Motor Starters in System xStart
Moeller® series

Eaton.com

Efficiently Combine, Install and Connect Motor Starters

Powering Business Worldwide

Solutions for Machines

Our components and systems for power distribution and automation in industry are used worldwide and are precisely adapted to the special requirements of different industries. As a leading supplier of automation solutions and components for machines and systems, we offer our customers comprehensive concepts, for automation, and also solutions in the motor and energy management fields. The expanded range from Eaton incorporates both the renowned quality products of the Moeller® series as well as many interesting innovations from Eaton.

Machine manufacturers do not just benefit from this comprehensive product range, but also from the comprehensive logistics and after sales service.

This is where the machine and system builders get just what they require – solutions from a single source for worldwide use. Our proven consulting and solution competence in all the relevant fields, such as automation, international regulations, codes and standards, simplify and optimize your day-to-day business.

Motor protection for machines and systems has always been a core competence of Eaton. Klöckner-Moeller had already developed the motor-protective circuit-breaker PKZ in 1932 and the very first contactor as early as 1912.

Devices for World Markets for Mechanical Engineering

Most of the switchgear and protective devices of the Moeller® series from Eaton are devices for world markets. Just one device version features all approval and certification symbols and can be used worldwide. This applies, for example, to

- Control circuit devices, position switches
- Contactors and a range of timer and special relays
- Motor-protective circuit-breakers and relays
- Electronic components and systems.

Eaton offers IEC-compliant circuit-breakers and switch disconnectors for use in most countries of the world and NA devices with almost the same dimensions and accessories for use on the North American market. This simplifies the device selection, particularly with the to some extent substantially different technical data of the North American standard.
www.eaton.eu/approbationen

Tailor-Made Catalog for Mechanical Engineering

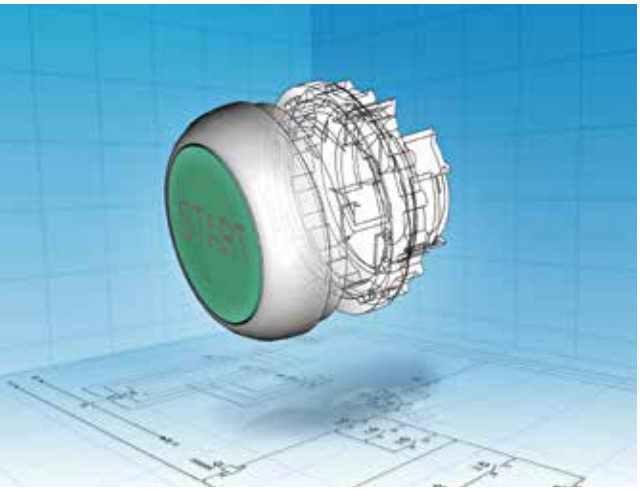
The mechanical engineering product overview includes all products for switching, protection and control of motors, for command and signalling, for automation and for energy management of machines and systems. Extensive overviews and illustrated catalog pages simplify the selection process. The catalog is available in paper format as well as a flip catalog version. It incorporates an extensive data sheet for every type. All the product information is provided at a glance with just one click – from the technical data to the installation instructions.

Value Added Services - Streamline, Optimize, Customize

With our Value Added Services (VAS), we support you in making the logistical processes in your company as smooth and efficient as possible. The VAS team supports you in the following areas:

- Simplification of procurement and ordering processes
- Improved product assembly and configuration
- Optimization of your design processes
- Reduction of overall costs
- End-to-end solutions from a single source

How can we add value for you? Contact us at
VAS-EMEA@eaton.com



Planning Security and Process Optimization – CAD Data at the Click of a Mouse!

Eaton provides its customers with CAD data to support the planning processes. Both electrical as well as mechanical construction data can be comfortably and quickly accessed around the clock. Processing times are reduced, errors are minimized and costs are saved even during the engineering phase of control panels, systems and machines.

www.eaton.eu/cad

Switch, Soft Start and Control of Motors Worldwide

Switching and controlling motors has been a core competence of Eaton for more than 100 years. The series has continually expanded to meet customer demands from the mini contactor relay for 7 A up to the largest vacuum contactor for 3180 A In addition to pure switching tasks for motors, soft starting and speed control tasks are the main emphasis in today's applications. Pumps, fans and belt conveyors from 4 A to 200 A start smoothly with soft starters DS7. Simple adjustment of the speed to the operating requirements is facilitated by the frequency inverters of the PowerXL series from 0.25 kW to 630 kW.

European machine and system engineering and worldwide export are inseparable in today's world. Apart from the components, Eaton provides all the most important approvals for mechanical and system engineering. In addition to the CE mark that opens many doors both within and outside the EU, it is the UL/CSA and CCC approvals that facilitate international export.

Eaton offers contactors for remote switching up to 2600 A

Contactor DIL M

All AC and DC contactors of the DIL M series feature the same compact dimensions. Identical accessories for both the AC and DC operated devices simplify engineering.

The pre-wired reversing and star-delta combinations reduce the wiring times in machine building and system engineering. All contactors with DC actuation from DIL M17 upwards feature an electronically controlled actuation. The benefits:

- Energy-efficient heat dissipation due to reduced holding power
- Smaller control transformers due to reduced pick-up power
- Direct actuation from the PLC without coupling contactor up to 38 A

In the large contactor area, just 4 variants cover the entire control voltage range in the comfort version. Contactors DIL M from 580 A and DIL H from 1400 A are vacuum contactor designs. They are impressive with their compact dimensions and long service life.

Soft Starter

The soft starter has become increasingly established as an alternative to the star-delta starter. Electronic soft starter fulfil the customer demand for an impact free rise in torque and a determined reduction in current during the start phase. You control the power supply of the three-phase motor in the start phase so that the motor matches the load behaviour of the load machine. The mechanical equipment is accelerated with the minimum of stress as a result. The operating behaviour and the work processes are influenced positively which means that negative influences are avoided.

With its DS7 devices for currents of up to 200 A and S811+ devices for currents of up to 850 A, Eaton offers two different soft starter series with different strengths: DS7 units are ideal for standard applications, while S811+ models make a compelling case with their powerful range of functionalities.

PowerXL™ variable frequency drives

- PowerXL DE1/DE11 variable speed starters combine ease of use and maximum reliability with variable motor speeds and improved machine energy efficiency.
- The compact PowerXL variable frequency drive is particularly well-suited for use with simple pump, fan, and conveyor belt systems. It can be quickly and easily configured and commissioned, resulting in tangible savings.
- The PowerXL DA1 variable frequency drive, designed for the machine and system building industry, is characterized by its enormous flexibility in terms of communications protocols, a function block editor (PLC) that makes it possible to configure the drive as necessary for specific applications, and a powerful vector control mode for highly dynamic applications.
- PowerXL DG1 multi-purpose drives are specifically designed for modern, sophisticated applications: In fact, a patented energy-saving algorithm, high short-circuit specifications, and a heavy-duty design all enable them to provide maximum efficiency, safety, and reliability - all combined with a conformal coating designed to provide protection against aggressive environments.
- The PowerXL DM1 variable frequency drive combines the advantages of the DG1 in a more compact housing with reduced overall depth. The IP20 device's control functions are focused on fans, conveyors and pumps or multi-pump applications.

Allround Motor Protection
Systematic Flexibility

ATEX

Reliable overload protection of motors for system and machine building is necessary for high levels of operation security. Eaton offers tailor-made solutions to this end:

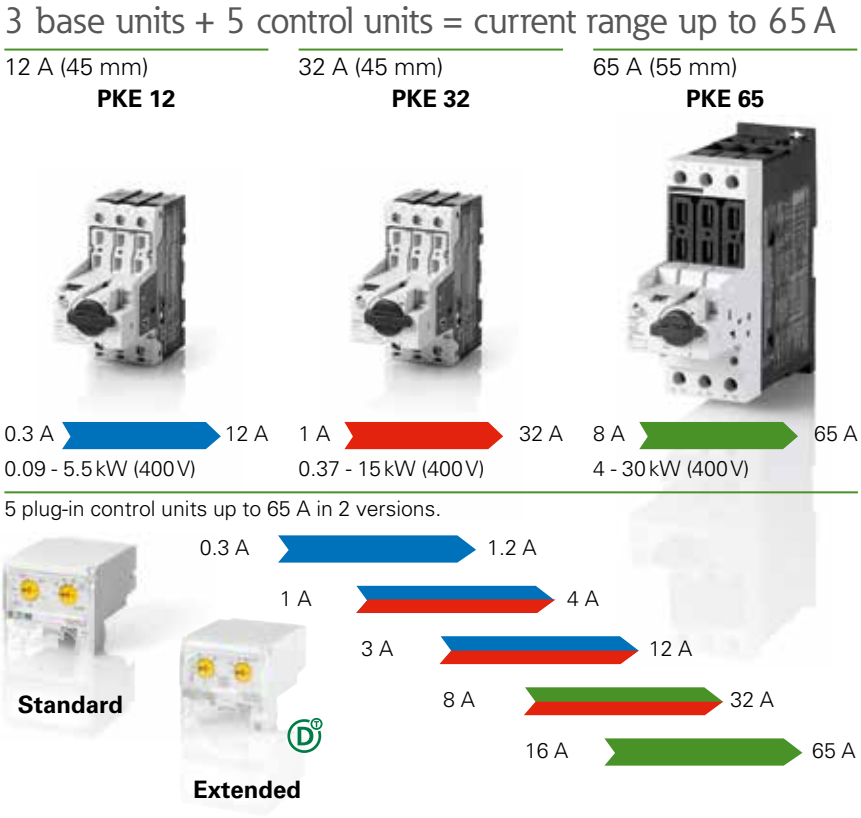
- Overload relays ZB operating on the bi-metal principle for simple overload monitoring
- Fuseless motor-protective circuit-breakers PKZM0 and PKZM4 combine motor protection and short-circuit protection in a single device. High peak inrush currents when protecting transformers are reliably mastered using the special PKZM0-T.
- Electronic overload relays ZEB impress with their wide adjustment ranges. The performance range up to 100 A is covered by just 5 current variants. Heavy duty starting is kept under control by CLASS settings.
- Should information be required concerning the state of the motor in the PLC, the motor-protective circuit-breakers with electronic releases PKE are the right choice. They can be networked directly with the PLC via SmartWire-DT and provide important status information.
- With the EMT6 series, Eaton offers thermistor overload relays for direct evaluation of thermistors in the motor windings.

Additional protective measures are necessary when using motors in explosive atmospheres. All motor protection systems from Eaton are ATEX certified and can be used for protection of EEx-e motors.

Whether it is motor-protective circuit-breakers, direct-on-line starters or reversing starters, whether for overload and short-circuit protection, heavy starting duty or thermistor protection - Eaton has the right solution for every task.

Modular with a Wide Setting Range

The functional safety and the service life of a motor depends mainly on the motor protection. Motor-protective circuit-breakers PKE with electronic overload protection offer an interesting alternative to the bimetal solution here and complement the intelligent PKZ series from Eaton. The motor-protective circuit-breaker PKE provides the highest level of flexibility featuring a compact and modular design with plug-in control unit for motor currents up to 65 A. The wide current setting ranges decisively reduce the number of variants and minimise the engineering work and costs accordingly. The right overload protection even for heavy duty starting is available with the selectable CLASS setting.



Information at your Fingertips Thanks to SmartWire-DT

Motor starters with PKZ and PKE are connected to the world of automation via SmartWire- DT. Diverse information is transferred from the motor-protective circuit-breaker PKE to the PLC.
Trip causes are transferred in addition to simple status messages. Furthermore, important data such as the actual flow of current or an overload early warning are available. The data transparency created enhances the efficiency and the operational reliability of the system.

Electronic Overload Protection

The motor-protective relay ZEB with an electronic wide-range overload protection in a ratio of 5:1 covers the current range from 0.3 A to 175 A with just 6 variants. Using CLASS settings 10, 20 and 30, overload protection is also provided even with heavy duty starting. Adjustable single-phasing sensitivity enables system protection. Furthermore, the variant ZEB…--GF offers protection against ground faults in grounded networks.

Systematic Motor Protection

The motor-protective circuit-breakers PKZ and PKE have versatile, approved accessories available from the xStart range for safe and rational control panel construction. A common range of accessories for motor-protective circuit-breakers PKZ and PKE minimize the logistics costs involved.

Motor Starter System xStart
Fast and Flexible Assembly and Connection

SmartWire-DT™
The easy way to connect

Eaton offers a comprehensive range for starting the motor with the xStart motor starter system: from the contactor to the soft starting device, and with motor protection from the bimetal relay extending to the motor-protective circuit-breaker with the electronic wide-range overload protection. All these standard components can be easily combined both mechanically and electronically. On direct-on-line starters, the contactor and circuit-breaker always have the same compact design. No precious millimetre of control panel space is wasted. For the main current wiring, three-phase commoning links, busbar adapters and motor feeder connectors offer comfortable ways for reducing assembly times.

Differing applications make varying demands on the short-circuit rating of the motor starters. This is indicated by the coordination types “1” and “2”. Eaton has tested motor starter combinations up to 560 kW on offer. A selection tool is available online
→ applications.eaton.eu/msc/

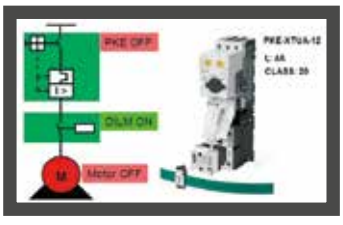
SmartWire-DT reduces the wiring effort and expense by up to 85% and helps along the entire value-added chain – from the design to the construction, to the commissioning right up to system expansion.

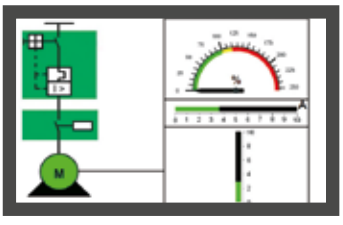
Connecting Motor Starters with SmatWire-DT

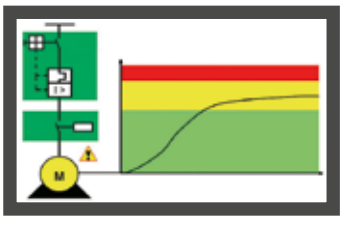
Conventional wiring of a control current circuit incorporating motor starters or contactors involves considerable time and effort. It is substantially more efficient with the motor starters and contactors of the xStart series complemented by SmartWire-DT. The SmartWire-DT module for DILM is simply plugged on like an auxiliary contact on contactors up to 38 A and connected to other SmartWire-DT devices with the "green cable". In this way, not only is the switching command provided, but also the control voltage is supplied via the SmartWire-DT system to the contactor. The switching state of the contactor is thus read back without the need for additional auxiliary contacts, and the wiring is complete. Using the system SmartWire-DT, a diverse range of switching and control components can be wired in addition to the contactors. Independently of the selected bus system of the higher-level control, up to 99 devices can be interconnected with the new SmartWire-DT line up to a maximum overall total length of 600 m inside and outside the control panel.

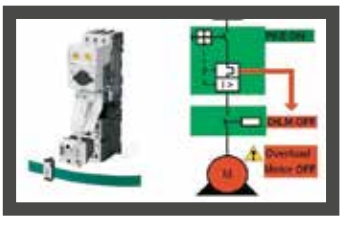
Effective Usage of Application Data

The electronic motor-protective circuit-breaker PKE is integrated into the world of automation with SmartWire-DT. The integration can be for both the individual PKE motor-protective circuit-breaker as well as for the PKE motor starter combination.
Accordingly, all the relevant information of the motor feeder is provided without the use of auxiliary contacts or additional sensors in the control. Transfer of up-to-date process data such as the actual motor current and thermal motor loading reduce the standstill times and enable efficient exploitation of the system.









Status

– Switch position PKE, contactor
– Set rated current
– Set time-lag class

Current / Loading

– Relative motor current value
– Thermal motor loading

Diagnostics

– Overcurrent (short-circuit), phase loss, overload, test

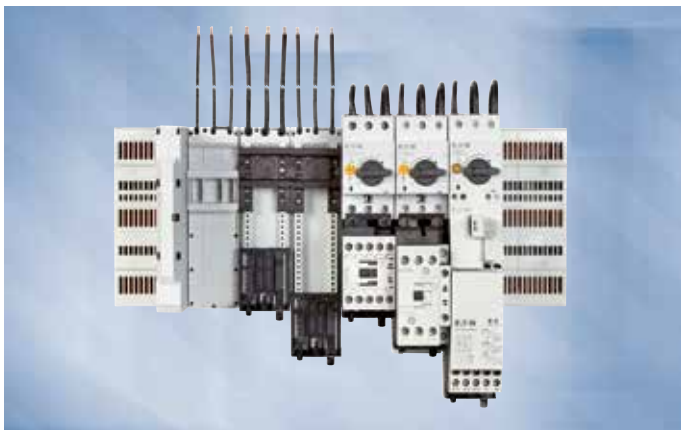
Additional Functions

– Overload relay function (contactor is switched off at overload)
– Manual / automatic operation via rotary switch

SmartWire-DT connects up to 99 devices over a length of 600 m and provides comprehensive information for maintenance and diagnostics

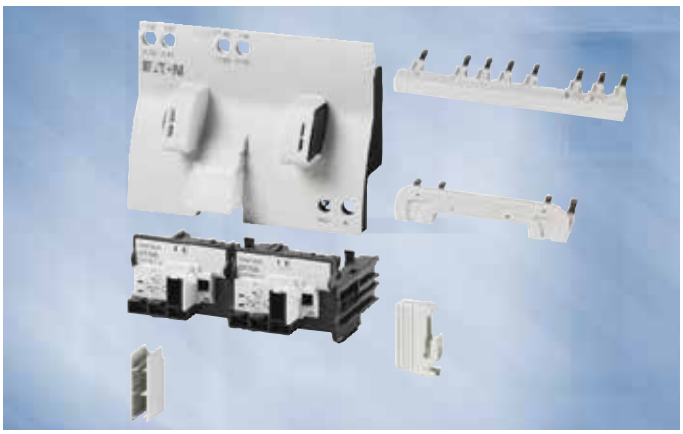
Faster Wiring with Spring-Loaded Terminals

Spring-loaded terminals enable a reduction in the wiring time. Contactors up to 15.5 A, auxiliary contacts and the motor-protective circuit-breaker PKZM0 are optionally available with spring-loaded terminals. The uniform spring force of the terminal also means high levels of reliability with wiring even with vibrating applications.



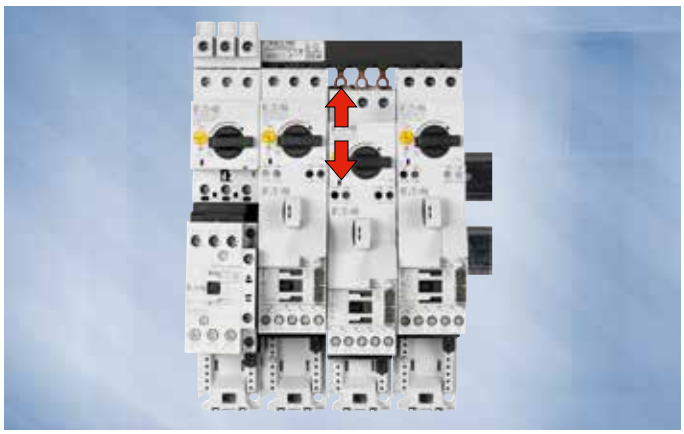
Simple, flexible and safe! The power feed system for motor-starter combinations

Easy and flexible handling of Motorstarter Feeder System reduces installation time and costs by up to 20 %. Mounting the feeder system is a breeze - fast, easy and safe - from the package straight to the control panel! This modular solution can be integrated easily and intuitively on your devices and installations by mounting it with the help of its plug-in system.



Simple, Fast and Reliably Wired

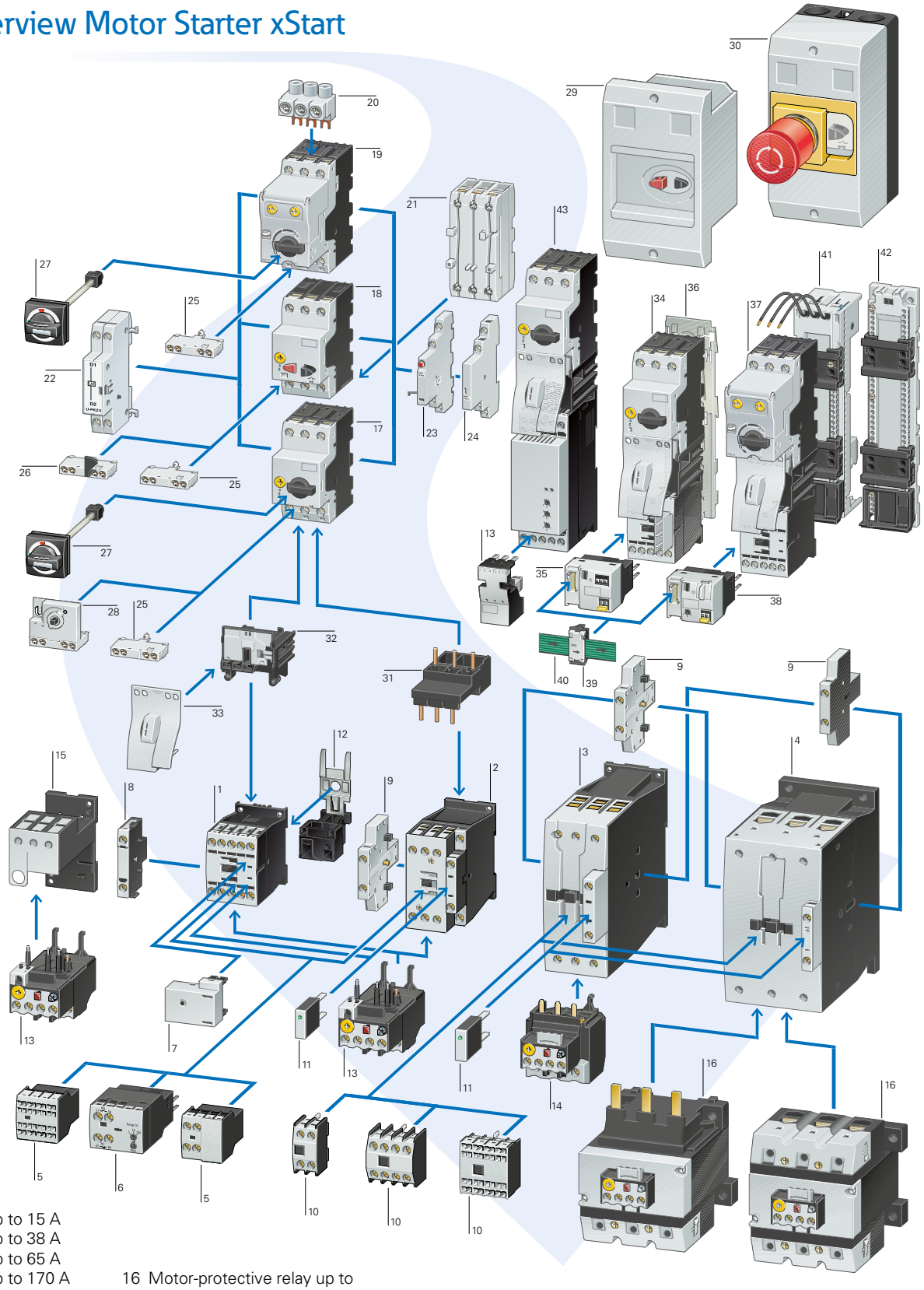
With the integrated interface of the tool-less plug connection with the contactors DILM(C) up to 15.5 A and the motor-protective circuit-breakers PKZM0, unbeatable time-saving applications such as DOL starters, reversing starters or star-delta combinations can be implemented. Standard components are toollessly plugged together to form combinations, not just mechanically, but also electrically connected. The mechanical connection saves space in the control panel, as the starter is simply installed on just one top-hat rail. In addition to the plug-in main current wiring, the electrical interlock with the reversing and star-delta combinations saves additional wiring time.



The Wiring Classic

Eaton offers the right wire jumpers for every motor-protective circuit-breaker type for parallel feeders to several PKZM0, PKZM4 or PKE motor-protective circuit-breakers. Matched to the respective application, whether with side mounted auxiliary contacts or with undervoltage or shunt releases, the three-phase commoning links can be cut to fit. Equipped with a special incoming terminal, the starters are compliant to the requirements for the American type E or type F starters.

System Overview Motor Starter xStart

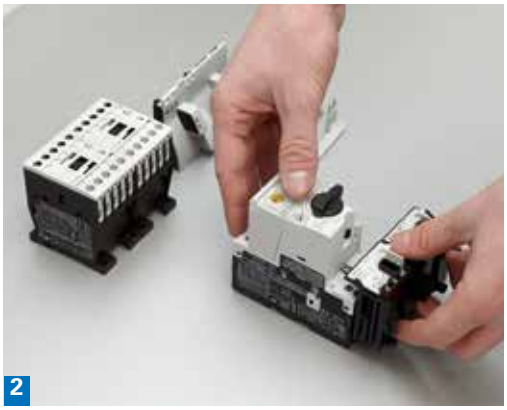


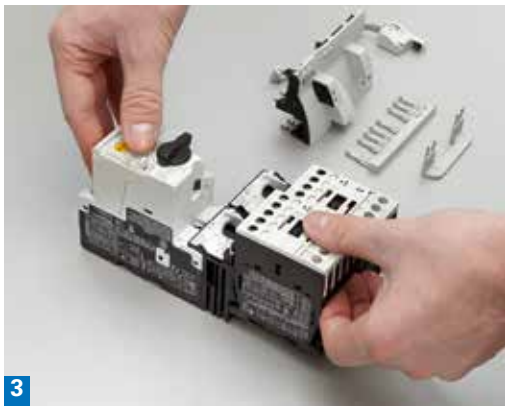
Legend

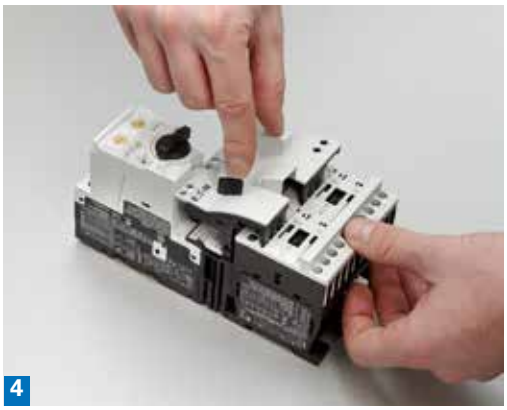
1 Circuit-breaker up to 15 A
2 Circuit-breaker up to 38 A
3 Circuit-breaker up to 65 A
4 Circuit-breaker up to 170 A
5 Surface mount auxiliary contact
6 Electronic timer
7 Motor filter
8 Side mounted auxiliary contact
9 Side mounted auxiliary contact
10 Surface mount auxiliary contact
11 Suppressor
12 PE module with sheet metal plate
13 Motor-protective relay up to 38 A
14 Motor-protective relay up to 65 A
15 Seperate mounting
16 Motor-protective relay up to 170 A
17 Motor-protective circuit-breaker with rotary operation
18 Motor-protective circuit-breaker with push button operation
19 Electronic motor-protective circuit-breaker
20 Incoming terminal block
21 Current limitation module
22 Shunt and overload release
23 Trip-indicating auxiliary contact
24 Side mounted auxiliary contact
25 Front mounted auxiliary contact
26 Early-make auxiliary contact
27 Door-coupling rotary handle and shaft extension
28 Early-make auxiliary contact
29 Insulated flush mounting enclosure
30 Insulated surface mounting enclosure with Emergency-Off pushbutton
31 Electrical plug-in connector
32 Mechanical plug-in connector
33 Combination plug-in connector
34 DOL starter MSC-D up to 7.5 kW
35 SmartWire-DT contactor module
36 Clip plate
37 DOL starter MSC-DEA up to 5.5kW with PKE
38 SmartWire-DT PKE module
39 SmartWire-DT PKE device connector
40 SmartWire-DT flat cable
41 Busbar adapter
42 Top-hat rail adapter plate
43 Soft starter combination DS7 with PKZ

Three Steps for Tool-less Motor Starter Assembly

1. Motor starter based on standard components
   - Motor-protective circuit-breaker PKE or PKZ
   - Contactor DILM
   - Wiring set for DOL starter PKZM0-XDM12 or for reversing starter PKZM0-XRM12
2. Snap on the mechanical connector on the motor-protective circuit-breaker
3. Snap on the contactor
4. Push on the electrical connector

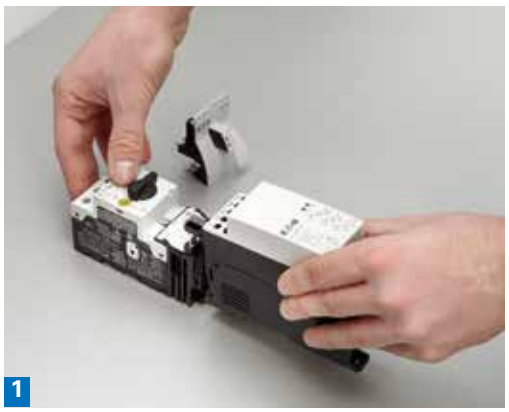


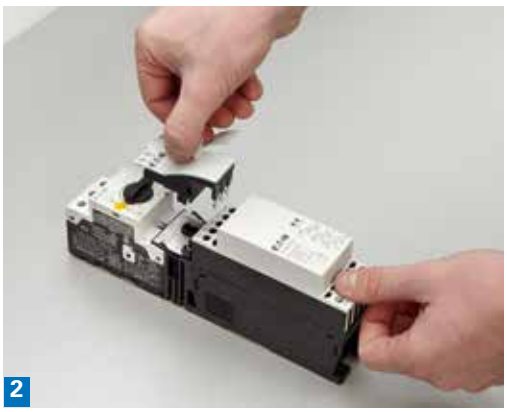




Tool-less Assembly of Soft Starter with Motor Protection

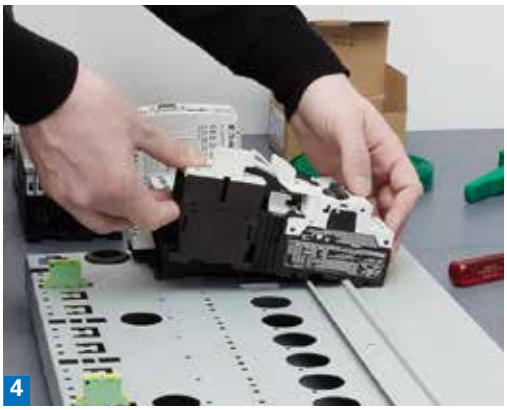
1. Snap in the soft starter on the mechanical connector on the motor-protective circuit-breaker
2. Push on the electrical connector

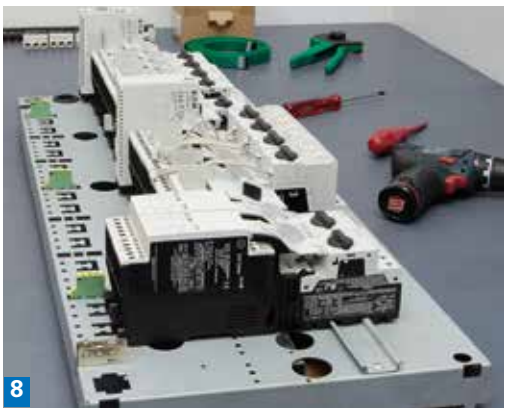




Efficient Creation of a Pre-wired Mounting Plate for Integration in the Machine

1. Eaton supplies fully pre-mounted DOL and reversing starters MSC
2. Preparation for mounting plate component insertion
3. Snap on of the SmartWire-DT gateway
4. Snap on DOL starter based on motor-protective circuit-breaker PKZ and contactor DILM
5. Add the reversing starter
6. Add power module EU5C-SWD-PF for separate Emergency-Stop circuits
7. Snap on motor starter based on electronic motor-protective circuit-breaker PKE and contactor DILM
8. Snap on soft starter DS7 with protective device PKZ

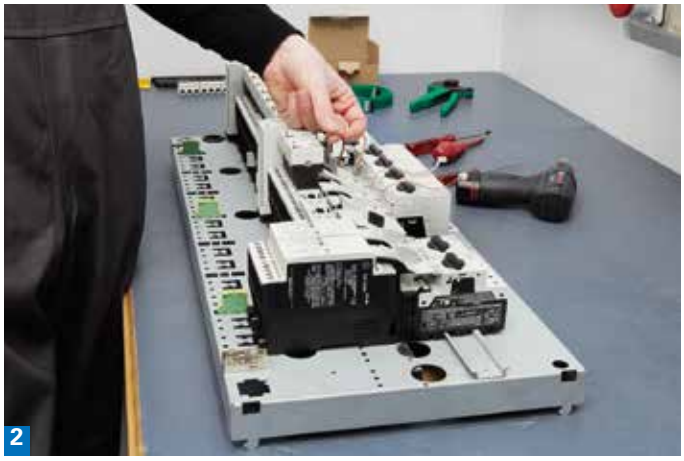




Increase Efficiency in Control Panel Construction

The cost pressure in the work-intensive area of control panel construction is immense. At the same time, perfect error-free work is expected. This is an almost impossible task with individual wiring in large controls. SmartWire-DT not only reduces the material requirement by up to 15 % and the wiring expense by up to 85 %, with its simple plug technology with check LED it also facilitates fault-free connection with fast testing and simple commissioning.

1. The SmartWire-DT devices are connected starting from the gateway. For this purpose, the SmartWire-DT contactor module or the SmartWire-DT PKE module are plugged on.



2. The electronic motor-protective circuit-breaker PKE is connected to the PKE module via the integrated connection cable.

3. The SmartWire-DT device connector is positioned on the flat cable and fixed in place by applying light pressure.

4. Contact is made with the device connector using the crimping tool, and it is then plugged onto the modules. The end of the SmartWire-DT line forms the bus termination.

All motor feeders are fully wired on the main and control current ends. The mounting plate is prepared for integration into the machine. The entire wiring does without conventional cables and is almost exclusively plugged together tool-lessly.

Parallel feeders for motor-protective circuit-breaker PKZ and PKE using three-phase commoning links and incoming terminal blocks.

Eaton's mission is to improve the quality of life and the environment through the use of power management technologies and services. We provide sustainable solutions that help our customers effectively manage electrical, hydraulic, and mechanical power – more safely, more efficiently, and more reliably. Eaton's 2019 revenues were $21.4 billion, and we sell products to customers in more than 175 countries. We have approximately 92,000 employees.

For more information, visit **Eaton.com.**

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Powering Business Worldwide