

**NEW**

## Electronic Protection Devices for use behind 24 V DC Switch Mode Power Supplies

**EPD24-TB-101**

The protection devices EPD24 extend the ABB product range of modular DIN rail components by electronic overcurrent protection modules for selective protection of 24V 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 1.5...1.8 times the selected rated current. An activation of capacitive loads up to 20,000  $\mu$ F 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 trip characteristics.
- Active current limitation for safe connection of capacitive loads up to 20,000  $\mu$ F and on overload/short circuit.
- Current ratings 0.5 A...12 A.
- Reliable overload disconnection with  $1.1 \times I_N$
- Manual ON/OFF button
- Clear status and failure indication through LED and auxiliary contact.
- Integral fail-safe element adjusted to current rating.
- Width per unit only 12.5 mm.
- Rail mounting
- Ease of wiring through busbar LINE+ and 0 V as well as signal bars.
- UL- and CSA-approvals allow international use of the devices.

### Selection table

Rated current $I_n$ in A	Order details Type code	Order code	bbn 40 16779 EAN	Price 1 piece	Price group	Weight 1 piece kg	Pack unit pc.
0.5	EPD24-TB-101-0.5A	2CDE 601 101 R2905	829960			0.065	4
1	EPD24-TB-101-1A	2CDE 601 101 R2001	829984			0.065	4
2	EPD24-TB-101-2A	2CDE 601 101 R2002	830003			0.065	4
3	EPD24-TB-101-3A	2CDE 601 101 R2003	830027			0.065	4
4	EPD24-TB-101-4A	2CDE 601 101 R2004	830041			0.065	4
6	EPD24-TB-101-6A	2CDE 601 101 R2006	830065			0.065	4
8	EPD24-TB-101-8A	2CDE 601 101 R2008	830089			0.065	4
10	EPD24-TB-101-10A	2CDE 601 101 R2010	830102			0.065	4
12	EPD24-TB-101-12A	2CDE 601 101 R2012	830126			0.065	4

### Selection table accessories

	Order details Type code	Order code	bbn 40 16779 EAN	Price 1 piece	Price group	Weight 1 piece kg	Pack unit pc.
Busbars for LINE+ and 0 V, grey insulation, length 500 mm <sup>1)</sup>	EPD-BB500	2CDE 605 100 R0500	830140			0.20	10
Signal Bars for aux. contacts, grey insulation, length 21 mm	EPD-SB21	2CDE 605 200 R0021	830164			0.04	10

1) Max. load with one line entry  $I_{max} = 50$  A (recommended: center-feeding)  
Max. load with two line entries  $I_{max} = 63$  A

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# Electronic Protection Devices EPD24-TB-101

## Technical data ( $T_{amb.} = 25\text{ }^{\circ}\text{C}$ , $U_B = 24\text{ V DC}$ )

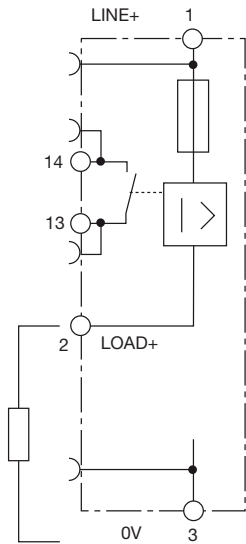
for use behind 24 V DC Switch Mode Power Supplies

### Wiring diagramm

#### EPD24-TB-101

without signal input  
with signal output F  
(single signal, NO)

Operating condition: 13-14 closed  
Fault condition: 13-14 open



Operating data	
<b>Operating voltage <math>U_B</math>:</b>	24 V DC (18...32 V)
<b>Current rating <math>I_N</math>:</b>	fixed current ratings: 0.5, 1, 2, 3, 4, 6, 8, 10, 12 A
<b>Closed current <math>I_0</math>:</b>	ON condition: typically 20...30 mA depending on signal output
<b>Status indication by means of:</b>	<ul style="list-style-type: none"> <li>- multicolour LED:</li> <li>Green:               <ul style="list-style-type: none"> <li>- unit is ON (S1 = ON)</li> <li>- load circuit / Power-MOSFET is switched on</li> </ul> </li> <li>Orange:               <ul style="list-style-type: none"> <li>- in the event of overload or short circuit until electronic disconnection</li> </ul> </li> <li>Red:               <ul style="list-style-type: none"> <li>- unit electronically disconnected</li> <li>- load circuit/Power-MOSFET OFF</li> <li>- undervoltage (<math>U_B &lt; 8\text{ V}</math>)</li> <li>- after switch-on till the end of the delay period</li> </ul> </li> <li>OFF:               <ul style="list-style-type: none"> <li>- manually switched off (S1 = OFF) or device is dead</li> </ul> </li> </ul> <ul style="list-style-type: none"> <li>- potential-free auxiliary contact F</li> <li>- ON/OFF/ condition of switch S1</li> </ul>
Load circuit	
<b>Load output</b>	Power-MOSFET switching output (high side switch)
<b>Overload disconnection</b>	typically $1.1 \times I_N$ ( $1.05...1.35 \times I_N$ )
<b>Short-circuit current <math>I_k</math></b>	active current limitation (see table 1)
<b>Trip time</b>	see time/current characteristics
<b>For electronic disconnection</b>	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 $1.5 \times I_N/1.3 \times I_N$ )
<b>Temperature disconnection</b>	internal temperature monitoring with electronic disconnection
<b>Low voltage monitoring load output</b>	with hysteresis, no reset required: load »OFF« at $U_B < 8\text{ V}$
<b>Starting delay <math>t_{start}</math></b>	typically 0.5 sec after every switch-on and after applying $U_B$
<b>Disconnection of load circuit</b>	electronic disconnection
<b>Free-wheeling circuit</b>	suitable external free-wheeling circuit to be used with inductive load
Several load outputs must not be connected in parallel	
Signal output	
<b>Electrical data</b>	potential-free auxiliary contact max. 30 V DC/0.5 A, min. 10 V DC/10 mA
<b>ON condition LED green</b>	voltage $U_B$ applied, switch S1 is in ON position no overload, no short circuit
<b>OFF condition LED off</b>	- device switched off (switch S1 is in OFF position) - no voltage $U_B$ applied
<b>Fault condition LED orange</b>	overload condition $> 1.1 \times I_N$ up to electronic disconnection
<b>Fault condition LED red</b>	- electronic disconnection upon overload or short circuit - Device switched off with control signal (switch S1 is in ON position)
<b>Aux. contact</b>	single signal, make contact contact open, terminal 13-14
<b>Fault</b>	signal output fault conditions - no operating voltage $U_B$ - ON/OFF switch S1 is in OFF position - red LED lighted (electronic disconnection)

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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 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 to IEC 60068-2-78, test Cab. climate class 3K3 to EN 60721
Vibration	3 g, test to IEC 60068-2-6 test Fc
Degree of protection	housing: IP20 DIN 40050 terminals: IP20 DIN 40050
EMC (EMC directive, CE logo)	emission: EN 61000-6-3 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 Solid State Overcurrent Protectors UL 1604, (class I, division 2, groups A, B, C, D) UL 508 CSA C22.2 No. 213 (class I, division 2) CSA C22.2 No. 142 CE logo
Dimensions (B x H x T)	12.5 x 80 x 83 mm
Weight	approx. 65 g
Terminals	<b>Line+/LOAD+/0V</b>
Screw terminals	M4
Max. cable cross section flexible with wire end ferrule w/wo plastic sleeve	0.5 – 10 mm <sup>2</sup>
Multi-lead connection (2 identical cables) rigid/flexible	0.5 – 4 mm <sup>2</sup>
Flexible with wire end ferrule without plastic sleeve	0.5 – 2.5 mm <sup>2</sup>
Flexible with TWIN wire end ferrule with plastic sleeve	0.5 – 6 mm <sup>2</sup>
Wire stripping length	10 mm
Tightening torque (EN 60934)	1.5 – 1.8 Nm
Terminals	<b>aux. contacts</b>
Screw terminals	M3
Max. cable cross section flexible with wire end ferrule w/wo plastic sleeve	0.25 - 2.5 mm <sup>2</sup>
Wire stripping length	8 mm
Tightening torque (EN 60934)	0.5 Nm

**Table 1: voltage drop, current limitation, max. load current**

current rating $I_N$	typically voltage drop $U_{ON}$ at $I_N$	active current max. load current at 100 % ON duty		
		limitation (typically)	$T_{ambient} = 40\text{ °C}$	$T_{ambient} = 40\text{ °C}$
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 ERD24 should not carry more than 80 % of its rated load with 100% ON duty due to thermal effects.

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# Technical details

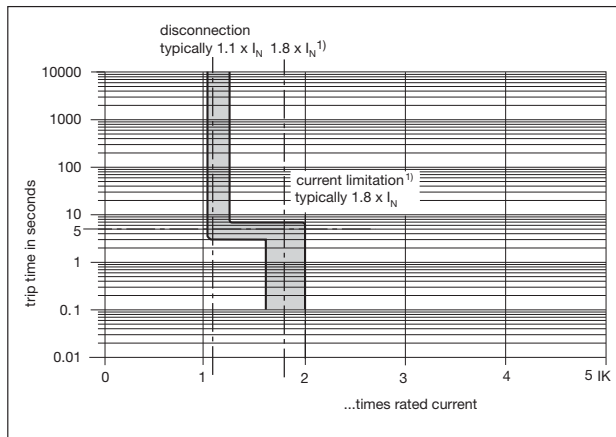
## EPD 24-TB-101

### Tripping curve and max. cable lengths

# Protection devices

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

- The trip time is typically 3 s in the range between  $1.1 \times I_N$  and  $1.8 \times I_N$ .
- Electronic current limitation occurs at typically  $1.8 \times I_N$ <sup>1)</sup> 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 sec (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.



<sup>1)</sup> 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  $10 \text{ A}$   
 Current limitation typically  $1.3 \times I_N$  at  $I_N = 12 \text{ A}$

#### Maximum cable lengths

EPD24 reliably trips from  $0\ \Omega$  up to max. circuit resistance  $R_{max}$ .

#### Calculation of $R_{max}$

Selected rating $I_N$ (A)	3	6
Operating voltage $U_S$ (V DC) (= 80 % of 24 V) <sup>2)</sup>	19.2	19.2
Trip current $I_{ab} = 1.25 \times I_N$ (A) (EPD24 trips after 3 s)	3.75	7.50
<b><math>R_{max} (\Omega) = (U_S / I_{ab}) - 0.050</math></b>	<b>5.07</b>	<b>2.51</b>

<sup>2)</sup> 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 <sup>2</sup> )	0.14	0.25	0.34	0.5	0.75	1.00	1.50
Cable length L (m) (= single length)	<b>cable resistance (<math>\Omega</math>) = <math>(\rho_0 \times 2 \times L) / A</math><sup>3)</sup></b>						
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

<sup>3)</sup> Resistivity of copper  $\rho_0 = 0.0178 (\Omega \times \text{mm}^2) / \text{m}$

**Example 1:** max. length for 1.5 mm<sup>2</sup> and 3 A: **214 m**

**Example 2:** max. length for 1.5 mm<sup>2</sup> and 6 A: **106 m**

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

$R_1 = 40 \text{ m}$  for 1.5 mm<sup>2</sup> and  $R_2 = 5 \text{ m}$  for 0.25 mm<sup>2</sup>:

$R_1 = 0.95 \Omega$ ,  $R_2 = 0.71 \Omega$ , **total ( $R_1 + R_2$ ) = 1.66  $\Omega$**



## Technical details

### EPD 24-TB-101

#### Approvals, safety instructions

## Protection devices

### Please note

The user should 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 EPD24.

### Information on UL approvals/CSA approvals



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



Non-hazardous use



Non-hazardous use



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

CSA C22.2 No. 142

Class 2

Meets requirement for Class 2 current limitation (EPD24 ... -0,5 A/1 A/2 A/3 A)

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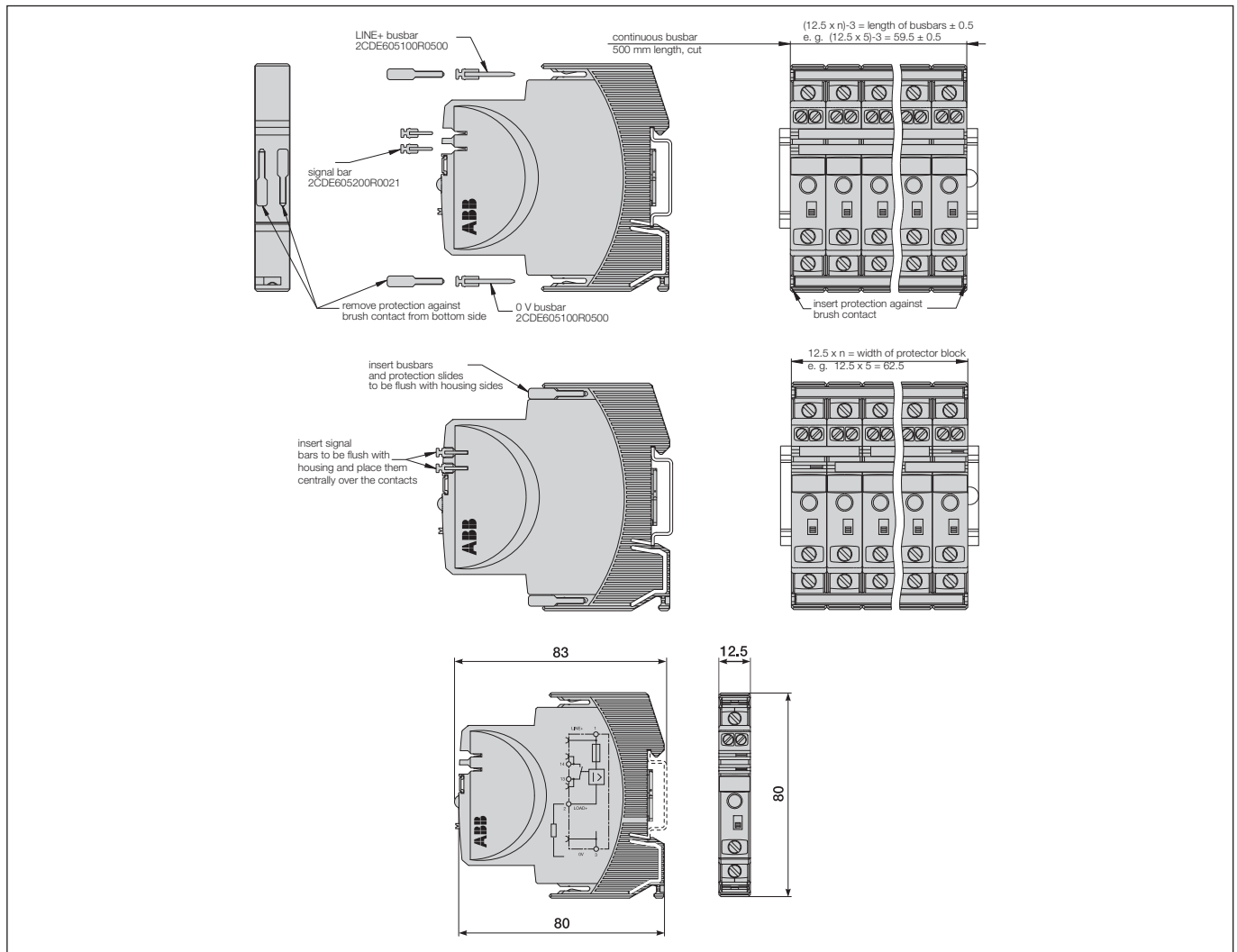
# Technical details EPD 24-TB-101, Installation guidelines

## Protection devices

The EPD24 features an integral power distribution system.

The following wiring modes are possible with various pluggable current and signal busbars:

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



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### Mounting procedure

Before wiring insert busbars into protector block. A maximum of 10 connection cycles are permissible using connecting busbars.

### Recommendation

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

### Table of length 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