APPLICATION NOTE

Switching & Protection solutions for Control and Distribution panels in Rolling Stock

Rail

Discover the ABB Switching & Protection solutions, compliant with the most recent rail standards and ready to provide reliability, safety and protection for low voltage distribution systems in rolling stock vehicles.

What is a Control and Distribution panel?
The control and distribution panel distributes energy from the auxiliary power converter to ensure that all the low voltage systems in a rolling stock vehicle - from security features such as lighting, communications and brakes, to comfort systems (i.e. HVAC) - continue to run.

Why you need Switching & Protection solutions for Control and Distribution panels
Ensure your rolling stock vehicles keep running by protecting and providing reliable connections to all low voltage systems thanks to our complete, rail standard-compliant Switching & Protection product portfolio.

Main benefits

Reliable Supplier
Choose ABB and help make the transportation industry more sustainable thanks to reliable solutions enabling energy to be used more effectively. Backed by over 50 years of experience, ABB can provide strong local support, expertise and service.

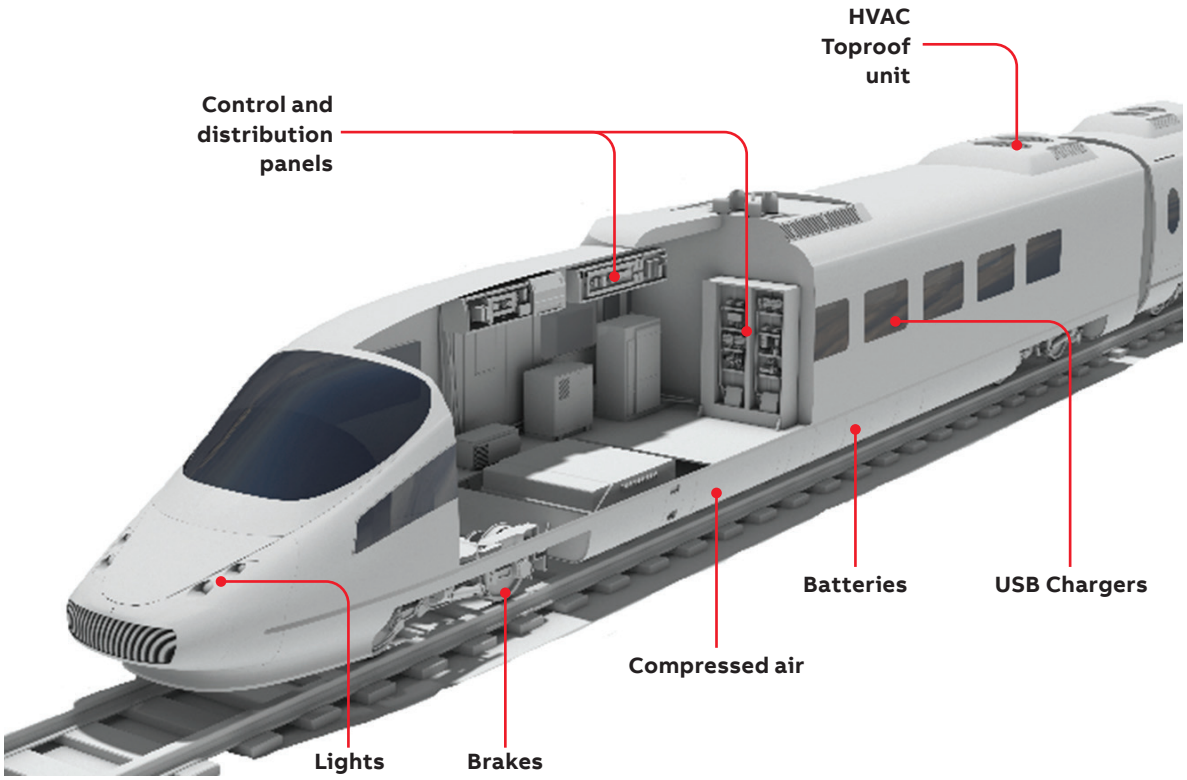
Designed for Rail
Prepare your rolling stock vehicles for extreme environmental conditions, high vibration and shock levels by choosing ABB solutions, tested in accordance with the latest and most demanding standards for rolling stock applications.

Energy Efficiency Savings
Smaller in size and lower in weight, our highly reliable, top-level products will enable you to increase capacity and reduce train energy consumption.

Control and distribution panels in rolling stock

The control and distribution panel is one of the main components in the low voltage system of rolling stock vehicles. It contains the apparatus that protects and controls all low voltage subsystems, including heating, ventilation and air conditioning (HVAC), the control system, communication, monitoring, lighting systems and indicators.

The rolling stock industry is moving towards next generation vehicles with increased energy efficiency, but this also leads to new electrical loads like extended equipment, passenger information or entertainment features.
This extended equipment implies that higher power must be distributed.



Rolling Stock Vehicle typologies

Locomotives

High Speed Trains

Regional trains

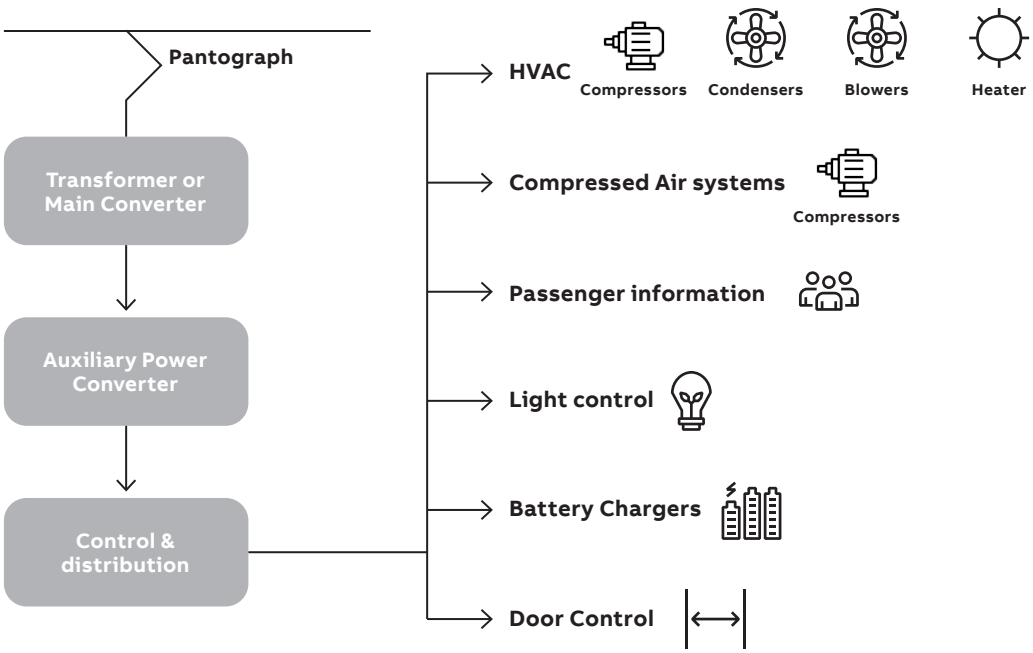
Metros / Light trains (LRV)

Passenger Coaches

Electric Buses

Rolling stock vehicles traditionally had two types of main energy sources: internal generators or external ones (i.e. pantograph), which supplied the traction and auxiliary systems.
The auxiliary power converter is one of the essential systems used in rolling stock. It is the incharge that provides low-voltage power to all onboard electrical equipment, protected by control and distribution panels.

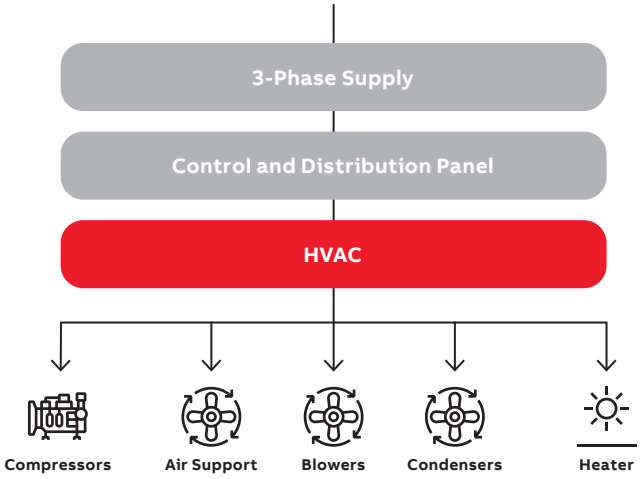
Depending on vehicle requirements and owing to the high degree of customization, control and distribution panels and their corresponding subsystems, HVAC electric panels, circuit breaker panels, circuit-breaker boxes, light protection and control units, may be different.



Low voltage systems in rolling stock

HVAC Systems

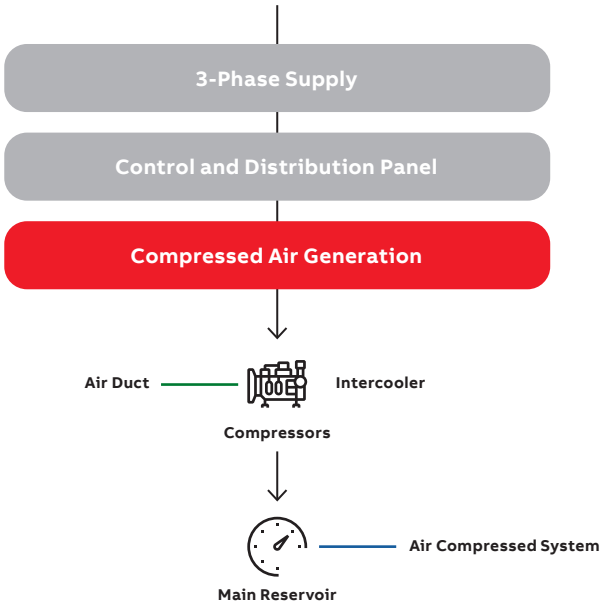
Heating, ventilation and air conditioning (HVAC) systems are used to control the temperature in rolling stock. The global rail industry is continuously developing around the world. To maintain passenger comfort, efficient temperature control is a must in all possible rail solutions, from high speed trains to metros. Depending on customer/market needs the HVAC control panel can be supplied by the HVAC manufacturer or can require rail manufacturer customization.



Compressed Air Systems

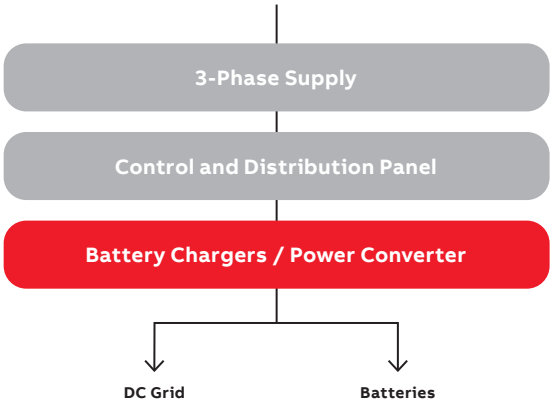
The services on board a train are almost all powered by electricity but some require compressed air, while other services use hydraulic power. Compressed air braking is one of the oldest and most reliable systems, but other systems on trains can also use compressed air, e.g. for door, suspension and coupler operation.

The compressor is controlled automatically and is typically energized by a contactor with a normally available bypass circuit. Owing to the criticality of the system, it is normal for two compressors with their own storage reservoir to be installed and used alternatively. Even though there are other possible uses for compressed air, the current trend is in favor of electric/electronic systems rather than air.



Battery Chargers for auxiliary power supply systems

Batteries are responsible for keeping the auxiliary power circuits running when the main converter is disconnected or in the event of loss of power, as when pantograph bounce occurs.
Batteries must guarantee that key sub-systems - like HVAC, climate control, communication, signaling, lighting, break compressors and the actual battery chargers - remain functional.
The battery charger module is fed by a three-phase AC or onboard DC grid and generates a DC voltage output to charge the vehicle backup batteries and/or supply DC loads.

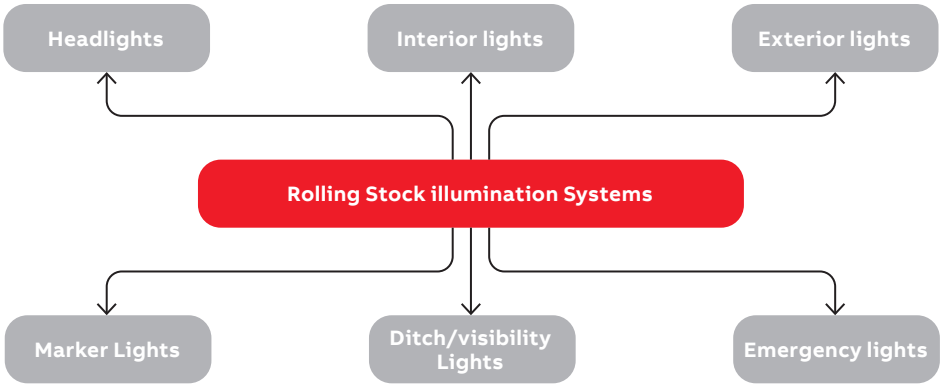


Lighting System

Besides ensuring correct visibility, the interior lighting system in passenger trains is one of key the comfort systems designed to provide the best use experience.

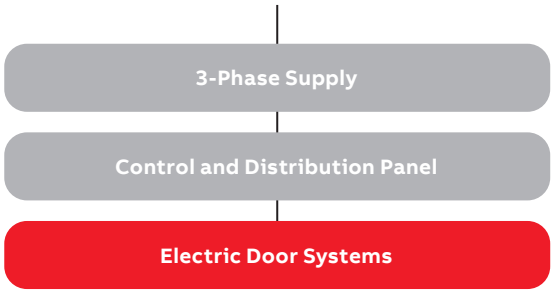
An illumination system can be divided into interior and exterior lighting:

- Interior: main illumination, step lights, reading lights, table lamps, ambience lighting.
- Exterior: headlights, signals, markers, tail and combined lights, bodyside indicators, door status indicators.



Passenger Electric Door Systems

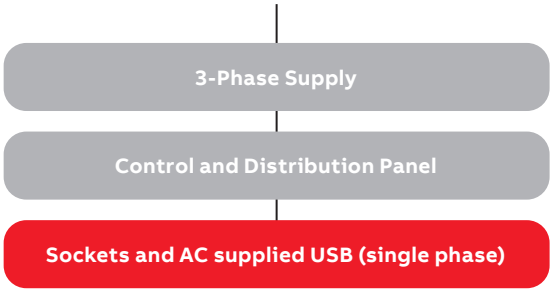
Rolling stock doors are one of the key vehicle systems to be considered with regard to passenger use since their size and position can optimize how long trains stop in stations.
Each electric door is operated by its own independent system and owing to direct human interface, it requires high level of safety and reliability.
The multiple configurations available can include single or dual motors, with linear or pinion rotatory movement.

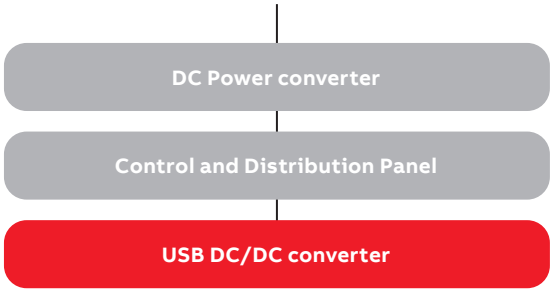


Seat/Table sockets and USB chargers

Smartphones, tablets, cameras and MP3 players can now be charged at your seat using the new USB socket outlets or traditional sockets.

The sockets only require AC single phase supply. AC with integrated AC/DC transformer or DC with DC/DC converter are both available for USBs.

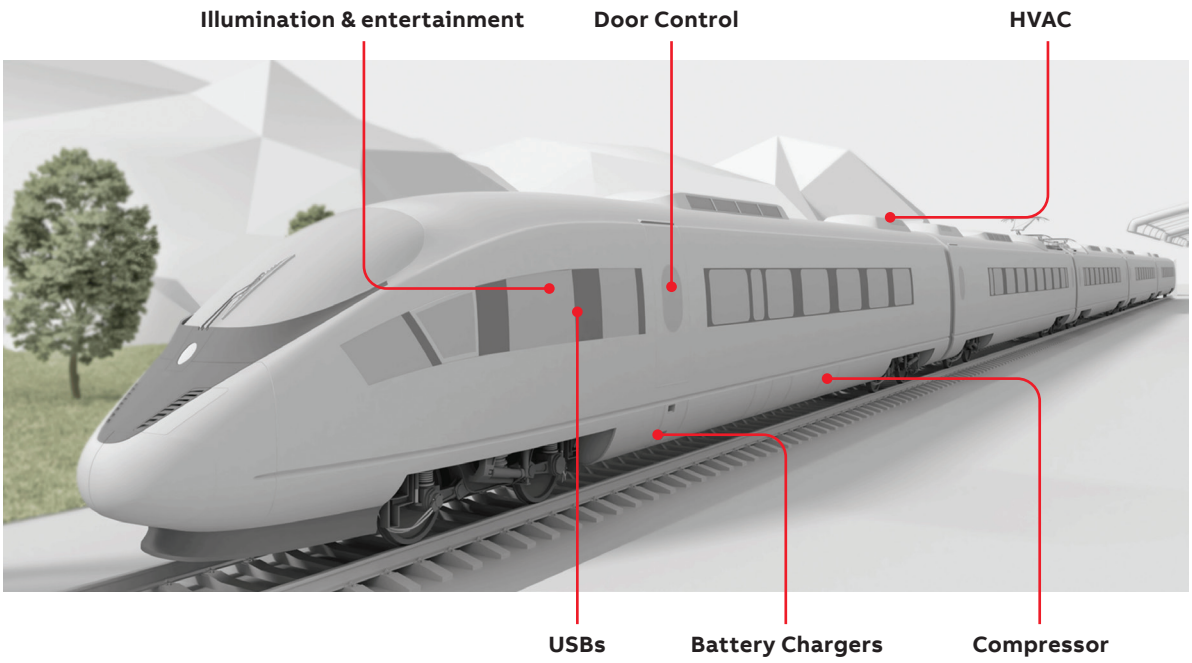




Switching & Protection solutions for control and distribution panels in Rolling stock

Discover our bundle of Switching & Protection solutions for protecting and enhancing the performance of the control and distribution panel in a 5-coach passenger train with the low voltage loads listed below.

In this example, the auxiliary blower and electric heaters are separated from the individual HVAC control panels.

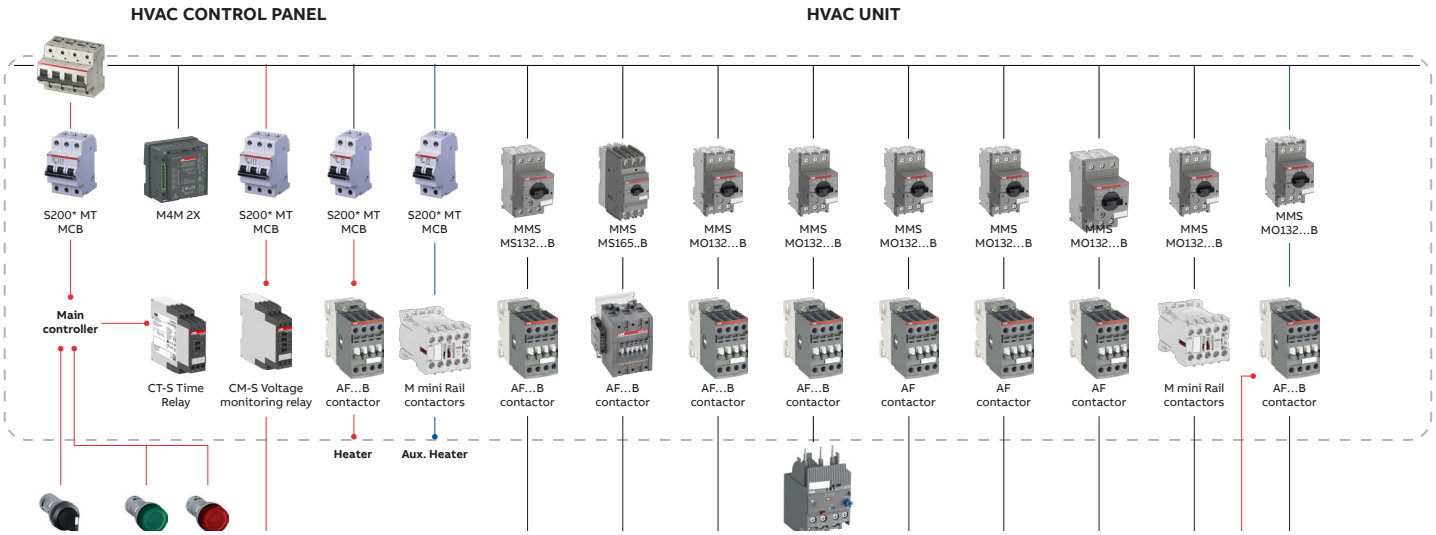


5-Coach intercity train control and distribution panel

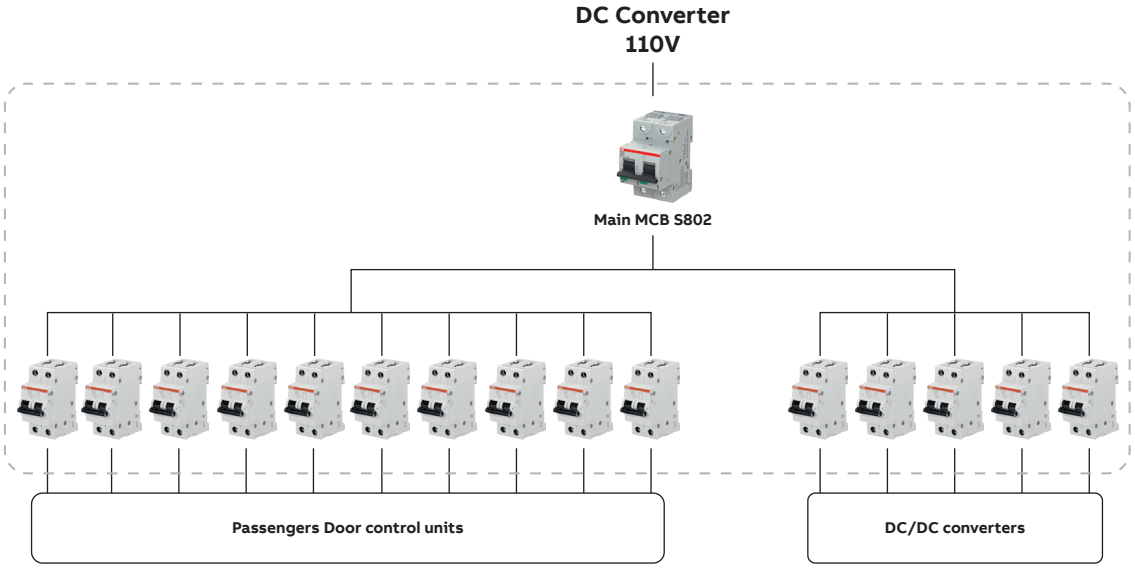
Auxiliary System	Main 400V AC 50Hz 3-Phase
	(Auxiliary Power Converter 480kW)
	DC Line 110V DC
System AC Loads	5x 47kW HVAC
	2 (two) 12kW Scroll compressors (1500l and 10bar)
	5 (five) 10kW Battery Chargers
	5 (five) 11kW Electrical Heaters
	5 (five) 1.1kW Auxiliary Blowers
	5 (five) Illumination and entertainment systems (4kW@240-Single phase)
System DC Loads	10 (ten) Passenger access doors with 1.2kW motors
	50 (fifty) DC/DC (110V to 5.3V@2.1Ax2Channels) converters for USB chargers

ABB offering (IEC)

Control & Distribution panel - AC loads



Control & Distribution panel - DC loads



Bill of materials

Product Notes	Part Number	Description	Quantity
Products for Power Circuit (HVAC)			
Main MCCB	1SDA100487R1	XT5H 630 TMA 630-6300 3p F F	1
Main MCCB remote shunt trip	1SDA104933R1	YO-C XT5-XT6 F/P 24...60 VAC/DC	1
Main MCCB aux block	1SDA054915R1	AUX-C 3Q 1SY 24V DC	1
Coach MCB	2CCS863001R0845	S803S-B125 High Performance MCB	5
Electrical Heating MCB	2CDS273006R0324	S203MT-C32 Miniature Circuit Breaker - 3P - C - 32 A	5
Electrical Heating Contactor	1SBL176061R2210	AF16ZB-30-10-22 48-130V50/60HZ-DC Contactor	5
MMS Auxliary Blower	1SAM350200R1008	MS132-4.0B Manual Motor Starter	5
MMS Aux Block	1SAM201901R1001	HKF1-11 Aux. contact for front mounting	5
Contactor Auxiliary Blower Fan	1SBL136061R2210	AF09ZB-30-10-22 48-130V50/60HZ-DC Contactor	5
Contactor Auxiliary block	1SBN010120T1011	CAL4-11-T Auxiliary Contact Block	5
Connection kit	1SBN081306T1000	BEA16-4 Connecting Link with Manual Motor Starter	5
Products for Power Circuit (Other loads)			
Main MCCB	1SDA100486R1	XT5H 630 TMA 500-5000 3p F F	1
Main MCCB remote shunt trip	1SDA104933R1	YO-C XT5-XT6 F/P 24...60 Vac/dc	1
Main MCCB aux block	1SDA054915R1	AUX-C 3Q 1SY 24V DC	1
MMS Scroll Compressor	1SAM350200R1015	MS132-32B Manual Motor Starter	2
MMS Aux Block	1SAM201901R1001	HKF1-11 Aux.-contact for front mounting	2
Contactor Scroll Compressor	1SBL276061R2200	AF30ZB-30-00-22 48-130V50/60HZ-DC Contactor	2
Contactor Auxiliary block	1SBN010120T1011	CAL4-11-T Auxiliary Contact Block	2
Connection kit	1SBN082306T2000	BEA38-4 Connecting Link with Manual Motor Starter	2
MCB Battery Chargers	2CDS273006R0254	S204MT-C25 Miniature Circuit Breaker - 3P - C - 25 A	5
MCB Illumination	2CDS272006R0104	S202MT-C10 Miniature Circuit Breaker - 2P - C - 10 A	5
Products for DC Loads			
Main MCB	2CCS862001R1845	S802S-UCB125 High Performance MCB	1
MCB Door Control	2CDS272065R0134	S202MT-C13UC Miniature Circuit Breaker - 2P - C - 13 A	10
MCB DC/DC converters	2CDS272065R0104	S202MT-C10UC Miniature Circuit Breaker - 2P - C - 10 A	5

APPLICATION FINDER

We've made it simpler for you to set up your project!
Click here to find the reference architecture that best fits your needs and download the Bill of Materials.

Key benefits of offered products

IRIS Certification

IRIS (International Railway Industry Standard) certification focuses on obtaining very high quality in the rail sector by developing and implementing a global system for evaluating companies that supply the railway industry. IRIS-certified ABB factories are listed on the IRIS internet portal: Link

Shock and Vibration

Compliance with IEC 61373 for equipment located inside the vehicle Category 1 – Body mounted.

- Class A: cubicles, sub-assemblies, equipment and components mounted directly on, or under the car body.
- Class B: Anything mounted inside an equipment case which, in turn, is 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.

Fire and smoke protection

Compliant with the main standards for rolling stock

- EN45545-2 (Applicable Hazzard Levels are product-dependent)
- NFPA 130.

Push-in Terminals

Completely secure Push-in Spring terminals make your equipment the perfect solution for environments with high vibration levels.

Ring tongue ferrules

Non-detachable screw for fast and secure tightening of cables with ring tongue ferrules.

Tested Co-ordination tables

ABB offers coordinated products to ensure the highest availability and protection for the installation. More than 1,800 tested and validated coordination tables are available in the SOC tool, enabling you to quickly and easily choose the right ABB solution.

Double Insulation

Tmax XT circuit-breakers feature double insulation between the live power parts (excluding the terminals) and the front parts of the apparatus where the operator normally works.

Positive operation

The operating lever always indicates the precise position of the moving contacts of the circuit-breaker, thereby guaranteeing safe and reliable signals, in compliance with Standards IEC 60073 and IEC 60417-2.

Installable in all positions

All devices can be supplied by cables or busbars from either the top or bottom. Flexible installation in all positions.

Reduced coil consumption

All System pro M compact® MCBs have contact position indications (CPI) on the toggle. You can easily see if the MCB is ON or OFF, thus maintenance work becomes simple and safe.

Fast installation and wiring

All terminals on the M4M are removable, including the current transformer (CTs) inputs for current measurement. This means that you can speed up the process by wiring directly on the terminals. In addition, wiring inside the switchboard is much more convenient since the terminals are positioned vertically.

Smart commissioning

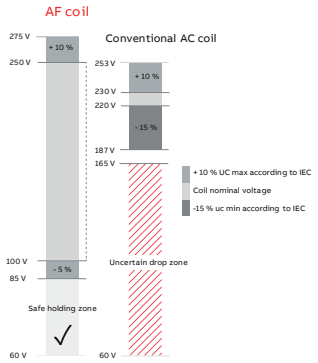
Being equipped with the Bluetooth BLE module ensures smart configuration and quick viewing via the unique EPIC commissioning tool, both available as mobile App and desktop software. Availability of regular remote firmware updates at any time guarantees you always have the latest and most secure version of the device with no impact on operations.

Reliable in all networks

The electronic system within the AF contactor continuously monitors the current and voltage applied to the coil.
The contatctor is safely operated in an always-optimized, hum-free condition.

Wide control voltage range

The AF contactor ensures steady operation in unstable networks and signifies a major advancement in motor control and power switching, with no threat of voltages sags, dips, or surges. Prevents stoppages caused by voltage fluctualtions.

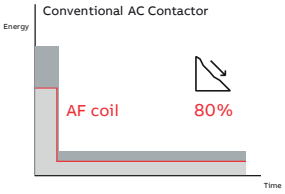


AC & DC control voltage

Thanks to AF technology, the same contactor can be used for both AC and DC control. This makes it easier to choose the type of contactor and reduces the number of parts to keep in stock.

Reduced coil consumption

Thanks to AF technology contactor coil consumption is reduced by 80%, thus less heat dissipation and reduced temperature rise. This allows increased installation density in the panel, reduced control transformer rating, reduced control panel footprint and cost savings.



Built-in Surge suppressor

Conventional contactor technology normally requires an external surge suppressor. With AF contactor technology, surges are handled by a built-in contactor and never reach the control circuit. One less product required and no need to worry about complications causing electronics near contactors to fail.

Troubleshooting made easy

Separate thermal and magnetic trip indication makes troubleshooting a lot easier and faster and reduces downtime.
This allows you to easily take action based on thermal or magnetic tripping.

Product offering

SACE Tmax XT:

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Modular DIN-Rail S200:

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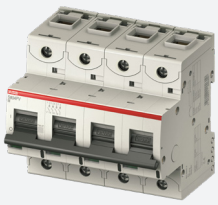
Modular DIN-Rail S800:



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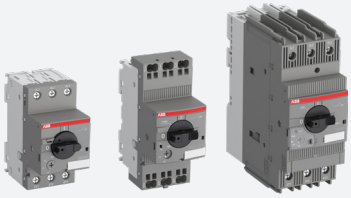
Manual motor starters:



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Contactors:

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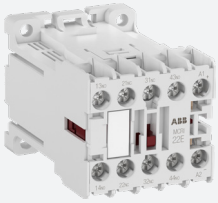
M mini contactors:



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Time relays:

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Three phase monitoring relays:

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Insulation monitoring relays:

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M4M 2X - Network analyzers:

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