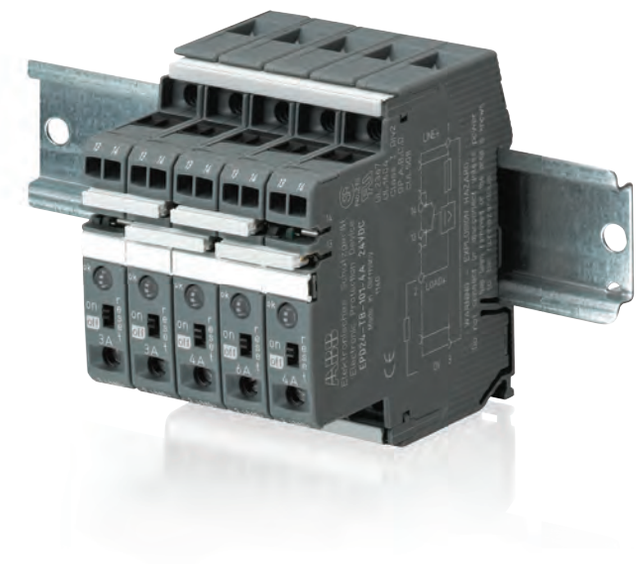
Electronic Protection Device EPD24-TB-101 for use on the load side of 24 V DC switch mode power supplies
Technical Information





The protection devices EPD24 extend the ABB product range of Modular DIN Rail Components by electronic overcurrent protection modules for selective protection of 24 V DC load circuits. This protection is achieved by a combination of active electronic current limitation in the case of a short circuit and an overload deactivation from 1.1 x I_N upwards.

If a fault occurs in a load circuit, the protection device EPD24 will detect this rapidly and reliably, disable the power output transistor and hence interrupt the current flow in the defective circuit. The maximum possible overcurrent is always limited to 1.3…1.8 times the selected rated current. An activation of capacitive loads up to 20,000 µF is possible, deactivation only occurring in the case of overloads or short circuits. Selective deactivation of the defective current circuit means undefined error states and a complete system stop are prevented.

Features

- Selective load protection, one electronic tripping characteristic
- 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
- Manual ON/OFF button
- Clear status and failure indication through LED and integrated auxiliary contact
- Integral fail-safe element adjusted to current rating
- Width per unit only 12.5 mm
- Rail mounting
- Easy wiring through busbar LINE+ and 0 V as well as signal bars
- UL- and CSA-approvals allow international use of the devices

Approvals

Authority	Voltage rating	Current ratings
UL 2367	24 V DC	0.5...12 A
UL 1604 (class I, div. 2, groups A, B, C, D)	24 V DC	0.5...12 A
UL 508	24 V DC	0.5...12 A
CSA C22.2 No. 213 (class I, division 2)	24 V DC	0.5...12 A
CSA C22.2 No. 142	24 V DC	0.5...12 A
CSA C22.2 No. 14	24 V DC	0.5...12 A

Technical data
Ambient temperature 25 °C, Operating voltage 24 V DC

Operating data

Operating voltage U_B	24 V DC (18...32 V DC)
Current rating I_N	fixed current ratings:
	0.5, 1, 2, 3, 4, 6, 8, 10, 12 A
Closed current I_0	ON condition: typically 20...30 mA
	depending on signal output
Staus indication	– multicolour LED:
by means of	Green: – unit is ON
	– load circuit / Power-MOSFET is switched on
	Orange: – in the event of overload or short circuit until electronic disconnection
	Red: – unit electronically disconnected
	– load circuit/Power-MOSFET OFF
	– undervoltage (U_B < 8 V)
	– after switch-on till the end of the delay period
	OFF: – manually switched off
	or device is dead
	– potential-free auxiliary contact
	– ON/OFF condition of switch

Load circuit

Load output	Power-MOSFET switching output
	(high slide 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	see time/current characteristics
For electronic	typically 3 s at I_{load} > 1.1 x I_N
disconnection	typically 100 ms...3 s 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	with hysteresis, no reset required:
load output	load »OFF« at U_S< 8 V
Starting delay t_{Start}	typically 0.5 sec
	after every switch-on and
	after applying U_B
Disconnection of	electronic disconnection upon overload/
load circuit	short-circuit
Free-wheeling circuit	suitable external free-wheeling circuit to be
	used with inductive load
Several load outputs must not be connected in parallel	

Signal output

Electrical data	potential-free auxiliary contact
	max. 30 V DC/0.5 A, min. 10 V DC/10 mA
ON condition LED green	voltage U_B applied, switch is in ON position
	and no overload, no short circuit
OFF condition LED off	– device switched off
	(switch is in OFF position)
	– no voltage U_B 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 is ON)
Auxiliary contact	single signal, make contact
	contact open, terminal 13-14
Fault	signal output fault conditions
	– no operating voltage U_B
	– ON/OFF switch is in OFF position
	– red LED lighted (electronic disconnection)

Table 1

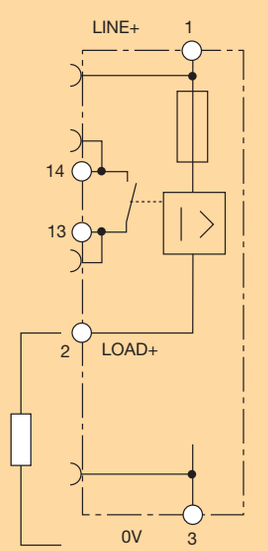
Voltage drop, current limitation, max. load current

Current rating I_N	Typically voltage drop U_{ON} at I_N	Active current limitation (typically)	Max. load current at T_{amb} = 40 °C	100 % ON duty T_{amb} = 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 EPD24 should not carry more than 80 % of its rated load with 100 % ON duty due to thermal effects.

Wiring diagramm

EPD24-TB-101
Without signal input
With signal output
(Single signal, N/O)



Operating condition:
13-14 closed

Fault condition:
13-14 open

General data	
Fail-Safe element	backup fuse for EPD24 not required
	because of the integral redundant fail-safe
	element
Housing material	moulded
Mounting	symmetrical rail acc. 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 acc. to
	IEC 60068-2-78, test cab.
	climate class 3K3 acc. to EN 60721
Vibration	3 g, test acc. to IEC 60068-2-6 test Fc
Degree of protection	housing: IP20 acc. to EN 60529
	terminals: IP20 acc. to EN 60529
EMC	emission: EN 61000-6-3
(EMC directive, CE logo)	susceptibility: EN 61000-6-2
Isolations coordination	0.5 kV/pollution degree 2
(IEC 60934)	reinforced insulation in operating area
Dielectric strength	max. 32 V DC (load circuit)
Isolation resistance	n/a, only electronic disconnection
(OFF condition)	
Approvals/	UL 2367, File # E 339236,
Declarations of	Solid State Overcurrent Protectors
conformity	UL 1604, File # E 339238 (class I, division 2,
	groups A, B, C, D)
	UL 508, File # E 149922
	CSA C22.2 No. 213 (class I, division 2),
	CSA C22.2 No. 142,
	CSA C22.2 No. 14, File # 2305929
	CE logo
Dimensions (W x H x L)	12.5 x 80 x 83 mm
Weight	approx. 65 g

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 auxiliary 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

Please note

The user must ensure that the cable cross sections of the relevant load circuit are suitable for the current rating of the EPD24 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 ESPD24.

Type code

EPD Electronic Protection Device, with current limitation

Operating voltage

24 operating voltage 24 V DC

Mounting and design

TB rail mounting, with auxiliary contact and slot for signal bars

Version

1 without physical isolation in the event of a failure

Signal input

0 without signal input

Signal output

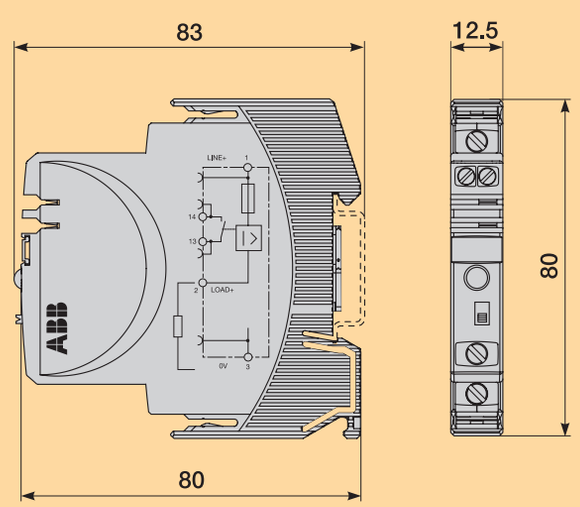
1 auxiliary contact N/O

Current rating

xxA current rating in A

EPD 24 - TB - 1 0 1 xxA

Dimensions

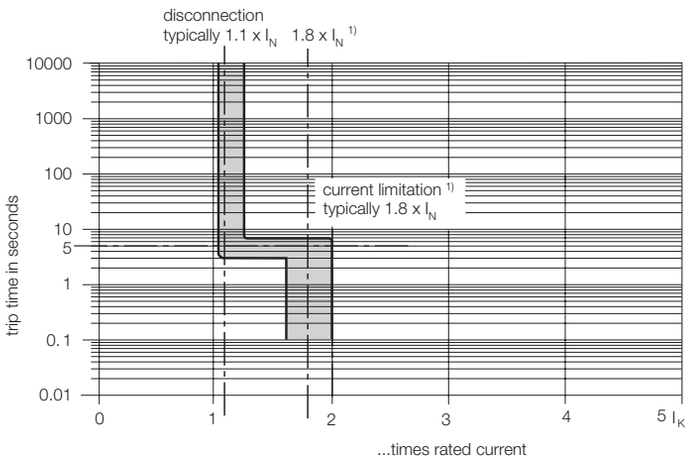


Reliable tripping
Characteristic curve and wire lengths

Time/Current characteristic curve ($T_{ambient}$ = 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 s (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 at I_N = 0.5 A...6 A
Current limitation typically 1.5 x I_N at I_N = 8 A or 10 A
Current limitation typically 1.3 x I_N at I_N = 12 A



Maximum cable lengths

EPD24 reliably trips from 0 Ω to max. circuitry resistance R_{max}.

Calculation of R_{max}

Selected current rating I_N (A)	**3**	**6**
Operating voltage U_S (V DC) [2] (= 80 % of 24 V)	19.2	19.2
Trip current I_{off} = 1,25 x I_N (A) (EPD24 trips after 3 s)	3.75	7.50
R_{max} = (U_S/I_{off}) -0.050 (Ω)	**5.07**	**2.51**

[2] Voltage drop of EPD24 and tolerance of trip point (typically 1.1 x I_N = 1.05 ... 1.35 x I_N) have been taken into account

Selection table for the incoming cable lengths with different cable cross sections

Cable cross section A (mm²)	0.14	0.25	0.34	0.5	0.75	1.00	1.50
Cable length L (m) (= single length)	overall cable resistance R_L (Ω) [3]						
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

[3] R_L = (ρ_0 x 2 x L) / A (Ω), resistivity of copper ρ_0 = 0,0178 (Ω mm²)/m

Example 1: max. length for 1.5 mm² and 3 A: **214 m**
Example 2: max. length for 1.5 mm² and 6 A: **106 m**
Example 3: mixed wiring (control cabinet --- sensor/actuator level)
R1 = 40 m for 1.5 mm² und R2 = 5 m for 0.25 mm²:
R1 = 0.95 Ω, R2 = 0.71 Ω, **total (R1 + R2) = 1.66 Ω**

Installation and safety instructions
UL approvals/CSA approvals

UL1604
UL File # E 339238

CSA C22.2 No. 213 (Class I, Division 2)
CSA File # 2305929

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

This device is OPEN type equipment that must be used within a suitable end-use system enclosure

UL2367
Non-hazardous use - UL File # E 339236

UL 508
Non-hazardous use - UL File # E 149922

CSA C22.2 No. 14
CSA C22.2 No. 142 - CSA File # 2305929

Instruction leaflet

Electronic Protection Device
EPD24-T

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UL1604 - File # E 339238 C22.2 No.213 - File # 2305929
This device is suitable for use in Class I, Div 2, Groups A, B, C, D; TC T5; Hazardous locations or nonhazardous locations only

Warnings:
1. Remove power before disconnecting device or the area is known to be nonhazardous
2. Components substitutions may impair suitability of Class I, Div 2.
3. Chemical exposure may degrade internal relay's sealing property.

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

UL2367 - File # E 339236
Non-hazardous use

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

UL508 - File # E 149922
Non-hazardous use

C22.2 No.14 - File # 2305929
Non-hazardous use

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

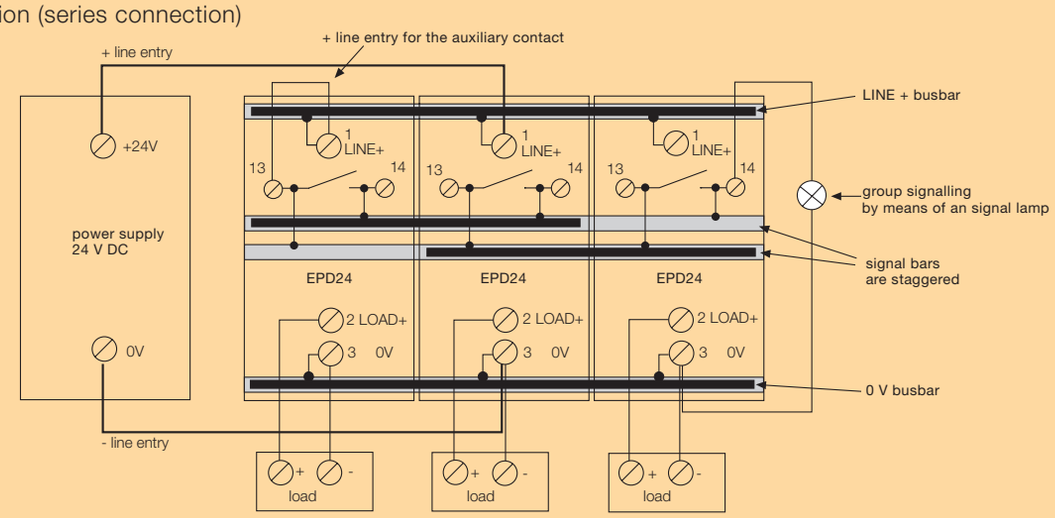
Power distribution system and accessory assembling

The EPD24 features an integral power distribution system. The following wiring modes are possible with the pluggable busbars and signal bars:

- LINE+ (24 V DC)
- 0 V
  Caution: The EPD24 require a 0 V connection
- Auxiliary contacts

Connection diagram and application example [1)]

Group signalisation (series connection)



[1)] Auxiliary contacts are shown in the OFF or fault condition.

Mounting procedure

Before wiring insert busbars into protector block.
Max. 10 insertion/removal cycles for busbars.

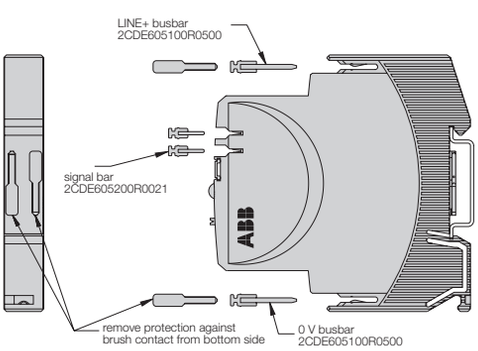
Recommendation

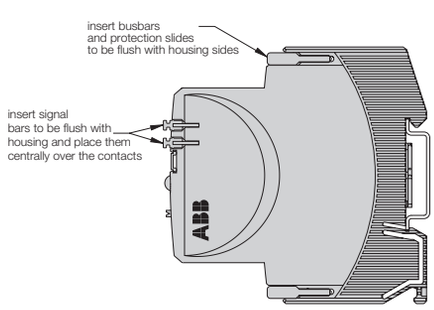
After 10 units the busbars should be interrupted and receive a new entry live.

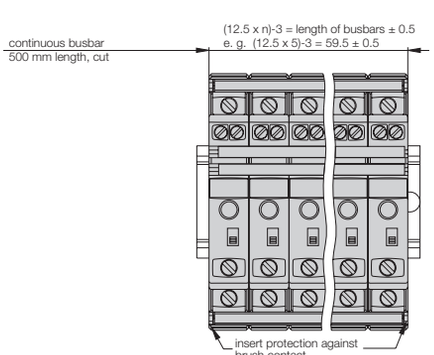
Table of lengths for busbars

(Order code 2CDE605100R0500)

No. of units	2	3	4	5	6	7	8	9	10
Length of busbar (mm) ± 0.5 mm	22	34.5	47	59.5	72	84.5	97	109.5	122







Order details

Electronic protection devices

Rated current I_N A	Type code	Order code	bbn 40 16779 EAN	Weight 1 piece in kg	Packing-unit
0.5	EPD24-TB-101-0.5A	2CDE601101R2905	829960	0.065	4
1	EPD24-TB-101-1A	2CDE601101R2001	829984	0.065	4
2	EPD24-TB-101-2A	2CDE601101R2002	830003	0.065	4
3	EPD24-TB-101-3A	2CDE601101R2003	830027	0.065	4
4	EPD24-TB-101-4A	2CDE601101R2004	830041	0.065	4
6	EPD24-TB-101-6A	2CDE601101R2006	830065	0.065	4
8	EPD24-TB-101-8A	2CDE601101R2008	830089	0.065	4
10	EPD24-TB-101-10A	2CDE601101R2010	830102	0.065	4
12	EPD24-TB-101-12A	2CDE601101R2012	830126	0.065	4

Accessories

	Type code	Order code	bbn 40 16779 EAN	Weight 1 piece in kg	Packing unit
Busbars for LINE+ and 0 V, grey insulation, length 500 mm[1)]	EPD-BB500	2CDE605100R0500	830140	0.20	10
Signal bars for auxiliary contacts, grey insulation, length 21 mm	EPD-SB21	2CDE605200R0021	830164	0.04	10

[1)] Ampacity at one line entry I_{max} = 50 A (Recommendation: mid line entry)
Ampacity at two line entries I_{max} = 63 A

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Order number 2CDC444002D0201 printed in Germany (02/11-4-ZVD)

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