

Electronic protection device

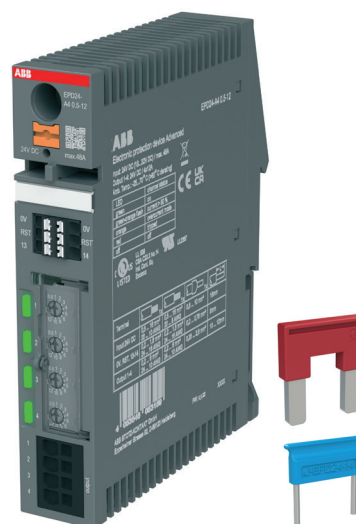
Entry EPD24-E4 1-10

Advanced EPD24-A4 0.5-12

Selective protection of 24 V DC load circuits

Electronic protection devices are used for the reliable protection of standard components in industrial automation applications with 24 V DC. The EPD24 offer selective over-current protection for the loads connected and react to short circuit or overload more rapidly than the supplying switch mode power supply; they then selectively switch off the electrical circuit affected. In this way straightforward, quick troubleshooting is made possible.

The 4-channel devices feature very high efficiency and significantly reduced power loss. With a rated current setting from 0.5 to 12 A, a width of 25 mm, seamless expandability by means of jumpers, front-top wiring and straightforward combination with ABB switch mode power supplies, they ensure a uniform portfolio.



EPD24-A4 0.5-12,
Power jumper for 24 V DC and signal jumper for 0 V, signal and reset

Characteristics

- 4-channel electronic protection device
- 24 V DC supply terminal
- Variable rated currents can be set on **Advanced** from 0.5 A to 12 A or on **Entry** from 1 A to 10 A
- Selective load protection using electronic trip characteristic curve
- **Advanced** with active linear current limiting, total current max. 48 A
- **Entry** with time-controlled tripping, total current max. 40 A
- Integrated fail-safe element matched to the maximum rated current
- Very high efficiency
- No derating up to 60 °C ambient temperature
- Switching on of capacitive loads up to 40,000 µF at 12 A rated current
- ON/OFF/Reset button with multicolor LED status indicator
- Signal output (13, 14) with 1 NO contact for group signaling
- Reset input (RST) for remote resetting of tripped channels
- All connection terminals equipped with push-in terminals
- Several devices can be combined using power jumpers for supply and signal jumpers for 0 V, signal and reset
- **Entry** and **Advanced** devices can be combined using jumpers



UL 508
CSA C22.2 No. 14
Ind. Cont. Eq.
E321314



Ordering details

Electronic protection devices

Order code	Type	Function	Input	Characteristics	Channels	Rated current
2CDE601102R0110	EPD24-E4 1-10	Entry	24 V DC	Time-controlled tripping	4	1–10 A
2CDE601102R0512	EPD24-A4 0.5-12	Advanced	24 V DC	Active current limiting	4	0.5–12 A

Accessories

Order code	Type	Characteristics
2CDE605300R0010	EPD24 jumpers (1 sets)	1 power jumper for 24 V DC and 3 signal jumpers for 0 V, signal and reset
2CDE605300R0050	EPD24 jumpers (5 sets)	5 power jumpers for 24 V DC and 15 signal jumpers for 0 V, signal and reset
2CDE605300R0250	EPD24 jumpers (25 sets)	25 power jumpers for 24 V DC and 75 signal jumpers for 0 V, signal and reset

Description of the device design

Device description

Switch mode power supplies provide a 24 V DC output voltage for supplying electronic protection devices with up to 4 load circuits. The response threshold for the output current can be set individually for each channel output using a latching rotary switch. If the adjustable threshold is exceeded due to a fault, the channel output switches off automatically according to a specified trip characteristic curve. The load circuit can be switched on again directly at the device using the button (ON/OFF/Reset) or by means of remote reset (RST). A multicolor LED indicates the status of the channel output. The state of the output channel can be further processed via a group signal output (13, 14).

Application

Entry EPD24-E4 1-10

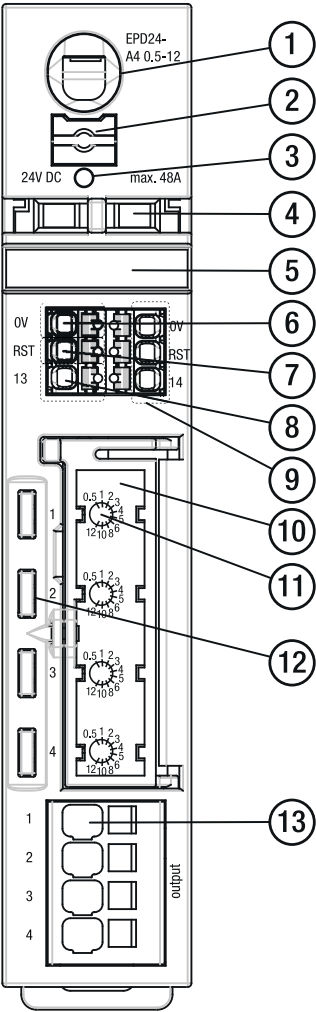
Devices without current limiting such as the Entry EPD24-E4 1-10 selectively protect 24 V DC load circuits from 1 A to max. 10 A and, if there is an overload or short circuit, switch off using a time-controlled trip characteristic curve. The electronic characteristic curve ensures the reliable protection of standard automation components such as sensors/actuators, controllers, bus couplers, etc.

Advanced EPD24-A4 0.5-12





The active linear current limiting in the Advanced EPD24-A4 0.5-12 provides optimal protection for the switch mode power supply, even with a low current reserve. The electronic protection device selectively protects all 24 V DC load circuits in the range from 0.5 A to max. 12 A and limits the output current linearly. Inrush currents for capacitive loads up to 40,000 μ F at 12 A rated current are tolerated, peak currents limited. This electronic characteristic curve with current limiting ensures (just like the Entry) the reliable protection of standard automation components such as sensors/actuators, controllers, bus couplers, etc. In addition, the integrated current limiting makes it possible to protect, among other items, drive technology, control technology for frequency converters, stepper motors, as well as to provide overcurrent protection for mechanical contacts on relays and safety switchgear with a limited current carrying capacity.

A brief dip in the output voltage at the switch mode power supply is also prevented by means of the active current limiting. If there is a fault, the device switches off the circuit with the fault after maximum of 3 s. As such, selective tripping increases machine availability if there is a fault.

Operating elements

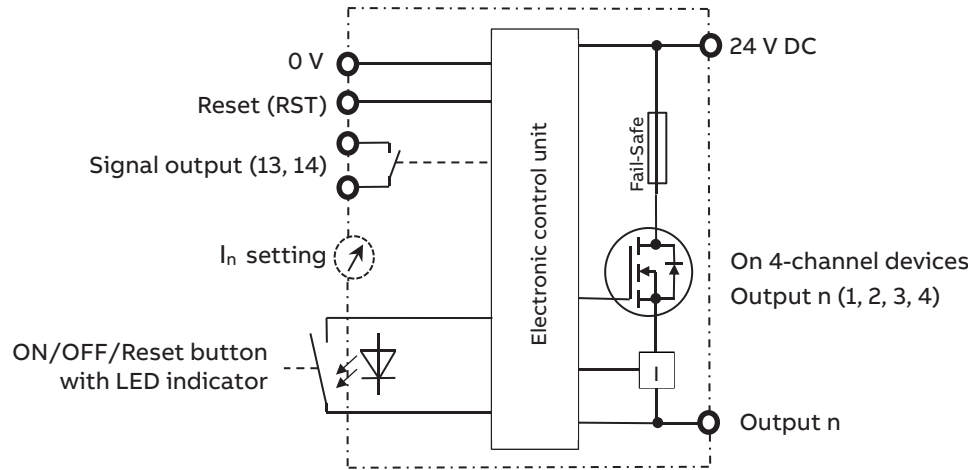


1. Push-in connection for 24 V DC input voltage (Input 24 V DC)
2. Pushbutton for disconnecting from the feed conductor
3. Measuring point for the 24 V DC input voltage
4. Terminal for red power jumper to transfer input voltage
5. Labeling plate
6. 0 V connection for internal supply, with pushbutton
7. Reset input (RST) connection, with pushbutton
8. Connection for signal output, NO contact (13, 14), with pushbutton
9. Terminals for blue jumpers for 0 V, signal and reset
10. Sealable cover for rated current setting
11. Rated current setting, 10-position latching rotary switch per output
12. ON/OFF/Reset button with multicolor LED status indicator per output
13. Load circuit channel output (Output 1–4)

Terminal	 1x	 1x	 1x	
Input 24 V DC	0.5 ... 16 mm ² 20 ... 10 AWG	0.5 ... 16 mm ² 20 ... 8 AWG	0.5 ... 10 mm ²	18 mm
0 V, RST (13, 14)	0.2 ... 1.5 mm ² 24 ... 16 AWG	0.2 ... 1.5 mm ² 24 ... 16 AWG	0.2 ... 0.75 mm ²	8 mm
Output 1-4	0.2 ... 6 mm ² 24 ... 10 AWG	0.2 ... 6 mm ² 24 ... 10 AWG	0.25 ... 2.5 mm ²	10 ... 12 mm






If the ambient temperature (operation) exceeds 40 °C, use conductors with insulation temperature resistance of 90 °C.

Block diagram



Indication and signaling

Visual signaling of the operating state via LED

Signaling	Description
 Green	Normal operation, channel output with load circuit switched on
 Green-orange flashing	Current in the load circuit > 80 %
 Orange	Overload or short circuit up until electronic tripping
 Red	<ul style="list-style-type: none"> Channel output switched off electronically after overload or short circuit Undervoltage cut-off of the operating voltage In the ON state with automatic switching back on
 Off	<p>All LEDs:</p> <ul style="list-style-type: none"> No supply voltage 24 V DC Device startup erroneous <p>LEDs for individual channel outputs:</p> <ul style="list-style-type: none"> Device switched off via ON/OFF button Fail-safe element tripped > channel output faulty

Electronic overload tripping and resetting

Switching on the load circuit/channel output

- Manual at the device using **ON/OFF/Reset** button
- Load circuit can be switched on only if operating voltage is present
- When the operating voltage is applied, the channel output adopts the last state saved

Tripping the load circuit/channel output

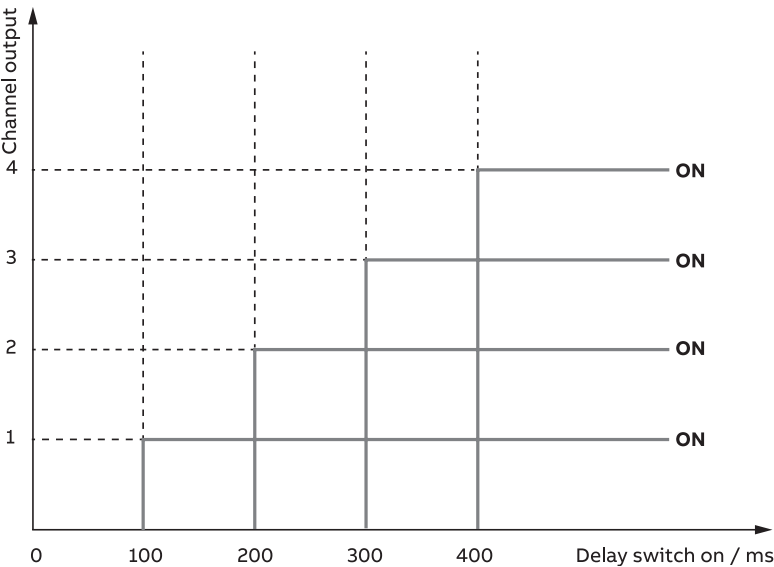
- Manual at the device using **ON/OFF/Reset** button
- After an overload/short circuit tripping with storage (no automatic switching on again)
- Temporarily if there is an undervoltage of < 16 V DC
- No operating voltage

Switching back on tripped channels after overload or short circuit cut-off

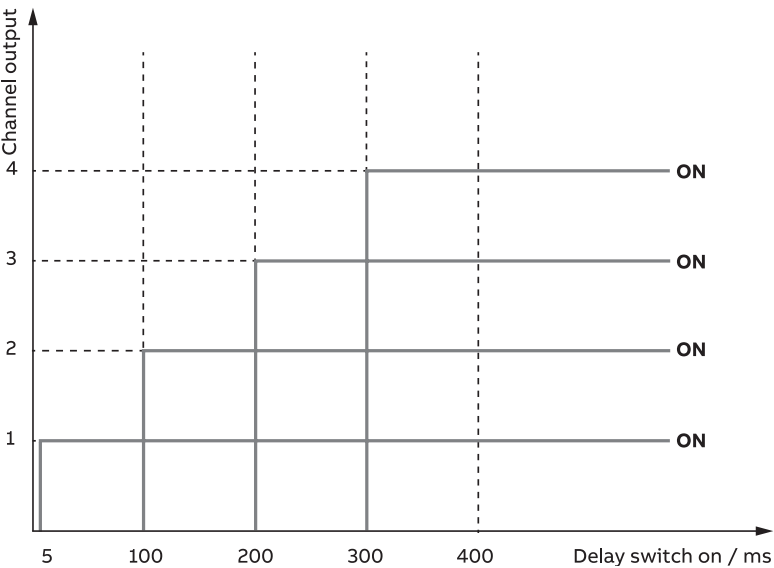
- Manual reset at the device using the **ON/OFF/Reset** button
- Remote reset possible via the reset input RST
- If the operating voltage is switched off, the related fault state of channels 1 to 4 is saved

Delay for switching on

Cascaded switching on of all outputs after power on with 24 V DC



Cascaded switching on of all outputs after switching on the outputs remotely or after undervoltage



Reading the operating state via signal output and reset input

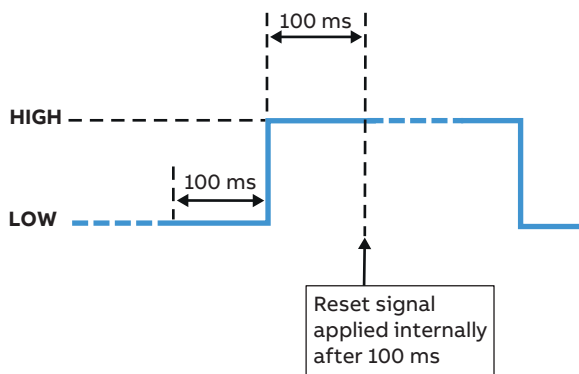
Signal output with connection terminals 13, 14

The state of the channel outputs can be further processed using a group signal output with one normally open (1 NO) contact (13, 14).

Operating state	Signal output	Description
Normal state	Closed	<ul style="list-style-type: none"> Closed circuit if channel output ON Open circuit if channel output OFF
Fault state	Open	<ul style="list-style-type: none"> Channel output disabled after overload/short circuit tripping Switched off due to undervoltage of the operating voltage in the ON state with automatic switching back on No operating voltage

Reset input with connection terminal RST

An output channel switched off due to an overload or short circuit can be switched on again remotely via an external signal using the reset signal. A common reset signal can also be applied to several devices at the same time. Channel outputs switched on are not affected by the signal.



If the LOW signal is present on the reset input RST for longer than 100 ms (or is present continuously), there must be a change to the high signal. Only after a further 100 ms do the internal electronics apply this signal and initiate the channel output reset. Then the reset input must be set to LOW again.

Operating mode

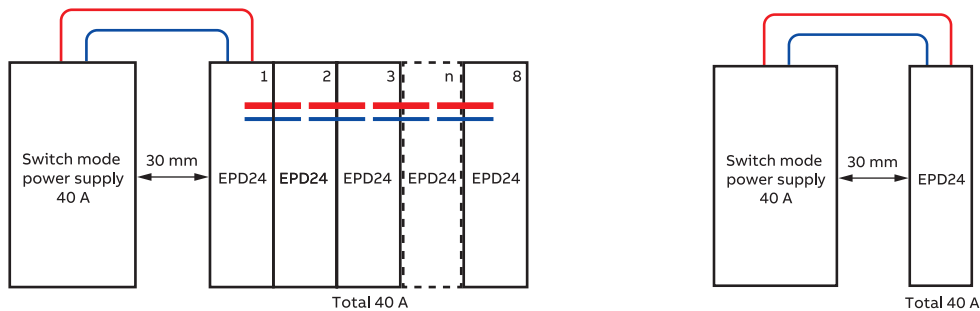
Details of other operating modes are available on request.

Bridging the devices with a power supply using a switch mode power supply

Up to 8 electronic protection devices can be directly connected to each other using power and signal jumpers. Entry and Advanced devices can be combined as required. The maximum rated current I_n must be observed.

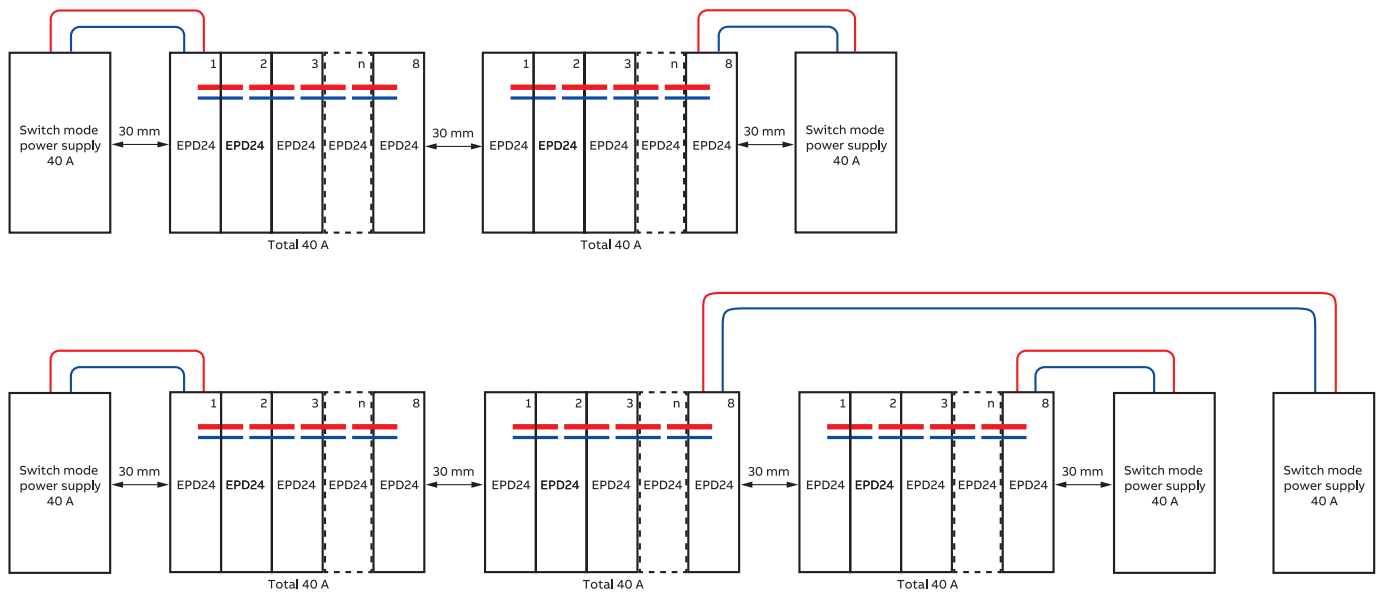
To ensure sufficient heat dissipation, the minimum distance to other modules must be 50 mm vertically and 30 mm horizontally.

The rated output current from the switch mode power supply is distributed as a total current to several EPD24 protection devices.



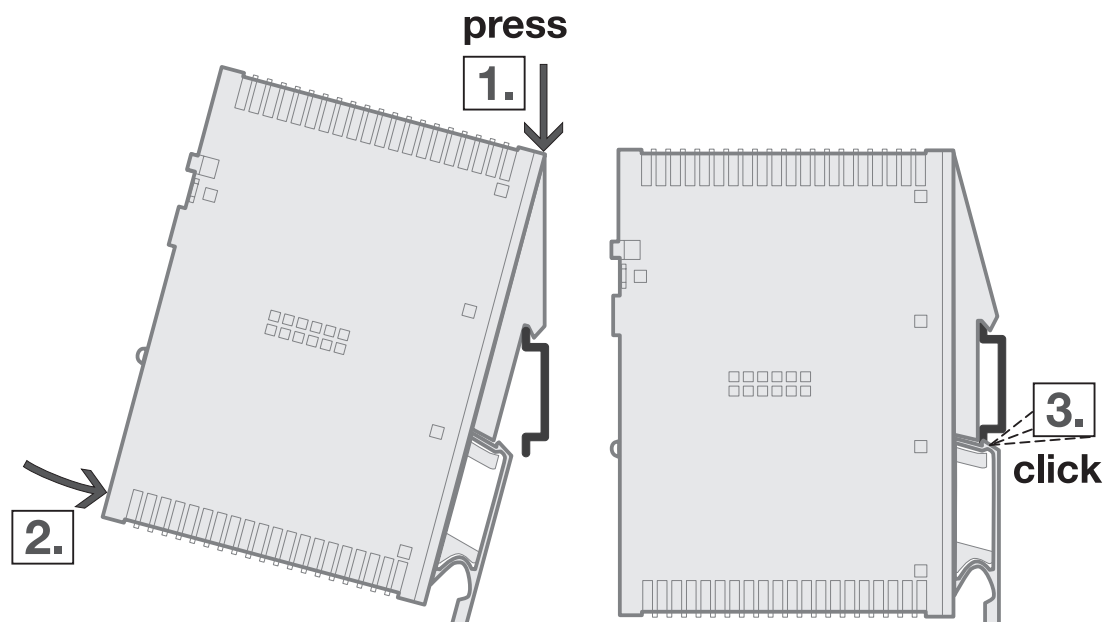
Bridging the devices with a power supply using several switch mode power supplies

When supplying power via switch mode power supplies, groups of up to 8 electronic protection devices with power and signal jumpers are directly connected to each other and mounted 30 mm apart.



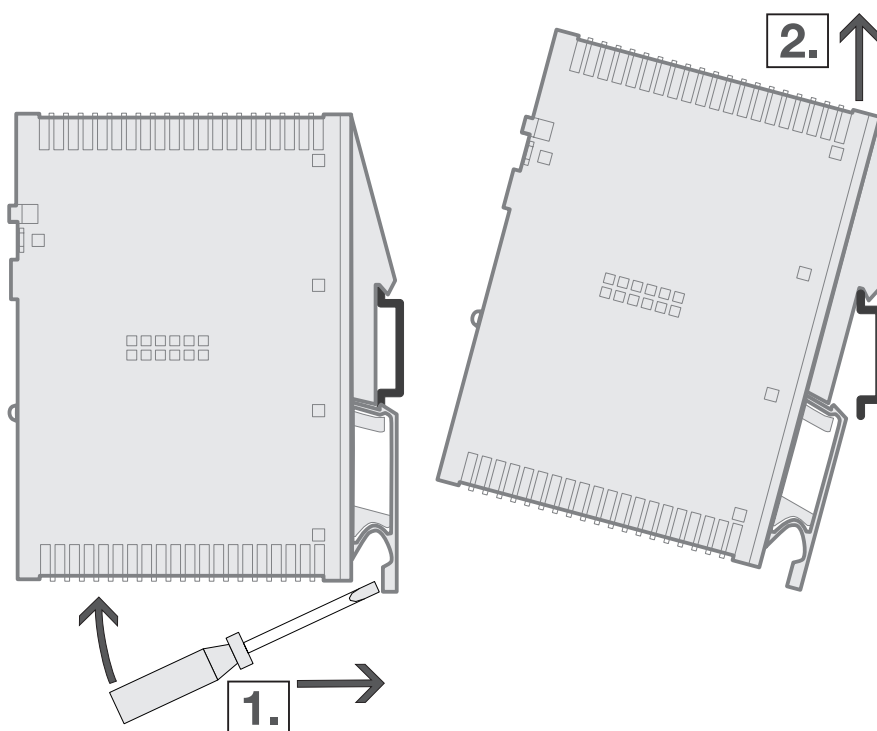
Mounting

The device is mounted on a DIN rail. For this purpose, place the top edge of the device's DIN rail receptacle on the top edge of the DIN mounting rail, with the device swiveled slightly upward as shown in the figure. Then swivel down the device until it engages on the DIN rail.



Removal

Pull down the latching lever using a slotted screwdriver with a blade width of 5.5 mm to release the device. The device can then be detached from the bottom edge of the DIN rail and lifted off.

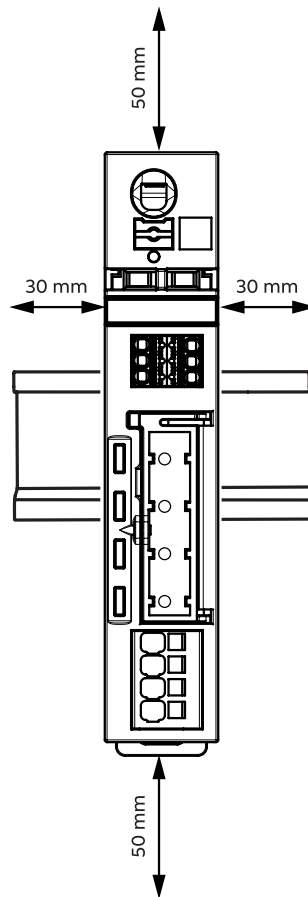


Mounting position

Please refer to the illustration for the mounting position of the device. Details of other mounting positions are available on request.

To ensure sufficient heat dissipation, the minimum distance to other modules must be 50 mm vertically and 30 mm horizontally. For the output current derating, check the characteristic temperature curve.

Also, it is possible to directly string together up to 8 electronic protection devices (Entry and Advanced devices can be combined), which are connected using power jumpers and signal jumpers. The maximum rated current I_n must be observed when doing this.



Safety regulations and warnings



WARNING

Warning! Installation may only be carried out by a person with electrical engineering training.

Safe operation of the product is guaranteed if the installation work has been carried out in accordance with these operating instructions. Repairs or modifications to the equipment are not permitted. Connection and disassembly work may only be carried out by authorized and qualified persons.

Defective products must be treated as hazardous waste and disposed of appropriately.

National or regional regulations for handling hazardous waste must be observed.

Notes

Users must ensure that the cable cross section of each load circuit is suitable for the rated current of the EPD24 used.

Intended use means the use of equipment, protective systems and devices in accordance with the equipment group and category and in compliance with all manufacturer's instructions necessary for the safe operation of the equipment, protective systems and devices.

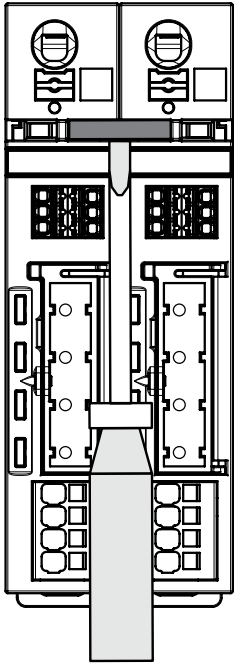
In addition, special precautions must be taken in the plant or machine, e.g. use of a safety PLC, to prevent plant parts from restarting (see Machinery Directive 2006/42/EC and EN 60204-1, Safety of Machinery). In the event of a fault (short circuit/overload), the load circuit is switched off electronically by the EPD24.

Fitting and removing the jumpers

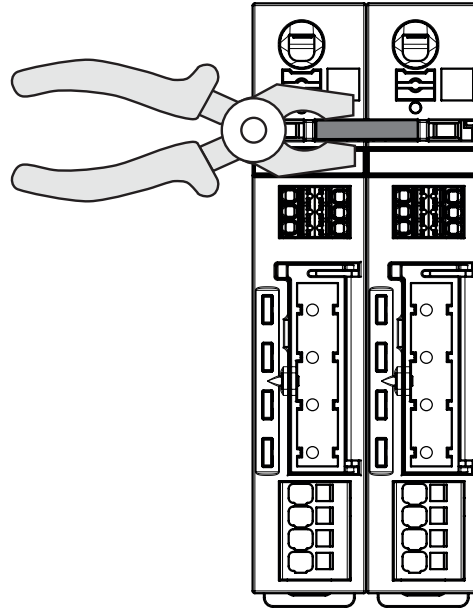
Up to 8 electronic protection devices (Entry and Advanced devices can be combined) can be placed directly next to each other and connected using power and signal jumpers.

Place a slotted screwdriver with a blade width of 5.5 mm underneath the red power jumper for 24 V DC and lever it out slightly. Then pull out the jumper with flat-nose pliers, gripping the top and bottom of the connecting bar with the pliers.

Step 1: Lever out from underneath

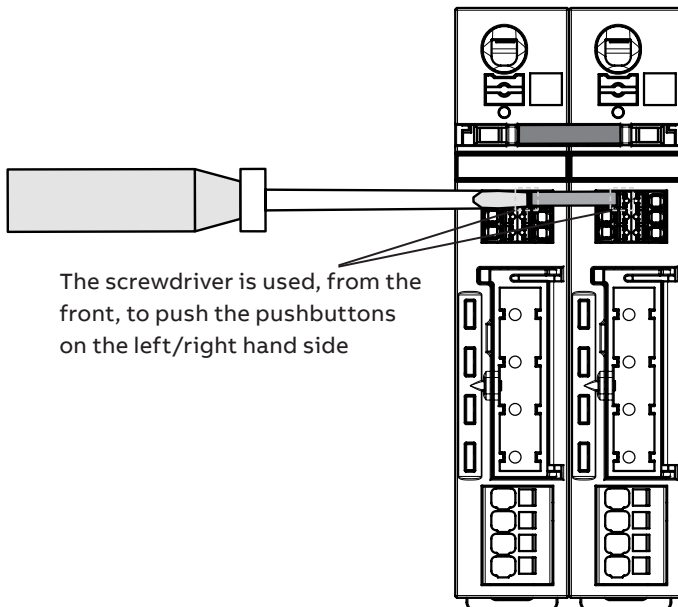


Step 2: Pull out with flat-nose pliers (gripping top and bottom of connecting bar with pliers)

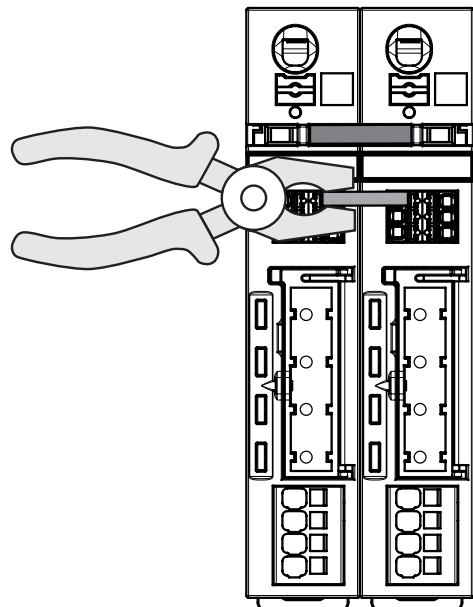


Loosen the blue signal jumpers using a slotted screwdriver with a blade width of 2.5 mm to push the pushbuttons on the left and right of the jumper. Then pull out the jumper with flat-nose pliers, gripping the top and bottom of the connecting bar with the pliers.

Step 1: Loosen the signal jumper using the pushbuttons on the left and right of the jumper



Step 2: Pull out by hand or with flat-nose pliers



Technical data

Data for rated values $T_a = 23\text{ °C}$, $U_{in} = 24\text{ V DC}$, unless otherwise specified.

		Entry EPD24-E4 1-10	Advanced EPD24-A4 0.5-12
Input data			
Rated voltage U_{in}		24 V DC	
Operating voltage		18 .. 30 V DC	18 .. 32 V DC
Total rated current I_n		Max. 40 A	Max. 48 A
Suitable for battery-buffered applications		No	On request
Rated insulation voltage U_i		30 V DC (load circuit)	32 V DC (load circuit)
Standby current I_o		Typ. 33 mA	Typ. 17 mA
Reverse power supply		Max. 30 V DC	Max. 32 V DC
Reverse polarity protection		Yes, not including load	
Output data			
Output		Power MOSFET switching output (positive switching) without galvanic isolation	
Trip characteristic		Time-controlled tripping	Active current limiting
Fuse type		Electronic	
Overload tripping I_{OL} with trip time t_{OL}		See page 14, trip characteristic curve, Entry EPD24-E4 1-10 for time-controlled tripping Typ. I_{OL} at $>1.05 \times I_n$, typ. $t_{OL} = 3\text{ s}$ Typ. I_{OL} at $>1.35 \times I_n$, typ. $t_{OL} = 0.5\text{ s}$ Typ. I_{OL} at $>2.00 \times I_n$, typ. $t_{OL} = 0.1\text{ s}$ Typ. I_{OL} at $>2.5 \times I_n$, typ. $t_{OL} = 0.012\text{ s}$ Typ. I_{OL} at $>3.0 \times I_n$, typ. $t_{OL} = 0.002\text{ s}$	See page 15, trip characteristic curve, Advanced EPD24-A4 0.5-12 with active current limiting Typ. I_{OL} at $1.2 \times I_n$, typ. $t_{OL} = 3\text{ s}$
Short circuit tripping I_{SC} with trip time t_{SC}		See page 14, trip characteristic curve, Entry EPD24-E4 1-10 for time-controlled tripping Typ. I_{SC} at $>3.0 \times I_n$, typ. $t_{SC} = 0.002\text{ s}$	See page 15, trip characteristic curve, Advanced EPD24-A4 0.5-12 with active current limiting Typ. $t_{SC} = 0.01...1\text{ s}$ applies to: $I_n = 0.5\text{ A}$: typ. I_{SC} at $8 \times I_n$ $I_n = 1\text{ A}$: typ. I_{SC} at $4 \times I_n$ $I_n = 2\text{ A}$: typ. I_{SC} at $2 \times I_n$ $I_n = 3...5\text{ A}$: typ. I_{SC} at $1.6 \times I_n$ $I_n = 6...12\text{ A}$: typ. I_{SC} at $1.4 \times I_n$
Output voltage U_{out}		$U_{out} = U_{in} - (I_a \times 12\text{ mV/A})$ (typ. approx. 12 mV per 1 A)	$U_{out} = U_{in} - (I_a \times 14\text{ mV/A})$ (typ. approx. 14 mV per 1 A)
Number of outputs		4 channels	
Rated current setting per channel output I_a		1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 A	0.5 / 1 / 2 / 3 / 4 / 5 / 6 / 8 / 10 / 12 A
Rated current factory setting per channel output		10 A	12 A
Load current warning limit		Typ. 80 % I_n Warning limit hysteresis typ. 5 % (referred to I_n)	
If mounted individually: output current up to 60 °C per output (rated value)		10 A	12 A
	Derating 60 °C ... 70 °C	2 %/K per channel output	2.5 %/K per channel output
Parallel connection of outputs		Not permissible	
Freewheeling circuit		External freewheeling circuit for inductive load (design to suit load)	
Undervoltage tripping		OFF at typ. $U_{in} < 16\text{ V DC}$ ON at typ. $U_{in} > 19\text{ V DC}$ Hysteresis typ. 2 V	
Delay for switching on	Cascaded switching on of all outputs after power on with 24 V DC	Channel 1: typ. 100 ms Channel 2: typ. 200 ms Channel 3: typ. 300 ms Channel 4: typ. 400 ms	
	Cascaded switching on of all outputs after switching on the outputs remotely or after undervoltage	Channel 1: typ. 5 ms Channel 2: typ. 100 ms Channel 3: typ. 200 ms Channel 4: typ. 300 ms	
Fuse protection required		Not necessary, integrated fail-safe element	
Rated current, fail-safe element (per output channel)		16 A	25 A
Status indicator		LED (green, orange, red)	
Efficiency		99.4 %	99.3 %
Power loss		5.6 W at max. 40 A	8.5 W at max. 48 A
Capacitive load		Up to 20,000 μF (depending on the power supply unit and the current setting)	Up to 40,000 μF (depending on the power supply unit and the current setting)

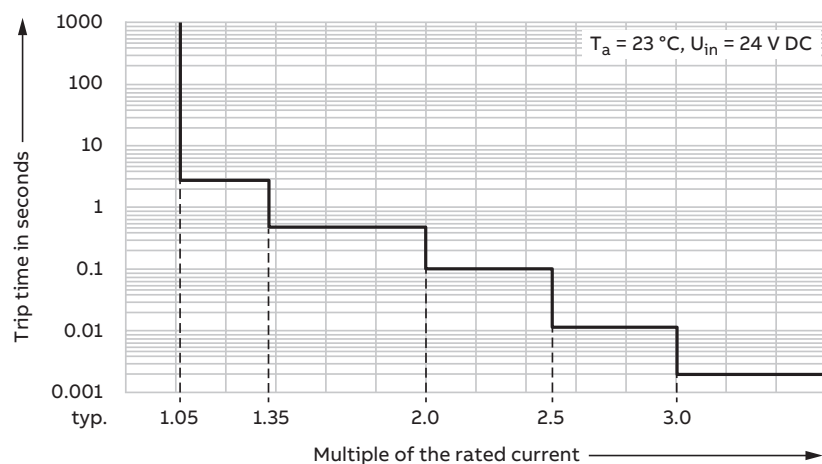
	Entry EPD24-E4 1-10	Advanced EPD24-A4 0.5-12
Signal inputs and outputs		
SIGNAL OUTPUT 13-14		
Description	Group signal output 13-14	
Contact arrangement	Potential-free signal output, NO contact (optocoupler)	
Operating voltage	10 ... 30 V DC	
Operational current	1 ... 200 mA	
RESET RST		
Input voltage	8 ... 32 V DC (reset with rising edge)	
Current consumption	Typ. 2.8 mA (at 24 V DC)	
Pulse length	≥ 100 ms (high signal) ≥ 100 ms (low signal)	
Voltage	> 8 V DC (high signal) ≤ 3 V DC (low signal)	
Connection data		
INPUT Input 24 V DC		
Connection type	Push-in terminal	
Stripping length	18 mm	
Tool	Slotted screwdriver with a blade width of 3.5 mm	
Conductor cross-section, rigid	0.5 mm² ... 16 mm² AWG 20...10	
Conductor cross-section, flexible	0.5 mm² ... 16 mm² AWG 20...8	
Conductor cross-section, flexible with ferrule with plastic sleeve	0.5 mm² ... 10 mm²	
INPUT 0 V		
Connection type	Push-in terminal	
Stripping length	8 mm	
Tool	Slotted screwdriver with a blade width of 2.5 mm	
Conductor cross-section, rigid	0.2 mm² ... 1.5 mm² AWG 24...16	
Conductor cross-section, flexible	0.2 mm² ... 1.5 mm² AWG 24...16	
Conductor cross-section, flexible with ferrule with plastic sleeve	0.2 mm² ... 0.75 mm²	
OUTPUT 1-4		
Connection type	Push-in terminal	
Stripping length	10...12 mm	
Tool	Slotted screwdriver with a blade width of 3.5 mm	
Conductor cross-section, rigid	0.2 mm² ... 6 mm² AWG 24...10	
Conductor cross-section, flexible	0.2 mm² ... 6 mm² AWG 24...10	
Conductor cross-section, flexible with ferrule with plastic sleeve	0.25 mm² ... 2.5 mm²	
SIGNAL OUTPUT 13-14		
Connection type	Push-in terminal	
Stripping length	8 mm	
Tool	Slotted screwdriver with a blade width of 2.5 mm	
Conductor cross-section, rigid	0.2 mm² ... 1.5 mm² AWG 24...16	
Conductor cross-section, flexible	0.2 mm² ... 1.5 mm² AWG 24...16	
Conductor cross-section, flexible with ferrule with plastic sleeve	0.2 mm² ... 0.75 mm²	
RESET RST		
Connection type	Push-in terminal	
Stripping length	8 mm	
Conductor cross-section, rigid	0.2 mm² ... 1.5 mm² AWG 24...16	
Tool	Slotted screwdriver with a blade width of 2.5 mm	
Conductor cross-section, flexible	0.2 mm² ... 1.5 mm² AWG 24...16	
Conductor cross-section, flexible with ferrule with plastic sleeve	0.2 mm² ... 0.75 mm²	

	Entry EPD24-E4 1-10	Advanced EPD24-A4 0.5-12
General data		
Ambient temperature (operation)	-25 °C ... +70 °C ; -25 °C ... +65 °C according to UL 2367	
Storage temperature	-40 °C ... +70 °C	
Mounting temperature	+5°C ... +60°C	
Mounting type	Mounting rail according to EN 60715-35x7.5	
Mounting position	Vertical	
Minimum distance to neighboring devices	Horizontal 30 mm Vertical 50 mm	
Humidity	96 h, 95 % RH, 40 °C	
Altitude	At 4,000 m up to 60 °C ambient temperature (operation)	
Degree of protection	IP20	
Flammability according to UL94	V-2	
Color	Dark grey: RAL7012	
Protection class	III	
Pollution degree	2	
Vibration resistance according to IEC/EN 60068-2-6	Test Fc: 2 g, 20 frequency cycles at 10 ... 500 ... 10 Hz	
Shock resistance according to IEC/EN 60068-2-27	15 G, 11 ms, 3 axes, 6 sides, 3x each side	
MTTF	25 °C: 2 068 776 h 40 °C: 1 244 772 h	25 °C: 999 324 h 40 °C: 604 854 h
Standards / electromagnetic compatibility		
Conformity	CE, RoHS, REACH, UKCA	
UL approval	UL 2367 recognized; E339236 UL 508 listed; E321314	
CSA approval	CSA C22.2 No. 14; E321314	
Maritime approval	Pending	
EMC requirements	Interference emissions: Interference immunity:	EN 61000-6-3 EN 61000-6-2
Dimensions		
Height	130 mm (133 mm incl. latching lever)	
Width	25 mm	
Depth	108 mm	
Weight	Approx. 175 g	Approx. 182 g
Power jumper for 24 V DC		
Number of contacts	2	
Pitch	15 mm	
Disassembly tools	Slotted screwdriver with a blade width of 5.5 mm, and flat-nose pliers	
Signal jumpers for 0 V, signal and reset		
Number of contacts	2	
Pitch	14 mm	
Disassembly tools	Slotted screwdriver with a blade width of 2.5 mm	

Time-current characteristic

Data for rated values $T_a = 23\text{ °C}$, $U_{in} = 24\text{ V DC}$, unless otherwise specified.

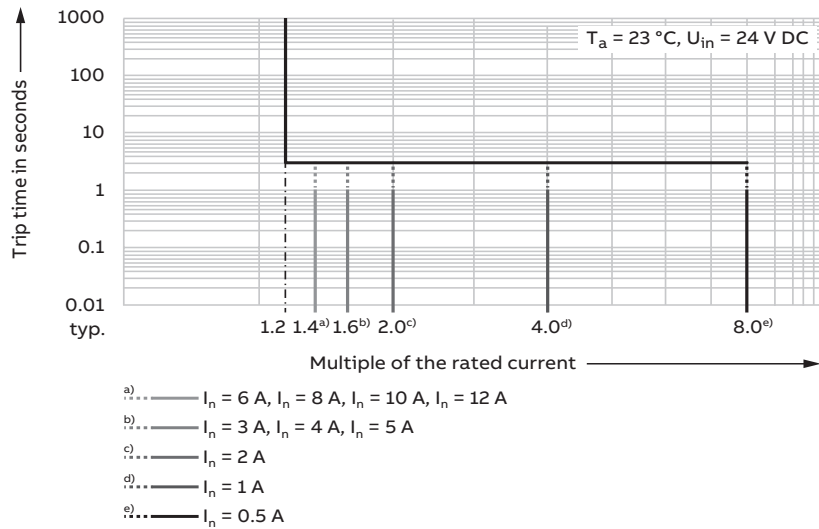
Trip characteristic curve, Entry EPD24-E4 1-10 for time-controlled tripping



Entry EPD24-E4 1-10	Rated current can be set per channel output									
I_n	1 A	2 A	3 A	4 A	5 A	6 A	7 A	8 A	9 A	10 A
No tripping	< typ. $1.05 \times I_n$									
Tripping	> typ. $1.05 \times I_n$ at $t = 3\text{ s}$									
	> typ. $1.35 \times I_n$ at $t = 0.5\text{ s}$									
	> typ. $2.0 \times I_n$ at $t = 0.1\text{ s}$									
	> typ. $2.5 \times I_n$ at $t = 0.012\text{ s}$									
	> typ. $3 \times I_n$ at $t = 0.002\text{ s}$									

- The channel output switches off as a function of the multiple of the rated current.
- The higher the overcurrent when an overload or a short circuit occurs, the quicker the switch-off (LED for the channel output illuminates red).

Trip characteristic curve, Advanced EPD24-A4 0.5-12 with active current limiting



Advanced EPD24-A4 0.5-12		Rated current can be set per channel output									
I_n		0.5 A	1 A	2 A	3 A	4 A	5 A	6 A	8 A	10 A	12 A
No tripping		< typ. $1.2 \times I_n$									
Tripping during overload		Typ. $1.2 \times I_n$ at $t = 3\text{ s}$									
Tripping during short circuit with active linear current limiting		Typ. $8 \times I_n$	Typ. $4 \times I_n$	Typ. $2 \times I_n$	Typ. $1.6 \times I_n$			Typ. $1.4 \times I_n$			
Typ. $t = 0.01 \dots 1\text{ s}$											

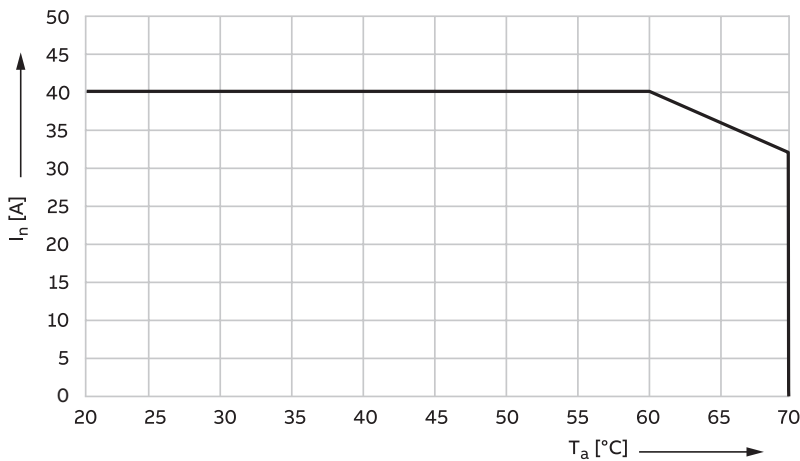
- At an overload current of $1.2 \times I_n$, the tripping time is typ. 3 s.
- The active electronic current limiting is dependent on the rated current set. The tripping time is typ. between 10 ms and 1 s as a function of the multiple of the rated current or if there is a short circuit.
 - Current limiting typ. $8 \times I_n$ at $I_n = 0.5\text{ A}$
 - Current limiting typ. $4 \times I_n$ at $I_n = 1\text{ A}$
 - Current limiting typ. $2 \times I_n$ at $I_n = 2\text{ A}$
 - Current limiting typ. $1.6 \times I_n$ at $I_n = 3\text{ A}$ to 5 A
 - Current limiting typ. $1.4 \times I_n$ at $I_n = 6\text{ A}$ to 12 A
- Without the activation of the current limiting, a considerably higher overload current would flow if an overload or short circuit occurred.

Derating

Data for rated values $T_a = 23\text{ °C}$, $U_{in} = 24\text{ V DC}$ relate to individual mounting, unless otherwise specified.

Temperature characteristic curve for the rated current I_n as a function of the ambient temperature T_a

Entry EPD24-E4 1-10

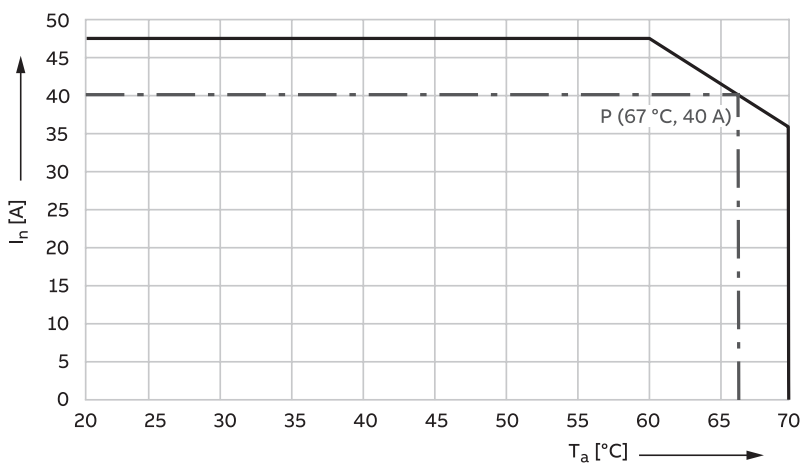


The electronic protection device Entry EPD24-E4 1-10 can supply the maximum rated current I_n at an ambient air temperature of

- $\leq 60\text{ °C}$, max. rated current 40 A
- $> 60\text{ °C}$ to $\leq 70\text{ °C}$, the rated current reduces by the factor 2 %/K
- 70 °C , max. rated current 32 A

Temperature characteristic curve for the rated current I_n as a function of the ambient temperature T_a

Advanced EPD24-A4 0.5-12



The electronic protection device Advanced EPD24-A4 0.5-12 can supply the maximum rated current I_n at an ambient air temperature of

- $\leq 60\text{ °C}$, max. rated current 48 A
- $> 60\text{ °C}$ to $\leq 70\text{ °C}$, the rated current reduces by the factor 2.5 %/K
- 70 °C , max. rated current 36 A

A rated current of 40 A is supplied by the electronic protection device Advanced EPD24-A4 0.5-12 at an ambient temperature of approximately 67 °C.

Maximum permissible cable lengths

The EPD24 safely trips from 0 Ω up to the max. circuit resistance R_{\max} .

Calculation of R_{\max} for Entry EPD24-E4 1-10

Rated current I_n [A] (can be set per channel output)	1	2	3	4	5	6	7	8	9	10
Operating voltage U_B [V DC] ⁽¹⁾ 80 % of rated current 24 V DC	19.2									
Cut-off current I_{off} [A] $1.05 \times I_n$	1.05	2.1	3.15	4.2	5.25	6.3	7.35	8.4	9.45	10.5
$R_{\max} = U_B / I_{\text{off}}$ ⁽¹⁾	18.3	9.1	6.1	4.6	3.7	3.0	2.6	2.3	2.0	1.8

Calculation of R_{\max} for Advanced EPD24-A4 0.5-12

Rated current I_n [A] (can be set per channel output)	0.5	1	2	3	4	5	6	8	10	12
Operating voltage U_B [V DC] ⁽¹⁾ 80 % of rated current 24 V DC	19.2									
Cut-off current I_{off} [A] $1.2 \times I_n$	0.60	1.2	2.4	3.6	4.8	6	7.2	9.6	12	14.4
$R_{\max} = U_B / I_{\text{off}}$ ⁽¹⁾	32.0	16.0	8.0	5.3	4.0	3.2	2.7	2.0	1.6	1.3

(1) The voltage drop or internal resistance of the EPD24 and the tolerance of the cut-off point are already taken into account.

Table for selecting supply line lengths for different cable cross sections

Cable cross section A [mm ²]	0.14	0.25	0.34	0.5	0.75	1	1.5
Distance L [m] (= basic length)	Total cable resistance R_L [Ω] $R_L = \frac{\rho_0 \cdot 2L}{A}$ Specific electrical resistance of copper $\rho_0 = 0.0178$ (Ω mm ²)/m						
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	25.43	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

The cable impedance determines the max. trip current for 24 V DC applications: $L = 50$ m; $A = 1.5$ mm²

$$I = \frac{U}{R_L} = \frac{24 \text{ V DC}}{1.19 \Omega} = 20.2 \text{ A}$$

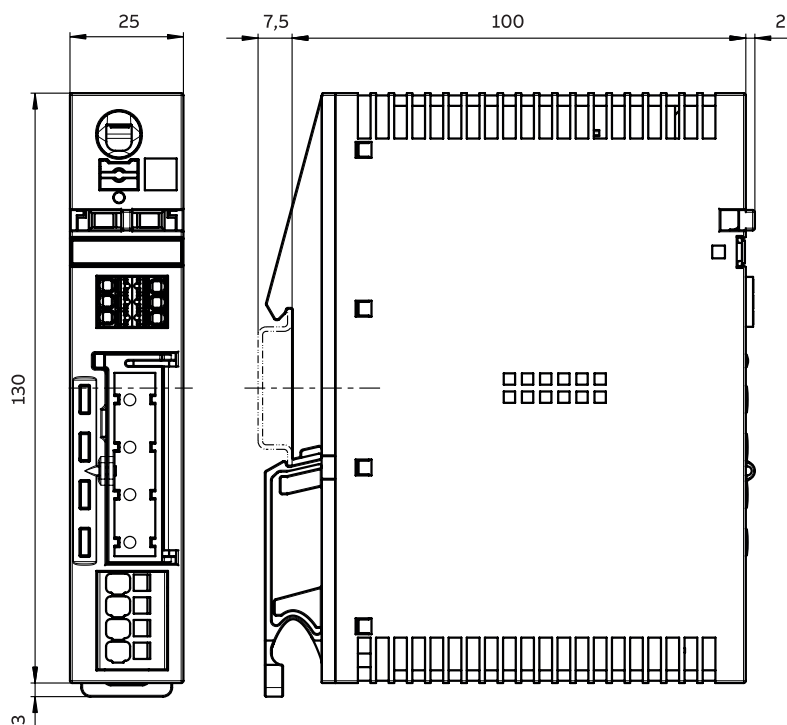
Max. cable length for different cable cross sections protected by Entry EPD24-E4 1-10							
Cable cross section A [mm ²]	0.14	0.25	0.34	0.5	0.75	1	1.5
Rated current I _n [A] (can be set per channel output)	Maximum cable length L (m)						
	$L = \frac{A \cdot R_{\max}}{2 \cdot \rho_0}$						
	Specific electrical resistance of copper $\rho_0 = 0.0178 \text{ } (\Omega \text{ mm}^2)/\text{m}$						
1	72	128	175	257	385	514	770
2	–	64	87	128	193	257	385
3	–	–	58	86	128	171	257
4	–	–	–	64	96	128	193
5	–	–	–	–	77	103	154
6	–	–	–	–	64	86	128
7	–	–	–	–	–	73	110
8	–	–	–	–	–	64	96
9	–	–	–	–	–	57	86
10	–	–	–	–	–	51	77

Note: Observe internationally applicable standards and regulations for current carrying capacity.

Max. cable length for different cable cross sections protected by Advanced EPD24-A4 0.5-12							
Cable cross section A [mm ²]	0.14	0.25	0.34	0.5	0.75	1	1.5
Rated current I _n [A] (can be set per channel output)	Maximum cable length L (m)						
	$L = \frac{A \cdot R_{\max}}{2 \cdot \rho_0}$						
	Specific electrical resistance of copper $\rho_0 = 0.0178 \text{ } (\Omega \text{ mm}^2)/\text{m}$						
0.5	126	225	306	449	674	899	1.348
1	63	112	153	225	337	449	674
2	–	56	76	112	169	225	337
3	–	–	51	75	112	150	225
4	–	–	–	56	84	112	169
5	–	–	–	–	67	90	135
6	–	–	–	–	56	75	112
8	–	–	–	–	–	56	84
10	–	–	–	–	–	45	67
12	–	–	–	–	–	–	56

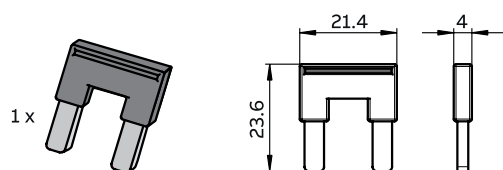
Note: Observe internationally applicable standards and regulations for current carrying capacity.

Electronic protection devices*

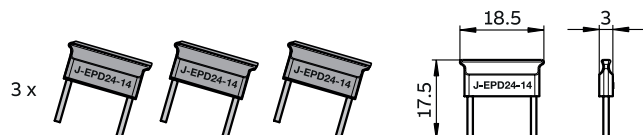


Accessories*

Red power jumper for 24 V DC



Blue signal jumpers for 0 V, signal and reset



* Dimensions in mm

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