

MANUAL

EASY-B CIRCUIT BREAKER
24V single channel



Easy-B circuit breaker
EB 24V

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1. ORDER DATA

The following table shows the ordering data for the 24V circuit breaker modules.

Table 1 Order numbers

Variant	Input voltage	Channels
EB-2724-XX0-0	24 Vdc	1-2
EB-2824-XX0-0	24 Vdc	1
EB-0824-100-0	24 Vdc	1
EB-1824-XX0-0	24 Vdc	1
EB-3824-100-0	24 Vdc	1

2. GENERAL INFORMATION

2.1 Safety instructions

Please read these warnings and safety instructions carefully before operating the appliance. The appliance may only be installed by specialised and qualified personnel. In the event of malfunctions or damage, switch off the supply voltage immediately and send the device to BLOCK Transformatoren-Elektronik GmbH for inspection. The device does not contain any service parts. If an internal fuse blows, there is most likely an internal defect in the appliance. The data provided is for product description purposes only and should not be construed as guaranteed characteristics in the legal sense.

2.2 Qualified personnel

The product associated with this documentation may only be handled by qualified personnel in compliance with the documentation associated with the respective task, in particular the safety instructions and warnings contained therein. Qualified personnel can ensure, on the basis of their training and experience, that the use of the described product fulfils all safety requirements as well as the applicable provisions, regulations, standards and laws.

2.3 Intended use

This device is designed for installation in a housing and is suitable for use in general electronic devices, such as industrial control systems, office equipment, communication devices or measuring devices. Do not use this device in the control systems of aeroplanes, trains or nuclear facilities where a malfunction could lead to serious injury or danger to life.

2.4 Disclaimer

The content of this publication has been checked with the utmost care to ensure that it corresponds to the hardware and software described. Nevertheless, there may be discrepancies between the product and the documentation. Deviations may also occur due to the continuous further development of the product. For this reason, we cannot guarantee complete conformity. Should this documentation contain errors, we reserve the right to make any necessary corrections without prior notice.



CAUTION

Switch off the input voltage before carrying out installation, maintenance or modification work and secure it against unintentional restarting.



CAUTION

Do not modify or attempt to repair the appliance. Do not open the device!



CAUTION

Prevent the ingress of foreign objects such as paper clips and metal parts.



CAUTION

Do not operate the appliance in a damp environment or in an environment where condensation or condensation is to be expected.



CAUTION

Do not touch the housing during operation or shortly after switching off. Hot surfaces can cause injuries.

3. Product description

3.1 Description of the overall system

The circuit breakers in the EasyB single-channel circuit breaker series are available both with and without current limiting. For comprehensive system monitoring, variants are available for connecting to an EasyB coupling module with an interface to a higher-level control system. Depending on the application and the number of channels to be protected, the modules can be combined as required. The aim in developing the electronic circuit breakers was to create a particularly flexible system. This is why the circuit breaker modules can be operated individually or form a functional unit both electrically and mechanically by connecting them in series. The 24 V supply can be provided with up to 40 A at the feed contact of any circuit breaker channel. If higher currents are required, additional feed contacts can be added. The current is distributed to the individual fuse channels via the continuous cross-connector, which can carry up to 80 A. The resulting network is just as suitable for protecting small units with only a few load circuits as it is for large systems in which up to 40 circuits need to be protected.

When setting up a system, the designer can arrange the required circuit breaker modules on the DIN rail depending on the application. The signalling contacts also connect automatically, making installation quick and easy. The advantage of the 1-channel concept is that the scope of the system can be adapted exactly to the current requirements, while still allowing for later expansions. If more than two loads are to be supplied per circuit breaker channel, potential distribution modules with eight additional outputs each are available. Up to three of these potential distributors can be easily connected to a circuit breaker channel, so that a maximum of 24 additional output contacts are available, and if the potentials are to be combined again when feeding back to the supplying power supply unit, this can be done quickly and easily with the EB-GNDx modules.

The 12 mm wide electronic circuit breakers offer various communication options as standard: For example, a collective message can be tapped via a signalling output for all modules in series in order to monitor up to 40 circuit breakers in series. Further variants are available for comprehensive evaluation which, in combination with a coupling module that can also be connected in series, offer an interface to the fieldbus level and provide dynamic data such as channel status, current current and input voltage as well as static data such as serial number and rated current. In this way, for example, the rated current of a module can also be set digitally. As all rated currents can be covered with one module, stock levels can be significantly reduced. The channels address themselves automatically when they are switched on, eliminating the need for time-consuming manual address assignment.

3.2 Overview of variants

The available circuit breakers can be divided into three groups in terms of their protection characteristics and range of functions:

EB-27: Electronic circuit breaker with thermomagnetic characteristic and transmission of the signalling signal for tripped and switched-off channels to connected channels. Entry-level version for the electronic fuse protection of 24 V loads.

EB-28: Electronic circuit breaker with current-limiting characteristic curve and forwarding of the signalling signal for tripped and switched-off channels to connected channels. Entry-level version for the electronic fuse protection of 24 V loads when active current limiting is required.

EB-08, EB-18, EB-38: Electronic circuit breaker with current-limiting characteristic characteristic and comprehensive communication with the connected modules. Suitable for the advanced protection of 24 V loads and the possibility of ability to read out detailed power supply parameters and actively control the channels. actively control the channels.

3.2.1 Equipment

EB-2724-XX0-0	EB-2824-XX0-0	EB-0824-100-0	EB-1824-XX0-0	EB-3824-100-0	
					Thermomagnetic characteristic
	■	■	■	■	Current limiting 1,25 x tripping current
		■	■	■	Communication interface
		■	■	■	Automatic addressing of channels
		■	■	■	Common reset
		■	■	■	Selective switch-on at $U_{in} > 18V$, load-dependent
■		■	■	■	Current detection and display > 90% of tripping current
■					Inrush capacity > 40 000 μF
	■	■	■	■	Inrush capacity > 70 000 μF
■	■		■		Preset tripping currents
		■			Tripping currents adjustable via rotary switch or interface
				■	Tripping currents adjustable via interface
■	■				Second load output
		■	■	■	Undervoltage switch-off as group
■	■				Undervoltage switch-off on individual basis
■	■	■	■	■	ON/OFF button
■	■	■	■	■	Labeling option
■	■	■	■	■	Coloured status indicator on button
■	■	■	■	■	Common message for tripped/switched off channels
■					Lever orange
	■				Lever red
		■	■	■	Lever blue

Figure 2-1: Equipment overview

3.2.2 Article number system

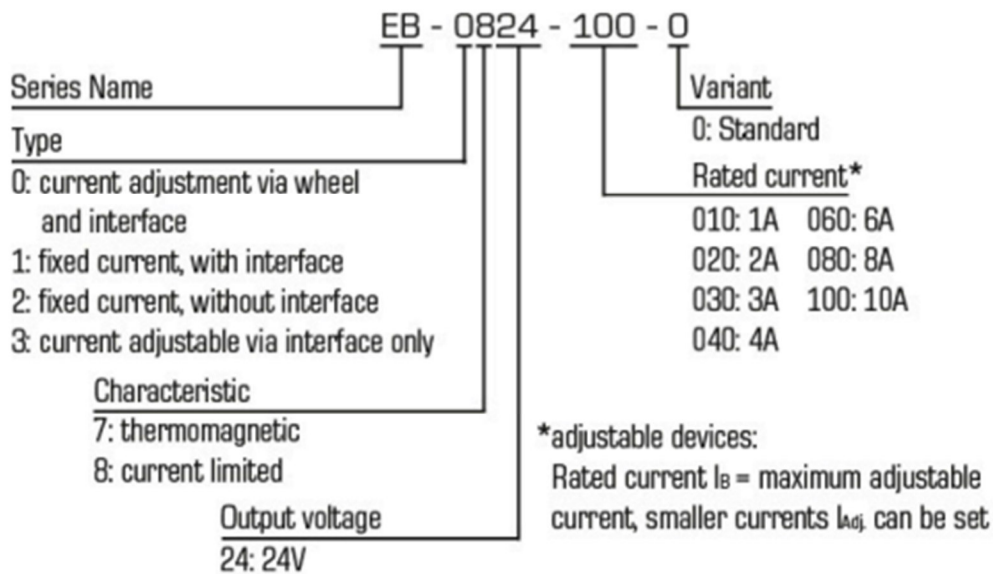


Figure 2-2: Article number system

3.3 Coupling modules

Coupling modules are used for communication between the electronic EasyB circuit breaker system and a higher-level control system (PLC, PC). In order to be compatible with various bus systems and communication standards widely used in automation, various coupling modules are available or are being planned. Some modules offer additional contacts, such as a collective reset input and several potential-free collective signalling contacts, and the coupling module is connected to the circuit breaker on the left-hand side. The use of several coupling modules on a circuit breaker network is not permitted. Detailed information on the individual coupling modules can be found in the download area of the respective coupling modules on the BLOCK homepage www.block.eu.

3.4 Connections and controls

3.4.1 EB-27, EB-28

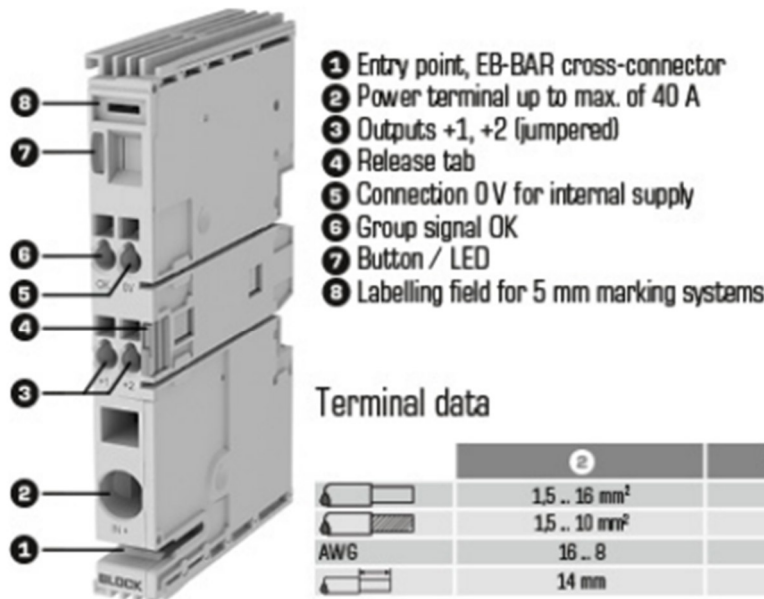


Figure 2-3: Connections, operating elements EB-27, EB-28

3.4.2 EB-08, EB-18, EB-38

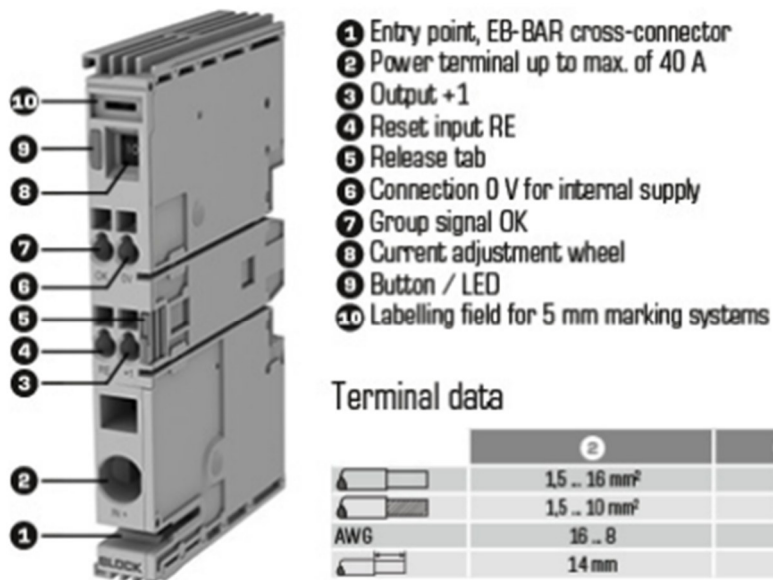


Figure 2-4: Connections, operating elements EB-08, EB-18, EB-38

3.5 Operating states

3.5.1 Operating states, signalling normal operation

	Operational status / Description	Output	LED	Signal output (group signal)	Button is pressed => switch to ...
Z 0	Module initialisation ¹	off	off	0 V	--
Z 1	Output activated, function OK	on	green	24V	Z 3
Z 2	Output current > 90% of rated current ²	on	green flashing	24V	Z 3
Z 2	Output current > 1.25 x rated current (EB 2824) ³	on	green flashing	24V	Z 3
Z 3	Output is shut down	off	red	0 V	Z 1
Z 4	Output shut down because of an overcurrent, thermal discharge active ⁴	off	red flashing	0 V	--
Z 5	Output shut down because of an overcurrent, thermal discharge is complete	off	orange flashing	0 V	Z 3
Z 6	Device fault (defective fuse detected)	off	red flashing fast	0 V	--

¹The outputs are activated once the modules have been initialised

²The outputs is shut down automatically in the event of any overcurrent as per the tripping characteristic.

³The status of the output is saved when the device is shut down.

⁴Once a wait time has elapsed (thermal discharge), there is a switch to operational status Z5. When the device is activated again. This provides a reliable means of preventing overloading of the switching element, even if the device is reactivated immediately.

3.5.2 Switch-on behaviour

3.5.2.1 EB-27:

As soon as the input voltage has reached the switch-on wave of $17.5V \pm 0.7V$, the channels switch on after an initialisation time of approx. 27ms. Each channel acts independently and switches on independently of the adjacent channels.

3.5.2.2 EB-28:

See 2.5.2.1 The module initialisation time is approx. 52ms.

3.5.2.3 **EB-08, EB-18, EB-38:**

A communicative network is created by connecting the circuit breakers in series. When the supply voltage is applied and the switch-on threshold of $17.7V \pm 0.7V$ is exceeded with a rise rate of at least $8V/s$, channel 1 (far left) switches on after an initialisation time of 52ms. Channel 2 is located to the right of channel 1 and switches on after 85ms if the current flowing in channel 1 is less than its rated current. If the current in channel 1 exceeds the nominal value, the switching on of channel 2 is delayed until the current in channel 1 is less than the nominal current. Only then is channel 2 switched on with a delay of 85 ms. If the current in channel 1 permanently exceeds the nominal current, channel 2 is switched on after a maximum waiting time of 5 seconds. The process is repeated with the following channels. Only then is the "OK" signalling contact set.

3.6 Automatic addressing

The circuit breakers with extended communication properties (EB 08, EB 18, EB 38) address themselves automatically when the supply voltage is switched on. For this purpose, an optical procedure is used in which the installed modules are assigned a consecutive number one after the other. The module on the far left is assigned the number 1. The time sequence is described in section 2.5.2.3.

For reliable addressing, it is necessary that all the connected circuit breakers are energised at the same time.

3.7 Undervoltage switch-off

3.7.1 **EB-27 / EB-28**

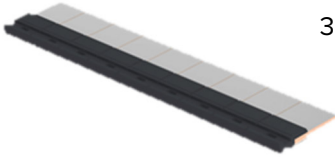
If the input voltage falls below the switch-off threshold of $16.7V \pm 0.7V$ during operation, the circuit breaker channel switches off and blocks the current flow. Each channel acts independently and, due to tolerances, has a slightly different voltage value from which the switch-off is realised. When switching on again, the last state is restored when the switch-on threshold (section 2.5.2) is exceeded.

3.7.2 **EB-08, EB-18, EB-38**

If the input voltage of the communicating circuit breakers falls below the switch-off threshold of $17.45V \pm 0.7V$, all channels with a current flow of more than 100% of the rated current are initially switched off and stored. Switch-off takes place channel by channel. There is a delay time of 16 ms in between. If the input voltage drops further, all remaining channels are switched off.

3.8 Zubehör

3.8.1 Notwendiges Zubehör



3.8.1.1 EB-BARx cross-connector:

The EB-BARx cross-connector is used to forward the +24V supply voltage to all connected modules. The current carrying capacity is 80A. The standard cross-connector is 492 mm long for 41 modules to be connected in series. Shortened cross connectors are available as an option.



3.8.1.2 EB-COV side cover:

The EB-COV cover serves as a cover and protection against accidental contact with the contacts protruding to the left of the modules.

3.8.2 Optional accessories

3.8.2.1 Communication modules:

Various communication modules are available for connecting communication-capable EasyB circuit breaker channels to a higher-level control system. The communication modules are connected to the left of the circuit breaker group. You can find more information on the individual communication modules in the product area at www.block.eu.



3.8.2.2 EB-PM potential distribution module:

If more than the output contacts available on the circuit breaker channel are required to distribute the output current, up to three EB-PMM potential distribution modules can be added to the right of the circuit breaker channel. This provides up to 24 additional output contacts. The potential distribution modules are automatically connected to the circuit breaker channel.

3.8.2.3 0 V-collection terminal EB-GNDx:

The EB-GND4 and EB-GND8 modules are used as 0V bus terminals with four and eight contacts respectively. The 2.5mm² contacts can be loaded with up to 10A. A total current of 40A is permitted per module. The current is distributed via EB-BAR cross-connectors and can be fed back to the supplying power supply unit via the 16mm² contact on EB-GND4.



3.8.2.4 Labelling options:

EasyB modules are labelled with standard 5 or 6 mm labels.

3.9 Functional diagram

3.9.1 EB-27, EB-28

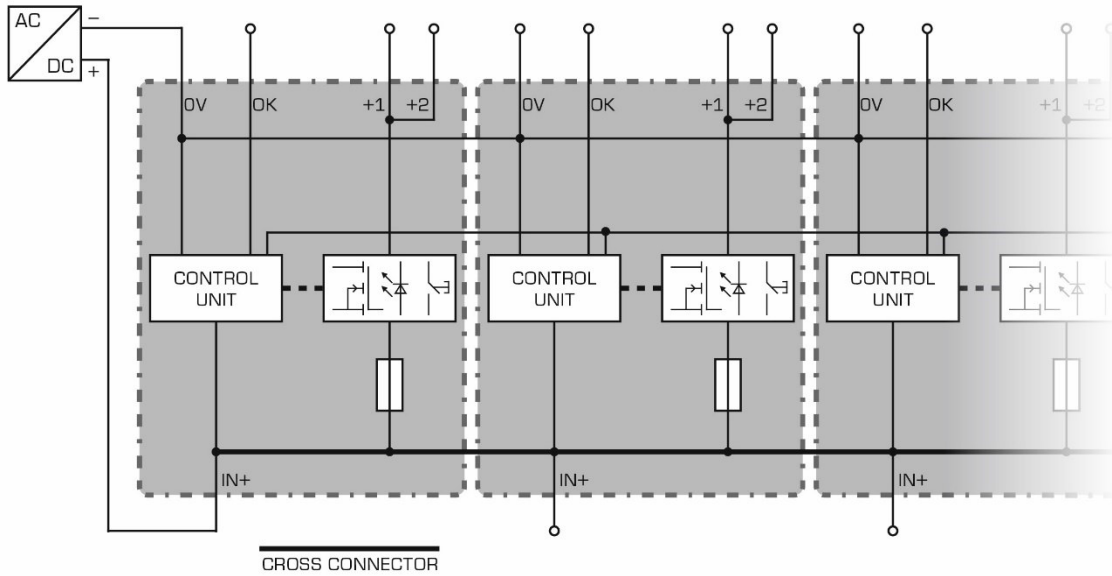
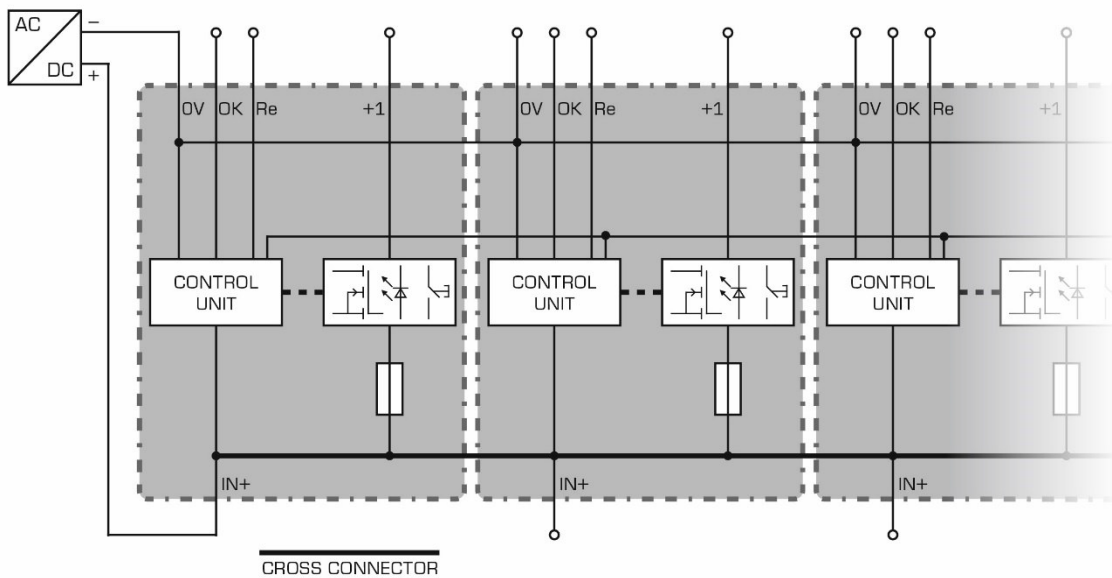


Figure 2-5: Functional diagram EB-27, EB-28

3.9.2 EB-08, EB-18, EB-38

Figure 2-6: Functional diagram EB-08, EB-18, EB-38



4. Installation

4.1 Schematic diagram Installation

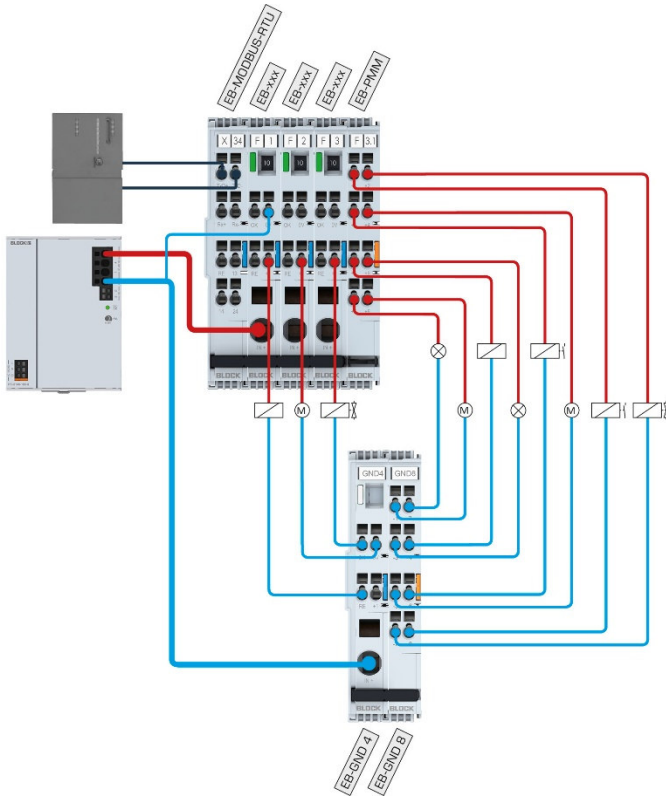
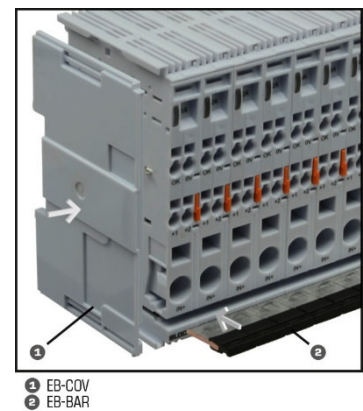


Figure 3-1: EasyB schematic diagram

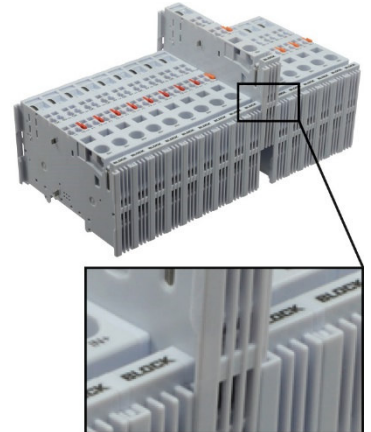
4.2 Assembly

The appliance must be mounted horizontally on the TH 35-15/7.5 standard profile rail (EN 60715). The appliance must be aligned so that the ventilation slots are at the top or bottom. A minimum distance of 30 mm must be maintained at the top and bottom. Additional modules are inserted at the side. Secure positioning and connection is achieved using a tongue and groove system. The EB-COV cover is required on the left-hand module on the left-hand side of the housing.



4.3 Connection

Dimension the cables according to the max. input or output current. Refer to Figure 2-3 or Figure 2-4 for the permissible cable cross-sections. Connect the +24V supply voltage to the In+ supply terminal. The +24V supply voltage is bridged across all modules by the EB-BAR cross-connector. All other signal connections are automatically bridged by the series connection. For currents >40 A, several feed terminals must be used. Select the feed terminals so that the current in the cross-connector does not exceed 80 A.



4.4 Use of different equipment variants

It is possible to connect circuit breaker channels of different equipment variants with each other. It should be noted that the communication capability of the circuit breakers (EB-08, EB-18, EB-38) is deactivated if they are connected to circuit breakers of equipment variants EB27 or EB28. In this case, only the function of the collective signalling signal is retained.

4.5 Accessories on the housing

There are two plastic parts on the back of the housing that can be broken off by gently levering them off the housing. The lower part is used to close the housing opening for the cross connector on the right-hand module. The upper demolition part can be used to close the opening of the current selector switch of EB-08.



4.6 Dismantling

Remove the EB-BAR cross connector and all connected cables from the EasyB module to be dismantled. Pull the module out of the assembly using the release tab.

5. Technical data

5.1 Input

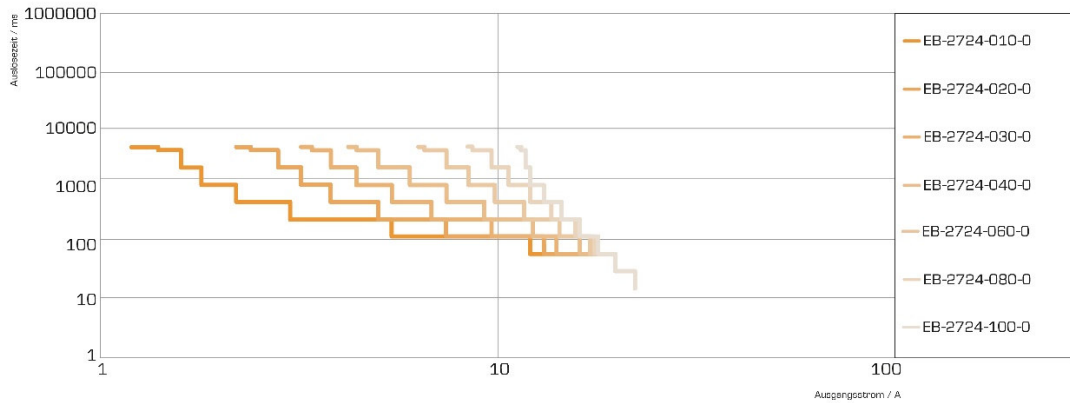
	EB-2724	EB-2824	EB-1824	EB-0824 EB-3824
Nominal input voltage	24V			
Input voltage range	18 - 30Vdc			
Max. Residual ripple/ripple of the input voltage	3%			
Switch-on threshold	17,5V ± 0,7V		17,7V ± 0,7V	
Duty cycle	27ms	52ms	min. 52ms; see 3.5.2.3	
Switch-off threshold	16,7 ± 0,7V		17,45 ± 0,7V	
Max. Continuous current per contact (0V)	10A			
Max. Continuous current per contact (In +)	40A			
Overvoltage protection	33V			
No-load power loss @ 24V	0,3W	0,5W	1,17W	

5.2 Output

	EB-2724	EB-2824	EB-1824	EB-0824 EB-3824
Nominal output voltage	24Vdc			
Rated output current	see section 3.2.2			
Current limitation	-	1,25 x I _{Rated current}		
Maximum voltage drop between input and output	< 140mV (10A)			
Module initialisation time	27ms		52ms	
Switch-on delay of the channels	-		Load-dependent, min. 85ms, max. 5s	
Waiting time after switching off an output (thermal expansion)	500ms (short circuit) - 5s (overload))			
Maximum power loss	< 1,2W	< 1,8W	< 2,5W	
Maximum load capacity per output (@24V)	> 40mF		> 70mF	
Integrated output fuses	15AT			
Regenerative strength	max. 35V			
Parallel connection of outputs	Not permitted			
Series connection of outputs	Not permitted			

5.3 Tripping characteristics

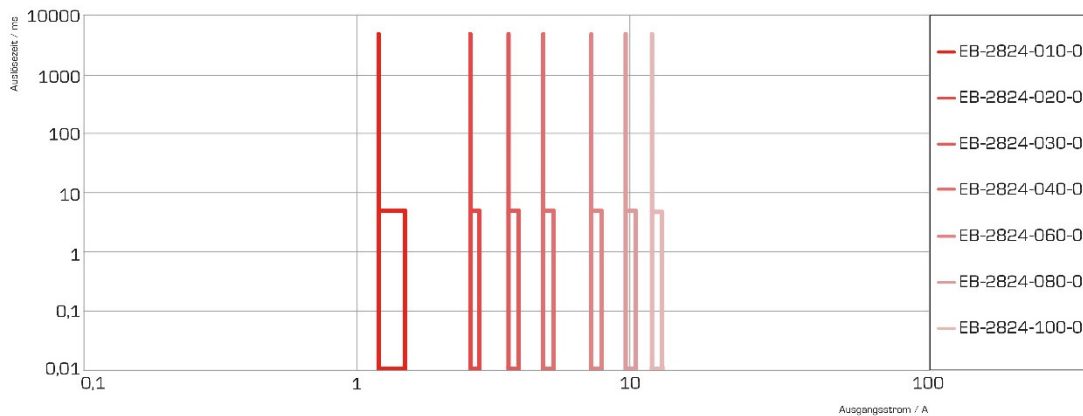
5.3.1 EB-27



Output current / A

Figure 4-1: Tripping characteristic EB-27

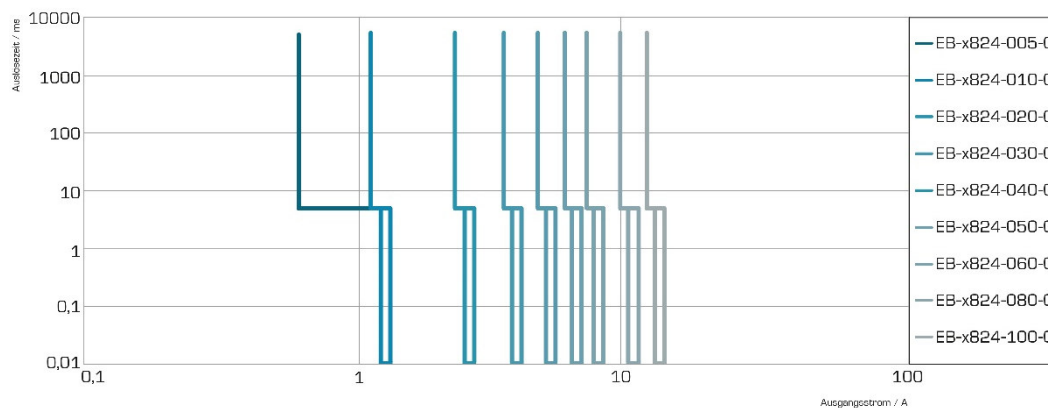
5.3.2 EB-28



Output current / A

Figure 4-2: Tripping characteristic EB-28

5.3.3 EB-08, EB-18, EB-38



Output current / A

Figure 4-3: Tripping characteristic EB-08, EB-18, EB-38

5.4 MTBF

	EB-2724	EB-2824	EB-1824	EB-0824 EB-3824
Mean Time Between Failures	> 500,000 h at 40°C, rated load			

5.5 EMC, Safety

	EB-2724	EB-2824	EB-1824	EB-0824 EB-3824
Standard for safety	EN 60950-1, EN 50178, EN/IEC 60204-1			
CE	In accordance with 2014/30/EU (EMC Directive)			
Protection class	III			
Type of protection	IP 20			
EMC immunity	EN 61204-3			
EMC interference emission	EN 61204-3			

5.6 Ambient conditions

	EB-2724	EB-2824	EB-1824	EB-0824 EB-3824
Ambient temperature up to 6A Rated current	-25°C ... +70°C			
Ambient temperature up to 8A Rated current	-25°C ... +60°C			
Ambient temperature up to 10A Rated current	-25°C ... +55°C			
Storage temperature	-25°C ... +85°C			
Degree of contamination	II			
Humidity	5 ... 96%, No Condensation			
Climate class (EN 60721)	3K3			

5.7 Dimensions, Weights

	EB-2724	EB-2824	EB-1824	EB-0824 EB-3824
Dimensions	See Figure 4-4			
Weights	39g	40g	42g	

