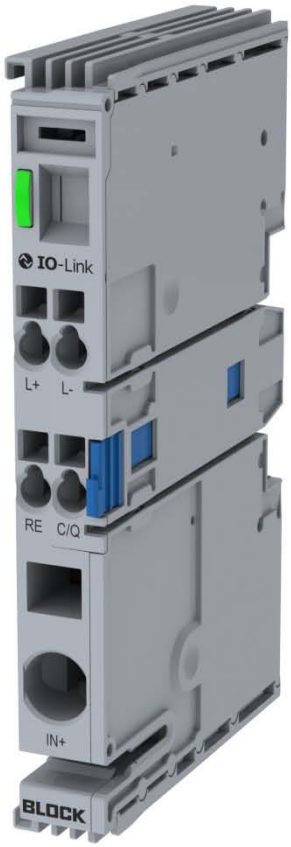
EB-IO-LINK

Communication Module Between PLC/PC
And
EasyB - Single Channel Circuit Breaker System



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11-06-17 / JUCH
Subject to technical changes

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1. General Information

1.1 Safety Instructions

Please read these warnings and safety instructions carefully before operating the device. The device may only be installed by qualified competent personnel. In the event of malfunctions or damage, switch off the supply voltage immediately and send the device to Block to be checked. The device does not contain any service components. When an internal fuse is triggered, there is most likely an internal defect in the device. The data provided are for product description purposes only and should not be construed as legally guaranteed properties.

1.2 Qualified Personnel

The product referred to in this documentation may only be operated by qualified personnel, in compliance with the specific documentation, pertinent to the respective task, in particular the safety instructions and warnings contained therein. Qualified personnel can, as a result of their training and experience, help to ensure that the use of the described product meets all safety requirements as well as applicable regulations, provisions, standards, and laws.

1.3 Intended Use

This device is designed for installation within an enclosure and is suitable for use with general electronic devices, such as industrial controls, office equipment, communications equipment, and gages. Do not use this device in control systems for airplanes, trains, or nuclear facilities where a malfunction can result in serious injury or death.

1.4 Disclaimer

The contents of this publication have been checked with great care for concordance with the described hardware and software. Nevertheless, there may be differences between the product and the documentation. Deviations may also arise due to the further development of the product.
For this reason, we cannot guarantee full concordance. Should this documentation contain any errors, we reserve the right to make necessary corrections without prior notice.

2. Product Description

2.1 Description of the Communication Module

The EB-IO-LINK communication module serves as an interface for connection to a higher-level controller and is compatible with circuit breakers of the variants EB-08, EB-18, and EB-38.

The communication module supports IO-Link standard V1.1 and works with the COM 3 speed of 230.4 kB. The cyclic data exchange is 2.0 ms and contains 6 bytes of process data.

To ensure error-free operation, the maximum number of 40 circuit breakers must not be exceeded.

2.2 System Design

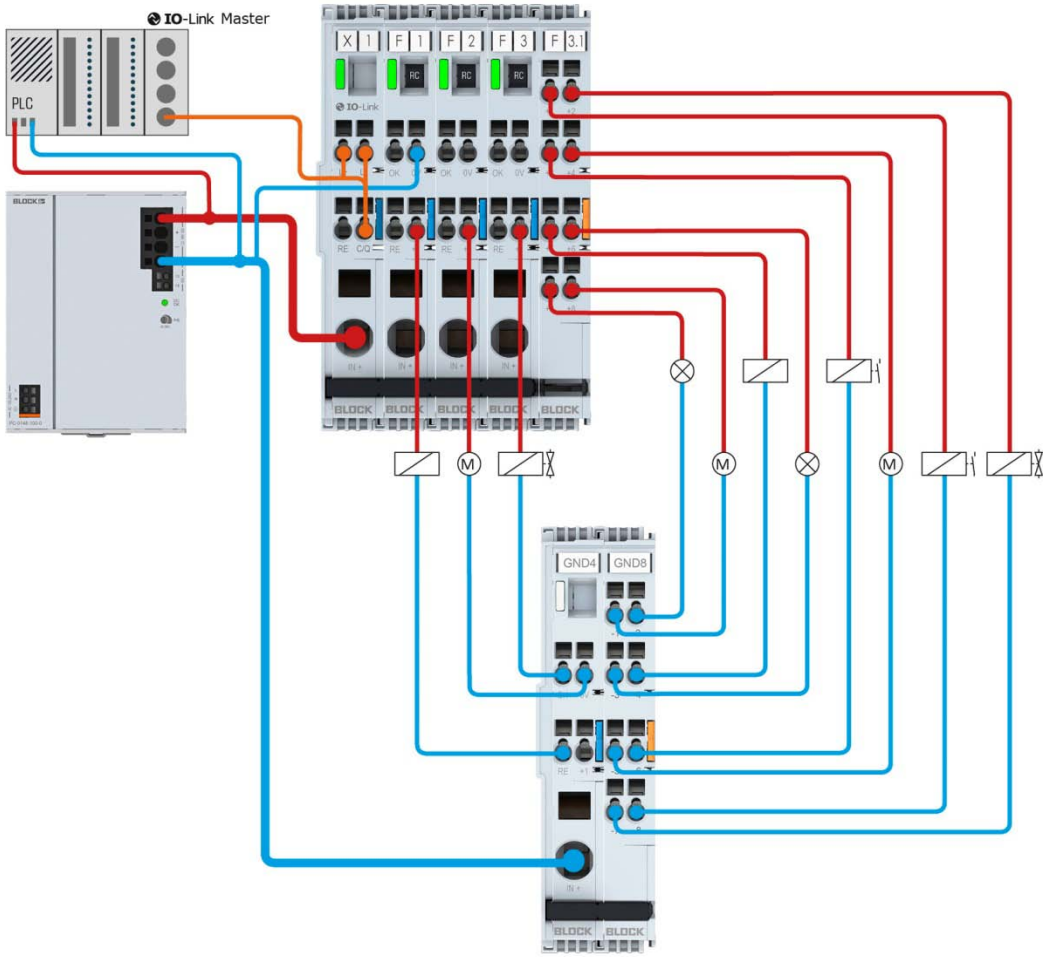

Illustration 1 Establishing a Network with EB-GND4/8

Modules used in the system structure:

X1 EB-IO-LINK
F1 EB-0824-100-0
F2 EB-0824-100-0
F3 EB-0824-100-0
F3.1 EB-PMM
GND4 EB-GND4
GND8 EB-GND8

Note:

Deviations in the wiring can destroy the modules.
The IO-LINK cable must not exceed a maximum length of 20m.

2.3 Dimensions

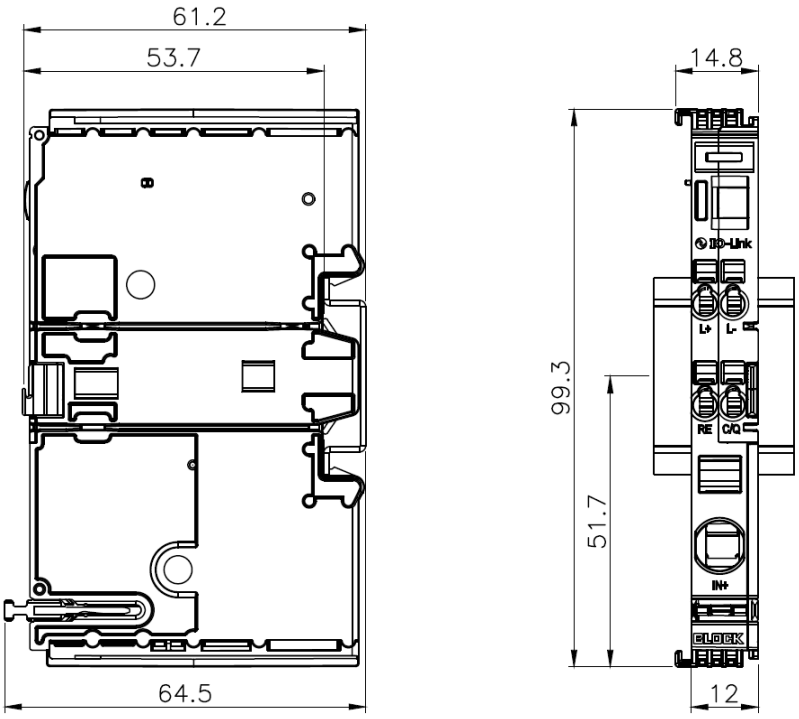

Illustration 2 Dimensions

2.4 Assembly

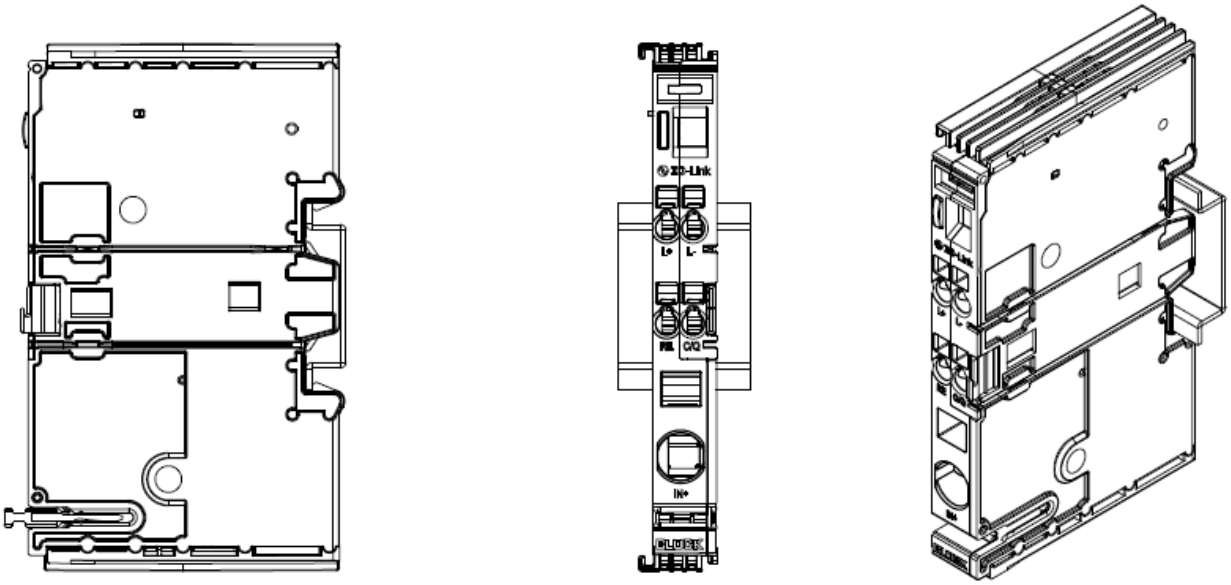

Illustration 3 Assembly

2.5 Connections and Signaling

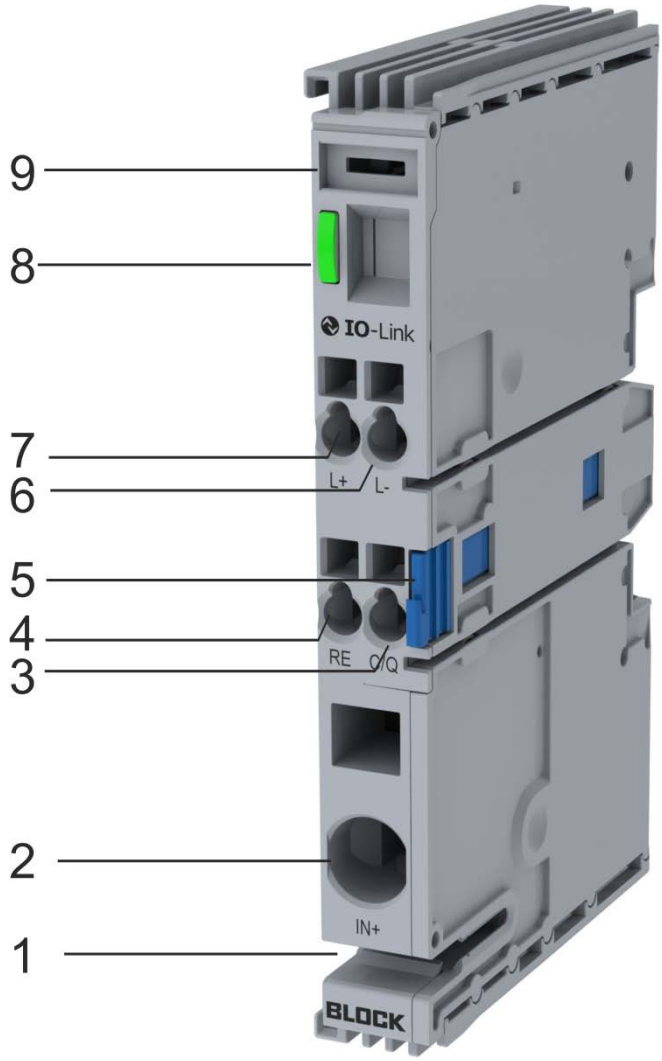

Illustration 4 Overview of Connections and Signaling

1) Mounting EB-BAR cross connector
2) Power terminal up to a max. of 40A
3) C/Q Communication
4) RE reset input
5) Unlocking latch
6) L- Communication
7) L+ Communication
8) LED Indicator
9) Labeling field

3. Initialization

The EB-IO-LINK module initializes itself by applying the supply voltage to terminal IN + or by setting up the IO-Link connection.

Functional operation is only made possible by connecting circuit breaker modules and applying the supply voltage to IN +.

After the supply voltage has been applied, all connected circuit breakers are addressed one after the other and then selectively switched on, one after the other.

Using the IO-Link module, a maximum of 40 circuit breaker channels can be addressed and managed.

To simplify initialization and configuration, the associated IODD can be downloaded from the following via the following link.

Note:

When applying the supply voltage to IN+, it is imperative that a separate GND line is connected to one of the circuit breaker channels.
Initialization without a series of circuit breaker modules can lead to faulty behavior.

3.1 Operating statuses

The EB-IO-LINK module has an LED to indicate the respective operating status.

Table 1 Operating Statuses

Operating Status	LED Indicator	Comments
Switched on, offline	Flashes green	Network is switched on and addressed, no IO-Link communication
Switched on, online	Green	Network is switched on and addressed, IO-Link communication is established
Off	Off	No supply voltage or IO-Link connection

3.2 Communication

The EB-IO-LINK communication module communicates according to the V1.1 IO-LINK standard and is backwards compatible with the V1.0.1 IO-LINK standard. For communication with the communication module and the connected network, a version V1.1 or V1.0 IO-Link Master is required.

The communication module operates in COM 3 mode (230.4 kB) and exchanges 6 bytes of process data with the Master per cycle (2 ms).

4. Process Data and Parameters

The EB-IO-LINK module has 6 bytes of process data which are exchanged with the Master every 2 ms. The structure and arrangement of these data is discussed in detail in Chapter 4.1.

The parameters and diagnostic data of each individual circuit breaker channel are transmitted in addition to the process data, see chapter 4.2 and chapter 4.3.

4.1 Process Data

The process data is exchanged with the IO-Link Master in a cycle of 2ms with 230400 baud. The process data consists of a total of 6 bytes. The coding of the individual bytes can be found in Tables 2-8.

Table 2 Process Data Collective Message Byte 1

Byte 1	MSB				LSB			
Description	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
00 Collective Message Channel Tripped / Switched Off	0	0	0	0	0	0	0	1
01 Collective Message Current >90% Nominal	0	0	0	0	0	0	1	0
02 Group Reset	0	0	0	0	0	1	0	0
03 Reserved	0	0	0	0	1	0	0	0
04 Reserved	0	0	0	1	0	0	0	0
05 Reserved	0	0	1	0	0	0	0	0
06 Reserved	0	1	0	0	0	0	0	0
07 Input Voltage Alarm	1	0	0	0	0	0	0	0

Table 3 Process Data eBreaker Tripped Byte 2

Byte 2	MSB				LSB			
Description	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
08 eBreaker 01 Tripped	0	0	0	0	0	0	0	1
09 eBreaker 02 Tripped	0	0	0	0	0	0	1	0
10 eBreaker 03 Tripped	0	0	0	0	0	1	0	0
11 eBreaker 04 Tripped	0	0	0	0	1	0	0	0
12 eBreaker 05 Tripped	0	0	0	1	0	0	0	0
13 eBreaker 06 Tripped	0	0	1	0	0	0	0	0
14 eBreaker 07 Tripped	0	1	0	0	0	0	0	0
15 eBreaker 08 Tripped	1	0	0	0	0	0	0	0

Table 4 Process Data eBreaker Tripped Byte 3

Byte 3	MSB				LSB			
Description	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
16 eBreaker 09 Tripped	0	0	0	0	0	0	0	1
17 eBreaker 10 Tripped	0	0	0	0	0	0	1	0
18 eBreaker 11 Tripped	0	0	0	0	0	1	0	0
19 eBreaker 12 Tripped	0	0	0	0	1	0	0	0
20 eBreaker 13 Tripped	0	0	0	1	0	0	0	0
21 eBreaker 14 Tripped	0	0	1	0	0	0	0	0
22 eBreaker 15 Tripped	0	1	0	0	0	0	0	0
23 eBreaker 16 Tripped	1	0	0	0	0	0	0	0

Table 5 Process Data eBreaker Tripped Byte 4

Byte 4	MSB				LSB			
Description	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
24 eBreaker 17 Tripped	0	0	0	0	0	0	0	1
25 eBreaker 18 Tripped	0	0	0	0	0	0	1	0
26 eBreaker 19 Tripped	0	0	0	0	0	1	0	0
27 eBreaker 20 Tripped	0	0	0	0	1	0	0	0
28 eBreaker 21 Tripped	0	0	0	1	0	0	0	0
29 eBreaker 22 Tripped	0	0	1	0	0	0	0	0
30 eBreaker 23 Tripped	0	1	0	0	0	0	0	0
31 eBreaker 24 Tripped	1	0	0	0	0	0	0	0

Table 6 Process Data eBreaker Tripped Byte 5

Byte 5	MSB				LSB			
Description	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
32 eBreaker 25 Tripped	0	0	0	0	0	0	0	1
33 eBreaker 26 Tripped	0	0	0	0	0	0	1	0
34 eBreaker 27 Tripped	0	0	0	0	0	1	0	0
35 eBreaker 28 Tripped	0	0	0	0	1	0	0	0
36 eBreaker 29 Tripped	0	0	0	1	0	0	0	0
37 eBreaker 30 Tripped	0	0	1	0	0	0	0	0
38 eBreaker 31 Tripped	0	1	0	0	0	0	0	0
39 eBreaker 32 Tripped	1	0	0	0	0	0	0	0

Table 7 Process Data eBreaker Tripped Byte 6

Byte 6	MSB				LSB			
Description	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
40 eBreaker 33 Tripped	0	0	0	0	0	0	0	1
41 eBreaker 34 Tripped	0	0	0	0	0	0	1	0
42 eBreaker 35 Tripped	0	0	0	0	0	1	0	0
43 eBreaker 36 Tripped	0	0	0	0	1	0	0	0
44 eBreaker 37 Tripped	0	0	0	1	0	0	0	0
45 eBreaker 38 Tripped	0	0	1	0	0	0	0	0
46 eBreaker 39 Tripped	0	1	0	0	0	0	0	0
47 eBreaker 40 Tripped	1	0	0	0	0	0	0	0

4.2 Acyclic I/O Data of the Communication Module

The acyclic I/O data is information that can be queried directly by the EB-IO-LINK communication module. The query is made using a function block provided by the IO-LINK Master manufacturer.

In addition to the standard information (up to index 37), parameters can be specified and retrieved here, as shown below in **Table 8**:

Table 8 Acyclic I/O Data

Index dec	Functions	Data Type	Attribute	Comments
16	Vendor Name	String	RO	IO-Link Interface and System Specification V1.1.2
17	Vendor Text	String	RO	IO-Link Interface and System Specification V1.1.2
18	Product Name	String	RO	IO-Link Interface and System Specification V1.1.2
19	Product ID	String	RO	IO-Link Interface and System Specification V1.1.2
20	Product Text	String	RO	IO-Link Interface and System Specification V1.1.2
21	Product Serial Number	String	RO	IO-Link Interface and System Specification V1.1.2
22	Hardware Revision	String	RO	IO-Link Interface and System Specification V1.1.2
23	Firmware Revision	String	RO	IO-Link Interface and System Specification V1.1.2
24	Application Specific Tag	String	R/W	IO-Link Interface and System Specification V1.1.2
32	Error Count	16 Bit	RO	IO-Link Interface and System Specification V1.1.2
36	Device Status	8 Bit	RO	IO-Link Interface and System Specification V1.1.2
37	Detailed Device Status	String	RO	IO-Link Interface and System Specification V1.1.2
81	Gateway Options	8 Bit	R/W	Options of the communication module
90	Input Voltage	16 Bit	RO	Input voltage level at the power terminal
91	Number of Nodes	8 Bit	RO	Number of addressed circuit breakers
100	ThresholdCriticalInputVoltageMax	16 Bit	R/W	Upper limit for input voltage alarm
101	ThresholdCriticalInputVoltageMin	16 Bit	R/W	Lower limit for input voltage alarm
102	Enable Events	8 to	R/W	Events for the first process data byte

4.3 Acyclic I/O Data of the Network

Acyclic I/O data is information that can be obtained directly from the circuit breaker channels, shown below in **Table 9**.

The different codes for the data are shown below.

Table 9 Acyclic I/O Data Composite

Index dec	Functions	Data Type	Attribute	Comments
70	eBreaker RC_Status 1-8	8 Bit	RO	Check bit for the setting of the current
71	eBreaker RC_Status 9-16	8 Bit	RO	Check bit for the setting of the current
72	eBreaker RC_Status 17-24	8 Bit	RO	Check bit for the setting of the current
73	eBreaker RC_Status 25-32	8 Bit	RO	Check bit for the setting of the current
74	eBreaker RC_Status 33-40	8 Bit	RO	Check bit for the setting of the current
80	eBreaker Command(ON/OFF/RESET)	8 Bit	WO	Switching on / Switching off / Resetting the individual circuit breakers
82	eBreaker Set Options to ALL	8 Bit	WO	Transfer the first circuit breaker options to all modules
83	eBreaker Reset Trip Counter 1-40	8 Bit	WO	Reset the trip counter. Automatically 0 after restart
201 – 240	eBreaker Trip Counter	8 Bit	RO	Trip counter of the circuit breaker
301 – 340	eBreaker Current	16 Bit	RO	Actual current
401 – 440	eBreaker Trip Current	8 Bit	RW	Tripping current
501 – 540	eBreaker Status	8 Bit	RO	Status of the circuit breaker (see Table 10)
601 – 640	eBreaker Software Version	16 Bit	RO	Software version of the circuit breaker
701 – 740	eBreaker Options	16 Bit	RW	Options of the circuit breaker
801 – 840	eBreaker Production Number	String	RO	Production number of the circuit breaker
901 – 940	eBreaker Type	8 Bit	RO	Type designation of the circuit breaker

4.3.1 Coding of the Circuit Breaker Currents

Coding of the tripping currents (Index 401-416) is shown in **Table 10**:

Table 10 Coding of the Currents

Dec. value	Functions	Comments
0	Default	IODD DEFAULT
5	0.5	Tripping current 0.5A
10	1	Tripping current 1A
20	2	Tripping current 2A
30	3	Tripping current 3A
40	4	Tripping current 4A
50	5	Tripping current 5A
60	6	Tripping current 6A
80	8	Tripping current 8A
100	10	Tripping current 10A

4.3.2 Coding of the Circuit Breaker Status

Coding of the status (Index 501-540) is shown in **Table 11**:

Table 11 Coding of the Status

Dec. value	Functions	Comments
0	N.C.	Not connected
1	Switched Off	Switched off via interface
2	Switched On	Switched on
3	Tripped	Tripped
6	Current >90% Nominal	Current >90% Nominal
14	Current >100% Nominal	Current >100% Nominal
18	Tripped, Hardware Error	Hardware error
20	Tripped, thermal release	Thermal release
50	Switched Off, local	Switched off locally

Note:
If a circuit breaker was switched off locally, it can only be switched back on locally. This functionality is used for safety purposes when working on the system.

4.3.3 Coding of the Circuit Breaker Options

Coding of the options (Index 701 - 740) is shown in **Table 12**:

Table 12 Coding of Options

	MSB1				LSB1				MSB0				LSB0			
Description	**Bit7**	**Bit6**	**Bit5**	**Bit4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**	**Bit7**	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Tripped / Tripped OFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
OK inverted / non inverted	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Auto Addr On / Off	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Note:
The circuit breaker options correspond to delivery condition 3 (dec.) – i.e., the first two options are set.
The "Auto Addr On / Off" option is only available as of the circuit breaker firmware version 1.12 (RO) and indicates whether automatic address assignment is switched on or off.

4.3.4 Coding of the Circuit Breaker Types

Coding of the types (Index 901-940) is shown in **Table 13**:

Table 13 Coding of Types

Dec. Value	Name	Type	Tripping Currents
170	EB-3824-100-0	Circuit breakers	Tripping currents can only be set via the interface (0.5 - 10A)
138	EB-0824-100-0	Circuit breakers	Tripping currents adjustable via interface or at the circuit breaker (0.5 - 10A)
145	EB-1824-010-0	Circuit breakers	Fixed value 1A nominal
146	EB-1824-020-0	Circuit breakers	Fixed value 2A nominal
147	EB-1824-030-0	Circuit breakers	Fixed value 3A nominal
148	EB-1824-040-0	Circuit breakers	Fixed value 4A nominal
150	EB-1824-060-0	Circuit breakers	Fixed value 6A nominal
152	EB-1824-080-0	Circuit breakers	Fixed value 8A nominal
154	EB-1824-100-0	Circuit breakers	Fixed value 10A nominal

4.3.5 Coding of the Circuit Breaker Commands

Coding of commands (Index 80) is shown in **Table 30**:

Table 14 Coding of Commands

Dec. Value	Name	Comments
1	ON	Channel 1 On
2	OFF	Channel 1 Off
3	RESET	Channel 1 Reset
6	ON	Channel 2 On
7	OFF	Channel 2 Off
8	RESET	Channel 2 Reset
11	ON	Channel 3 On
12	OFF	Channel 3 Off
13	RESET	Channel 3 Reset
…	…	…

Note:
The addresses of the channels are formed using an offset of decimal 5.

4.3.6 Coding for Reset of the Circuit breaker Trip Counter

The coding of the reset function (Index 83) for the trip counter is shown in **Table 30**:

Table 15 Coding of the Reset

Dec. value	Functions	Comments
1	RESET	Channel 1 Reset Trip Counter
2	RESET	Channel 2 Reset Trip Counter
3	RESET	Channel 3 Reset Trip Counter
4	RESET	Channel 4 Reset Trip Counter
5	RESET	Channel 5 Reset Trip Counter
6	RESET	Channel 6 Reset Trip Counter
…	…	…

Note:
The addresses of the channels are formed using the channel numbers.