PRODUCT PORTFOLIO

BATTERY RECYCLING SOLUTIONS

For shredding, crushing, granulating, and separating equipment

ENGINEERED
TO OUTRUN

The battery recycling industry is experiencing significant growth due to the increasing demand for reclaiming critical materials from batteries used in electric and hybrid vehicles, stationary energy storage systems, and consumer electronics.

Discover how ABB products can provide reliable, efficient, and robust electrical solutions for this critical material recovery industry.

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APPLICATION OVERVIEW

Battery recycling process

The recycling process of lithium-ion batteries involves several stages from pretreatment to refining, resulting in the recovery of precious metals.

Processing technologies involves discharging and disassembling the lithium-ion batteries. Disassembly includes shredding, crushing, and granulating technologies, which are used to reduce the batteries to smaller fragments.

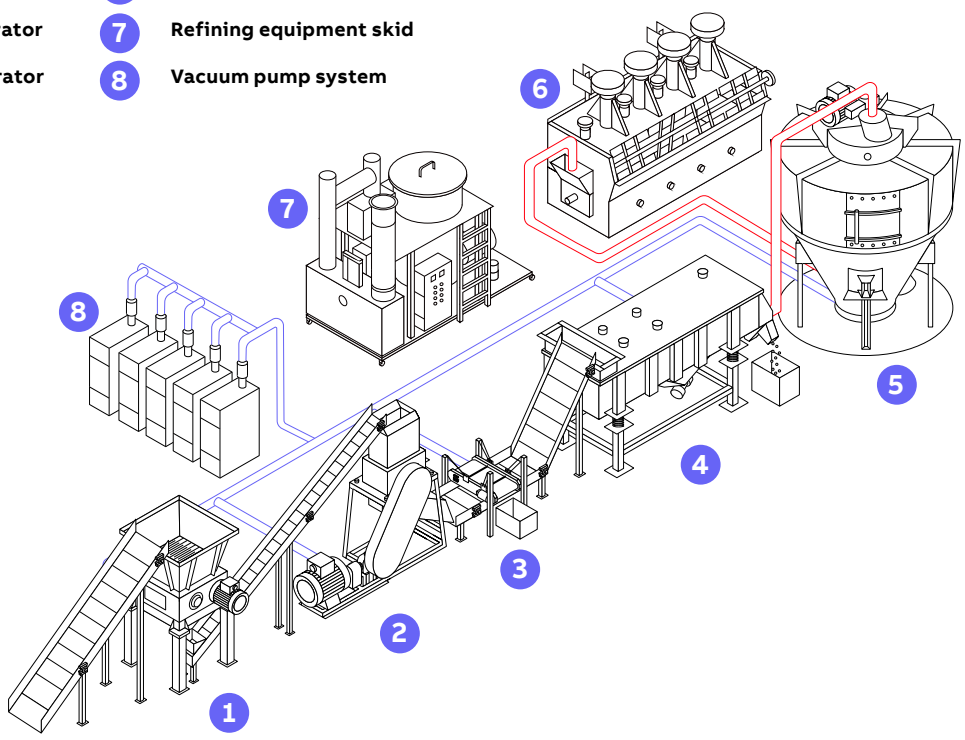
Next, **separation** occurs, isolating the black mass from other structural components such as copper, aluminum, and plastic. Magnetic, flotation, vibration, and air separation are examples of methods used in battery recycling.

For **material recovery or refining**, hydrometallurgical processes extract valuable metals from spent batteries using liquid solutions, while pyrometallurgical processes utilize high-temperature furnaces for the same purpose.

To ensure operational efficiency, **control and monitoring systems** are essential. Automating processes and monitoring them enhances efficiency, reduces human error, and improves the quality of the recycled materials. Additionally, tracking material flow and ensuring safety are crucial for managing inventory levels and optimizing recovery operations safely.

The figure below shows the typical components in a lithium-ion battery recycling system.

1. **Shredder**
2. **Crusher or granulator**
3. **Magnetic separator**
4. **Vibration separator**
5. **Air classifier**
6. **Flotation separator**
7. **Refining equipment skid**
8. **Vacuum pump system**



APPLICATION OVERVIEW

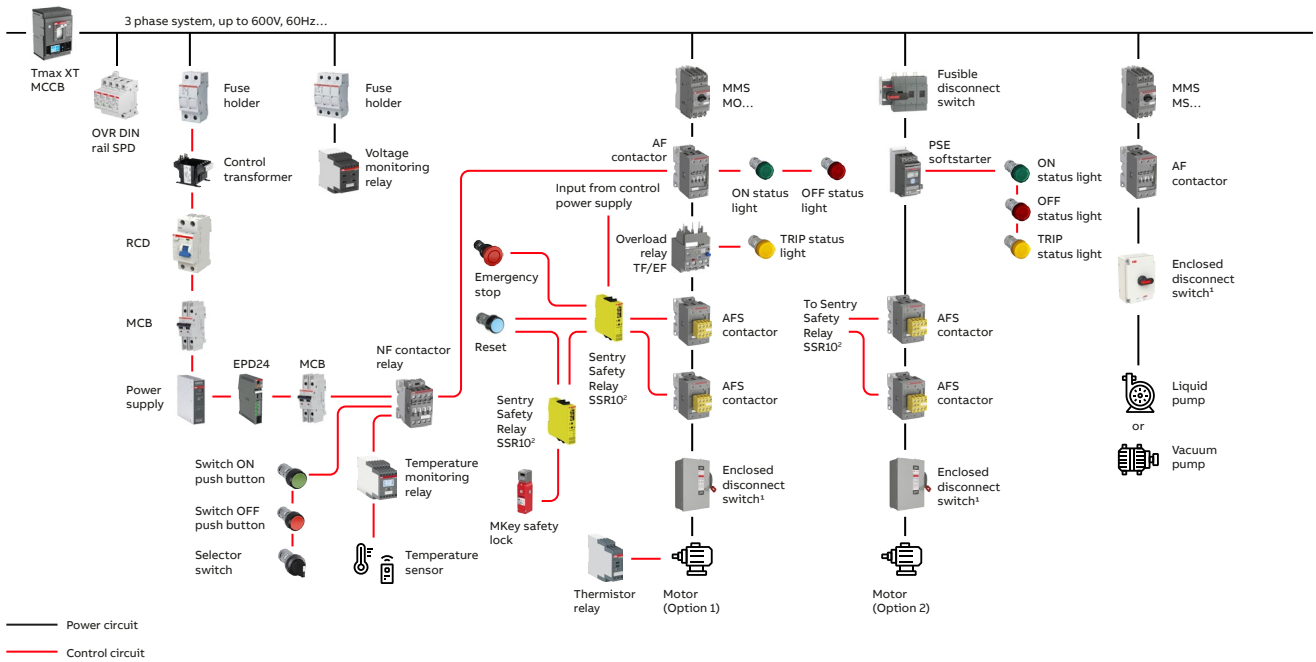
Shredders, Crushers and Granulators

Shredders
Shredders are designed to break down whole batteries into smaller pieces for further processing, which may include disassembly based on the equipment's design. This process allows for the recovery of valuable electrode materials and enhances overall recycling efficiency. The shredders use rotating knives and a feeding hopper to mechanically reduce the size of the batteries. They are also equipped with vacuum pumps that remove airborne particles and volatile organic compounds (VOCs) to maintain a clean environment, and liquid pumps that aid in dust suppression and cooling during the shredding process.

Crushers and granulators
Crushers and granulators are used to reduce the size of battery components after they have been shredded. They achieve this by applying mechanical force to break larger pieces into smaller fragments. Crushers reduces the components to smaller sizes while granulators breaks them down further, producing uniform particles that enhance the recovery of metals, significantly improving separation efficiency and metal recovery for elements like lithium (Li), cobalt (Co), and nickel (Ni).

These machines use high-strength blades and screens to ensure controlled output sizes. Additionally, vacuum pumps help maintain negative pressure for safe and enclosed operation, while liquid pumps aid in wet granulation and the transportation of slurries.

The figure shows an illustration of power and control solutions for shredders, crushers, and granulators:



Note: This configuration is for a generic system and is not representative of all existing manufacturers.
¹ The type of enclosed disconnect switch used depends on the application and environment.
² The safety circuit can be used to stop multiple motors in a machine. For advanced safety protection, a Pluto PLC can be used instead of the Sentry Safety Relays.

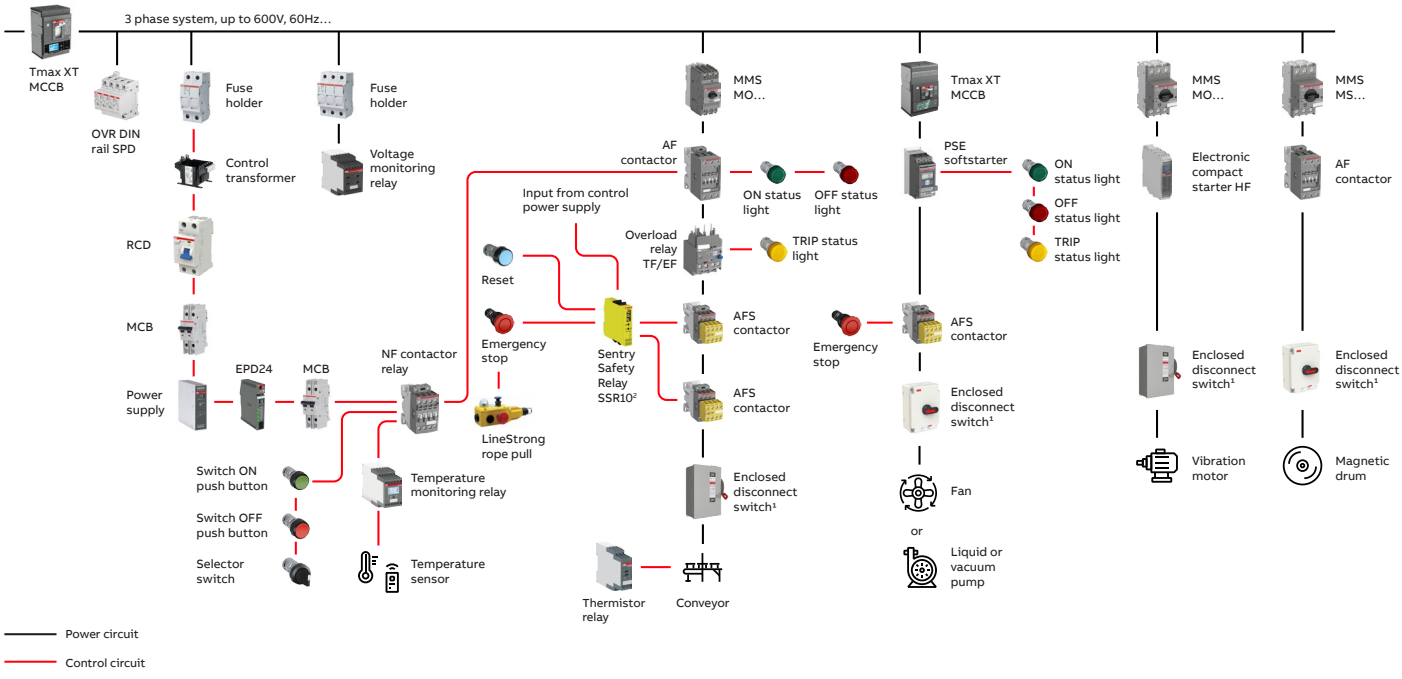
APPLICATION OVERVIEW

Separators

Separators are used to sort and isolate materials after they have been shredded, crushed, or granulated. This process helps to separate valuable metals, plastics, and electrolytes from black mass, thereby improving both the efficiency and purity of material recovery. By categorizing components based on their type and composition, separators enable targeted downstream refining.

Multiple separation methods are often used in combination, including air classifiers, vibratory screens, flotation processes, magnetic separators, and eddy current systems. Vacuum pumps support these operations by assisting in dust and volatile organic compound (VOC) control during dry separation processes. Additionally, liquid pumps are utilized in flotation systems to manage fluid flow and maintain optimal separation conditions.

The figure shows an illustration of power and control solutions for separators:



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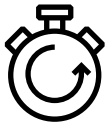
¹ The type of enclosed disconnect switch used depends on the application and environment.
² The safety circuit can be used to stop multiple motors in a machine. For advanced safety protection, a Pluto PLC can be used instead of the Sentry Safety Relays.

KEY VALUES

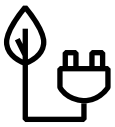
01



Continuous operation

Intelligent protection and control solutions, including circuit breakers, softstarters, and monitoring relays, safeguard equipment and help maintain uptime.

02



Energy-efficiency

Boost control panel energy-efficiency with our AF coil technology, which reduces energy consumption and dissipates less heat, resulting in a lower temperature rise and increased panel density.

03

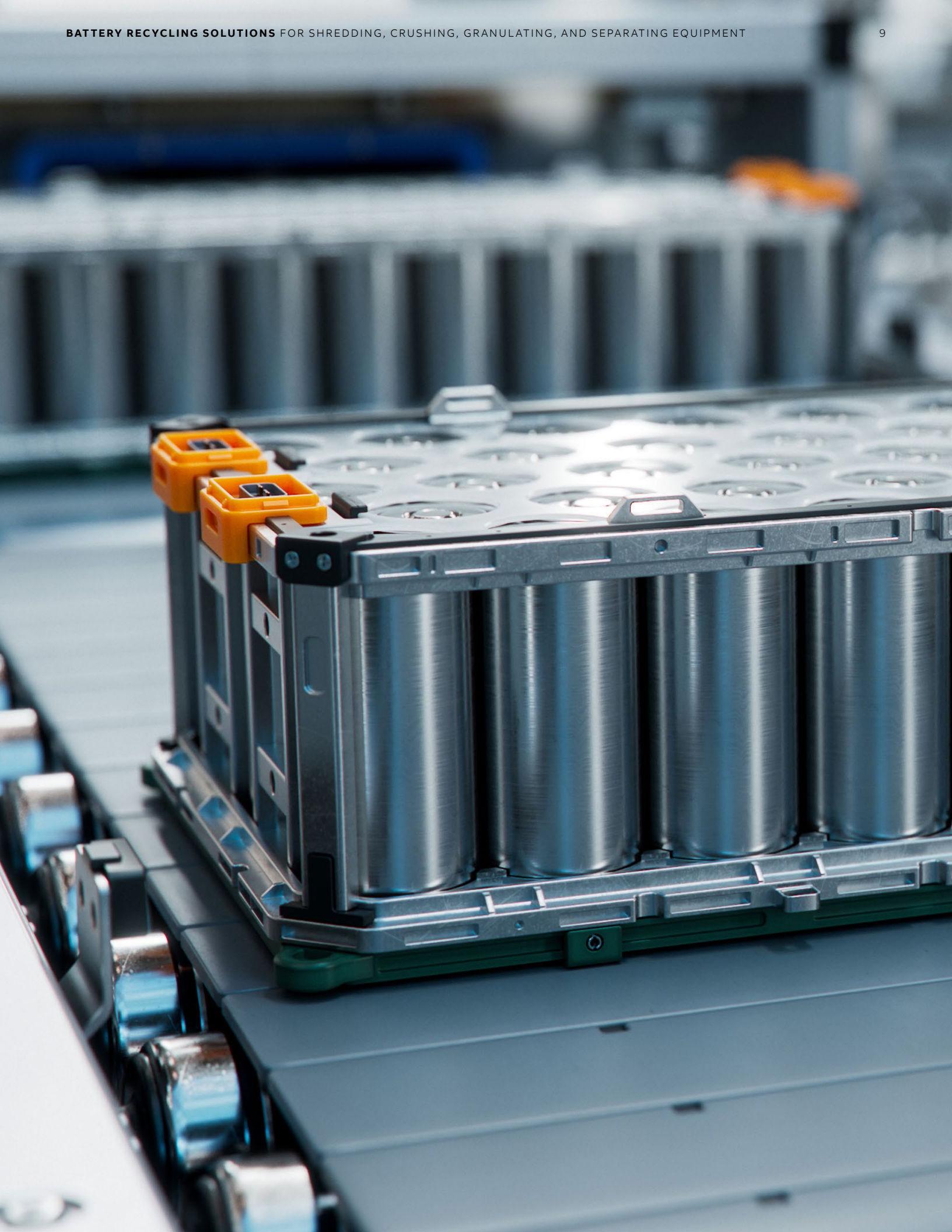
Safety & protection

Enhance safety and thermal management, reduce the risk of hazards and fires, and prevent downtime using circuit breakers, surge protective devices, monitoring relays, or safety components.

04

Compact & easy to install

Compact designs and user-friendly installation features help reduce setup time and save valuable space in control panels.



FEATURED PRODUCTS

SACE® TMAX® XT MOLDED CASE CIRCUIT BREAKERS (MCCBs)

Product range
This circuit breaker portfolio helps ensure extreme performance and protection features up to 1200 A.
Performance & protection
It sets the standards when extreme breaking capacity is needed, sharing the same logic, interfaces, and features regardless of operating voltage or environmental conditions.
Data & connectivity
Provide advanced metering features and access, monitor, and control information remotely, improving efficiency and saving energy.

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AF CONTACTORS

Product range
UL 508 and UL 60947-4-1 contactors certified for up to 900 hp - 480 V and 2850 A - general use.
Installation
Comes in screw, push-in spring and ring tongue connection types. The push-in spring terminals offer only one push for extremely fast wiring.
Energy efficient
A reduction of the coil's energy consumption lets customers save energy.

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MINIATURE CIRCUIT BREAKERS (MCBs)

Product range
Largest selection of current-limiting, compact, DIN-rail mounted MCBs for applications with ratings of 0.2 to 100 A, up to 600 V AC/DC and 50 kA short circuit protection.
Safety
Thermal and magnetic trips are provided to cover both overcurrent and short-circuit faults.
Compliance
UL 489 and UL 1077 approved.

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SOFTSTARTERS

Secure motor reliability
Help increase your motor's lifetime by protecting it from electrical stress and optimizing your load, application, and motor size.
Improve installation efficiency
Reduce your installation time and panel size by having all the features you need built into your softstarter, such as a built-in bypass or overload protection.
Increase application productivity
Reduce the mechanical stress on your motor application, which will increase your uptime, by using torque control, pump cleaning, motor brake, and many other features.

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ELECTRONIC COMPACT STARTERS

Saving space
With a narrow width of 22.5 mm, this starter saves cabinet space, especially with group mounting, and yet still provides motor starting functionalities with motor protection and safety embedded.
Safety and protection
Protect your people with an emergency stop version that complies with SIL 3, PL e safety standards.
Easy to install
Wiring time during installation is cut to a minimum with motor protection, reversing function and emergency stop already integrated into the product.

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DIN-RAIL SURGE PROTECTIVE DEVICES (SPDs)

Product range
UL 1449 5th edition and has options for voltages up to 600 V AC.
Durability
Safety reserve system with two varistors per line extends protection lifetime.
Installation
Pluggable and replaceable cartridges for easy replacement during maintenance.

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COMPLEMENTARY PRODUCTS

RESIDUAL CURRENT DEVICES (RCDs)

Product range
This product trips when the system leaks a significant current to ground and it is rated up to 125 A, 120–277 V AC (2-pole) and 120–480Y V AC (4-pole).
Innovation
The contact position indicator (CPI) always indicates the status of the contacts (red = closed contacts; green = open contacts) independent of the toggle position.
Compliance
The ground-fault sensing and relaying equipment components are UL 1053 approved.

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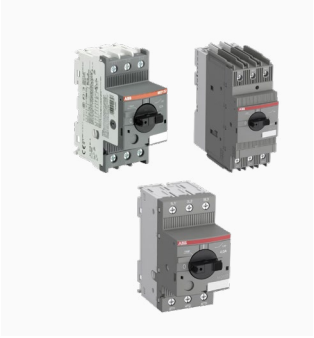

MANUAL MOTOR STARTERS

Protection and control
Protection and control in almost every situation, including hazardous areas, protecting installations from short-circuits, overloads and phase failures while also controlling the current flow through a simple ON/OFF switch.
Speed up your projects
The main range of accessories is shared across multiple starters (both with screw and push-in spring terminals available), making logistics and planning simpler.
Continuous operation
Fuseless motor protection reduces maintenance costs and downtimes by avoiding fuse replacement after faults.

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OVERLOAD RELAYS

Product range
Thermal overload relays cover a current range from 0.1 A to 200 A, while electronic overload relays cover an even larger current range from 0.1 A to 1250 A.
Energy-efficient
Electronic overload relays combine high accuracy with an energy-efficient design that does not need an extra external supply.
Continuous operation
The selectable automatic reset mode allows for reduced downtimes and traveling costs for installation in dispersed locations.

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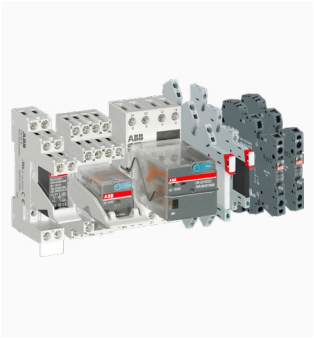

INTERFACE RELAYS AND OPTOCOUPLERS

Continuous operation
Optocouplers allow for continuous operation without any mechanical wear and tear.
Installation
The interface relay includes both pluggable and non-pluggable relays. The pluggable relays allow for the easy and seamless exchange of relay modules.
Product rating
The wide variety of pluggable interface relays have coil voltages from 5 V DC to 230 V AC and are accompanied by standard or logic sockets that may be used for switching AC or DC loads.

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MEASURING AND MONITORING RELAYS

Design
Wide range of products from single- and three-phase monitors to temperature monitoring relays.
Technology
Easy Connect Technology with push-in terminals allows the product to be wired much more quickly and easily – without the need for tools.
Product range
Comes in value devices (CM-E range) and advanced solutions (CM-S and CM-N range) to meet customer's needs.

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ELECTRONIC PROTECTION DEVICES (EPDs)

Product range
UL 508 and UL 2367 approved and variable rated currents can be set on advanced from 0.5 A to 12 A or on entry from 1 A to 10 A. Expansion up to 32 channels (8 devices) via jumpers.
Reliability and performance
This product offers selective overcurrent protection for the loads connected and reacts to short circuits or overloads more rapidly than the supplying switch mode power supply.
Energy efficiency
The 4-channel devices feature very high efficiency and significantly reduced power loss.

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COMPLEMENTARY PRODUCTS

OS FUSIBLE DISCONNECT SWITCHES

Safety and protection
Designed for personal safety as well as for reliable process protection.
Reliability and performance
The knife contact design, in combination with the fuse link, enables rapid fault clearance and maintains a protection level even after a fault occurs.
Installation
Its accessories create considerable savings in terms of installation time and costs. For example, the shaft can be adjusted to various installation depths, which eliminates the need for special cutting tools.

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OT NON-FUSIBLE DISCONNECT SWITCHES

Product range
UL 508 and UL 98 approved portfolio of switches with ratings between 16 and 2000 A.
Installation
Their modular design and smaller dimensions enable installation into even the smallest enclosures, saving space and significantly reducing material, handling and installation costs.
Reliability
Designed to be virtually maintenance free across their entire extended lifespan.

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FUSE HOLDERS

Durability and reliability
Fuse holders have venting grooves and cooling chambers to improve heat dissipation.
Product range
UL approved IP20 fuse holders with ratings up to 60 A at 600 V AC/DC.
Installation
Ergonomic flip hinge makes fuse replacement easier in small spaces, even while wearing gloves.

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22 MM PILOT DEVICES

Product range
Modular plastic and metal ranges include flexible and adjustable products to meet your exact needs.
Reliability
Designed with a protection degree of up to 4X, helping provide reliability in extreme environments.
Installation
The compact range reduces installation space and saves time, and the modular range enables tool-free installation that is quick and simple.

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NEMA 30 MM HEAVY-DUTY OIL-TIGHT PILOT DEVICES

Product range
NEMA types 1, 3, 3R, 4, 4X, 12 and 13 to meet a wide range of applications.
Durability
Due to the octagonal locking nut design, greater torque can be applied during assembly and installation to provide a water- and oil-tight fit.
Installation
Ease of assembly with one-screw contact block mounting and easy wiring with 45° angled wire terminals.

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CONTROL POWER AND MACHINE TOOL TRANSFORMERS

Installation
Type IP transformers are lightweight, small, and designed for minimum mounting dimensions.
Safety
Finger-safe terminals offer added protection and safety.
Reliability
Pressure-plate terminals ensure secure connections.

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COMPLEMENTARY PRODUCTS

POWER SUPPLIES

Product range
Wide range of supply voltages with output voltage of up to 48 V DC, output current of up to 20 A and output power of up to 480 W.
Durability
Coated (PCBA) and ATEX certification available for hazardous locations. It has overload protection, active power factor correction and a broad certified AC and DC input range.
Efficiency
These power supplies have a 150% integrated power reserve and operate at an efficiency of up to 94%.

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SAFETY SWITCHES

Product range
Wide range of switches offering from 30 A to 1200 A.
Safety
Clear line shield on 600 V rated switches shield allows visual confirmation of blade positions while helping to protect against accidental contact with live parts.
Installation
Spring-reinforced fuse clips assure reliable contact for cool operation. Suitable for Class H, K or R fuses, where applicable.

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ENCLOSED ROTARY SWITCHES

Product range
UL 508 and UL 98 approved portfolio of enclosed switches 16 to 100 A and UL/NEMA 1, 3R/12, 4/4X enclosure options.
Harsh conditions
Suitable for wet and corrosive environments housed in thermoplastic/polycarbonate, steel sheet, or stainless-steel sheet enclosures.
Continuous operation
Maximize uptime with a switch rated for a minimum of 6,000 operations under load and 20,000 operations mechanical endurance.

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TEY CIRCUIT BREAKERS

Product range
Range of breakers from 15 to 125 A with multiple short circuit tiers (TEY 14 kA, TEYF 18 kA, TEYD 25 kA, TEYH 35 kA and TEYL 65 kA at 480/277 V) allow the most cost-effective ratings for the application.
High performance
Dependable and effective thermal-magnetic trip units with time-current curves designed for easy coordination with upstream main devices.
Installation
Flexible installation with a mounting base for unit mount/lug-lug type installations and 1 inch per pole spacing.

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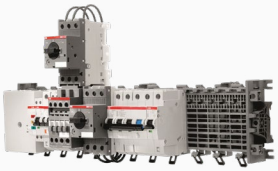

SMISSLINE TP POWER BAR SYSTEMS

Installation
Quick maintenance of the switchboard as the wiring is already integrated into the plug-in socket system.
Flexibility
Rapid replacement, easy expansion and mixed-pole layout possible and directly pluggable devices such as MCBs, RCDs, RCBOs, motor starters, and switch disconnectors.
Safety
Allows for load-free plugging in and unplugging under voltage without additional personal safety equipment for protection against electrical hazards.

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JOKAB SAFETY PRODUCTS

Safety & protection
ABB offers an extensive range of innovative products and solutions for machine safety systems to help protect single machines or entire production lines.
Product range
Jokab includes a large portfolio of safety products such as safety relays, safety controllers, emergency stops, light curtains, safety locks, sensors, and more.
Ease of use
Easily integrated into existing systems with flexible mounting and plug-and-play connectivity to simplify installation and help ensure compliance with safety regulations.

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LEARN MORE

To learn more about ABB engineered products for battery recycling, visit our website

CONTACT US

Do you have a similar project and are you searching for the right application configuration?
Contact us and talk to our experts!

Additional information
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