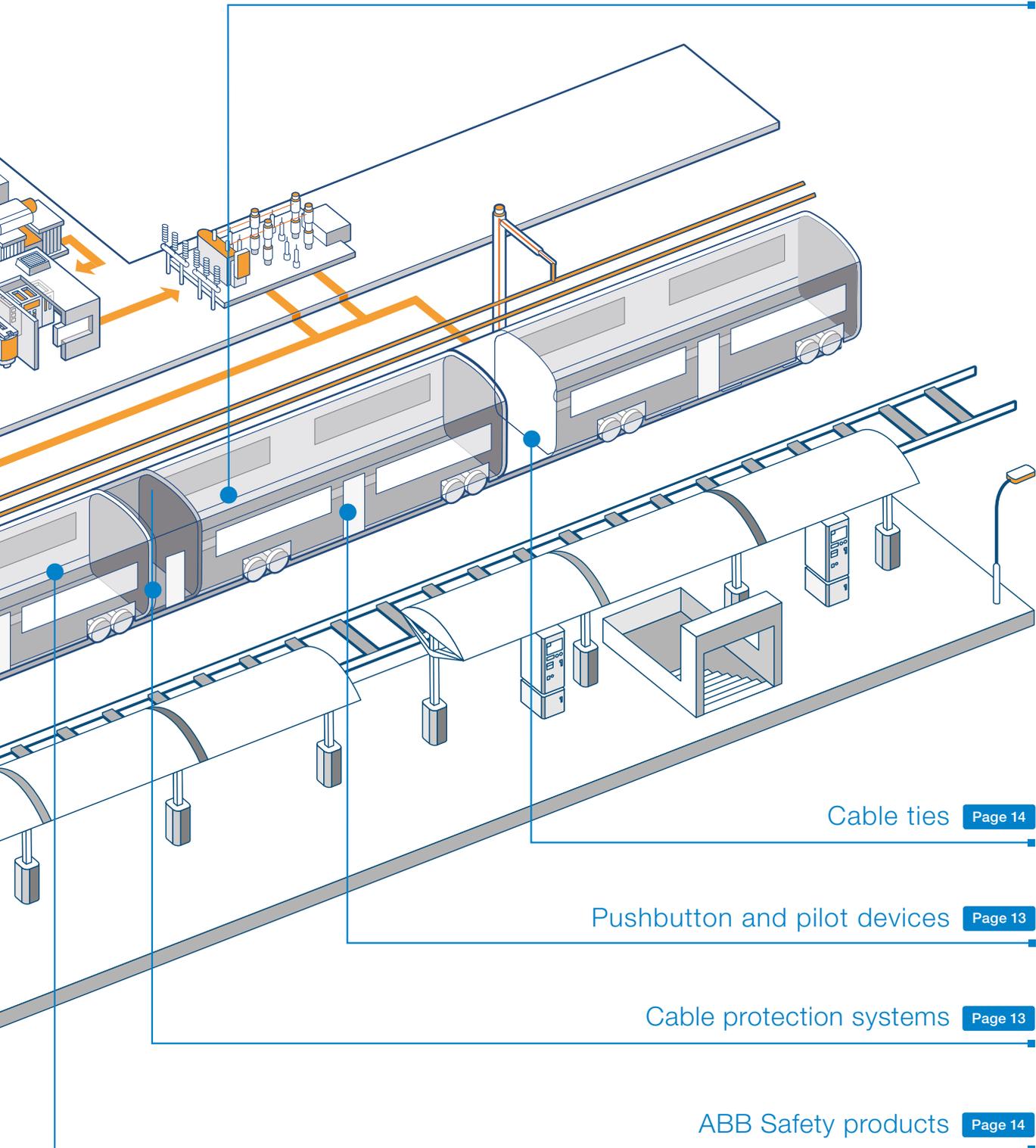
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Rolling stock products

Overview



ABB offers a wide range of innovative design solutions and products for rolling stock applications. As part of our ongoing efforts to meet your requirements, our products are developed to be reliable, safe and easy to install.

By offering a wide range of innovative products for rolling stock applications including breakers, miniature circuit breakers, contactors, sensors, cable protection systems, electronic products and relays, etc. we offer you a solution for each of your applications and contribute to the increased efficiency of your equipment.

Rolling stock applications:

- High speed train
- Light rail vehicle
- Regional train
- Metro
- Tram
- Locomotive
- Monorail

System suppliers:

- Power converter
- Auxiliary converter
- Heating ventilation
- Air conditioning
- Door
- Brakes
- Battery charger
- Master control unit

Other ABB products:

- Transformers
- Converters
- Auxiliary converters
- Motors

Rolling stock equipment

Product range overview

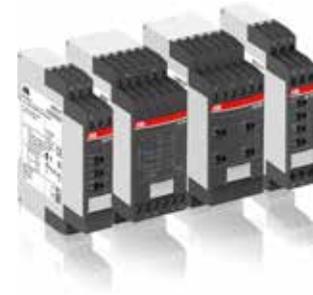


ABB Power breakers and switches

The Tmax XT Moulded Case Circuit Breaker and the SACE Tmax XT Moulded case circuit breakers guarantee an extremely high performance level, while being progressively smaller in size, simple to install and providing better safety. Range is exhaustive and complete up to 3200 Amps. ABB manual and motorised switches include the OT range of switch dis-connectors from 16 to 3200 Amps and OS switch fuses from 20 to 1250 Amps.

Pilot devices

From the smallest inside component to the outer tough shell, ABB's pilot devices are pieces of engineering ingenuity. Reliable, flexible and available worldwide.



PMA

Cable protection systems

PMA's extensive over 6,500 cable protection products contribute to safe, reliable railway systems worldwide. PMA's products have earned an excellent reputation by constantly developing, and manufacturing revolutionary new products for the rail sector. Applications include on the carriage roof, couplings and intercar jumper connections, under the carriages, on bogies, inside carriages and in passenger zone, underground railways and breaking systems.

ABB Electronic products and relays

ABB relays can be installed in all kinds of rolling stock, including passenger and driving cabins, covering all risk categories. The selected assortment reaches the highest level in fire and smoke behaviour, according to the requirements of EN 45545 and NF F 16-101/102.



ABB Terminal blocks and connection systems

ABB traction terminal blocks are the most complete range on the market, providing all connection technologies, including ABB ADO System terminal block, ABB PI-Spring terminal block and pluggable system, ABB Quick connection terminal blocks and ABB single & double stud terminal blocks. Features include connection capacity from 0.6 to 185mm² for control to power, distribution applications, technologies for rolling stocks and railroad infrastructures: Screw, ADO Systems® (IDC), PI-Spring & stud.

Current and voltage sensors

ABB current and voltage sensors combine accuracy, reliability and robustness to rough environments, including closed loop sensors, CS type sensors from 100 to 2000A, NCS type sensors from 4kA to 40kA and voltage sensors from 50V to 5000V.

Rolling stock equipment

Range overview



Ty-Rap®

Cable ties

Premium cable ties with a steel locking barb to secure and manage cables, providing a “Grip of Steel” through a Non-Magnetic Stainless Steel locking Barb – marine grade type 316. Rounded edges also prevent sharp edges from damaging cables and a smooth, notchless body, makes the cable ties even stronger – up to a tensile strength of 540N. A Ribbed and Stippled surface prevents the tie from slipping under vibration conditions and external shock. UV-resistant and flame retardant.



Modular & DIN rail components - System pro M

ABB offers a wide range of Modular MCB - RCBO and DIN rail traction approved components for protecting and switching. The S200MT UC is designed to be used AC & DC in traction applications, according to French standard NFF 16-101/102 (I2/F3, Exigence 3). The S200MT UC range includes a Real-CPI (Contact Position Indicator) on the front of the device increasing the security comfort for the installer and the user, available from 0.2 to 63A. Miniature circuit-breakers are available in 1, 2, 3 and 4 pole versions. With residual current circuit-breakers and overcurrent protection, the DS201T range, up to 40 Amps, complies with all main international standards including EN 45545; NFF (Exigence 3); NF C 16-101, etc. The S800 range High performance miniature circuit breakers, up to 125 A and 50kA breaking capacity are also available. Interchangeable terminals (Cageor ring terminals) with a wide range of accessories, comply with all main international standards.



ABB Safety products

ABB offers an extensive range of innovative products and solutions for machine safety systems. Our range of safety products are also designed to make your machine safety system easy to build, up to SIL 3 (EN 62061 and EN 61508).



Contactors and relays for traction applications

AF(Z)B contactors and NF(Z)B contactor relays have been developed in order to meet the specific requirements of rolling stock application. Compact and modular design decreasing the space required in installations. Light weight, resulting in less energy by axle. Low coil consumption for energy saving. Connection for ring tongue or standard ferrules. Compliance to the latest rolling stock standards. Our contactor range is available from 5.5 to 160kW, 400V, AC-3 and 25 to 500A, 690V, AC-1, $\leq 40^{\circ}\text{C}$.

Reducing fire hazards

EN45545

EN45545 - What subjects will the new standards cover?

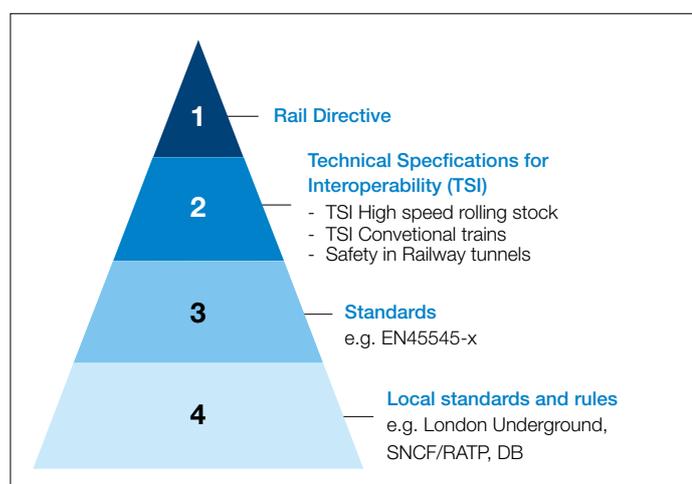
EN45545 is the most comprehensive set of fire safety standards ever developed. There will be 7 parts to the Standard but only Parts 1 and 2 will be applicable to conduit systems:

Part 1: General definitions, operation and design categories, and fire safety objectives

Part 2: Reaction to fire performance requirements of products This new standard will harmonise the requirements for fire safety on railway vehicles that operate within Europe.

What fire properties will be required for European rail products?

EN 45545-2 is the part of the existing series EN 45545-1 to -7 for testing materials. National standards are still valid and allowed for specification until March 2016. Afterwards EN45545-x:2013 has to be used (where specified in the TSIs). Customers can require additional standards like London Underground engineering standard.



Today TSI High Speed does mention the EN 45545-2, all others not. TSI conventional trains is currently in the process to be merged with TSI High Speed. This means EN 45545-2 will be **mandatory** in Europe for high speed and conventional trains. It will **not** be mandatory for:

- Light rail (trams)
- Tunnels
- Infrastructure

The fire properties of products installed on future European railway vehicles are specified in Part 2 of EN45545. The essential reaction to fire properties detailed are aimed at limiting the fire growth through the train if an ignition event occurs and to provide sufficient time for passengers and staff to reach a place of safety. The satisfactory reaction to fire performance will be determined by flame spread, rate of heat release, smoke and toxic gas generation tests on the train.

The new European Standard for fire safety in rolling stock applications has a very similar character to BS6853 with categorisation of applications to assess risk. Material requirements are adjusted to risk.

Applications are divided into 4 **operation categories**:

1. Over-ground operation with fast evacuation min delay
2. Operation including tunnels or elevated sections with fast side evacuation possibilities
3. Operation including tunnels or elevated sections with slower side evacuation possibilities
4. Operation including tunnels or elevated sections with no side evacuation possibilities

Design / Operation Category	N- Standard Vehicles	A-Automatic vehicles with no emergency	D - Double decked vehicles	S - Sleeping & couchette cars. Double/single decked
1	HL1	HL1	HL1	HL2
2	HL2	HL2	HL2	HL2
3	HL2	HL2	HL2	HL3
4	HL3	HL3	HL3	HL3

The highest risk applications are naturally for a sleeping cars where a passenger would have to be woken before he can be evacuated and operation where side evacuation is not possible. The material requirements for these higher risk applications HL3 are in the areas of flammability, smoke emission and toxicity the highest.

What product performance levels will be required?

Three hazard levels of reaction to fire performance will be required for rail products. These levels relate to the risks associated with the operational category of the vehicle and to the location of the product on the vehicle.

What testing and certification of products will be involved?

All rail products will need to be type-tested to the fire tests specified for their application in the future EN45545 Part 2. Notified Bodies to the rail industry will require test certification from an official fire laboratory for rail products.

Fire performance is only one aspect of performance specification for conduit systems. Products must also be fit or purpose, durable and appropriate for the end use.

Standards and compliance

Rail vehicles are subjected to extreme environmental conditions (high vibration and shock), corrosion (underground applications or tunnels). All ABB terminal blocks listed in this catalogue are tested in accordance with the latest and most demanding standards applying to rolling stock applications.

IEC 61373 Railway applications

Rolling stock equipment - Shock and vibration tests.

ABB terminal blocks are complying with **category 1 (body mounted) class B**.

EN 45545-2 Railway applications

Fire protection on railway vehicles - Requirements for fire behavior of materials and components.

ABB terminal blocks plastic materials are rated **HL3 R22 (the highest Hazard level)**. They can be used on vehicles for subway, tube, sleeping and couchette.

NF F 16-101 Directive

Selecting materials in relation to their fire resistance in terms of its behaviour in a fire, the opacity of smoke and the toxicity of the gas released.

NF F 16-102 Complement to NF F 16-101

The purpose of this standard is to specify the application of NF F 16-101 to electrical equipment and especially to individual apparatus.

ABB terminal blocks plastic materials are rated **I2F2, Level 3**. This level concern products mounted inside a room for passengers or running crew.

UL94 (North America) standard

Safety of flammability of plastic materials for parts in devices and appliances testing.

ABB terminal blocks plastic materials are rated **UL94 V0**.

NFPA 130 (North America) standard

Fixed guideway transit and passenger rail systems

ABB terminal blocks plastic materials complies with **NFPA130 per ASTM E 162 and ASTM E 662** standards tests. It also complies with **FRA238.103** and **BSS 7239** standards.



ABB has IRIS certification since 2009 (International Railway Industry Standard certification created by the European Union of railways industry). ABB manages the manufacturing company and always focuses on optimising all processes as required by IRIS certification.

UNI CEI 11170-3 (Italy)

Fire test to railway components

ABB terminal blocks have their plastic materials in accordance with the FS Italian standard UNI EN 11170-3 according to the test conditions of ISO 11925-2 (flame 30s) and NF F 16-101 (F2 index).

AF and NF Contactor relays

Meet all main rolling stock standards

- Designed in accordance with IEC 60947-4-1, IEC 60947-5-1, IEC 60077 standards and applicable parts of EN 50155 standard
- Withstands shocks and vibrations in compliance with IEC 61373 category 1, class B:
 - i. Functional random vibration tests: 5-150Hz 1ms⁻² eff axe / 20min
 - ii. Accelerated random vibration tests: 5-150Hz 5.70ms⁻² eff axe / 5 hours
 - iii. Shock tests: 5g 30ms all axes OX, OY, OZ / 3 shocks per sens

Reach the highest levels in fire and smoke behaviour according to national or european requirements without mounting restriction.

French standard: NF F 16-101 / NF F 16-102 category A1 (1):

- Weight part > 100g: severity level 3
- Parts close to electrical arc: severity level 4

Italian standard: UNI CEI 11170, LR4 severity level⁽¹⁾:

- Reaction to fire, ignitability according to EN ISO 11925-2: 30 seconds
- Smoke class to NF F 16-101: F2 max.

German standard: DIN5510-2

European standard project: CEN/TS 45545 hazard level HL2

⁽¹⁾ 4-pole AF26/38ZB with standard ferrules, please consult us.

Table 1: Operating conceptions

		Operating Conceptions			
		N	A	D	S
Train Types		Standard vehicles	Automatic vehicles without staff on board	2 Level vehicles	Sleeping cars 2 levels or 1 level
1	Tunnels < 1km	HL1	HL1	HL1	HL2
2	Tunnels < 5km	HL2	HL2	HL2	HL2
3	Tunnels < 5km	HL2	HL2	HL2	HL3
4	Tunnels < 5km (no side evacuation)	HL3	HL3	HL3	HL3

EPR

Standards keep you on track

The use of electrical products in rolling stock is subject to the highest possible safety standards and thus compliance with special standard. In this regard, the key standards are:

- **For electronic devices in rolling stock EN 50155:** 'Railway applications - Electronic equipment used on rolling stock' and IEC 60571: 'Railway applications - Electronic equipment used on rolling stock'
- **The fire protection standard EN 45545:** 'Railway applications - Fire protection on railway vehicles'
- **The fire protection standard NF F 16-101:** 'Railway rolling stock - Fire behaviour - Choosing materials for electrical equipment application'
- **The German fire protection standard DIN 5510:** 'Preventive fire protection in railway vehicles'
- **Shock and vibration IEC 61373:** 'Railway applications - Rolling stock equipment - Shock and vibration tests'

The standards for electronic devices in and on rolling stock EN 50155 and IEC 60571

The most important standard for electronic devices in and on vehicles is EN 50155. With the exception of local fire and smoke protection standards, this umbrella standard combines all the relevant electrical and mechanical aspects. These include:

- Temperature according to EN 50125
- Humidity according to EN 50125
- Supply voltage according to EN 50155
- Insulation coordination according to EN 50124
- Electromagnetic compatibility according to EN 50121
- Resistance to shock and vibrations according to EN 61373
- Fire and smoke protection standards EN 45545, NF F 16-101/102, DIN 5510-2

Amongst other things, this standard contains special fire protection requirements for the electrical equipment of rolling stock.

Fire load behaviour of the selected products

In the context of fire load behaviour, you are definitely on the safe side with the selected products of the ABB Electronic Products and Relays range. Besides NFF 16-101 and NF F 16-102 classification, the products also fulfill the requirements of EN 45545.

Fire and smoke protection standard EN 45545

This standard indicates a risk level 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'. A standard vehicle which is only operating in tunnels smaller than one kilometer is classified as HL1. Table 1 (above) shows a matrix which is indicating the hazard level of the different combinations of operating conceptions in combination with the train type.

The selected devices of the EPR assortment are all applicable for train conceptions and types of the risk level HL3.

The main criteria of EN 45545 include the oxygen index, which must be higher than 32%. This is fulfilled with a value of 32.2% for all the selected products. A further critical aspect is the creation of smoke and the opacity and toxicity of smoke. If there is a fire, the opacity value of 150 (value may not exceed 300) ensures that the smoke is not opaque and that the passenger can still orient themselves in the train.

The sample applies to smoke gas toxicity, which may not exceed 0.9 for the materials used. The material used for the selection products has a so-called C.I.T. value of 0.45.



Track & tunnels



Rolling stock



Underground

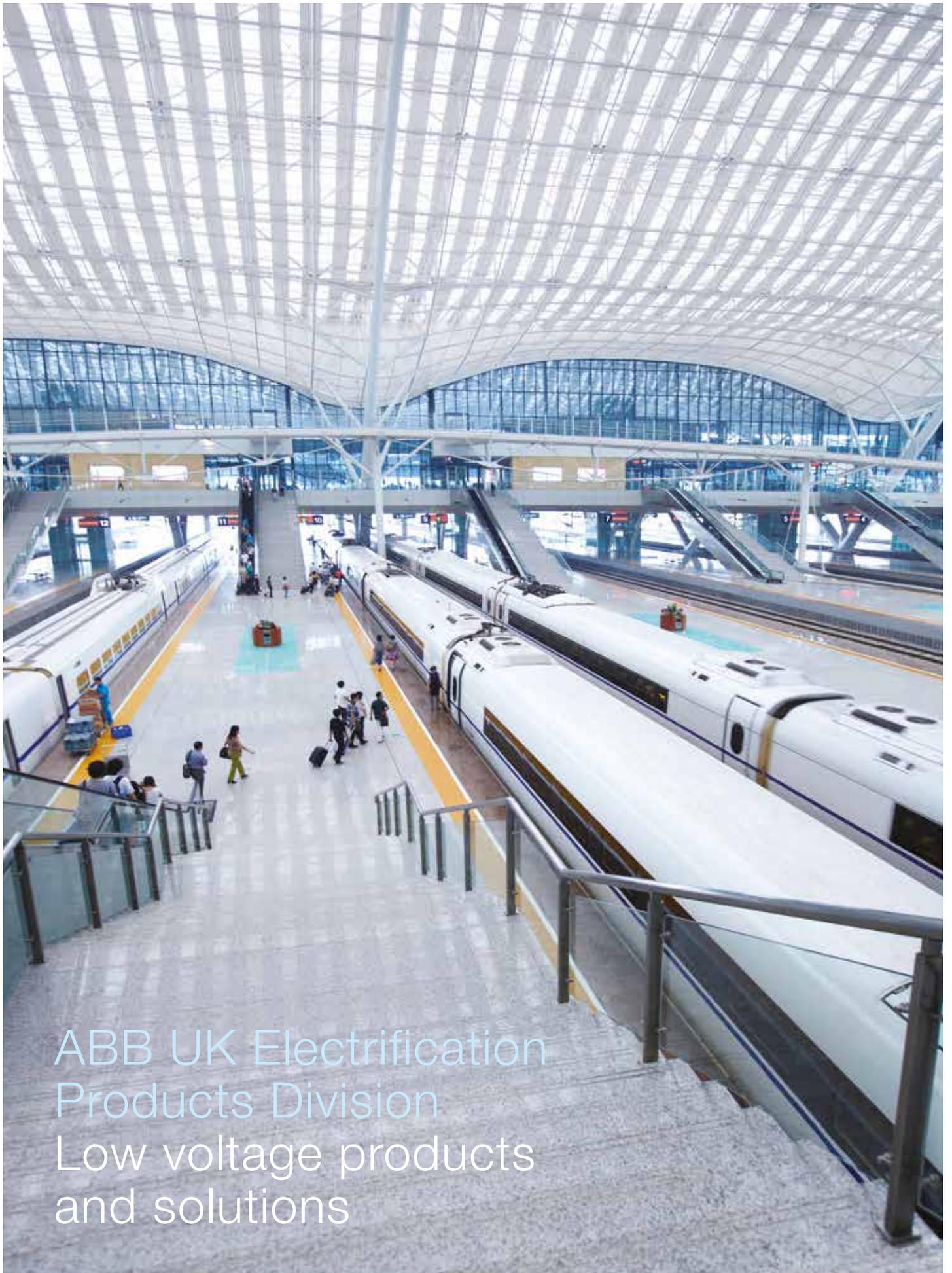


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