Description

The electronic circuit breaker ESS1 is designed to ensure selective disconnection of individual loads in industrial systems which are powered by a DC 24 V switch mode power supply.
Selectivity means that the ESS1 responds faster to overload or short circuit conditions than the power supply.

The ESS1 has four major tasks:

1. **In the event of an overload or short circuit in a load circuit, even the shortest break-down of the output voltage of the power supply to values below 18 V must be prevented under all circumstances.**
   Otherwise all other components fed by the power supply will respond unpredictably to the voltage dip. Result: reset, re-start, standstill of components or whole system. The voltage dip is caused by the characteristic overcurrent behaviour of the power supply (straight characteristic curve, fold-back curve, hiccup mode etc.).

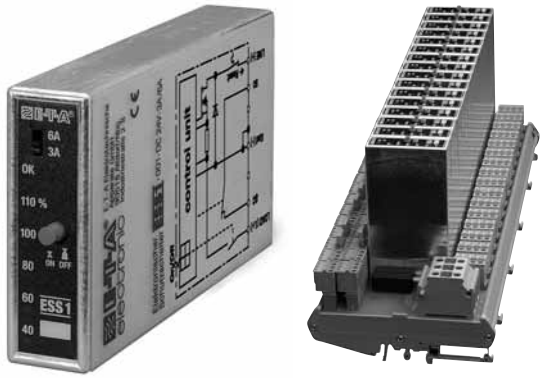
2. **Selective protection/disconnection must be ensured even at worst-case overload conditions.**
   Long feed lines prevent the occurrence of a significant short circuit current (see table 1).

3. **The current limited switch-on of loads with high input capacitance must be ensured without increase of rated current adjustment.**
   Electronic DC 24 V components contain big input capacitors for suppression or back-up of voltage dips.

4. **Fault indication**

Features

- Electronic circuit breaker for protecting system components (sensors, actuators, field bus couplers, control units etc.) which are powered by a DC 24 V switch mode power supply.
- Connection of all load types (resistive, inductive, capacitive).
- Alternative current ratings (3 A or 6 A) can be selected by means of the switch on the device.
- Overload- and short-circuit proof switching output with active limitation of inrush and short-circuit currents.
- Overload-dependent trip characteristics (“thermal-magnetic circuit breaker style”, but much narrower trip curve tolerances).
- Power Mosfet switching output, high side switch.
- Additional disconnection by electromechanical switch in the event of overload.
- RED actuator button: reset or manual trip.
- Visual status indication:
  GREEN LED: O.K. signal
  YELLOW LEDs (40, 60, 80, 100 % of rated current): load current indication
  RED LED (110 %): flashing or lighted after tripping
- Fault indication through auxiliary contact (N/C, break contact).
- Integral thermal circuit breaker (with VDE, UL, CSA approval) serving as a fail-safe element in the load circuit and providing reverse polarity protection.
- Option: control input



ESS1-.../SVS1-...

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

Operating data	
Operating voltage U_S	DC 24 V (DC 18...32 V)
Current rating I_N	3 A or 6 A (selected by means of a switch)
Current consumption I_0 (load output non-conductive)	typically 13 mA
OK signal	GREEN LED lighted when operating voltage is applied
Reverse polarity protection U_S	integral with the device -> internal fail-safe-element tripped (see »Reset« on connection side), LEDs are unlit
Insulation voltage	AC 500 V (control circuit, load circuit, fault indication)
Load circuit	
Load output	Power-MOSFET switching output (high side switch)
Max. data of load (100 % ON duty)	DC 24 V / 5 A (resistive, inductive, capacitive, lamp load)
Voltage drop at I_N	typically 220 mV / 3 A typically 440 mV / 6 A
Overload disconnection	typically 1.1 x I_N
Trip times t_v1: I_{load} > 1.05...2 x I_N t_v2: I_{load} > 2 x I_N	see time/current characteristic curve: typ. 5 s, LED RED (110 %) flashing until disconnection occurs typ. 5 s...100 ms, LED RED (110 %) lighting after disconnection, fault indication F closed
Short-circuit current I_K	active current limitation max. 2 x I_N (6 A or 12 A)
Trip time t_K (at I_K)	typically 100 ms
Temperature disconnection:	internal temperature monitoring with physical isolation, LED RED (110 %) lighting after disconnection, fault indication F
Load current indication	4 YELLOW LEDs (40, 60, 80, 100 %) or 1 RED LED (110 %) signalling utilization of the set current rating in % (e. g. higher than 40 %)
Starting delay t_{start}	typically 1 s upon application of U_S after each switch-on
Free-wheeling circuit	integral bi-directional transil diode; external free-wheeling diode recommended for inductive loads
Disconnection of load circuit	single pole (switch contact) - by manual operation of the RED button - upon electronic fault disconnection (overload, short-circuit)

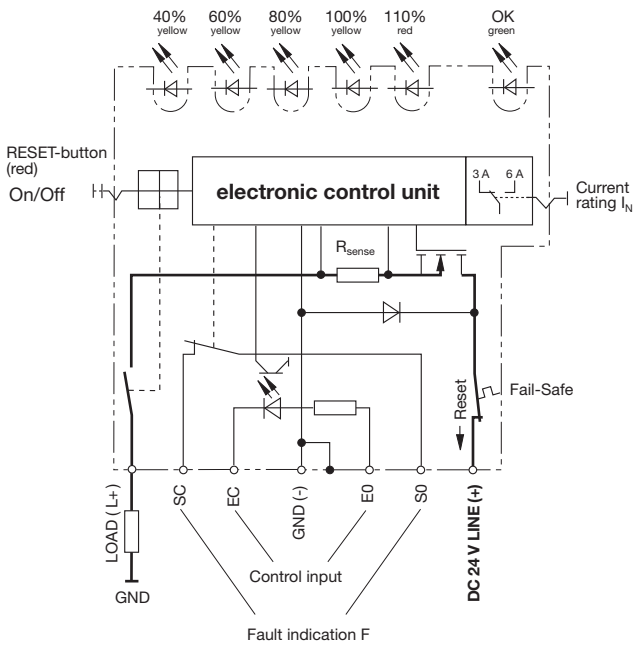
Technical data ($T_{ambient}$ = 25 °C, operating voltage U_S = DC 24 V)

Several load outputs must not be connected in parallel	
Control circuit (option)	
	Control input EC/EO - **to customer requirement:** possibly physically isolated via opto coupler/ control voltage U_S/ control current I_S / switching frequency f_{max} / control signal (U_S = >>1<<) Switching times /t_{on} / t_{off}/ leakage current/ protection
Fault indication	
Fault indication F	potential-free auxiliary contact (SC-S0), break contact (N/C), DC 30 V / max. 1 A
Status of fault indication	Contact closed in the event of power failure or when the switch (RED button) has tripped upon: - overload/short-circuit in the load circuit (RED LED lights). The fault indicated by that LED is stored until the RED operating button is reset. - manual disconnection of the device
Signal delay	typically 150 ms
Reverse polarity of U_S	internal fail-safe element will trip
General data	
Ambient temperature	0...40 °C (without condensation, see EN 60204-1)
Storage temperature	-20...+70 °C
Blade terminals	6.3 mm to DIN 46244-A6.3-0.8 for E-T-A Power distribution system SVS1-xx-...
Backup fuse for ESS1	not required because of the integral redundant fail-safe element (thermal E-T-A circuit breaker)
Housing material	aluminium
Mounting of housing	Plug-in for distribution system SVS1 for symmetric rail mounting
Vibration	3 g, test to IEC 60068-2-6 test Fc
Degree of protection	Housing: IP20 DIN 40050/IEC 529 Terminals: IP00 DIN 40050/IEC 529
EMC (EMC directive, CE logo)	Emission: EN 50081-1 Susceptibility: EN 61000-6-2
Dimensions (W x H x D)	17.5 x 100 x 55 mm
Mass	approx. 80 g

Ordering information

Type No.								
ESS1	Electronic Circuit Breaker for DC 24 V applications							
	Version							
	0 standard							
		Control input						
		0 without control input						
		1 with control input 8.5 V...30 V (option)						
			Signal output					
			0 without auxiliary contact					
			1 with auxiliary contact (N/O)					
				Input voltage				
				DC 24 V voltage rating DC 24 V (18...32 V)				
					Current rating			
					3 A/6 A adjustable (by slide switch)			
ESS1	- 0	0	1	-	DC 24 V	-	3 A/6 A	ordering example

Basic circuit diagram



Shown on the switched-off and de-energised condition.
The red reset button is in the tripped (OFF) position, the auxiliary contacts of the fault indication (SC-S0) are closed.

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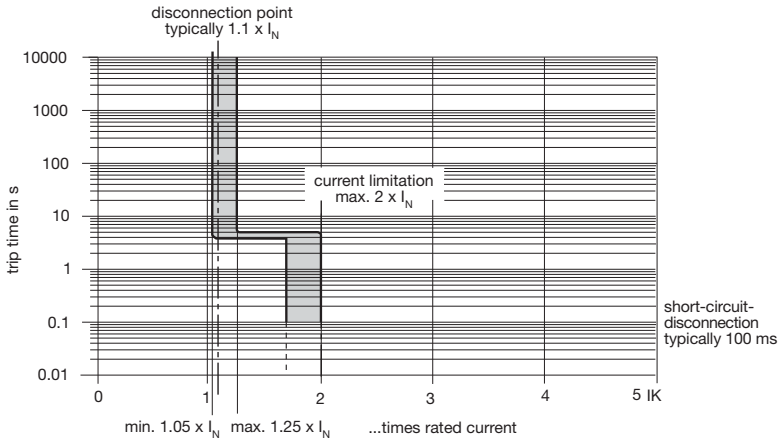
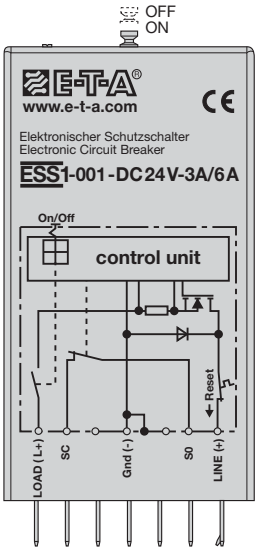
Time/Current characteristic curve (T_A = 25 °C)



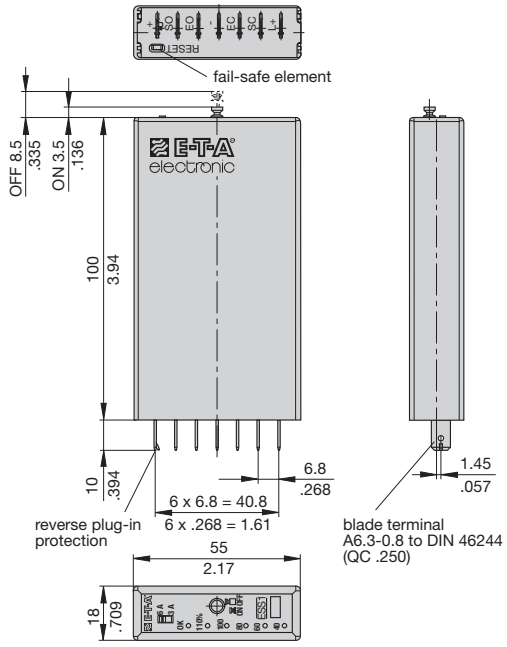
Explanation of the characteristic curve:

- The trip time is typically 5 s in the range between 1.05 and 2 x I_N.
- Electronic current limitation starts at 2 x I_N which means that under all overload conditions (independent of the power supply and the resistance of the load circuit) the max. overload until disconnection will not exceed two times the current rating.
- Without the current limitation activated at 2 x I_N a much higher overload current would flow in the event of an overload or short circuit.
- Trip time after activation of current limitation is between 5 s and 100 ms (short circuit).

Terminal wiring diagram



Dimensions



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

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.

Matrix of the ESS1 switching conditions

Operating mode (unit without Control input)	Trouble-free operation	Overload: I_{load} = 1.1...2 x I_N	Short-circuit: I_{load} > 2 x I_N	temperature disconnection (> 150 °C/ 302 °F) *	internal-failure **)
Load output	**ON** = *conductive*	**OFF** = *non-conductive*	**OFF** = *non-conductive*	**OFF** = *non-cond.*	
Load circuit 1-pole discon. (through switching contact)	no	yes, after approx. 5 s	yes, after approx. 5 s...100 ms	yes, after approx. 60 ms	
Indication					
GREEN LED O. K.-signal	lighted	lighted	lighted	lighted	not lighted
RED LED (I > 110 % von I_N)	not lighted	LED flashes for approx. 5 sec, LED flashes momentarily, lighted after tripping	LED flashes for approx. 5 sec, LED flashes momentarily, lighted after tripping	LED flashes momentarily, lighted after tripping	
YELLOW LEDs Load current indication (> 40, 60, 80,100 % von I_N)	0...4 LEDs lighted, dependent on load current	none of the LEDs lighted after tripping	none of the LEDs lighted after tripping	none of the LEDs lighted after tripping	
Fault indication F aux. contact	open	closed	closed	closed	
RED actuator/ reset button	ON	tripped	tripped	tripped	

- With manual operation (RED button pulled): fault indication F, RED LED also lighted.

* Upon response of the internal temperature control (chip temperature of power semiconductors is +150 °C / +302 °F for a short period of time) the load current is disconnected. The circuit breaker trips and the red LED (I > 110 %) is lighted.

If the ESS1 is to be switched off again, a short cooling down period must be taken into account due to the temperature hysteresis of the semiconductor chip. The cooling down period will be approx. 5 sec dependent on the energy absorption (behaviour similar to thermal circuit breaker).

**) Electronic control unit defective
- internal fail-safe element has tripped (see »reset« on terminal side of the ESS1).

Table 1: Electronic Circuit Breaker ESS1 for DC 24 V

Reliable trip of ESS1 with different cable lengths and cross sections

Specific conductivity of copper ρ_0 = 0.0178 (Ohm x mm²) / m

U_S = DC 19.2 V (= 80 % v. 24 V) — voltage drop of ESS1 and tolerance of trip point (typically 1.1 x I_N = 1.05...**1.25 x I_N**) have been taken into account.

ESS1-selected rating I_N (in A) →	**3**	**6**	
trip current I_{ab} = max. 1.25 x I_N (in A) →	3.75	7.5	→ **ESS1 trips after typically 5 s**
R_{max} in Ohm = (U_S / I_{ab}) - 0.050 →	**5.07**	**2.51**	

The ESS1 reliably trips from 0 Ohm to max. circuitry resistance R_{max}

Cable cross section **A** in mm² →	0.14	0.25	0.34	0.5	0.75	1	1.5
cable length **L** in meter (= single length) ↓	**cable resistance in Ohm = (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. length at 1.5 mm² and 3 A → **214 m**

Example 2: max. length at 1.5 mm² and 6 A → **106 m**

Example 3: mixed wiring: R1 = 40 m in 1.5 mm² and R2 = 5 m in 0.25 mm²:
(Control cabinet – sensor/actuator level) R1 = 0.95 Ohm, R2 = 0.71 Ohm **Total (R1 + R2) = 1.66 Ohm**

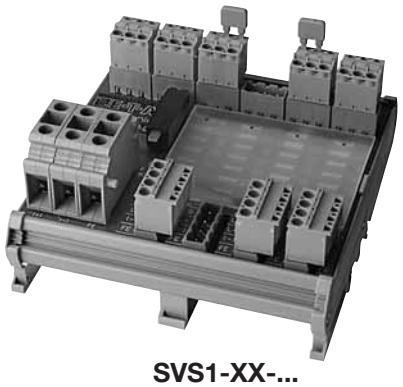
Description

The E-T-A power distribution system SVS1 is designed to accommodate the electronic circuit breaker series ESSx. It distributes the current supplied by a switch mode power supply up to 40 A to 4, 8, 12 or 16 channels. Mains connection is via screw terminals. The individual circuit breakers can be plugged in. Loads are connected via cage clamp screwless terminals. The power distribution includes integral wiring of the signalisation of the individual channels which can be combined to group signals A and B. The SVS1 can be snapped onto a DIN symmetrical rail.

Features

- Power distribution system for short-circuit limited DC 24 V applications up to max. 40 A continuous load
- Three screw terminals (max. 10 mm²/AWG 8) for:
  - DC 24 V (+) (green)
  - DC 24 V (-) (green)
  - FE (functional earth) (green)

  for connecting the switched-mode power supply
- Modular design ESS1-positions:
  - SVS1-16-...: 16 channels - SVS1-12-...: 12 channels
  - SVS1-08-...: 8 channels - SVS1-04-...: 4 channels
- Load outputs (L) per channel
  (complete with screwless spring-loaded terminals, wiring 4 x max. 2.5 mm² (AWG 14)/ without connector sleeve):
  - (LB) group output (+) internally bridged across all channels (for special applications)
  - (L+) load output (+), per channel
  - (-) DC 24 V (-)
  - (FE) functional earth
- Signal output (S) per channel
  (complete with screwless spring-loaded terminals, wiring 3 x max. 2.5 mm² (AWG 14)/ without connector sleeve):
  - (S0) single output
  - (SA) signal group A
  - (SB) signal group B
- 2 Group signal outputs (output or further connection)
  (complete with screwless spring-loaded terminals, wiring 3 x max. 2.5 mm² (AWG 14)/ without connector sleeve):
  - (SAS) signal group A --> group signal
  - (SBS) signal group B --> group signal
  - (SCS) common return wire for groups A/B
    (protected by a 1 Amp. E-T-A Circuit Breaker F/SCS)
- Option: control input (E) - not used -



SVS1-XX-...

Ordering information

Type

SVS1 Power distribution system
- Short-circuit limited DC 24 V applications
- Max. 40 A continuous load
- 3 screw terminals max. 10 mm² (AWG 8) for
  - DC 24 V (+) /DC 24 V (-) / functional earth FE

Version, number of channels (K)

04	4 channels (K1...K4)
08	8 channels (K1...K8)
12	12 channels (K1...K12)
16	16 channels (K1...K16)

Load outputs (L) per channel

L2	load (+), load (-) (on request)
L3	load (+), load (-), FE (on request)
L4	4 load outputs per channel ● (LB) group output (+) internally bridged across all channels ● (L+) load output (+), per channel ● (-) DC 24 V (-) ● (FE) functional earth

Signal outputs (S)

S0	without signal outputs (option)
S1	- with signal output (S) per channel: ● (S0) single output ● (SA) signal group A ● (SB) signal group B - with group signal outputs: ● (SAS) signal group A group signal ● (SBS) signal-group B group signal ● (SCS) common return wire for groups A/B

Control input (E)

E0	without control input
E1	with control input (E) per channel (option)

Fitting variants

C0	not fitted
C1	complete with screwless spring-loaded terminals max. 2.5 mm² (AWG 14) without connector sleeve

SVS1	-	**16**	-	**L4**	-	**S1**	-	**E0** - **C1**	ordering example

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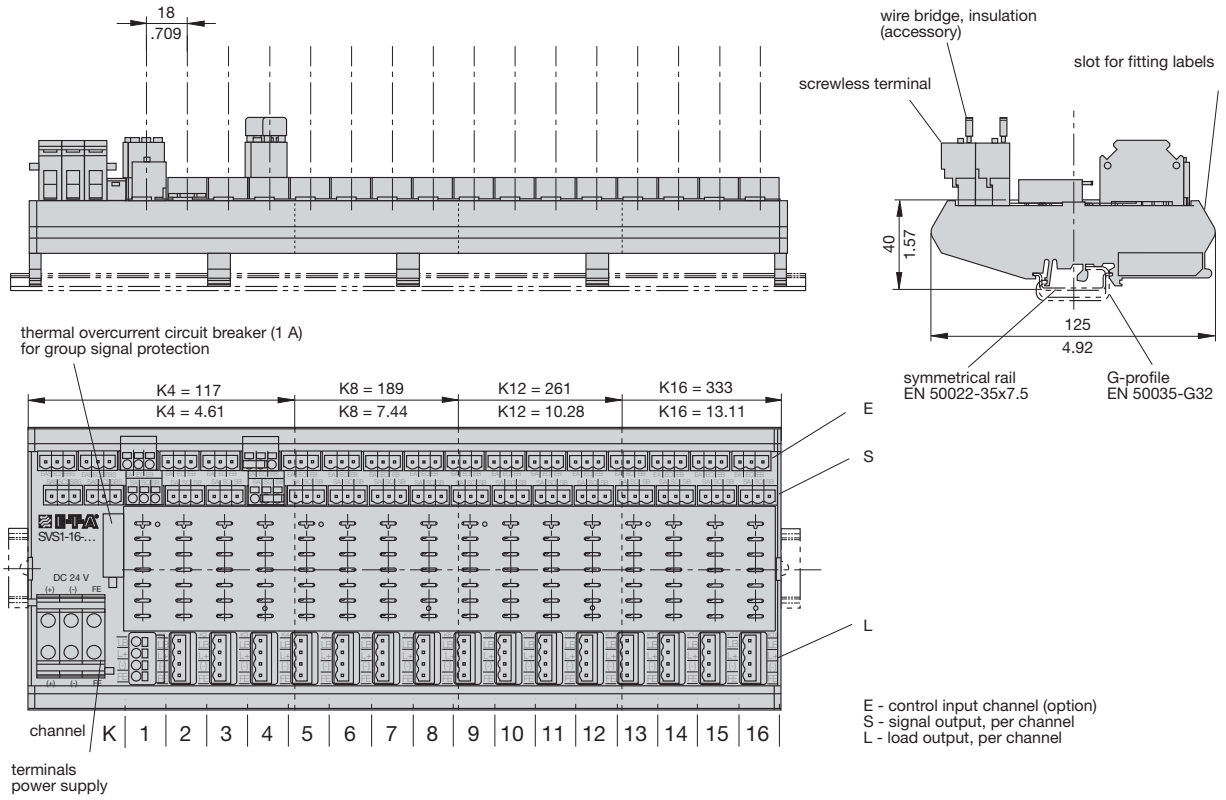
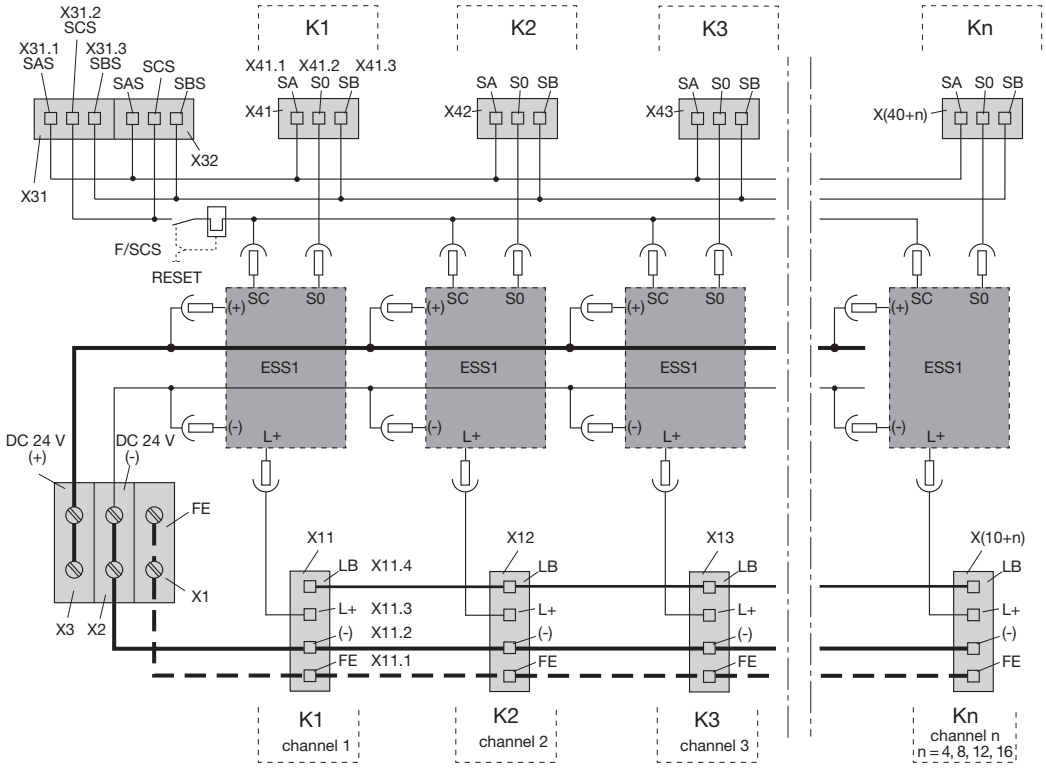
Dimensions SVS1-16

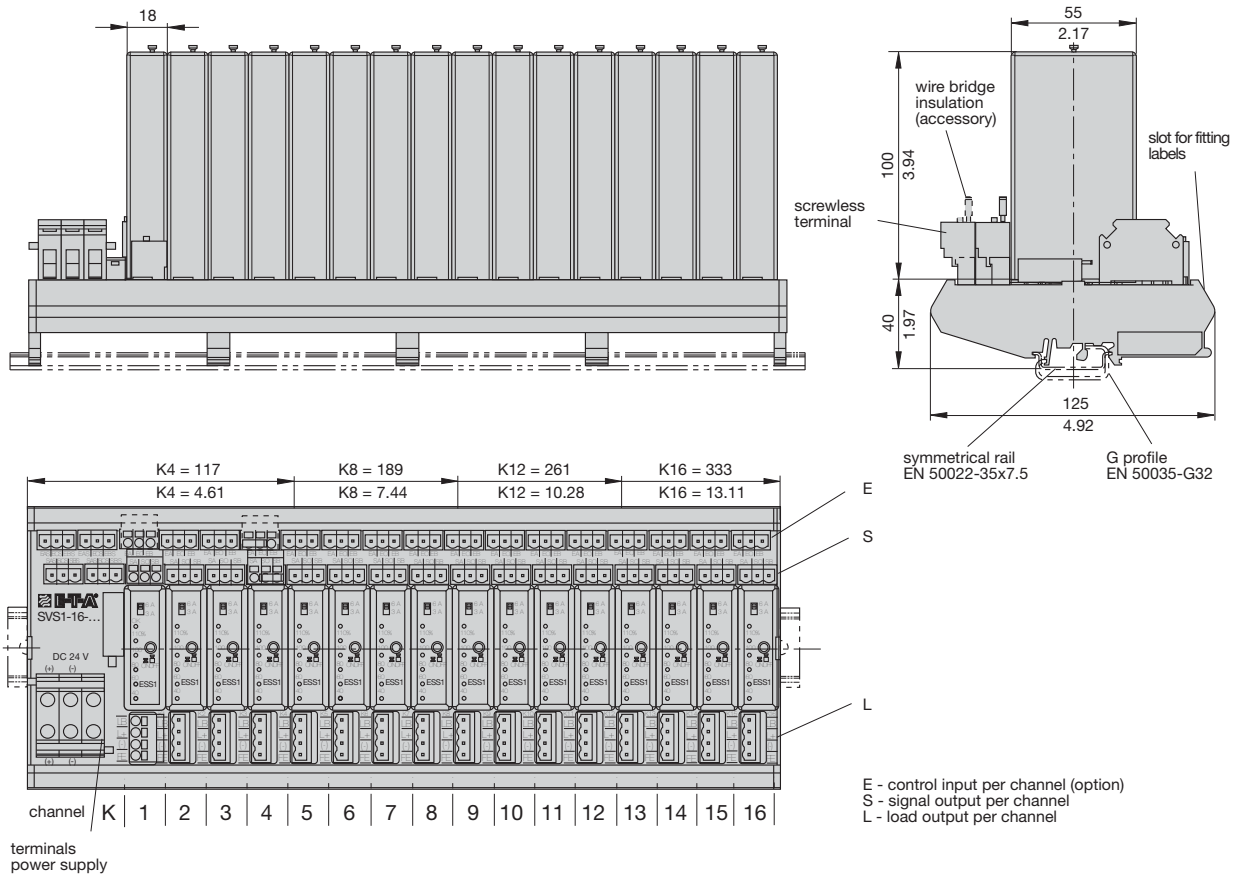


This is a metric design and millimeter dimensions take precedence ($\frac{mm}{inch}$)

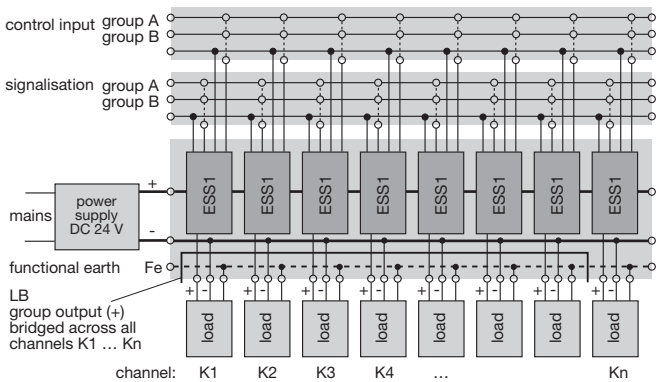
Connection diagram SVS1-(n)



Dimensions SVS1-16, fitted with ESS1



Schematic diagram SVS1-(n)



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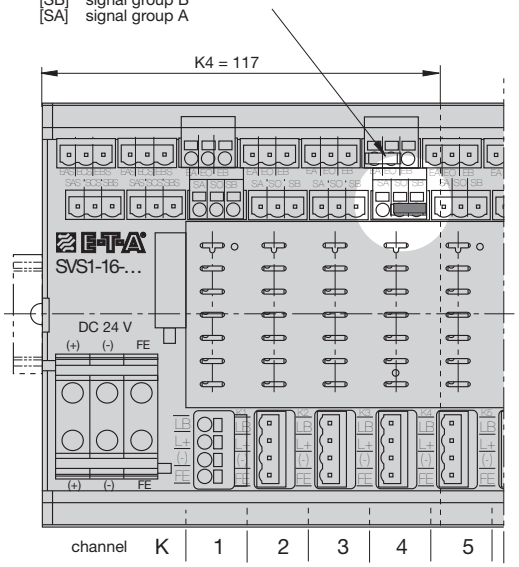
Example of signal group

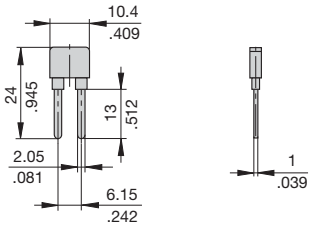
Signal output of channel K4:
Insulated wire bridge (accessory) placed:
[S0] ⊓ [SB]
This means that [S0] of K4 has been assigned to the group signal of signal group B [SBS].
[S0] single output
[SB] signal group B
[SA] signal group A



Accessories

Insulated wire bridge
Y 303 881 08

- Group connection of signal outputs (S0) - (SA) or (S0) - (SB)
- Group connection of control inputs (option)



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Description

Electronic circuit breaker type ESS20-0.. is designed to ensure **selective** disconnection of individual loads in systems which are powered by a DC 24 V switch-mode power supply.

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 ESS20-0.. responds much faster to overload or short circuit conditions than the switch-mode power supply. This is achieved by a combination of active current limitation and well-proven circuit breaker technology including physical isolation. The ESS20-0.. limits the highest possible current to 1.8 or 1.5 times the selected rated current of the circuit breaker. Thus it is possible to switch on capacitive loads of up to 20,000 µF lamp loads, but they are disconnected only in the event of an overload or short circuit.

For optimal adjustment to the application conditions the current rating of the ESS20-0.. can be selected in fixed values from 0.5 A...10 A and in adjustable variants 1 A/2 A or 3 A/6 A. Failure and status indication are provided by a bicolour LED and an integral signal contact.

The ESS20-0.. features a width of only 12.5 mm and can be plugged into the E-T-A power distribution socket Module 17plus and SVS02/SVS04 (for ESS20-003) ensuring ease of installation and saving space in control cabinets.

Features

- Selective load protection with physical isolation in the event of a fault.
- All types of loads can be connected (small DC motors etc. on request).
- Active current limitation (1.8 or 1.5 times rated current I_N = 8 A or 10 A) for safe connection of capacitive loads up to 20,000 µF and on overload/short circuit.
- Electronic trip characteristic.
- Reliable overload disconnection with 1.1 x I_N plus, even with long load lines or small cable cross sections (see table 2).
- Selectable current ratings (fixed values 0.5 A...10 A or two steps: 1 A/2 A or 3 A/6 A).
- Manual ON/OFF button (push-push actuation).
- Clear status and failure indication.
- Width per unit only 12.5 mm.
- Plug-in mounting utilising power distribution system Module 17plus or SVS02/SVS04 (for ESS20-003), see product group 7.

Approvals

Authority	Voltage rating	Current ratings
UL 1077	DC 24 V	0.5...10 A

Attention: the user has to make sure that the cable cross sections of the relevant load circuit are suitable for the current rating of the ESS20 used.

ESS20-0..

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

Operating data	
Operating voltage U_S	DC 24 V (18...32 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 switchable: 1 A/2 A or 3 A/6 A
Power consumption	typically 13 mA
Trip current (bimetal)	typically 0.3 A (only in the event of a failure, before physical isolation)
Status indication by means of	**bicolour LED:** GREEN: unit is ON, power-MOSFET is switched on ORANGE: in the event of overload or short circuit until physical isolation LED not lighted: push button in OFF position **potential-free signal contact** (change-over contact) **OFF-position of push button**
Reverse polarity protection of U_S	internal bimetal (fail-safe element) trips, push button moves into OFF position
Load circuit	
Load output	Power-MOSFET switching output (high side switch)
Max. data of load with side-by-side mounting	see table 1
Voltage drop at I_N	see table 1
Overload disconnection	typically 1.1 x I_N (1.05...1.35 x I_N)
Short-circuit current I_K	typically 1.8 x I_N / active current limitation
Trip time for physical isolation for electronic disconnection	see time/current characteristics typically 5 sec at I_{load} > 1.1 x I_N typically 5 sec...100 ms at I_{load} > 1.8 x I_N or 1.5 x I_N
Temperature disconnection	internal temperature monitoring with physical isolation
Low voltage monitoring load output	ON at U_S >16 V OFF at U_S < 8 V
Starting delay t_{start}	typically 0.3 sec after every switch-on and after applying U_S
Disconnection of load circuit	single pole (switch contact) - by push-push actuation of the blue push button - upon electronic fault disconnection (overload, short circuit) - with reverse polarity
Free-wheeling circuit	external free-wheeling diode recommended with inductive load
Several load outputs must not be connected in parallel.	

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

Fault indication, signal output	
Fault indications	potential-free auxiliary contact change-over (SC-SO / SC-SI) simultaneously with physical isolation max. DC 30 V / 0.5 A, min. 10 V / 10 mA
Signal output ESS20-001 (single signalisation N/O)	blue push button in ON position: signal contact SC-SI is closed blue push button in OFF position: signal contact SC-SI is open
Signal output ESS20-003 (group signalisation N/C)	blue push button in ON position: signal contact SC-SO is closed (SC-SI is copen) blue push button in OFF position: signal contact SC-SO is open (SC-SI is closed)
Visual indication	LED lighted in ORANGE (until physical isolation)
General data	
Backup fuse for ESS20-0..	not required because of the integral redundant fail-safe element (thermal E–T–A circuit breaker) push button in OFF position when fail-safe element has tripped.
Blade terminals	6.3 mm to DIN 46244-A6.3-0.8
Housing material	plastics material
Mounting of housing	plug-in mounting utilising power distribution system Module 17plus or SVS02
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: IP30 DIN 40050 terminals: IP00 DIN 40050
EMC (EMC directive, CE logo)	emission: EN 50081-1 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 operating area installation area load circuit-signal contact	(see dimensions) test voltage AC 1000 V test voltage AC 500 V test voltage AC 500 V
Insulation resistance (OFF condition)	> 100 MΩ (DC 500 V) [LINE (+) – LOAD (+)]
Approvals	UL 1077, File E67320 Supplementary Protectors for use in Electrical Equipment CE logo
Dimensions (W x H x D)	12.5 x 105 x 60 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)	max. load current at 100 % ON duty T_U = 40 °C	T_U = 50 °C
0.5 A	100 mV	1.8 x I_N	0.5 A	0.5 A
1 A	140 mV	1.8 x I_N	1 A	1 A
2 A	180 mv	1.8 x I_N	2 A	2 A
3 A	140 mV	1.8 x I_N	3 A	3 A
4 A	190 mV	1.8 x I_N	4 A	4 A
6 A	280 mV	1.8 x I_N	6 A	5 A
8 A	220 mV	1.5 x I_N	8 A	7 A
10 A	280 mV	1.5 x I_N	10 A	9 A
1 A/2 A	140 mV/280 mV	1.8 x I_N	1 A/2 A	1 A/2 A
3 A/6 A	140 mV/280 mV	1.8 x I_N	3 A/6 A	3 A/5 A

Attention: when mounted side-by-side without convection the ESS20-0.. should not carry more than 80 % of its rated load with 100 % ON duty because of the integral thermal circuit breaker.

Ordering information

Type No.

ESS20 Electronic Circuit Breaker with current limitation (e.g. typically 1.8 times rated current or 1.5 x I_N, see table 1)

Version
- **0** with physical isolation in the event of a failure

Control input
- **0** without control input

Signal output
- **1** signal contact N/O (single signalisation)
- **2** signal contact N/C (single signalisation)
- **3** signal contact changeover (group signalisation)

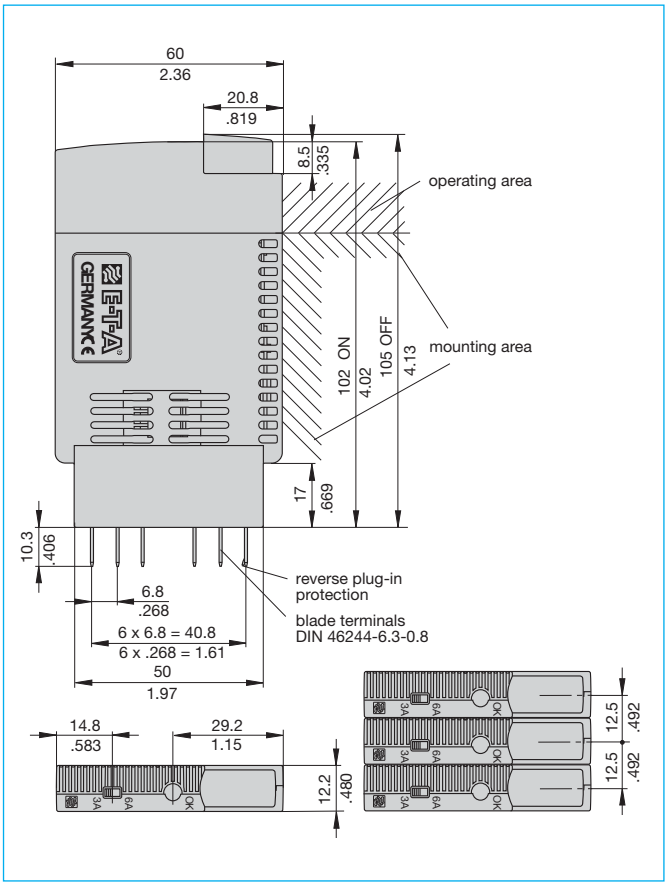
Operating voltage
- **DC 24 V** rated voltage DC 24 V

Current rating
- **0.5 A**
- **1 A**
- **2 A**
- **3 A**
- **4 A**
- **6 A**
- **8 A**
- **10 A**
- **1 A/2 A** (selectable)
- **3 A/6 A** (selectable)

ESS20 - 0 0 3 - DC 24 V - 3 A/6 A ordering example (recommended type)

Attention: the user has to make sure that the cable cross sections of the relevant load circuit are suitable for the current rating of the ESS20 used.

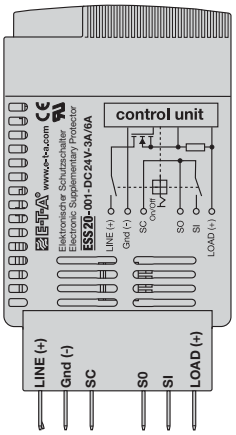
Dimensions



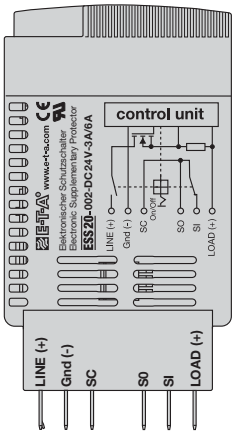
This is a metric design and millimeter dimensions take precedence ($\frac{mm}{inch}$)

Terminal wiring diagrams (e. g. adjustable 3 A/6 A)

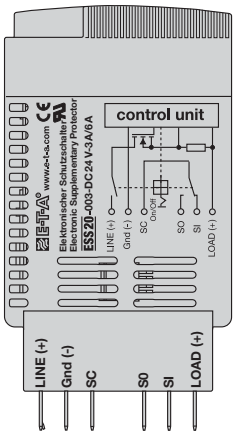
ESS20-001-...



ESS20-002-...

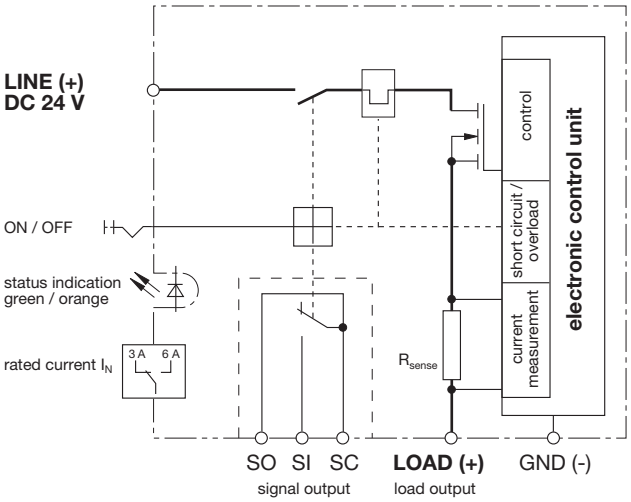


ESS20-003- ...

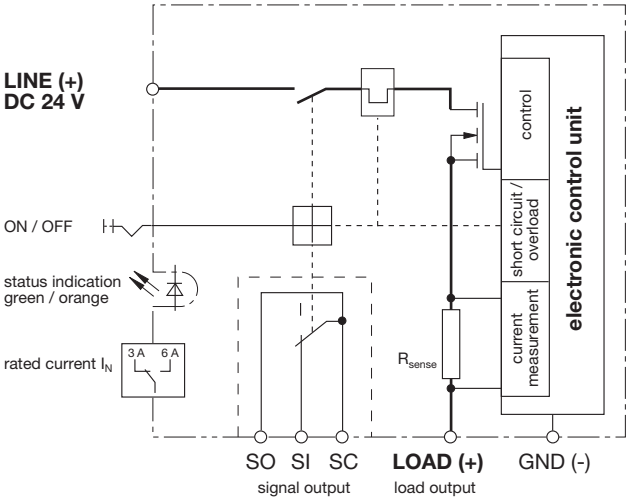


Basic circuit diagrams (e. g. adjustable 3 A/6 A)

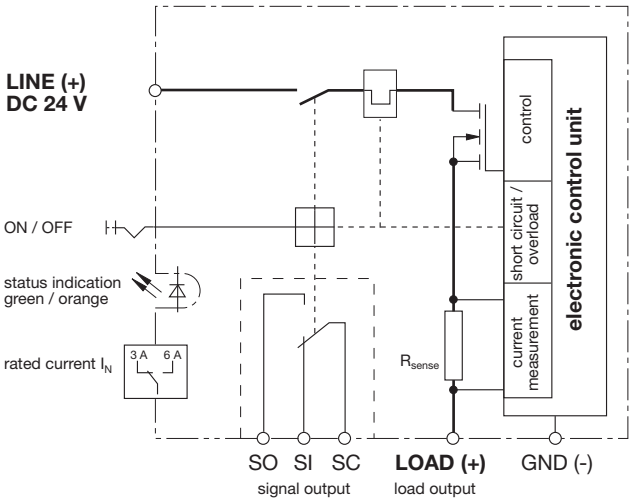
ESS20-001-... (single signalisation N/O)



ESS20-002-... (single signalisation N/C)



ESS20-003- ... (group signalisation with change over)



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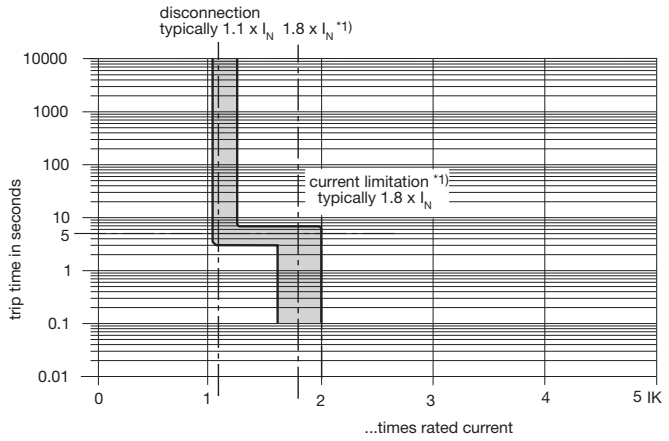
Time/Current characteristic curve (T_A = 25 °C)



*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...10 A

- The trip time is typically 5 s in the range between 1.1 and 1.8 x I_N*1).
- Electronic current limitation starts 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 until 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 5 sec (at overload with high line attenuation).
- Without the current limitation activated at typically 1.8 x I_N*1) a considerably higher overload current would flow in the event of an overload or short circuit.
- After detection of an overload or short circuit the LED changes colour from GREEN to ORANGE. The LED will no longer be lighted after the circuit breaker has tripped.
- Resetting the circuit breaker is not possible before the integral bimetal has cooled down (approx. 10 sec).

Table 2: Reliable trip of ESS20

Reliable trip of ESS20 with different cable lengths and cross sections

Resistivity of copper ρ_0 = 0.0178 (Ohm x mm²) / m

U_S = DC 19.2 V (= 80 % v. 24 V) — voltage drop of ESS20 and tolerance of trip point (typically 1.1 x I_N = 1.05...**1.35 x I_N**) have been taken into account.

ESS20-selected rating I_N (in A) →	**3**	**6**	
e. g. trip current I_{ab} = 1.25 x I_N (in A) →	3.75	7.5	→ **ESS20 trips after 3...5 s**
R_{max} in Ohm = (U_S / I_{ab}) - 0.050 →	**5.07**	**2.51**	

The ESS20 reliably trips from 0 Ohm to max. circuitry resistance R_{max}

Cable cross section **A** in mm² →	0.14	0.25	0.34	0.5	0.75	1	1.5
cable length **L** in meter (= single length) ↓	**cable resistance in Ohm = (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. length at 1.5 mm² and 3 A → **214 m**

Example 2: max. length at 1.5 mm² and 6 A → **106 m**

Example 3: mixed wiring: R1 = 40 m in 1.5 mm² and R2 = 5 m in 0.25 mm²:
(Control cabinet – sensor/actuator level) R1 = 0.95 Ohm, R2 = 0.71 Ohm **Total (R1 + R2) = 1.66 Ohm**

Accessories for ESS20-0..

Description

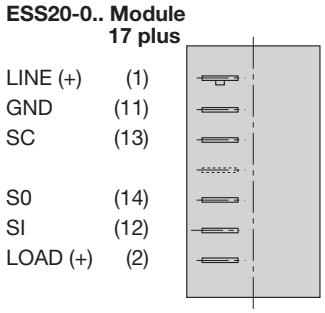
Module 17plus is a power distribution system for use with electronic circuit breaker ESS20-0...
Each module accommodates two breakers with an individual housing width of only 12.5 mm and fits onto all industry standard mounting rails.
The two-way modules can be interconnected to provide as many ways as required with a terminal block fitted at each end for connection of signalling circuits. A distribution busbar can be fitted on the supply side of the modules (positive pole) though each pole of multipole circuit breakers must be individually connected.
Electrical connections are by means of spring-loaded terminals. The reference potential for the ESS20-0.. (Gnd pin 11) is also looped through and connected to the terminals at the sides.
The integral make contact of the ESS20-001 (SC-SI) can be tapped at terminal 12 of the relevant channel (individual signalisation).
The integral make contact of the ESS20-002 (SC-SI) can be tapped at terminal 12 of the relevant channel (individual signalisation).
The ESS20-003 has an integral signal contact (change-over contact). The contact SC-SO is used for group fault signalisation. For this purpose the contacts for signalisation are connected in series in the Module 17plus and are connected to the terminal blocks via two terminals (13,14). It is possible with a test probe to contact the series connection in each module and detect possible interruptions.
All internal wirings for the ground potential and the group signal are established by the modular mounting of the individual Modules 17plus.
Meets the requirements of UL60950.

17plus

Ordering information

17PLUS-Q02-00	Module 17plus, centre piece, two-way
17PLUS-QA0-LR	one each left- and right-side terminal block for supply feed from the side by means of screw terminal, connection of signalisation etc.

Pin configuration, fitted with ESS20-0..



Technical data

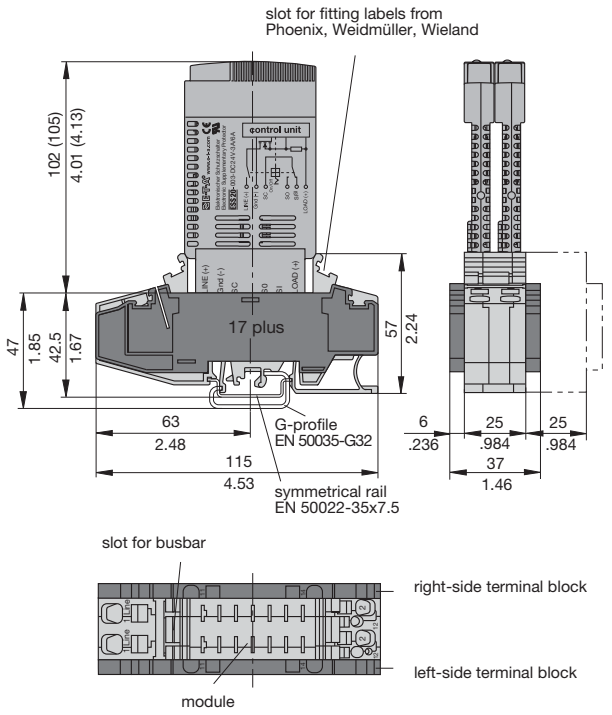
Connection	Spring-loaded terminals for solid conductors and stranded cables with and without wire end ferrules. Please use appropriate screw driver size (SD) for removing the spring loaded terminals.
LINE feed (1)	spring-loaded terminals for 1.5-10 mm² (AWG 10), SD 2 (0.8x4.0)
LOAD output (2)	spring-loaded terminals for 0.25-4 mm² (AWG 12), SD 1 (0.6x3.5)
Reference potential Gnd/ group signal terminals (11 or 13, 14):	spring-loaded terminals for 0.25-2.5 mm² (AWG 14), SD 1 (0.6x3.5)
individual signal terminal (12)	spring-loaded terminal for 0.25-1.5 mm² (AWG 16), SD 0 (0.4x2.5)

Test probe for testing the group signal for line interruption: ≤ 2 mm ø

Voltage rating (without ESS20-0..):	AC 433 V; DC 65 V
Current rating (without ESS20-0..)	
LINE feed (1)	50 A
LOAD output (2)	25 A
Reference potential Gnd (11)	10 A
Individual signal (12)	1 A (with ESS20-0..: 0.5 A)
Group signal /(13-14)	1 A (with ESS20-0..: 0.5 A)
Internal resistance values (without ESS20-0..)	
LINE-LOAD (1-2)	≤ 5 mΩ
Group signal (13-14) per module	≤ 8 mΩ per pole + 5 mΩ for each additional module
Busbar for power distribution	
insulated busbar (blue or red):	I_{max} 32 A
non-insulated busbar:	I_{max} 50 A
(The non-insulated busbar, too, meets brush contact safety standards when fitted.)	
Dielectric strength of Module 17plus (without ESS20-0..)	
between main circuits (without busbar):	1,500 V
main circuit to auxiliary circuit:	1,500 V
between auxiliary circuits:	1,500 V
Mass: Module 17plus (centre piece)	approx. 85 g
terminal blocks (pair)	approx. 30 g

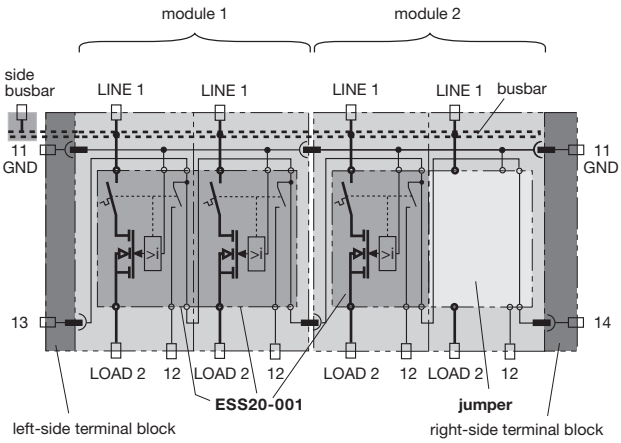
5

Dimensions



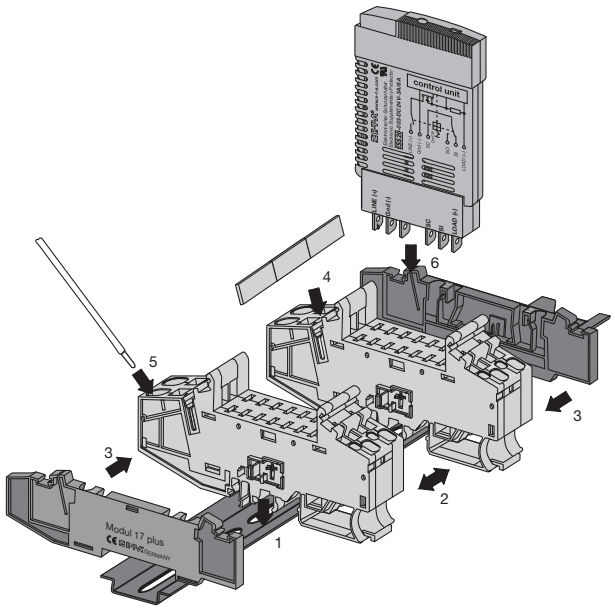
This is a metric design and millimeter dimensions take precedence ($\frac{mm}{inch}$)

Connection diagram for ESS20-001



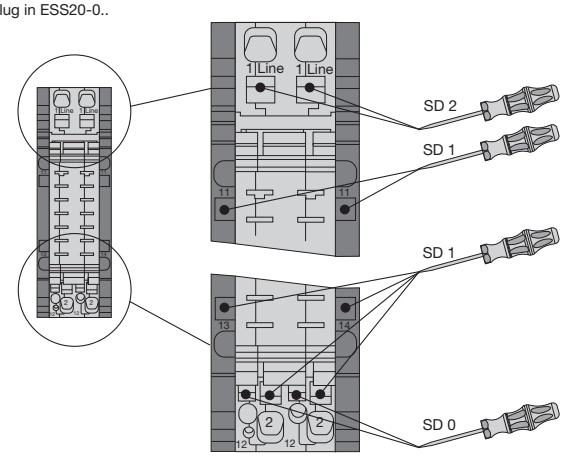
11	GND
12	terminal for single signalisation per channel
13, 14	feed for single signalisation

Installation example



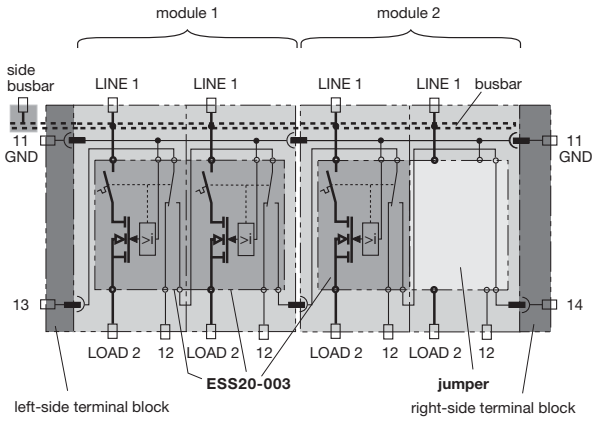
Installation:

1 Clip modules onto DIN rails.
2 Push modules together (side-by-side).
3 Snap on right-side and left-side terminal blocks.
4 Cut busbar to required length and fit on supply side of the modules.
5 Connect line feed with spring-loaded terminals.
6 Plug in ESS20-0..



Connection and disconnection of cables with screw driver

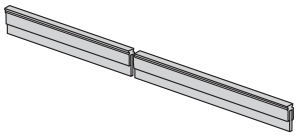
Connection diagram for ESS20-003



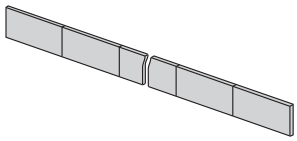
11	GND
13, 14	terminal for group signalisation

Accessories

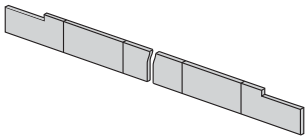
Busbar 32 A
X 222 005 01 blue insulation, 500 mm/19.68 in.
X 222 005 02 red insulation, 500 mm/19.68 in.
X 222 005 03 grey insulation, 500 mm/19.68 in.



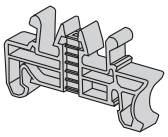
Busbar 50 A
Y 307 016 01 non-insulated, 500 mm/19.68 in.



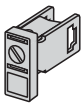
Busbar 50 A
Y 307 016 11 non-insulated, 500 mm/19.68 in.



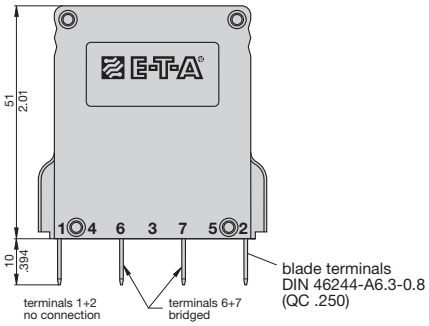
End bracket
X 222 004 01



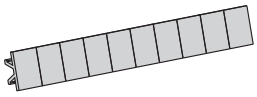
Screw terminal for busbar
X 211 156 01 non insulated



Jumper
X 222 066 01

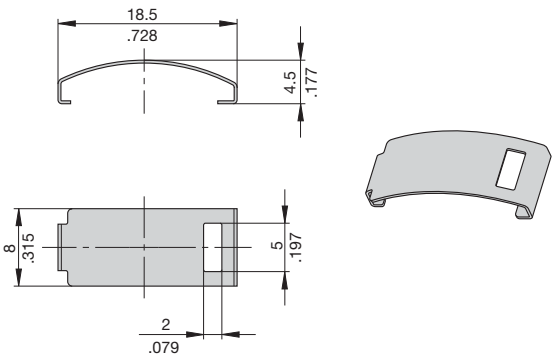


Labels
marking area 6 x 10 mm
(packing unit 10 pcs = 1 strip)
part. no. Y 307 942 61



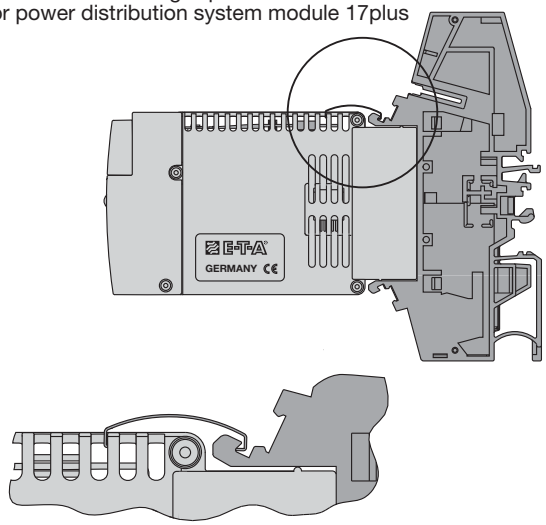
Accessories for ESS20-0..

Retaining clip Y 307 754 01

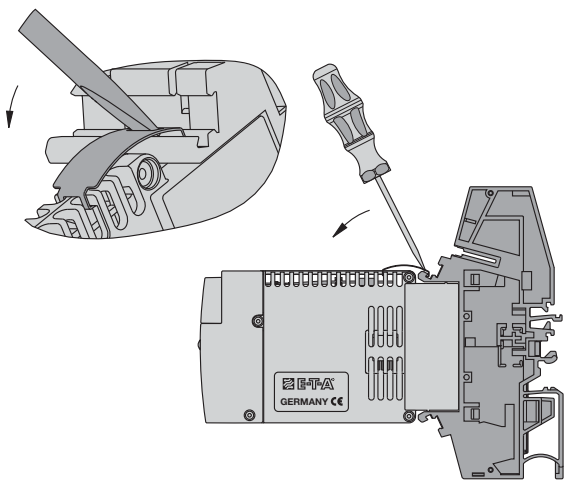


Mounting of retaining clip

ESS20 with retaining clip Y 307 754 01
for power distribution system module 17plus



Removal of retaining clip Y 307 754 01



This is a metric design and millimeter dimensions take precedence (mm / inch)

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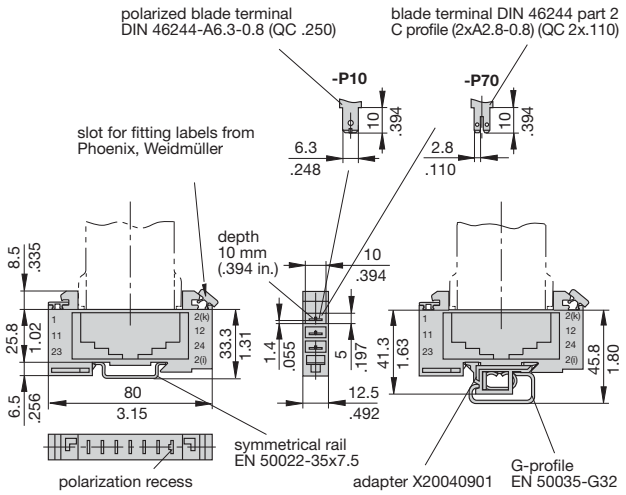
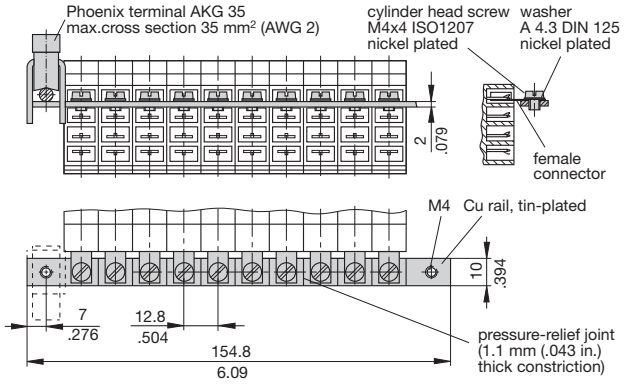
Accessories for ESS20-0..

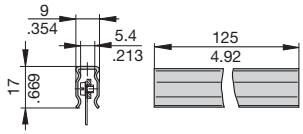
Single mounting sockets (with adapter)
(up to 16 A max. load)
17-P10-Si **17-P10-Si-20025**
17-P70-Si **17-P70-Si-20025**



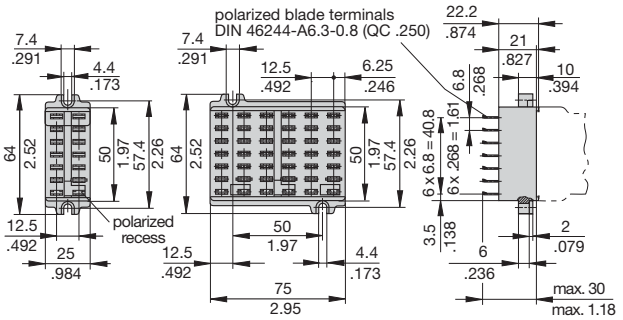
Busbar (10-way) (supplied as a complete package)
for type 17 socket
(for max. 100 A continuous load),
more positions available on request
X 211 157 01 with terminal
X 211 157 02 without terminal



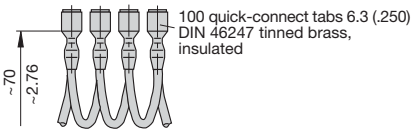
Insulating sleeving for busbar (10-way)
Y 303 824 01



2-way mounting socket **6-way mounting socket**
23-P10-Si **63-P10-Si**
(retaining clip Y 300 581 03 available on request)

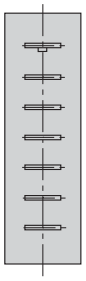


Connector bus links -P10
X 210 588 01/ 1.5 mm², (AWG 16), brown (up to 13 A max. load)
X 210 588 02/ 2.5 mm², (AWG 14), black (up to 20 A max. load)
X 210 588 03/ 2.5 mm², (AWG 14), red (up to 20 A max. load)
X 210 588 04/ 2.5 mm², (AWG 14), blue (up to 20 A max. load)



Pin selection, fitted with ESS20-0..

ESS20-0..	17-P10-Si
LINE (+)	[2(k)]
GND	[12]
SC	[24]
	[2(i)]
S0	[23]
SI	[11]
LOAD (+)	[1]



This is a metric design and millimeter dimensions take precedence (mm / 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.

Electronic Circuit Breaker with reset input ESS20-1..

Description

The special device ESS20-1.. is a further extension of the product line “electronic circuit breakers”. Type ESS20-1.. has a width of only 12.5 mm and selectively protects all DC 24 V loads through a combination of active electronic current limitation and well-proven circuit breaker technology including physical isolation and manual actuation. The ESS20-1.. can be plugged into the E-T-A power distribution socket Module 17plus, ensuring ease of installation and a significant reduction of wiring time.

DC 24 V switch-mode power supplies (10 A...40 A), which are widely used in automation 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.

The ESS20-1.. helps to overcome this problem as it responds to the overload condition faster than the switch-mode power supply. The highest possible overcurrent is limited to 1.8 or 1.5 times rated current. Thus it is possible to switch on capacitive loads up to **20.000 µF** but they are disconnected only in the event of an overload or short circuit. For optimal adjustment to the application conditions the current rating of the ESS20-1.. can be selected in fixed values from 0.5 A...10 A and in switchable variants 1 A/2 A or 3 A/6 A. Failure and status indication are provided by a bicolour LED and an integral short-circuit proof signal output.

Upon detection of overload or short circuit in the load circuit the MOSFET of the load output will be blocked and current flow in the load circuit will be interrupted. MOSFET and load circuit may be reset by means of the electronic reset input or manually by actuating the push-button (PUSH-PUSH operation). The load circuit may also be physically isolated during start-up of the equipment, e. g. for measuring purposes.

Features

- Selective load protection, electronic trip curve
- Active current limitation (1.8 or 1.5 times rated current I_N = 8 A or 10 A) with connection of capacitive loads up to 20,000 µF and at overload/short circuit.
- Reliable overload disconnection with 1.1 x I_N plus, even with long load lines or small cable cross sections (see table 2).
- Selectable current ratings (fixed values 0.5 A...10 A or two steps: 1 A/2 A or 3 A/6 A).
- Manual ON/OFF button (push-push actuation) with physical isolation
- Clear status and failure indication through LED and signal output
- Electronic reset input
- Integral fail-safe element
- Width per unit only 12.5 mm
- Plug-in mounting utilising power distribution system Module 17 plus

Approvals

Authority	Voltage rating	Current ratings
UL 1077	DC 24 V	0.5...10 A

Attention: the user has to make sure that the cable cross sections of the relevant load circuit are suitable for the current rating of the ESS20 used.

ESS20-1..

Technical Data (T_U = 25 °C, U_S = DC 24 V) (T_U = ambient temperature at U_N)

Operating data	
Operating voltage U_S	DC 24 V (18...32 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 switchable: 1 A/2 A or 3 A/6 A
Closed circuit current I_0	typically 22 mA
Status indication by means of	● bicolour LED: GREEN: unit is ON, load circuit/power-MOSFET is switched on, signal output on, supplying +DC 24 V ORANGE: in the event of overload or short circuit until electronic disconnection RED: unit switched off electronically, load circuit/power MOSFET off, status output blocked, undervoltage (U_S < 8 V), after switch-on until end of switch-on delay. OFF: switched off manually with push-button, unit off load ● signal output SF: - 1 signalisation per channel - load “ON” SF = +DC 24 V - load “OFF” SF = 0 V ● ON/OFF position of push button
Load circuit	
Load output	power MOSFET switching output (plus switching)
Max. data of load with side-by-side mounting	see table 1
Voltage drop U_{ON} at I_N	see table 1
Disconnection at overload	typically 1.1 x I_N (1.05...1.35 x I_N)
Short circuit current I_K	typically 1.8 x I_N / active current limitation see table 1
Trip time for physical isolation for electronic disconnection	see time/current characteristics typically 3 s at I_{load} > 1.1 x I_N typically 3 s...100 ms at I_{load} > 1.8 x I_N or 1.5 x I_N
Temperature disconnection	internal temperature monitoring with electronic disconnection
Low voltage monitoring of load output	with hysteresis, no reset necessary “OFF” at U_S < 8V “ON” at U_S > 16V
Starting delay t_{start}	typically 0.5 sec after every switch-on and after applying U_S
Physical isolation	single pole (switch contact) of load circuit - by push-push actuation of the blue push button

5

Technical Data (T_U = 25 °C, U_S = DC 24 V) (T_U = ambient temperature at U_N)

Free-wheeling circuit	external free-wheeling diode recommended with inductive load
Several load outputs	must not be connected in parallel
Signal output SF	
Signal output SF	plus-switching signal output per unit, applies U_S to terminal 12 of module 17plus Ratings: DC 24 V / max. 0.5 A (short-circuit proof)
Signal output SF ON	signal output has +24 V level if - the load output has continuity (ON condition of load)
Signal output SF OFF	signal output has 0 V level if - the load output is electronically blocked (fault condition or switch-on delay) - the blue push button is in OFF position - no operating voltage U_S is connected. The signal output is connected to ground via a pull-down resistor (10 kOhm).
Reset input	
Reset input RE (terminal 13 or 14 of module 17plus Caution: unused slots have to be fitted with jumpers)	The electronically blocked ESS20-1.. may e.g. be reset via an external momentary switch due to the falling edge of a short +DC 24 V impulse. The reset signal will be fed in terminal 13 or 14 of the module 17plus and is internally pre-wired. The reset simultaneously affects all blocked ESS20-1.. channels of the power distribution system, all switched on ESS20-1.. channels remain unaffected.
Reset input level:	
voltage	max. +DC 32 V
high	> DC 8 V...DC 32 V
low	< DC 3 V...0 V
current consumption	at +DC 24 V typically 2.6 mA
min. pulse length	10 ms
General data	
Fail-safe element	back-up fuse for ESS21 not required as it has an integral redundant fail-safe element (thermal E-T-A circuit breaker); push button in OFF position with tripped fail-safe element
Blade terminals	6.3 mm to DIN 46244-A6.3-0.8
Housing material	plastics
Mounting	plug-in type for E-T-A power distribution socket Module 17plus
Ambient temperature	0...+50 °C (without moisture condensation, cf. 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
Protection class	housing: IP30 DIN 40050, terminals: IP00 DIN 40050
EMC requirements (EMC directive, CE logo)	emitted interference: EN 50081-1 immunity: EN 61000-6-2
Insulation co-ordination (IEC 60934)	0.5 kV/2 re-inforced insulation in operating area
Dielectric strength	(see dimensions)
operating area	test voltage AC 1,000 V
installation area	test voltage AC 500 V
Insulation resistance (OFF condition of push button)	> 100 MΩ (DC 500 V) between [LINE (+) – LOAD (+)]
Approvals	UL 1077, File E67320 Supplementary Protectors for use in Electrical Equipment CE logo
Dimensions (B x H x T)	12.5 x 105 x 60 mm
Mass	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)	max. load current at 100 % ON duty T_U = 40 °C	T_U = 50 °C
0.5 A	100 mV	1.8 x I_N	0.5 A	0.5 A
1 A	140 mV	1.8 x I_N	1 A	1 A
2 A	180 mv	1.8 x I_N	2 A	2 A
3 A	140 mV	1.8 x I_N	3 A	3 A
4 A	190 mV	1.8 x I_N	4 A	4 A
6 A	280 mV	1.8 x I_N	6 A	5 A
8 A	220 mV	1.5 x I_N	8 A	7 A
10 A	280 mV	1.5 x I_N	10 A	9 A
1 A/2 A	140 mV/280 mV	1.8 x I_N	1 A/2 A	1 A/2 A
3 A/6 A	140 mV/280 mV	1.8 x I_N	3 A/6 A	3 A/5 A

Attention: when mounted side-by-side without convection the ESS20-1.. should not carry more than 80 % of its rated load with 100 % ON duty because of the integral thermal circuit breaker.

Ordering information

Type

ESS20 Electronic Circuit Breaker with current limitation (e.g. typically 1.8 x I_N or 1.5 x I_N, see table 1)

Version

1 without physical isolation in the event of a failure

Control input

2 with reset input RE

Signal output

4 status output SF (single signalisation, plus switching)

Operating voltage

DC 24 V rated voltage DC 24 V

Current rating

0.5 A
1 A
2 A
3 A
4 A
6 A
8 A
10 A
1 A/2 A (selectable)
3 A/6 A (selectable)

ESS20 - 1 2 4 - DC 24 V -3 A/6 A ordering example (recommended type)

Attention: the user has to make sure that the cable cross sections of the relevant load circuit are suitable for the current rating of the ESS20 used.

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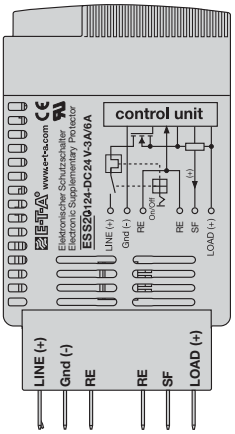
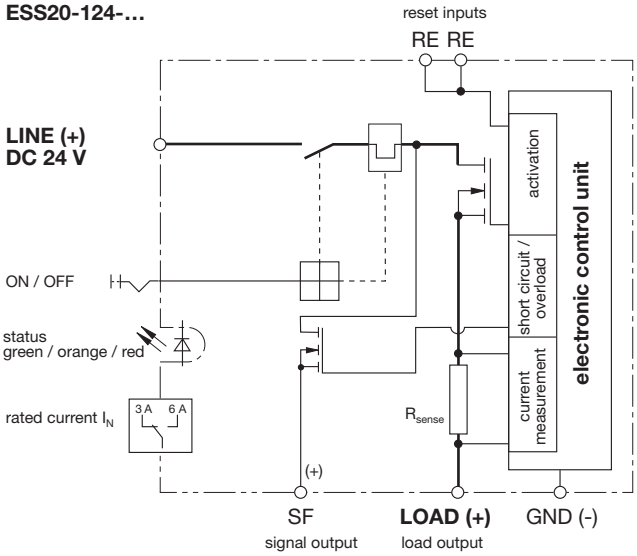
Terminal wiring diagram ESS20-124 (e. g. switchable 3 A/6 A)

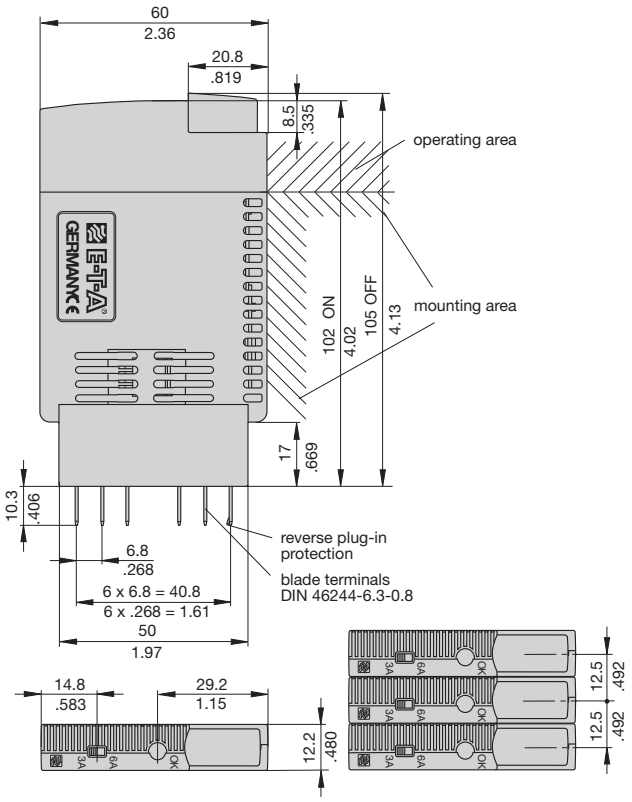
ESS20-124-...



Basic circuit diagram ESS20-124 (e. g. switchable 3 A/6 A)



Dimensions



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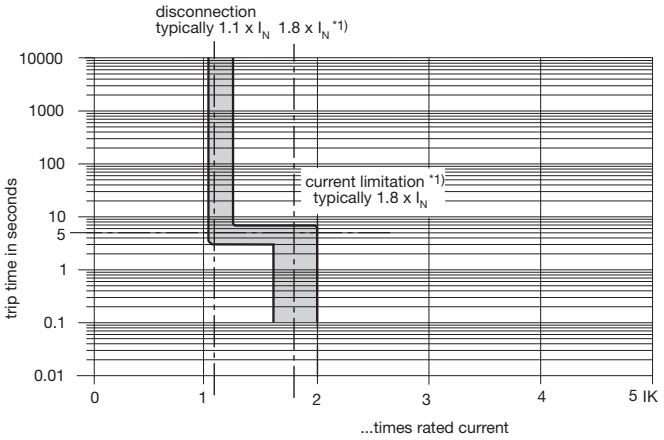
Time/Current characteristic curve (T_A = 25 °C)



*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...10 A

- The trip time is typically 3 s in the range between 3 s.
- Electronic current limitation starts at 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 until disconnection will not exceed 1.8*1) times the current rating. Trip time depends on extent of overcurrent. In the event of an overload of 1.8 x I_N*1) plus the trip time will be up to 3 s, in the event of a short circuit it will be 100 ms.
- Without current limitation to typically 1.8 x I_N*1) a much higher overcurrent would occur in the event of overload or short circuit.

Table 2: Reliable trip of ESS20

Reliable trip of ESS20 with different cable lengths and cross sections

Resistivity of copper ρ_0 = 0.0178 (Ohm x mm²) / m

U_S = DC 19.2 V (= 80 % v. 24 V) — voltage drop of ESS20 and tolerance of trip point (typically 1.1 x I_N = 1.05...**1.35 x I_N**) have been taken into account.

ESS20-selected rating I_N (in A) →	**3**	**6**	
e. g. trip current I_{ab} = 1.25 x I_N (in A) →	3.75	7.5	→ **ESS20 trips after 3 s**
R_{max} in Ohm = (U_S / I_{ab}) - 0.050 →	**5.07**	**2.51**	

The ESS20 reliably trips from 0 Ohm to max. circuitry resistance R_{max}

Cable cross section **A** in mm² →	0.14	0.25	0.34	0.5	0.75	1	1.5
cable length **L** in meter (= single length) ↓	**cable resistance in Ohm = (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. length at 1.5 mm² and 3 A → **214 m**

Example 2: max. length at 1.5 mm² and 6 A → **106 m**

Example 3: mixed wiring: R1 = 40 m in 1.5 mm² and R2 = 5 m in 0.25 mm²:
(Control cabinet – sensor/actuator level) R1 = 0.95 Ohm, R2 = 0.71 Ohm **Total (R1 + R2) = 1.66 Ohm**

Accessories for ESS20-1..

Description

Module 17plus is a power distribution system for use with electronic circuit breaker ESS20-1..
Each module accommodates two breakers with an individual housing width of only 12.5 mm and fits onto all industry standard mounting rails.
The two-way modules can be interconnected to provide as many ways as required with a terminal block fitted at each end for connection of signalling circuits. A distribution busbar can be fitted on the supply side of the modules (positive pole) though each pole of multipole circuit breakers must be individually connected.
Electrical connections are by means of spring-loaded terminals. The reference potential for the ESS20-1.. (GND pin 11) is also looped through and connected to the terminals at the sides.
The integral signal output SF of the ESS20-124 may be picked off at terminal 12 of the corresponding channel (single signalisation). The reset input RE may be connected via terminal 13 or 14.
Meets the requirements of UL60950.

17plus

Ordering information

17PLUS-Q02-00	Module 17plus, centre piece, two-way
17PLUS-QA0-LR	one each left- and right-side terminal block for supply feed from the side by means of screw terminal, connection of signalisation etc.

Pin configuration, fitted with ESS20-1..

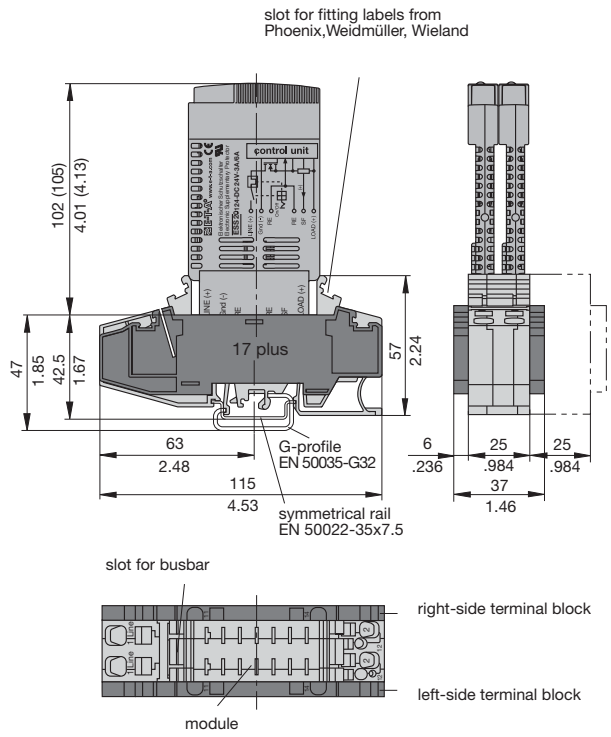
ESS20-124	Module 17 plus		
LINE (+)	(1)		operating voltage PLUS, DC 24 V
GND	(11)		operating voltage MINUS
RE	(13)		reset input RE
RE	(14)		reset input RE
SF	(12)		signal output SF
LOAD (+)	(2)		protected load output

Technical data

Connection	Spring-loaded terminals for solid conductors and stranded cables with and without wire end ferrules. Please use appropriate screw driver size (SD) for removing the spring loaded terminals.
LINE feed (1)	spring-loaded terminals for 1.5-10 mm² (AWG 10), SD 2 (0.8x4.0)
LOAD output (2)	spring-loaded terminals for 0.25-4 mm² (AWG 12), SD 1 (0.6x3.5)
Reference potential GND/ group signal terminals (11 or 13, 14):	spring-loaded terminals for 0.25-2.5 mm² (AWG 14), SD 1 (0.6x3.5)
individual signal terminal (12)	spring-loaded terminal for 0.25-1.5 mm² (AWG 16), SD 0 (0.4x2.5)
Test probe for testing the group signal for line interruption: ≤ 2 mm ø	
Voltage rating (without ESS20-1..):	AC 433 V; DC 65 V
Current rating (without ESS20-1..)	
LINE feed (1)	50 A
LOAD output (2)	25 A
Reference potential GND (11)	10 A
Individual signal (12)	1 A (with ESS20-1..: 0.5 A)
Group signal /(13-14)	1 A (with ESS20-1..: 0.5 A)
Internal resistance values (without ESS20-1..)	
LINE-LOAD (1-2)	≤ 5 mΩ
Group signal (13-14) per module	≤ 8 mΩ per pole + 5 mΩ for each additional module
Busbar for power distribution	
insulated busbar (blue or red):	I_{max} 32 A
non-insulated busbar:	I_{max} 50 A
(The non-insulated busbar, too, meets brush contact safety standards when fitted.)	
Dielectric strength of Module 17plus (without ESS20-1..)	
between main circuits (without busbar):	1,500 V
main circuit to auxiliary circuit:	1,500 V
between auxiliary circuits:	1,500 V
Mass: Module 17plus (centre piece)	approx. 85 g
terminal blocks (pair)	approx. 30 g

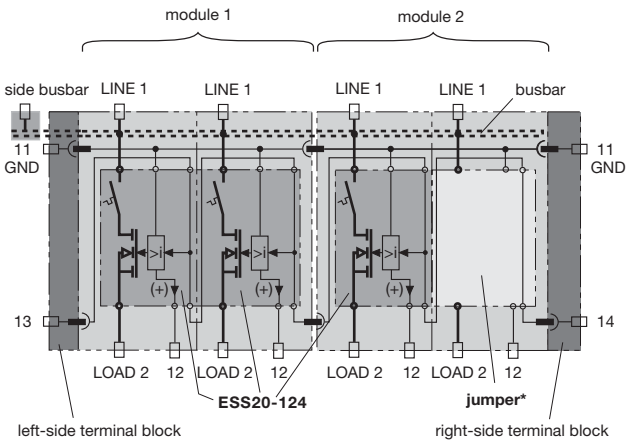
5

Dimensions



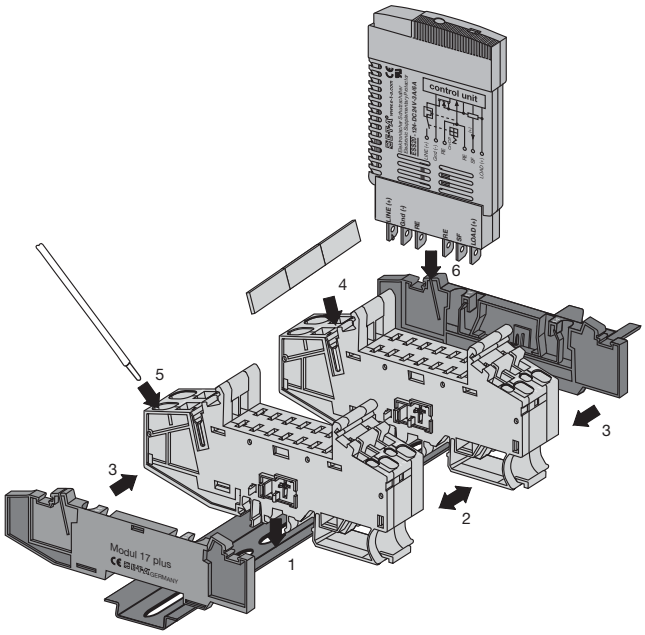
This is a metric design and millimeter dimensions take precedence ($\frac{mm}{inch}$)

Connection diagram pour ESS20-124



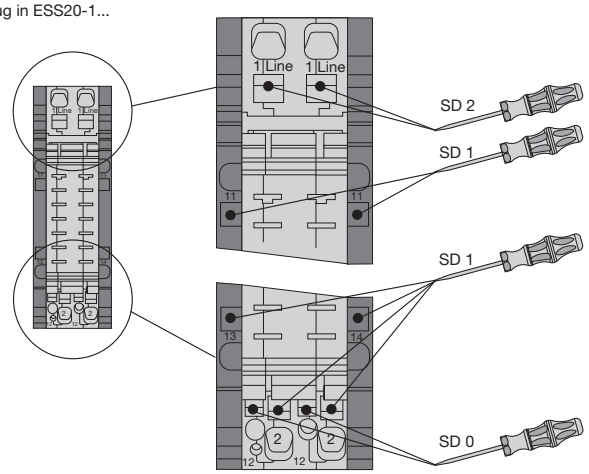
11 GND
12 terminal for signalisation SF (+DC 24 V)
13, 14 reset input RE
*Caution: unused slots have to be fitted with jumpers

Installation example



Installation:

1 Clip modules onto DIN rails.
2 Push modules together (side-by-side).
3 Snap on right-side and left-side terminal blocks.
4 Cut busbar to required length and fit on supply side of the modules.
5 Connect line feed with spring-loaded terminals.
6 Plug in ESS20-1...

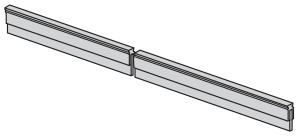


Connection and disconnection of cables with screw driver

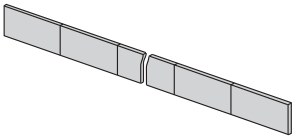
5

Accessories

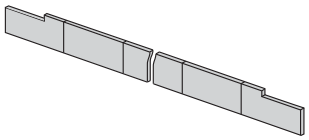
Busbar 32 A
X 222 005 01 blue insulation, 500 mm/19.68 in.
X 222 005 02 red insulation, 500 mm/19.68 in.
X 222 005 03 grey insulation, 500 mm/19.68 in.



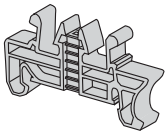
Busbar 50 A
Y 307 016 01 non-insulated, 500 mm/19.68 in.



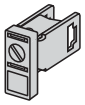
Busbar 50 A
Y 307 016 11 non-insulated, 500 mm/19.68 in.



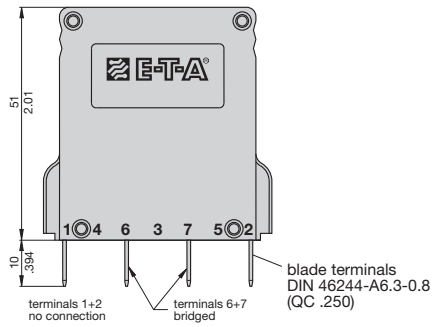
End bracket
X 222 004 01



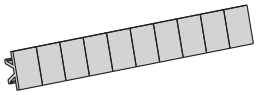
Screw terminal for busbar
X 211 156 01 non insulated



Jumper
X 222 066 01

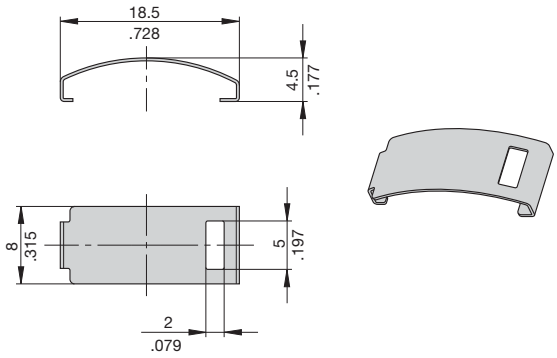


Labels
marking area 6 x 10 mm
(packing unit 10 pcs = 1 strip)
part. no. Y 307 942 61



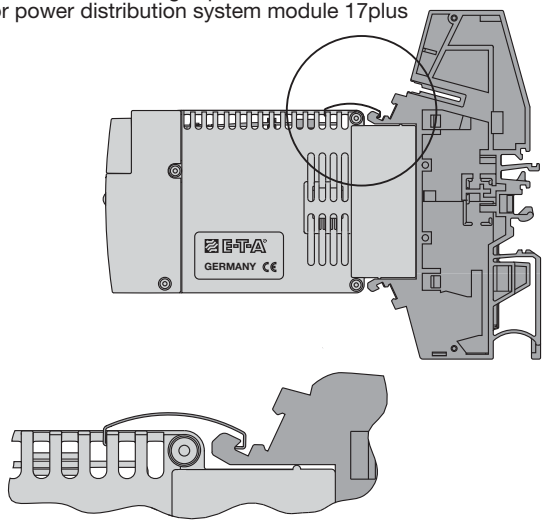
Accessories for ESS20-1..

Retaining clip Y 307 754 01

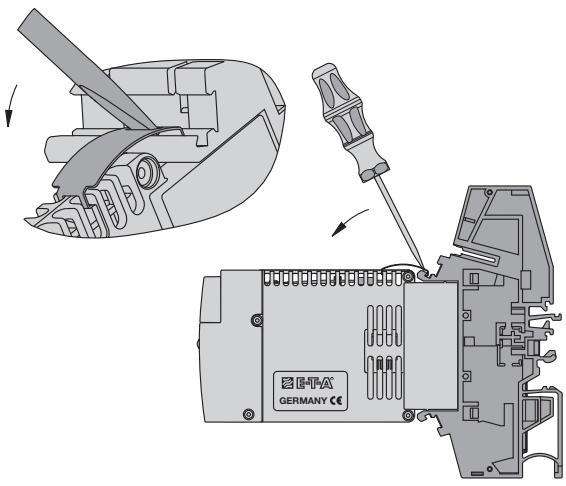


Accessories for ESS20-1..

ESS20 with retaining clip Y 307 754 01
for power distribution system module 17plus



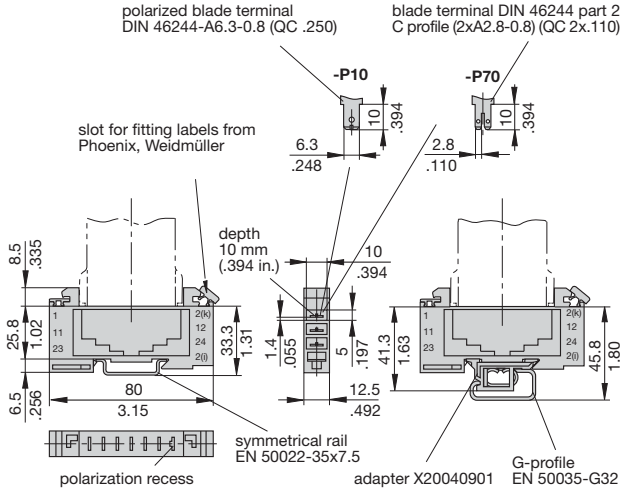
Removal of retaining clip Y 307 754 01



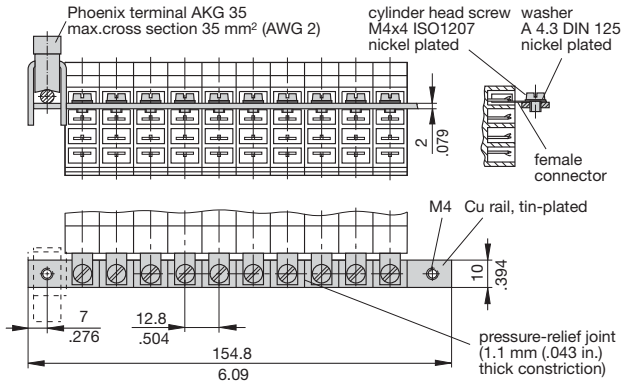
This is a metric design and millimeter dimensions take precedence (mm / inch)

Accessories for ESS20-1..

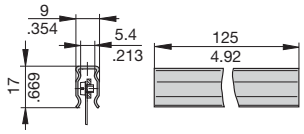
Single mounting sockets (with adapter)
(up to 16 A max. load)
17-P10-Si **17-P10-Si-20025**
17-P70-Si **17-P70-Si-20025**



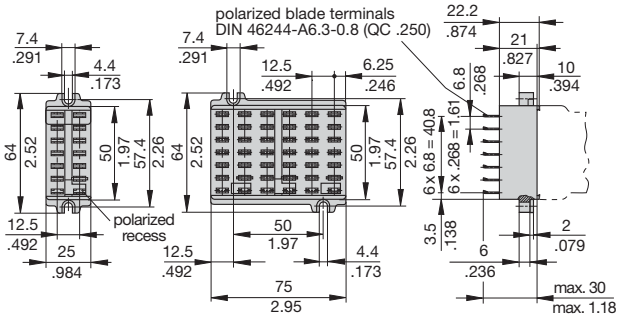
Busbar (10-way) (supplied as a complete package)
for type 17 socket
(for max. 100 A continuous load),
more positions available on request
X 211 157 01 with terminal
X 211 157 02 without terminal



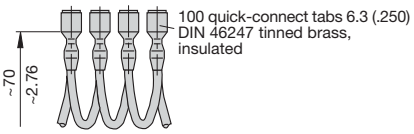
Insulating sleeving for busbar (10-way)
Y 303 824 01



2-way mounting socket **6-way mounting socket**
23-P10-Si **63-P10-Si**
(retaining clip Y 300 581 03 available on request)



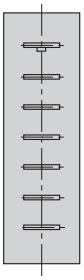
Connector bus links -P10
X 210 588 01/ 1.5 mm², (AWG 16), brown (up to 13 A max. load)
X 210 588 02/ 2.5 mm², (AWG 14), black (up to 20 A max. load)
X 210 588 03/ 2.5 mm², (AWG 14), red (up to 20 A max. load)
X 210 588 04/ 2.5 mm², (AWG 14), blue (up to 20 A max. load)



Pin selection, fitted with ESS20-124

ESS20-124 17-P10-Si

LINE (+)	[2(k)]
GND	[12]
RE	[24]
	[2(i)]
RE	[23]
SF	[11]
LOAD (+)	[1]



This is a metric design and millimeter dimensions take precedence (mm / 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.

Description

Electronic circuit protector type ESX10 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 responds much faster to overload or short circuit conditions than the switch-mode power supply. This is achieved by active current limitation. The ESX10 limits the highest possible current to values between 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 µF** lamp loads, 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 can be selected in fixed values from 0.5 A...12 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.

The ESX10, with a width of only 12.5 mm, can be plugged into the E-T-A power distribution socket Module 17plus 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 MOSFET and the load circuit may be re-activated via the remote electronic reset input or manually by means of the ON/OFF button. When starting up the system, the load circuit may also be manually disconnected.

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.
- 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).
- Clear status and failure indication through LED, status output SF or Si contact F.
- Electronic reset input RE (option).
- Integral fail-safe element.
- Width per unit only 12.5 mm.
- Plug-in mounting utilising power distribution system Module 17plus or SVSxx optionally (see product group 7)

Approvals

Authority	Voltage rating	Current ratings
UL 2367	DC 24 V	0.5...12 A

Attention:
- The user should ensure that the cable cross sections of the relevant load circuit are suitable for the current rating of the ESX10 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.

ESX10

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

Operating data	
Operating voltage U_S	DC 24 V (18...32 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 20...30 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 (1.05...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...100 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, no reset necessary load "OFF" at U_S < 8 V
Starting delay t_{start}	typically 0.5 sec after every switch-on and after applying U_S
Disconnection of load circuit	electronic disconnection
Free-wheeling circuit	external free-wheeling diode recommended with inductive load
Several load outputs must not be connected in parallel	

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

Status output SF	**ESX10-104/-106/-124/-127**
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 V +24 V = S1 is ON, load output connected through 0V = S1 is ON, load output blocked and/or switch S1 is OFF
Status $\overline{OUT}$	ESX10-127 (signal status OUT inverted), at U_S = +24 V +24 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
Signal output F	**ESX10-101/-102/-103/-105/-106/-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
ESX10-105/-106/-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)

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)	max. load current at 100 % ON duty 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.

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

Reset input RE	**ESX10-124/-125/-127**
Electrical data	voltage: max. +DC 32 V high > DC 8 V ≤ DC 32 V low ≤ 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) Caution: unused slots have to be fitted with jumpers	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. 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+	+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+
General data	
Fail-safe element:	backup fuse for ESX10 not required because of the integral redundant fail-safe element
Blade terminals	6.3 mm to DIN 46244-A6.3-0.8
Housing	moulded
Mounting	plug-in mounting utilising power distribution system Module 17plus or SVSxx
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: IP30 DIN 40050 terminals: IP00 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	UL 2367, File E306740 Solid State Overcurrent Protectors CE logo
Dimensions (W x H x D)	12.5 x 70 x 60 mm
Mass	approx. 40 g

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Ordering information

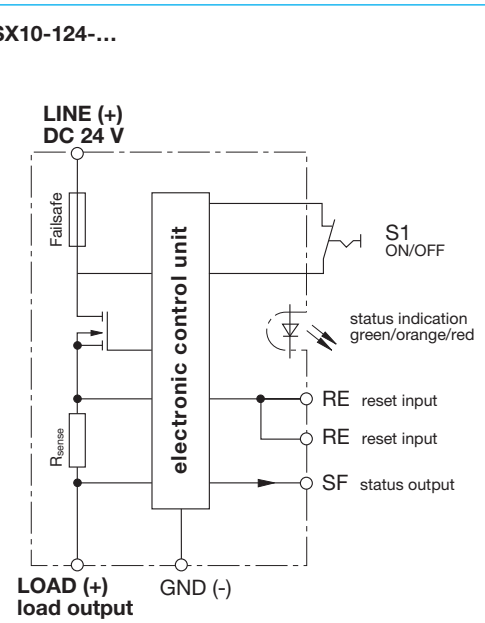
Type No.							
ESX10	Electronic Circuit Protector for DC 24 V applications						
	Version						
	1	standard, without physical isolation in the event of a failure					
		Signal input					
		0	without signal input				
		1	with control input IN+, only ESX10-115				
		2	with reset input RE, only ESX10-124, ESX10-125, ESX10-127				
			Signal outputs				
			0	without, only ESX10-100			
			1	signal output F (single signal, N/O), only ESX10-101			
			2	signal output F (single signal, N/C), only ESX10-102			
			3	signal output F (group signal, change-over), only ESX10-103			
			4	status output SF (+24 V = OK), only ESX10-104, ESX10-124			
			5	signal output F (group signal, N/O), ESX10-105, ESX10-115, ESX10-125			
			6	signal output F (group signal, N/O), status output SF +24 V = OK, only ESX10-106			
			7	status output inverted, 0 V = OK, only ESX10-127			
				Operating voltage			
				DC 24 V	rated voltage DC 24 V		
					Current rating		
					0.5 A		
					1 A		
					2 A		
					3 A		
					4 A		
					6 A		
					8 A		
					10 A		
					12 A		
ESX10 -	1	0	5	- DC 24 V -	6 A		ordering example

Description of ESX10 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 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.

Schematic diagram ESX10-124



Terminal wiring diagram ESX10-124

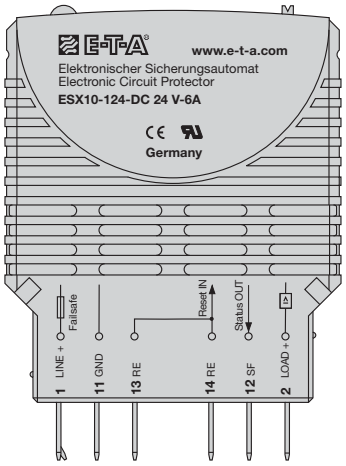


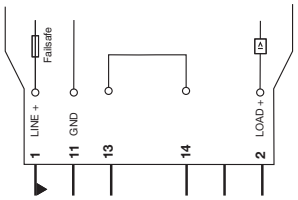
Table 2: ESX10 - product version

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	single signal N/O	single signal N/C	group signal N/O	group signal change-over	status OUT +24 V = OK	status $\overline{\text{OUT}}$ 0 V = OK
-100								
-101			x					
-102				x				
-103						x		
-104							x	
-105					x			
-106					x		x	
-115	x				x			
-124		x					x	
-125		x			x			
-127		x						x

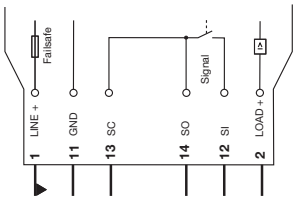
ESX10 Signal inputs / outputs (wiring diagram)

ESX10 signal inputs / outputs (wiring diagrams)
Signal contacts are shown in the OFF or fault condition.

ESX10-100
without signal input/output

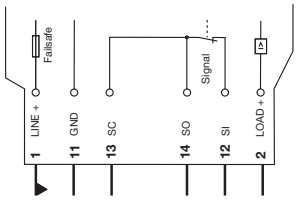


ESX10-101
without signal input
with signal output F (single signal, N/O)



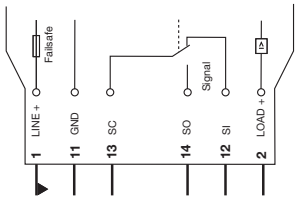
operating condition: SC/SO-SI closed
fault condition: SC/SO-SI open

ESX10-102
without signal input
with signal output F (single signal, N/C)



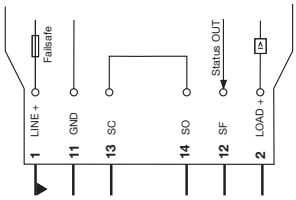
operating condition: SC/SO-SI open
fault condition: SC/SO-SI closed

ESX10-103
without signal input
with signal output F (group signal, change-over)



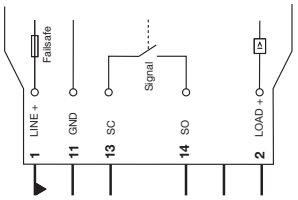
operating condition: SC/SO closed, SC-SI open
fault condition: SC/SO open, SC-SI closed

ESX10-104
without signal input
with status output SF (+24V = load output ON)



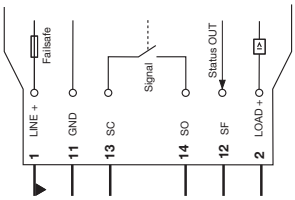
operating condition: SF +24V = OK
fault condition: SF 0V

ESX10-105
without signal input
with signal output F (group signal, N/O)



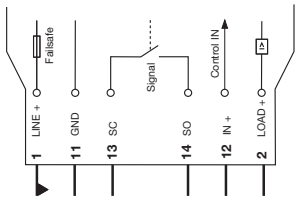
operating condition: SC-SO closed
fault condition: SC-SO open

ESX10-106
without signal input
with signal output F (group signal, N/O)
with status output SF (+24V = load output ON)



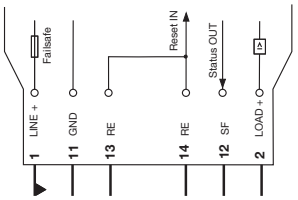
operating condition: SC-SO closed
fault condition: SC-SO open

ESX10-115-...
with control input IN+ (+DC 24V)
with signal output F (group signal, N/O)



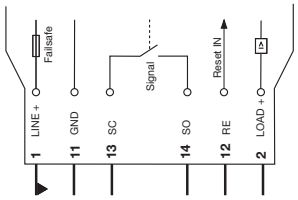
operating condition: SC-SO closed
fault condition: SC-SO open

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



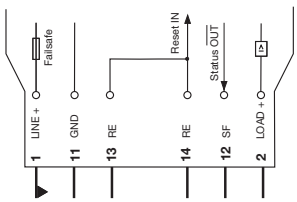
operating condition: SF +24V = OK
fault condition: SF 0V

ESX10-125-...
with reset input RE (+DC 24V↓)
with signal output F (group signal, N/O)



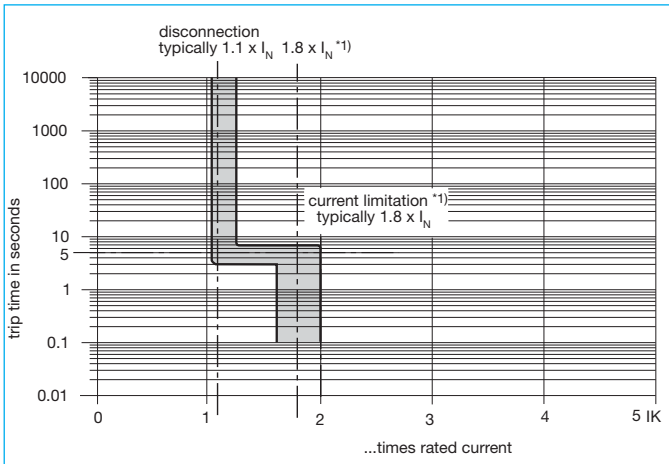
operating condition: SC-SO closed
fault condition: SC-SO open

ESX10-127-...
with reset input RE (+DC 24V↓)
with status output SF inverted, 0V = load output ON



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

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



- 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.

*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

Table 3: Reliable trip of ESX10

Reliable trip of ESX10 with different cable lengths and cross sections

Resistivity of copper ρ_0 = 0.0178 (Ohm x mm²) / 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**	**6**	
e. g. trip current I_{ab} = 1.25 x I_N (in A) →	3.75	7.5	→ **ESX10 trips after 3 s**
R_{max} in Ohm = (U_S / I_{ab}) - 0.050 →	**5.07**	**2.51**	

The ESX10 reliably trips from 0 Ohm to max. circuitry resistance R_{max}

Cable cross section **A** in mm² →	0.14	0.25	0.34	0.5	0.75	1	1.5
cable length **L** in meter (= single length) ↓	**cable resistance in Ohm = (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

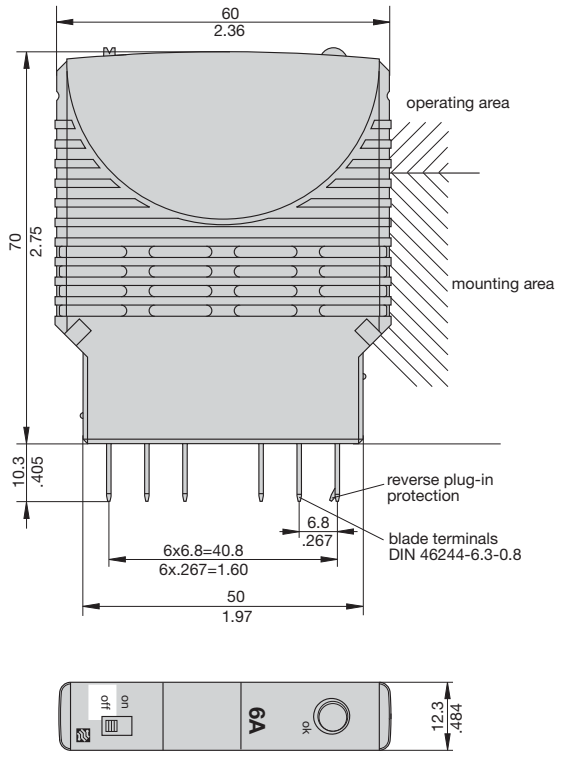
Example 1: max. length at 1.5 mm² and 3 A → **214 m**

Example 2: max. length at 1.5 mm² and 6 A → **106 m**

Example 3: mixed wiring: R1 = 40 m in 1.5 mm² and R2 = 5 m in 0.25 mm²:
(Control cabinet – sensor/actuator level) R1 = 0.95 Ohm, R2 = 0.71 Ohm **Total (R1 + R2) = 1.66 Ohm**

5

Dimensions



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

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.

Accessories for ESX10

Description

Module 17plus is a power distribution system for use with electronic circuit protectors ESX10.
Each module accommodates two protectors with an individual housing width of only 12.5 mm and fits onto all industry standard mounting rails.
The two-way modules can be interconnected to provide as many ways as required with a terminal block fitted at each end for connection of signalling circuits. A distribution busbar can be fitted on the supply side of the modules (positive pole) though each pole of multipole circuit breakers must be individually connected.
Electrical connections are by means of spring-loaded terminals. The reference potential for the ESX10 (GND pin 11) is also looped through and connected to the terminal blocks at the sides.
The integral status output SF of the ESX10-104/-106/-124/-127 can be tapped at terminal 12 of the relevant channel (single signalisation). The reset input RE may be connected via terminal 13 or 14 (ESX10-124/-127) or terminal 12 (ESX10-125). The integral control input IN+ of ESX10-115 is connected via terminal 12.
Depending on the version a potential-free signal contact is available (ESX10-101/-102/-103/-104/-105/-106/-115/-125).
Meets the requirements of UL60950.

17plus

Ordering information

17PLUS-Q02-00	Module 17plus, centre piece, two-way
17PLUS-QA0-LR	one each left- and right-side terminal block for supply feed from the side by means of screw terminal, connection of signalisation etc.

Pin configuration, fitted with ESX10-124 (Example)

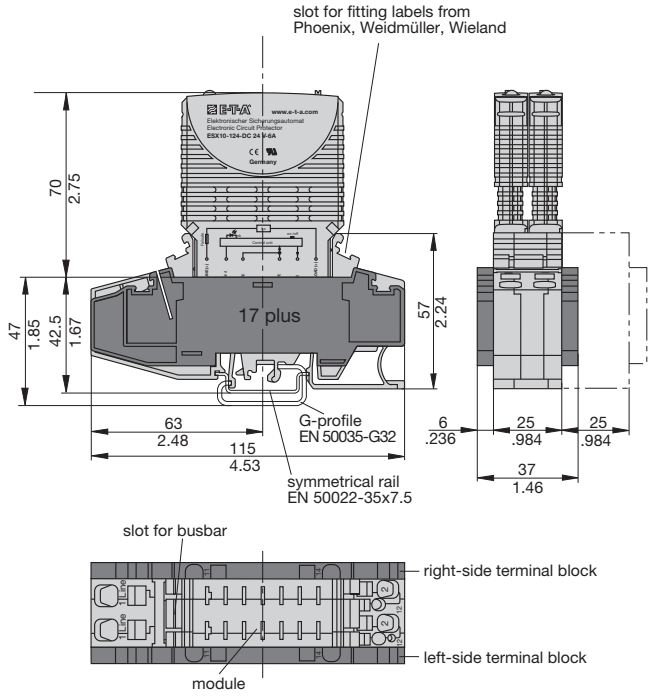
ESX10-124	Modul 17 plus	
LINE (+)	(1)	operating voltage PLUS, DC 24 V
GND	(11)	operating voltage MINUS
RE	(13)	reset input RE
RE	(14)	reset input RE
SF	(12)	status output SF
LOAD (+)	(2)	protected load output

Technical data

Connection	Spring-loaded terminals for solid conductors and stranded cables with and without wire end ferrules. Please use appropriate screw driver size (SD) for removing the spring loaded terminals.
LINE feed (1)	spring-loaded terminals for 1.5-10 mm² (AWG 10), SD 2 (0.8x4.0)
LOAD output (2)	spring-loaded terminals for 0.25-4 mm² (AWG 12), SD 1 (0.6x3.5)
Reference potential GND/ group signal terminals (11 or 13, 14):	spring-loaded terminals for 0.25-2.5 mm² (AWG 14), SD 1 (0.6x3.5)
single signal terminal (12)	spring-loaded terminal for 0.25-1.5 mm² (AWG 16), SD 0 (0.4x2.5)
Test probe for testing the group signal for line interruption: ≤ 2 mm ø	
Voltage rating (without ESX10)	AC 433 V; DC 65 V
Current rating (without ESX10)	
LINE feed (1)	50 A
LOAD output (2)	25 A
Reference potential GND (11)	10 A
single signal (12)	1 A (with ESX10: 0.5 A)
Group signal /(13-14)	1 A (with ESX10: 0.5 A)
Internal resistance values (without ESX10)	
LINE-LOAD (1-2)	≤ 5 mΩ
Group signal (13-14) per module	≤ 8 mΩ per pole +5 mΩ for each additional module
Busbar for power distribution	
insulated busbar (blue or red):	I_{max} 32 A
non-insulated busbar:	I_{max} 50 A
(The non-insulated busbar, too, meets brush contact safety standards when fitted.)	
Dielectric strength of Module 17plus (without ESX10)	
between main circuits (without busbar):	1,500 V
main circuit to auxiliary circuit:	1,500 V
between auxiliary circuits:	1,500 V
Mass: Module 17plus (centre piece)	approx. 85 g
terminal blocks (pair)	approx. 30 g

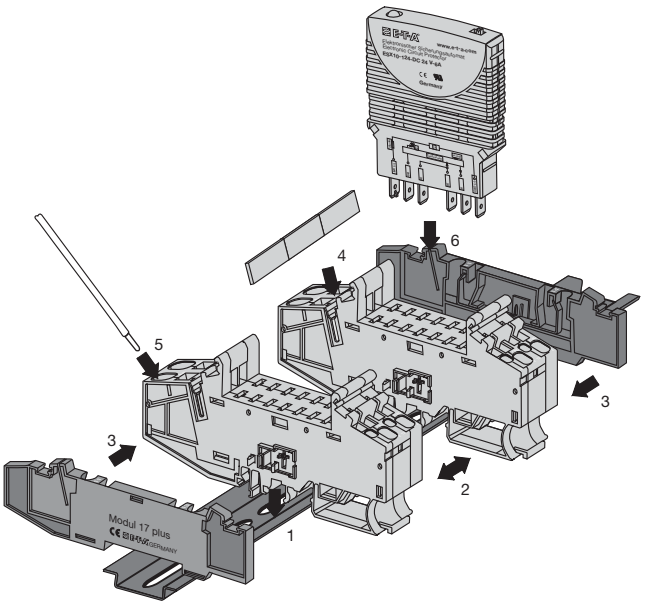
5

Dimensions



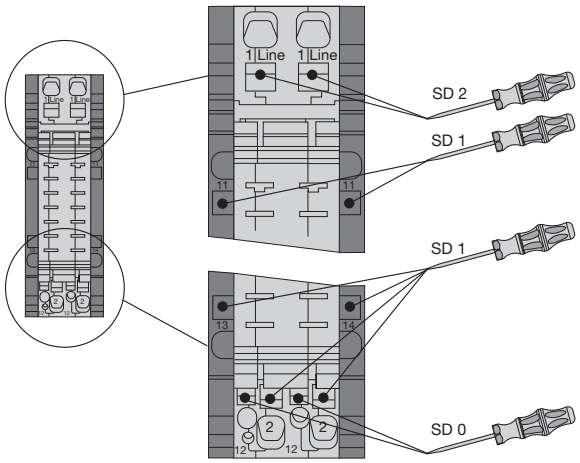
This is a metric design and millimeter dimensions take precedence ($\frac{mm}{inch}$)

Installation example



Installation:

1 Clip modules onto DIN rails.
2 Push modules together (side-by-side).
3 Snap on right-side and left-side terminal blocks.
4 Cut busbar to required length and fit on supply side of the modules.
5 Connect line feed with spring-loaded terminals.
6 Plug in ESX10.

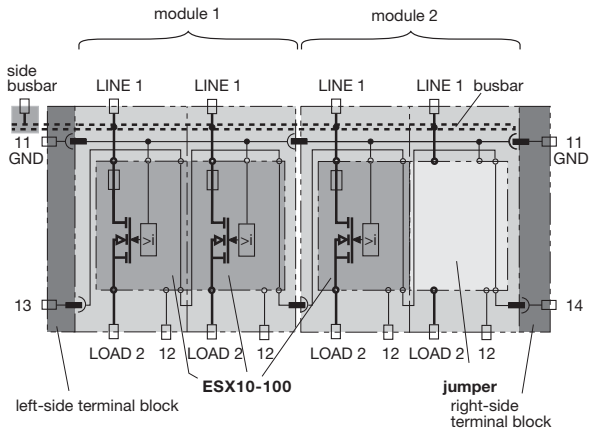


Connection and disconnection of cables with screw driver

5

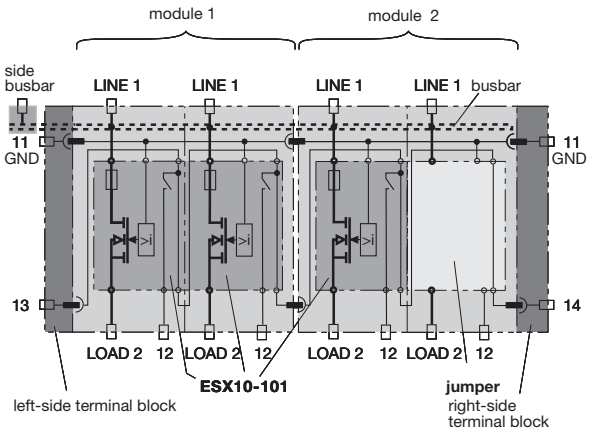
Connection diagram for ESX10-...

Module 17plus with ESX10-100



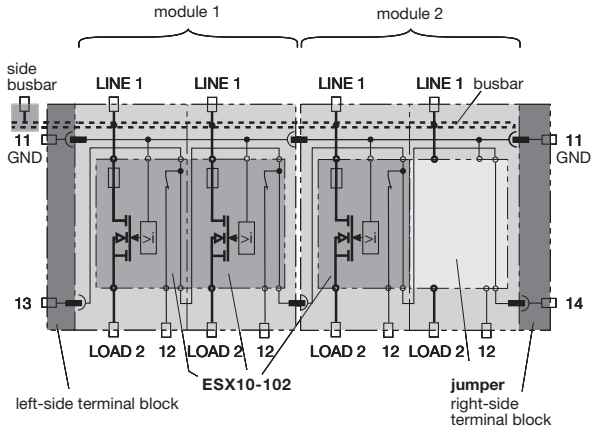
11 GND
13, 14 looped through

Module 17plus with ESX10-101



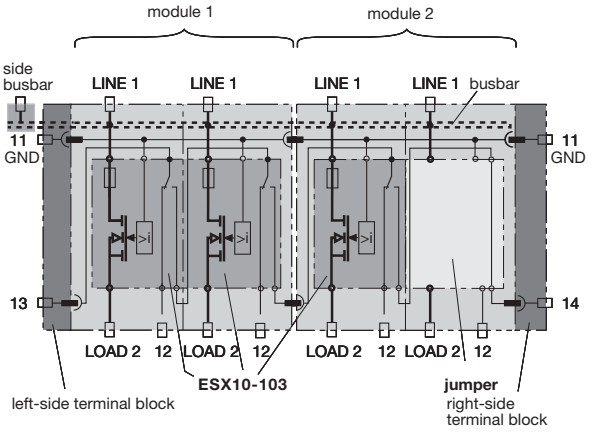
11 GND
12 output single signalisation per channel (N/O)
13, 14 feed single signalisation

Module 17plus with ESX10-102



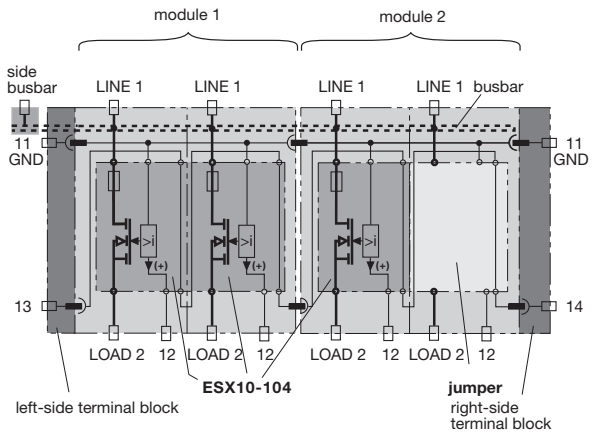
11 GND
12 output single signalisation per channel (N/C)
13, 14 feed single signalisation

Module 17plus with ESX10-103



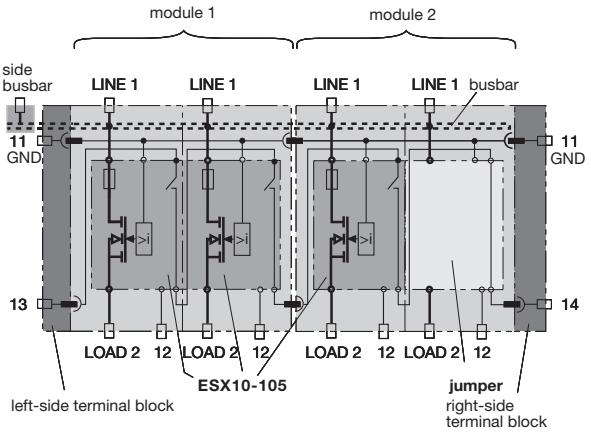
11 GND
12, 13, 14 terminal group signalisation (change-over)
(13-12 N/C, 13-14 N/O)

Module 17plus with ESX10-104



11 GND
12 status indication SF +24V=OK
13, 14 looped through

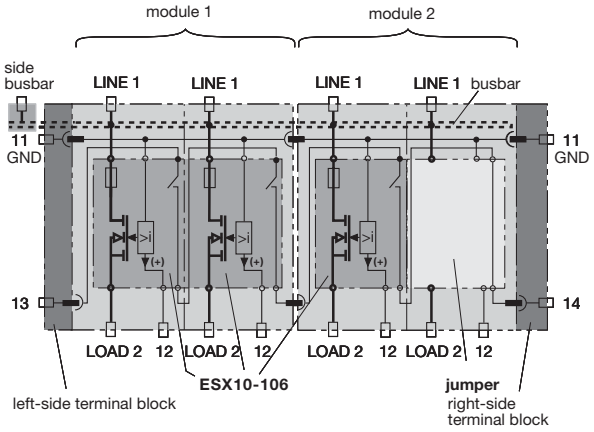
Module 17plus with ESX10-105



11 GND
13, 14 terminal group signalisation (N/O)

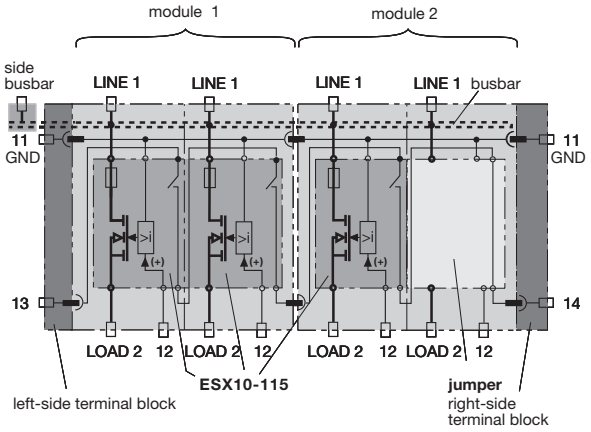
Connection diagram for ESX10-...

Module 17plus with ESX10-106



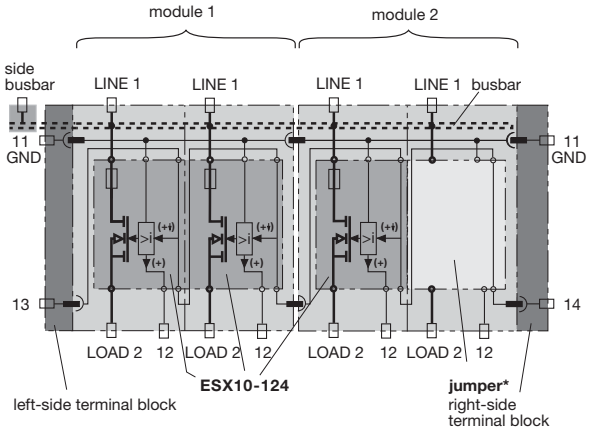
11 GND
12 status indication SF +24V=OK
13, 14 terminal group signalisation (N/O)

Module 17plus with ESX10-115



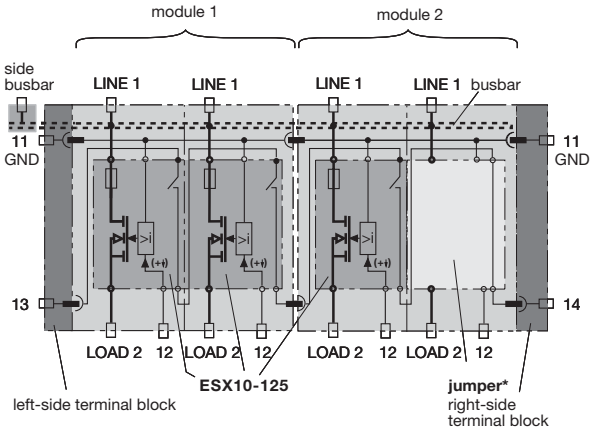
11 GND
12 terminal control signal ON (+24V DC)
13, 14 terminal group signalisation (N/O)

Module 17plus with ESX10-124



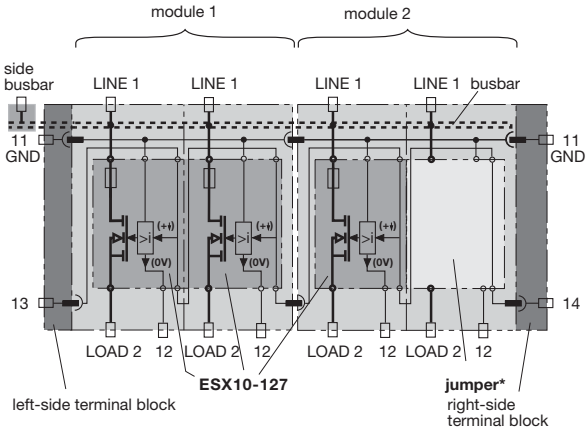
11 GND
12 status indication SF +24V=OK
13, 14 reset input RE (group reset), +24V falling edge
*Caution: unused slots have to be fitted with jumpers

Module 17plus with ESX10-125



11 GND
12 reset input RE (single reset), +24V falling edge
13, 14 terminal group signalisation (N/O)
*Caution: unused slots have to be fitted with jumpers

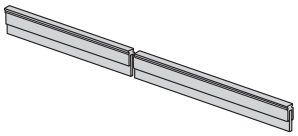
Module 17plus with ESX10-127



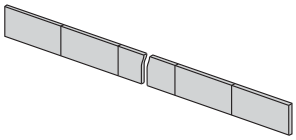
11 GND
12 status indication SF inverted, 0V=OK
13, 14 reset input RE (group reset), +24V falling edge
*Caution: unused slots have to be fitted with jumpers

Accessories for ESX10

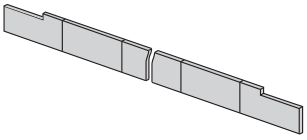
Busbar 32 A
X 222 005 01 blue insulation, 500 mm/19.68 in.
X 222 005 02 red insulation, 500 mm/19.68 in.
X 222 005 03 grey insulation, 500 mm/19.68 in.



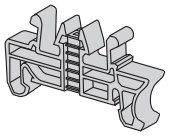
Busbar 50 A
Y 307 016 01 non-insulated, 500 mm/19.68 in.



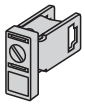
Busbar 50 A
Y 307 016 11 non-insulated, 500 mm/19.68 in.



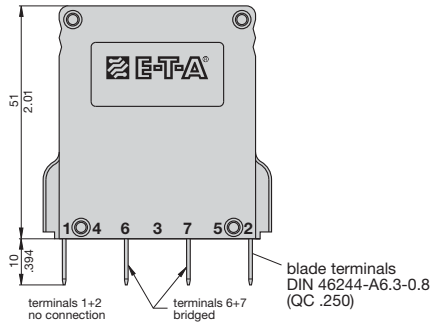
End bracket
X 222 004 01

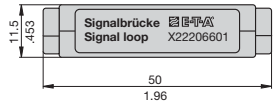


Screw terminal for busbar
X 211 156 01 non insulated

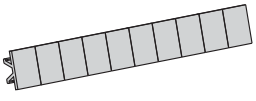


Jumper
X 222 066 01





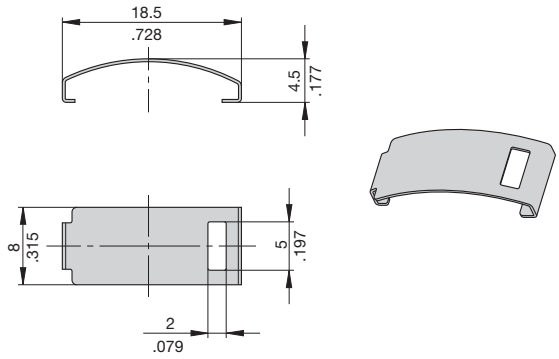
Labels
marking area 6 x 10 mm
(packing unit 10 pcs = 1 strip)
part. no. Y 307 942 61



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

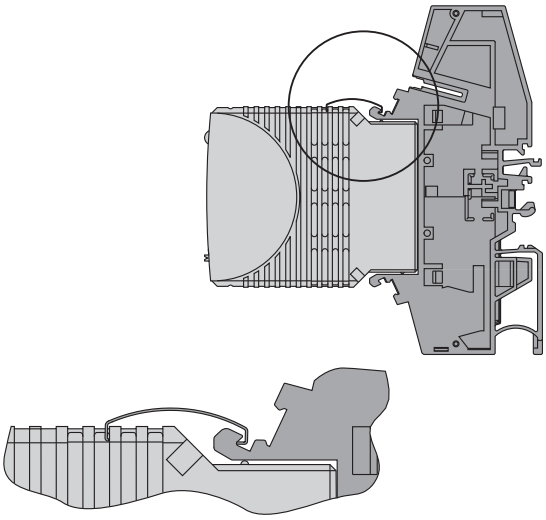
Accessories for ESX10

Retaining clip Y 307 754 01

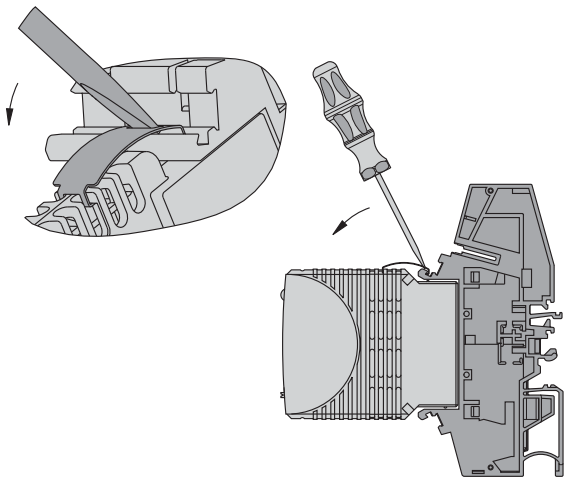


Mounting of retaining clip

ESX10 with retaining clip Y 307 754 01
for power distribution system module 17plus



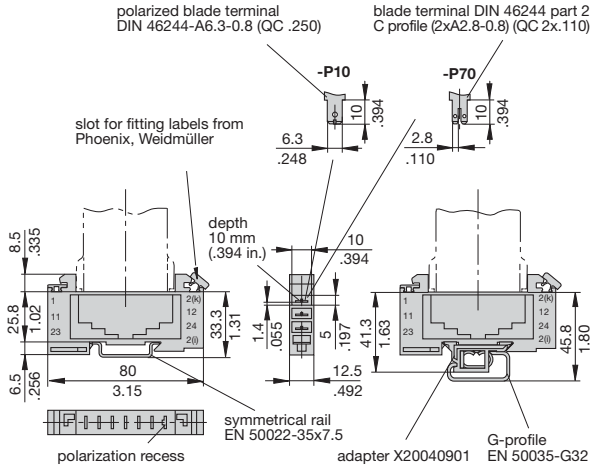
Removal of retaining clip Y 307 754 01



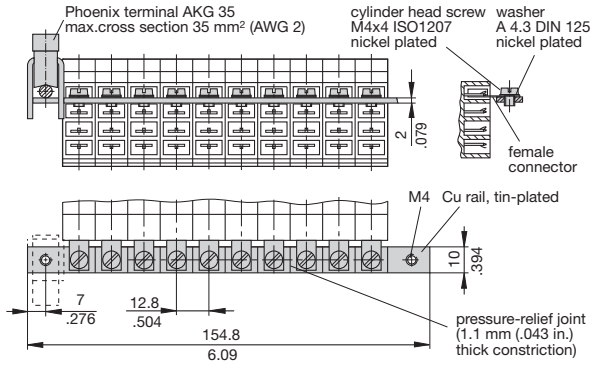
5

Accessories for ESX10

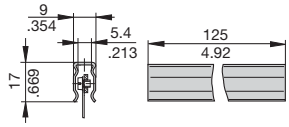
Single mounting sockets (with adapter)
(up to 16 A max. load)
17-P10-Si **17-P10-Si-20025**
17-P70-Si **17-P70-Si-20025**



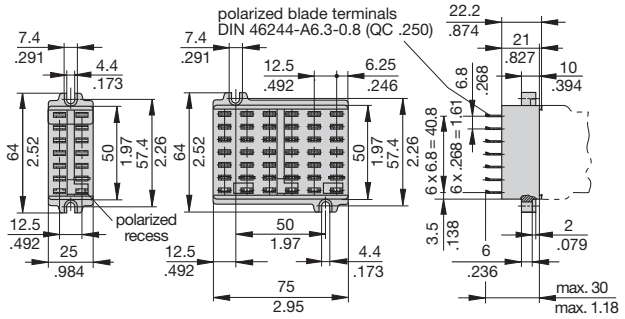
Busbar (10-way) (supplied as a complete package)
for type 17 socket
(for max. 100 A continuous load),
more positions available on request
X 211 157 01 with terminal
X 211 157 02 without terminal



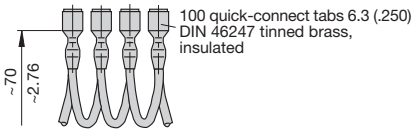
Insulating sleeving for busbar (10-way)
Y 303 824 01



2-way mounting socket **6-way mounting socket**
23-P10-Si **63-P10-Si**
(retaining clip Y 300 581 03 available on request)



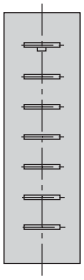
Connector bus links -P10
X 210 588 01/ 1.5 mm², (AWG 16), brown (up to 13 A max. load)
X 210 588 02/ 2.5 mm², (AWG 14), black (up to 20 A max. load)
X 210 588 03/ 2.5 mm², (AWG 14), red (up to 20 A max. load)
X 210 588 04/ 2.5 mm², (AWG 14), blue (up to 20 A max. load)



Pin selection, fitted with ESX10-124 (Example)

ESX10-124 17-P10-Si

LINE (+)	[2(k)]
GND	[12]
RE	[24]
	[2(i)]
RE	[23]
SF	[11]
LOAD (+)	[1]



This is a metric design and millimeter dimensions take precedence (mm / inch)

Table 4: ESX10-... - Pin assignment 17-P10-Si

17-P10-Si	ESX10-										
Pins	**-100**	**-101**	**-102**	**-103**	**-104**	**-105**	**-106**	**-115**	**-124**	**-125**	**-127**
[2(k)]	LINE (+) DC +24 V	LINE (+) DC +24 V	LINE (+) DC +24 V	LINE (+) DC +24 V	LINE (+) DC +24 V	LINE (+) DC +24 V	LINE (+) DC +24 V	LINE (+) DC +24 V	LINE (+) DC +24 V	LINE (+) DC +24 V	LINE (+) DC +24 V
[12]	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND
[24]		single SF N/O terminal	single SF N/C terminal	group SF changeover terminal		group SF N/O	group SF N/O	group SF N/O	reset IN+ +24 V↓	group SF N/O	reset IN+ +24 V ↓
[2(i)]	not assigned	not assigned	not assigned	not assigned	not assigned	not assigned	not assigned	not assigned	not assigned	not assigned	not assigned
[23]		single SF N/O terminal	single SF N/C terminal	group SF changeover N/O		group SF N/O	group SF N/O	group SF N/O	reset IN+ +24 V ↓	group SF N/O	reset IN+ +24 V ↓
[11]		single SF N/O output	single SF N/C output	group SF changeover N/C	status OUT +24 V = OK		status OUT +24 V = OK	control signal IN+ +24 V = ON	status OUT +24 V = OK	reset IN+ +24 V ↓	status $\overline{\text{OUT}}$ +0 V = OK
[1]	LOAD (+)	LOAD (+)	LOAD (+)	LOAD (+)	LOAD (+)	LOAD (+)	LOAD (+)	LOAD (+)	LOAD (+)	LOAD (+)	LOAD (+)

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 µF**, 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. 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.
- 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

Authority	Voltage rating	Current ratings
UL 2367	DC 24 V	0.5...12 A
UL 1604 (class I, div. 2, group A, B, C, D)	DC 24 V	0.5...12 A
UL 508 / cUL 508	DC 24 V	0.5...12 A
CSA C22.2 No: 213 (class I, division 2) pending		
CSA C22.2 No: 142 pending		

ESX10-T

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

Operating data	
Operating voltage U_S	DC 24 V (18...32 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
Closed current I_0	ON condition: typically 20...30 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 (1.05...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...100 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, no reset required load “OFF” at U_S < 8 V
Starting delay t_{start}	typically 0.5 sec after every switch-on and after applying U_S
Disconnection of load circuit	electronic disconnection
Free-wheeling circuit	external free-wheeling diode recommended with inductive load
Several load outputs must not be connected in parallel	

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

Status output SF	**ESX10-TB-114/-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-TB-114/-124 (signal status OUT), at U_S = +24 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-TB-101/-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
	device switched off with control signal (switch S1 is in ON position)
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-TB-124/-127**
Electrical data	voltage: max. +DC 32 V high > DC 8 V ≤ DC 32 V low ≤ 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-TB-114**
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+

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

General data	
Fail-safe element:	backup fuse for ESX10-T not required because of the integral redundant fail-safe element
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
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 Nm
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	UL 2367, File E306740, Solid State Overcurrent Protectors UL 1604, File E320024, (class I, division 2, groups A, B, C, D) UL 508 / cUL 508, File E322549 CSA C22.2 No: 213 (class I, division 2) pending CSA C22.2 No: 142 pending CE logo
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)	max. load current at 100 % ON duty $T_{ambient}$ = 40 °C	$T_{ambient}$ = 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

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.

Ordering information

Type No.							
ESX10	Electronic Circuit Protector, with current limitation						
	Mounting and design						
	TA	rail mounting, without signal contact					
	TB	rail mounting, with signal contact and slot for busbars and jumpers					
		Version					
		1	standard, without physical isolation in the event of a failure				
			Signal input				
			0	without signal input			
			1	with control input IN+, only ESX10-T-114			
			2	with reset input RE, only ESX10-T-124, ESX10-T-127			
				Signal outputs			
				0	without signal output		
				1	signal contact N/O		
				2	signal contact N/C		
				4	status output SF (only ESX10-T-114, ESX10-T-124)		
				7	inverse status output SF (only ESX10-T-127		
					Operating voltage		
					DC 24 V	rated voltage DC 24 V	
						Current rating	
						0.5 A	
						1 A	
						2 A	
						3 A	
						4 A	
						6 A	
						8 A	
						10 A	
						12 A	
ESX10 - TA		1	0	0 -	DC 24 V -	6 A	ordering example

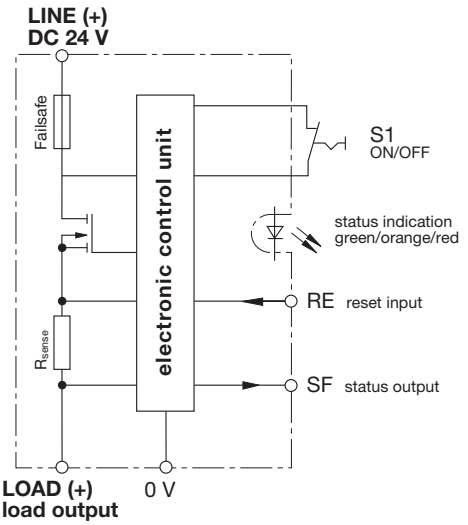
Description of ESX10-T signal inputs and outputs (wiring diagrams) see next page.

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)

ESX10-TB-124-...



Terminal wiring diagram ESX10-TB-124 (Example)

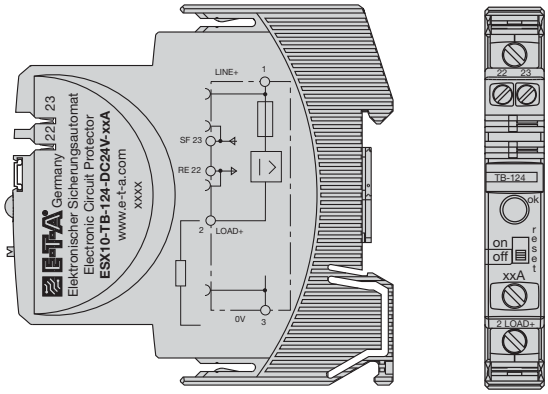
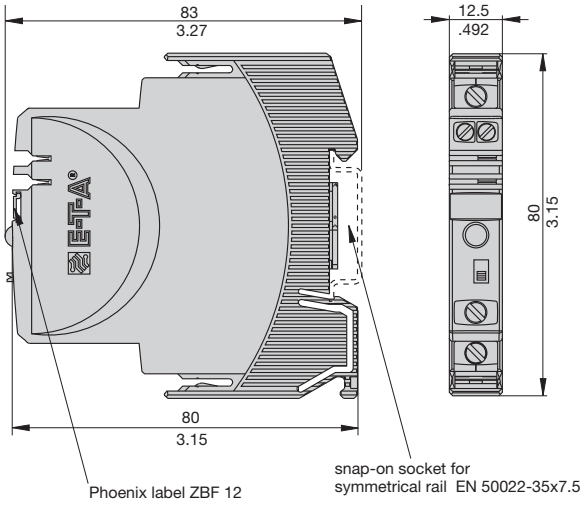


Table 2: ESX10-T - product version

Version		Signal input			Signal output					
					Signal output F (Signal contact)			Status 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 $\overline{\text{OUT}}$ 0 V = OK
-TA	-100	x			x			x		
-TB	-101	x				x		x		
-TB	-102	x					x	x		
-TB	-114		x						x	
-TB	-124			x	x				x	
-TB	-127			x	x					x

Dimensions



Information on UL approvals

UL1604
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

WARNING:
- 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
  Supplier: Fine Polymers Corporation
  Type: Epi Fine 4616L-160PK
  Casing Material:
  Generic Name: Liquid Crystal Polymer
  Supplier: Sumitomo Chemical
  Type: E4008, E4009, or E6008

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

UL 508 / cUL 508
File E322549

Class 2
Meets requirement for Class 2 current limitation
(ESX10-T...-0.5 A / 1 A / 2 A / 3 A)

CSA C22.2 No: 213 (Class I, Division 2) pending
CSA C22.2 No: 142 pending

Instruction leaflet

E-T-A Circuit Protection & Control

Electronic Circuit Protector
ESX10-T

UL1604

This device is suitable for use in Class I, Div 2, Groups A, B, C, D; TC T5; UL File E320024

Warnings:
1. Remove power before disconnecting device.
2. Components substitutions may impair suitability of Class I, Div 2.
3. Chemical exposure may degrade internal relay's sealing property.

UL2367
Non-hazardous use - UL File E306740

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

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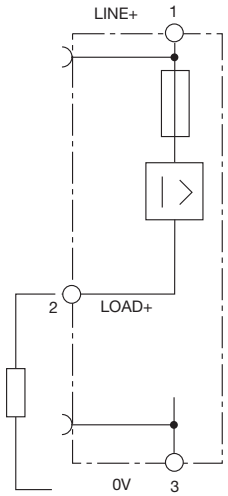
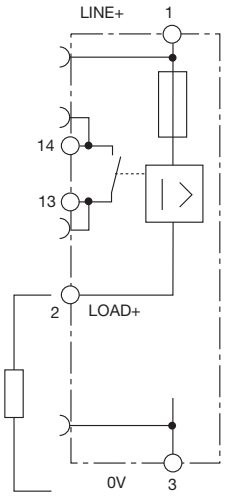
DEUTSCHLAND
Tel. +49 (09187) 10-0 · Fax +49 (09187) 10-397
E-Mail: info@e-t-a.de · www.e-t-a.com

ESX10-T Signal inputs / outputs (wiring diagram)

ESX10-TA-100
without signal input/output

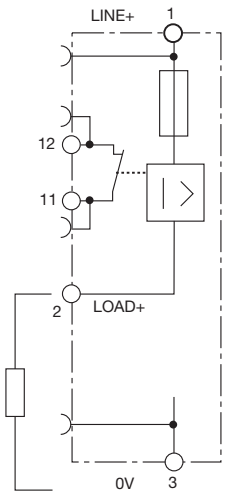


ESX10-TB-101
without signal input
with signal output F
(single signal, N/O)



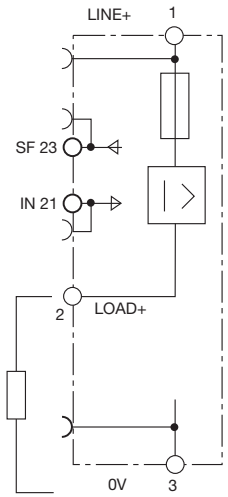
operating condition: 13-14 closed
fault condition: 13-14 open

ESX10-TB-102
without signal input
with signal output F
(single signal, N/C)



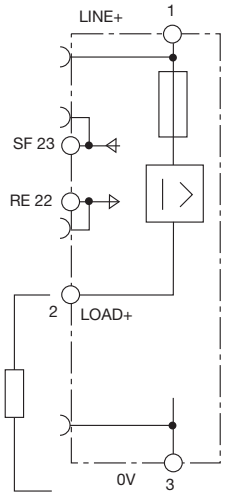
operating condition: 11-12 open
fault condition: 11-12 closed

ESX10-TB-114
with control input IN+
(+DC 24 V)
with status output SF
(+24 V = load output ON)



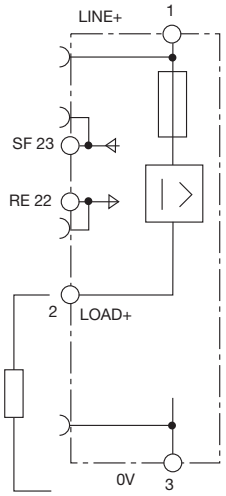
operating condition: SF +24 V = OK
fault condition: SF 0 V

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



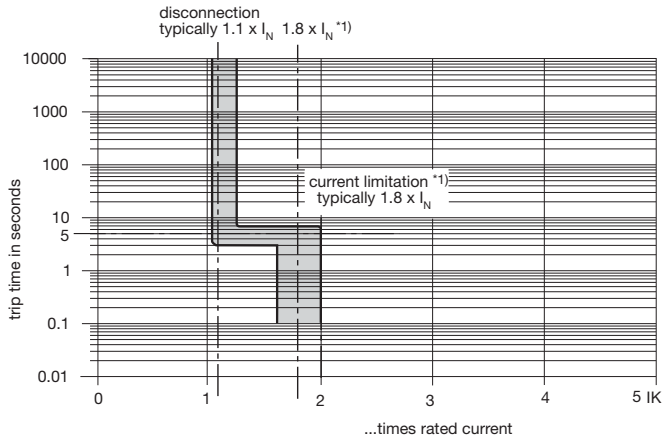
operating condition: SF +24 V = OK
fault condition: SF 0 V

ESX10-TB-127
with reset input RE
(+DC 24 V ↓)
with inverse status output SF
(0 V = load output ON)



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

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



- 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.

*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

Table 3: Reliable trip of ESX10-T

Reliable trip of ESX10-T with different cable lengths and cross sections

Resistivity of copper ρ_0 = 0.0178 (Ohm x mm²) / m

U_S = DC 19.2 V (= 80 % of 24 V) — voltage drop of ESX10-T and tolerance of trip point (typically 1.1 x I_N = 1.05 ... **1.35 x I_N**) have been taken into account.

ESX10-T-selected rating I_N (in A) →	**3**	**6**
e. g. trip current I_{ab} = 1.25 x I_N (in A) →	3.75	7.5 → **ESX10-T trips after 3 s**
R_{max} in Ohm = (U_S / I_{ab}) - 0.050 →	**5.07**	**2.51**

The ESX10-T reliably trips from 0 Ohm to max. circuitry resistance R_{max}

Cable cross section **A** in mm² →	0.14	0.25	0.34	0.5	0.75	1	1.5
cable length **L** in meter (= single length) ↓	**cable resistance in Ohm = (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

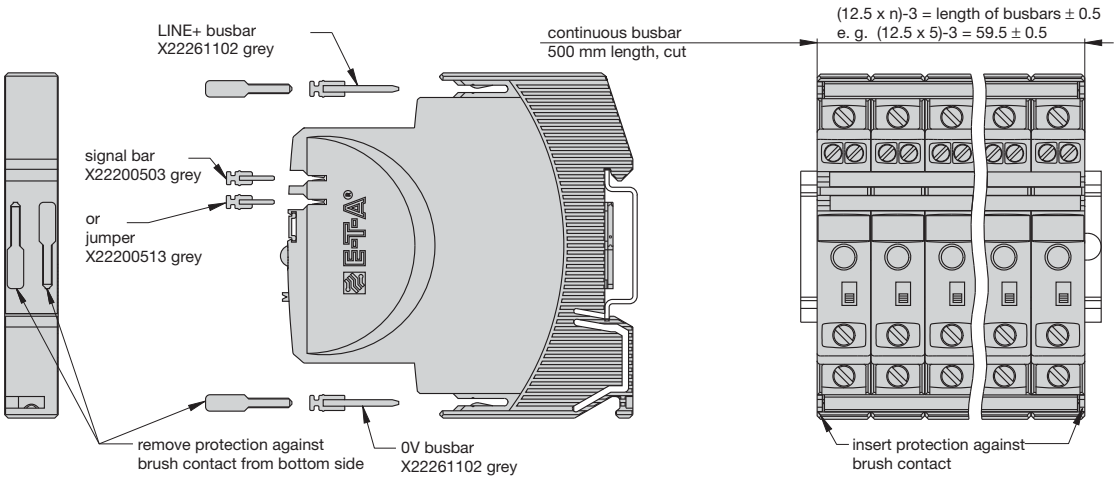
Example 1: max. length at 1.5 mm² and 3 A → **214 m**

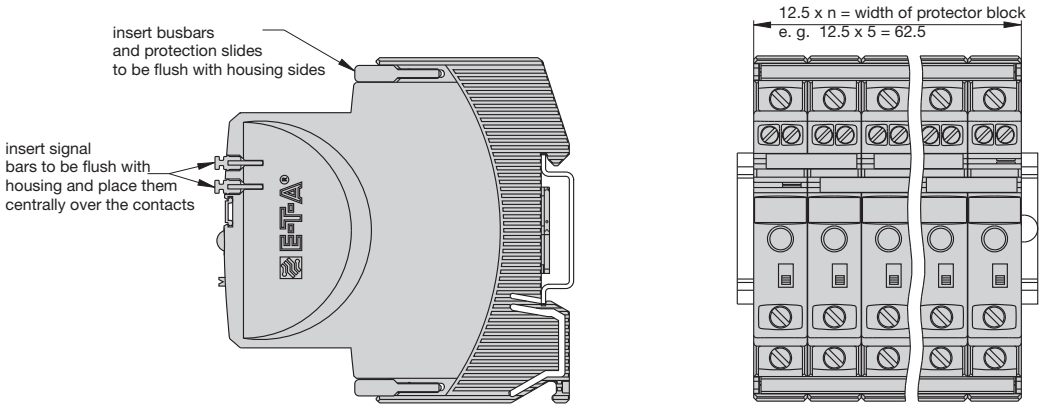
Example 2: max. length at 1.5 mm² and 6 A → **106 m**

Example 3: mixed wiring: R1 = 40 m in 1.5 mm² and R2 = 5 m in 0.25 mm²:
(Control cabinet – sensor/actuator level) R1 = 0.95 Ohm, R2 = 0.71 Ohm **Total (R1 + R2) = 1.66 Ohm**

Mounting examples for ESX10-T

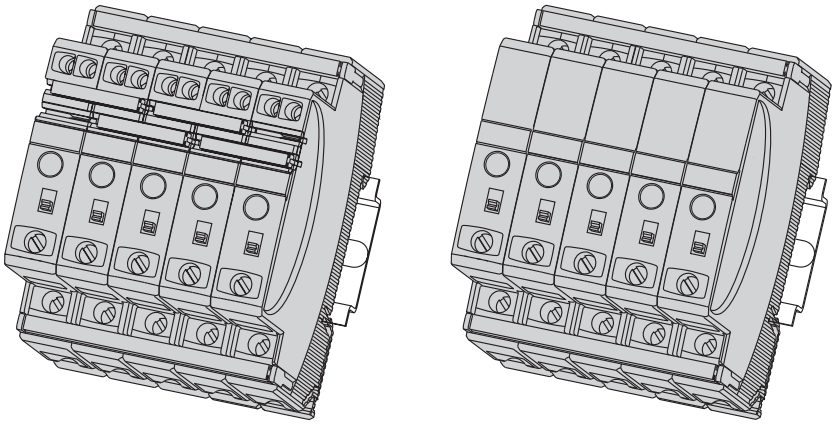
The ESX10-T features an integral power distribution system.





5 ESX10-TB
with busbars
and jumpers

5 ESX10-TA
with busbars



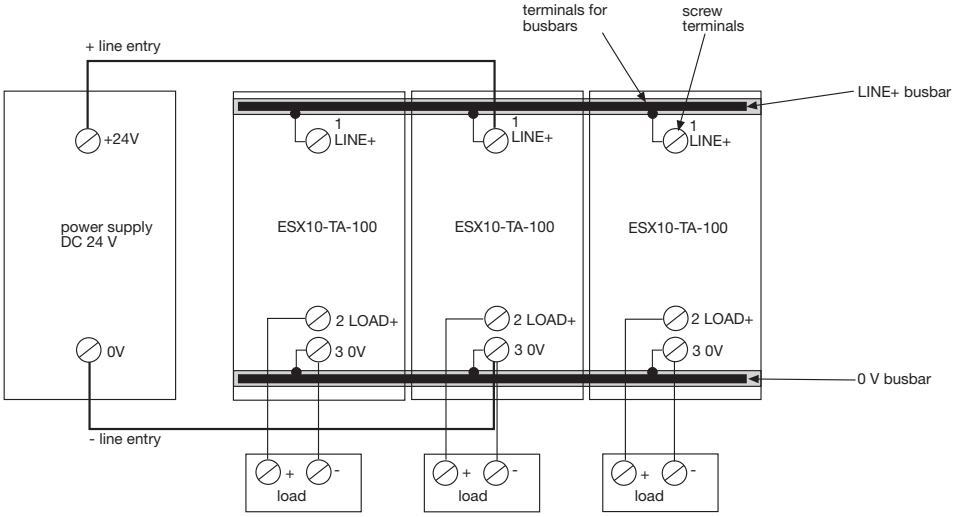
Mounting procedure:
Before wiring insert busbars into protector block.

Connection diagrams and application examples ESX10-T

Connection diagrams and application examples ESX10-T...

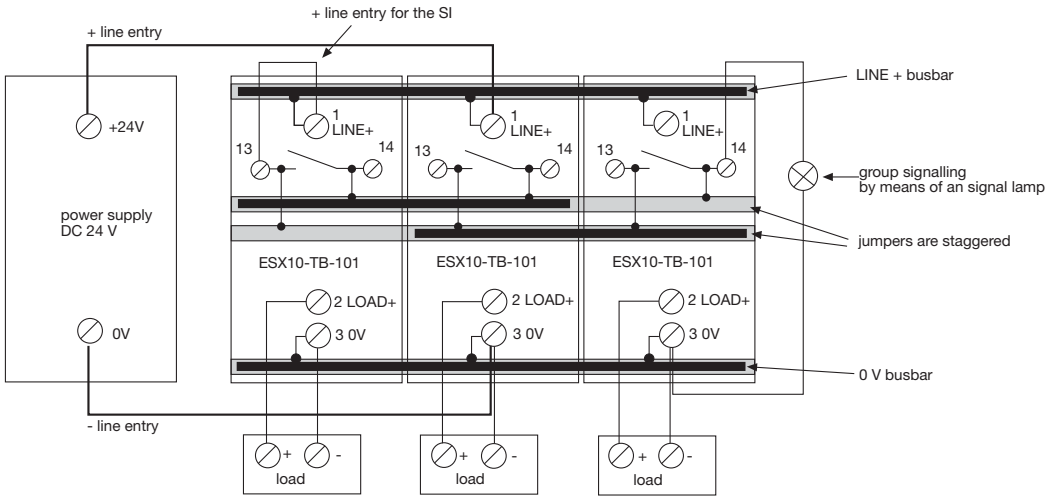
Signal contacts are shown in OFF or fault condition.

ESX10-TA-100



ESX10-TB-101

group signalling (series connection)

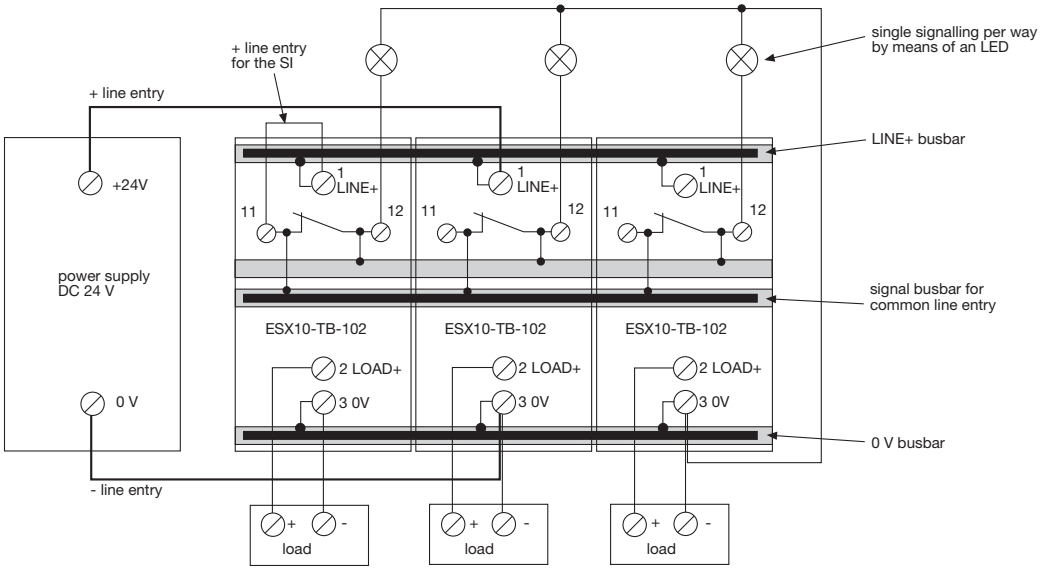


5

Connection diagrams and application examples ESX10-T

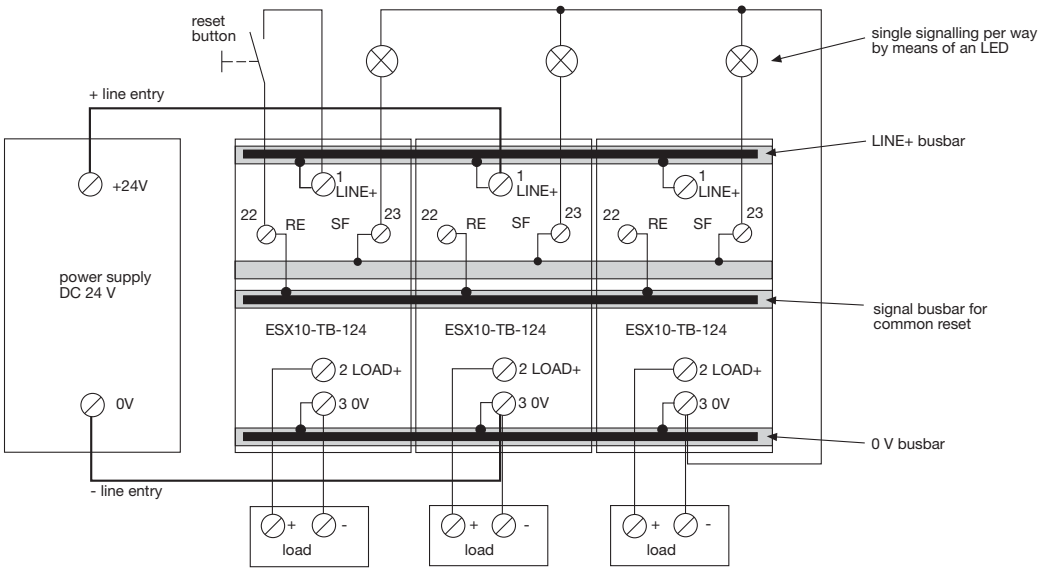
ESX10-TB-102

Single signalling with common line entry



ESX10-TB-124

Single signalling with common reset



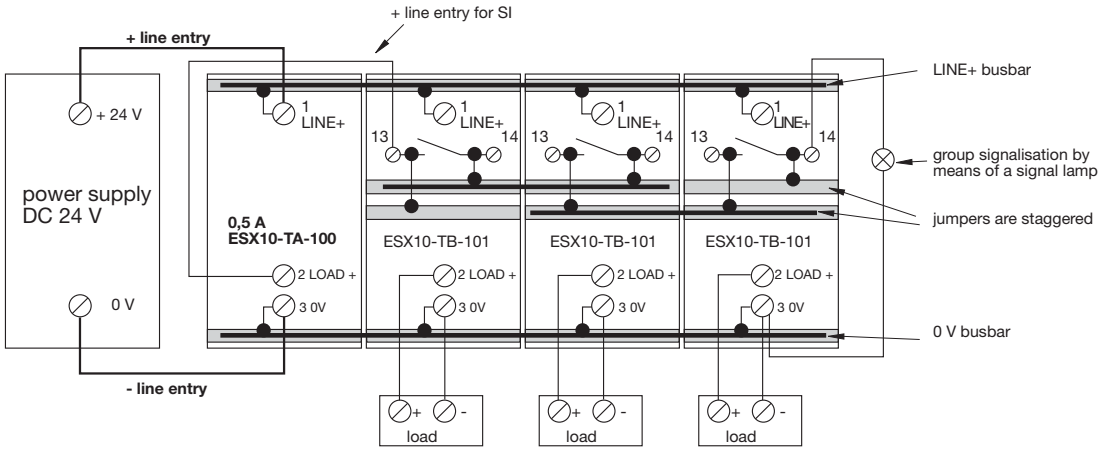
5

Connection diagrams and application examples ESX10-T

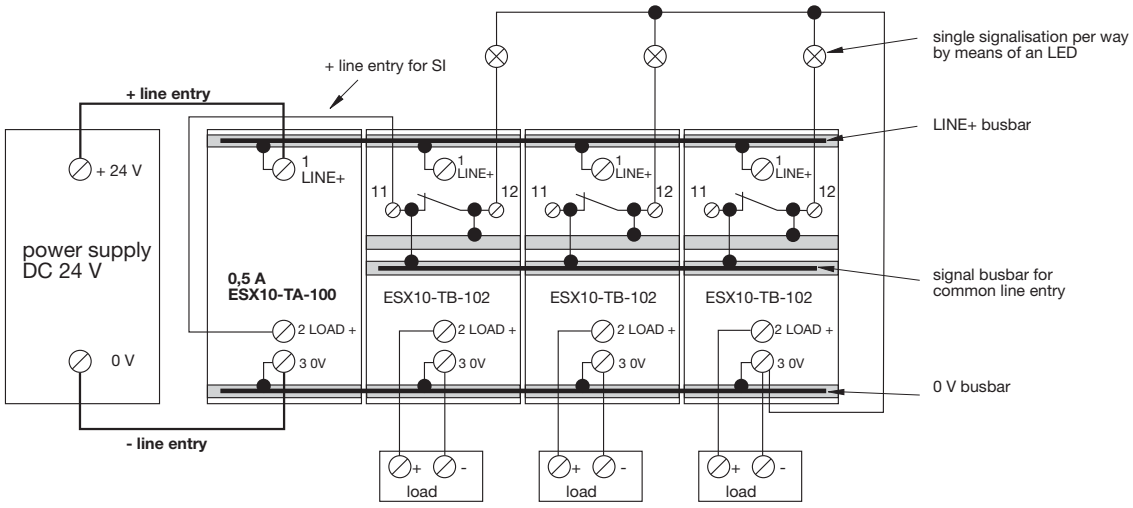
Application examples: feed in module with concurrent protection of auxiliary circuit

Auxiliary contacts are shown in the OFF of fault condition

ESX10-TB-101
Group signalisation (series connection)
Type ESX10-TA-100-DC24V-0.5A can be used as a feed in module including protection of auxiliary circuit



ESX10-TB-102
Single signalisation with common line entry
Type ESX10-TA-100-DC24V-0.5A can be used as a feed in module including protection of auxiliary circuit



5

Description

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

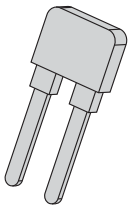
- LINE +(DC 24 V)
- 0 V
  Caution: The electronic devices ESX10-T require a 0 V connection
- signal contacts
- reset inputs

Busbars for LINE+ and 0 V
max. load with one line entry I_{max} 50 A
(recommended: centre line entry)
max. load with two line entries I_{max} 63 A
grey insulation, length: 500 mm
X 222 611 02

Signal busbars for signal contacts and reset inputs
max. load with one line entry I_{max} 1 A
with one series connection of signal contacts I_{max} 0.5 A
grey insulation, length: 500 mm
X 222 005 03

Jumpers for signal contacts
grey insulation, length: 21 mm
X 222 005 13
packing unit: 10 pcs

Insulated wire bridge
optional as jumper for ESX10-TB-101
for group signalisation (series connection)
X 222 984 01
packing unit: 10 pcs



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