

Successful Implementation  
of the ErP Directive

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# Perfectly Prepared

With Energy-Efficient Solutions  
for Electric Motors



**EATON**

*Powering Business Worldwide*

# Switch, Protect, and Drive Your Motors – Today and Tomorrow

Using Eaton devices is the best way to make sure you are ready for the new ErP Directive. Our existing range of products for safely switching, protecting, and driving motors has not only been re-engineered in order to meet the Directive's requirements, but has also been expanded with ingenious new solutions, including the new PowerXL™ DE1 variable speed starter.



**Regulation (EC) No. 640/2009 implementing Directive 2005/32/EC with regard to ecodesign requirements for electric motors** takes effect on 01/01/2015. This regulation not only governs the use of IE2, IE3, and IE4 motors, but also places new requirements on motor starters and drives.

Our „Successful Implementation of the ErP Directive“ white paper will answer any questions you may have regarding the new Directives:

[www.eaton.eu/moem-ee](http://www.eaton.eu/moem-ee)

## IE3 motors – a new challenge for switchgear

IE3 premium efficiency motors are characterized not only by significantly improved efficiency, but also by lower internal resistance. As a result, their inrush currents can reach magnitudes of 14 x  $I_N$ . This means that contactors that are not suitable for use with IE3 motors will see their contact mechanism wear out more quickly as a result of higher inrush currents, eventually leading to the contacts sticking sooner than normal. Process downtimes are a definite possibility in applications with frequent switching operations, and configurations using short-circuit protective devices, such as fuses and motor-protective circuit-breakers, that are not designed for IE3 motors are likely to be rendered ineffective due to nuisance blowing and tripping.

For more detailed information, please visit:

[www.eaton.eu/moem-ee](http://www.eaton.eu/moem-ee)



## Be on the safe side with tested „IE3-ready“ motor starters

Eaton motor starters have been specifically tested for operation with IE3 motors. The results? The higher inrush currents produced by these motors pose no problem for our motor starters, meaning that there is absolutely no risk of having to deal with faster wear and increased maintenance. You can simply continue to use your Eaton motor starters as usual and switch and protect your IE3 motors today and tomorrow.

For detailed information, please visit our IE3 page:

[www.eaton.eu/IE3](http://www.eaton.eu/IE3)



## As easy-to-use as a motor starter, as variable as a variable frequency drive: The PowerXL™ DE1 variable speed starter

With its new PowerXL™ DE1 variable speed starter, Eaton has created an entirely new device category that makes it extremely easy to make the change from motor starters to variable speed control: In fact, DE1 devices can be installed and commissioned without any special drives engineering skills or knowledge. The user simply has to take the device out of the box and wire it the same way as a motor starter – DE1 now is ready for start. It doesn't get any easier than that! In addition, commissioning Out-of-the-box reduces the probability of installation errors to a minimum, eliminating the associated work and costs.

[www.eaton.eu/de1](http://www.eaton.eu/de1)

Click here to see  
the product video  
[www.eaton.eu/de1](http://www.eaton.eu/de1)



## The right drive for each application

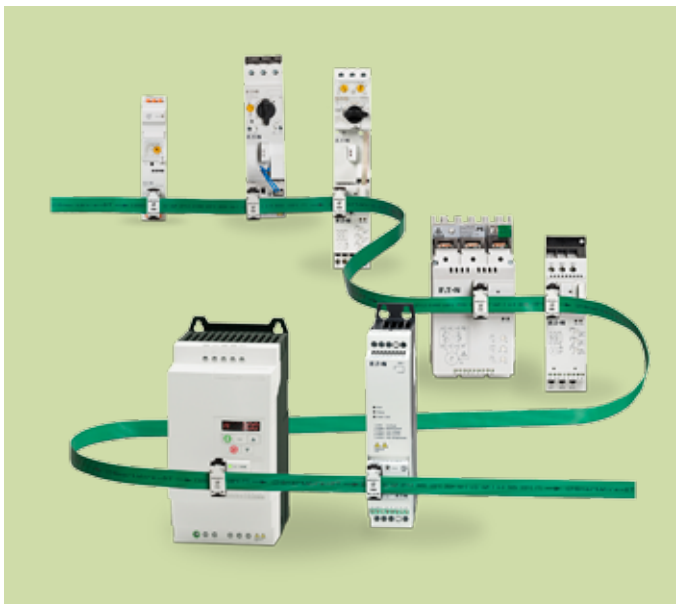
Our customers have a wide range of requirements that is only matched by the wide range of devices and functionalities in Eaton's range of high-efficiency drives engineering products – from starting motors in simple machines to speed control for complex applications and heavy loads.

In fact, the PowerXL™ and 9000X drive families, from the variable speed starter to the liquid cooled variable frequency drive, cover every single application. Especially now that the PowerXL family has been expanded with two impressive new additions: The highly efficient DE1 variable speed starter and the general purpose DG1 variable frequency drive.



## Ingenuously connected with SmartWire-DT®

SmartWire-DT, the intelligent communication system that integrates the I/O level directly into the switching level and as a result makes designing automation structures a breeze, is quickly becoming one of the industry's preferred choices. In fact, the simple, easy-to-use connection system is replacing complex and error-prone point-to-point wiring in a constantly growing number of applications. One of the immediate advantages is that this can lower wiring costs by up to 85%. Another important advantage is that Eaton drives can communicate via SmartWire-DT, whether they be motor starters, soft starters, our new variable speed starters, or variable frequency drives.



# Solution map

Perhaps uniquely, Eaton has created an ErP-compliant offer for starting, controlling, and protecting more energy efficient electric motors:

an ultra-reliable range of IE3-ready contactors, motor-protective circuit breakers and motor starters.

For variable speed applications, we've also introduced a completely new product category with the PowerXL™ DE1 variable speed starter– the simplest way to manage IE2 and IE3 motors and future-proof your operations. For a smooth start, Eaton also offers soft starters and a broad range of variable frequency drives.

All these solutions can be cleverly combined with Eaton's SmartWire-DT® intelligent wiring system.

This simple wiring system reduces wiring costs up to

# 85%

reduces engineering time and increases design flexibility, increases productivity and uptime, and simplifies maintenance.

It helps to improve the performance and availability of the machine. And it transfers data about energy consumption to the BreakerVisu system where it is visualized and logged.

## BreakerVisu—monitoring & analysis



## NZM—circuit breaker



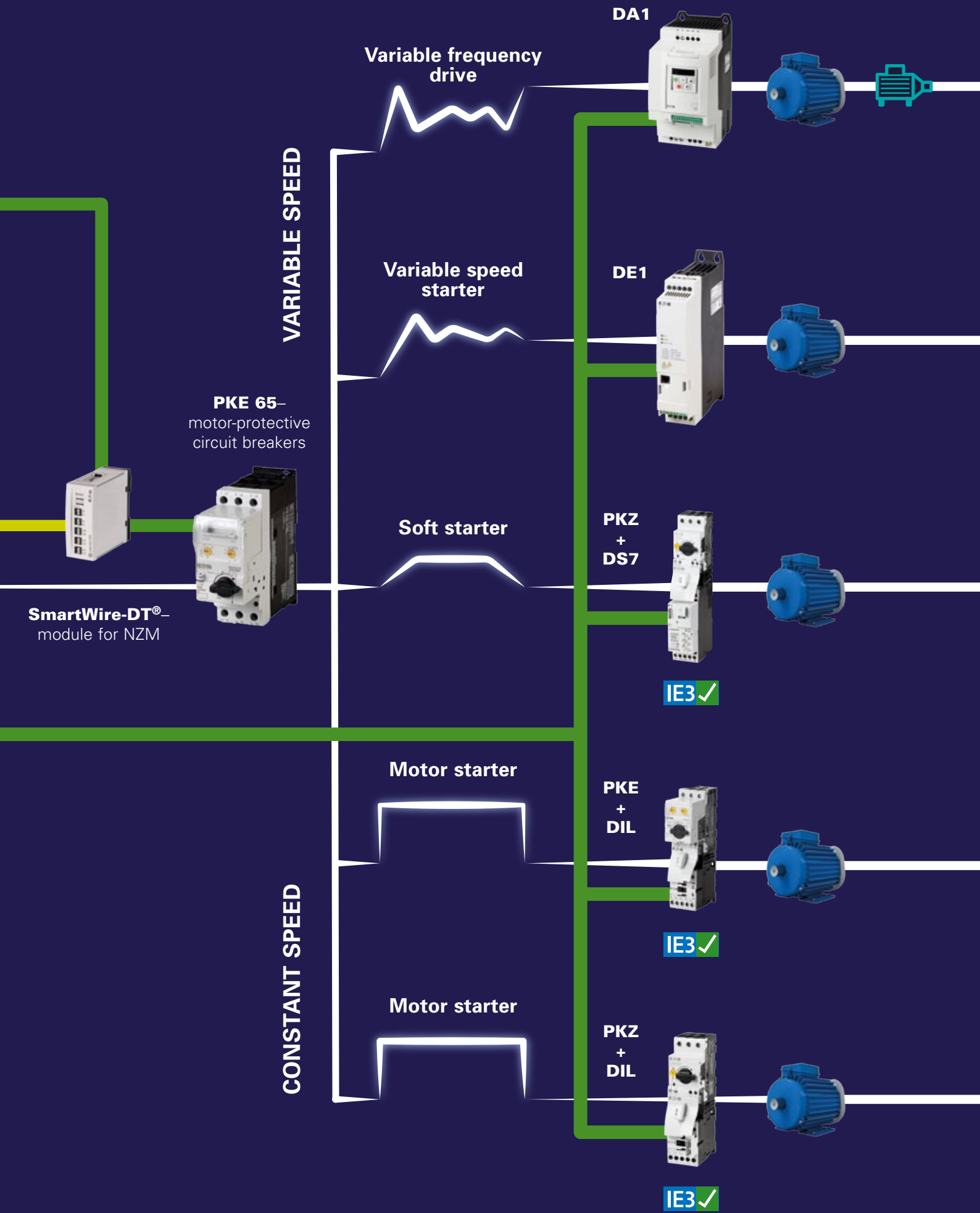
**XV300**—HMI/PLC with multi-touch technology

### KEY

SmartWire-DT®

Data

Power



# Eaton Drive Systems at a Glance

## MOTOR STARTERS



**MSC motor starter with bimetal overload protection**



**PKE motor starter with electronic overload protection**



**Electronic motor starter EMS**

### Product description

This two-component motor starter, made up of a DILM contactor and a PKZ motor-protective circuit-breaker, is rated for currents of up to 15 A and features plug-in terminals that make it easy to replace components. It improves safety and system availability while simplifying installation and reducing wiring times.

This two-component motor starter, made up of a DILM contactor and a PKE motor-protective circuit-breaker, is rated for currents of up to 15 A and features plug-in terminals that make it easy to replace components, providing the same tried-and-true functions offered by the MSC-PKZ starter combination. However, it expands on the concept by adding the advantages of electronic overload protection.

This electronic motor starter for two operating directions, featuring integrated motor protection, is suitable for three-phase motors with a rated output of up to 3 kW and is perfect as a universal motor starter for small drive systems in standard and safety applications.

### Performance range

0.06 - 15 kW at 400V

0.06 - 15 kW at 400V

0.06 - 3 kW at 400V

### Voltage range

220 - 690 V

220 - 690 V

42 - 500 V

### Features

- Two independent separate contact systems in the motor starter
- Clearly visible isolating gap between motor-protective circuit-breaker and contactor
- Communication: connection to SmartWire-DT

- Wide-range overload protection
- Variable CLASS setting: 5 to 20
- Plug-in trip blocks
- Overload relay function (optional)
- Communication: enhanced SmartWire DT connection for reading motor current values

- Compact: 30-mm width
- Hybrid switching technology with 30 million switching operations
- Push-in terminal type
- Integrated reversing starter function
- Integrated emergency stop function
- Wide-range overload protection

### Application

Standard applications and custom-tailored motor-starter combinations

Applications with more demanding requirements concerning current monitoring, including heavy starting duty and increased short-circuit breaking capacity

- Motor protection
- System protection
- Transformer protection

Standard and safety applications

- Conveyor belt control
- Small elevators
- Fans

**SOFT STARTERS**

**VARIABLE SPEED STARTER**

**VARIABLE FREQUENCY DRIVES**



**Softstarter DS7**



**S801+ / S811+**

**NEW**



**PowerXL™ DE1 Variable Speed Starter**



**PowerXL™ DC1 Compact Machinery Drive**



**PowerXL™ DA1 Advanced Machinery Drive**

The DS7 soft starter is ideal for applications like pumps, fans, and small conveyor belts. It is a fully integrated xStart system module. DS7 units not only replace the mechanical contactor, but also add a "soft motor startup" function to it. Additional advantages include longer service intervals and reduced operating costs.

The compact Eaton S811+/S801+ family of soft starters provides solid performance that goes beyond the standard protective functions offered by most soft starters. This range of solutions increases productivity and lowers costs in applications with a set speed.

The new PowerXL™ DE1 variable speed starter combines ease of use and maximum reliability with variable motor speed and improved energy efficiency of the machine. This new device category is the first to close the gap between conventional motor starters and variable frequency drives and to combine all the advantages of both in a single unit.

The compact PowerXL™ DC1 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.

2.2 - 110 kW

18.5 - 900 kW

0.25 - 7.5 kW

0.37 - 11 kW

0.75 - 250 kW

200 - 480 V

208 - 690 V

200 - 480 V

110 - 480 V

200 - 600 V

- Compact: 45-mm width up to 32 A
- Improved motor torque control for extended gear and bearing service life
- Version with minimum temperature of -40 °C
- Communication: onboard SmartWire-DT
- Comprehensive monitoring functions
- Overload protection for the soft starter in combination with PKE and SmartWire-DT

- Special pump stop algorithm
- Overload protection for both motor and soft starter
- Comprehensive monitoring functions
- Improved motor torque control for extended gear and bearing service life
- Onboard Modbus® RTU
- Removable keypad with copy & paste functionality

- Compact: 45-mm width
- Commissioning Out-of-the-box without having any parametrization
- No special drives engineering skills or knowledge required
- Parameters can be set with a screwdriver when using the DXE-EXT-SET optional module
- Trip-Free-Design ensures maximum machine availability
- Suitable for use in ambient temperatures of up to 60 °C

- Compact size
- V/Hz control with voltage boost
- Onboard CANopen/Modbus
- Versions for single-phase AC motors
- Enclosure IP20 and IP66

- Vector control (CLV, SLV)
- PM, BLDC, and synchronous reluctance motor control
- Integrated function block editor
- OLED display
- Onboard CANopen/Modbus
- 200% torque at 0 rpm
- STO onboard
- Coated boards als Standard
- Degree of protection IP20, IP55 or IP66

- Applications with low overload capability requirements
- Star-delta replacement
  - Fans and pumps for HVAC applications
  - Water/water treatment industry
  - Conveyor belts

- Applications with heavy starting duty
- Star-delta replacement
  - Fans and pumps for HVAC applications
  - Water/water treatment industry
  - Conveyor belts
  - Mixers

- Fans, pumps
- Simple Machines
- Retrofits in machines and systems in order to replace conventional motor starters or contactors for motor control

- Fans, pumps
- Machines
- Conveyor belts
- Distributed applications (IP66)
- Applications with single-phase motors

- Winding machines
- Respooler machines
- Coating systems
- Compressors
- Mills, roller mills, shredders
- Extruders
- Cranes and lifting systems
- Marine applications
- Distributed applications (IP66)



**PowerXL™ DL1  
Elevator Drive**

The PowerXL™ DL1, also known as the elevator version of the PowerXL™ DA1, is designed for use with motors with up to 100 poles and PM motors. It's designed with specific functions for elevators that make it easy to integrate it into new elevator systems and retrofit it into existing ones.

4 - 37 kW

380 - 480 V

- Special DA1 version for elevator systems
- Independent S curves
- Smooth cabine control
- UPS operation with small-load detection
- Short-floor operation
- Anti-rollback function
- Can be used to run 100-pole motors
- Braking contactor control

- Elevator applications

**NEW**



**PowerXL™ DG1  
General Purpose Drive**

PowerXL™ DG1 general-purpose drives are variable frequency drives in Eaton's „Next-Generation“ PowerXL™ series. They are specifically designed for modern, sophisticated applications: In fact, energy-saving algorithms, high short-circuit values, and a heavy-duty design all enable them to provide maximum efficiency, safety, and reliability.

0.75 - 160 kW

208 - 600 V

- Dual rating with high (CT) and low (VT) overload capability
- Onboard Modbus RTU/TCP, EtherNet/IP, and BACnet MS/TP
- Two PID controller
- Two slots (I/O and COM)
- STO
- 5% DC Link Choke
- Removable keypad with copy & paste functionality
- Startup Wizard

- Multi-pump applications
- HVAC
- Roller and chain conveyors
- Compressors, mills
- Production machines
- Centrifuges and extruders
- Traction drives, conveyor belts
- Sawing, drilling, dosing unit drives
- Chemical and primary industries
- Water jet cutting, crushers



**9000X SVX, SPX, SPI, LCX  
Performance Drive**

9000X variable frequency drives are used in high-performance and/or high-power applications. Among other advantages, they are able to synchronize multi-motor systems and winding systems. This family of products also includes a series of active front-end modules for feeding regenerative power back into the grid.

0.75 - 2,750 kW

208 - 690 V

- High output range
- Vector control (CLV, SLV)
- Mains choke included
- Available with air and liquid cooling
- Fast communications between multiple variable frequency drives
- Regenerative units (THDi < 5%)
- Five freely usable expansion slots for I/O and communication

- Conveying heavy loads
- Heavy Industry
- Primary industry
- Chemical industry
- Winches
- Marine
- Compressors
- Production machines
- Winders and unwinders



Visit the “**Motor Applications**” section of our online catalog at [www.eaton.eu/ecat](http://www.eaton.eu/ecat)



For more information on our products, as well as our selection tools, our white paper on the ErP Directive, and additional technical information, please visit [Eaton.eu/moem-ee](http://Eaton.eu/moem-ee)



# Motor-starter combinations for IE2 and IE3 motors

Moeller® series



## Motor data

AC-3	Rated operational current	Rated short-circuit current
380V	400V	380-415V
400V	400V	
415V	400V	
P	$I_e$	$I_q$
KW	A	kA

## Motor-Protective Circuit-Breakers

## Contactor

Type 1 coordination

## Contactor

Type 2 coordination

PKZM0 ...+DIL M7 TO DIL M15		0.06	0.21	150/50*	PKZM0-0,25	DILM7-...	DILM7-...
		0.09	0.31	150/50*	PKZM0-0,4	DILM7-...	DILM7-...
		0.12	0.41	150/50*	PKZM0-0,63	DILM7-...	DILM7-...
		0.18	0.6	150/50*	PKZM0-0,63	DILM7-...	DILM7-...
		0.25	0.8	150/50*	PKZM0-1	DILM7-...	DILM7-...
		0.37	1.1	150/50*	PKZM0-1,6	DILM7-...	DILM7-...
PKZM0 ...+DIL M17 TO DIL M32		0.55	1.5	150/50*	PKZM0-1,6	DILM7-...	DILM7-...
		0.75	1.9	150/50*	PKZM0-2,5	DILM7-...	DILM7-...
		1.1	2.6	150/50*	PKZM0-4	DILM7-...	DILM7-...
		1.5	3.6	150/50*	PKZM0-4	DILM7-...	DILM7-...
		2.2	5	150/50*	PKZM0-6,3	DILM7-...	DILM7-...
		3	6.6	150/50*	PKZM0-10	DILM7-...	DILM17-...
PKZM4 ...+DIL M38 TO DIL M65		4	8.5	150/50*	PKZM0-10	DILM9-...	DILM17-...
		5.5	11.3	50	PKZM0-12	DILM12-...	DILM17-...
		7.5	15.2	50	PKZM0-16	DILM17-...	DILM17-...
		11	21.7	50	PKZM0-25	DILM25-...	DILM25-...
		15	29.3	50	PKZM0-32	DILM32-...	DILM32-...
		18.5	36	50	PKZM4-40	DILM40-...	DILM40
NZM ...+DIL M72 TO DIL M500		22	41	50	PKZM4-50	DILM50	DILM50
		30	55	50	PKZM4-58	DILM65	DILM65
		34	63	50	PKZM4-63	DILM65	DILM65
		37	68	50	NZMN1-M80	DILM80	DILM80
		45	81	50	NZMN1-M100	DILM95	DILM95
		55	99	50	NZMN1-M100	DILM115	DILM115
		75	134	50	NZMN2-M160	DILM150	DILM150
		90	161	50	NZMN2-M200	DILM185A	DILM185A
		110	196	50	NZMN2-M200	DILM225A	DILM225A
		132	231	50	NZMN3-ME350	DILM250	DILM250
160	279	50	NZMN3-ME350	DILM300A	DILM300A		
200	349	50	NZMN3-ME350	DILM400	DILM400		
250	437	50	NZMN3-ME450	DILM500	DILM500		

\* Type 2 coordination

## Motor-starter combinations for IE2 and IE3 motors Quick selection online and easy ordering

Whether you want to configure your motor starter as a DOL, reversing, or wyedelta starter. Whether you prefer a fused or fuseless configuration. Whether you want an electromechanical motor starter or an electronic motor starter: Eaton's motor starter configurator will take you through the process step by step in just a few clicks. Moreover, the configurator is linked to our online

catalog, ensuring that you will enjoy convenient access to our entire range of products, including wiring sets.

Once finished, you can then send the finished list to your sales partner – it's as simple as that.

[www.eaton.eu/selectiontools](http://www.eaton.eu/selectiontools)

Eaton is dedicated to ensuring that reliable, efficient and safe power supply 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.eu](http://www.eaton.eu)

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