



Electronic circuit breaker ESS30-Sxxx-DC24V

Description

The electronic circuit breaker ESS30-S with physical isolation is the globally unique electronic overcurrent protection for DC 24 V applications as a “low energy breaker”. For the use in decentralised and centralised power supply units, it meets the requirements to DIN EN 60934, to UL1077 as a Supplementary Protector and to UL 1310 as “Class2 power unit” (NEC class2). The compact device can be plugged into the terminal blocks 17plus and 18plus and into the SVS power distribution systems and ensures quick and easy installation.

The ESS30-S is only 12.5 mm wide and selectively protects all DC 24 V load circuits. This is achieved by a combination of active electronic current limitation in the event of a short circuit and overload disconnection at typically 1.2 times rated current. 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.

The max. possible overcurrent is limited to typically 1.2 times rated current (see table 1). Switching capacitive loads up to 40,000 µF is possible without any problems. For adjustment to the load conditions the current rating can be selected in fixed values from 0.5 A to 10A and adjustable versions 1A/2A or 3A/6A are also available. 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.



ESS30-S...

Features

- Plug-in mounting on power distribution modules 17plus,18plus and SVSxx
- Physical isolation in the event of a failure
- Active linear current limitation
- Capacitive loads up to 40,000 µF
- Fixed current ratings 0.5 A...10 A (0.5A...3.6A NEC Class 2)
- 2 steps (1A/2A or 3A/6A) can be adjusted on the device by means of a switch
- Approvals: UL, NEC Class 2, VDE

Your Benefits

- Inventory costs are cut, because one model covers two current ratings
- Flexibility is enhanced through plug-in design and ease of current rating adjustment
- Cost-savings because the breakers up to 3.6A approved to UL12310 (NEC Class 2) replace the previously used expensive switch mode power supplies
- Saves energy costs through 1/3 lower power loss compared to competitive solutions.
- Increases system availability through clear failure detection and signalling

Preferred types – for more details on all configurations please see order numbering code

Preferred types are E-T-A products most frequently used by E-T-A customers. We manufacture E-T-A preferred types in particularly high

volumes. Our preferred types are supplied at shorter lead times than non-standard versions.

| Preferred types | Preferred ratings (A) | | | | | | | | | | | |
|------------------|-----------------------|---|---|-----|---|---|---|---|----|---------|---------|-----------|
| | 0.5 | 1 | 2 | 3.6 | 3 | 4 | 6 | 8 | 10 | 2 (CL2) | 3 (CL2) | 3.6 (CL2) |
| ESS30-S | | | | | | | | | | | | |
| ESS30-S003-DC24V | x | x | x | | x | x | x | x | x | | | x |

Approvals



Information online

For access to the latest documents please follow: www.e-t-a.de/e353

Compliances



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

For further details please see: www.e-t-a.de/ti_e

Operating data

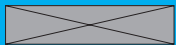
| | |
|--------------------------|---|
| Operating voltage U_B | DC 24 V (18...30 V) |
| Current ratings I_N | fixed ratings: 0.5 A; 1 A; 2 A; 2 A CL2; 3 A; 3 A CL2; 3,6 A; 3,6 CL2 4 A; 6 A; 8 A; 10 A; Adjustable current ratings: 1 A/2 A; 3 A/6 A |
| Standby current I_0 | in ON condition: typically 4 mA with adjustable versions typically 5.5 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 ($U_B < 14\ V$) OFF: <ul style="list-style-type: none"> - manually OFF (S1 = OFF) load circuit physically isolated or device is dead-voltage ● 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 $1.2 \times I_N$ 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 $U_B < 14\ V$ »ON« at $U_B > 17\ V$ |
| Switch-on delay t_{Start} | typically 2 ms after each ON operation, reset and after applying of U_B |
| 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 |
| 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 |

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

| | |
|---|---|
| Signal output ESS30-S001 changeover aux. contact | blue push button is in ON position: aux. contact 13/14-12 is closed blue push button is in OFF position: aux. contact 13/14-12 is open |
| Signal output ESS30-S002 changeover aux. contact | blue push button is in ON position aux. contact 13/14-12 is open blue push button is in OFF position: aux. contact 13/14-12 is closed |
| Signal output ESS30-S003 changeover aux. contact | blue push button is in ON position: aux. contact 13-14 is closed, 13-12 is open blue push button is in OFF position: aux. 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 operating area installation area load circuit auxiliary contact | (see also dimensions) test voltage AC 1000 V test voltage AC 500 V test voltage AC 500 V |
| Insulation resistance (OFF condition) | > 100 M Ω (DC 500 V) between LINE (+) and LOAD (+) |
| Compliance | CE-marking |
| 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 OFF | 5...8 N 7...10 N |
| Mass | approx. 39 g |



Electronic circuit breaker ESS30-Sxxx-DC24V

Preferred types

Preferred types are E-T-A products most frequently used by E-T-A customers. We manufacture E-T-A preferred types in particularly high

volumes. Our preferred types are supplied at shorter lead times than non-standard versions.

| Preferred types | Preferred ratings (A) | | | | | | | | | | | |
|------------------|-----------------------|---|---|-----|---|---|---|---|----|---------|---------|-----------|
| | 0.5 | 1 | 2 | 3.6 | 3 | 4 | 6 | 8 | 10 | 2 (CL2) | 3 (CL2) | 3.6 (CL2) |
| ESS30-S003-DC24V | x | x | x | | x | x | x | x | x | | | x |

Order numbering code

| | | |
|--|--------------------|---|
| Type | ESS30 | Electronic circuit breaker with current limitation |
| Mounting | S | plug-in type |
| Version | 0 | with physical isolation in the event of a failure |
| Signal input | 0 | without signal input |
| Signal output: | 1 | signal make contact (min. 12 V/10 mA; max. 30 V/2 A) |
| | 2 | signal break contact (min. 12 V/10 mA; max. 30 V/2 A) |
| | 3 | signal 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 (Class 2) | |
| | 1 A (Class 2) | |
| | 2 A | |
| | 3 A | |
| | 3.6 A | |
| | 4 A | |
| | 6 A | |
| | 8 A | |
| | 10 A | |
| | 1 A/2 A adjustable | |
| | 3 A/6 A adjustable | |
| Approvals | CL2 | Class2 (only for 2, 3 and 3.6 A versions) |
| ESS30 - S 0 0 3 - DC 24 V - 3,6 A-CL2 ordering example | | |
| ESS30 - S 0 0 3 - DC 24 V - 10 A ordering example | | |

Please be informed that we have minimum ordering quantities to be observed.

Class 2
Meets requirement for Class 2 current limitation
(ESS30-S...-0.5 A/1 A/2 A/3 A/3.6 A)

Custom designed versions

Looking for a version you cannot find in our ordering number code? Please get in touch. We will be pleased to find a solution for you.

Application note

- The user has to ensure that the cable cross section of the load circuit in question complies with the current rating of the ESS31-T used.
- In addition special precautions must be taken in the system or machine (e.g. use of a safety PLC) which reliably prevent an automatic re-start of parts of the system (cf. Machinery Directive 2006/42/EG and EN 60204-1, Safety of Machinery). In the event of a failure (short circuit/overload) the load circuit will be disconnected electronically with physical isolation of the contacts by the ESS31-T.

Approvals of ESS30-S

| Approval authority | Standard | File-Certificate Nr. | Rated voltage | Current ratings |
|--------------------|-----------------------------|----------------------|---------------|--------------------------------|
| UL | UL 2367 | E306740 | 24 V DC | 0.5 A...10 A |
| UL | UL 1310 NEC Class 2 | E306740 | 24 V DC | 0.5 A, 1 A, 2 A, 3 A, 3.6 A |
| UL | UL 2367 | E306740 | 24 V DC | 0.5 A...10 A |
| UL | UL 1077 C22.2 No. 235-04 | E67320 | 24 V DC | 0.5 A...10 A, 1 A/2 A, 3 A/6 A |
| VDE | IEC/EN 60934 (VDE 0642) | 40039681 | 24 V DC | 0.5 A...10 A |



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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 |
| 2 A CL2 | 130 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 A CL2 | 200 mV | 1.2 x rated current | 500 ms | 500 ms | 4 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 |
| 3,6 A CL2 | 220 mV | 1.05 x rated current | 450 ms | 500 ms | 4 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 |
| 1 A/2 A | 45 mV/90 mV | 1.2 x rated current | 500 ms | 500 ms | 4 A | 1 A/2 A | 1 A/2 A | 1 A/2 A |
| 3 A/6 A | 80 mV/160 mV | 1.2 x rated current | 500 ms/150 ms | 500 ms | 10 A | 3 A/6 A | 3 A/6 A | 3 A/6 A |

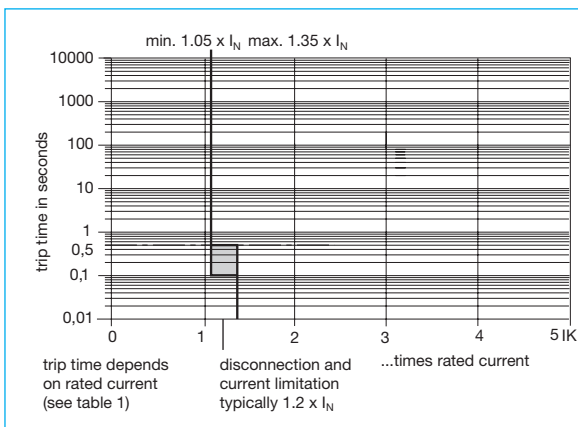
Note: When mounted side-by-side without convection the devices can only carry max. 80 % of their rated current continuously (100 % ON duty) due to thermal effect.

¹⁾ short circuit
²⁾ overload

Tabelle 2: ESS30-S – Gerätevarianten

| Version | Signal input | | | Signal output: | | | | | | |
|----------|--------------|--|------------------------|--------------------------------|---|--|--------------------------------------|---------|----------------------|--------------------|
| | | | | signal output F (aux. contact) | | | status output SF | | | |
| ESS30-S. | without | control input ON/OFF +24 V Control IN+ | reset input +24 V ↓ RE | without | single signal make contact (normally open NO) | single signal break contact (normally closed NC) | double auxiliary change over contact | without | status-OUT +24V = OK | status-OUT 0V = OK |
| 001 | x | | | | x | | | x | | |
| 002 | x | | | | | x | | x | | |
| 003 | x | | | | | | x | x | | |

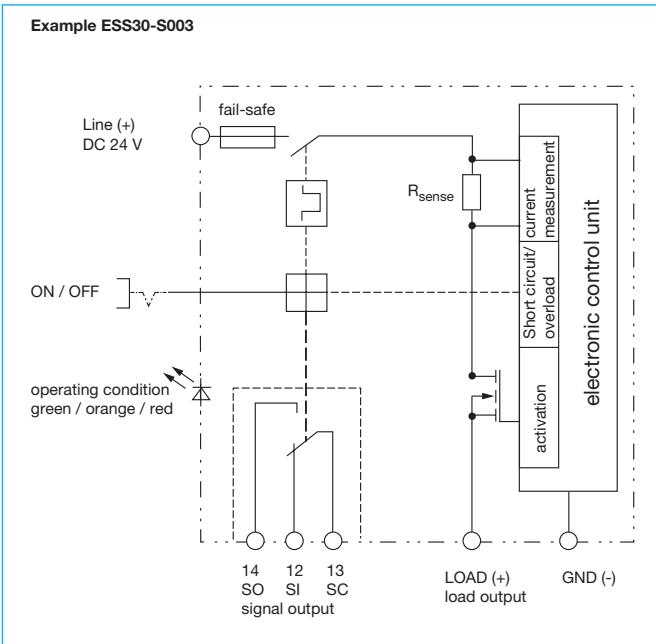
Typical time/current characteristic ($T_{amb} = 25\text{ °C}$)



- The overload trip time is typically 500 ms (e.g. ESS30-S...-6A)
- **The electronic current limitation typically begins at $1.2 \times I_N$ (exception: ESS30-S-...-3.6 A CL2 typically $1.05 \times I_N$).** 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.

Electronic circuit breaker ESS30-Sxxx-DC24V

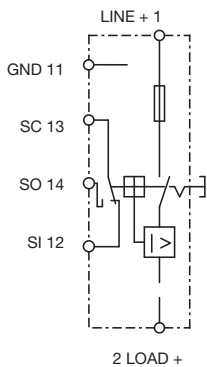
Connection diagram ESS30-S003-... (Example)



ESS30-S signal output (connection diagrams)

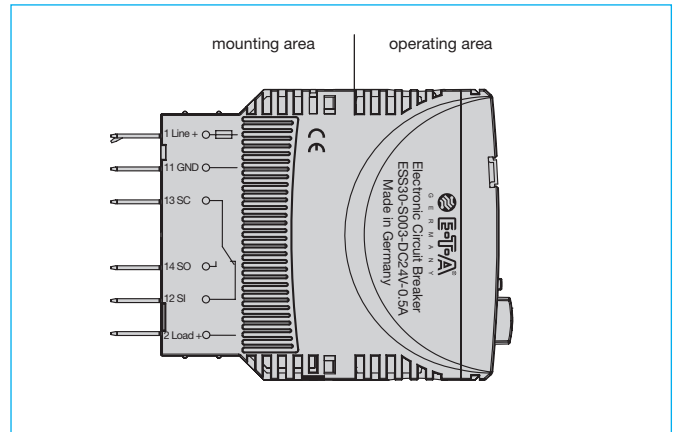
The auxiliary contacts are shown in OFF or fault condition

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

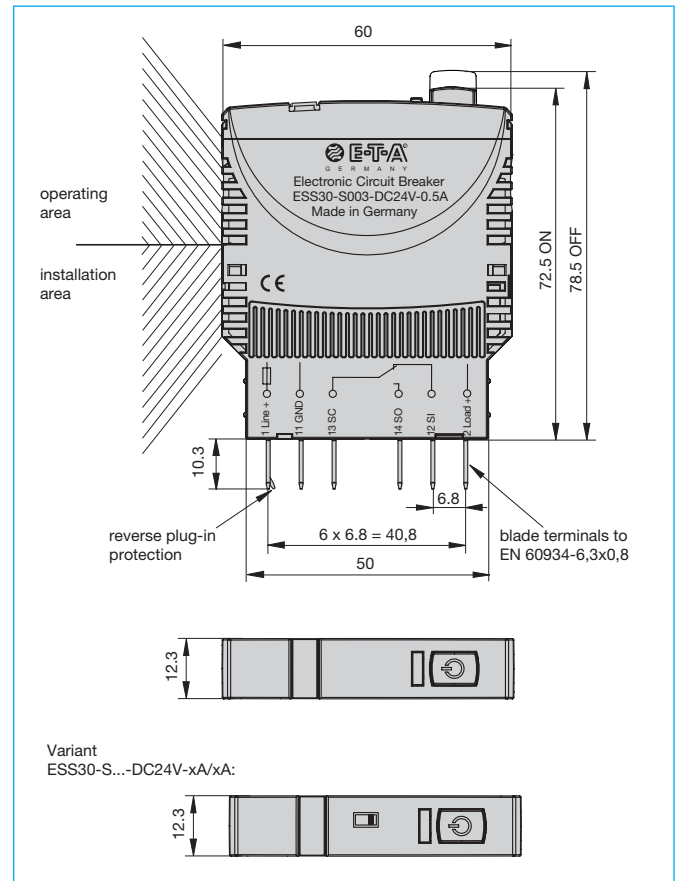


operating condition
13-14 closed; 13-12 open
fault condition
13-14 open; 13-12 closed

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



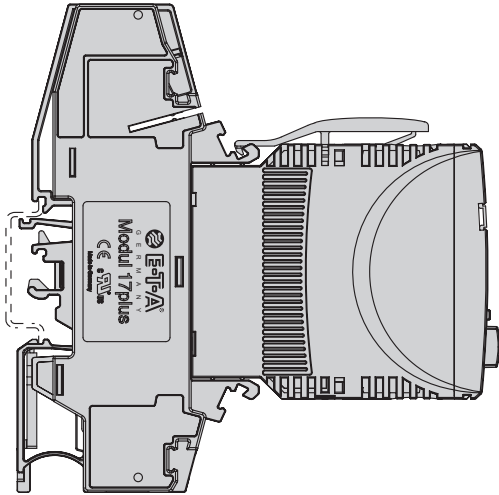
Dimensions ESS30-S



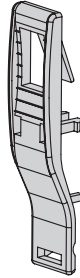


Mounting examples for ESS30-S

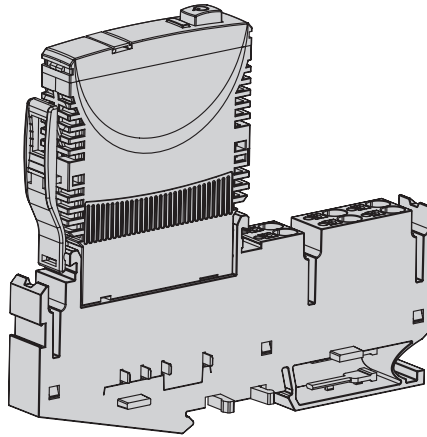
Module 17plus



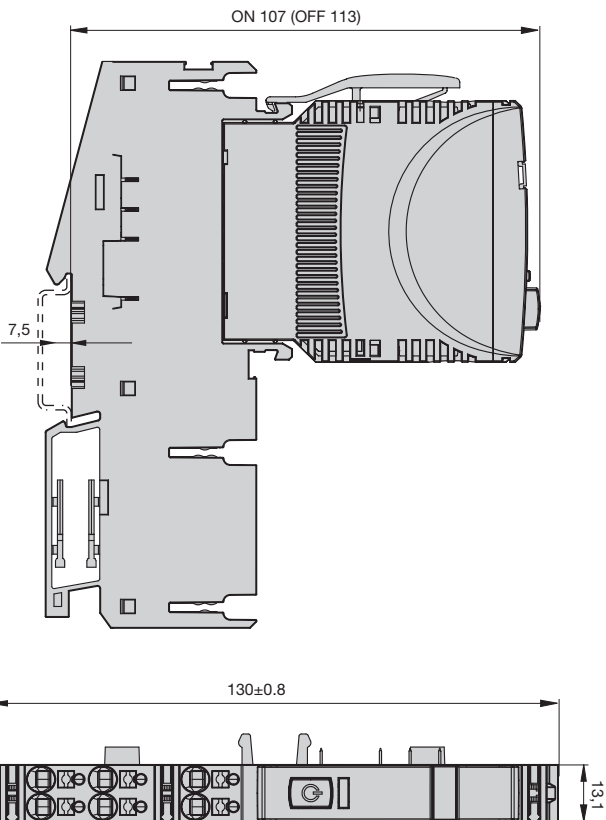
Retaining clip Y 311 978 01



Installation example with ESS30-S with optional retaining clip



Module 18plus



All dimensions without tolerances are for reference only. E-T-A reserves the right change specifications at any time 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.



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Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
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- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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