Efficiently Combine, Install and Connect Motor Starters

Moeller® series

Motor Starters in System xStart
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 safety, 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.moeller.net/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. The flip catalogs are available at www.eaton.eu/Europe/Electrical/CustomerSupport/Catalogues.
The Eaton Catalogs App also delivers all Eaton flip catalogs to your iPad.

Value Added Logistics

Eaton offers more than just standard logistics services when required. It is thus possible, for example, to deliver various products that are already pre-assembled. This saves time during installation and simplifies your logistics. Corresponding combinations can be ordered and managed with just one material number and can also be provided with customized markings.
Eaton can also fulfil special requests regarding the packaging or format: Thus, the use of large and reusable packaging with series production is often more economical than standard packaging. Furthermore, customized packaging complete with special logos or individual standard packs can be fabricated. Utilize the benefits from Eaton with real added value at attractive prices.

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.

URL: www.moeller.net/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 2600 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 M-MAX series from 0.25 kW to 18.5 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.
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 DS7

Soft starters are the ideal alternative as a replacement for star-delta starters. Soft starters of the DS7 series are available for the 4 to 200 A current range. They slot perfectly into the xStart system, and every size matches the assigned protective device as you are accustomed to with mechanical contactors. The identical connection section means that the entire range can be used on the contactor connection technology. DS7 up to 12 A can thus use the connector to the PKZ/PKE as well as the motor connector, and up to 32 A the mechanical connector can be used as with the contactors. Overload relays can also be connected just like the contactors to the output of the DS7, and separate mounting is not necessary. The NZM is used as a protective device for currents from 41 A to 200 A. DS7 has the same terminals as the corresponding NZM, and by using spacers a direct connection to the NZM can be made, without having to bend the busbars.

Frequency Inverter M-Max – Exemplary Operating Comfort

The frequency inverters of the M-MAX series enable stepless speed control of three-phase motors below and above the mains frequency without a need to change the number of poles on the motor. The torque can be controlled as a constant, quadratic or customized function over a wide power band from 0.25 to 18.5 kW and even increased in comparison to mains operation (87 Hz characteristic, factor $\sqrt{3}$).

Fast and user-friendly commissioning is guaranteed by integrated quick start assistants, which guide the user through the standard parameters during initial commissioning, providing preset application parameters to suit the application (Basic, Fan, Pump, Conveying).

The compact design of the M-Max frequency inverter enables optimum usage of the control panel capacities. The devices of frame size FS 1 to 3 enable installation with a lateral clearance of 0 mm to the neighbouring device.
Allround Motor Protection
Systematic Flexibility

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.
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.
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 ➞ www.moeller.net/select
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
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.

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.

Plug-in Motor Connectors, the Quick Way to Connect the Control Panel to the Machine

With the motor connector plug system DILM12-XMCP/E or the PE module DILM12-XMCE, Eaton is undertaking a whole new form of connection philosophy. The motor cable is plugged directly to the contactor. This saves time during installation. In addition, the space requirement in the control panel is reduced, as the input terminal blocks are no longer required. There is a saving in terms of time and cost as the wiring and testing time for the input terminal blocks is no longer necessary.

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. 4-pole motor feeder connector
14. Motor-protective relay up to 38 A
15. Motor-protective relay up to 65 A
16. Separate mounting
17. Motor-protective relay up to 170 A
18. Motor-protective circuit-breaker with rotary operation
19. Motor-protective circuit-breaker with push button operation
20. Electronic motor-protective circuit-breaker
21. Incoming terminal block
22. Current limitation module
23. Shunt and overload release
24. Trip-indicating auxiliary contact
25. Side mounted auxiliary contact
26. Front mounted auxiliary contact
27. Early-make auxiliary contact
28. Door-coupling rotary handle and shaft extension
29. Early-make auxiliary contact
30. Insulated flush mounting enclosure
31. Insulated surface mounting enclosure with Emergency-Off pushbutton
32. Electrical plug-in connector
33. Mechanical plug-in connector
34. Combination plug-in connector
35. DOL starter MSC-D up to 7.5 kW
36. SmartWire-DT contactor module
37. Clip plate
38. DOL starter MSC-DEA up to 5.5 kW with PKE
39. SmartWire-DT PKE module
40. SmartWire-DT PKE device connector
41. SmartWire-DT flat cable
42. Busbar adapter
43. Top-hat rail adapter plate
44. 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.

2. Plug on the motor cable directly to the contactor or soft starter using the motor feeder connector.

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-less.
Eaton is dedicated to ensuring that reliable, efficient and safe power is available when it’s needed most. With unparalleled knowledge of electrical power management across industries, experts at Eaton deliver customized, integrated solutions to solve our customers’ most critical challenges.

Our focus is on delivering the right solution for the application. But, decision makers demand more than just innovative products. They turn to Eaton for an unwavering commitment to personal support that makes customer success a top priority. For more information, visit www.eaton.com/electrical.

To contact an Eaton salesperson or local distributor/agent, please visit www.eaton.eu/electrical/customersupport