図画面 Electronic Circuit Protector ESX10-T.-DC 24 V

Description

Electronic circuit protector type ESX10-T is designed to ensure selective disconnection of DC 24 V load systems.

DC 24 V power supplies, which are widely used in industry today, will shut down the output in the event of an overload with the result that one faulty load in the system can lead to complete disconnection of all loads. As well as an unidentified failure this also means stoppage of the whole system.

Through **selective** disconnection the ESX10-T responds much faster to overload or short circuit conditions than the switch-mode power supply. This is achieved by active current limitation. The ESX10-T limits the highest possible current to 1.3 to 1.8 times the selected rated current of the circuit protector. Thus it is possible to switch on **capacitive loads of up to 20,000 \mu F**, but they are disconnected only in the event of an overload or short circuit.

For optimal alignment with the characteristics of the application the current rating of the ESX10-T can be selected in fixed values from 0.5 A...12 A or in adjustable ratings 2 A/4 A/6 A or 2 A/3 A/4 A. Failure and status indication are provided by a multicolour LED and an integral short-circuit-proof status output or a potential-free signal contact. Remote operation is possible by means of a remote reset signal or a remote ON/OFF control signal. The manual ON/OFF button allows separate actuation of individual load circuits.

The ESX10-T, with a width of only 12.5 mm, can be snapped onto symmetrical rails ensuring ease of installation and saving space in control cabinets.

Upon detection of overload or short circuit in the load circuit, the MOSFET of the load output will be blocked to interrupt the current flow. The load circuit can be re-activated via the remote electronic reset input, control input or manually by means of the ON/OFF button.

Features

- Selective load protection, electronic trip characteristics.
- Active current limitation for safe connection of capacitive loads up to 20,000 µF and on overload/short circuit.
- Current ratings 0.5 A...12 A or adjustable ratings 2 A/4 A/6 A or 2 A/3 A/4 A.
- Reliable overload disconnection with 1.1 x I_N plus, even with long load lines or small cable cross sections (see table 3).
- Manual ON/OFF button (S1).
- Control input IN+ for remote ON/OFF signal (option).
- Electronic reset input RE (option).
- Clear status and failure indication through LED, status output SF or Si contact F.
- Integral fail-safe element adjusted to current rating.
- Width per unit only 12.5 mm.
- Rail mounting
- Ease of wiring through busbar LINE+ and 0 V as well as signal bars and bridges.

Approvals

ESX10-TA/-TB and -TD

Authority V	oltage rating	Current ratings
UL 2367	DC 24 V	0.512 A
UL 508	DC 24 V	0.512 A
ESX10-TA and -TB		
UL 1604 (class I, div. 2, groups A, B, C, D)	DC 24 V	0.512 A
CSA C22.2 No: 14	DC 24 V	0.512 A
CSA C22.2 No: 142	DC 24 V	0.512 A
CSA C22.2 No: 213 (class I, division 2)	DC 24 V	0.512 A



Technical data (Tambient = 25 °C, operating voltage U_S = DC 24 V)

Operating data		
Operating voltage l	J _S	DC 24 V (1832 V)
Current rating I _N		fixed current ratings: 0.5, 1 A, 2 A, 3 A, 4 A, 6 A, 8 A, 10 A, 12 A
		adjustable ratings (ESX10-TD): 2 A, 4 A, 6 A
		adjustable ratings (ESX10-TD-101): 2 A, 3 A, 4 A
Closed current I ₀		ON condition: typically 2030 mA depending on signal output
Status indication by means of	GREEN:	 multicolour LED: unit is ON, power-MOSFET is switched on status output SF ON, supplies + DC 24 V
	ORANG	E: in the event of overload or short
	RED:	circuit until electronic disconnection - unit electronically disconnected
	OFF:	 load circuit/Power-MOSFET 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 disconne	ction	typically 1.1 x I _N (1.051.35 x I _N)
Short-circuit currer	nt I _K	active current limitation (see table 1)
Trip time for electronic disco	onnection	see time/current characteristics 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 x $I_{N}/1.3 \times I_{N}$)
Temperature disconnection		internal temperature monitoring with electronic disconnection
Low voltage monitoring load output		with hysteresis, no reset required load "OFF" at $U_S < 8 \text{ V}$
Starting delay t _{start}		typically 0.5 sec after every switch-on and after applying U _S
Disconnection of lo	ad circuit	electronic disconnection
Free-wheeling circu	uit	external free-wheeling diode recommended with inductive load
Several load output	ts must n	ot be connected in parallel

図匠函 Electronic Circuit Protector ESX10-T.-DC 24 V

Technical data σ _{am}	bient = 25°C, operating voltage U _S = DC 24 V)
Status output SE	ESX10-T114/-124/
Electrical data	plus-switching signal output, connects $U_{\rm S}$ 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-TB-114/-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 red LED lighted
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
Signal output F	ESX10-T101/-102
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
ESX10-TB-101	single signal, make contact contact SC/SO-SI open
ESX10-TB-102	single signal, break contact contact SC/SO-SI closed
Fault	signal output fault conditions: • no operating voltage U _S • ON/OFF switch S1 is in OFF position • red LED lighted (electronic disconnection)
Reset input RE	ESX10-T124/-127
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 22)	The electronically blocked ESX10-TB-124/-127 may remotely be reset via an external momentary switch due to the falling edge of a +24 V pulse. A common reset signal can be applied to several devices simultaneously. Switched on devices remain unaffected.
Control input IN+	ESX10-T114
Electrical data Control signal IN+ (terminal 21)	see reset input RE +24V 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+
LED display	ON: LED green OFF: LED red
General data	
Fail-safe element:	backup fuse for ESX10-T not required because of the integral

because of the integral redundant fail-safe element

Technical data (T_{ambient} = 25°C, operating voltage U_S = DC 24 V)

Terminals	LINE+ / LOAD+ / 0V					
screw terminals max. cable cross section	M4					
flexible with wire end ferr multi-lead connection (2 identical cables)						
rigid/flexible	0.5 - 4 mm ²					
flexible with wire end ferrough flexible with TWIN wire end wire stripping length	ule without plastic sleeve 0.5 - 2,5 mm ² nd ferrule with plastic sleeve 0.5 - 6 mm ²					
tightening torque (EN 609						
Terminals	aux. contacts					
screw terminals max. cable cross section	M3					
flexible with wire end ferr wire stripping length	rule w/wo plastic sleeve 0.25 - 2.5 mm ² 8 mm					
tightening torque (EN 609	,					
Housing material	moulded					
Mounting	symmetrical rail to EN 50022-35x7.5					
Ambient temperature	0+50 °C (without condensation, see EN 60204-1)					
Storage temperature	-20+70 °C					
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	housing: IP20 DIN 40050 terminals: IP20 DIN 40050					
EMC (EMC directive, CE logo)	emission: EN 61000-6-3 susceptibility: EN 61000-6-2					
Insulation co-ordination (IEC 60934)	0.5 kV/2 pollution degree 2 re-inforced insulation in operating area					
dielectric strength	max. DC 32 V (load circuit)					
Insulation resistance (OFF condition)	n/a, only electronic disconnection					
Approvals (ESX10-TA/-TB/-TD)	CE-logo UL 2367, File # E306740, Solid State Overcurrent Protectors UL 508, File # E322549					
Approvals (ESX10-TA/-TB)	UL 1604, File # E320024 (class I, division 2 groups A, B, C, D) CSA C22.2 No: 14, File # 16186 CSA C22.2 No: 142, File # 16186 CSA C22.2 No: 213 (class I, division 2)					
Dimensions (W x H x D)	12.5 x 80 x 83 mm					
Mass	approx. 65 g					

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

current rating I _N	typically voltage drop U _{ON} at I _N	active current limitation (typically)		at 100 % ON duty T _{ambient} = 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			
2 A/4 A/6 A	130/100/130 mV	1.8 x I _N	2 A/4 A/6 A	2 A/4 A/5 A			
2 A/3 A/4 A	130/80/100 mV	1.8 x I _N	2 A/3 A/4 A	2 A/3 A/4 A			
Attention: when mounted side-by-side without convection the ESX10-T should not carry more than 80 % of its rated load with 100 % ON duty due to thermal effects.							

図画型 Electronic Circuit Protector ESX10-T.-DC 24 V

Ordering information

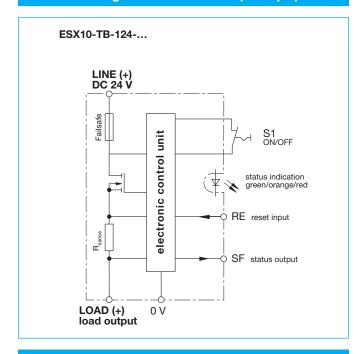
ESX10 Electronic Circuit Protector, with current limitation Mounting and design TA rail mounting, without signal contact rail mounting, with signal contact and slot for busbars and jumpers rail mounting, with signal contact and switch for current rating adjustment standard, without physical isolation in the event of a failure without signal input with control input IN+, only ESX10-T-114 with reset input RE, only ESX10-T-124, ESX10-T-127 without signal output (only ESX10-TA) signal contact N/O signal contact N/C status output SF (only ESX10-T-114, ESX10-T-124) inverse status output SF (only ESX10-T-127 erating voltag DC 24 V rated voltage DC 24 V **Current rating** 0.5 A 2 A 3 A 4 A 8 A 10 A 12 A 2/4/6 A adjustable (only ESX10-TD-...) 2/3/4 A adjustable (only ESX10-TD-101...) 0 - DC 24 V - 6 A ordering example

Description of ESX10-T signal inputs and outputs (wiring diagrams) see next page.

Please note:

- The user should ensure that the cable cross sections of the relevant load circuit are suitable for the current rating of the ESX10-T used.
- Automatic start-up of machinery after shut down must be prevented (Machinery Directive 98/37/EG and EN 60204-1). In the event of a short circuit or overload the load circuit will be disconnected electronically by the ESX10-T.

Schematic diagram ESX10-TB-124 (Example)



Terminal wiring diagram ESX10-TB-124 (Example)

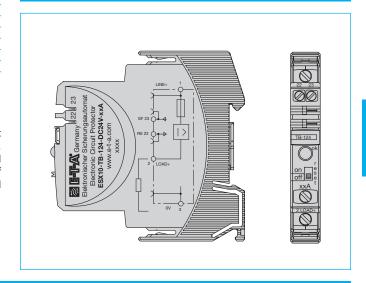
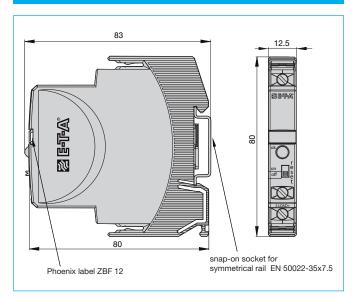


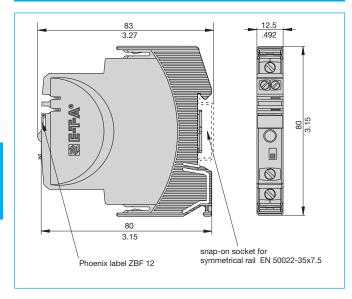
Table 2: ESX10-T - product version

Versi	on		Signal inp	ut	Signal output					Signal output		
					Signal output F (Signal contact) Status of			Status outpu	output SF			
ESX10		without	Control input ON/OFF +24 V Control IN+	Reset input +24 V ↓RE	without	single signal N/O (normally open NO)	single signal N/C (normally closed NC)	without	Status OUT +24 V = OK	Status OUT 0 V = OK		
-TA	-100	х			х			х				
-TB/-TD	-101	х				х		х				
-TB/-TD	-102	х					х	х				
-TB/-TD	-114		х						х			
-TB/-TD	-124			Х	х				х			
-TB/-TD	-127			х	х					х		

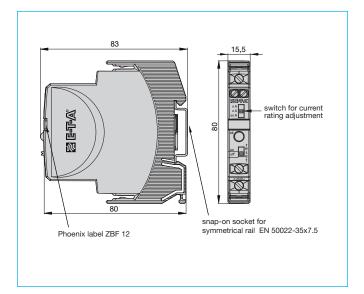
Dimensions ESX10-TA



Dimensions ESX10-TB



Dimensions ESX10-TD



Information on UL approvals/CSA approvals

ESX10-TA/-TB UL1604

UL File # E320024

Operating Temperature Code T5

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

Exposure to some chemicals may degrade the sealing properties of materials used in the following device: relay Sealant Material:

Generic Name: Modified diglycidyl ether of bisphenol A

Fine Polymers Corporation Supplier: Type: Epi Fine 4616L-160PK

Casing Material:

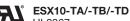
Generic Name: Liquid Crystal Polymer Supplier: Sumitomo Chemical E4008, E4009, or E6008 Type:

RECOMMENDATION:

Periodically inspect the device named above for any degradation of properties and replace if degradation is found

WARNING - EXPLOSION HAZARD:

- Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous
- Substitution of any components may impair suitability for Class I, Division 2



UL2367

Non-hazardous use - UL File # E306740

ESX10-TA/-TB/-TD

UL 508

Non-hazardous use - UL File # E322549

ESX10-TA/-TB

CSA C22.2 No: 14 - File # 16186 CSA C22.2 No: 142 - File # 16186 CSA C22.2 No: 213 (Class I, Division 2)

Class 2

Meets requirement for Class 2 current limitation (ESX10-T...-0,5 A/1 A/2 A/3 A)

Instruction leaflet



Electronic Circuit Protector

ESX10-T

FL° UL1604 UL File # E320024



This device is suitable for use in Class I, Div 2, Groups A, B, C, D; TC T5; Hazardous locations or nonhazardous locations only

Warnings:

Remove power before disconnecting device or the area is known to be nonhazardous.
 Components substitutions may impair suitability of Class I, Div 2.
 Chemical exposure may degrade internal relay's sealing property.

FL° UL<u>2367</u> Non-hazardous use

FL UL508 Non-hazardous use UL File # E322549



Refer to data sheet / installation guidelines for installation and safety instructions.

E-T-A Elektrotechnische Apparate GmbH D-90518 Altdorf · Industriestraße 2-8
Tel. +49 (0 91 87)10-0 · Fax +49 (0 91 87)10-397
E-Mail: info@e-t-a.de · www.e-t-a.com

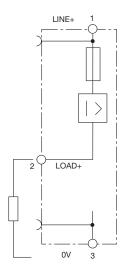
ESX10-T Signal inputs / outputs (wiring diagram)

ESX10-T signal inputs / outputs (schematic diagrams)

Auxiliary contacts are shown in OFF or error condition

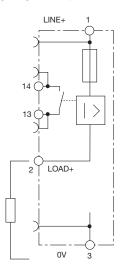
ESX10-TA-100

without signal input/output



ESX10-TB-101

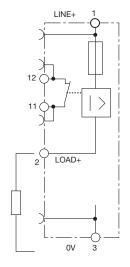
without signal input with signal output F (single signal, N/O)



operating condition: 13-14 closed fault condition: 13-14 open

ESX10-TB-102

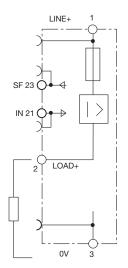
without signal input with signal output F (single signal, N/C)



operating condition: 11-12 open fault condition: 11-12 closed

ESX10-TB-114

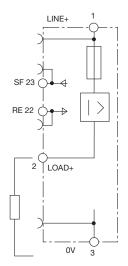
with control input IN+ (+DC 24 V) with status output SF (+24 V = load output ON)



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

ESX10-TB-124

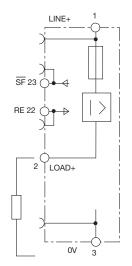
with reset input RE $(+DC\ 24\ V\ \downarrow)$ with status output SF $(+24\ V\ =\ load\ output\ ON)$



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

ESX10-TB-127

with reset input RE $(+DC\ 24\ V\ \downarrow)$ with inverse status output SF $(0\ V=load\ output\ ON)$

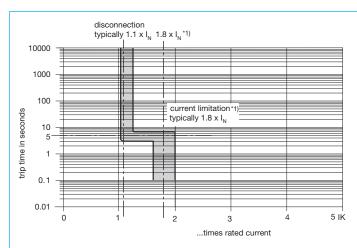


operating condition: SF 0 V = OK fault condition: SF +24 V

ESX10-TD

Schematic diagram similar to ESX10-TB, without signal busbars (on top)

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



 $^{\star 1)}$ 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

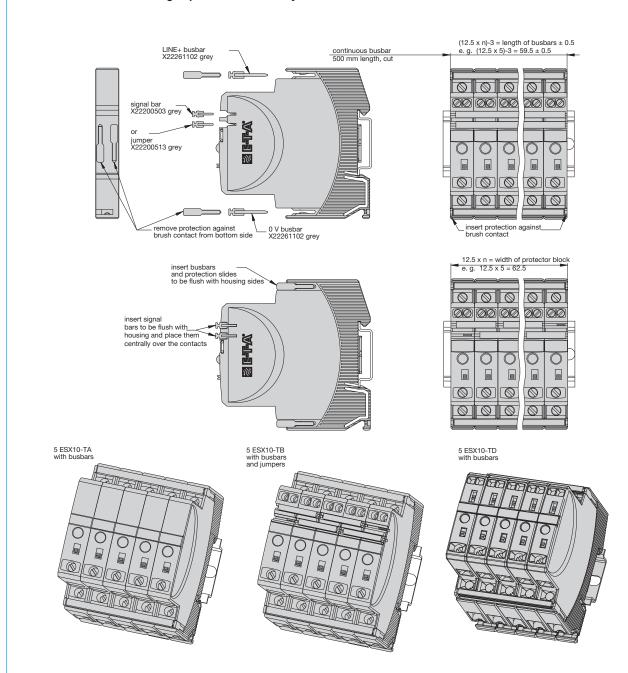
- The trip time is typically 3 s in the range between 1.1 and 1.8 x I_N^{*1}).
- Electronic current limitation occurs at typically 1.8 x I_N^{*1}) which means that under all overload conditions (independent of the power supply and the resistance of the load circuit) the max. overload before disconnection will not exceed 1.8 x I_N^{*1} times the current rating. Trip time is between 100 ms and 3 sec (depending on overload or at short circuit).
- Without this current limitation a considerably higher overload current would flow in the event of an overload or short circuit.

Table 3: Reliable trip of ESX10-T

Resistivity of copp	per ρ ₀ =	0.01	78 (Ohm x r	nm²) / m						
U _S = DC 19.2 V (= 80 % of 24 V)		volta	voltage drop of ESX10-T and tolerance of							
			point (typica	lly 1.1 x I _N =	: 1.05 1.3	5 x I_N) have I	oeen taken ii	nto account		
ESX10-T-selected rating I _N (in A) →			6							
e. g. trip current I _{ab} = 1.25 x I _N (in A) →			7.5	→ E	SX10-T trips	s after 3 s				
R _{max} in Ohm = (U		→ 5.07	2.51							
	ne ESX10-T reliably trips from	m 0 Ohm to	max. circu	itry resistar	ice R _{max}					
	Cable cross section A		0.14	0.25	0.34	0.5	0.75	1	1.	
	cable length L in meter		esistance ir	n Ohm = (R	x 2 x L) / A	\				
	(= single length)	ļ	\downarrow	↓ ` `	,	\downarrow	\downarrow	\downarrow	\downarrow	
	5		1.27	0.71	0.52	0.36	0.24	0.18	0.1	
	1	0	2.54	1.42	1.05	0.71	0.47	0.36	0.2	
	1	5	3.81	2.14	1.57	1.07	0.71	0.53	0.3	
	2	0	5.09	2.85	2.09	1.42	0.95	0.71	0.4	
	2	5	6.36	3.56	2.62	1.78	1.19	0.89	0.5	
	3	0	7.63	4.27	3.14	2.14	1.42	1.07	0.7	
	3	5	8.90	4.98	3.66	2.49	1.66	1.25	0.8	
	4	0	10.17	5.70	4.19	2.85	1.90	1.42	0.9	
		5	11.44	6.41	4.71	3.20	2.14	1.60	1.0	
		0	12.71	7.12	5.24	3.56	2.37	1.78	1.1	
		5	19.07	10.68	7.85	5.34	3.56	2.67	1.7	
		00	25.34	14.24	10.47	7.12	4.75	3.56	2.3	
		25 50	31.79 38.14	17.80 21.36	13.09 15.71	8.90 10.68	5.93 7.12	4.45 5.34	2.9 3.5	
		75	44.50	24.92	18.32	12.46	8.31	6.23	4.1	
		00	50.86	28.48	20.94	14.24	9.49	7.12	4.7	
		25	57.21	32.04	23.56	16.02	10.68	8.01	5.3	
		50	63.57	35.60	26.18	17.80	11.87	8.90	5.9	
Example 1:	max. length at 1.5 mm ²	and 3 A	214	m— →						
Example 2:	max. length at 1.5 mm ²		106	m						
Example 3:	mixed wiring:				nm ² and R2	= 5 m in 0.2	5 mm ² :			
•	(Control cabinet – sens	(Control cabinet – sensor/actuator level) $R1 = 0.95$ Ohm, $R2 = 0.71$ Ohm $Total (R1 + R2) = 1.66$ Ohm								

Mounting examples for ESX10-T

The ESX10-T features an integral power distribution system.



Mounting procedure:

Before wiring insert busbars into protector block.

Max. 10 insertion/removal cycles for busbars.

Recommendation:

After 10 units the busbars and signal busbars should be interrupted and receive a new entry live

Table of lengths for busbars

(X 222 611 02 / X 222 005 03 or cut off, see accessories)

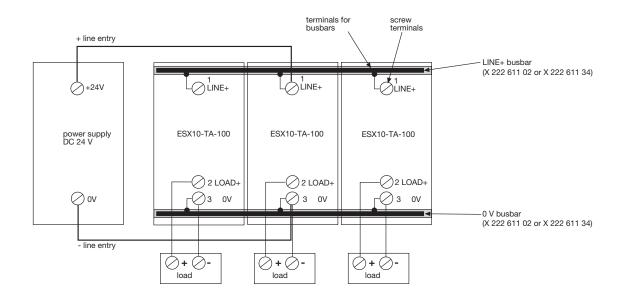
No. of units	2	3	4	5	6	7	8	9	10
Length of busbar [mm] ± 0.5 mm	22	34.5	47	59.5	72	84.5	97	109.5	122

Connection diagrams and application examples ESX10-T

Connection diagrams and application examples ESX10-T...

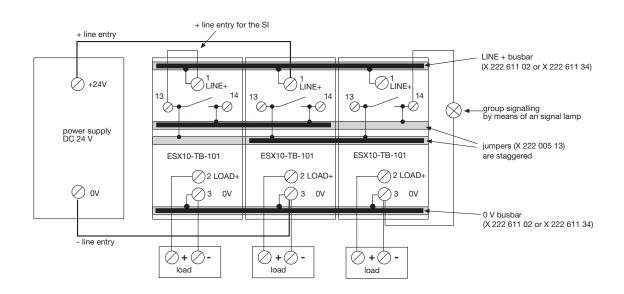
Signal contacts are shown in OFF or fault condition.

ESX10-TA-100



ESX10-TB-101

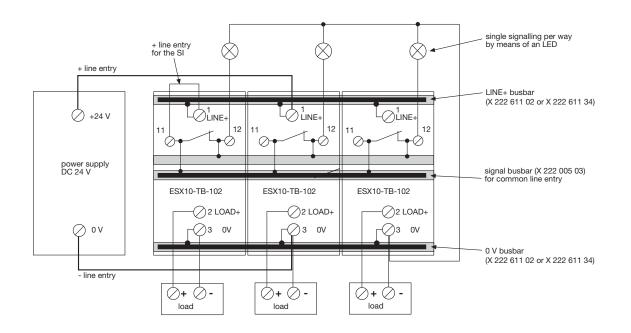
group signalling (series connection)



Connection diagrams and application examples ESX10-T

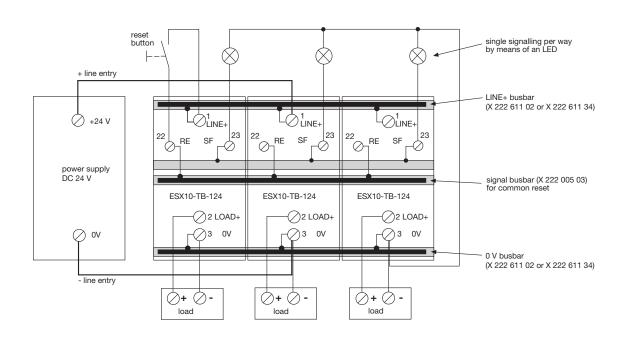
ESX10-TB-102

Single signalling with common line entry



ESX10-TB-124

Single signalling with common reset



Connection diagrams and application examples ESX10-T

Application examples: feed in module with

concurrent protection of auxiliary circuit and direct connection of loads

Auxiliary contacts are shown on the OFF of fault condition

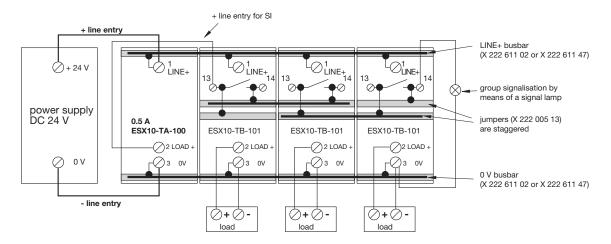
ESX10-TB-101

Group signalisation (series connection)

Type ESX10-TA-100-DC24V-0.5A can be used as a supply module including protection of auxiliary circuit

optional: supply module

AD-TX-EM01

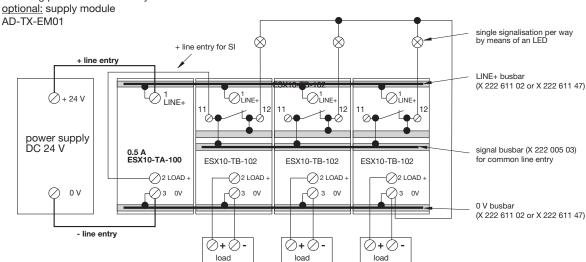


ESX10-TB-102

Single signalisation with common line entry

Type ESX10-TA-100-DC24V-0.5A can be used as a supply module

including protection of auxiliary circuit



Description

The ESX10-T features an integral power distribution system. The following wiring modes are possible with various pluggable current and signal busbars:

- LINE +(DC 24 V)
- 0 V

Caution: The electronic devices ESX10-T require a 0 V connection

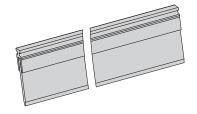
- signal contacts
- reset inputs

Accessories

Busbars for LINE+ and 0 V

max. load with one line entry (recommended: centre line entry) max. load with two line entries grey insulation, length: 500 mm





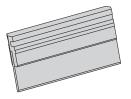
Busbars for LINE+ and 0 V

grey insulation

max. number of plug-on operations 10:

X 222 611 34, (3-unit-block ESX10-T), length: 34.5 mm X 222 611 47, (4-unit-block ESX10-T), length: 47 mm X 222 611 59, (5-unit-block ESX10-T), length: 59.5 mm packing unit: 10 pcs

X 222 611 97, (8-unit-block ESX10-T), length: 97 mm X 222 611 12, (10-unit-block ESX10-T), length: 122 mm packing unit: 4 pcs

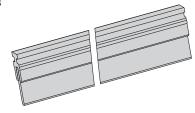


Signal busbars for signal contacts and reset inputs

suitable for signal busbar ESX10-TB-... max. load with one line entry

with one series connection of signal contacts I_{max} grey insulation, length: 500 mm

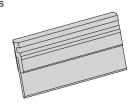
X 222 005 03



Jumpers for signal contacts

suitable for jumper ESX10-TB-... grey insulation, length: 21 mm X 222 005 13

packing unit: 10 pcs



Insulated wire bridge

optional as jumper for ESX10-TB-101.../ESX10-TD-101... for group signalisation (series connection)

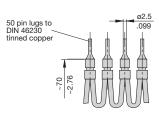
X 223 108 01

packing unit: 10 pcs



Connector bus link -K10

suitable for auxiliary contacts (series connection) **X 210 589 02** (1.5 mm², brown),



Accessories

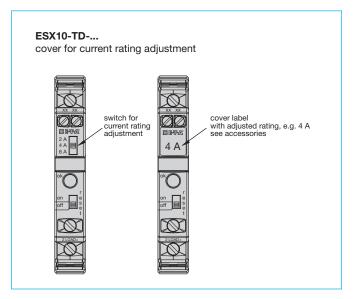
Labels, pack of 10 suitable for ESX10-TD, cover of current rating adjustment Y 309 705 12 (2 A, 4 A, 6 A) Y 309 705 14 (2 A, 3 A, 4 A)

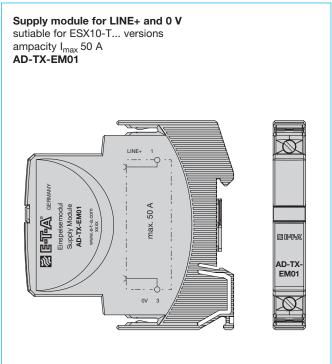
2 A

267A° 4 A

26 A

ESX10-TD-... application example for label





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.