

Description

The model ESX10-TB-101-DC24V-16A extends our product group of electronic overcurrent protection devices for DC 24 V applications. At a width of only 12.5mm it provides selective protection for all DC 24 V load circuits. This is achieved by a combination of active electronic current limitation in the event of a short circuit and overload disconnection typically from 1.15 times rated current. The ESX10-T is track-mountable and provides ease of installation for groups of devices with several circuits.

DC 24 V switch-mode power supplies are widely used in automation today. In the event of an overload, however, they turn down the output voltage which is intended to power all connected loads. So if there is a failure in a single load of the system, the supply voltage will break down also in all other load circuits. Not only does this frequently cause undefined fault conditions, but it can even lead to machine stoppages or system downtimes.

This is exactly where the ESX10-T comes in by responding to the overload conditions faster than the switch-mode power supply. The max. possible overcurrent is limited to typically 1.15 times 16A (see table 1). This allows switching on capacitive loads of up to 20,000 μ F, but a disconnection will only be effected in the event of an overload or short circuit. Visual status indication is by means of a multicoloured LED and by a single alarm. The manual ON/OFF switch on the device itself allows start-up of certain individual load circuits.

As soon as the ESX10-T detects overload or short circuit in its load circuit, it blocks the load output transistor and disconnects the current flow in the faulty circuit. After remedy of the failure, the load output of the ESX10-T is re-activated by actuating the ON/OFF switch on the device.

Features and Benefits

- Selective load protection, electronic trip curve
- Protection of modular control components (DC24V side, frequency converter, drive control etc.)
- Active current limitation when switching on capacitive loads up to 20,000 μ F and in case of overload/short circuit
- Fixed current rating 16 A
- Reliable overload disconnection typically from $1.15 \times I_N$ even with long load lines or small cable cross sections
- Low voltage monitoring
- Manual ON/OFF switch (S1)
- Clear status indication by means of LED and signal contact F
- Integral fail-safe element, adjusted to current rating
- Width per channel only 12.5 mm
- For direct rail mounting
- Ease of wiring via entry line busbars LINE+ and 0V, signal busbars and jumpers.



ESX10-TB-101-DC 24 V-16 A

Technical data ($T_{amb} = 25^\circ\text{C}$, $U_B = \text{DC } 24 \text{ V}$)

Operating data

Operating voltage U_B	DC 24 V (18...26.4 V)
Current ratings I_N	fixed rating: 16 A
Standby current I_0	in ON condition: typically 18 mA
Visual status indication	<ul style="list-style-type: none"> • multicoloured LED: <ul style="list-style-type: none"> green: <ul style="list-style-type: none"> - device is ON (S1 = ON) load circuit/Power-MOSFET fed through orange: <ul style="list-style-type: none"> - overload up to electronic disconnection red: <ul style="list-style-type: none"> - after disconnection due to overload or short circuit - short circuit up to electronic disconnection - at undervoltage OFF: <ul style="list-style-type: none"> - switched off manually (S1 = OFF) or device is dead-voltage • potential-free signal contacts F (Option) • ON/OFF position of the switch S1

Load circuit

Load output	power MOSFET switching output (plus switching)
Overload and short circuit disconnection	typically $1.15 \times I_N$ with active current limitation
Trip times	see time/current characteristic typically 100ms at short circuit typically 220ms at overload (see table 1)
Temperature disconnection	internal temperature monitoring with electronic disconnection
operating voltage monitoring with regard to low voltage	OFF at typically $U_B < 14 \text{ V}$ ON at typically $U_B > 17 \text{ V}$ with automatic ON and OFF switching
Switch-on delay t_{Start}	typically 2 ms after each ON operation, after reset and after applying of U_B
Disconnection of load circuit	electronic disconnection without physical isolation
Leakage current in load circuit in the OFF condition	typically $< 1 \text{ mA}$
Capacitive loads	up to 20,000 μ F
Free-wheeling diode	external free-wheeling diode recommended for inductive load
Parallel connection of several load outputs	not allowed

Technical data ($T_{amb} = 25\text{ °C}$, $U_B = \text{DC } 24\text{ V}$)

Signal output F

ESX10-TB-101

Electrical data potential-free auxiliary change-over contact max. DC 30 V / 0.5 A min. 10 V / 10 mA

ESX10-TB-101 single signal, make contact contact open, terminal 13-14

Signal delay of signal output (F)

in standard condition typically 20 ms
in fault condition typically 220 ms

Error signal output is in fault condition

- when the device is switched off
 - in the event of overcurrent trip
 - through lacking operating voltage U_B
 - at undervoltage
 - by means of the ON/OFF switch

General Characteristics

Fail-safe-element integral fail-safe element compliant with the current rating (see table 1)

Terminals

LINE+ / LOAD+ / 0V

screw terminals M4
max. cable cross section
flexible with wire end ferrule w/wo plastic sleeve 0.5 - 10 mm²
multi-lead connection (2 identical cables)
rigid / flexible 0.5 - 4 mm²
flexible with wire end ferrule without plastic sleeve 0.5 - 2.5 mm²
flexible with TWIN wire end ferrule with plastic sleeve 0.5 - 6 mm²
wire stripping length 10 mm
tightening torque (EN 60934) 1.5 - 1.8 Nm

Technical data ($T_{amb} = 25\text{ °C}$, $U_B = \text{DC } 24\text{ V}$)

Terminals

aux. contacts

screw terminals M3
max. cable cross section
flexible with wire end ferrule w/wo plastic sleeve 0.25 - 2.5 mm²
wire stripping length 8 mm
tightening torque (EN 60934) 0.5-0.6 Nm

Housing material moulded

Mounting symmetrical rail to EN 50022-35x7.5

Ambient temperature 0...+50 °C (without condensation, cf. EN 60204-1)

Storage temperature -40...+70 °C

Humidity 96 hrs / 95% RH 40°C to IEC 60068-2-78-Cab climate class 3K3 to EN 60721

Vibration 3g test to IEC 60068-2-6, test Fc

Protection class housing IP20 EN 60529
terminals IP20 EN 60529

EMC requirements (EMC directive, CE logo) emission: EN 61000-6-3
susceptibility: EN 61000-6-2

Insulation co-ordination (IEC 60934) 0.5 kV / pollution degree 2
reinforced insulation in operating area

Dielectric strength max. DC 30 V (load circuit)

Insulation resistance (OFF condition) n/a, only electronic disconnection

Approvals CE logo
UL 2367, File # E306740
Solid State Overcurrent Protectors

Dimensions (w x h x d) 12.5 x 80 x 83 mm (tolerances to DIN ISO 286 part 1 IT13)

Mass approx. 65 g

Table 1: Voltage drop, current limitation, trip times, fail-safe element, max. load current

Current rating I_N	typical voltage drop U_{ON} at I_N	active current limitation typically	trip time I_{SC} typically ¹⁾	trip time I_{OL} typically ²⁾	Fail-safe element	Max. load current at 100 % ON duty	
						$T_{AMB} = 40\text{ °C}$	$T_{AMB} = 50\text{ °C}$
16 A	150 mV	$1.15 \times I_N$	100 ms	220 ms	20A	16 A	14 A

Note: When mounted side-by-side without convection, the devices should carry max. 80% of their rated load continuously (100 % ON duty).

1) short circuit
2) overload

Order numbering code

Type No.

ESX10 Electronic Circuit Protector, with current limitation

Mounting

TB rail mounting, with signal contact and hole for signal busbars

Version

1 without physical isolation

Signal input

0 without signal input

Signal output:

1 signal make contact

Operating voltage

DC 24 V voltage rating DC 24 V

Current rating

16 A

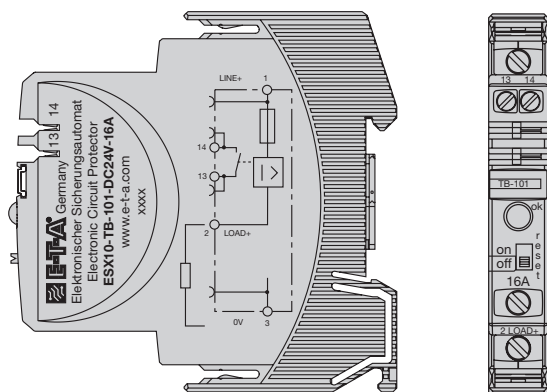
ESX10 - TB - 1 0 1 - DC 24 V - 16 A ordering example

Description of signal output (ESX10-T) see schematic diagram.

Please note

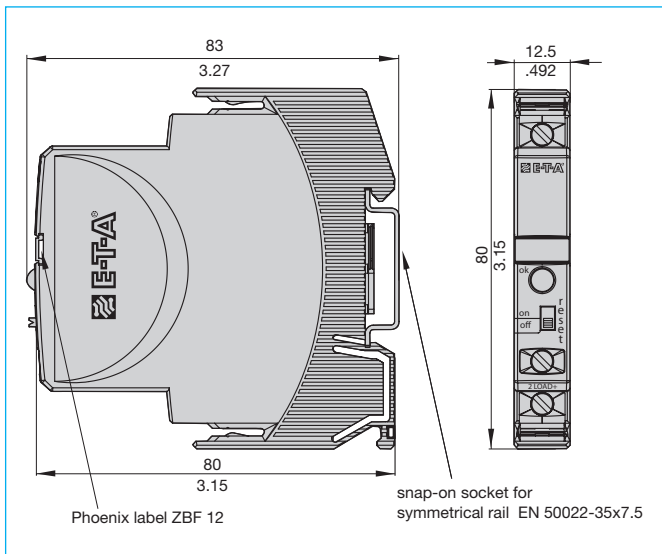
- The user has to ensure that the cable cross section of the load circuit in question complies with the current rating of the ESX10-T used.
- In addition special precautions have to be taken in the system or machinery to exclude automatic re-start (e.g. by using a safety PLC) (cf. Machinery Directive 98/37/EG und 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.

Schematic diagram ESX10-TB-101-DC24V-16 A



Signal output is shown in the OFF or fault condition.
Normal condition: 13-14 closed

Dimensions ESX10-TB

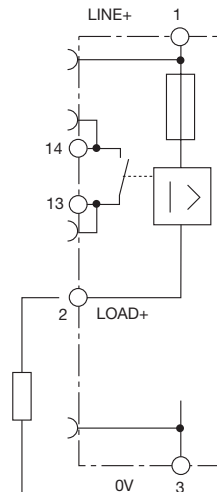


ESX10-TB signal output (connection diagram)

ESX10-T signal inputs / outputs (schematic diagrams)

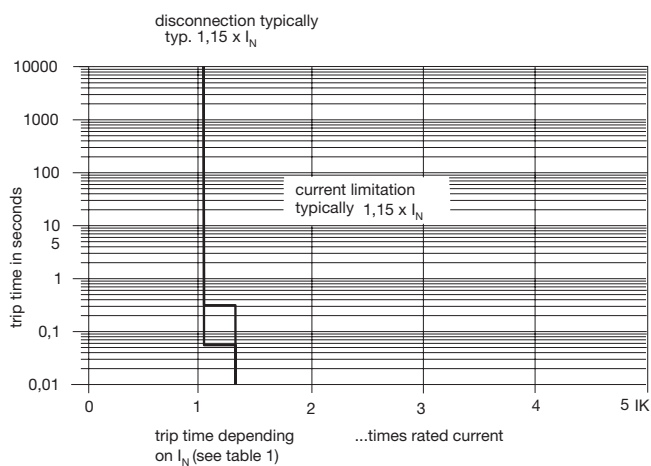
Auxiliary contacts are shown in OFF or error condition

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



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

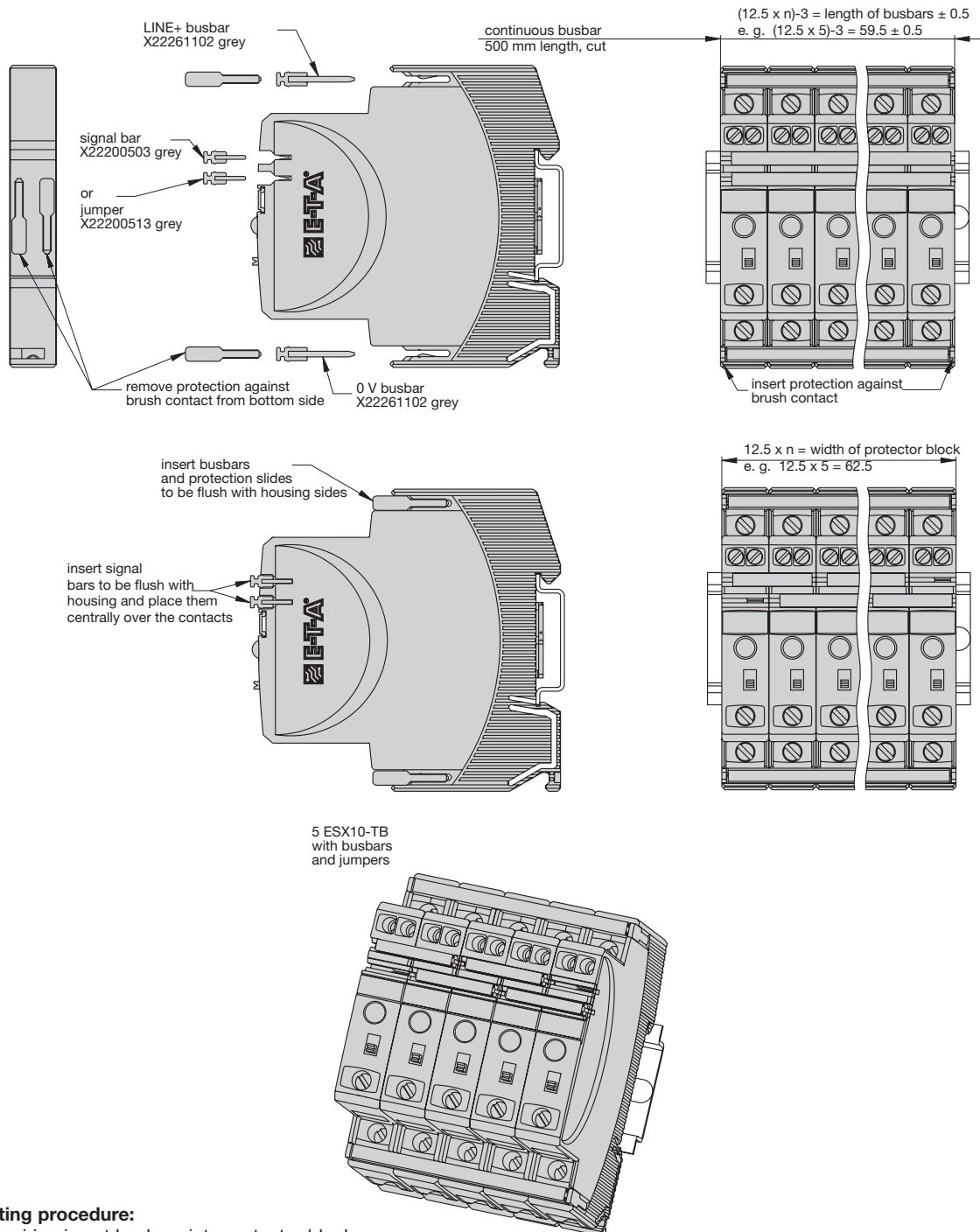
Typical time/current characteristic ($T_{amb} = 25^\circ\text{C}$)



- Electronic disconnection and/or current limitation begins at typically 1.15 times I_N . **This means: under all overload conditions (independent of power supply and load circuit resistance) typically 1.15 times rated current is applied..**
- Without the current limitation getting into effect at typically 1.15 x I_N there would be a much higher overcurrent in the event of an overload or short circuit.

Mounting examples for ESX10-TB-101

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

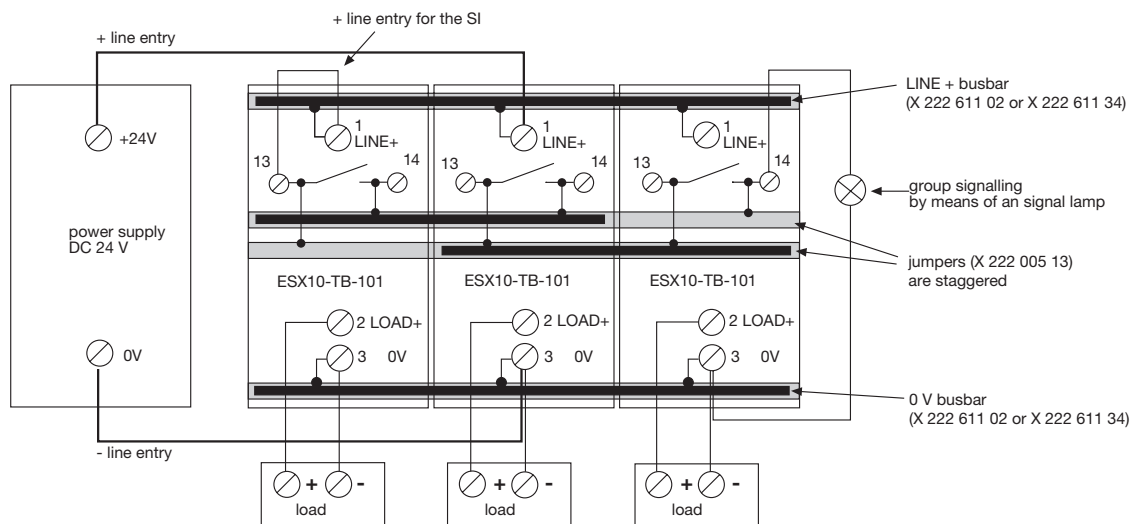
(X 222 611 02 / X 222 005 03 or cut off, see accessories)

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

Wiring diagrams, application examples ESX10-T

ESX10-TB-101

group signalling (series connection)



Wiring diagrams, application examples ESX10-T

Applications examples: line entry DC 24 V with protection of signal circuit and direct connection of loads

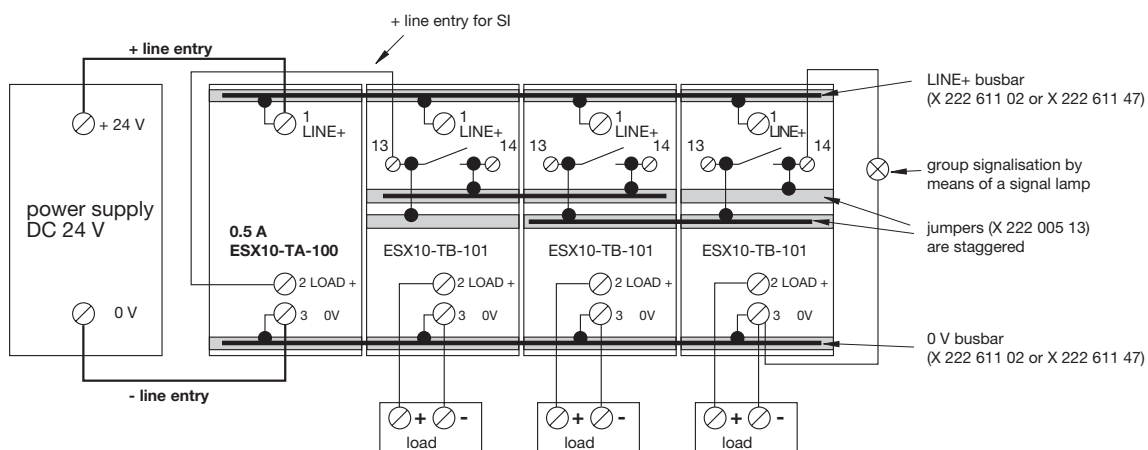
Auxiliary contacts are shown on the OFF of fault condition

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: passive supply module AD-TX-EM01 (without protection)



Description

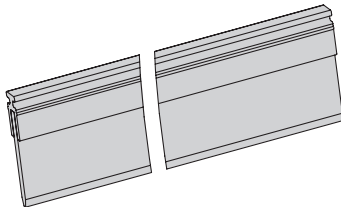
The ESX10-T has an integral power distribution system. The following wirings can be carried out with different plug-in type busbars:

- LINE +(DC 24 V)
- 0 V
- **Important:** The electronic devices ESX10-T require a 0 V connection.
- Auxiliary contacts

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 insulation, length: 500 mm
X 222 611 02



busbars for LINE and 0 V

grey insulation
max. 10 plug-in cycles allowed

X 222 611 22
(double block ESX10-T), length: 22 mm
Packaging unit: 10 pcs

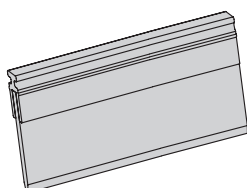
X 222 611 34
(block of 3 ESX10-Ts), length: 34.5 mm
Packaging unit: 10 pcs

X 222 611 47
(block of 4 ESX10-Ts), length: 47 mm
Packaging unit: 10 pcs

X 222 611 59
(block of 5 ESX10-Ts), length: 59.5 mm
Packaging unit: 10 pcs

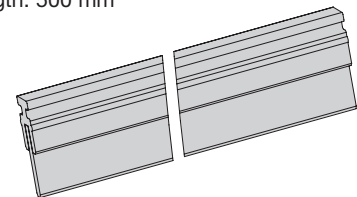
X 222 611 97
(block of 8 ESX10-Ts), length: 97 mm
Packaging unit: 4 pcs

X 222 611 12
(block of 10 ESX10-Ts), length: 122 mm
Packaging unit: 4 pcs



Signal busbars for aux. contacts and reset inputs

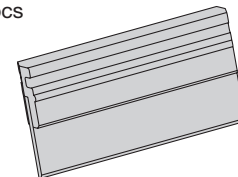
suitable for signal busbars ESX10-TB-...
ampacity with one input I_{\max} 1 A
with aux. contacts connected in series I_{\max} 0.5 A
grey insulation, length: 500 mm
X 222 005 03



Busbars for auxiliary contacts

suitable for signal busbars ESX10-TB-...
grey insulation, length: 21 mm

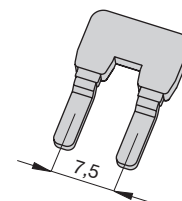
X 222 005 13
Packaging unit: 10 pcs



Insulated wire bridge (for aux. contact)

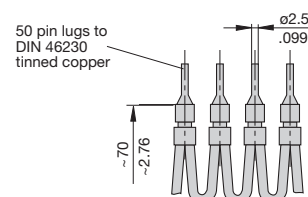
optional as jumper for ESX10-TB-101...
for group signalling
(series connection of make contacts 13 - 14)

X 223 108 01
Packaging unit: 10 pcs



Connector bus link -K10

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



Accessories

Passive supply module for for LINE+ and 0 V (without protection)

optional for all types ESX10-T versions allowing to connect the loads in question to all ESX10-T.

Ampacity I_{\max} 50 A
Max. cable cross section 0.5 - 10 mm²

Technical Data
see terminals of ESX10-T

AD-TX-EM01

