Description

E-T-A's ESX10 electronic circuit protector is only 12.5 mm wide and selectively protects all DC 24 V load circuits, thereby increasing the uptime of machines and systems. This is achieved by a combination of active current limitation in the event of a short circuit and overload disconnection typically from 1.1 times rated current. The ESX10 responds faster than frequently used DC 24 V switch mode power supplies without tripping fast and thus prevents disastrous voltage dips of the supply. It works with a single trip curve for all loads. Even capacitive loads up to 75,000 μF can be handled very easily. The device is available in fixed current ratings from 0.5 A to 12 A and with optional control inputs. The integral fail-safe element (fuse) is adjusted to the circuit protectors rated current and can thus very easily be synchronised with the wired cable cross section. This makes planning much easier.

US patent number: US 6,490,141 B2



Features

- Plug-in mounting on power distribution modules 17plus, 18plus and SVSxx
- Active linear current limitation
- Capacitive loads up to 75,000 μF
- Fixed current ratings 0.5 A...12 A
- Approvals: UL, CSA, DNV GL
- OPTION: Control inputs, signalling
- OPTION: ATEX and IECEx approval

Your benefits

- Increases machine uptime through clear failure detection and stable power supply
- Reduces downtimes through quick fault resolution
- Simplifies planning through clear sizes and ratings
- Saves costs and time through fast and flexible plug-in mounting

Preferred types - for more details on all configurations please see order numbering code

Preferred types are E-T-A products most frequently used by E-T-A customers. We manufacture E-T-A preferred types in particularly high

volumes. Our preferred types are supplied at shorter lead times than non-standard versions.

Preferred types	Preferred ratings (A)							
ESX10	1	1 2 3 4 6 8 10 12						
ESX10-103-DC24V	х	х	х	Х	х	х	х	х

Approvals



Information online

The current data sheet is available on our website: www.e-t-a.de/d355

Compliances





2010 www.e-t-a.de

Technical data (τ _{amt}	pient = 25 °C, operating voltage U _S = DC 24 V)
Operating data	
Operating data Operating voltage U _S	DC 24 V (1832 V)
Current rating I _N	fixed current ratings: 0.5 A, 1 A, 2 A, 3 A, 4 A, 6 A, 8 A, 10 A, 12 A
Closed current I ₀	ON condition: typically 2030 mA depending on signal output
Status indication by means of	multicolour LED: GREEN: unit is ON, power-MOSFET is switched on - status output SF ON, supplies +DC 24 V ORANGE: in the event of overload or short circuit until electronic disconnection RED: - unit electronically disconnected - load circuit/Power-MOSFET OFF OFF: - manually switched off (S1 = OFF) or device is dead - undervoltage (U _S < 8 V) - after switch-on till the end of the delay period status output SF (option) potential-free signal contact F (option) ON/OFF/ condition of switch S1
Load circuit	
Load output	Power-MOSFET switching output (high side switch)
Overload disconnection	typically 1.1 x I _N (1.051.35 x I _N)
Short-circuit current I _K	active current limitation (see table 1)
Trip time for electronic disconnectio	see time/current characteristics n typically 3 s at $I_{load} > 1.1 \times I_{N}$ typically 3 s100 ms at $I_{load} > 1.8 \times I_{N}$ (or $1.5 \times I_{N}/1.3 \times I_{N}$)
Temperature disconnection	n internal temperature monitoring with electronic disconnection
Low voltage monitoring load output	with hysteresis, no reset necessary load "OFF" at $\rm U_S < 8~V$
Starting delay t _{start}	typically 0.5 sec after every switch-on and after applying U _S
Disconnection of load circu	it electronic disconnection
Free-wheeling circuit	external free-wheeling diode recommended with inductive load
Several load outputs must	not be connected in parallel
Status output SF	ESX10-104/-124
Electrical data	plus-switching signal output, connects U _S to terminal 12 of module 17plus nominal data: DC 24 V / max. 0.2 A (short circuit proof) status output is internally connected to GND with a 10 kOhm resistor
Status OUT	ESX10-104/-106/ -124 (signal status OUT), at $U_S = +24 \text{ V}$ +24 V = S1 is ON, load output connected through 0V = S1 is ON, load output blocked and/or switch S1 is OFF
Status OUT	ESX10-127 (signal status OUT inverted), at $U_S = +24 \text{ V} +24 \text{ V} = S1$ is ON, load output blocked, red LED lighted 0 V = S1 is ON, load output connected through and/or switch S1 is in OFF position
OFF condition	 0 V level at status output when: switch S1 is in ON position, but device is still in switch-on delay switch S1 is OFF, or control signal OFF, device is switched off no operating voltage U_S

Teeriffical data ('am	bient = 25°C, operating voltage U _S = DC 24 V)
Signal output F	ESX10-103/-115/-125
Electrical data	potential-free signal contact max. DC 30 V/0.5 A, min. 10 V/10 mA
ON condition LED green	voltage U _S applied, switch S1 is in ON position no overload, no short circuit
OFF condition LED off	 device switched off (switch S1 is in OFF position) no voltage U_S applied
Fault condition LED orange	overload condition > 1.1 x I _N up to electronic disconnection
Fault condition LED red	electronic disconnection upon overload or short circuit
	device switched off with control signal (switch S1 is in ON position)
ESX10-101	single signal, make contact contact SC/SO-SI open
ESX10-102	single signal, break contact contact SC/SO-SI closed
ESX10-103	group signal change-over contact contact SC-SO open, SC-SI closed
ESX10-115/-125	group signal, make contact contact SC-SO open
Fault	signal output fault conditions: no operating voltage U _S ON/OFF switch S1 is in OFF position red LED lighted (electronic disconnection

ESX10-124/-125

neset input ne	LOX 10-12-7-125
Electrical data	voltage: max. + DC 32 V high > DC 8 V \leq DC 32 V low \leq DC 3 V > 0 V power consumption typically 2.6 mA (+DC 24 V) min. pulse duration typically 10 ms
Reset signal RE (= terminal 13,14 or 12 of Module 17plus)	The electronically blocked ESX10-124/-127 may remotely be reset via an external momentary switch due to the falling edge of a +24 V pulse.
Caution: unused slots have to be fitted with jumpers	The reset signal will be fed in terminal 13, 14 or 12 of Module 17plus and is internally pre-wired. The reset simultaneously affects all blocked
	ESX10-124/-127 channels of the power distribution system, all switched on ESX10-124/-127 channels remain unaffected. With type ESX10-125 the reset only affects the device concerned. By connecting the individual terminals 12 of the Module 17plus a joint reset signal for all ESX10-125 may be generated.
Control input IN+	ESX10-115
Electrical data	see reset input RE
Control signal IN+	+24 V level (HIGH): device will be switched on by a remote ON/OFF signal 0 V level (LOW): device will be switched off by a remote ON/OFF signal
Switch S1 ON/OFF	unit can only be switched on with S1 if a HIGH level is applied to IN+
General data	
Fail-safe element:	backup fuse for ESX10 <u>not required</u> because of the integral redundant fail-safe element
Blade terminals	6.3 mm to EN 60934-A6.3-0.8
Housing	moulded
Mounting	plug-in mounting utilising power distribution system Module 17plus or Module 18plus (optionally SVSxx)

Reset input RE

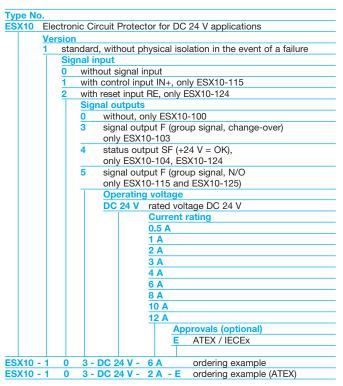
Technical data (Tambient = 25°C, operating voltage U _S = DC 24 V)					
Ambient temperature Storage temperature	0+50 °C (without condensation, see EN 60204-1)				
Humidity	96 hrs/95 % RH/40 °C to IEC 60068-2-78, test Cab. climate class 3K3 to EN 60721				
Vibration	3 g, test to IEC 60068-2-6 test Fc				
Degree of protection	IEC 60529, DIN VDE 0470 operating area IP30, terminal area IP00				
EMC (EMC directive, CE logo)	emission: EN 61000-6-3 susceptibility: EN 61000-6-2				

Technical data (τ _{ambient} = 25°C, operating voltage U _S = DC 24 V)					
Insulation co-ordination (IEC 60934)	0.5 kV/2 pollution degree 2 re-inforced insulation in operating area				
Dielectric strength Insulation resistance (OFF condition)	max. DC 32 V (load circuit)				
Approvals	n/a, only electronic disconnection to directive 2014/30/EU, 2011/65/EU ESX10-1E additionally directve 2014/34/EU (ATEX)				
Dimensions (W x H x D)	12.5 x 70 x 60 mm (tolerances to DIN ISO 286 part 1 IT13)				
Mass	approx. 40 g				

Preferred types

Preferred types	Preferred ratings (A)							
ESX10	1	1 2 3 4 6 8 10 12						
ESX10-103-DC24V	х	х	х	х	х	х	х	х

Ordering information



Application note

- The user has to ensure that the cable cross section of the load circuit in question complies with the current rating of the ESX10 used.
- In addition special precautions must be taken in the system or machine (e.g. use of a safety PLC) which reliably prevent an automatic re-start of parts of the system (cf. Machinery Directive 2006/42/EG and EN 60204-1, Safety of Machinery). In the event of a failure (short circuit/overload) the load circuit will be disconnected electronically with physical isolation of the contacts by the ESX10.

Custom designed versions

Looking for a version you cannot find in our ordering number code? Please get in touch. We will be pleased to find a solution for you.

4

Authority Standard File certificate no. Voltage ratings **Current ratings** UL UL 2367 E306740 DC 24 V 0.5...12 A UL UL 121201 (Class I, Division 2, Groups E320024 DC 24 V 0.5...12 A A, B, C, D) UL UI 508 F322549 DC 24 V 0.5...12 A CSA C22.2 No. 14 **CSA** C22.2 No. 213 (Class I, Division 2 016186 DC 24 V 0.5...12 A Groups A, B, C, D) CG-0339 (classes: temperature: B; humidity, vibration, EMC: A) DNV GL TAE000025Y DC 24 V 0.5...12 A ATEX (EU additionally directive EPS 18 ATEX 1 127 X DC 24 V Bureau Veritas 0.5...12 A 2014/34/EU) EN 60079-0 EN 60079-7 EN 60079-15 **IECEx** IEC 60079-0 IECEx EPS 18.0059X DC 24 V 0.5...12 A IEC 60079-7 IEC 60079-15

❷ 国际A Electronic Circuit Protector ESX10

Information on UL approvals/CSA approvals



ESX10 UL2367 Solid State Overcurrent Protectors UL File # E306740

UL 121201 (Hazardous Locations Class I, Division 2, Group A, B, C, D)
UL File # E320024



ESX10

UL 508, CSA C22.2 No. 14 Auxiliary Devices –Industrial Control Equipment UL File # E322549



ESX10

CSA C22.2 No: 14

CSA C22.2 No. 213 (Hazardous Locations Class I, Division 2, Group A, B, C, D) - File # 16186

Operating Temperature Code T4 A / 0 °C to 50 °C

- This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only

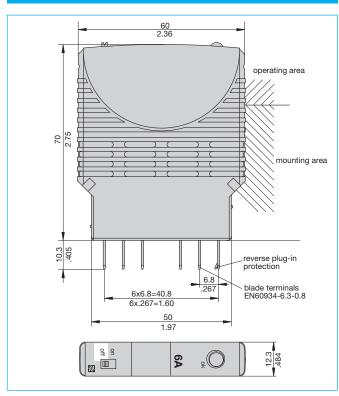
WARNING - EXPLOSION HAZARD:

- Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous
- When plugged into the E-T-A 18plus power distribution system the max. current rating for the 18plus EM module is 48 A.

This device is OPEN type equipment that must be used within a suitable end-use system enclosure, the interior of which is accessible only through the use of a tool. The suitability of the enclosure is subject to investigation by the local Authority Having Jurisdiction at the time of installation.

Wiring to or from this device, which enters or leaves the system enclosure, must utilize wiring methods suitable for Class , Division 2 Hazardous Locations, as appropriate for the installation.

Dimensions



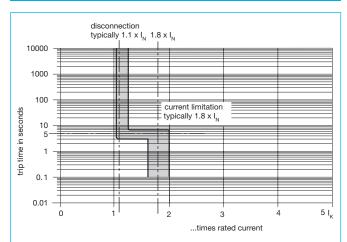
This is a metric design and millimeter dimensions take precedence ($\frac{mm}{inch}$)

Table 1: voltage drop, current limitation, max. load current

current rating I _N	typical voltage drop U _{ON} at I _N	active current limitation (typically)	max. load cu 100 % ON d	
			T _U = 40 °C	T _U = 50 °C
0.5 A	70 mV	1.8 x I _N	0.5 A	0.5 A
1 A	80 mV	1.8 x I _N	1 A	1 A
2 A	130 mV	1.8 x I _N	2 A	2 A
3 A	80 mV	1.8 x I _N	3 A	3 A
4 A	100 mV	1.8 x I _N	4 A	4 A
6 A	130 mV	1.8 x I _N	6 A	5 A
8 A	120 mV	1.5 x I _N	8 A	7 A
10 A	150 mV	1.5 x I _N	10 A	9 A
12 A	180 mV	1.3 x I _N	12 A	10.8 A

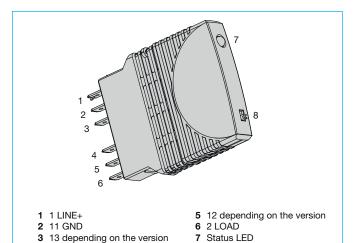
Attention: when mounted side-by-side without convection the ESX10-0.. should not carry more than 80 % of its rated load with 100 % ON duty due to thermal effects.

Time/current characteristic curve (T_A = 25 °C)



- *1) current limitation typically 1.8 x I_N times rated current at $I_N = 0.5$ A...6 A current limitation typically 1.5 x I_N times rated current at $I_N = 8$ A or 10 A current limitation typically 1.3 x I_N times rated current at $I_N = 12$ A
- The trip time is typically 3 s in the range between 1.1 and 1.8 x I_N^{*1}).
- Electronic current limitation occurs at typically 1.8 x I_N*1) which means that under all overload conditions (independent of the power supply and the resistance of the load circuit) the max. overload before disconnection will not exceed 1.8 x I_N*1) times the current rating. Trip time is between 100 ms (short circuit current I_K) and 3 sec (at overload with high line attenuation).
- Without this current limitation a considerably higher overload current would flow in the event of an overload or short circuit.

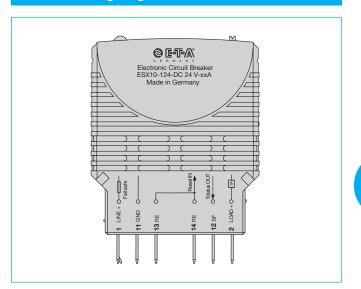
Connection and operation elements ESX10-1xx



8 ON/OFF switch

Terminal wiring diagram ESX10-124

14 depending on the version



Schematic diagram ESX10-124

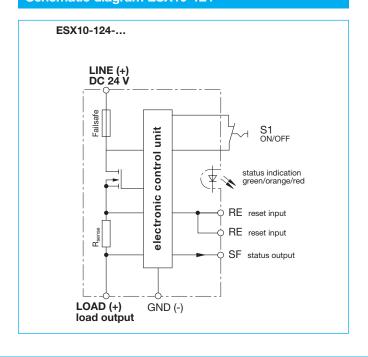


Table 2: ESX10 - product version

version	signal	input	signal output				
			signal output F		status output SF		
ESX10	control input ON/OFF +24 V Control IN+	reset input +24 V RE	group signal N/O	group signal change-over	status OUT +24 V = OK		
-100							
-103				Х			
-104					Х		
-115	Х		Х				
-124		Х			Х		
-125		Х	Х				

Table 3: Reliable trip of ESX10

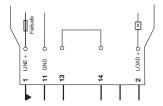
Reliable trip o	f ESX10 with	n different o	cable lengtl	hs and cross	sections		
Resistivity of copper $\rho_0 = 0.0178$ (Ohm x mm ²)	/ m						
U _S = DC 19.2 V (= 80 % v. 24 V)	voltage drop of ESX10 and tolerance of trip point (typically 1.1 x I_N = 1.05 1.35 x I_N) have been taken into account.						
ESX10-selected rating I _N (in A) →	3	3 6					
e. g. trip current $I_{ab} = 1.25 \times I_N$ (in A) \rightarrow	3.75	7.5	7.5 → ESX10 trips after 3 s 2.51				
R_{max} in Ohm = (U _S / I _{ab}) - 0.050 \rightarrow	5.07	2.51					
The ESX10 re	iably trips fr	om 0 Ohm	to max. cir	cuitry resista	ance R _{max}		
Cable cross section A in mm ² →	0.14	0.25	0.34	0.5	0.75	1	1.5
cable length L in meter (= single length)			cable resi	istance in Ol	nm = (R ₀ x 2	x L) / A	
5	1.27	0.71	0.52	0.36	0.24	0.18	0.12
10	2.54	1.42	1.05	0.71	0.47	0.36	0.24
15	3.81	2.14	1.57	1.07	0.71	0.53	0.36
20	5.09	2.85	2.09	1.42	0.95	0.71	0.47
25	6.36	3.56	2.62	1.78	1.19	0.89	0.59
30	7.63	4.27	3.14	2.14	1.42	1.07	0.71
35	8.90	4.98	3.66	2.49	1.66	1.25	0.83
40	10.17	5.70	4.19	2.85	1.90	1.42	0.95
45	11.44	6.41	4.71	3.20	2.14	1.60	1.07
50	12.71	7.12	5.24	3.56	2.37	1.78	1.19
75	19.07	10.68	7.85	5.34	3.56	2.67	1.78
100	25.34	14.24	10.47	7.12	4.75	3.56	2.37
125	31.79	17.80	13.09	8.90	5.93	4.45	2.97
150	38.14	21.36	15.71	10.68	7.12	5.34	3.56
175	44.50	24.92	18.32	12.46	8.31	6.23	4.15
200	50.86	28.48	20.94	14.24	9.49	7.12	4.75
225	57.21	32.04	23.56	16.02	10.68	8.01	5.34
250	63.57	35.60	26.18	17.80	11.87	8.90	5.93
Example 1:	max. leng	th at 1.5 mr	m ² and 3 A	→ 214 m			
Example 2:	max. leng	th at 1.5 mr	m² and 6 A	→ 106 m			
mixed wiring: R1 = 40 m in 1.5 mm ² and R2 = 5 m in 0.25 mm ² : (Control cabinet – sensor/actuator level) R1 = 0.95 Ohm, R2 = 0.71 Ohm)hm				
	· ·	+ R2) = 1.6		,			

ESX10 Signal inputs / outputs (wiring diagram)

ESX10 signal inputs / outputs (wiring diagrams)

Signal contacts are shown in the OFF or fault condition.

ESX10-100 without signal input/output



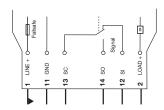
ESX10-115-... with control input IN+ (+DC 24 V)

with signal output F (group signal, N/O)

operating condition: SC-SO closed fault condition: SC-SO open

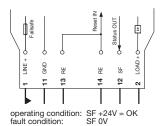
ESX10-103

without signal input with signal output F (group signal, change-over)



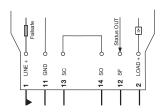
operating condition: SC/SO closed, SC-SI open fault condition: SC/SO open, SC-SI closed

ESX10-124-... with reset input RE (+DC 24 V↓) with status output SF (+24V = load output ON)



ESX10-104

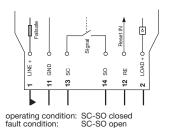
without signal input with status output SF (+24 V = load output ON)



operating condition: SF +24 V = OK fault condition: SF 0V

ESX10-125-...

with reset input RE (+DC 24 V↓) with signal output F (group signal, N/O)



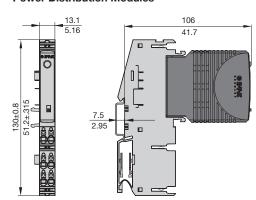
Installation example Module 17plus

LOAD+

Module 17plus for ESX10-1xx For technical data please see product group **Power Distribution Modules** slot for fitting labels from Phoenix, Weidmüller, Wieland 70 57 17 plus 47 1.85 42.5 1.67 63 2.48 G-profile EN 50035-G32 .236 max. 38 max. 1.50 slot for busbar right-side terminal block ╌╌╌ left-side terminal block

Installation example Module 18plus

Module 18plus for ESX10-100 / ESX10-103 For technical data please see product group **Power Distribution Modules**



EU Declaration of Conformity for ATEX-version ESX10-TA/-TB-...-E



E-T-A Elektrotechnische Apparate GmbH

EU-Konformitätserklärung Nr. 100.218.1053-01

Wir we Industriestraße 2-8, D-90518 Altdorf, Germany

erklären in alleiniger Verantwortung, dass das Produkt declare under our sole responsibility that the product

Elektronische Schutzschalter / Electronic circuit-breaker

EMV-Richtlinie EMC directive

auf das sich diese Erklärung bezieht, mit den wesentlichen Anforderungen folgender Richtlinie(n) übereinstimmt: to which this declaration relates, is in conformity with the essential requirements of following Directive(s)

2014/30/EU 2014/30/EU

2014/34/EU 2014/34/EU

ATEX-Richtlinie ATEX directive 2011/65/EU

Beschränkung bestimmter gefährlicher Stoffe (RohS) Restriction of hazardous substances (RohS)

Zur Beurteilung der Übereinstimmung wurde(n) folgende Norm(en) oder normativen Dokumente herangezogen: For evaluation of the conformity following standard(s) or normative document(s) were consulted: EN 61000-6-2: 2005 Elektromagnetische Verträglichkeit (EMV) Tell 6-2: Fachgrundnormen – Störfestigkeit für Industriebereiche Electromagnetisc compatibility (EMC) Part 6-2: Generic standards – Immunity for industrial environments.

EN 61000-6-3: 2007 +A1:2011 Elektromagnetische Verträglichkeit (EMV) Teil 6-3: Fachgrundnormen – Slöraussendung für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe Electromagnetic compatibility (EMC) Part 6-3: Generic standards – Emission standard for residential, commercial and tight-industrial environments

EN 60079-0:2012+A11:2013 Explosionsgefährdete Bereiche - Teil 0: Betriebsmittel - Allgemeine Anforderungen/ Explosive atmospheres - Part (- General requirements

EN 60079-7: 2015 Explosionsfähige Atmosphäre - Teil 7: Geräteschutz durch erhöhte Sicherheit "e" / Explosive atmospheres - Part 7: Equipment protection by increased safety "e"

EN 60079-15:2010 Explosionsfähige Atmosphäre - Teil 15: Geräteschutz durch Zündschutzart "n" / Explosive atmospheres - Part 15: Equipment protection by protection "n"

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1/2 form: KE_01.12.2015



E-T-A Elektrotechnische Apparate GmbH

EN ISO/IEC 80079-34:2011 Explosionsgefährdete Bereiche - Teil 34: Anwendung von Qualitätsmanagementsystemen für die Herstellung von Ex-Produkten / Explosive atmospheres. Application of quality systems for equipment manufac

EN 50581:2012 Technische Dokumentation zur Beurteilung von Elektro-und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

m der Norm(en) oder der anderen normativen Dokur ndard(s) or other normative document(s) Juhichik

ppa. Flaff Dietrich (Mitglied der Geschäftsleitung) (Name: Position und Unterschrift oder gleichwertige Kennzeichnung des Befügten / name, position and signature or equivalent of authorized person)

E-T-A Elektrotechnische Apparate GmbH • Tel. +49 9187 100 • Fax +49 9187 10398
2/2 form: KE_01.12.2015

This is a metric design and millimeter dimensions take precedence ($\frac{mm}{\text{inch}})$

All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

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