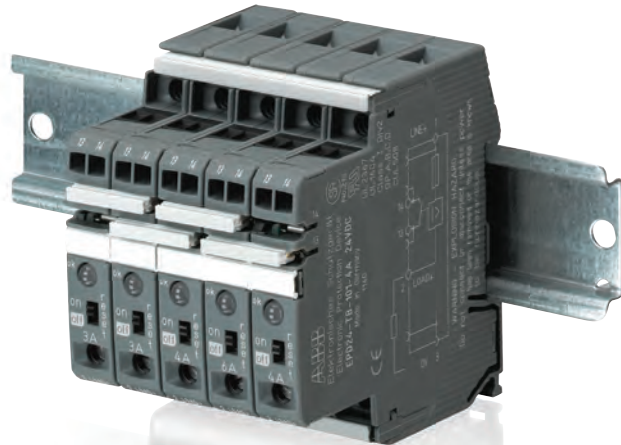


Electronic Protection Device EPD24-TB-101 for use on the load side of 24 V DC switch mode power supplies Technical Information



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 $1.1 \times I_N$ 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 $1.1 \times I_N$ 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_o	ON condition: typically 20...30 mA depending on signal output
Status indication by means of	<ul style="list-style-type: none"> – multicolour LED: Green: <ul style="list-style-type: none"> – unit is ON – load circuit / Power-MOSFET is switched on Orange: <ul style="list-style-type: none"> – in the event of overload or short circuit until electronic disconnection Red: <ul style="list-style-type: none"> – unit electronically disconnected – load circuit/Power-MOSFET OFF – undervoltage ($U_B < 8$ V) – after switch-on till the end of the delay period OFF: <ul style="list-style-type: none"> – 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 side switch)
Overload disconnection	typically $1.1 \times I_N$ ($1.05...1.35 \times I_N$)
Short-circuit current I_K	active current limitation (see table 1)
Trip time	see time/current characteristics
For electronic disconnection	typically 3 s at $I_{load} > 1.1 \times I_N$ typically 100 ms...3 s at $I_{load} > 1.8 \times I_N$ (or $1.5 \times I_N / 1.3 \times I_N$)
Temperature disconnection	internal temperature monitoring with electronic disconnection
Low voltage monitoring load output	with hysteresis, no reset required: load »OFF« at $U_B < 8$ V
Starting delay t_{Start}	typically 0.5 sec after every switch-on and after applying U_B
Disconnection of load circuit	electronic disconnection upon overload/ 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 $> 1.1 \times I_N$ 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

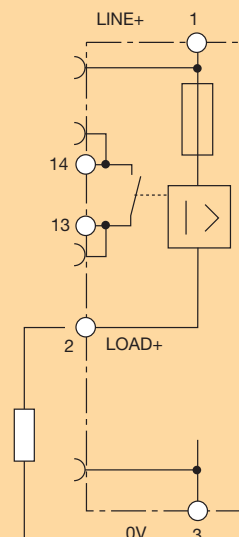
Current rating I_N	Typically voltage drop U_{ON} at I_N	Active current limitation (typically)	Max. load current at $T_{amb} = 40$ °C	100 % ON duty $T_{amb} = 50$ °C
0.5 A	70 mV	$1.8 \times I_N$	0.5 A	0.5 A
1 A	80 mV	$1.8 \times I_N$	1 A	1 A
2 A	130 mV	$1.8 \times I_N$	2 A	2 A
3 A	80 mV	$1.8 \times I_N$	3 A	3 A
4 A	100 mV	$1.8 \times I_N$	4 A	4 A
6 A	130 mV	$1.8 \times I_N$	6 A	5 A
8 A	120 mV	$1.5 \times I_N$	8 A	7 A
10 A	150 mV	$1.5 \times I_N$	10 A	9 A
12 A	180 mV	$1.3 \times I_N$	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 (IEC 60934)	0.5 kV/pollution degree 2 reinforced insulation in operating area
Dielectric strength	max. 32 V DC (load circuit)
Isolation resistance (OFF condition)	n/a, only electronic disconnection
Approvals/Declarations of conformity	UL 2367, File # E 339236, Solid State Overcurrent Protectors 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 mm ²
Multi-lead connection (2 identical cables)	
rigid/flexible	0.5 ... 4 mm ²
Flexible with wire end ferrule without plastic sleeve	0.5 ... 2.5 mm ²
Flexible with TWIN wire end ferrule with plastic sleeve	0.5 ... 6 mm ²
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 mm ²
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.

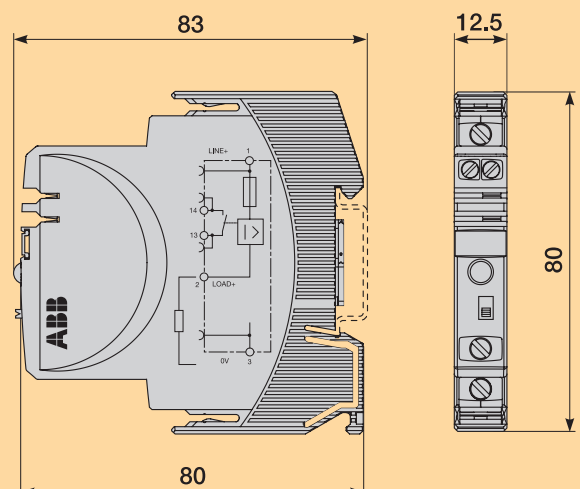
Type code

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



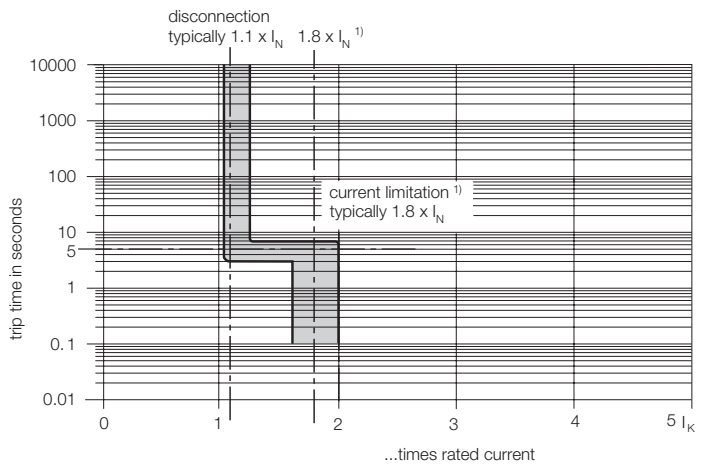
Reliable tripping

Characteristic curve and wire lengths

Time/Current characteristic curve ($T_{\text{ambient}} = 25\text{ °C}$)

- The trip time is typically 3 s in the range between $1.1 \times I_N$ and $1.8 \times I_N$ ¹⁾.
- Electronic current limitation occurs at typically $1.8 \times I_N$ 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 $1.8 \times I_N$ 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 $1.8 \times I_N$ at $I_N = 0.5\text{ A} \dots 6\text{ A}$
 Current limitation typically $1.5 \times I_N$ at $I_N = 8\text{ A}$ or 10 A
 Current limitation typically $1.3 \times I_N$ at $I_N = 12\text{ A}$



Maximum cable lengths

EPD24 reliably trips from $0\ \Omega$ 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 $I_{\text{off}} = 1.25 \times I_N$ (A) (EPD24 trips after 3 s)	3.75	7.50
$R_{\text{max}} = (U_S / I_{\text{off}}) - 0.050$ (Ω)	5.07	2.51

²⁾ Voltage drop of EPD24 and tolerance of trip point (typically $1.1 \times I_N = 1.05 \dots 1.35 \times I_N$) have been taken into account

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

Cable cross section A (mm ²)	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⁾ $R_L = (\rho_0 \times 2 \times L) / A$ (Ω), resistivity of copper $\rho_0 = 0.0178$ ($\Omega\text{ mm}^2/\text{m}$)

Example 1: max. length for 1.5 mm^2 and 3 A: **214 m**

Example 2: max. length for 1.5 mm^2 and 6 A: **106 m**


Example 3: mixed wiring (control cabinet --- sensor/actuator level)


$R1 = 40\text{ m}$ for 1.5 mm^2 und $R2 = 5\text{ m}$ for 0.25 mm^2 :

$R1 = 0.95\ \Omega$, $R2 = 0.71\ \Omega$, **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

ABB

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 guidelines 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  C22.2 No.14 - File # 2305929

Non-hazardous use

Non-hazardous use

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

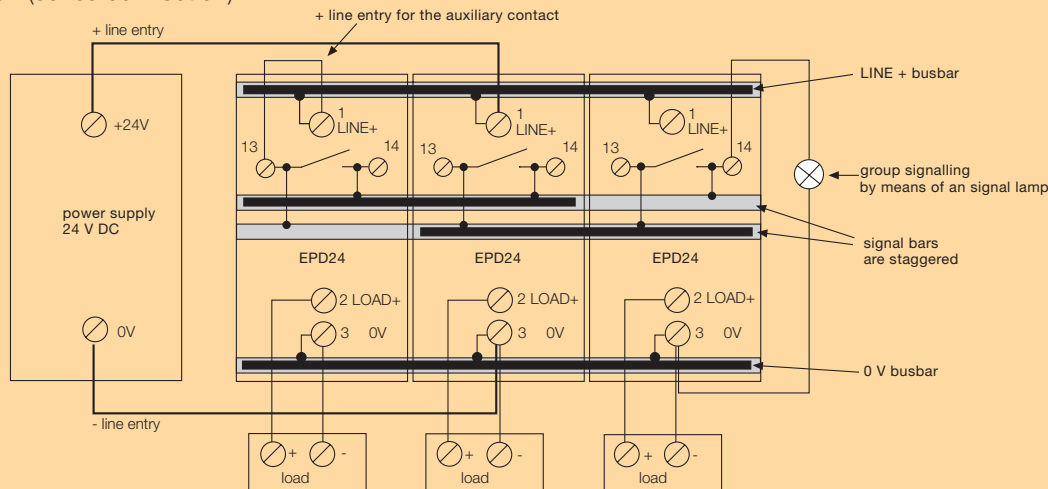
Power distribution system and accessory assembling

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.

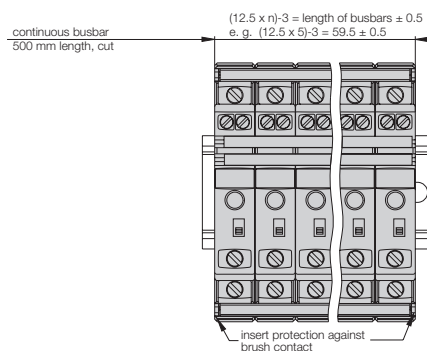
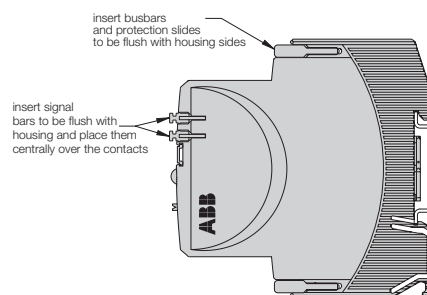
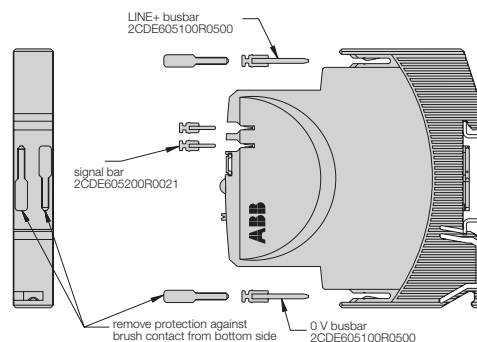
Recommendation

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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