

Easy Multifunctional Safe



**ROYAL ELECTRIC SUPPLY
COMPANY**

3233 W Hunting Park Avenue, Philadelphia PA 19132-1845
(800) 79-ROYAL (215) 221-1200 fax (215) 221-1201
advisors@royalelectric.com www.royalelectric.com

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Powering Business Worldwide





EMS – Multifaceted Performance with only 30 mm

Eaton Moeller® series products have always embodied quality and reliability in the machine building industry. As many know, this applies in particular to our PKZ motor-protective circuit-breakers and DIL contactors, which continue to set new standards to this day. Our new EMS electronic motor starters not only continue with this tradition, but are also a leap into fully electronic motor starters, and therefore a leap into the future.

Defining the future.

Trendsetting is simply another word for action. This is why it was only natural for renowned Eaton products such as our DIL contactors and PKZ motor-protective circuit-breakers to be further developed and expanded on.

The result is the new series of PKE motor protection systems with electronic wide-range overload protection for state-of-the-art systems intended to increase machine availability above all.

Motor start from the tiniest space.

With its EMS electronic motor starter, Eaton is setting a new standard by offering a multifunctional motor protection and control relay with a frame width of 30 mm. This electronic motor starter is intended for applications in which motors with a performance range from 0.06 kW to 3 kW need to be reliably driven and protected while using up as little space as possible. Accordingly, four functions have been incorporated into this single switching device:

- DOL starter
- Reversing starter
- Motor protection as per IEC 60947

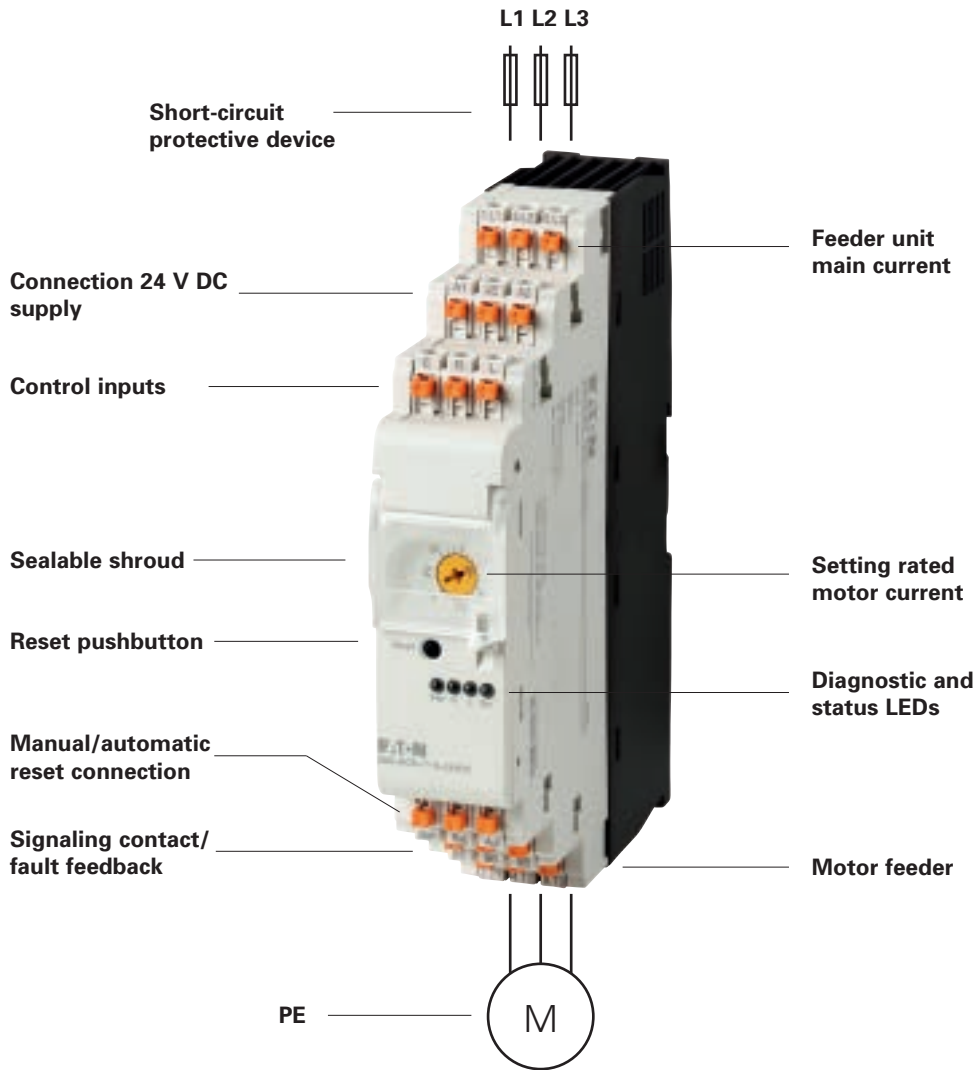
- Safety-oriented drive stopping in accordance with category 3 (EN 13849)

This electronic motor starter is mainly intended for applications in which motors have to be controlled and protected in the following systems:

- Logistics systems
- Material handling systems, small elevators
- Packaging machines
- Production machines
- Machine tools



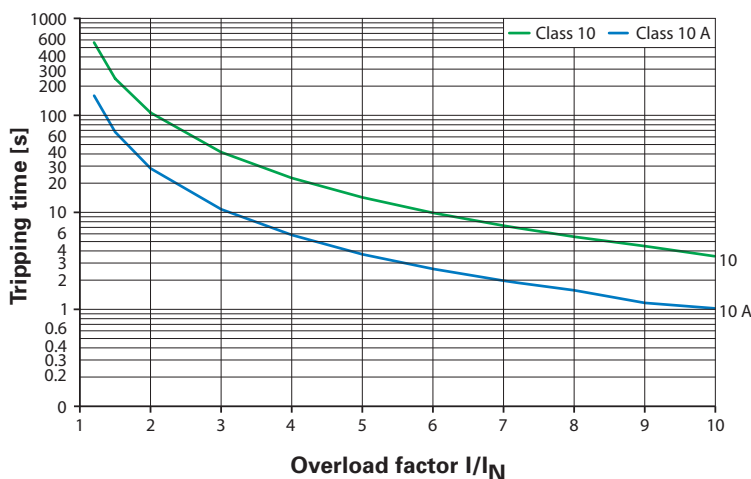
Features at a glance



Always the right tripping class.

The electronic motor starter's motor protection is implemented using two different tripping classes. For motor currents greater than 4 A, a Class 10 A time-current curve is used for motor protection. Meanwhile, for motor currents of up to 4A,

a slower Class 10 time-current curve is used for motor protection. This curve prevents the motor protection mechanism from tripping prematurely in the event of frequent start/stop operations or high inrush currents.



Four functions in a single device



DOL start with high contact life

Integrated hybrid switching provides the electronic motor starter with a significantly longer contact life than conventional switching devices. How long is longer? A total of 30 million switching operations.



Motor starter with DOL and reversing capabilities

The electronic motor starters feature an integrated reversing circuit in order to drive motors in the forward and reverse directions. This eliminates the need for additional switching devices.



Emergency-stop actuator

The electronic motor starter can be used to set up safety circuits with a performance level of e or a safety integrity level of 3 without the need for additional switching devices in the main current path.



Integrated motor protection as per IEC 60947

All EMS electronic motor starters come with electronic wide-range overload protection with additional detection of phase unbalances as per IEC 60947. This eliminates the need for additional motor protection elements.



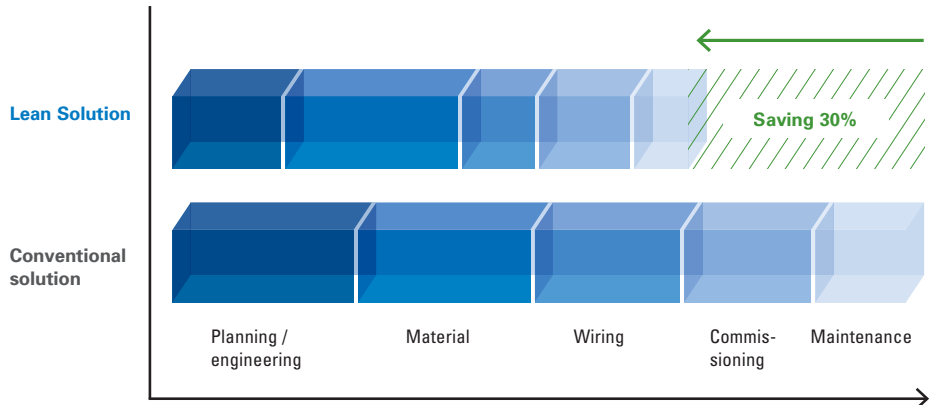
Eaton - The Right Drive for your Technology.

The machine and system building industries know that there's a one-stop provider that they can always count on: Eaton. Whether your needs are related to power management, automation, signaling, or solutions designed to cover every aspect of a motor's operation, Eaton has you covered. Our variable frequency drives, soft starters, motor starters, and hydraulic components are designed to meet all the needs of your drives. And on top of all this, integrating our EMS electronic motor starters into a SmartWire-DT system will save you precious time during planning, wiring, and commissioning.

Lean Solution powered by SmartWire-DT®

The world of mechanical engineering needs technologies that will streamline its processes. That's where SmartWire-DT comes in: By shifting the I/O layer to its modules, SmartWire-DT allows for simple and straightforward structures that can be configured quickly while eliminating the I/O layer on PLCs. The data transparency achieved this way makes diagnostics and maintenance simpler, cutting the time and resources spent on wiring, testing, and commissioning by up to 85%.

Example: Savings in every step of the life cycle

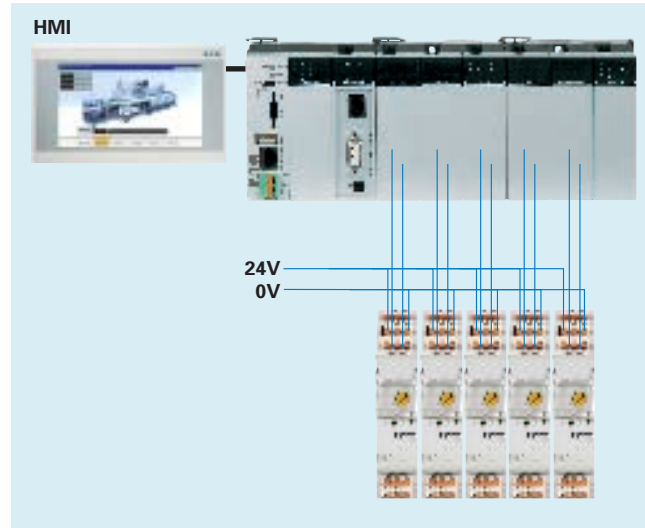




EMS - Simpler with SmartWire-DT

With its EMS units, Eaton is offering the first ever multi-functional motor starter that is integrated into its SmartWire-DT system. This not only makes it possible to benefit from the advantages that EMS motor starters offer in comparison to conventional motor starters, e.g., a longer lifespan, taking up less space, and integrated motor protection, but also from the advantages provided by Eaton's Lean Connectivity system.

Conventional solution



This lean solution with SmartWire-DT not only reduces the time and resources spent on wiring, testing, and commissioning dramatically, but also makes it possible to eliminate the need for expensive components, such as the PLC's I/O layer. Ideally, the PLC and visualization interface would be combined into a single HMI/PLC device with an on-board SmartWire-DT master.

Lean Solution with SmartWire-DT



The green SmartWire-DT cable takes care of both the control wiring and power supply wiring for EMS units. This reduces the time and resources spent on wiring by up to 85% in comparison to conventional switchgear assemblies, helping keep installation costs down. In fact, the only things left to connect afterwards are the main conductors and the SmartWire-DT connector. This reduction in complexity prevents wiring mistakes and renders complex troubleshooting unnecessary. In addition, SmartWire-DT can be used to change an EMS unit's operating direction, as well as to evaluate any faults.

Features:

- Reduces the time required for planning, engineering, wiring, testing, and commissioning
- Reduces the PLC's I/O layer
- Control wiring and power supply through SmartWire-DT
- Operating direction feedback
- Fault diagnostics via SWD

Four functions in a single device



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Motor starter with DOL and reversing capabilities

The electronic motor starters feature an integrated reversing circuit in order to drive motors in the forward and reverse directions. This eliminates the need for additional switching devices.



Networking via SmartWire-DT

By integrating EMS motor starters into the SmartWire-DT system, all previously required control wiring is eliminated. Moreover, this makes it possible to drive motors and power EMS units through a distributed system. All of this saves precious time during planning, wiring, and commissioning.



Integrated motor protection as per IEC 60947

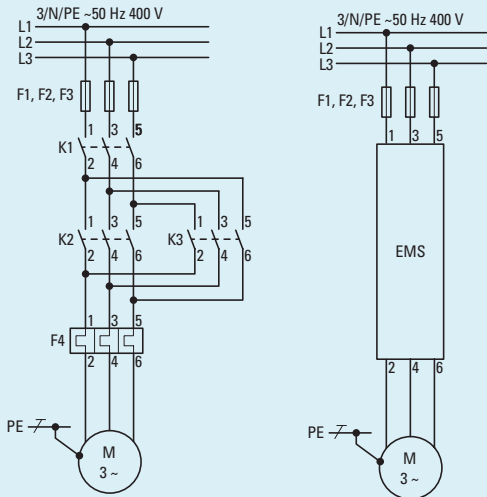
All EMS electronic motor starters come with electronic wide-range overload protection with additional detection of phase unbalances as per IEC 60947. This eliminates the need for additional motor protection elements.



EMS – Complex Functions Made Simple

Reversing starter with emergency stop

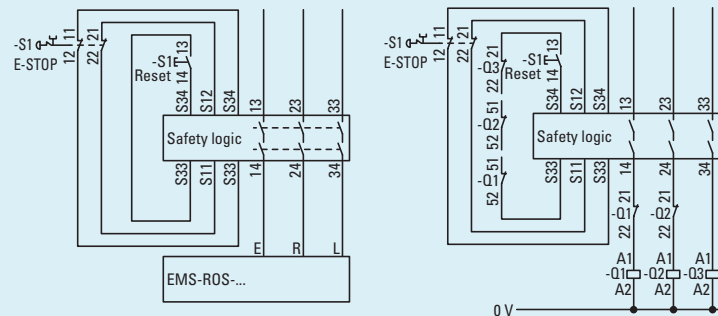
Main circuit



Conventional

Electronic motor starter

Actuating circuit



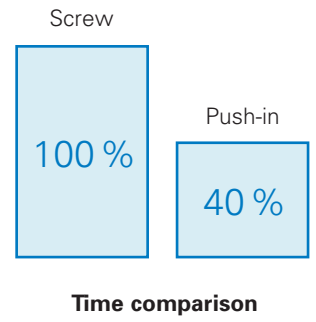
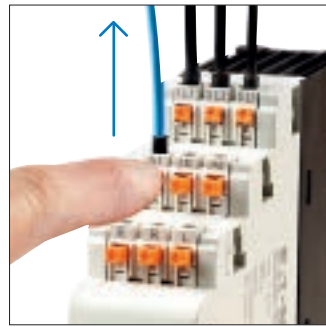
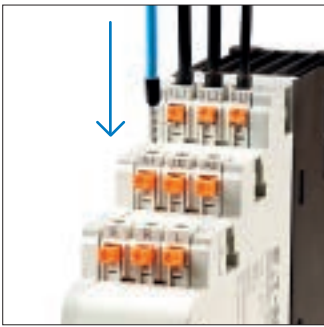
Electronic motor starter

Conventional

Faster for increased safety

EMS motor starters make it possible to implement applications with safety-oriented stopping in accordance with cat. 3 /SIL 3 and PLe much faster and easier than conventional motor starters.

In addition, wiring is less complex both at the main circuit and actuating circuit levels. In total, installation efforts are reduced by up to 60%, while the number of required hardware components is reduced by 70%.



Smart terminal type

The electronic motor starter relies on push-in terminals for its main circuit and actuating circuit connections. This enables users to connect and disconnect

the connection cables without tools and reduces the time spent wiring the starter up to 60% in comparison to conventional screw terminals.

This ensures that you will not only benefit from increased safety, but also from faster, simpler, and clearer handling.

Time is money

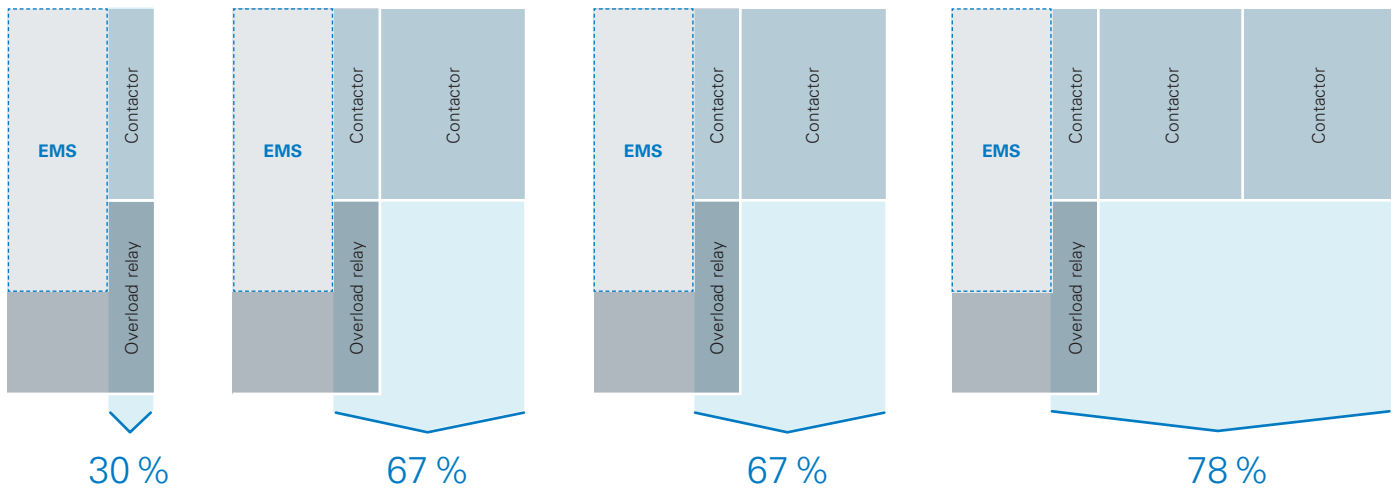
Reduce the time it takes to install your motor starters by up to 60%. Tool-less push-in terminals ensure that installation is done in the blink of an eye, enabling you to use your time on more important things.

DOL starter

Reversing starter

DOL starter emergency stop

Reversing starter emergency stop

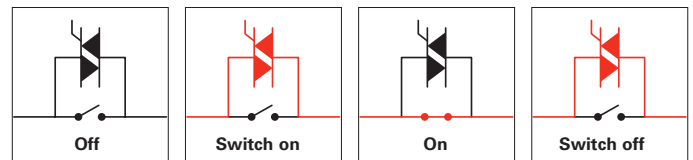


A frame width reduction of up to 78% in comparison to conventional motor starters.

Compact, reliable, safe

A small electronic motor starter frame width of only 30 mm translates into important space savings inside control cabinets. This advantage is particularly important in the case of machines with numerous reversing starters and strict safety requirements (emergency stop), since using these motor starters also makes it possible to eliminate the need for multiple conventional switching devices.

In addition to the space that is freed up, the device's staggered terminals reduce wiring efforts even further. This makes it possible to put together motor starter groups much faster, and the reduction in wiring efforts makes it possible to reduce installation times by 60%.



Hybrid switching ensures a longer life

The electronic motor starter's integrated hybrid switching increases its life significantly in comparison to conventional switching devices. The semi-conductor connected in parallel to the main contacts handles the current flow during switch-on and switch-off operations, ensuring that the starter will have a longer contact life of 30 million switching operations.

Technical data

EMS-...2,4-24VDC EMS-...9-24VDC EMS-...2,4-SWD-ADP EMS-...9-SWD-ADP

General	Standards		IEC/EN 60947-4-2; UL508	IEC/EN 60947-4-2	
	Dimensions (W x H x D)	mm	30x157x123.5	30x157x139	
	Weight	kg	0.3	0.32	
	Mounting		Top-hat rail IEC/EN 60715, 35mm		
	Mounting position		Vertical, motor feeder on bottom		
	Degree of protection (IEC/EN 60529, EN 50178, VBG 4)		IP20		
	Lifespan	Operations	3 x 10 ⁷		
	Max. switching frequency (50:50 duty cycle)	Operations/h	7200		
Terminal capacity	solid	mm ²	1 x (0.75...2.5), 1x(AWG20...14)		
	Flexible with ferrule ^{*)}	mm ²	2 x (0.75...2.5), 1x(AWG20...14)		
	flexible with twin ferrule ^{*)}	mm ²	2 x (0.75...1.5), 2x(AWG20...16)		
Electromagnetic compatibility (EMC)	Electrostatic discharge (IEC/EN 61000-4-2, Level 3, ESD)				
	Air discharge	kV	8		
	Contact discharge	kV	6		
	Electromagnetic fields (IEC/EN61000-4-3)				
	80-1000MHz	V/m	10		
	1.4-2 GHz	V/m	10		
	2-2.7 GHz	V/m	3		
	Emitted interference cable related (EN 55011)		Class A ^{**}		
	Radiated emitted interference (EN 61000-6-3)		Class A ^{**}		
	Burst pulses (IEC/EN 61000-4-4, level 3)	kV	2		
	Surge (IEC/EN 61000-4-5)				
	Symmetric	kV	1		
asymmetrical	kV	2			
Radiated RFI (IEC/EN 61000-4-6)	V	10			
Ambient climatic conditions	Operating ambient temperature (IEC 60068-2)	°C	-25...+60		
	Condensation		prevent with suitable measures		
	Storage	°C	-40...+80		
Input data	Supply voltage (A1-A2 / UAUX)	VDC	24 -20% + 25%		
	Residual ripple	%	5		
	Supply voltage "confirm Off" (EMS-DOS-... / EMS-ROS-...)	VDC	< 5	-	
	Input current (without return signal)	mA	40	-	
	UAUX current draw (inrush)	mA	-	120	
	UAUX current draw (operation)	mA	-	50	
Actuating circuit (ON, L, R)	Switching level "Low"	VDC	-3...9.6	-	
	Switching level "confirm Off"	VDC	< 5	-	
	Switching level "High"	VDC	19.2...30	-	
	Input current	mA	5	-	
Feedback outputs (95, 96/97, 98)	Contact type		Single contact, 1 changeover contact	-	
	Maximum switching voltage VAC/VDC 250		250	-	
	Switching capacity AC-15 (230 VAC)	A	3	-	
	Switching capacity DC13 (24 VDC)	A	2	-	

*) Minimum length 10mm

**) This product is designed for use in industrial environments (environment 2). Its use in residential environments (environment 1) may cause radio-frequency interference, requiring additional noise suppression measures.

Technical data

			EMS-...2,4- 24VDC	EMS-...-9- 24VDC	EMS-...2,4- SWD-ADP	EMS-...-9- SWD-ADP
Power section	Circuit design		safety end stage with bypass, Three-phase switch off			
	Rated operational voltage	VAC	500 (42...550)			
	Rated operational current					
	AC51 (EN60947-4-3)	A	0.15...2.4	1.2...9	0.15...2.4	1.2...9
	AC53a (EN60947-4-2)	A	0.15...2.4	1.2...6.5	0.15...2.4	1.2...6.5
	Minimum heat dissipation	W	1.1	3.3	1.1	3.3
	Max. heat dissipation		3.3	14.6	3.3	14.6
Main circuits	Rated impulse withstand voltage	VAC	6000			
	Overvoltage category		III			
	Pollution degree		2			
	Basic insulation (IEC/EN 60947-1)					
	Between supply, control, and switching voltages	VAC	500			
	Feedback output and switching voltage	VAC	500	-	-	-
	Safe isolation (IEC/EN 60947-1)					
	Between supply, control, and switching voltages	VAC	≤300 (z.B. 230/400, 277/480)			
	Feedback output and switching voltage	VAC	≤300 (z.B. 230/400, 277/480)	-	-	-
	Safe isolation according to EN 50178					
Between supply, control, and switching voltages	VAC	500				
Feedback output and switching voltage	VAC	500	-	-	-	
Ammeter	Setting range of overload releases	A	0.18...2.4	1.5...9	0.18...2.4	1.5...9
	Motor protection, characteristic	CLASS	10	10 (I _r ≤ 4A) 10A (I _r > 4A)	10	10 (I _r ≤ 4A) 10A (I _r > 4A)
	Recovery time	Min.	2 (manual starting) / 20 (automatic restarting)			
	Balance monitoring					
	Magnitude of I _{max} > I _{nenn} (I _{max} - I _{min} /I _{max})	%	≥33 / ≥67			
	Magnitude of I _{max} < I _{nenn} (I _{max} - I _{min} /I _{nenn})	%	≥33 / ≥67			
	Pick-up time	s	120 / 1.8			
Stall protection	pick-up value I (L1) or I (L3)	A	-	45A	-	45A
	Pick-up time	s	-	2	-	2
Short-circuit strength type of coordination 1	50kA/500VAC		Fuse 16A gG/gL			
	50kA/415VAC		-	-	-	PKM0-4
	15kA/415VAC		-	-	-	PKM0-6.3
Conformity / Approval	EC prototype test certification according to ATEX		II (2) G [Ex e] [Ex d] [Ex px] II (2) D [Ex t] [Ex p] PTB 13 ATEX 3003		-	-
	UL		UL508 NLDX File: E29096 NLDX7 File: E29096		-	-

Safety engineering		Safe switch off (EMS-DOS-.../EMS-ROS-...)	Ambient Temperature	°C	Motor protection EMS-DO.../EMS-RO...
Ambient Temperature	°C	40	Ambient Temperature	°C	40
MTTFd	Years	421/420	MTTFd	Years	316/316
λ _{sd} [FIT]		47/49	λ _{sd} [FIT]		0/0
λ _{su} [FIT]		1582/1818	λ _{su} [FIT]		1550/1731
λ _{dd} [FIT]		269/269	λ _{dd} [FIT]		314/314
λ _{du} [FIT]		2.4/2.7	λ _{du} [FIT]		47.2/47.2
SFF	%	99.8/99.8	SFF	%	97.9/97.7
DCS	%	2.9/2.6			
DC	%	99/99	DC	%	86.9/86.9
PFH	1/h	2.4 x 10 ⁻⁹ /2.7 x 10 ⁻⁹			
Sicherheitslevel					
IEC 61508-1		SIL 3	IEC 61508-1		SIL2
ISO 13849-1		PL e			
EN 954-1		Kat. 3			

Electronic motor starter EMS

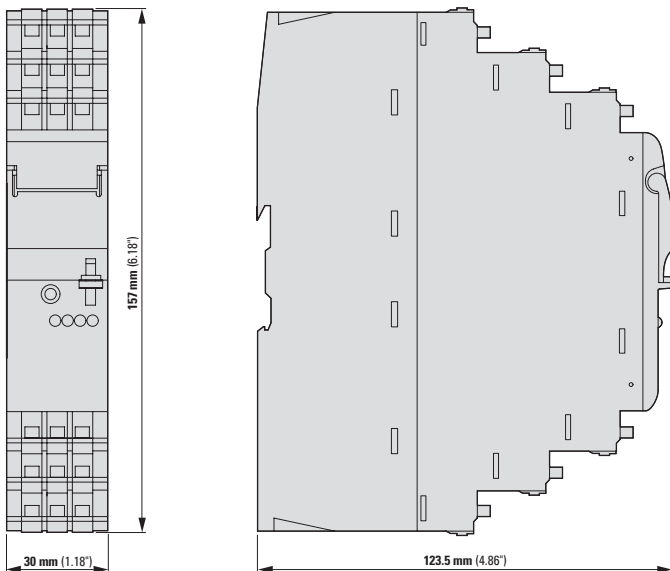


Function	Setting range Overload protector I _r A	Motor rating AC-53a 380V 400V 415V kW	Part no.	Article no.
DOL starting				
DOL start, motor protection	0.18...2.4	0.06...0.75	EMS-DO-T-2.4-24VDC	170099
DOL start, motor protection	1.5...9 (6.5 AC53a)	0.55...3	EMS-DO-T-9-24VDC	170100
DOL start, motor protection, emergency stop	0.18...2.4	0.06...0.75	EMS-DOS-T-2.4-24VDC	170103
DOL start, motor protection, emergency stop	1.5...9 (6.5 AC53a)	0.55...3	EMS-DOS-T-9-24VDC	170104
DOL start, motor protection SmartWire-DT	0.18...2.4	0.06...0.75	EMS-DO-T-2.4-SWD-ADP	172760
DOL start, motor protection SmartWire-DT	1.5...9 (6.5 AC53a)	0.55...3	EMS-DO-T-9-SWD-ADP	172762
Reversing start				
DOL start, reversing start, motor protection	0.18...2.4	0.06...0.75	EMS-RO-T-2.4-24VDC	170101
DOL start, reversing start, motor protection	1.5...9 (6.5 AC53a)	0.55...3	EMS-RO-T-9-24VDC	170102
DOL start, reversing start, motor protection, emergency stop	0.18...2.4	0.06...0.75	EMS-ROS-T-2.4-24VDC	170105
DOL start, reversing start, motor protection, emergency stop	1.5...9 (6.5 AC53a)	0.55...3	EMS-ROS-T-9-24VDC	169789
DOL start, reversing start, motor protection, SmartWire-DT	0.18...2.4	0.06...0.75	EMS-RO-T-2.4-SWD-ADP	172761
DOL start, reversing start, motor protection, SmartWire-DT	1.5...9 (6.5 AC53a)	0.55...3	EMS-RO-T-9-SWD-ADP	172763

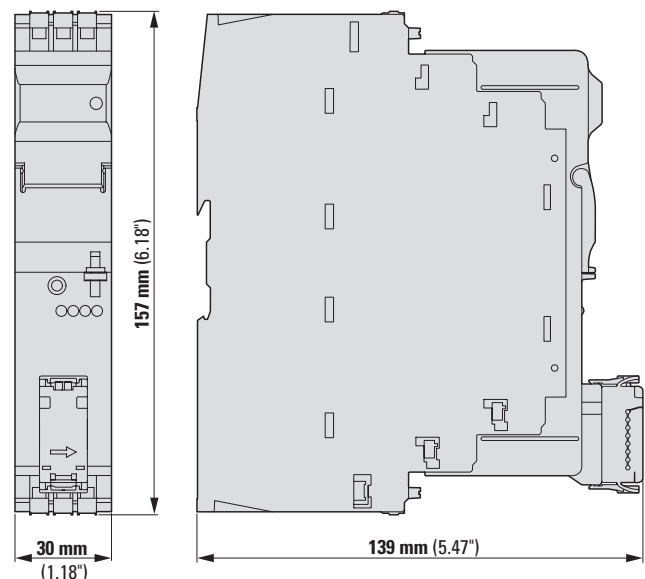
Prices see price list

Dimensions

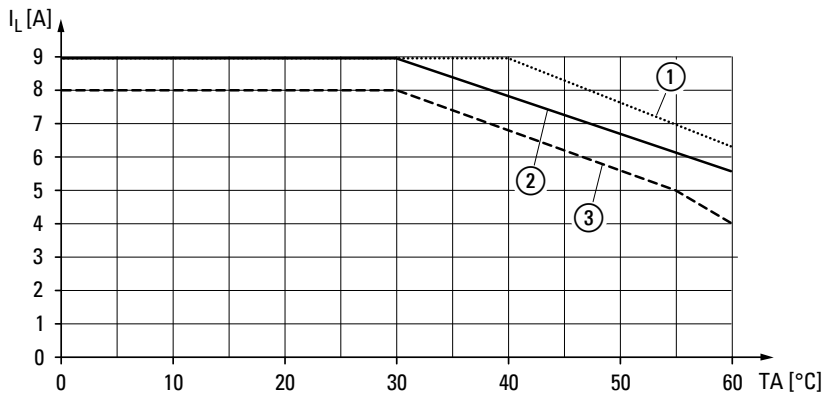
EMS without SmartWire-DT



EMS with SmartWire-DT



Derating rated operational current EMS-...-9-...



- 1 Stand-alone device
- 2 Connected in series, with a distance equal to one housing width (30 mm)
- 3 Connected in series, without any distance

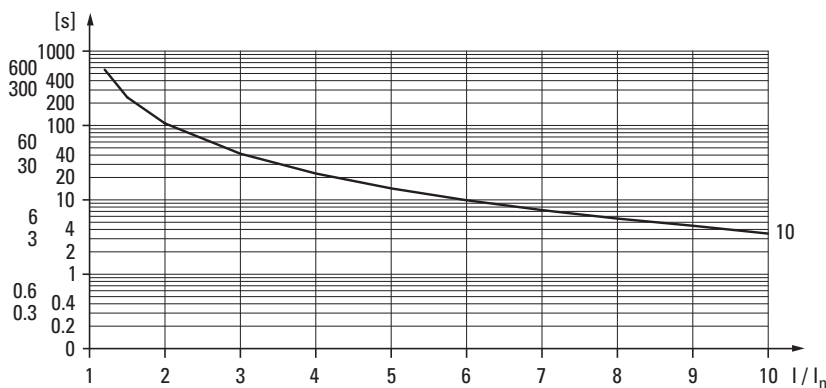
Engineering rated operational current

Derating curve EMS-...-9-...										
Utility category	AC-51							AC-53a		
Overcurrent factor I_A/I_N	1	2	3	4	5	6	7	8	9	10
Adjustment factor K	1	1	1	1	1	0.96	0.83	0.72	0.64	0.58

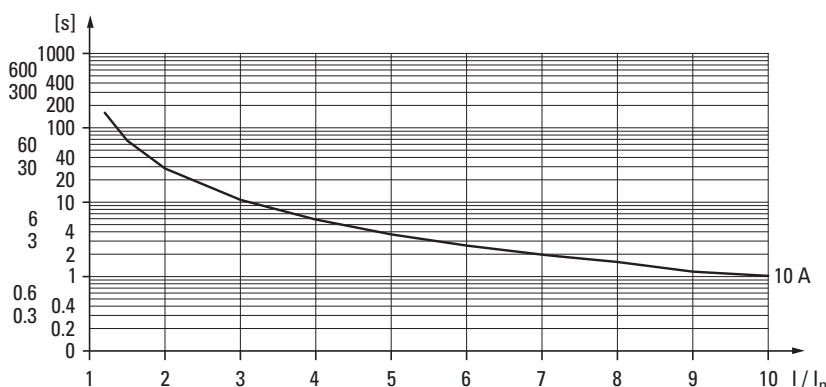
Example 1		
Motor with overcurrent factor (from motor data sheet)	I_A/I_N	8
Adjustment factor	K	0.72
Max. permissible load current at 30° C, not connected in series	I_L	9A
Max. permissible rated operational current	I_N	6.5A

Example 2		
Motor with overcurrent factor (from motor data sheet)	I_A/I_N	8
Adjustment factor	K	0.72
Max. permissible load current at 60° C, connected in series	I_L	4A
Max. permissible rated operational current	I_N	2.88A

Trip type EMS



EMS-...-2,4-...
EMS-...-9-... ($I_r \leq 4A$)



EMS-...-9-... ($I_r > 4A$)



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