

Description

The electronic circuit protector ESS30-S with physical isolation is the globally unique electronic overcurrent protection for DC 24 V applications as a "low energy breaker". It meets the requirements to DIN EN 60934 and UL 1077 as a Supplementary Protector in central and decentralised energy supply units. The compact device can be plugged into the terminal block systems 17plus and 18plus and is also suitable for the SVS power distribution systems, ensuring quick and easy installation.

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

In this context selectivity means that type ESS30-S responds faster to any overload or short circuit conditions in a load circuit than the switch-mode power supply. This is ensured by the combination of active electronic current limitation and well-proven circuit breaker technology including physical isolation.

The max. possible overcurrent is limited to typically 1.2 times rated current (see table 1). This allows switching on capacitive loads of up to 40,000 μF , but a disconnection will only be effected in the event of an overload or short circuit. For adjustment to the load conditions the current rating can be selected in fixed values from 0.5 A to 10A. Visual status indication is by means of a multicoloured LED and by integral signal outputs. The manual ON/OFF switch on the device itself allows start-up of certain individual load circuits and reset after disconnection on grounds of overcurrent.

As soon as the ESS30-S detects an overload or short circuit in its load circuit, it blocks the load output transistor and disconnects the current flow in the faulty circuit. Physical isolation is activated. After remedy of the failure, the load output of the ESS30-S is re-activated manually by actuating the ON/OFF switch on the device.

Features and Benefits

- Low Energy Breaker with 30 % reduction of power loss compared to competitive product
- Ambient temperatures up to 60 °C
- Selective load protection with physical isolation in the event of a failure
- Compact design, 30 % height reduction compared to equivalents at a width of only 12.5 mm
- One trip curve for all loads (DC 24 V motors upon request)
- Active current limitation when switching on capacitive loads up to 40,000 μF and in case of overload/short circuit
- Fixed current ratings from 0.5 A to 10 A
- Reliable overload disconnection typically from 1.2 x I_N even with long load lines or small cable cross sections
- Manual ON/OFF switch (push-push actuation)
- Clear status indication by means of LED
- Integral fail-safe element, adjusted to current rating
- Width per channel only 12.5 mm
- Can be plugged into side-by-side mounted power distribution modules 17plus, 18plus and SVSxx



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

Operating data

Operating voltage U_B	DC 24 V (18...30 V)
Current ratings I_N	fixed ratings: 0.5 A; 1 A; 2 A; 3 A; 3,6 A; 4 A; 6 A; 8 A; 10 A;
Standby current I_0	in ON condition: typically 4 mA
Trip current (bimetal)	typically 0.4 A (only under fault condition, till physical isolation)
Visual status indication	<ul style="list-style-type: none"> • multicoloured LED: <ul style="list-style-type: none"> green: <ul style="list-style-type: none"> - device is ON (S1 = ON) load circuit connected orange: <ul style="list-style-type: none"> - overload or short circuit until electronic disconnection red: <ul style="list-style-type: none"> - device switched OFF electronically load circuit OFF - undervoltage ($U_B < 14\text{ V}$) OFF: <ul style="list-style-type: none"> - manually OFF (S1 = OFF) load circuit physically isolated or device is dead-voltage
	<ul style="list-style-type: none"> • Potential-free signal contact • On/off position of the switch S1

Load circuit

Load output	power MOSFET switching output (plus switching)
Overload and short circuit disconnection	typically 1.2 x I_N with active current limitation
Trip times for electronic disconnection	see time/current characteristic overload trip time typically 500 ms short circuit trip time depending on current rating (see table 1)
for physical isolation	typically 5 s (3 ... 9 s)
Temperature disconnection	internal temperature monitoring with physical isolation
Undervoltage monitoring of load output	with hysteresis, no reset required: »OFF« at $U_B < 14\text{ V}$ »ON« at $U_B > 17\text{ V}$
Switch-on delay t_{Start} reset and after applying of U_B	typically 2 ms after each ON operation,
Capacitive loads	up to 40,000 μF
Free-wheeling diode	external free-wheeling diode recommended for inductive load
Parallel connection of several load outputs	not allowed

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

Error message:

Signal output F	potential-free signal contact switches simultaneously with physical isolation, max. DC 30 V / 2 A, min. DC 12 V / 10 mA
Signal output ESS30-S003	blue push button is in ON position: signal contact 13-14 is closed
Signal change over contact	13-12 is open blue push button is in OFF position: signal contact 13-14 is open 13-12 is closed

Visual status indication

LED green	U _B is applied and switch S1 is ON and no overload, no short circuit
OFF condition LED off	<ul style="list-style-type: none"> device switched off (switch S1 is OFF) load circuit physically isolated no operating voltage U_B
LED orange	overload conditions > 1.2 times rated current until, electronic disconnection
LED red	electronic disconnection upon overload, short circuit or undervoltage

General data

Fail-safe element	back-up fuse for ESS30-S.. <u>not required</u> due to integral redundant fail-safe element (protective element)
Blade terminals	6.3 mm to EN 60934-6.3-0.8
Housing material	moulded
Mounting	pluggable into power distribution systems for side-by-side mounting (module 17plus or 18plus by E-T-A)
Ambient temperature	0...+60 °C (without condensation, cf. EN 60204-1)
Storage temperature	-40...+70 °C
Humidity	96 hours at 95 % RH, 40 °C to IEC 60068-2-78, -Cab climate class 3K3 to EN60721
Vibration	3 g test to IEC 60068-2-6, test Fc
Degree of protection	operating area IP30 EN 60529 installation area IP00 EN 60529
EMC requirements (EMC directive, CE logo)	noise emission: EN 61000-6-3 susceptibility: EN 61000-6-2
Insulation co-ordination (IEC 60934)	0.5 kV / pollution degree 2 reinforced insulation in operating area
Dielectric strength	(see also dimensions)
operating area	test voltage AC 1000 V
installation area	test voltage AC 500 V
load circuit	
auxiliary contact	test voltage AC 500 V
Insulation resistance (OFF condition)	> 100 MΩ (DC 500 V) between LINE (+) and LOAD (+)
Dimensions (w x h x d)	12.5 x 78.5 x 60 mm (tolerances to DIN ISO 286 part 1 IT13)
Operating force	
ON	5...8 N
OFF	7...10 N
Mass	approx. 39 g

Order numbering code

Ttype	ESS30	Electronic circuit breaker with current limitation
Mounting	S	
Version	0	with physical isolation in the event of a failure
Signal input	0	without signal input
Signal output:	3	double auxiliary change over contact (min. 12 V/10 mA; max. 30 V/2 A)
Operating voltage	DC 24 V	voltage rating DC 24 V
Current ratings		0.5 A 1 A 2 A 3 A 3.6 A 4 A 6 A 8 A 10 A

ESS30 - S 0 0 3 - DC 24 V - 6 A ordering example

Notes

- The user has to ensure that the cable cross section of the load circuit in question complies with the current rating of the ESS30-S used.
- In addition special precautions must be taken in the system or machine (e.g. use of a safety PLC) which reliably prevent an automatic re-start of parts of the system (cf. Machinery Directive 2006/42/EG and EN 60204-1, Safety of Machinery). In the event of a failure (short circuit/overload) the load circuit will be disconnected electronically with physical isolation of the contacts by the ESS30-S.

Approvals of ESS30-S

Approval authority	Standard	Rated voltage	Current ratings
VDE	EN 60934	DC 24 V	0.5 A...10 A
UL	UL 1077	DC 24 V	0.5 A...10 A

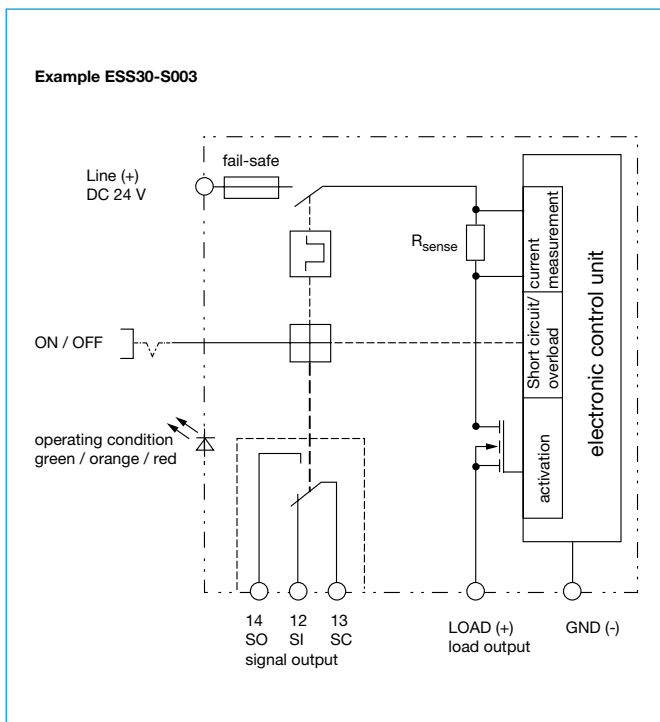
Table 1: Voltage drop, current limitation, trip times, fail-safe element, max. load current

current rating I_N	typical voltage drop U_{ON} at I_N	active current limitation typically	trip time I_{KS} typically ¹⁾	trip time I_{OL} typically ²⁾	fail-safe element	max. load current at 100 % ON duty		
						$T_{Amb} = 40\text{ °C}$	$T_{Amb} = 50\text{ °C}$	$T_{Amb} = 60\text{ °C}$
0.5 A	90 mV	1.2 x rated current	500 ms	500 ms	2 A	0.5 A	0.5 A	0.5 A
1 A	100 mV	1.2 x rated current	500 ms	500 ms	2 A	1 A	1 A	1 A
2 A	110 mV	1.2 x rated current	500 ms	500 ms	4 A	2 A	2 A	2 A
3 A	150 mV	1.2 x rated current	500 ms	500 ms	6.3 A	3 A	3 A	3 A
3.6 A	155 mV	1.2 x rated current	350 ms	500 ms	6.3 A	3.6 A	3.6 A	3.6 A
4 A	160 mV	1.2 x rated current	280 ms	500 ms	6.3 A	4 A	4 A	4 A
6 A	170 mV	1.2 x rated current	150 ms	500 ms	10 A	6 A	6 A	6 A
8 A	190 mV	1.2 x rated current	280 ms	500 ms	15 A	8 A	7.5 A	7 A
10 A	210 mV	1.2 x rated current	200 ms	500 ms	15 A	9.5 A	9 A	8.5 A

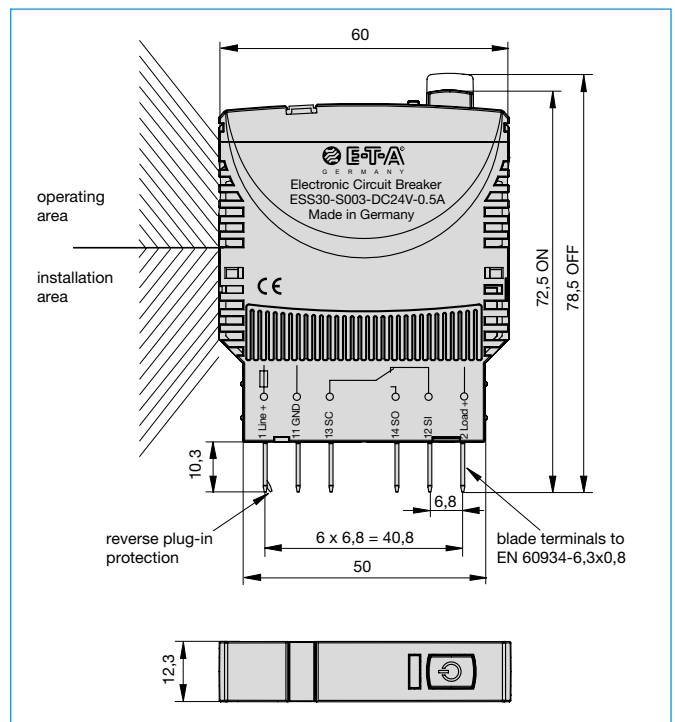
Note: When mounted side-by-side without convection the devices can only carry max. 80 % of their rated current continuously (100 % ON duty) due to thermal effect.

- 1) short circuit
- 2) overload

Connection diagram ESS30-S003-... (Example)



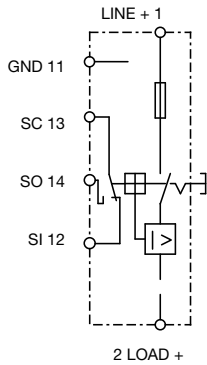
Dimensions ESS30-S



ESS30-S Signal output / (connection diagrams)

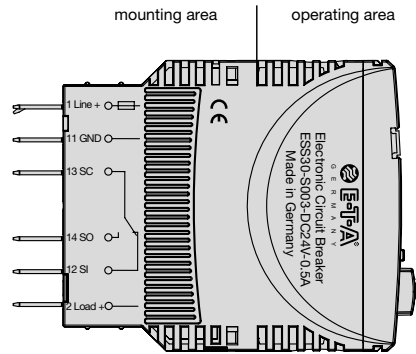
The auxiliary contacts are shown in OFF or fault condition

ESS30-S003
without signal input
with signal output f
single signal, change-over

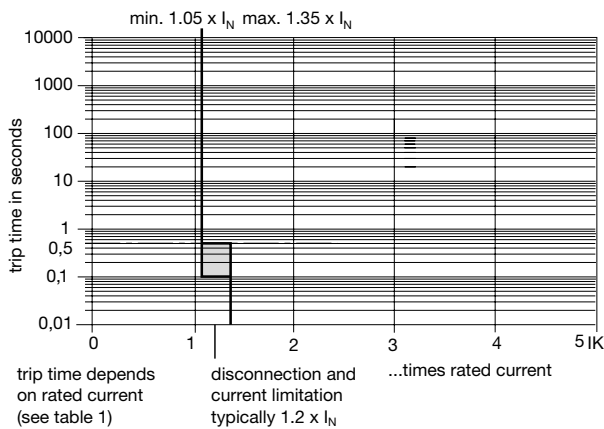


operating condition
13-14 closed; 13-12 open
fault condition
13-12 open; 13-14 closed

Connection diagram ESS30-S003-... (Example)



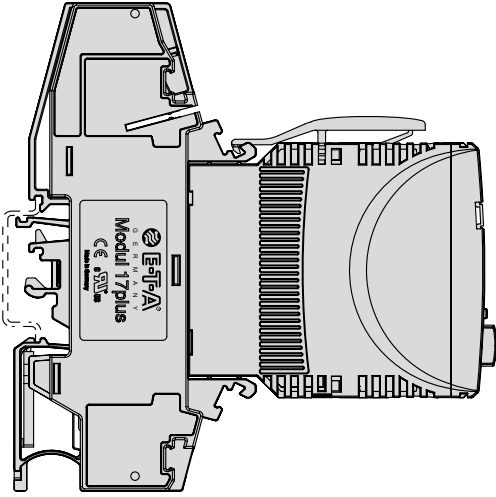
Typical time/current characteristic ($T_{amb} = 25\text{ °C}$)



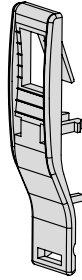
- The overload trip time is typically 500 ms (e.g. ESS30-S...-6A)
- **The electronic current limitation typically begins at $1.2 \times I_N$.** This means: under all overload conditions (independent of power supply and load circuit resistance) typically 1.2 times rated current is applied until disconnection. The corresponding current limitation value I_{Limit} depends on the current rating of the device I_N .
- Without the current limitation getting into effect at typically $1.2 \times I_N$ there would be a much higher overcurrent in the event of an overload or short circuit.
- Reset of the circuit breaker is only possible approximately 10 sec after tripping.

Mounting examples for ESS30-S

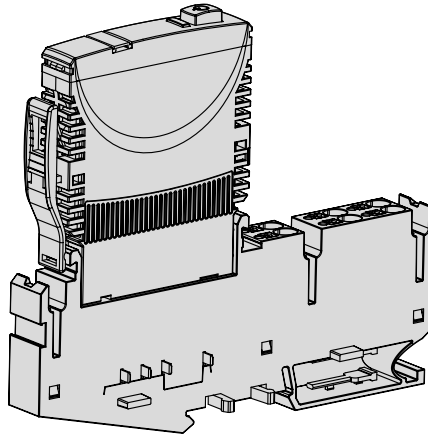
Module 17plus
For technical data see section Power Distribution Systems



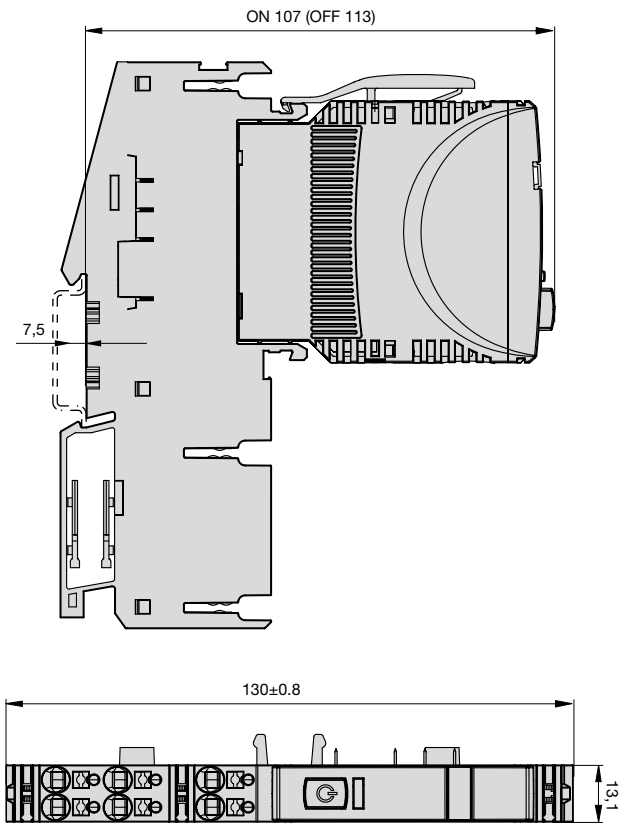
Retaining clip Y 311 978 01 (under preparation)
Retaining clip for ESS30-S



Installation example with ESS30-S
with optional retaining clip



Module 18plus
For technical data see section Power Distribution Systems



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