

## Description

The model ESX10-TC-DC48V extends our product group of electronic overcurrent protection devices to include DC 48 V applications. At a width of only 12.5 mm it provides selective protection for all DC 24 V, DC 36 V and DC 48 V load circuits.

The robust design ensures unrivalled stability for selective protection of more loads at one DC power supply. The ESX10-TC-101-DC48V electronic circuit protector provides superior performance and functional reliability, especially for the protection of power trains such as DC motors, multiphase motors, servomotors and their control technology.

ESX10-T helps to save time and costs. The track-mountable circuit protector's standard version provides one channel in the current ratings 1 A through 16 A. By means of busbars, the modular device allows construction of multi-channelled solutions and configuration of single or group signalling. The sophisticated mechanical design of the component also enables a minus load return directly to the module. This function enables hardware planners to realise a sub-distribution directly on the ESX10-T electronic circuit protector.

**US patent number:** US 6,490,141 B2  
US 8,237,311 B2



**ESX10-T DC 48 V**

## Features

- 3 voltage ranges in a single device: DC 24 V, DC 36 V and DC 48 V
- Active linear current limitation
- Reverse voltage protected up to DC 63 V
- Capacitive loads up to 5,000 µF
- Fixed current ratings 1 A...16 A
- Track-mountable
- Approvals: UL

## Your benefits

- Reduces machine downtimes through robust design with max. performance and faultless operation
- Increases productivity with maximum transparency through clear and precise detection of short circuit and overload
- Simplifies planning and logistics since only a single unit is required for three voltage ranges DC 24 V, DC 36 V, DC 48 V
- Offers maximum flexibility through modular design

## Preferred types – for more details on all configurations please see ordering number code on page 4

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	Short description	Preferred ratings (A)								
ESX10-TC		1	2	3	4	6	8	10	12.5	16
ESX10-TC -101-DC48V-			•		•	•		•	•	

## Approvals



## Data sheet

The current data sheet is available on our website: [www.e-t-a/d350](http://www.e-t-a/d350)

## Conformities



## Technical data ( $T_{amb} = 25\text{ °C}$ , $U_B = \text{DC } 12\text{ V}$ )

### Operating data

Operating voltage $U_B$	DC 48 V (18 ... 60 V) 0 V terminal required
Current rating range $I_N$	fixed current ratings: 1 / 2 / 3 / 4 / 6 / 8 / 10 / 12.5 / 16 A
Standby current $I_0$ in ON condition:	typically 5 mA
Status indication via	<ul style="list-style-type: none"> <li>• multi-coloured LED</li> <li>• potential-free signal output F:</li> <li>• ON/OFF position of the switch S1</li> </ul>
Low voltage monitoring of operating voltage	OFF at $U_B < 9\text{ V}$ ON at $U_B > 17\text{ V}$ with automatic reset when voltage is restored
Fail-safe element	integral fail-safe element adjusted to the current rating (see table 1)

### Load circuit

Load output	Power MOSFET switching output (plus switching)
Overload and short circuit currents	typically $1.2 \times I_N$ ( $1.05 \dots 1.35 \times I_N$ )
Trip times	see time/current characteristics
ON delay $t_{Start}$	typically 550 ms after each ON operation, after reset and after applying of $U_B$
Disconnection of the load circuit	electronic disconnection without physical isolation
Leakage current in OFF condition:	typically $< 1\text{ mA}$

Capacitive loads	min. 5,000 $\mu\text{F}$ depending on cable attenuation, power supply used, load current and current rating
Inductive loads	external free-wheeling diode recommended for inductive load
Dielectric strength	max. DC 63 V
Parallel connection of several load outputs	not permitted

### Signalling

Electrical data	Potential-free auxiliary contact, make contact, terminals 13 – 14 DC 48 V (0 ... 60 V) max. 0.2 A
Standard condition	$U_B$ is applied and switch S1 is ON and no overload, no short circuit <ul style="list-style-type: none"> <li>• LED green</li> <li>• Signal output contact 13-14 closed</li> </ul>
Error condition ( $U_B$ low or overload or short circuit)	<ul style="list-style-type: none"> <li>• LED red</li> <li>• Signal output contact 13-14 open</li> </ul>
OFF condition ( $U_B$ off or switch S1 in OFF position)	<ul style="list-style-type: none"> <li>• LED OFF</li> <li>• Signal output contact 13-14 open</li> </ul>
Delay of signal output	<ul style="list-style-type: none"> <li>• in normal condition: typically 30 ms</li> <li>• in error/OFF condition: typically 200 ms</li> </ul>

## Technical data ( $T_{amb} = 25\text{ °C}$ , $U_B = \text{DC } 12\text{ V}$ )

Terminals	LINE+ / LOAD+ / 0 V
screw terminals	M4
max. cable cross section	
rigid and flexible	0.5 – 16 mm <sup>2</sup>
flexible with wire end ferrule	
with/without plastic sleeve	0.5 – 10 mm <sup>2</sup>
wire stripping length	10 mm
tightening torque (EN 60934)	1.5 – 1.8 Nm
multi-lead connection (2 cables with the same cross section)	
rigid / flexible	0.5 – 4 mm <sup>2</sup>
flexible with wire end ferrule without plastic sleeve	0.5 – 2.5 mm <sup>2</sup>
flexible with TWIN wire end ferrule with plastic sleeve	0.5 – 6 mm <sup>2</sup>

Terminals	auxiliary contacts
screw terminals	M3
max. cable cross section	
flexible with wire end ferrule w/wo plastic sleeve	0.25 – 2.5 mm <sup>2</sup>
wire stripping length	8 mm
tightening torque (EN 60934)	0.5 – 0.6 Nm

Housing material	moulded
Mounting method	symmetrical rail to EN 60715-35x7.5
Ambient temperature	-25 ... +60 °C (without condensation, cf. EN 60204-1)
Storage temperature	-40 ... +70 °C
Damp heat	96 hrs / 95 % RH 40 °C to IEC 60068-2-78 test Cab climate class 3K3 to EN60721
Vibration resistance	3 g, test to IEC 60068-2-6 test Fc, all positions 5 g (limited mounting position)
Shock	25 g test to IEC 60068-2-27, test Ea 25 g (11 ms half sine)
Degree of protection	housing IP20, EN 60529 terminals IP20 EN 60529
EMC requirements (EMC Directive, CE Logo)	Emitted interference: EN 61000-6-3 Noise immunity: EN 61000-6-2
Insulation co-ordination (IEC 60934)	0.5 kV/pollution degree 2 reinforced insulation in the operating area and between main circuit and auxiliary circuit
Insulation resistance (OFF condition)	n/a, only electronic disconnection
Conformity:	CE-marking to 2014/30/EU and RoHS directive
Dimensions (w x h x d)	12.5 x 80 x 82 mm (tolerances to DIN ISO 286 part 1 IT13)
Mass	approx. 65 g

## Preferred types

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	Short description	Preferred ratings (A)								
ESX10-TC		1	2	3	4	6	8	10	12.5	16
ESX10-TC -101-DC48V-			•		•	•		•	•	

## Order numbering code

### Type No.

ESX10 Electronic Circuit Protector, with current limitation

#### Mounting

TC symmetrical rail, without slot for busbars

#### Version

1 without physical isolation

#### Signal input

0 without signal input

#### Signal output

1 signal make contact

#### Operating voltage

DC 48 V voltage rating DC 48 V

#### Current rating

1 A

2 A

3 A

4 A

6 A

8 A

10 A

12.5 A

16 A

ESX10 - TC - 1 0 1-DC48V - 6 A ordering example

Description of ESX10-T signal inputs / outputs (see wiring diagrams).

## 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-T 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 by the ESX10-T.

## 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.

## Terminal design ESX10-TC-101-DC48V- xxA

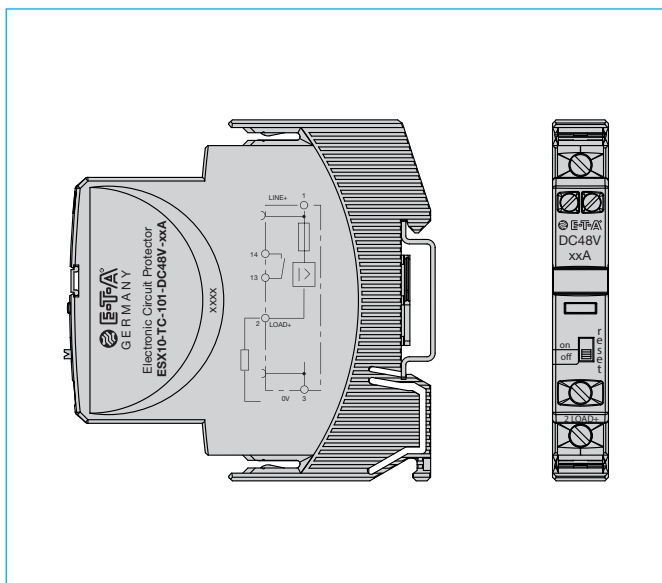


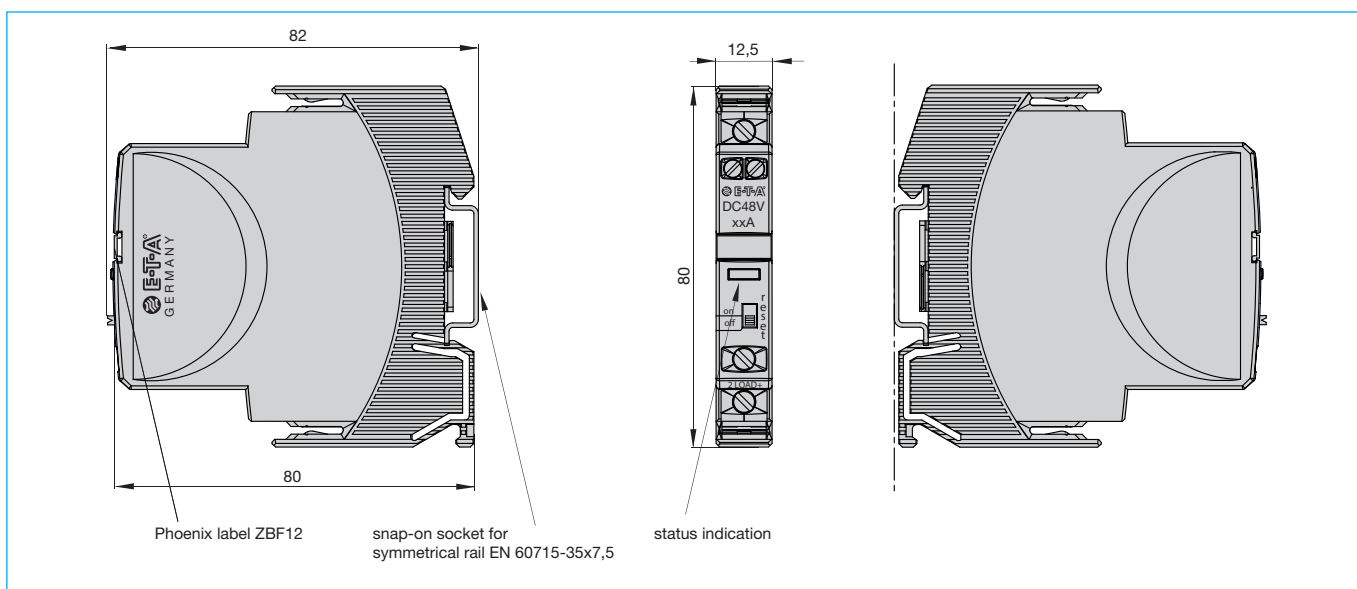
Table 1: Voltage drop, current limitation, max. load current

Current rating range $I_N$	Voltage drop $U_{ON}$ at $I_N$	active current limitation	trip time $I_{KS}$	Fail-safe element	Max. load current			
					single mounting			
					side-by-side mounting			
	typically	typically	typically		$T_{amb} = 25\text{ °C}$	$T_{amb} = 40\text{ °C}$	$T_{amb} = 50\text{ °C}$	$T_{amb} = 60\text{ °C}$
1 A	120 mV	$1.2 \times I_N$	350 ms	2 A	1 A	1 A	1 A	1 A
					1 A	1 A	1 A	1 A
2 A	100 mV		200 ms	4 A	2 A	2 A	2 A	2 A
					2 A	2 A	2 A	2 A
3 A	130 mV		96 ms	6.3 A	3 A	3 A	3 A	3 A
					3 A	3 A	3 A	3 A
4 A	170 mV		54 ms	6.3 A	4 A	4 A	4 A	4 A
					4 A	4 A	3.8 A	2.9 A
6 A	140 mV		32 ms	10 A	6 A	6 A	6 A	5.6 A
					6 A	6 A	5.1 A	3.9 A
8 A	110 mV		32 ms	15 A	8 A	8 A	8 A	7.1 A
					8 A	8 A	6.6 A	4.9 A
10 A	130 mV		20 ms	15 A	10 A	10 A	9.3 A	7.4 A
					10 A	8 A	6.8 A	5.1 A
12.5 A	140 mV		13 ms	20 A	12.5 A	12.5 A	10.5	8.3 A
					10.7 A	9.0 A	7.6 A	5.8 A
16 A	150 mV		8 ms	25 A	16 A	12.8 A	11.3 A	9.1 A
					11.4 A	9.6 A	8.3 A	6.2 A

**Note:**

Without forced convection – in the event of forced convection, the max. current may be increased by up to 20 % until the rated current is reached.

**Dimensions / mounting position ESX10-TC-xxx-DC48V-xxA**



## Approvals

ESX10-TC				
Approval authority	Standard	File Certificate no.	Voltage rating	Current rating range
UL	UL 2367	E306740	DC 48 V	1 A...16 A
UL	UL 508 C22.2 No. 14	E322549	DC 48 V	1 A...16 A

## Information on UL approvals



**ESX10-TC**  
UL2367  
Non-hazardous use – UL File # E306740

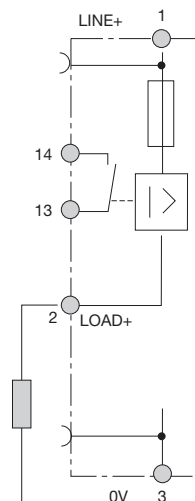


UL508  
CSA C22.2 No. 14  
INDUSTRIAL CONTROL EQUIPMENT  
UL File # E322549

## ESX10-TC signalling output (connection diagram)

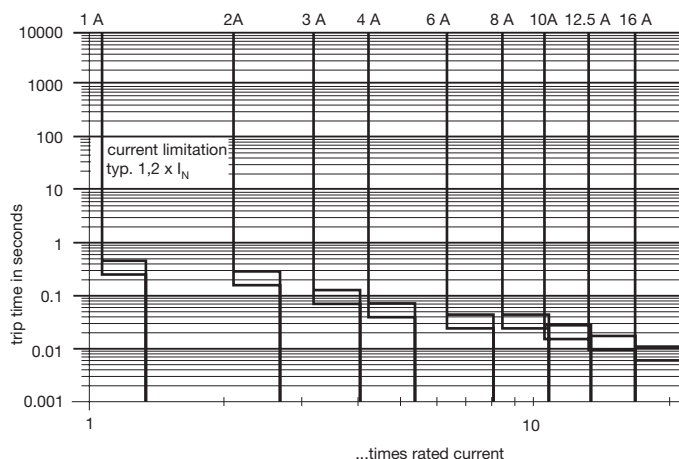
The auxiliary contacts are shown in the OFF or fault condition

**ESX10-TC-101**  
without signal input  
with signal output F  
(single signal, N/O)



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

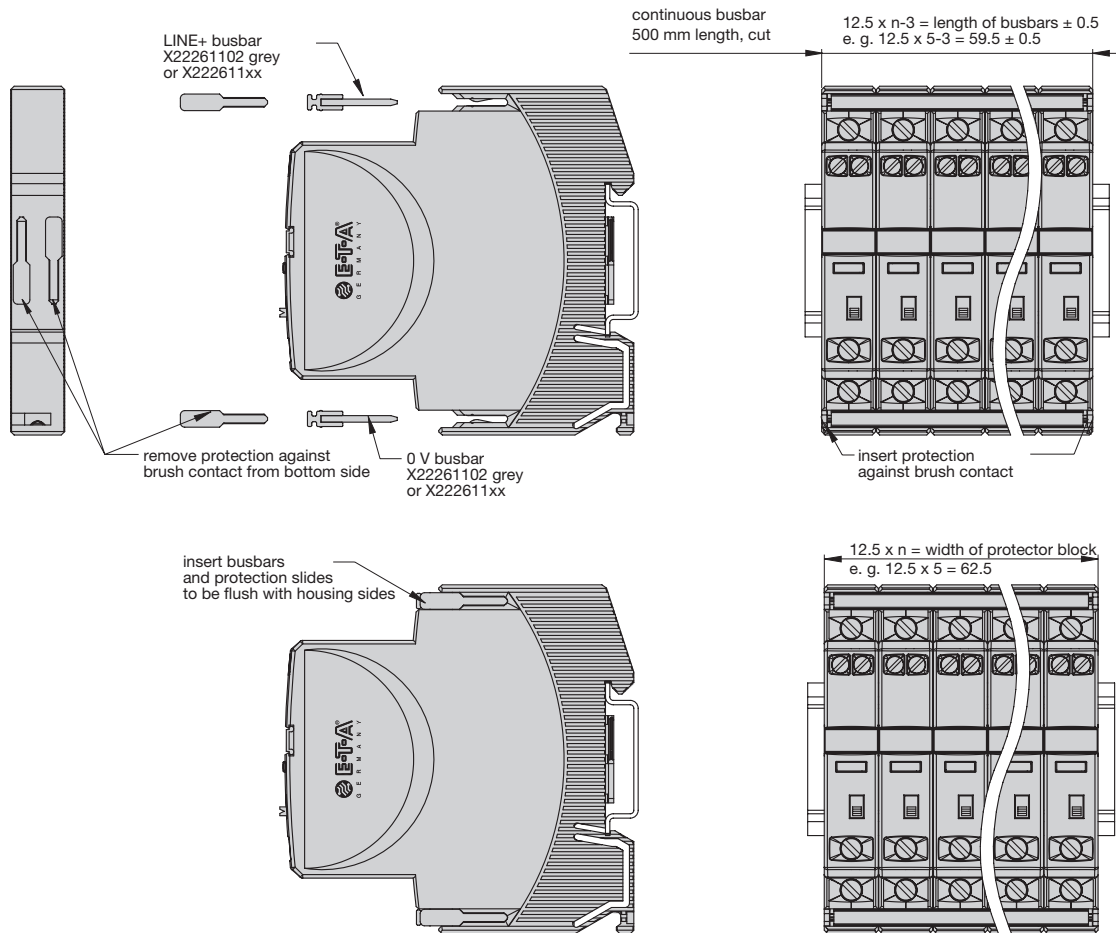
## Time/current characteristic ( $T_{amb} = 25\text{ °C}$ )



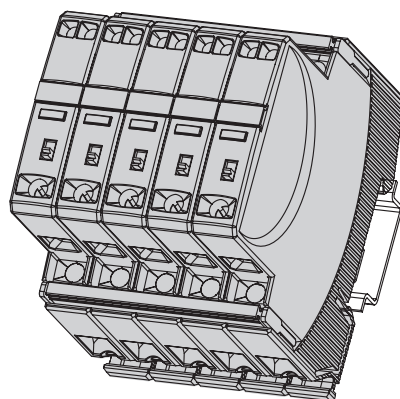
- Electronic disconnection and/or current limitation begins at typically 1.2 times  $I_N$ . This means: under all overload conditions (independent of power supply and load circuit resistance) typically 1.2 times rated current is applied.
- Without the current limitation getting into effect at typically 1.2 x  $I_N$  there would be a much higher over-current in the event of an overload or short circuit.

## Mounting examples for ESX10-T DC48V

### The ESX10-TC has an integral power distribution system



5 x ESX10-TC-xxx-DC48C-xxA



#### Description of installation:

With a block of devices the busbars have to be inserted before wiring.  
Max. 10 plug-in cycles for busbars allowed.

#### Recommendation:

The line entry busbars and signal busbars should be interrupted after 10 devices and line entry should start anew.

#### Table of possible busbar lengths

(X 222 611 02, X 222 005 03, possibly cut to length, see accessories).

Number of devices	2	3	4	5	6	7	8	9	10
Length of rail [mm] ± 0,5 mm	22	34.5	47	59.5	72	84.5	97	109.5	122

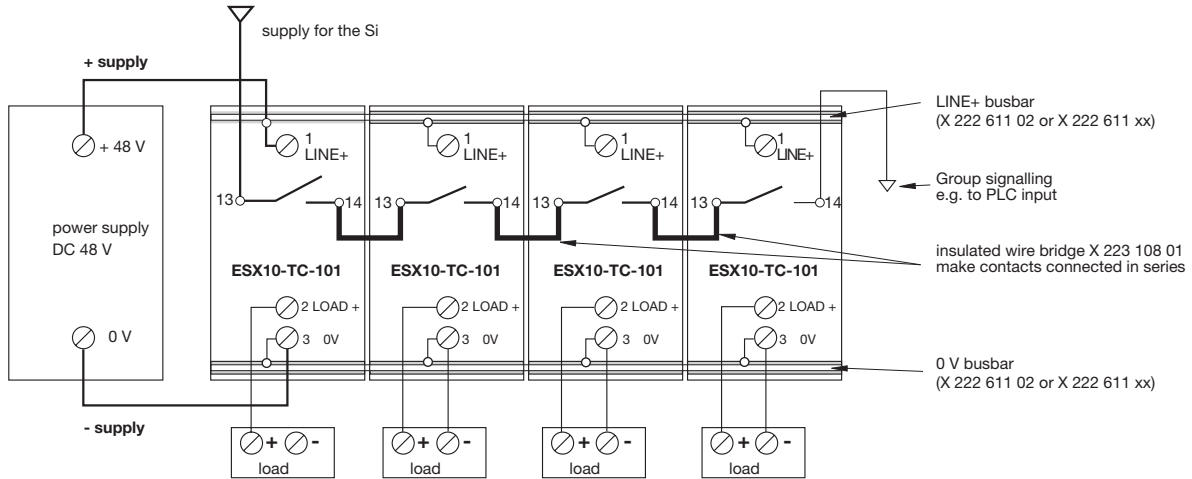
**Wiring diagrams, application examples ESX10-TC-101-...**

**Wiring diagrams, application example ESX10-TC-...**

The auxiliary contacts are shown in the OFF or fault condition.

**ESX10-TC-101**

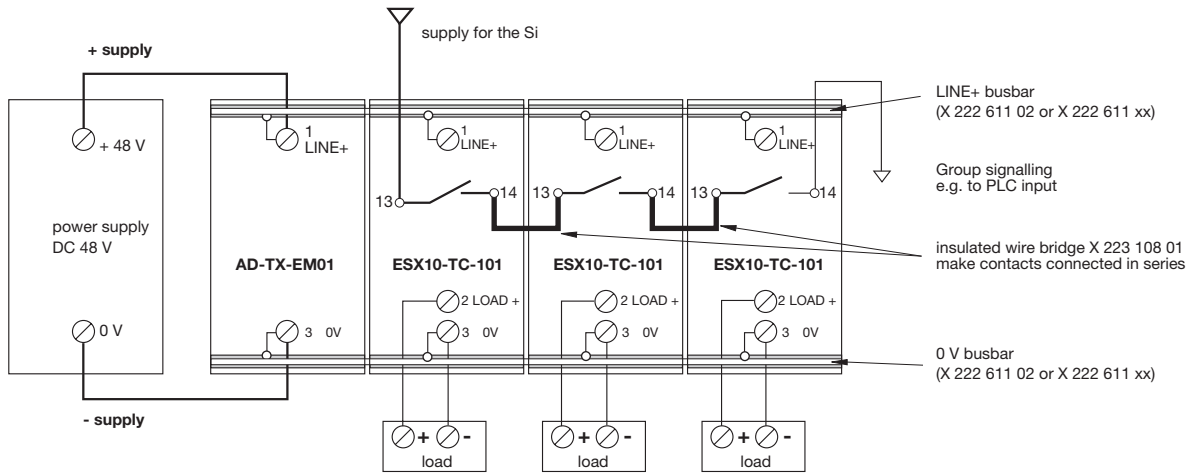
Group signalling (series connection)



**ESX10-TC-101**

Group signalling (series connection)

**Optional:** passive supply module AD TX EM01 (without protection)



## Description

The ESX10-T has an integral power distribution system. The following wirings can be carried out with different plug-in type busbars:

- LINE
- 0 V

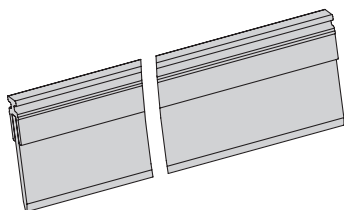
**Important:** The electronic devices ESX10-T require 0 V connection

All information and data given on our products are accurate and reliable to the best of our knowledge, but E-T-A does not accept any responsibility for the use in applications which are not in accordance with the present specification. E-T-A reserves the right to change specifications at any time in the interest of improved design, performance and cost effectiveness. Dimensions are subject to change without notice. Please enquire for the latest dimensional drawing with tolerances if required. All dimensions, data, pictures and descriptions are for information only and are not binding. Amendments, errors and omissions excepted. Ordering codes of the products may differ from their marking.

## Accessories

### busbars for LINE+ and 0 V

ampacity with one input  $I_{max}$  50 A  
(recommendation: central supply)  
ampacity with two inputs  $I_{max}$  63 A  
grey insulated, length: 500 mm  
**X 222 611 02**



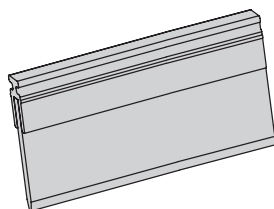
### busbars for LINE+ and 0 V

grey insulated  
max. 10 plug-in cycles allowed

**X 222 611 22** (block of 2 ESX10-Ts), length: 22 mm  
**X 222 611 34** (block of 3 ESX10-Ts), length: 34.5 mm  
**X 222 611 47** (block of 4 ESX10-Ts), length: 47 mm  
**X 222 611 59** (block of 5 ESX10-Ts), length: 59.5 mm  
packaging unit: 10 pcs

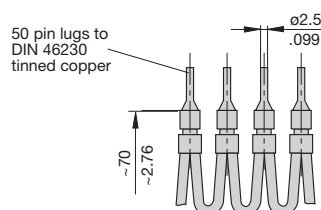
**X 222 611 72** (block of 6 ESX10-Ts), length: 72 mm  
**X 222 611 97** (block of 8 ESX10-Ts), length: 97 mm  
**X 222 611 12** (block of 10 ESX10-Ts), length: 122 mm

packaging unit: 4 pcs



### Connector bus link -K10

**X 210 589 02** (1.5 mm<sup>2</sup>, brown), suitable for auxiliary contacts (series connection)



### supply module for LINE+ and 0 V

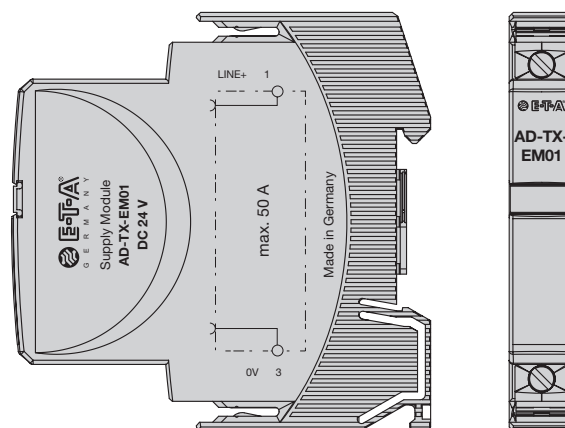
(without protection)

optional for all types ESX10-T, if loads shall be connected directly to all ESX10-T.

ampacity  $I_{max}$  50 A  
Max. cable cross section see ESX10-T

technical data  
see terminals of ESX10-T

### AD-TX-EM01

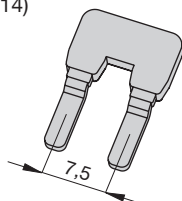


### Insulated wire bridge (for aux. contact)

(series connection of make contacts 13 – 14)

**Part no. X 223 108 01**

Packaging unit: 10 pcs





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[ESX10-TC-101-DC48V-3A](#) [ESX10-TC-101-DC48V-4A](#) [ESX10-TC-101-DC48V-6A](#) [ESX10-TC-101-DC48V-8A](#) [ESX10-TC-101-DC48V-10A](#)