

Electronic Circuit Protection

ESX10-TC



Features

- Selective load protection, electronic trip characteristics
- Active current limitation for safe connection of capacitive loads up to 20,000 μ F and on overload/short circuit
- Current ratings 1 A...10 A at 12VDC
- Reliable overload disconnection with $1.1 \times I_n$ plus, even with long load lines or small cable cross sections (see table 2)
- 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
- 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
- Hazardous area approved– Class1Div 2, Zone 2 (ATEX)



Electronic circuit protection type ESX10-TC is designed to ensure selective disconnection of 12VDC load systems. 12VDC 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.

Through selective disconnection, the ESX10-TC responds much faster to overload or short circuit conditions than the switch-mode power supply. This is achieved by active current limitation. The ESX10-TC limits the highest possible current to 1.3 to 1.8 times the selected rated current of the circuit protector. It is possible to switch on capacitive loads of up to 20,000 μ 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-TC can be selected in fixed values from 1.0 A...10 A. Failure and status indication are provided by a multicolor LED and an integral short-circuit-proof status output or a relay 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 and reset of individual load circuits. The ESX10-TC, with a width of only 12.5 mm, can be snapped onto symmetrical rails for easy installation and control cabinet space savings.

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.

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Approvals

Authority	Voltage rating	Current ratings
UL2367 (E306740)	12VDC	1...10A
UL 121201 (E320024) (class 1, div.2, group A, B, C, D)	12VDC	1...10A
UL508/ cUL 508	12VDC	1...10A
CSA file 165971 (LR16186):		
CSA C22.2 No: 213 (class I, div. 2) Groups A, B, C, D, T5	12VDC	1...10A
CSA C22.2 No: 14	12VDC	1...10A
Class 2 meets requirements for Class 2 current limitation (ESX10-TC... 1 A / 2 A / 3 A / 4 A)		

Technical Data (T_{ambient} = 25°C, operating voltage U_S = 12VDC)

Operating data			
Operating voltage U _S	12VDC (9... 18 V)		
Current rating I _N	fixed current ratings: 1 A, 2 A, 3 A, 4 A, 6 A, 10 A		
Closed current I _Q	ON condition: typically 20... 30 mA depending on signal output		
Status indication	status output SF (option)	ON/OFF/ condition of switch S1	Multicolor LED
	Yes	Yes	GREEN: <ul style="list-style-type: none">unit is ON, power-MOSFET is switched onstatus output SF ON, supplies + 12VDC
			ORANGE: <ul style="list-style-type: none">in the event of overload or short circuit until electronic disconnection
			RED: <ul style="list-style-type: none">unit electronically disconnectedload circuit/Power-MOSFET OFFlow voltage (< 3.25 V)after switch-on till the end of switch-on delay
			OFF: <ul style="list-style-type: none">manually switched off (S1 = OFF) or device is deadundervoltage
Load circuit			
Load output	Power-MOSFET switching output (high side switch)		
Overload disconnection	typically 1.1 x I _N (1.05... 1.35 x I _N)		
Short-circuit current I _K	active current limitation (see table 1)		
Trip time for electronic disconnection	• see time/current characteristics; • typically 3 s at I _{Load} > 1.1 x I _N ; • typically 3 s... 50 ms at I _{Load} > 1.8 x I _N (or 1.5 x I _N /1.3 x I _N)		
Temperature disconnection	internal temperature monitoring with electronic disconnection		
Low voltage monitoring load output	with hysteresis at voltage dips < 500 ms, no reset required load "OFF" at U _B < 3.2 V		
Starting delay t _{start}	typically 10ms		
Disconnection of load circuit	electronic disconnection		
Free-wheeling circuit	external free-wheeling diode recommended with inductive load		
* Note: several load outputs must not be connected in parallel			
Status output SF	ESX10-TC-114/-124		
Electrical data	plus-switching signal output, connects U _S to terminal 12 of module 17plus, - nominal data: 12VDC / max. 0.2 A (short circuit proof), status output is internally connected to GND with a 10 kΩ resistor		
Status OUT	• ESX10-TCB-114/-124 (signal status OUT) • +12 V = S1 is ON, load output connected through OV = S1 is ON, load output blocked and/or switch S1 is OFF • red LED is lit		
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		
Reset input RE	ESX10-TC-124		
Electrical data	voltage: max. +32VDC; high > 4.5VDC ≤ 18VDC; low ≤ 2.5VDC > 0 V; power consumption typically 1.4 mA (+12VDC); min. pulse duration typically 10 ms		
Reset signal RE (terminal 22)	The electronically blocked ESX10-TC-124 may remotely be reset via an external momentary switch due to the falling edge of a +12 V pulse. A common reset signal can be applied to several devices simultaneously. Switched on devices remain unaffected.		
Control input IN+	ESX10-TC-114		
Electrical data	see reset input RE		
Control signal IN+ (terminal 21)	+12V 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+		

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General data	
Fail-safe element:	backup fuse for ESX10-TC <u>not required</u> because of the integral redundant fail-safe element
Terminals	
LINE+ / LOAD+ / OV	
Screw terminals	M4
Max. cable cross section, flexible with wire end ferrule w/wo plastic sleeve	20-6 AWG (0.5 - 10 mm ²)
Multi-lead connection (2 identical cables), rigid/flexible	20-11 AWG (0.5 - 4 mm ²)
Flexible with wire end ferrule without plastic sleeve	20-13 AWG (0.5 - 2.5 mm ²)
Flexible with TWIN wire end ferrule with plastic sleeve	20-9 AWG (0.5 - 6 mm ²)
Wire stripping length	10 mm
Tightening torque (EN 60934)	1.2 Nm
Terminals	
Aux. contacts	
Screw terminals	M3
Max. cable cross section, flexible with wire end ferrule w/wo plastic sleeve	23-13 AWG (0.25 - 2.5 mm ²)
Wire stripping length	8 mm
Tightening torque (EN 60934)	0.5 Nm
Other general data	
Housing material	molded
Mounting	symmetrical rail to EN 50022-35x7.5
Ambient temperature	-20...+60°C (without condensation, see EN 60204-1) (with condensation upon request)
Storage temperature	-20...+70°C
Humidity	96 hrs/95% RH/40°C to IEC 60068-2-78-Cab climate class 3K3 to EN 60721
Vibration	3 g, test to IEC 68-2-6 test Fc
Degree of protection	housing: IP20 DIN 40050 terminals: IP20 DIN 40050
MC (EMC directive, CE logo)	emission: EN 61000-6-3 susceptibility: EN 61000-6-2
Insulation coordination (IEC 60934)	0.5 kV/2 pollution degree 2; re-inforced insulation in operating area
Dielectric strength	max. 18VDC (load circuit)
Insulation resistance (OFF condition)	N/A, only electronic disconnection
Approvals	UL2367, File E306740, Solid State Overcurrent Protectors UL1604 (class I, div. 2, zone 2), UL508, CE logo CSA C22.2 No. 142 - file 165971, C22.2 No. 213 - file 165971, C1D2 Groups A, B, C, D, Temp Code T5; Ambient 0°-60°C
Dimensions	12.5 x 80 x 83 mm
Mass	approximately 65 g

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 current at 100% ON duty	
			T ₀ = 40° C	T _u = 50° C
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
10 A	150 mV	1.5 x I _N	10 A	9 A

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

Table 2: Specifications

Protection	to EN6052 housing IP30, terminals IP00
EMC	emitted interference to EN 61000-6-3 noise immunity to EN 61000-6-2
Insulation co-ordination	0.5 kV / pollution degree 2, re-inforced insulation in operating area to IEC60934 / IEC60664
CE logo	to 2004/108/EG and 94/9/EG
UL	UL2367, File No E306740 UL508, File No E322549 UL1604, File No E320024
ATEX	IEC/EN60079-0 /-14/-15 ⊕ II 3G Ex nA II B T4 Gc X

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-TC 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-TC.
- Refer to UL/CSA file for proper wiring and installation techniques.

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Table 3: ESX10-TC - Ordering Information

Version	Signal input		Signal output
	Control input ON/OFF Reset	Remote Reset	Status OUT Positive 12V = OK
ESX10-TC-114	x		x
ESX10-TC-124		x	x

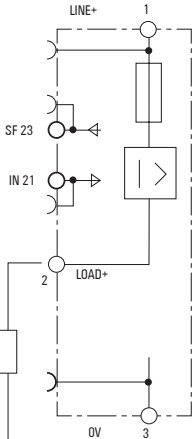
ESX10-TC-114*			ESX10-TC-124**		
Material description	Current rating (amps)	Control input Order number	Material description	Current rating (amps)	Reset input Order number
ESX10-TC-114-DC12V-1A-E	1	7940100373	ESX10-TC-124-DC12V-1A-E	1	7940100360
ESX10-TC-114-DC12V-2A-E	2	7940100377	ESX10-TC-124-DC12V-2A-E	2	7940115330
ESX10-TC-114-DC12V-3A-E	3	7940100375	ESX10-TC-124-DC12V-3A-E	3	7940100362
ESX10-TC-114-DC12V-4A-E	4	7940100376	ESX10-TC-124-DC12V-4A-E	4	7940115293
ESX10-TC-114-DC12V-6A-E	6	7940100378	ESX10-TC-124-DC12V-6A-E	6	7940109732
ESX10-TC-114-DC12V-10A-E	10	7940100379	ESX10-TC-124-DC12V-10A-E	10	7940115331

Note: * Control force input on/off
 ** Reset input only to reset under fault conditions



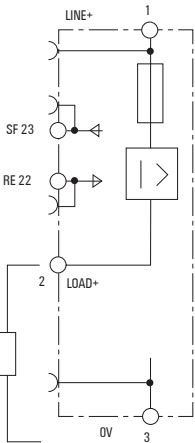
Signal inputs / outputs (wiring diagram)

ESX10-TC-114
 with control input IN+ (+12VDC)
 with status output SF (+12V = load output ON)



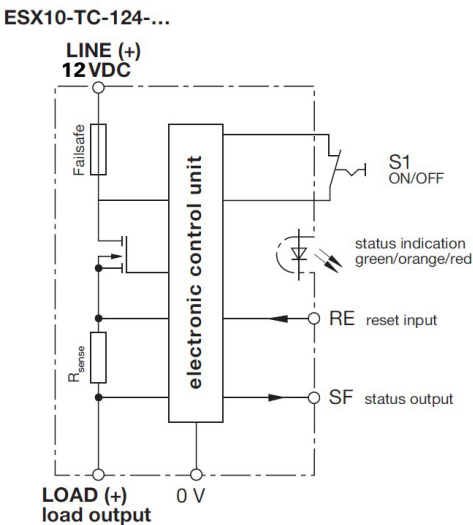
operating condition: SF + 12V = OK
 fault condition: SF 0-V

ESX10-TCB-124
 with reset input RE (+12VDC ↓)
 with status output SF (+12V = load output ON)



operating condition: SF + 12V = OK
 fault condition: SF 0-V

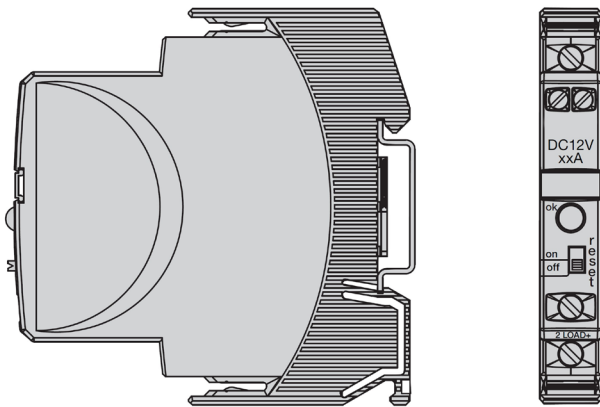
Schematic diagram



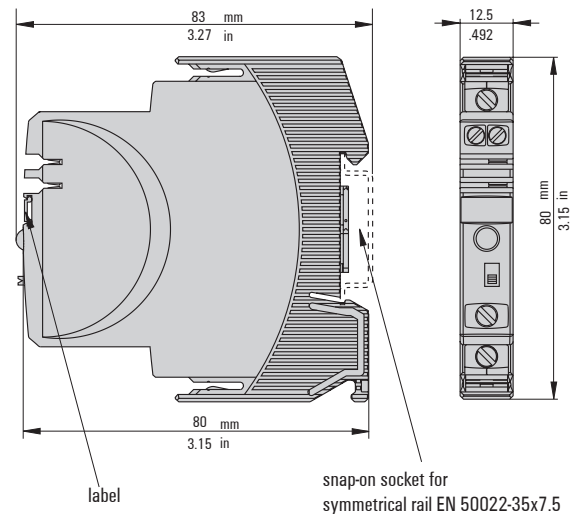
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Terminal wiring diagram

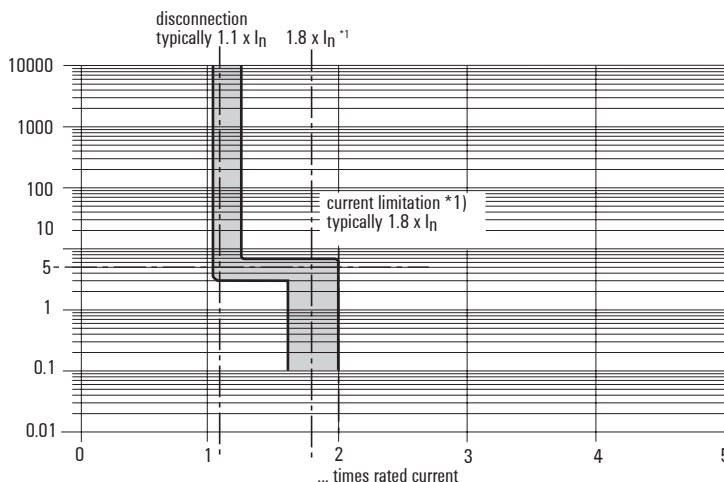


Dimensions



This is a metric design and millimeter dimensions take precedence.

Time/Current characteristic curve ($T_a = 25^\circ\text{C}$)



*1) current limitation typically $1.8 \times I_n$ times rated current at $I_n = 1.0 \text{ A} \dots 6 \text{ A}$
current limitation typically $1.5 \times I_n$ times rated current at $I_n = 10.0 \text{ A}$

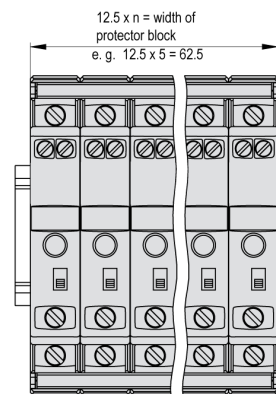
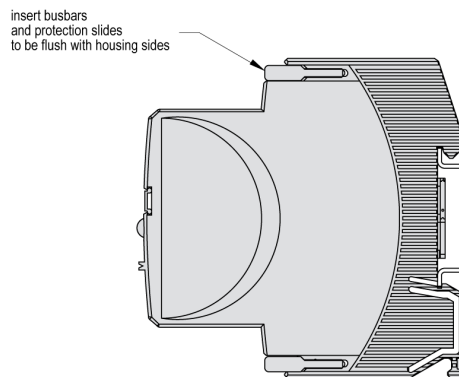
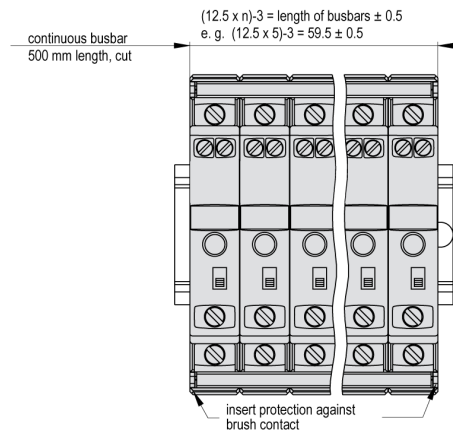
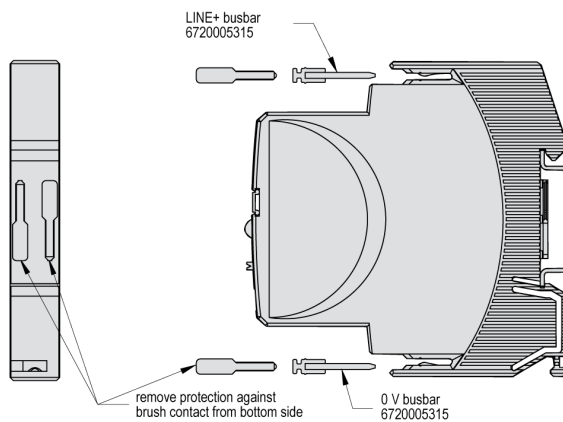
- The trip time is typically 3 seconds in the range between 1.1 and $1.8 \times I_n^{-1}$.
- Electronic current limitation occurs at typically $1.8 \times I_n^{-1}$ which means that under all overload conditions (independent of the power supply and the resistance of the load circuit) the max. overload before disconnection will not exceed $1.8 \times I_n^{-1}$ 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.

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Mounting examples for ESX10-TC

The ESX10-TC features an integral power distribution system



Mounting procedure:

- Before wiring, insert busbars into protection block.
- Max. 10 insertion/removal cycles for busbars.

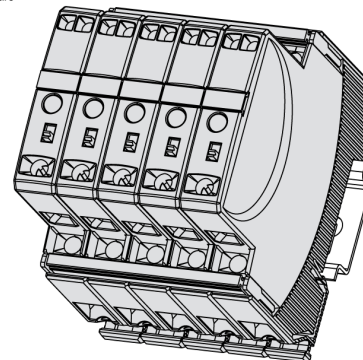
Recommendation:

Every 10 units busbars should be interrupted and fed in anew.

Lengths for busbars: (see accessories)

No. of Units	2	3	4	5	6	7	8	9	10
Length of busbar [mm] + 0.5mm	22	34.5	47	59.5	72	84.5	97	10.95	122

5 ESX10-TC with busbars



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Accessories for ESX10-TC

Description

The ESX10-TC features an integra power distribution system.

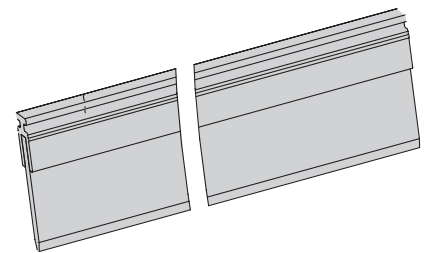
The following wiring modes are possible with various pluggable current and signal busbars:

- LINE +(12VDC)
- 0 V

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

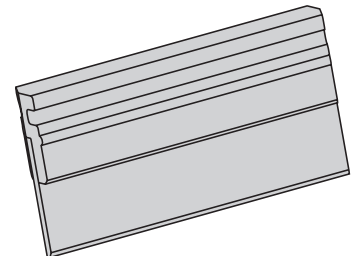
Busbars

Description	Ampacity	Ampacity	Insulation Color	Length	Qty.	Order No.
Busbars for LINE+ and 0 V	With one line entry: I_{max} 50 A	With two line entries: I_{max} 63 A	Gray	500 mm	1	6720005315
Recommended: center line entry						



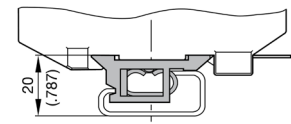
Busbars for Line+ and 0 V

Description	Insulation Color	Length	Qty.	Order No.
ESX10-T MCB/3-UNIT BLOCK 34.5MM	Gray	34.5 mm	1	7940100363
ESX10-T MCB/4-UNIT BLOCK 47.0MM	Gray	47 mm	1	7940100364
ESX10-T MCB/5-UNIT BLOCK 59.5MM	Gray	59.5 mm	10	7940100365
ESX10-T MCB/8-UNIT BLOCK 97MM	Gray	97 mm	1	7940100419
ESX10-T MCB/BUSBAR FOR LINE + AND 0V/72m	Gray	122 mm	4	7940100420



Rail Adapter

Description	Qty.	Order No.
TS32 rail adapter	1	9102100000
Note: remove protection walls/barriers before using adapter		



Supply module

Description	Ampacity	Insulation Color	Length	Qty.	Order No.
ESX10-T SUPPLY MODULE AD-TX-EM01	I_{max} 50 A	Gray	34.5 mm	1	7940098836

