CPC12MB *ControlPlex*®
CONTROLLER

Instruction manual

E-T-A
ENGINEERING TECHNOLOGY

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1 GENERAL INFORMATION

1.1 Safety Instructions

This manual points out possible danger for your personal safety and gives instruction how to avoid property damage. The following safety symbols are used to draw the reader's attention to the safety instructions included in this manual.

DANGER!
Danger to life and limb unless the following safety precautions are taken.

WARNING!
Danger to machinery, materials or the environment unless the following safety precautions are taken.

NOTE!
Information is provided to allow a better understanding.

CAUTION!
Electrostatically sensitive devices (ESD). Devices must exclusively be opened by the manufacturer.

DISPOSAL GUIDELINES
Packaging can be recycled and should generally be brought to re-use.

1.2 Qualified Personnel

This user manual must exclusively be used by qualified personnel, who are able - based on their training and experience - to realise arising problems when handling the product and to avoid related hazards. These persons must ensure that the use of the product described here meets the safety requirements as well as the requirements of the presently valid directives, standards and laws.

1.3 Use

The product is part of a continuous enhancement process. Therefore, there might be deviations between the product in hand and this documentation. These deviations will be remedied by a regular review and resulting corrections in future editions. The right to make changes without notice is reserved. Errors and omissions excepted.

1.4 Delivery State

The product is supplied with a defined hardware and software configuration. Any changes in excess of the documented options are not permitted and lead to liability exclusion.

2 GENERAL DESCRIPTION

The customer’s demands for consistent quality and increased quantities of their products pose high challenges on the machine construction and process control. At the same time, globalisation leads to worldwide value streams and production chains. Machines and plants that were organised only region- ally some years ago are connected via global networks today. These developments increase the requirements of machine and system control as well as the used components. An increasing number of measuring data must be recorded, analysed, evaluated and stored. This increases transparency and the system availability of production processes.

Even the DC 24 V power distribution is affected by this development. The control voltage supplies the essential components of machines or systems. They include not only the programmable controls, but e.g. actuators and sensors. Therefore, it plays an important part in all production processes. Their availability and stability are essential for the system availability and the quality of the produced goods. The REX system meets these requirements. It includes electronic circuit protectors, which are connected without requiring further accessories via an integral contact arm. The EM12 supply module can supply the circuit protectors with max. 40 A. The new CPC12 bus controller provides access to all system relevant data of the superordinate control systems via a Modbus-TCP interface and an Ethernet interface.

This is how the CPC12 connects the circuit protectors with the superordinate control system. The connection from the REX product group to the intelligent circuit protectors are realised via the internal ELBus® interface. The CPC12 allows entire access to all required parameters of the electronic circuit protectors, their control unit and the visualisation of the device data, either via the field bus interface of the superordinate control unit or via the RJ45 interface for operation on site. The system provides a fully parametrisable protection for DC 24 V circuits and ensures the selective overcurrent protection of sensors and actuators, decentralised periphery modules etc. and their supply lines.

1 For a clear presentation and description, the intelligent circuit protectors are only named with their system designation REX. This indication includes the REX12D and REX22D circuit protectors.

2.1 Design of the Entire System

The CPC12 bus controller is the centre of the ***ControlPlex***® system. It allows consistent communication between the electronic circuit protectors and the superordinate control level, connected HMIs and even up to the Cloud.

The Modbus-TCP interface connection to the superordinate control unit is realised with two RJ45 sockets. It allows connection of the required control unit with the ***ControlPlex***® system and therefore, to display, analyse and diagnose the individual measuring values. The individual electronic circuit protectors can be con- trolled selectively. The integral web server of the bus controller can be directly accessed via an additional Ethernet interface. Service staff can access the system on site. Furthermore, the connected infrastructure of the company can be accessed from all over the world. In the future, OPC UA and MQTT provide the option to transmit all measuring values and status information, independent from the control system, e.g. to a superordinate Cloud application. Any changes of the measuring values of all electronic circuit protectors are also signalled to the automation system. This enables the user to have unrestricted access to the safety-relevant functions even in the event of an interruption. Any occurring failures will be detected quickly and can be remedied without delay. The ***ControlPlex***® system effectively reduces system downtimes and significantly increases productivity.

Up to 16 double-channel electronic circuit protectors can be connected to the CPC12 bus controller.

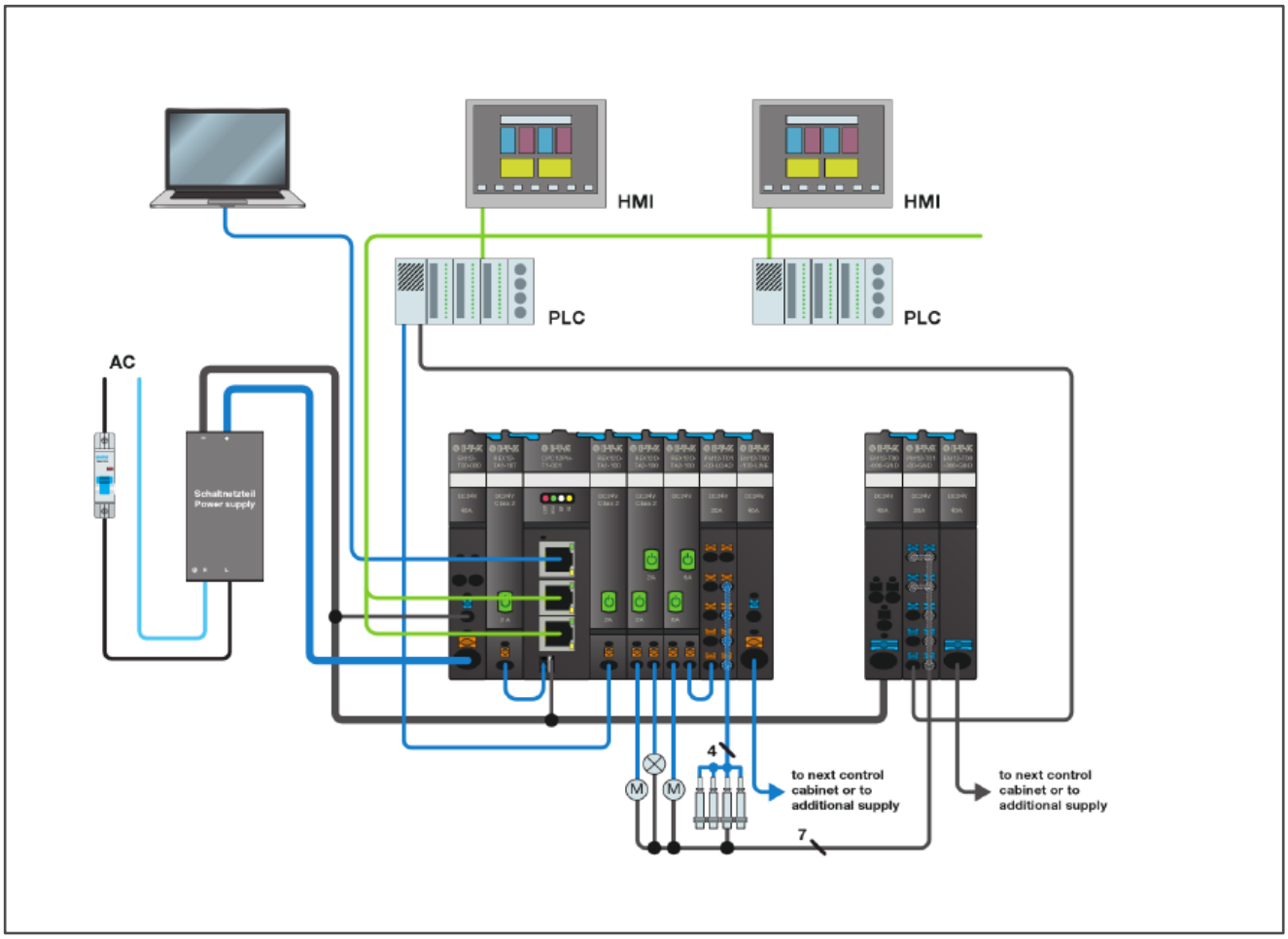

Figure 1: System Overview

2.2 CPC12XX-TX Dimensions

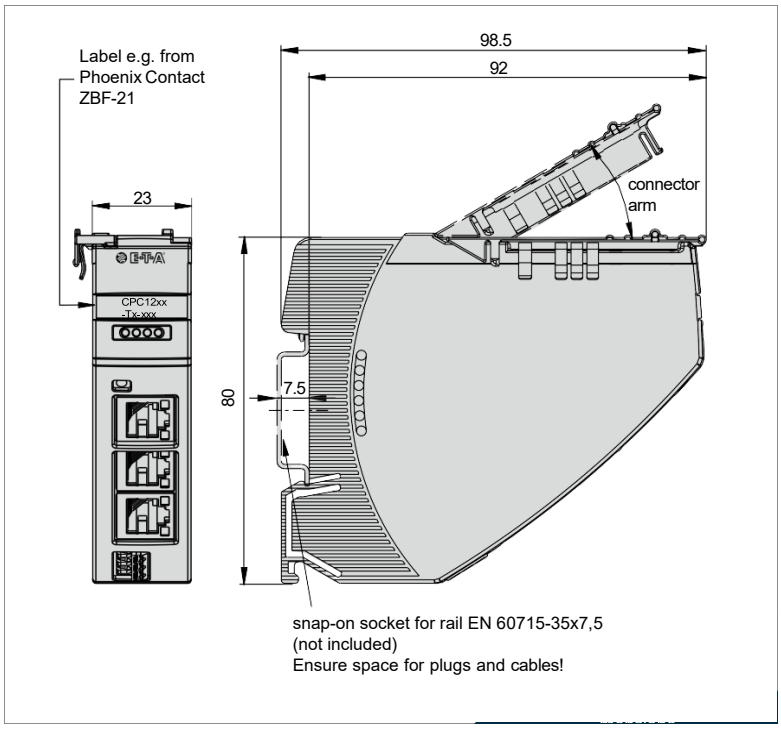

Figure 2: CPC12 dimensions

2.3 Status Indication and Terminals

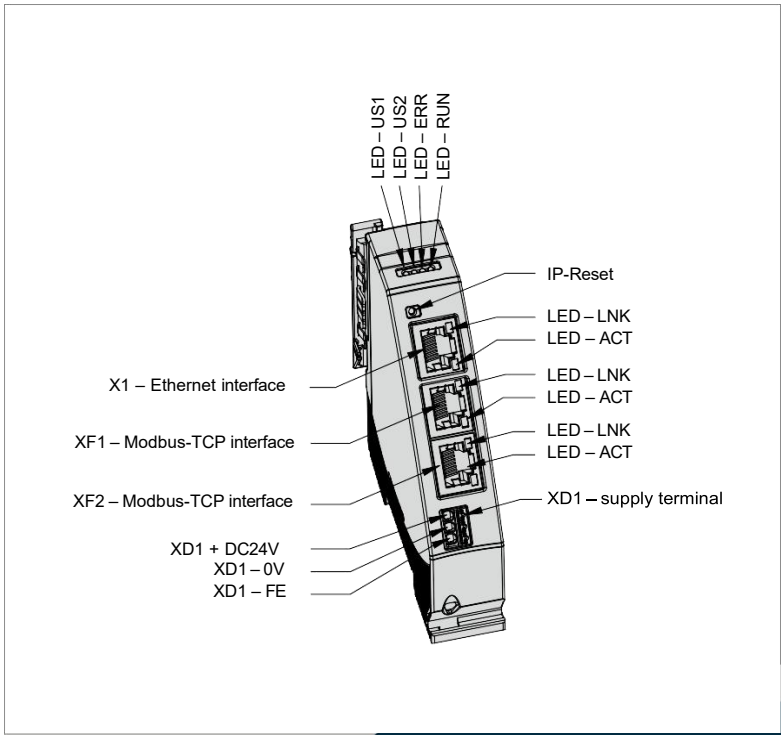

Figure 3: CPC12 Status Indication and Terminals

2.3.1 Terminals for Voltage Supply

Supply XD1

Voltage ratings:	DC 24 V (±5 % → 18 ... 30 V)	
Rated current:	typ. 75 mA	
Terminal design:	3 x push-in terminals (+/0V/ FE)	
	max. cable cross section rigid	0.2 – 1.5 mm^2
	flexible with wire end ferrule (without plastic sleeve)	0.2 – 1.5 mm^2
	flexible with wire end ferrule (with plastic sleeve)	0.2 – 0.75 mm^2
	cable cross section	AWG24 – AWG16 str.
	stripping length	8 mm

Using a supply voltage outside the indicated operating range can cause malfunctions or destruction of the device.

The power supply of the CPC12 bus controller is also ensured by the EM12 supply module through the integrated connector arm. The use of the power supply terminal XD1 is optional.

2.3.2 Modbus TCP Interfaces with Integral Switch, XF1, XF2 Sockets

XF1 Connection to bus system Modbus TCP
Type: RJ45

XF2 Connection to bus system Modbus TCP
Type: RJ45

When wiring and connecting to the bus system Modbus TCP, the installation and wiring regulations of the Modbus TCP Specification have to be observed.

2.3.3 Ethernet Interface, Connector X1

X1 Connection to the CPC12 bus controller and the integral web server
Type: RJ45

2.3.4 LED Status Indication

Visual status indication by means of multicoloured LED:

Operating mode	Indication of operating mode	
	LED US1	LED US2
Supply voltage OK	Green	n.a.
Firmware Update	Off	Off
Actuator voltage OK	Green	Green
No actuator voltage	Green	Red
No connected device or bus error	Green	Orange blinking

Figure 4: LED status indication

n.a. = not applicable

Communication Error	
Operating mode	**LED ERR**
No error	Off
Communication error	Red
Internal error	Red blinking

Communication Status	
Operating mode	**LED RUN**
TCP connected	Green
Waiting for communication	Green blinking (5 Hz)
Internal configuration	Green blinking (1 Hz)
Not ready	Red blinking

Figure 5: LED status indication fieldbus

Optical signalling of the RJ45 interfaces:

LED LNK

Operating mode	Indication of operating mode
Link available	Green
No link available	Off

LED ACT

Operating mode	Indication of operating mode
Act available	Orange blinking
No act available	Off

Figure 6: RJ45 sockets LED indication

3 MOUNTING AND INSTALLATION

The preferred mounting position of the ***ControlPlex***® system is horizontal.

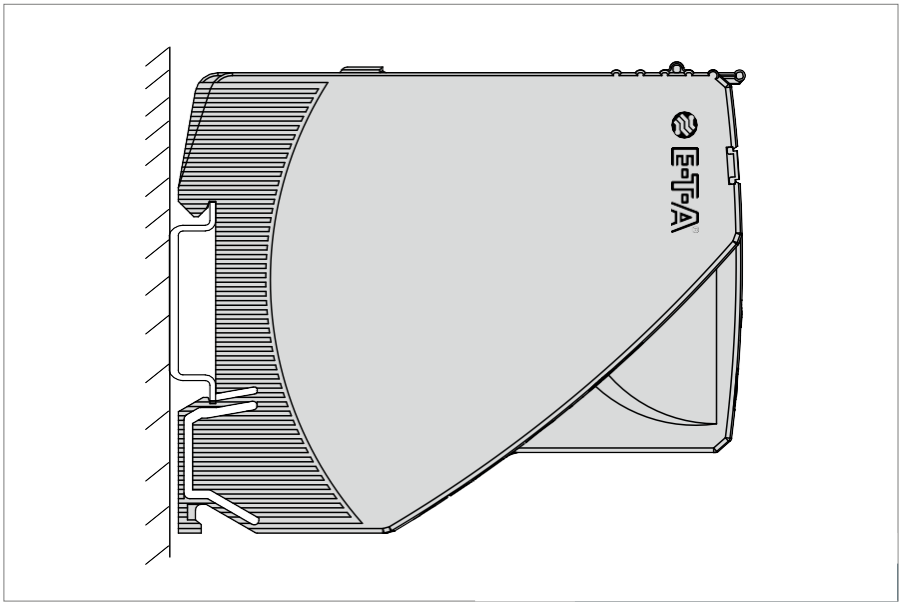

Figure 7: CPC12 installation drawing

4 OPERATING MODES OF THE CPC12 BUS CONTROLLER

Independent of the respective operating mode, the system has a basic safety function. As soon as a circuit protector channel is switched off manually, it cannot be switched on again via the control or the web server. The channel must be switched on manually again.

4.1 Operating Mode: Start-Up Mode

The CPC12 bus is initialised by applying the supply voltage. The device carries out internal programme memory tests and self-test routines. Communication via the interfaces is not possible in this time.

4.2 Operating Mode: System Error Mode

If a failure is detected during the self-test routines, the bus controller will change into the System Error operating mode. You can only exit this operating mode by re-starting the device and it prevents the data exchange via the interfaces. If the bus controller is in the aforementioned operating mode, it is unable to control the electronic circuit protectors and they will remain in the stand-alone mode (overcurrent protection).

4.3 Operating Mode: Configuration Error Mode

If there are no valid or invalid configuration data available at the Modbus controller, it will change into this operating mode. This operating mode only allows a non-cyclical data exchange. The cyclical data exchange is prevented. You can exit this operating mode upon receipt of the correct module and slot parameters and configuration data.

4.4 Operating Mode: Stand-Alone Mode

During normal operation, there is a connection between the bus controller and the superordinate control unit. The CPC12 bus controller will automatically take over the control and parametrisation of the electronic circuit protectors, as all required data sets are stored there. You can access the electronic circuit protectors and their status and parameters via the Ethernet interface by means of the web server. This way, you can change e.g. the parameter data of the various electronic circuit protectors. After the failure on the communication level is remedied, you can exit this operating mode and the superordinate control unit will take over control again as master. If a parameter was changed during the time when no communication was available, this will be signalled to the superordinate control unit. This helps the user define the control behaviour accordingly and programme it in the programmable control unit. This allows the users to select a reaction perfectly adapted to their requirements.

4.5 Operating Mode: Slave Mode

In this operating mode, the CPC12 bus controller is integrated in a Modbus-TCP system. The communication to the CPC12 bus controller works faultlessly and the controller can be addressed and controlled via the superordinate control unit. If communication breaks down, this will have no influence on the protective function of the circuit protectors. You can determine the bus controller behaviour in case of parallel use of the field bus interface and the web server via the device configuration of the superordinate control unit. You can specify whether the Ethernet interface or the web server only has reader access or reader and editor access. The editor access allows to make changes to the parametrisation of the electronic circuit protectors as well as to the field bus system. These parameter changes will then be transmitted to the superordinate control system and can be taken over by it or overwritten. The user can select the behaviour accordingly.

4.6 Operating Mode: Firmware Update Mode

The devices are supplied with a software programmed according to their functionality. If the function scope of the devices is extended, the new functions are added via the firmware update. If you want to use the new function, you must carry out a firmware update.

The firmware updates of the bus controller can be downloaded via the integral web server. You can find further information on this in the instruction manual of the web server. The current firmware file is available in the download portal of the ***ControlPlex***® systems via the E-T-A homepage.

INSTRUCTION MANUAL
WEB SERVER

DOWNLOAD PORTAL LINK
CONTROLPLEX SYSTEMS

5 BASIC FUNCTIONS OF THE ENTIRE SYSTEM

5.1 Internal Cycle Times

The cycle time of the system depends on the number of connected electronic circuit protectors and the internal baud rate. The internal baud rate can amount to 9600 Baud or 19200 Baud. The baud rate only amounts to 19200 when all connected circuit protectors support this function. These are normally REX22D circuit protectors and REX12D devices with the software version 2.0.2 printed on their enclosure.* The software version can be found below the white type label on the front side of the REX12D. The baud rate is displayed in the cyclical data in the “Status Controller”. The current cycle time can be requested via the non-cyclic access to the “dynamic CPC12 information”.

The cycle time for 16 circuit protectors at an internal baud rate of 9600 Baud is about 480 ms for the cyclic data, i.e. 30 ms per device. A time window of 130 ms is reserved for non-cyclic data. This makes a total cycle time of max. 610 ms. With an internal Baud rate of 19200 Baud the cycle time for cyclical data is reduced to about 240 ms, i.e. 15 ms per device. A time window of 100 ms is reserved for non-cyclic data. This makes a total cycle time of max. 340 ms.

5.2 Hot Swap of the Circuit Protectors

If a new circuit protector is installed at an existing application, it is automatically parametrised with the parameters designated for this circuit protector address. The parameter transmission will be done without interruption of the cyclical data exchange between the CPC and the electronic circuit protectors.

5.3 Additional Ethernet Interface

The additional Ethernet interface (X1) expands the function scope of the bus controller. The following functions are provided via this interface:

5.3.1 Web Server

The web server provides all measuring data, status information, parametrisation options and control functions of the CPC12 bus controller. The parametrisation of the interface is explained separately.

5.3.2 Default X1 IP address

The default IP address of the CPC12 is:

IP Address	192.168.1.1
Netmask	255.255.255.0
Gateway	192.168.1.254

The web server can be reached via this IP address. By pressing the IP reset button for 3 seconds, the IP address is reset to the default value.

* Customised solutions are excluded from this regulation.

5.3.3 Username and Password

The user must have the necessary access authorisation to be able to carry out configurations via the web server. This authorisation is defined in the user administration.

The default setting is:

User	admin
Password	admin

It is highly recommended to individually adjust the device settings during the first operation.
Please note that it is not possible to automatically reset the user and password to the default settings.

6 COMMUNICATION VIA MODBUS TCP

Modbus is an application layer messaging protocol, positioned at level 7 of the OSI model, which provides client/server communication between devices. The default TPC/IP port for Modbus is 502.
Modbus is a request/reply protocol and offers services specified by function codes and register addresses. Each Modbus register contains two bytes of data.

The default IP address for CPC12MB on connector XF1 and XF2 is:

IP Address	192.168.0.10
Netmask	255.255.255.0
Gateway	192.168.0.254

By pressing the IP-Reset button for 3 seconds, the Modbus TCP IP address is reset to the default value.

6.1 *ControlPlex*® Device Model

The power distribution system with CPC12 controller consists of a passive supply module EM12-T00-000-DC24V-40A and up to 16 intelligent circuit protectors of the REX series.
The power distribution system ***ControlPlex***® uses the following Modbus TCP model:

Modbus Address	CPC12MB
40001 - 40099	This address range represents the CPC12 controller. All system wide information and settings can be accessed through this class. Details are described in Chapter 8.
40100 – 49999	This address range represents the circuit protectors connected to the CPC12. All circuit breaker specific information and settings can be accessed as described in Chapter 8. If more than 16 circuit protectors are connected, these cannot be accessed by the PLC. The CPC12 allows configuration of 1 to max. 16 circuit protectors.

Figure 8: Communication properties

6.2 Channel Allocation

Each of the circuit protectors is represented by 2 channels even if the connected circuit breaker contains only one output channel. Channels are counted in ascending order as follows.

Channels are counted in ascending order as follows.
circuit protector 1, load output 1: channel 1
circuit protector 1, load output 2: channel 2
circuit protector 2, load output 1: channel 3
circuit protector 2, load output 2 not available: channel 4
circuit protector 3, load output 1: channel 5
circuit protector 3, load output 2: channel 6

7 MODBUS-REGISTER OVERVIEW

The CPC12MB supports following function codes:
3 Read Holding Registers: Address Range 40001 – 49999
6 Write Single Register: Address Range 40001 – 49999
16 Write Multiple Registers: Address Range 40001 – 49999
4 Read Input Registers: Address Range 30001 - 39999

All registers available with function code 03 are also available with function code 04 within its address range.

The access to the data of CPC12 is grouped as follows:

Modbus Address	Number of registers	Function code	Reading (R) Writing (W))	Description
47500	1	3, 4	R	Status information of CPC12 controller (see chapter 8.1.1)
47401	1	3, 4	R	Total current of all circuit protectors (see chapter 8.1.2)
40020 – 40030	11	3, 4	R	Device information of CPC12 controller (see chapter 8.1.3)
40001 – 40003	3	3, 4, 6, 16	R/W	Configuration data of CPC12 controller (see chapter 8.1.4)
40050	1	6, 16	W	Action commands for all channels and the CPC12 controller (see chapter 8.1.5)
40031	1	3, 4	R	Dynamic information of CPC12 controller (see chapter 8.1.6)

Figure 9: Modbus Register CPC12

The access to each circuit protectors is divided into two channels.
The access to the data of each channels is grouped as follows:

Modbus Address	Number of registers	Function code	Reading (R) Writing (W))	Description
47201 - 47232	32	3, 4	R	Status information of channel 1 - 32 (see chapter 8.2.1)
47001 - 47032	32	3, 4	R	Load voltage of channel 1 - 32 (see chapter 8.2.2)
47101 - 47132	32	3, 4	R	Load current of channel 1 - 32 (see chapter 8.2.3)
47301 - 47332	32	6, 16	W	Control output of channel 1 - 32 (see chapter 8.2.4)
40101 - 40132 **40201 - 40232**	32	3, 4, 6, 16	R/W	Device parameters of channel 1 - 32 (see chapter 8.2.5)

Modbus Address	Number of registers	Function code	Reading (R) Writing (W))	Description
42001 – 42032 **42101 – 42132** **42201 – 42232** **42301 – 42332** **42401 – 42432** **42501 – 42532** **42601 – 42632** **42701 – 42732** **42801 – 42832** **42901 – 42932** **43001 – 43032**	32	3, 4	R	Device information of channel 1 - 32 (see chapter 8.2.6)
41001 - 41032	32	3, 4, 6, 16	R/W	Configuration data of channel 1 - 32 (see chapter 8.2.7)
45101 - 45132	32	3, 4	R	Event message of channel 1 - 32 (see chapter 8.2.8)
45001 – 45032	32	6, 16	W	Action commands for channel 1 - 32 (see chapter 8.2.9)
43101 – 43132 **43201 – 43232** **43301 – 43332** **43401 – 43432** **43501 – 43532** **43601 – 43632** **43701 – 43732** **43801 – 43832** **43901 – 43932** **44001 – 44032** **44101 – 44132** **44201 – 44232**	32	3, 4	R	Diagnosis data of channel 1 - 32 (see chapter 8.2.10)

Figure 10: Modbus Register Channels

8 MODBUS REGISTER CONTENT

8.1 Bus controller CPC12

8.1.1 CPC12 Status

The 2 bytes contain the following global error and diagnostic messages.
This register is only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Status Controller	47500	UInt16	0xFFFF	bit 0 = no configuration data available bit 1 = invalid configuration data bit 2 = connected device type differs from configuration bit 3 = parameters restored bit 4 = command buffer overflow bit 5 = no communication to ***ELBus***® 1 bit 6 = reserve bit 7 = reserve bit 8 = reserve bit 9 = CPC temporary error bit 10 = CPC hardware error bit 11 = ***ELBus***® 1 communication speed: 0=9600 Baud, 1=19200 Baud bit 12 = reserve bit 13 = reserve bit 14 = reserve bit 15 = writing access via web server deactivated = 1, allowed = 0

Figure 11: CPC12MB Status

8.1.2 Total Current

This register is only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Total Current	47401	UInt16	0 ... 65535	A standardised 16-bit-value with a resolution of 10 mA is made available. Example for calculation of the measuring value: value (1320)/ 100 ≙ 13.20 Amps

Figure 12: Total Current

8.1.3 Device Information CPC12 Controller

These registers are only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Device Type	40020	UInt16	0 ... 65535	16565 = CPC12MB-T1 This list may be extended by future controllers.
Hardware version	40021	UInt16	0 ... 65535	Holds the hardware version of the installed product
Internal assembly order numbers	High word: 40022 Low word: 40023	UInt32	0 ... 4294967295	Holds the assembly order number of the installed product
Internal order split number	40024	UInt16	0 ... 65535	Holds the internal order split number of the installed product
Production facilities number	40025	UInt16	0 ... 65535	Holds the production facilities number of the installed product
Serial number	High word: 40026 Low word: 40027	UInt32	0 ... 4294967295	Holds the serial number of the installed product
Software version (major.x.x)	40028	Byte	0 … 255	Holds the major software version of the installed product
Software version (x.minor.x)	40029	Byte	0 … 255	Holds the major software version of the installed product
Software version (x.x.build)	40030	Byte	0 … 255	Holds the build software version of the installed product

Figure 13: Device information CPC12MB

8.1.4 Configuration Data CPC12 Controller

These registers are readable and writeable. Function codes 3, 4, 6 and 16 are available.

	Modbus Address	Type	Scope	Description
Configuration data of the CPC	40001	Byte	0 … 255	bit 0 = writing via web server permitted. Allows changing of parameters via the server even when the bus connection is active. bit 1 True: In the event of a fieldbus interruption, the status of the Load outputs is maintained. False: In the event of a fieldbus interruption, all load outputs will be set to the status OFF. bit 2 = power saving mode, the LEDs will be dimmed for power reduction. bit 3 = reserve bit 4 = reserve bit 5 = reserve bit 6 = reserve bit 7 = reserve If not described otherwise “True” means that the function is active.
PLC Lock: Control commands disable ELBus® 1 on CPC channel 1 ... 16	40002	UInt16	0 ... 65535	Each bit represents a channel. (bit 0 = channel 1; bit1 = channel 2 ...) If the bit is set, this means that the channel cannot be switched on or off via the control unit or the web server.
PLC Lock: Control commands disable ELBus® 1 on CPC channel 17 ... 32	40003	UInt16	0 ... 65535	Each bit represents a channel. (bit 0 = channel 17; bit1 = channel 18 ...) If the bit is set, this means that the channel cannot be switched on or off via the control unit or the web server.

Figure 14: Configuration Data CPC12MB

8.1.5 Action Commands CPC12 Controller

The action commands of the controller consist of 1 byte. All action commands being sent to the CPC12 carry out the action for all channels.
This register is only writeable. Function codes 6 and 16 are available.

	Modbus Address	Type	Scope	Description
Action Commands	40050	Byte	0 … 255	116 = reset trip counter 118 = reset device parameters to factory settings including CPC12 [1)] 131 = back to box [2)] 132 = adopt device type configurations to connected devices (see chapter 8.2.7) 192 = reset statistics minimum values 196 = reset statistics maximum values 220 = reset statistics mean values Other values will not be accepted.

Figure 15: Action commands CPC12MB

[1)] The command “118 = reset device parameters to factory settings including CPC12” within the action commands for the CPC12 shall reset the following data:

- parameters (current ratings = 10 A, limit value load current = 80 %) of each channel
- PLC lock bit of each channel (default = True, i.e. Channel not to be controlled by the PLC)
- **not** the configured device types
- **not** the statistical values (min, max, avg) of the channels
- **not** the error memory, trip counter and trip reason of the channels
- configuration data
    - power saving mode = False = LEDs normal
    - behavior of load outputs after fieldbus interruption = True = status is maintained
    - writing via web server permitted = True

[2)] The command »131 = back-to-box« within the action commands for the CPC12 shall reset the following data:

- Parameters (rated current = 10 A, limit value load current = 80 %) of each channel
- PLC lock bit of each channel (default = True, i.e. Channel not controllable by PLC)
- configured device types (default = REX12D-TA1 = 0x9009 = 36873)
- the statistical values (min, max, avg) of the channels
- the error memory, trip counter and trip reason of the channels
- configuration data
    - power saving mode = False = LEDs normal
    - behavior of the load outputs on fieldbus interruption = True = Status is maintained
    - writing via web server permitted = True

- IP configuration of the third ETH port X1
  - IP address = 192.168.1.1
  - Netmask = 255.255.255.0
  - Gateway = 192.168.1.254
  - DHCP = False
- User data
  - User = „admin“
  - Password = „admin“

8.1.6 Dynamic Information CPC12 Controller

This register is only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Cycle time ELBus® 1	40031	UInt16	0 ... 65535	Holds the internal cycle time of the **ELBus®** in milliseconds [ms]

Figure 16: Dynamic Information CPC12MB

8.2 Circuit Protectors/Channels

The parameters of the circuit protectors are described in the following chapters. The parameters are organized in channels.
Each circuit protector has up to two channels.

8.2.1 Status for one Channel

These registers are only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Status Channel	47201 - 47232	Byte	0 ... 255	0xFF (255) ≙ no device available or wrong configuration bit 0 = load output ON bit 1 = short circuit bit 2 = overload bit 3 = low voltage bit 4 = reserve bit 5 = reserve bit 6 = limit value current bit 7 = event / or button pressed “True” means the status is active.

Figure 17: Status Channel

8.2.2 Load Voltage for one Channel

These registers are only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Load voltage channel	47001 - 47032	UInt16	0 ... 65535	A standardised 16-bit-value with a resolution of 10 mV is made available. Example for calculation of the measuring value: value (2512)/100 ≙ 25.12 Volt

Figure 18: Load Voltage Channel

8.2.3 Load Current for one Channel

These registers are only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Load current channel	47101 - 47132	UInt16	0 ... 65535	A standardised 16-bit-value with a resolution of 10 mA is made available. Example for calculation of the measuring value: value (150)/100 ≙ 1.50 Amps

Figure 19: Load Current Channel

8.2.4 Control Output for one Channel

These registers are only writeable. Function codes 6 and 16 are available.

	Modbus Address	Type	Scope	Description
Control channel	47301 - 47332	Byte	0 ... 255	bit 0 = load output ON/OFF bit 1 = reset load output (only responds to rising edge 0 -> 1) bit 2 = reserve bit 3 = reserve bit 4 = reserve bit 5 = reserve bit 6 = reserve bit 7 = reserve “True” means the status is active.

Figure 20: Control Channel

8.2.5 Device Parameters for one Channel

These registers are readable and writeable. Function codes 3, 4, 6 and 16 are available.

	Modbus Address	Type	Scope	Description
Rated current	40101 - 40132	Byte	1 ... max. rated current of the circuit breaker	Holds the current rating of the channel. With adjustable devices, you can set a new current rating here and transmit with a write command. 1 = 1A current rating 2 = 2A current rating 3 = 3A current rating ... 10 = 10A current rating (default value)
Limit value load current	40201 - 40232	Byte	50 ... 100	Determines at which percentage of the current rating of a channel the limit value is exceeded. Exceedance is signaled with a bit in the »status channel« of the cyclical data. The range is from 50 % to 100 %. The default value is 80 %.

Figure 21: Device parameters channel

8.2.6 Device Information for one Channel

These registers are only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Circuit breaker device type	42001 – 42032	UInt16	0 ... 65535	36873 = REX12D-TA1-100 36874 = REX12D-TA2-100 36873 = REX12D-TA1-100 36874 = REX12D-TA2-100 36878 = REX12D-TE2-100 36910 = REX12D-TE2-100-CL2 36905 = REX12D-TB1-100 36937 = REX12D-TA1-100-CL2 36969 = REX12D-TB1-100-CL2 36906 = REX12D-TA2-100-CL2 36942 = REX12D-TE2-101 36974 = REX12D-TE2-101-CL2 37001 = REX12D-TA1-101 36938 = REX12D-TA2-101 37033 = REX12D-TB1-101 37065 = REX12D-TA1-101-CL2 37097 = REX12D-TB1-101-CL2 36970 = REX12D-TA2-101-CL2 37130 = REX22D-TD2-100-CL2 37162 = REX22D-TD2-100 37129 = REX22D-TD1-100 37161 = REX22D-TA1-100 37134 = REX22D-TE2-100 37166 = REX22D-TE2-100-CL2 37194 = REX22D-TD2-101-CL2 37226 = REX22D-TD2-101 37193 = REX22D-TD1-101 37225 = REX22D-TA1-101 37198 = REX22D-TE2-101 37230 = REX22D-TE2-101-CL2 This list may be extended by future circuit protectors.
Hardware version	42101 – 42132	UInt16	0 ... 65535	Holds the hardware version of the installed product
Internal assembly order	High words: 42201 – 42232 Low words: 42301 – 42332	UInt32	0 ... 4294967295	Holds the assembly order number of the installed product
Internal order split number	42401 – 42432	UInt16	0 ... 65535	Holds the internal order split number of the installed product
Production facilities number	42501 – 42532	UInt16	0 ... 65535	Holds the production facilities number of the installed product

	Modbus Address	Type	Scope	Description
Serial number	High words: 42601 – 42632 Low words: 42701 – 42732	UInt32	0 ... 4294967295	Holds the serial number of the installed product
Software version (major.x.x)	42801 – 42832	Byte	0 ... 255	Holds the major software version of the installed product
Software version (x.minor.x)	42801 – 42832	Byte	0 ... 255	Holds the minor software version of the installed product
Software version (x.x.build)	43001 – 43032	Byte	0 ... 255	Holds the build software version of the installed product

Figure 22: Device information channel

8.2.7 Configuration Data for one Channel

These registers are readable and writeable. Function codes 3, 4, 6 and 16 are available.

	Modbus Address	Type	Scope	Description
Circuit breaker device type	0 HighByte 1 LowByte	UInt16	0 ... 65535	The expected device type is adjusted here for the channel. The device type always influences a circuit protector, i.e. both possible channels. 36873 = REX12D-TA1-100 36874 = REX12D-TA2-100 36873 = REX12D-TA1-100 36874 = REX12D-TA2-100 36878 = REX12D-TE2-100 36910 = REX12D-TE2-100-CL2 36905 = REX12D-TB1-100 36937 = REX12D-TA1-100-CL2 36969 = REX12D-TB1-100-CL2 36906 = REX12D-TA2-100-CL2 36942 = REX12D-TE2-101 36974 = REX12D-TE2-101-CL2 37001 = REX12D-TA1-101 36938 = REX12D-TA2-101 37033 = REX12D-TB1-101 37065 = REX12D-TA1-101-CL2 37097 = REX12D-TB1-101-CL2 36970 = REX12D-TA2-101-CL2 37130 = REX22D-TD2-100-CL2 37162 = REX22D-TD2-100 37129 = REX22D-TD1-100 37161 = REX22D-TA1-100 37134 = REX22D-TE2-100 37166 = REX22D-TE2-100-CL2 37194 = REX22D-TD2-101-CL2 37226 = REX22D-TD2-101 37193 = REX22D-TD1-101 37225 = REX22D-TA1-101 37198 = REX22D-TE2-101 37230 = REX22D-TE2-101-CL2 This list may be extended by future circuit protectors.

Figure 23: Configuration data channel

8.2.8 Event Message for one Channel

These registers are only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Event	45101 - 45132	Byte	0 … 255	bit 0 = waiting for parameterisation bit 1 = reserve bit 2 = new current rating available bit 3 = channel off via momentary switch/switch bit 4 = reserve bit 5 = reserve bit 6 = reserve bit 7 = device error detected “True” means the status is active.

Figure 24: Event message channel

8.2.9 Action Commands for one Channel

These registers are only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Action commands	45001 – 45032	Byte	0 … 255	116 = reset trip counter 118 = reset device parameters to factory settings [1)] 131 = back to box [2)] 192 = reset statistics minimum values 196 = reset statistics maximum values 220 = reset statistics mean values Other values will not be accepted.

Figure 25: Action commands channel

[1)] The command “118 = reset device parameters to factory settings” within the action commands per channel shall reset the following data:

- parameters (current ratings = 10 A, limit value load current = 80 %) of each channel
- PLC lock bit of each channel (default = True, i.e. channel not to be controlled by the PLC)
- **not** the configured device types
- **not** the statistical values (min, max, avg) of the channels
- **not** the error memory, trip counter and trip reason of the channels

[2)] The command “131 = back-to-box” within the action commands per channel shall reset the following data:

- Parameters (rated current = 10 A, limit value load current = 80 %) of each channel
- PLC lock bit of each channel (default = True, i.e. channel not controllable by PLC)
- configured device types (default = REX12D-TA1 = 0x9009 = 36873)
- the statistical values (min = 655.35 A/V, max = 0 A/V, avg- 0 A/V) of the channel
- the error memory, trip counter and trip reason of the channel

8.2.10 Diagnostic Data for one Channel

These registers are only readable. Function codes 3 and 4 are available.

	Modbus Address	Type	Scope	Description
Error memory	43101 – 43132	UInt16	0 ... 65535	bit 0 = no parameters available bit 1 = error parameter memory bit 2 = error programme memory bit 3 = error data memory bit 4 = error control unit bit 5 = reset through watchdog bit 6 = reserve bit 7 = reserve bit 8 = reserve bit 9 = reserve bit 10 = reserve bit 11 = reserve bit 12 = reserve bit 13 = reserve bit 14 = reserve bit 15 = reserve “True” means the status is active.
Trip counter	43201 – 43232	UInt16	0 ... 65535	The number of trippings since the last reset of is shown here.
Reason for trip	43301 – 43332	Byte	0 ... 255	0 = no trip 1 = short circuit 2 = overload 3 = device temperature too high 4 = internal device failure
Min. load voltage	43401 – 43432	UInt16	0 ... 65535	Contains the lowest measured voltage of the channel since the last reset. A standardised 16-bit-value with a resolution of 10 mV is made available. Example for calculation of the measuring value: value (2512)/100 ≙ 25.12 Volt
Max. load voltage	43501 – 43532	UInt16	0 ... 65535	Contains the highest measured voltage of the channel since the last reset. A standardised 16-bit-value with a resolution of 10 mV is made available. Example for calculation of the measuring value: value (2512)/100 ≙ 25.12 Volt
Medium value load voltage	43601 – 43632	UInt16	0 ... 65535	Contains the mean voltage value of the channel since the last reset. A standardised 16-bit-value with a resolution of 10 mV is made available. Example for calculation of the measuring value: value (2512)/100 ≙ 25.12 Volt

	Modbus Address	Type	Scope	Description
Min. load current	43701 – 43732	UInt16	0 ... 65535	Contains the lowest measured current of the channel since the last reset. A standardised 16-bit-value with a resolution of 10 mA is made available. Example for calculation of the measuring value: value (150)/100 ≙ 1.50 Amps
Max. load current	43801 – 43832	UInt16	0 ... 65535	Contains the highest measured current of the channel since the last reset. A standardised 16-bit-value with a resolution of 10 mA is made available. Example for calculation of the measuring value: value (150)/100 ≙ 1.50 Amps
Medium value load current	43901 – 43932	UInt16	0 ... 65535	Contains the mean current value of the channel since the last reset. A standardised 16-bit-value with a resolution of 10 mA is made available. Example for calculation of the measuring value: value (150)/100 ≙ 1.50 Amps
Reserve	44001 – 44032	UInt16	0 ... 65535	Reserve
Reserve	44101 – 44132	UInt16	0 ... 65535	Reserve
Diagnostic information of the channel	44201 – 44232	Byte	0 … 255	0 = OK 1 = available device type does not match the configured type 2 = no device detected 3 = unused channel 144 = device parameters not plausible 146 = channel off via momentary switch/switch 147 = detected undervoltage 148 = detected excess temperature 149 = reset command required 150 = command was processed correctly 151 = parameterisation required 152 = Internal failure detected 153 = unknown command 154 = set length error 155 = rated current available, check sum error 156 = current rating selector switch was actuated

Figure 26: Dynamic information

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