EMS
Electronic motor starters

www.eaton.eu

Easy
Multifunctional
Safe

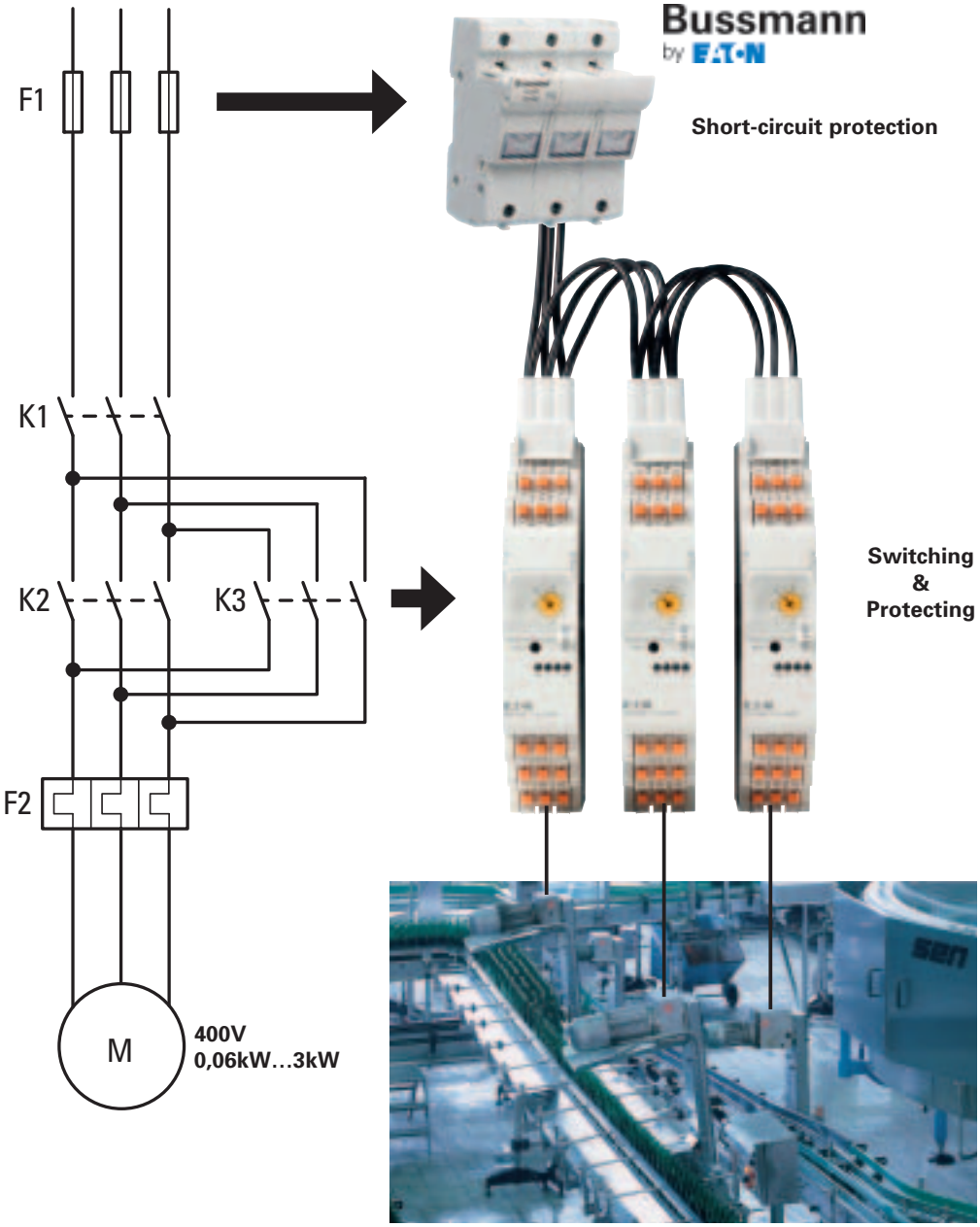
Powering Business Worldwide

EMS – The perfect all-rounder on a mere 30 mm

EMS electronic motor starters combine an extremely compact design with the traditional functions of conventional motor starters. Their narrow overall width of 30 mm means that these units can be used wherever motors with a rated power of up to 3 kW need to be driven.

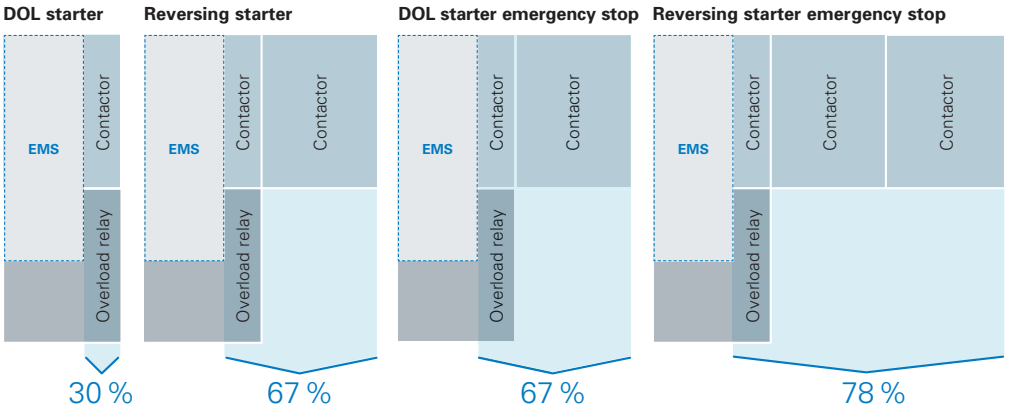
Electronic motor starters in the Eaton range of products

 **MSC-D motor starters**	 **MSC-DE motor starters**	 **EMS hybrid starters**	 **DS7 soft starters**
Motor-starter combination (motor-protective circuit-breaker and contactor) • Overload and short-circuit protection • A large variety of accessories • Proven components • Can be expanded with SmartWire-DT	Motor-starter combination (motor-protective circuit-breaker and contactor) • High short-circuit breaking capacity • Wide-range overload protection (4:1) • Variable motor protection characteristic (class 5 - 20) • Replaceable trip blocks • Additional monitoring functions via SmartWire-DT	Multifunctional motor starter • DOL and reversing • Wide-range overload protection • Emergency stop contactor (SIL3) • 30 mm width • Additional monitoring functions via SmartWire-DT	• 45 mm width for up to 32 A • Version able to handle temperatures as low as -40 °C • Improved control of motor torque, ensuring longer gearbox and bearing service lives • Comprehensive monitoring functions via SmartWire-DT
Motor output (AC-3 / 400 V)			
0.06...15 kW	0.06...15 kW	0.06...3 kW	2.2...110 kW
Application			
• Standard version and custom-tailored motor-starter combinations	Can be used universally for: • Motor protection • Transformer protection • System protection	• Slide valve control • Horizontal / vertical conveyors • Small drives • Fans	• Wye-delta applications • Pumps and fans in HVAC applications • Water/sewage treatment industries • Conveyor belts



All-in-one design saves space

By combining DOL starting (K2), reversing starting (K3), motor protection (F2), and emergency stop contactor (K1) functions on a mere 30 mm, these electronic motor starters take up much less installation width – up to 78% less, in fact.



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

Four functions in a single device

Motor starting with long service lives

Integrated hybrid switching technology not only ensures that motors are started with virtually zero wear, but also makes it possible to achieve a contact life of 30 million operations.

Integrated reversing starter

These electronic motor starters can drive motors both counterclockwise and clockwise.

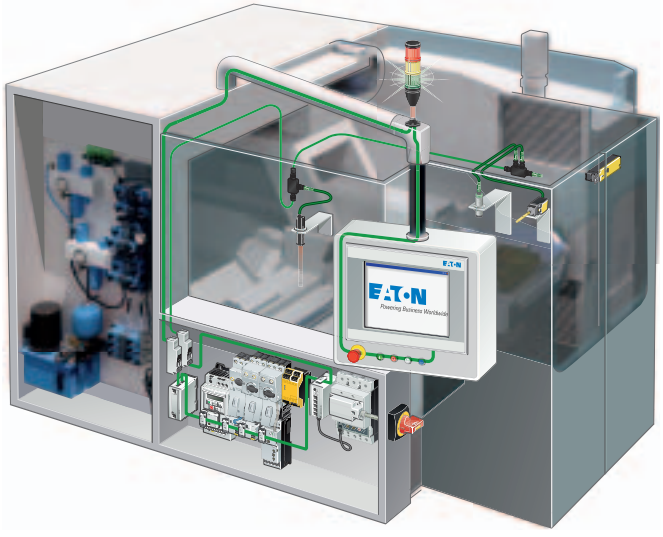
Safe stop

Internal dual-channel circuitry ensures that the electronic motor starters can be used.

Electronic motor protection

With only two current ranges, the electronic motor starters can be used for motor protection for ratings of 0.06 to 3 kW (400 V, 50 Hz).

EMS with SmartWire-DT – Faster commissioning, powerful extra features



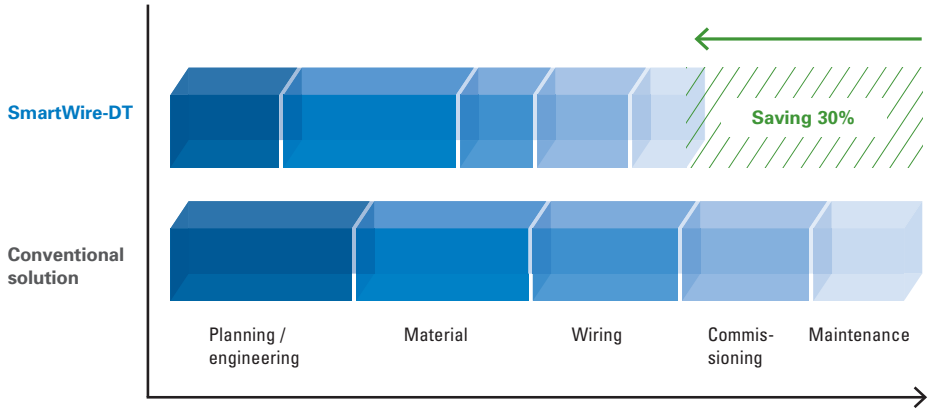
SmartWire-DT
Added value for your entire machine

By using the SmartWire-DT system, previously needed control wiring for switchgear can be eliminated and replaced with a plug-in communication connection, minimizing the time needed for planning, wiring, and commissioning. Moreover, the additional communication connection makes it possible to obtain further information on machine and process states, making it possible to detect faults and the need for machine maintenance much faster.

Cost reduction by SmartWire-DT®

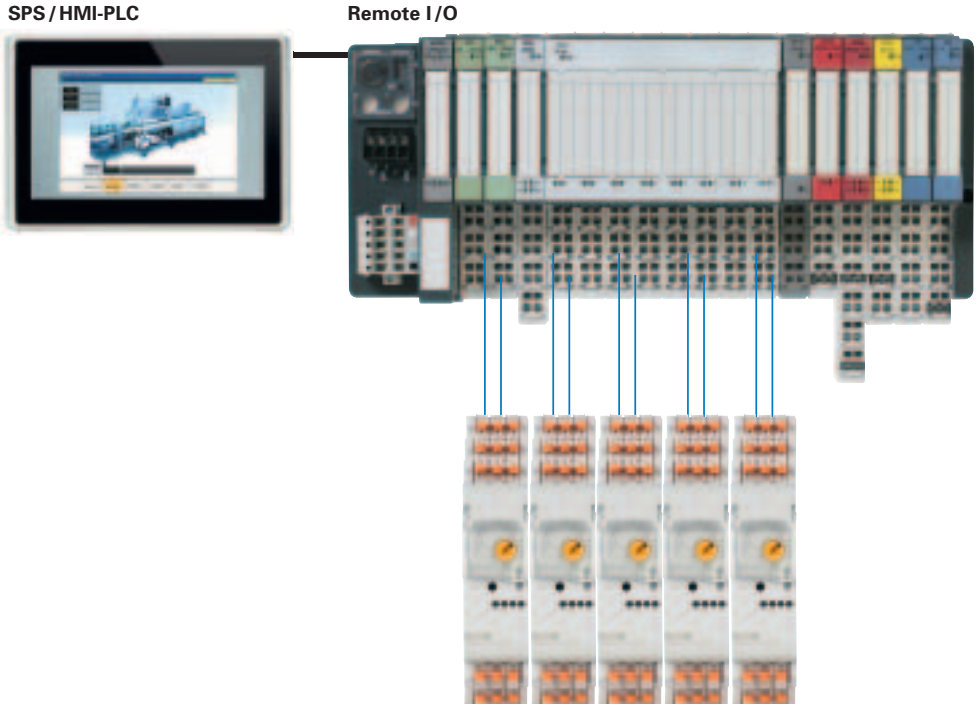
The world of mechanical engineering needs technologies that will streamline its processes. That's where SmartWire-DT comes in: By shifting the I/O layer to its modules, SmartWire-DT allows for simple and straightforward structures that can be configured quickly while eliminating the I/O layer on PLCs. 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



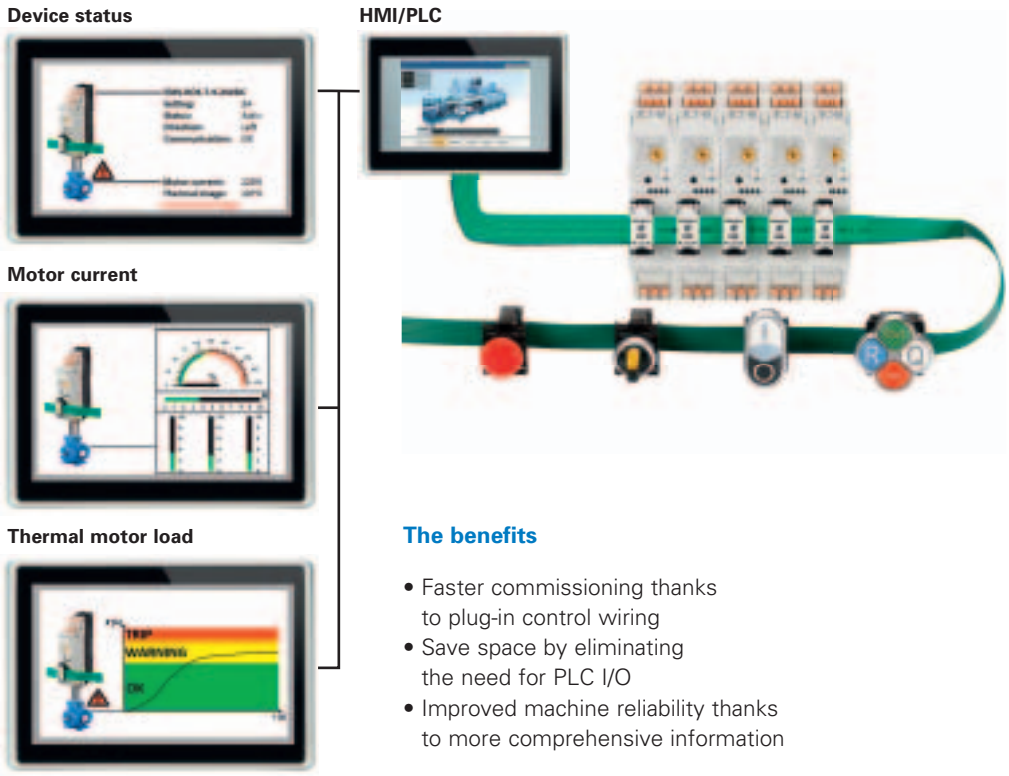
Conventional control wiring

Traditionally, motor starters have usually been driven through a PLC system's inputs and outputs. The wiring required for this is time-consuming, prone to errors, and, once installed, can only provide limited information on the corresponding application's state.



SmartWire-DT control

When used, SmartWire-DT replaces the PLC system's digital inputs and outputs. Moreover, it provides switchgear with communication capabilities and makes it possible to obtain much more detailed information regarding the application at hand. In addition, the system makes it possible to detect critical states in advance and ensures that your machine will keep running without any problems.



The benefits

- Faster commissioning thanks to plug-in control wiring
- Save space by eliminating the need for PLC I/O
- Improved machine reliability thanks to more comprehensive information

Five functions in a single device

Motor starting with long service lives

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Integrated reversing starters

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Safe stop

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Electronic motor protection

With only two current ranges, the electronic motor starters can be used for motor protection for ratings of 0.06 to 3 kW (400 V, 50 Hz).

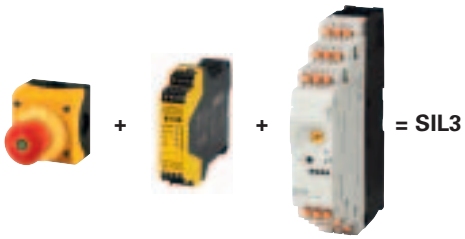
Intelligent networking

A SmartWire-DT interface replaces previously needed control wiring and provides additional information.

EMS – Complex Functions Made Simple

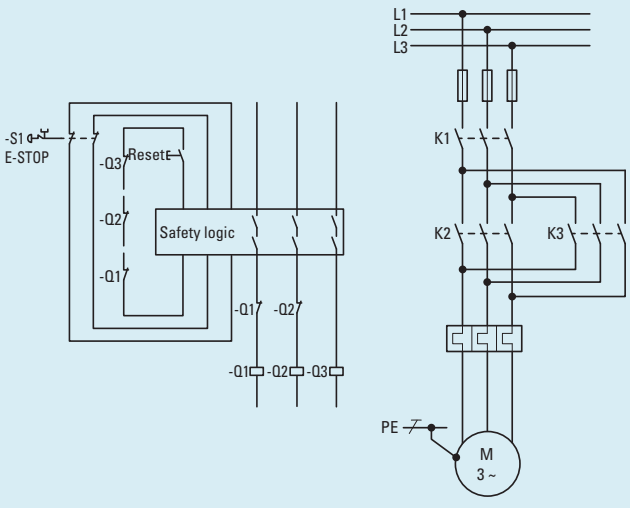
Faster for increased safety

EMS motor starters make it possible to implement applications with safe stopping in accordance with SIL 3 and PLe much faster and easier than possible with conventional motor starters. In addition, their multifunctionality makes implementing the corresponding main and actuating circuits much simpler. This reduces installation efforts by up to 60% and the number of hardware components required by 70%.



Reversing starter with emergency stop

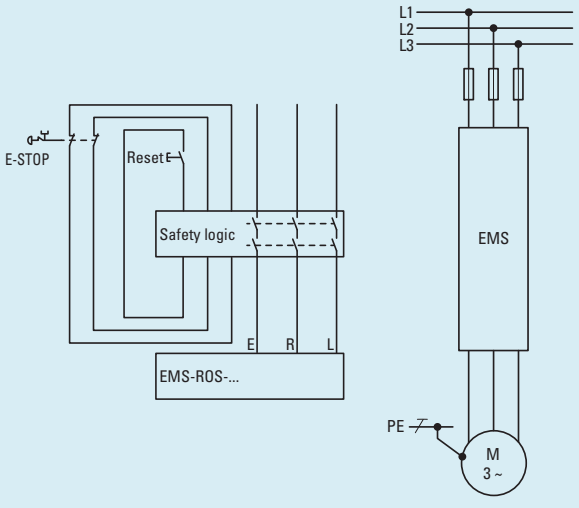
Conventional



Actuating circuit

Main circuit

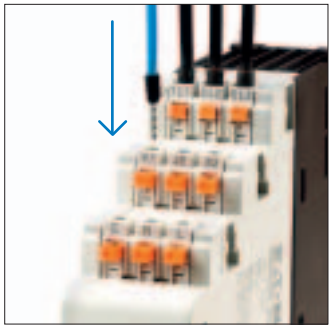
Electronic motor starter

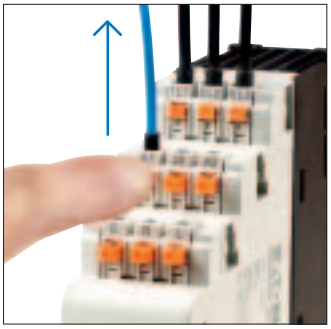


Actuating circuit

Main circuit

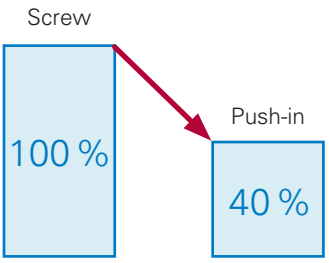
Smart terminal type





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



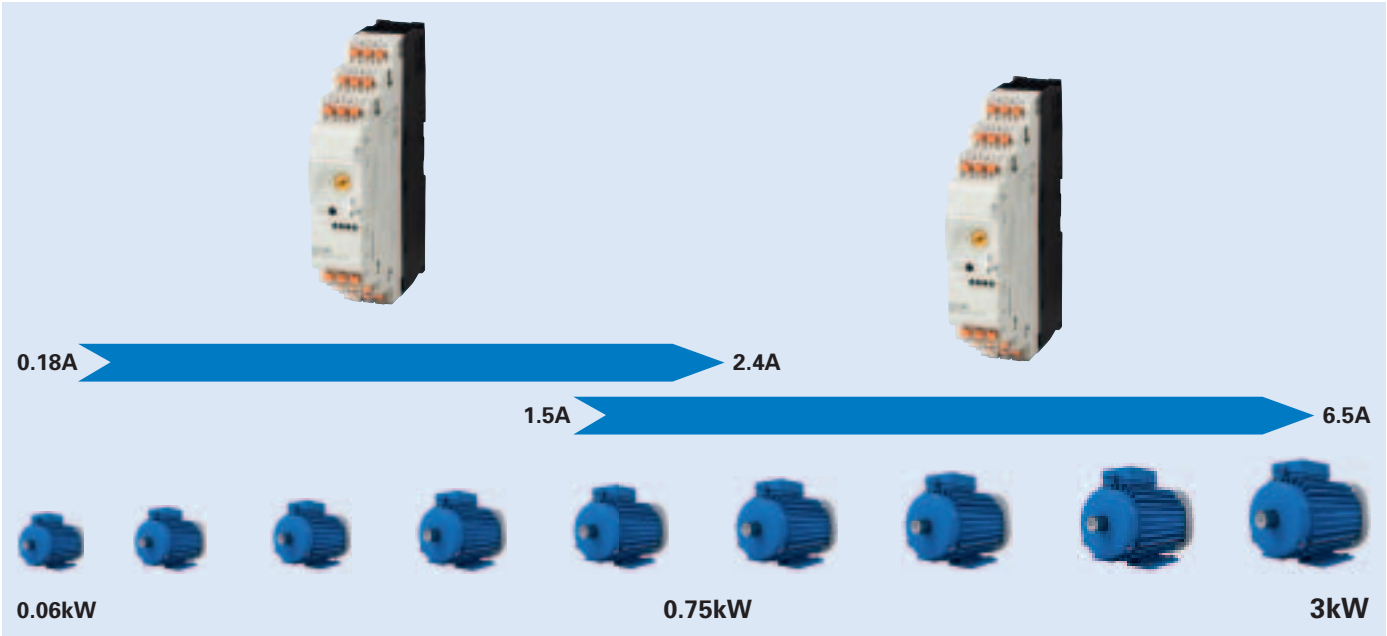
Time comparison

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.

Plug-in three-phase supply

EMS-XBR3 three-phase plug-in jumpers make it possible to quickly set up the three-phase supply for multiple electronic motor starters. In addition, the connection can be quickly disconnected by simply applying pressure in case one of the electronic motor starters needs to be replaced.

Wide-range overload protection



Electronic wide-range overload protection enables a single electronic motor starter model to cover multiple motor outputs. This makes it easier to select products, simplifies bills of materials for machines, and reduces the number of models for spare parts.

Technical data

			EMS-…-2,4-24VDC	EMS-…-9-24VDC	EMS-…-2,4-SWD	EMS-…-9-SWD
General	Standards		IEC / EN 60947-4-2, UL508			
	Dimensions (W x H x D)	mm	30 x 157 x 123.5		30 x 157 x 132.5	
	Weight	kg	0.3			
	Mounting		Top-hat rail IEC/EN 60715, 35mm			
	Mounting position		Vertical, motor feeder on bottom			
	Degree of protection		IP20			
	Max. heat dissipation		3.3	14.6	2	12
	Lifespan	Operations	30 x 106			
Terminal capacity	Solid	mm²	1 x (0,2 … 2.5, 1 x (AWG24…14)			
	Flexible with ferrule *)	mm²	1 x (0,2 … 2.5, 1 x (AWG24…14)			
	Flexible with twin ferrule *)	mm²	2 x (0,2 … 1.5, 1 x (AWG24…16)			
Ambient climatic conditions	Operating ambient temperature	°C	-25 … 60		-5…60	
	Condensation		prevent with suitable measures			
	Storage	°C	-40 … 60			
Electromagnetic compatibility	Burst	kV	2			
	Surge	kV	1 (symmetric) / 2 (asymmetrical)			
	Electrostatic discharge					
	Air discharge	kV	8			
	Contact discharge	kV	6			
	Electromagnetic fields					
	80 - 1000MHz	V/m	10			
	1.4 - 2GHz	V/m	10			
	2 – 2.7GHz	V/m	3			
	Emitted interference cable related		Class A **)			
	Radiated emitted interference		Class A **)			
	Radiated RFI	V	10			
Control circuit	Supply voltage	V DC	24 (-20% +25%)			
	Supply voltage UAUX	V DC	-		24 (-15% + 20%)	
	Supply voltage USWD	V DC	-		15 (-30% + 10%)	
	Current draw	mA	40 (operation) / 120 (inrush)			
	Current draw UAUX	mA	-		70 (operation) / 120 (inrush)	
	Current draw USWD	mA	-		50	
Feedback output	Contact type		Single contact (1 changeover contact)			
	Maximum switching voltage	VAC	250			
	Switching capacity AC-15 (230VAC)	A	3			
	Switching capacity DC-13 (24VDC)	A	2			
Power section	Circuit design		safety end stage with bypass, Three-phase switch off			
	Rated operational voltage	VAC	500 (42…550)	500 (42…550)	500 (42…550)	500 (42…550)
	Rated operational current					
	AC-51 (EN60947-3)	A	0.15…2.4	1.2…9	0.15…2.4	1.2…9
	AC-53a (EN60947-3)	A	0.15…2.4	1.2…6.5	0.15…2.4	1.2…7
	Minimum heat dissipation	W	1.1	3.3	0.1	2
	Max. heat dissipation	W	3.3	14.6	2	12

*) 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	EMS-…-9-SWD
Main circuits	Rated impulse withstand voltage (to control circuit)	kV	6			
	Overvoltage category		III			
	Pollution degree		2			
	Rated insulation voltage (to control circuit)	VAC	500			
	Load cycle		Ir ≤ 2.4A: AC-53a: 8-0.4: 50-100	Ir ≤ 4A: AC-53a: 8-0.4: 50-100 Ir ≤ 6.5A AC-53a: 8-1: 50-20	Ir ≤ 2.4A: AC-53a: 8-0.4: 50-100	Ir ≤ 4A: AC-53a: 8-0.4: 50-100 Ir ≤ 7A AC-53a: 8-1: 50-20
Motor protection	Overload release setting range	A	0.18…2.4	1.5…9	0.18…2.4	1.5…9
	Motor protection characteristic	Class	10	10 (Ir ≤ 4A) 10A (Ir > 4A)	10	10 (Ir ≤ 4A) 10A (Ir > 4A)
	Reclosing capability	Min.	2 (manual starting) / 20 (automatic restarting)			
	Balance monitoring					
	Current deviation threshold values	%	≥33 / ≥67			
	Pick-up time	s	120 / 1,8			
	Stall protection					
	Pick-up value I (L1) or I (L3)	A	-	45	33	60
	Pick-up time	s		2	0.5	0.5
Short-circuit protective device	500V AC / 50kA (IEC)				16A gG/gL 30A CCMR30	
	415V AC / 50kA (IEC)				PKM0-4	
	415V AC / 15kA (IEC)				PKM0-6,3	
	400V AC / 2,5kA (IEC)				FAZ-B16/3	
	480V AC / 100kA (UL)				30A Class J / CC	
	480V AC / 5kA (UL)				20A RK5	
Conformity / Approval	EC prototype test certification according		II (2) (G) [Ex e] [Ex d] [Ex px] II (2) (D) [Ex t] [Ex p] PTB 13 ATEX 3003			
	UL		E29096			
Safety characteristic values	Safe stop (EMS-…S-…)					
	MTTFd	a	420		167	
	Safety level					
	As per IEC 61508-1		SIL3			
	As per ISO 13849-1		PL e			
	As per EN 954-1		Cat. 3			
	Motor protection (EMS-…-24VDC, EMS-…S-SWD)					
	MTTFd	a	316		192	
	Safety level		SIL 2		SIL2	

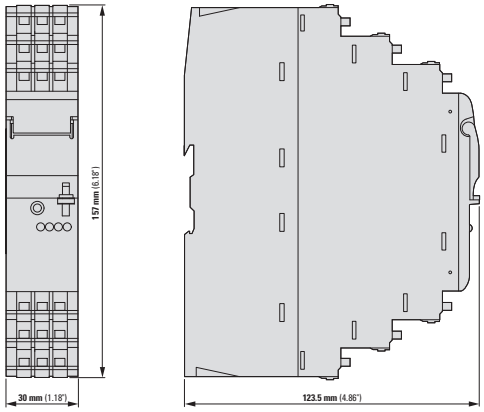
Safety engineering		Safe switch off (EMS-DOS-…/EMS-ROS-…)			Motor protection EMS-DO…/EMS-RO…
Ambient Temperature	°C	40	Ambient Temperature	°C	40
MTTFd	Years	421/420	MTTFd	Years	316/316
λsd [FIT]		47/49	λsd [FIT]		0/0
λsu [FIT]		1582/1818	λsu [FIT]		1550/1731
λdd [FIT]		269/269	λdd [FIT]		314/314
λdu [FIT]		2.4/2.7	λdu [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	$2.4 \times 10^{-9}/2.7 \times 10^{-9}$			
Safety level					
IEC 61508-1		SIL 3	IEC 61508-1		SIL2
ISO 13849-1		PL e			
EN 954-1		Cat. 3			

Electronic motor starter EMS

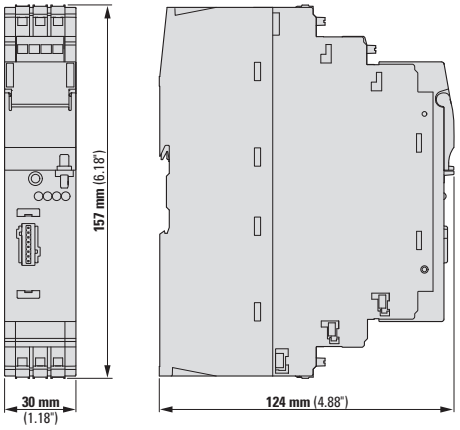
	Function	Setting range Overload protector Ir A	Motor rating AC-53a 380V 400V 415V kW	Part no.	Article no.
	**Conventional control**				
	DOL start, motor protection	0.18…2.4	0.06….0.75	**EMS-DO-T-2,4-24VDC**	170099
	DOL start, motor protection	1.5…9(6.5 AC-53a)	0.55…3	**EMS-DO-T-9-24VDC**	170100
	DOL start, motor protection, emergency stop	0.18…2.4	0.06….0.75	**EMS-RO-T-2,4-24VDC**	170101
	DOL start, motor protection, emergency stop	1.5…9(6.5 AC-53a)	0.55…3	**EMS-RO-T-9-24VDC**	170102
	DOL start, reversing start, motor protection	0.18…2.4	0.06….0.75	**EMS-DOS-T-2,4-24VDC**	170103
	DOL start, reversing start, motor protection	1.5…9(6.5 AC-53a)	0.55…3	**EMS-DOS-T-9-24VDC**	170104
	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 AC-53a)	0.55…3	**EMS-ROS-T-9-24VDC**	169789
	**SmartWire-DT control**				
	DOL start, motor protection, SmartWire-DT	0.18…2.4	0.06….0.75	**EMS-DO-T-2,4-SWD**	170106
	DOL start, motor protection, SmartWire-DT	1.5…9(7 AC-53a)	0.55…3	**EMS-DO-T-9-SWD**	170107
	DOL start, motor protection, emergency stop, SmartWire-DT	0.18…2.4	0.06….0.75	**EMS-RO-T-2,4-SWD**	170108
	DOL start, motor protection, emergency stop, SmartWire-DT	1.5…9(7 AC-53a)	0.55…3	**EMS-RO-T-9-SWD**	170109
	DOL start, reversing start, motor protection, SmartWire-DT	0.18…2.4	0.06….0.75	**EMS-DOS-T-2,4-SWD**	170110
	DOL start, reversing start, motor protection, SmartWire-DT	1.5…9(7 AC-53a)	0.55…3	**EMS-DOS-T-9-SWD**	170111
	DOL start, reversing start, motor protection, emergency stop, SmartWire-DT	0.18…2.4	0.06….0.75	**EMS-ROS-T-2,4-SWD**	170112
	DOL start, reversing start, motor protection, emergency stop, SmartWire-DT	1.5…9(7 AC-53a)	0.55…3	**EMS-ROS-T-9-SWD**	169790
	**Main current connection**	Number of devices that can be connected			
	3-phase, A = 2.5 mm², black, 2 m input wiring	2		**EMS-XBR3-2**	177248
	3-phase, A = 2.5 mm², black, 2 m input wiring	3		**EMS-XBR3-3**	177249
	3-phase, A = 2.5 mm², black, 2 m input wiring	4		**EMS-XBR3-4**	177250
	3-phase, A = 2.5 mm², black, 2 m input wiring	5		**EMS-XBR3-5**	177251
	**Control current connector**				
	Single-phase, A = 0.75 mm², blue, 2 m input wiring	2		**EMS-XCW-2**	172741
	Single-phase, A = 0.75 mm², blue, 2 m input wiring	3		**EMS-XCW-3**	172742
	Single-phase, A = 0.75 mm², blue, 2 m input wiring	4		**EMS-XCW-4**	172743
	Single-phase, A = 0.75 mm², blue, 2 m input wiring	5		**EMS-XCW-5**	172744

Dimensions

EMS without SmartWire-DT

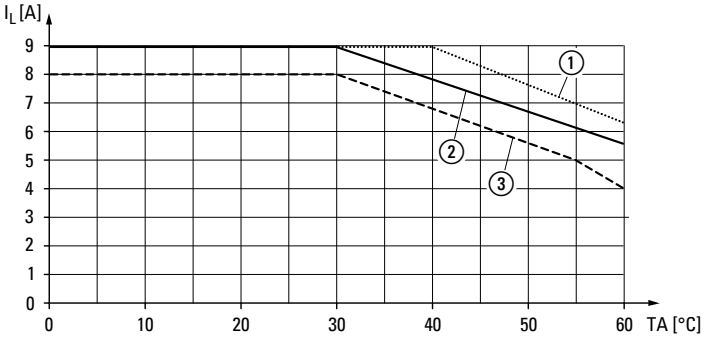


EMS with SmartWire-DT



Derating

rated operational current EMS-…-9-…



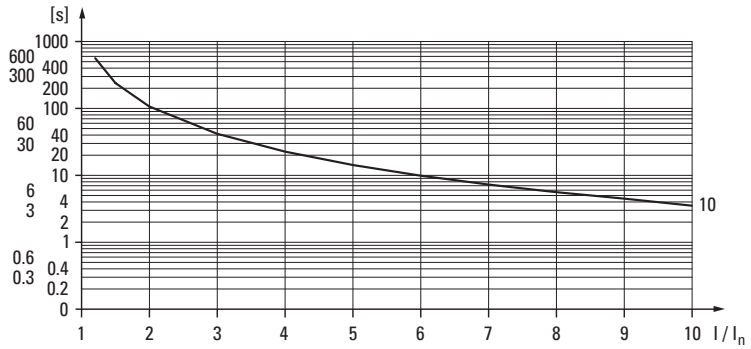
1 Stand-alone device
2 Connected in series, with a distance equal to one housing width (30 mm)
3 Connected in series, without any distance

rated operational current EMS-…-SWD

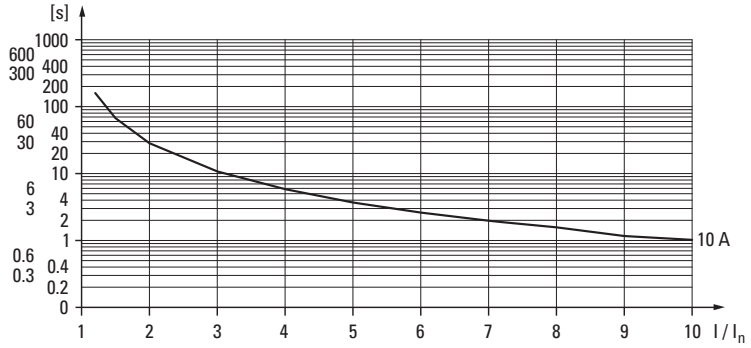
EMS-…-2,4-SWD					
Temperature (°C)	**40**	**45**	**50**	**55**	**60**
Stand-alone device	2.4	2.4	2.4	2.4	2.4
Connected in series, with a distance equal to one housing width	2.4	2.4	2.4	2.4	2.4
Connected in series, without any distance	2.4	2.4	2.4	2.4	–

EMS-…-9-SWD					
Temperature (°C)	**40**	**45**	**50**	**55**	**60**
Stand-alone device	9	9	9	9	7.6
Connected in series, with a distance equal to one housing width	9	9	7.6	7.6	5.2
Connected in series, without any distance	7.6	6.8	5.2	2.4	–

Trip type EMS



EMS-…-2,4-…
EMS-…-9-…(Ir ≤ 4A)



EMS-…-9-…(Ir > 4A)

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.eu.**

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

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