EBU10-T Electronic circuit breaker

Description

The EBU Electronic Breaker Unit provides selective overcurrent protection for AC 230 V UPS systems. The unit is equipped with an MCB approved for short circuit interruptions up to 10 kA and adjustable electronics with measuring and analysing functions. The product is available with rated currents of 4 A, 6 A, 10 A and 16 A, with B and C characteristics, and is directly operated at the output of the respective UPS. UPS units often do not supply sufficient power in the event of a short circuit to trip conventional MCBs. The electronic AC circuit breakers can be individually adjusted to the UPS and reliably disconnect it in the event of a short circuit. Thanks to optimally adjustable load current ratings, an overload in the load circuit can be directly detected and disconnected. This prevents the fatal disconnection of the entire output voltage of the UPS unit. UPS units can be dimensioned 1/3 smaller by using EBU10-T Electronic Breaker Units, as they do not need additional cable reserves for the trip mechanism. The EBU increases system availability, reduces overall costs and facilitates electrical planning.

EBU10-T
(1-pole)

EBU10-T
(2-pole)

Typical applications

Electronic overcurrent protection by means of electronic AC circuit breakers is ideally suitable to selectively protect uninterruptible power supplies (UPS) in industrial plants. These solutions ensure energy security in AC UPS systems.

Benefits

- Increased system availability through effective protection
- Reduced overall costs by a 1/3 more efficient design
- Facilitated planning through adjustable overcurrent protection

Preferred types – for further details regarding all product versions please see ordering number 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)			
	4	6	10	16
EBU10-TA1-003-AC230V-C-...	x	x	x	x

4

Compliance

CE RoHS REACH

Further information

www.e-t-a.de/d400

Facilitated system planning with the EBU-T design tool

www.e-t-a.de/usv_tool_de

Technical data

Rated voltage U_N	AC 230 V ±10 %
Current ratings I_N	4 A, 6 A, 10 A, 16 A
Frequency	50 Hz
Rated insulation voltage	AC 250 V
Rated voltage and current rating range of the auxiliary contact	DC 110 V / 0.3 A – 33 W DC 30 V / 1.1 A – 33 W AC 120 V / 0.5 A – 60 VA AC 240 V / 0.25 A – 60 VA
Min. load of aux. contact (valid for standard industrial environments, no aggressive gases)	3 mA at 24 V
Reference ambient temperature	-35 °C ... +60 °C
Actuating method	S-type
Tripping mode/ Degree of trip-free behaviour	mechatronic / trip free mechanism (positively)

Note for the electronic trip mechanism:

The EBU-T electronically trips in the event of a short circuit and simultaneously occurring low voltage (<70 % U_{rated}). This helps prevent nuisance tripping in the event of short-term inrush current peaks and ensures the supply of the final circuits through the UPS. The overload detection remains unaffected.

Recommended cable length (supply line) from generator to EBU10-T max.

B6	B10	B16	C4	C6	C10	C16
31 m/ mm²	19 m/ mm²	12 m/ mm²	24 m/ mm²	17 m/ mm²	10 m/ mm²	6 m/ mm²

Typical electrical operational values

Voltage drop in V at 1 x I_N

I_n (A)	4	6	10	16
V	0.77	0.53	0.35	0.3

Power loss of the electronics	typically 1.5 W
Insulation co-ordination (except signalling)	Rated impulse voltage 4 kV; overvoltage category III; pollution degree 2; reinforced insulation in the actuating area
Insulation co-ordination of the signalling	Rated impulse voltage: 2.5 kV

Note: The SI-contacts are not suitable for connection to SELV control voltage.

Insulation resistance	> 100 MOhm (DC 500 V)
Degree of protection	II
Typical life	
mechanical (contacts) electronic potentiometer	20,000 cycles > 15 years within specification min. 1000 steps
Operating behaviour (endurance) IEC 60947-2	1500 cycles; U_N (AC); 1*I_N; cos phi= 0.8 + 8500 cycles mechanically + 12 cycles; U_N (AC); 6*I_N; cos phi= 0.5
Rated short-circuit rupture capacity (Ics) according to IEC 60947-2	3 cycles (O-CO-CO); U_N (AC); 7500A; cos phi = 0.5

Technical data

Rated ultimate short-circuit rupture capacity (Icu) IEC 60947-2	2 cycles (O-CO); U_N AC); 10,000A; cos phi = 0.5
Signalling	
Auxiliary contacts	1 change over contact (terminals 11, 12, 14) terminals 11-12 closed in OFF or error condition terminals 11-14 open in OFF or error condition
LED status indication	Green: normal operation Orange blinking typ. 5 s: After adjustment process Red: MCB OFF / electronic trip OFF: device not connected to power or error Red blinking device error
Mounting values	
Mounting method	DIN rail mounting
Mounting position	any
Terminal data	
On the input side	screw terminals input (cage clamps) horizontal busbar connection possible with comb, busbars
Output side / Auxiliary contacts	Push-in terminals

	A [mm²]	AWG	I [mm]	T [Nm]
Line (1)	1...25	18...4	18	max. 2
N	1...10	18...7	16	max. 2
Load (2.1/2.2)	0.5...4	20...11	11	---
SI (11/12/14)	0.5...1.5	20...16	8	---

Mass	Approx. 230 g	1-pole
	Approx. 330 g	2-pole
Environmental tests (typical values)		
Vibration (sinusoidal) Test according to IEC 60068-2-6, test Fc	± 0.38 mm (10– 57 Hz), 5 g (57 – 500 Hz) 10 frequency cycles per axis	
Shock Test according to IEC 60068-2-27, test Ea	30 g (11 ms)	
Humidity Test according to IEC 60068-2-78, test Cab	48 hours at 95 % RH, temperature +40 °C	
Degree of protection	Operating area IP 40 Terminal area IP00	
Storage temperature range	-40 °C ... +70 °C	
Selectivity	Analogue miniature circuit breaker	

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)			
	4	6	10	16
EBU10-TA1-003-AC230V-C-...	x	x	x	x

Ordering number code

Type number
EBU10 Electronic circuit breaker for AC UPS applications

Mounting method
T Rail mounting

Design
A Adjustability I_N UPS + I_N load

Number of poles
1 1-pole, 1-pole protected electronically
1 1-pole, 1-pole protected electronically

Version
0 With physical isolation by means of MCB 4230-T

Signal input
0 Without signal input

Signal output
3 Auxiliary change-over contact

Operating voltage
AC 230 V Voltage rating AC 230 V

Characteristic curve
B Thermal 1.05 - 1.30 I_N; magnetic 3.2 - 4.8 I_N
C Thermal 1.05 - 1.30 I_N; magnetic 6.4 – 9.6 I_N

Current rating range
4 A (C characteristic only)
6 A
10 A
16 A

EBU10 - T A 1 - 0 0 3 - AC 230 V - C - 10 A ordering example

Preferred Types C characteristic

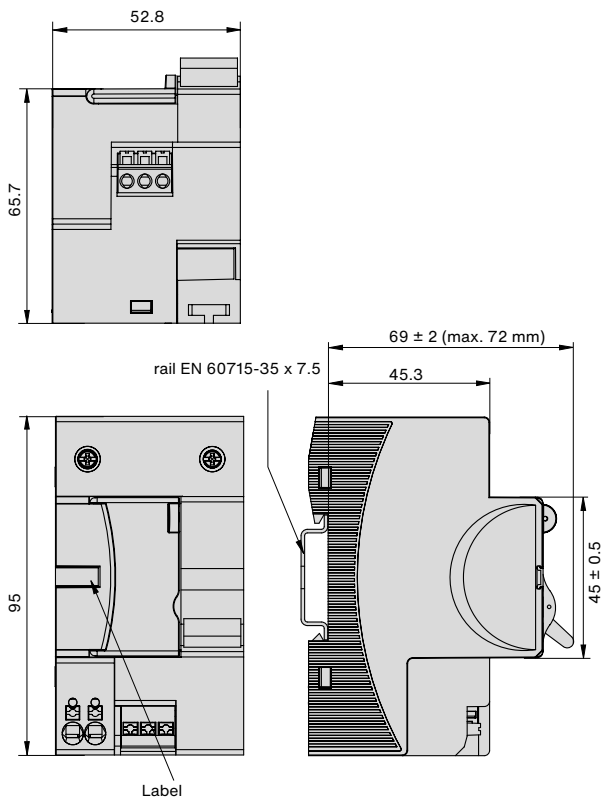
Max. operating currents depending on ambient temperature

Rated current I_N (A)	Max. operating currents depending on ambient temperature T (A)									
	-35 °C	-30 °C	-25 °C	-20 °C	-15 °C	-10 °C	-5 °C	0 °C	+5 °C	+10 °C
4	5.08	5.00	4.92	4.84	4.76	4.68	4.60	4.52	4.40	4.32
6	7.70	7.58	7.46	7.34	7.21	7.09	6.96	6.83	6.70	6.56
10	13.89	13.62	13.35	13.07	12.81	12.53	12.23	11.93	11.63	11.33
16	20.78	20.43	20.08	19.75	19.40	19.05	18.70	18.33	17.96	17.58

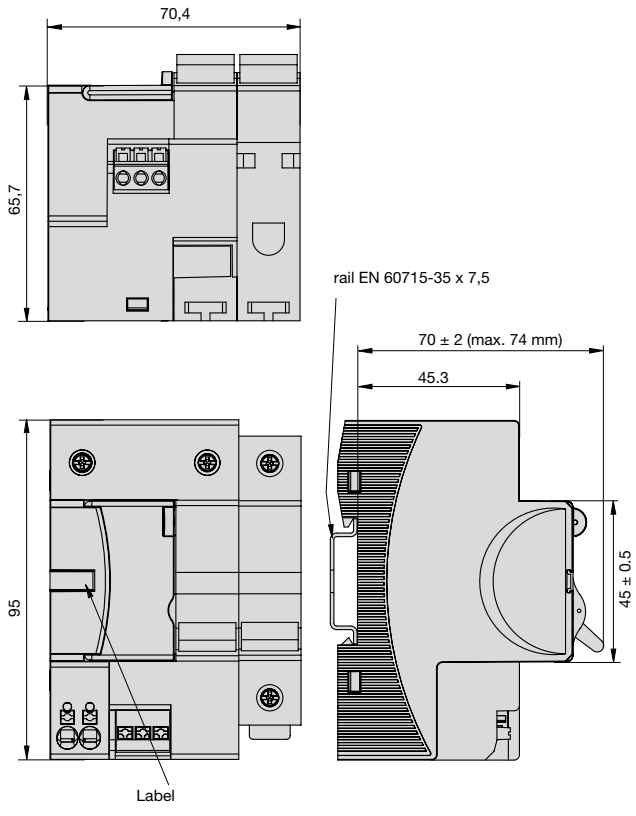
Rated current I_N (A)	Max. operating currents depending on ambient temperature T (A)									
	+15 °C	+20 °C	+25 °C	+30 °C	+35 °C	+40 °C	+45 °C	+50 °C	+55 °C	+60 °C
4	4.24	4.20	4.08	4.00	3.88	3.76	3.64	3.56	3.44	3.32
6	6.42	6.27	6.14	6.00	5.84	5.68	5.52	5.36	5.19	5.01
10	11.01	10.67	10.34	10.00	9.63	9.24	8.85	8.45	8.01	7.55
16	17.20	16.80	16.40	16.00	15.55	15.11	14.66	14.20	13.71	13.21

Dimensions

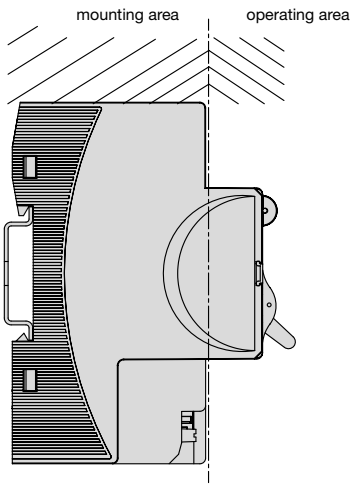
EBU10-T 1 pole



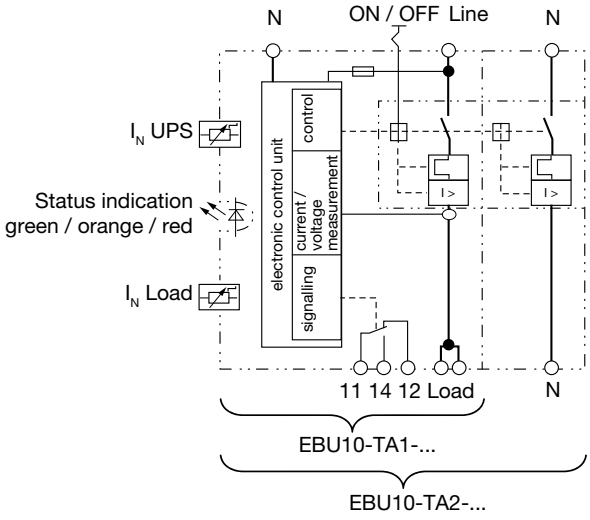
EBU10-T 2 pole



Installation drawing

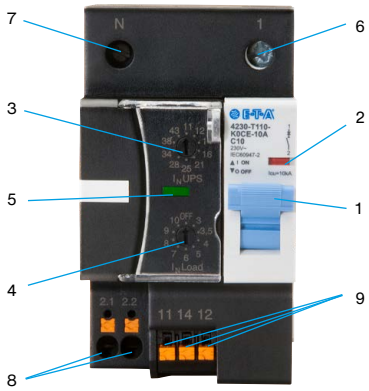


Schematic diagram



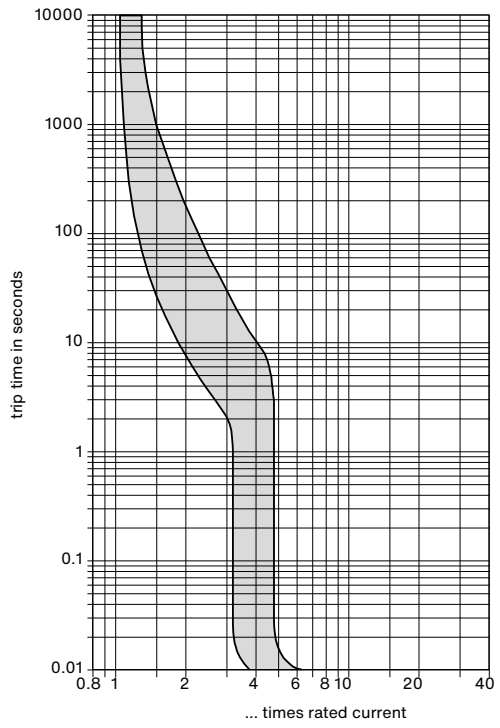
Connection and operating elements

1	Toggle MCB	
2	Status indication MCB	
3	Adjustment of operating range UPS	(I_N UPS in [A])
4	Adjustment of trip range load	(I_N load in [A])
5	LED status indication status indication EBU10-T	
6	Screw terminal line	(1)
7	Screw terminal neutral conductor	(N)
8	Push-in terminal load	(2.1/2.2)
9	Push-in terminal signalling (change over contact)	(11/12/14)



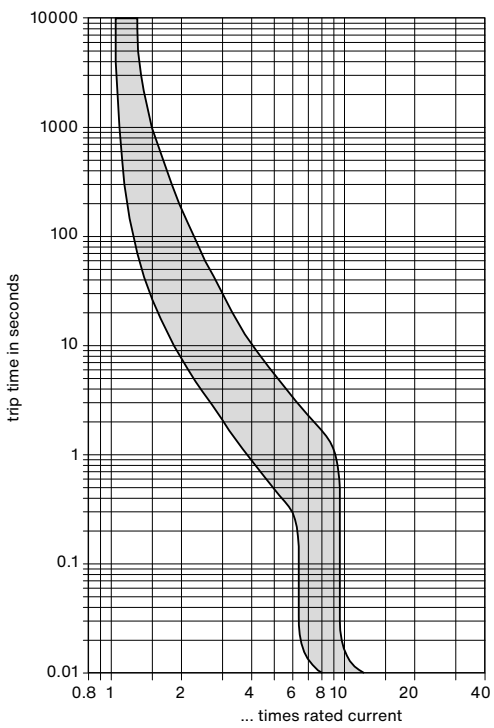
Time/current characteristics

Curve B



Ambient temperature 30 °C

Curve C



Ambient temperature 30 °C

Electronic trip curve:

	thermal	magnetic	electronically variable
Type B	1.05 ... 1.30 × I_N	3.2 ... 4.8 × I_N	I (t > 100 s) = 1.05 x I_N, load
			I (t > 10 s) = 1.6 x I_N, load
			I (t > 1 s) = 2.7 x I_N, load
			I (t < 20 ms) = 1.5 x I_N, UPS
Type C	1.05 ... 1.30 × I_N	6.4 ... 9.6 × I_N	I (t > 300 s) = 1.05 x I_N, load
			I (t > 30 s) = 1.3 x I_N, load
			I (t > 3 s) = 2.3 x I_N, load
			I (t > 0.3 s) = 5.2 x I_N, load
			I (t < 20 ms) = 1.5 x I_N, UPS

Tolerance of electronic trip curve (at 23 °C)

	t > 100 s	t < 20 ms
Type B	I (t > 1.05 s) = 1.17 x I_N, load	1.33...1.5 I_N,UPS
	t > 300 s	**t < 20 ms**
Type C	I (t > 1.05 s) = 1.17 x I_N, load	1.31...1.5 I_N,UPS

Tolerance of the electronic characteristic curve (in the range of -35 ... +60 °C):

	t > 100 s	t < 20 ms
Type B	I (t > 1.04 s) = 1.18 x I_N, load	1.30...1.53 I_N,UPS
	t > 300 s	**t < 20 ms**
Type C	I (t > 1.04 s) = 1.18 x I_N, load	1.26...1.55 I_N,UPS

Adjustment of electronic time-current characteristics (example)

1. step EBU10-T selection:
Uninterrupted
power supply/UPS
I_{RATED} = 12 A

Selection of trip characteristic and current rating:
Characteristic curve: C ⇒ Cut-in current SNT
Rated current: 10 A ⇒ cable protection for cable cross section 1.5 mm²

EBU10-TA1-003-AC230V-C-10A

UPS
current
rating = 12 A

Load SMPS DC 24 V: I_{RATED} = **3 A**

2. step Adjust EBU10-T setting to the UPS:

EBU10-T ⇒ I_N UPS:
Adjusted to 12 A
⇒ I_{RATED} UPS = 12 A

3. step Adjust EBU10-T setting to the load:

EBU10-T ⇒ I_N Load:
Adjusted to 3 A
⇒ rated current load = 3 A

Setting options:
I_N, UPS: Single phase rated current of the UPS unit at cont. load
I_N, load: Rated current of the connected load

Recommendation:
I_N, UPS: smaller or equal to the determined value
I_N, load: higher or equal to the determined value

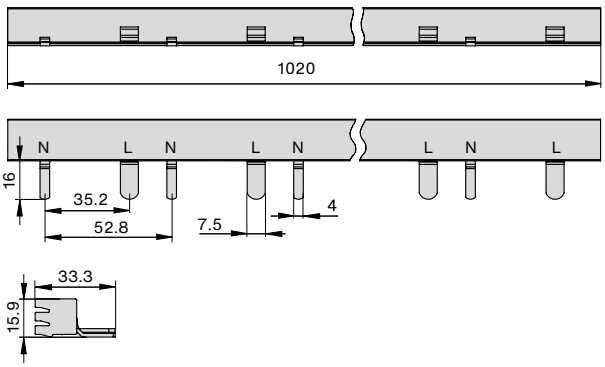
Setting parameters:

B6		B10		B16		C4		C6		C10		C16	
I_N, UPS	I_N, load:	I_N, UPS	I_N, load:	I_N, UPS	I_N, load:	I_N, UPS	I_N, load:	I_N, UPS	I_N, load:	I_N, UPS	I_N, load:	I_N, UPS	I_N, load:
7	OFF	11	OFF	17	OFF	4.3	OFF	7	OFF	11	OFF	17	OFF
7.5	2	12	3	19	4	5.5	1.3	8	2	12	3	21	4
8	2.5	13	3.5	21	5	6.5	1.6	9	2.5	14	3.5	25	5
8.5	3	14	4	23	6	7	2.0	11	3	16	4	28	6
9	3.5	15	5	25	7	8.5	2.3	12	3.5	21	5	34	7
9.5	4	16	6	28	8	10	2.6	14	4	25	6	38	8
10	4.5	17	7	29	10	11	3.0	16	4.5	28	7	43	10
11	5	19	8	31	12	13	3.3	18	5	34	8	57	12
12	5.5	21	9	34	14	14.5	3.6	21	5.5	38	9	64	14
13	6	22	10	35	16	17	4.0	25	6	43	10	68	16

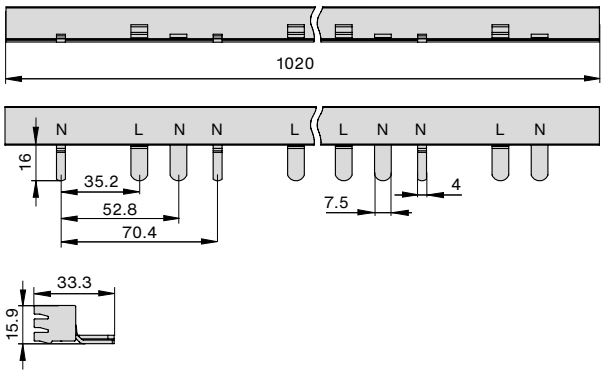
In OFF condition the electronic trip curve only comes into effect in the short-circuit range.

Accessories

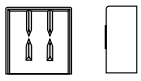
Busbar
EBU10-Tx1 16 mm² 80 A/250 V AC (1-pole devices)
Y 312 284 01



Busbar
EBU10-Tx2 16 mm² 80 A/250 V AC (2-pole devices)
Y 312 285 01

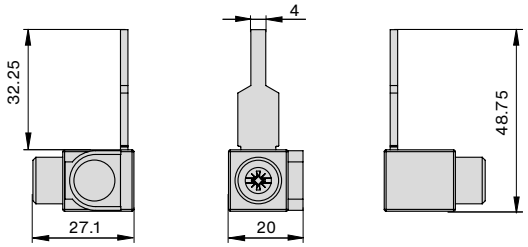


End cap for busbars, 2-/3-pole
Y 308 506 01

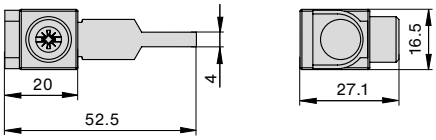


Label, packing unit 50 pcs
X 222 977 50

Screw terminal
6 – 50 mm² connection from the side, 32 x 4 mm
Y 312 288 01



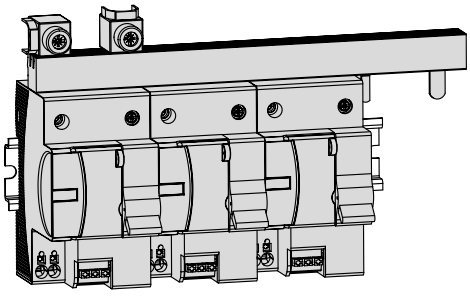
Screw terminal
6 – 50 mm² connection from above, 32 x 4 mm
Y 312 289 01



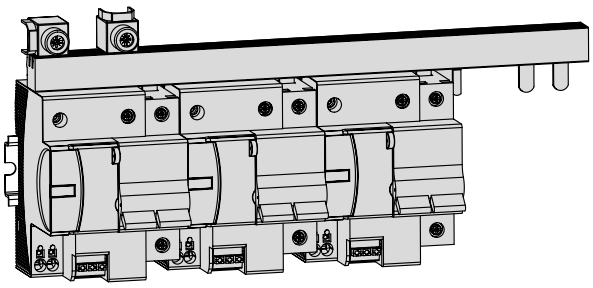
Wire stripping length: 14 mm
Tightening torque
6...10 mm²: 1 Nm, 10....16 mm²: 1.5 Nm,
16...25 mm²: 2 Nm, 25...50 mm²: 3.5 Nm

Mounting examples

Mounting examples (1-pole; end caps not shown)



Mounting examples (2-pole; end caps not shown)



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