E-T-A®
ENGINEERING TECHNOLOGY

User Manual

ControlPlex® Controller CPC12PN

PROFI NET®

1 Table of contents

2 General information

2.1 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.

2.2 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 have to 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.

2.3 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. Error and omissions excepted.

2.4 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.

3 General description

The customers' demands for a constant quality of the produced goods, while at the same time increasing the quantities, pose great challenges to the mechanical and plant engineering industry. At the same time, globalisation is creating worldwide value flows and production chains. Machines and plants that had still been regionally organised just a few years ago are now networked worldwide. These developments extend the requirements of machine and plant control as well as of the installed components. An ever growing number of measuring data need to be recorded, analysed, evaluated and saved. This increases the transparency of the manufacturing process and thus system availability.

The DC 24 V power distribution is also affected by this development. The control voltage supplies all essential components of the machine or system. These include, besides programmable control units, for example actuators and sensors. Therefore, the control voltage has a special importance in the entire production process. Its availability and stability is crucial for system availability and quality of the produced goods. The REX system is equal to the task. It consists of electronic circuit protectors which are connected with each other via an integral connector arm without requiring additional components. Power supply is via the EM12 supply module which can supply the circuit protectors with max. 40 A. The new CPC12 bus controller additionally allows access to all system-relevant data of the superordinate control systems. This can be via the the PROFINET interface as well as via an additional Ethernet interface.

The CPC12 connects the circuit protectors with the superordinate control unit. Its internal **ELBus®** interface realises the connection with the REX intelligent circuit protectors[1]. The CPC12 allows entire access on all required parameters of the electronic circuit protectors, their control unit and the visualisation of the device data.

This is made available at the field bus interface for the superordinate control unit and also at the third RJ45 interface for further connection. Thus the system offers a fully parameterisable protection of the DC 24 V circuits and ensures selective overcurrent protection of sensors and actuators, decentralised peripheral sub-assemblies etc. and there supply lines.

[1] To simplify presentation and explanation, the naming of intelligent circuit breakers is limited to the system designation REX. This designation includes the REX12D and REX22D circuit breakers.

3.1 Design of the entire system

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

The PROFINET interface to the superordinate control unit is implemented as two RJ45 connectors. It allows connection of the required control unit with the ***ControlPlex***® system. This enables display, analysis as well as diagnosis of the individual measuring values. In addition, it allows control of the individual electronic circuit protectors. An additional Ethernet interface enables direct access of the integral web server of the bus controller. Service staff can thus directly access the system on site. Moreover, access via the connected infrastructure of the company is enables and thus global access. OPC UA and MQTT allow transmission of all measuring values and status information independently of the control system, e.g. to a superordinate cloud application. Revised measuring values of all electronic circuit protectors are also forwarded 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 the productivity.

The CPC12 bus controller allows connection of up to 16 double channel electronic circuit protectors:.

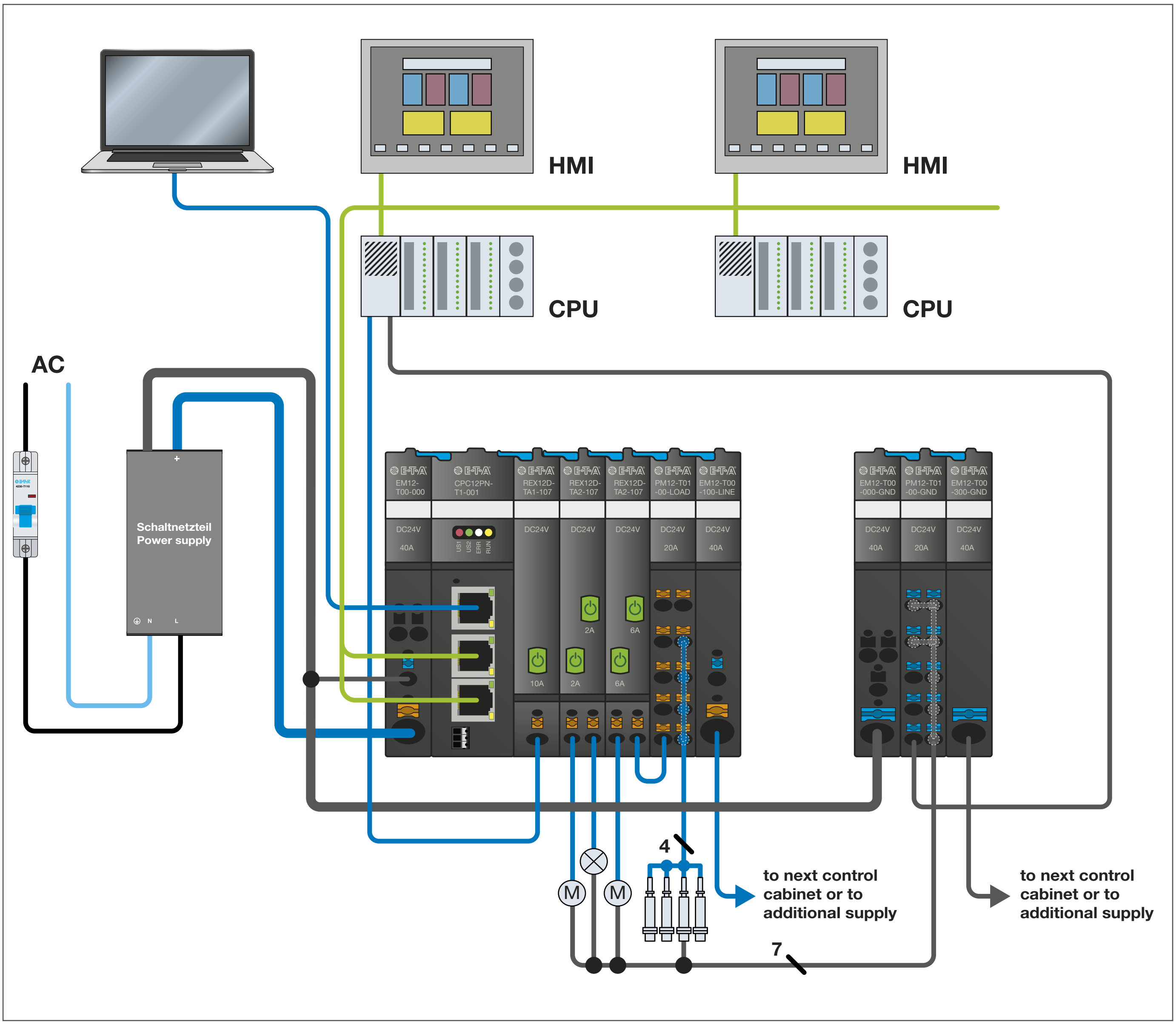


fig. 1: System overview

3.2 Dimensions CPC12xx-Tx

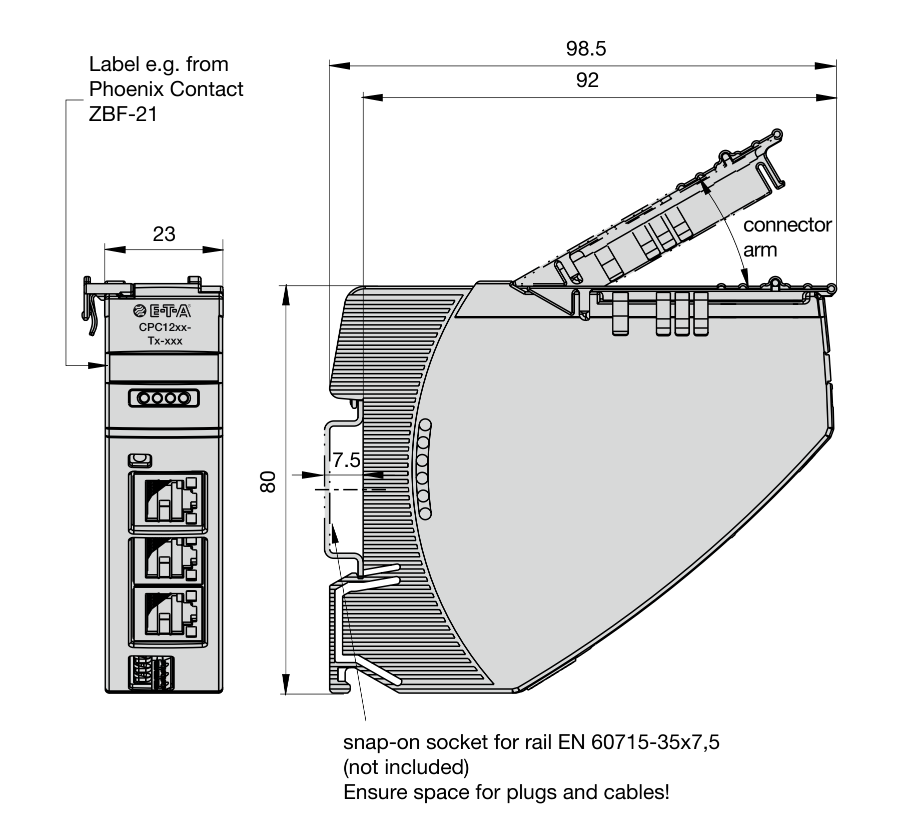


fig. 2: Dimensions CPC12

3.3 Status indication and terminals

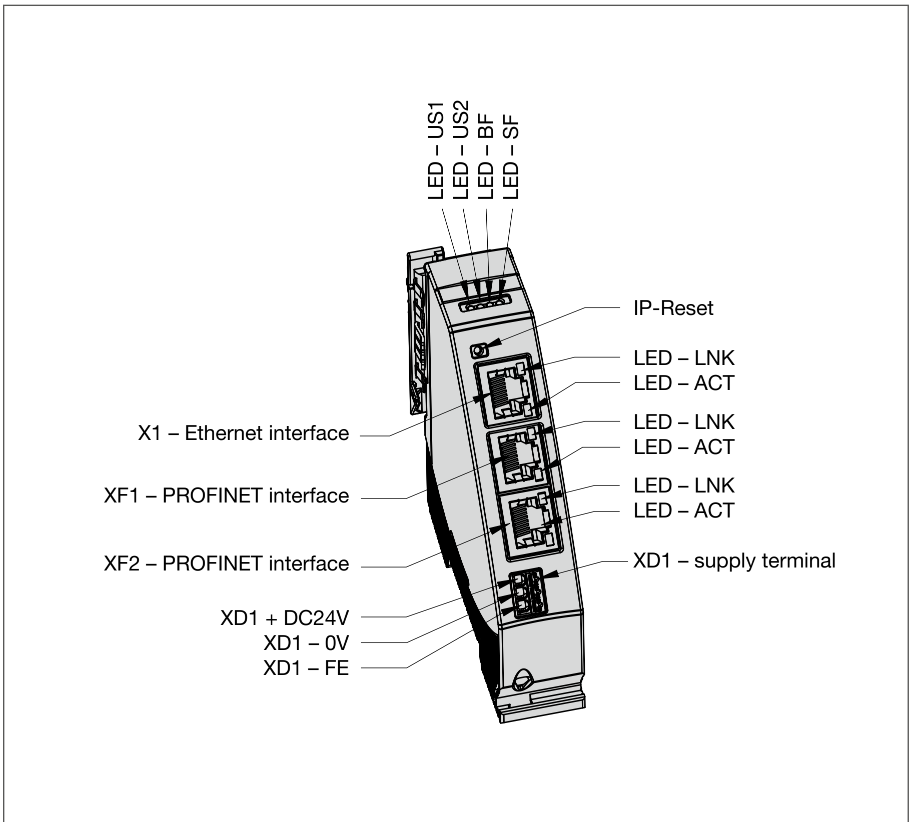


fig. 3: Status indication and terminals

3.3.1 Terminals for voltage supply

Supply XD1

Voltage ratings:	DC 24 V(± 5 % →18 ... 30 V)	
Rated current:	typically 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 voltage supply of the CPC12 bus controller is guaranteed via the supply module and the related connector arm. The use of the line terminals is optional.

3.3.2 PROFINET interfaces with integral switch, connection sleeve XF1, XF2

XF1 Connection to bus system PROFINET
Type: RJ45

When wiring and connecting to the bus system PROFINET the installation and wiring regulations of the PROFIBUS User Organisation (PNO) have to be observed.

XF2 Connection to bus system PROFINET
Type: RJ45

When wiring and connecting to the bus system PROFINET the installation and wiring regulations of the PROFIBUS User Organisation (PNO) have to be observed.

3.3.3 ETHERNET interface, connection sleeve X1

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

3.3.4 LED status indication

Visual status indication by means of multicoloured LED

Operating mode	Indication of operating mode			
	LED US1	LED US2	LED BF	LED SF
Bus error	green	green	red	off
System error	green	green	off	red
Firmware update 1)	off	off	off	off
No actuator voltage	n.a.	red	n.a.	n.a.
No connected device or bus error	n.a.	orange blinking:	n.a.	n.a.
PROFINET device localisation	n.a.	n.a.	n.a.	red blinking

fig. 4: Display status LEDs

n.a. = not applicable

Visual signalling of 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

fig. 5: Display LEDs RJ45 connectors

4 Mounting and installation

4.1 Mounting of the system

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

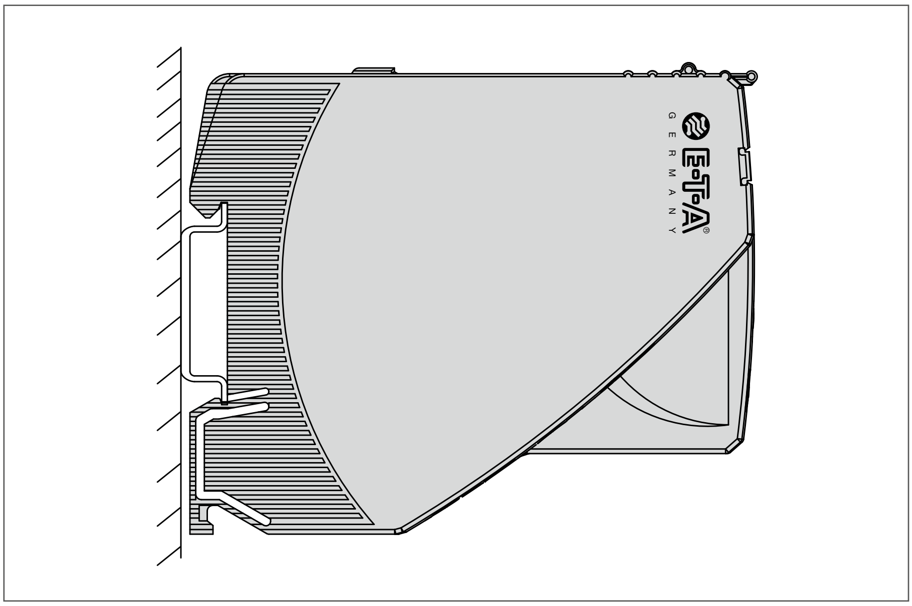


fig. 6: Installation drawing

5 Operating modes of the CPC12 bus controller

5.1 Operating mode: Start-up mode

The CPC12 bus controller is initialised by applying the supply voltage. The device will carry out internal programme memory tests and self test routines. During this time a communication via the interfaces is not possible.

5.2 Operating mode: System error mode

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

5.3 Operating mode: Configuration error mode

If there are no valid or invalid configuration data available in the bus controller, it will change into this operating mode. This operating mode only allows non-cyclical data exchange. Cyclical data exchange is prevented. Leave this operating mode upon receipt of the correct slot parameters and
configuration data.

5.4 Operating mode: Stand-alone mode

In this operating mode there is none connection between the bus controller and the superordinate control unit. In this case the CPC12 bus controller will automatically adopt the control and parameterisation of the electronic circuit protectors, because all required data sets are saved within the CPC20. By means of the web server, the electronic circuit protectors, their status and parameters can be accessed via the Ethernet interface interface. It is thus possible to change e.g. parameter data of the various electronic circuit protectors. After connection is built up to ion level is remedied, this operating mode will be left and the control unit will take over control again as master. If during this time a parameter was changed while there was no communication, this will be signalled to the superordinate control unit. In this case the user can correspondingly define the control behaviour and it can be programmed in the programmable control unit. This allows the user to select a reaction meeting his requirements.

5.5 Operating mode: Slave mode

In this operating mode, the CPC12 is involved in a PROFINET system. Communication to the CPC12 bus controller works faultlessly and the controller can be addressed and controlled by the superordinate control unit. Should the communication fail, this has no influence on the protective function of the circuit protectors. The behaviour of the bus controller with simultaneous use of a field bus interface and of the web server interface can be determined by means of the configuration of the device in the superordinate control unit.

It can be pre-selected there that Ethernet interface or the Web Server are granted either only reader access or reader and editor access. In the event of editor access, changes of the parameterisation of the electronic circuit protectors can be carried out in parallel to the field bus system. These parameter changes will then be advised to the superordinate control system and can be adopted by it or also overwritten. The user can select the behaviour accordingly.

5.5 Operating mode: Firmware Update Mode

The devices are supplied with a software programmed according to their functionality. If the functions of the devices are extended, they will be added by firmware update. It is therefore necessary to carry out a firmware update if the new functionality shall be used.

6 Basic functions of the entire system

6.1 Internal cycle times

The cycle time of the system depends on the number of electronic circuit protectors connected and on the internal baud rate. The internal baud rate can be 9600 or 19200 baud. The baud rate is only changed to 19200 when all connected circuit protectors support this function. The baud rate is signalled in the cyclical data in the »Status Controller«. The current cycle time can be retrieved with the non-cyclical access to the »dynamic information of the CPC12«.

The cycle time in the event of 16 circuit protectors and an internal baud rate of 9600 baud is approx. 480 ms for the cyclical data, i.e. 30 ms per unit. A window of 130 ms is kept free for non-cyclical data. In total, this is a max. cycle time of 610 ms.

An internal baud rate of 19200 baud reduces the cycle time for the cyclical data to some 240 ms, i.e. 15 ms per unit. A window of 100 ms is kept free for non-cyclical data. In total, this is a max. cycle time of 340 ms.

6.2 Hot swap of circuit protectors

If a new circuit protector is added to an existing application, it will automatically be parameterised with the available parameters for address slot. Transmission of the parameters will be without interruption of the cyclical data exchange between the CPC and the electronic circuit protector.

6.3 About the additional Ethernet interface

The additional Ethernet interface (X1) extends the functional scope of the bus controller. The following functionalities are provided via this interface.

6.3 1 Web Server

The web server offers the entire scope of measuring data, status information, parameterisation options an d control function of the CPC12 bus controller. The parameterisation of the interface is described separately.

6.3.2 Default IP address -X1

The default IP address of the CPC12 is: 192.168.1.1 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.

6.3.3 User name and password

In order to be able to carry out configurations, the user has to have the required access authorisation. It is defined in user administration.
The default settings are:

User	admin
Password:	admin

We urgently recommend to individually adjust these settings upon startup of the device.

6.3.4 OPC UA

This functionality will only be included and described in a later version.

6.3.5 MQTT

This functionality will only be included and described in a later version.

7 Communication via PROFINET

7.1 *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. In the SubSlot 2 of the second slot, the maximum number of circuit protectors can be configured. This configuration will influence the length of the cyclical data.

The power distribution system ***ControlPlex***® uses the following PROFINET model:

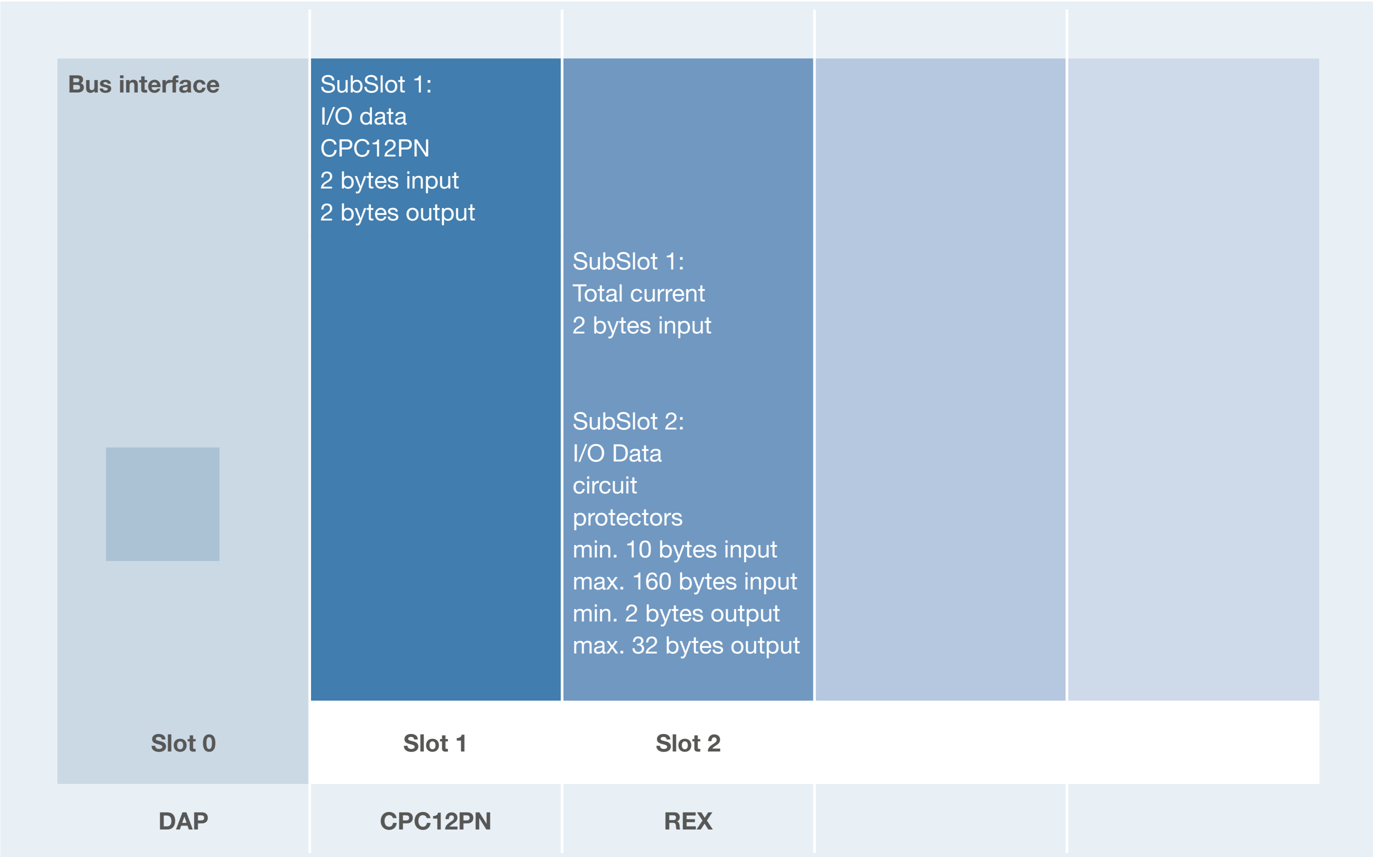


fig. 7: Device model

PROFINET	CPC12PN
Slot 0	The PROFINET interface requires the Device Access Point (DAP) in slot 0. The DAP serves as an accesspoint for the communication with the master and is described in the GSD file. It does not have to be configured further.
Slot 1	Slot 1 represents the CPC12PN controller. SubSlot 1 holds the firmly assigned module withe the I/O data of the CPC12PN. This module contains 2 input and output bytes which are described in more detail in the chapter 8.1 Module I/O Data CPC12 controller. This slot is firmly installed and cannot be removed.
Slot 2	Slot 2 represents the power distribution by means of the circuit protectors connected to the CPC12PN. SubSlot 1: total current of all connected channels. This module is firmly assigned. SubSlot 2: Status, control bytes and measuring values of the circuit protectors. In this subslot, you can configure the number of circuit protectors by module selection (from the GSDML file). The process data image of the PLC holds 10 input bytes and 2 output bytes for each circuit protector, which are described in chapter 8.2 Module power distribution. It is thus possible to determine the quantity of process data cyclically to be exchanges depending on the application. If less circuit protectors are connected than configured, th einput data of the not available circuit protectors are marked as »not available«. If more circuit protectors are connected than configured, these cannot be energised by the PLC. The CPC12 allows configuration of 1 to max. 16 circuit protectors.

fig. 8: Communication properties

7.2 GSDML file

The IODD file is in the download area of the E-T-A website and can be downloaded there.

7.3 I&M data (identification & maintenance)

The following I&M data are made available by the CPC12 controller:

I&M data	length	data set	meaning	
VENDOR_ID	2 bytes	I&M0	manufacturer identification	value manufacturer ID 696
ORDER_ID	20 bytes	I&M0	Part number	
SERIAL_NUMBER	16 bytes	I&M0	serial number	
HARDWARE_REVISION	2 bytes	I&M0	revision index	
SOFTWARE_REVISION	4 bytes	I&M0	firmware version	
REVISION_COUNTER	2 bytes	I&M0		
PROFILE_ID	2 bytes	I&M0	profile ID	0000h
PROFILE_TYP	2 bytes	I&M0	profile-specific coding	0005h
IM_VERSION	2 bytes	I&M0	version of the I&M data	0101h
IM_SUPPORTED	2 bytes	I&M0	supported data sets	001Eh
TAG_FUNCTION	32 bytes	I&M1	Unambiguous marking throughout the plant	
TAG_LOCATION	22 bytes	I&M1	Installation area	
INSTALLATION_DATE	16 bytes	I&M2	installation date and time YYYY-MM-DD HH:MM	
DESCRIPTOR	54 bytes	I&M3	comments	

fig. 9: I&M data

8 Cyclical I/O data

Depending on the selected Module in slot 2. sub-slot 2, a varying number of data bytes are exchanged in the cyclical data traffic.

The GSDML file made available for the projecting tool allows the related configuration, the system recognises all permitted configurations and processes the cyclical data defined in the projection.

The module I/O data CPC12 controller is firmly pre-set in slot 2 and cannot be removed because the input bytes hold vital failure and diagnostic information as described in the following.

8.1 Module I/O data CPC12 controller

The 2 bytes input data contain the following global error and diagnostic messages.
This module holds 2 bytes output data which are meant for the later system extensions and which cannot currently be used.

	byte	Type	range	Description
status controller	0 HighByte 1 LowByte	UInt16	0xFFFF	bit 0 = no configuration data available bit 1 = invalid configuration data bit 2 = connected device type is not compatible to configuration bit 3 = reserve 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 2 = reserve bit 3 = reserve bit 4 = reserve bit15 = writing access via web server deactivated = 1, allowed = 0

fig. 10: Cyclical diagnostic data CPC12

8.2 Module power distribution

This module holds the total current in sub-slot 1 and the cyclical input and output data of the circuit protectors in sub-slot 2.

8.2. 1 Submodule total current

The sub-module total current supplies a standardised 16 bit value with the calculated total current of all circuit protectors in a slot (2 byte input data).
The sub-module does not have output data.
The measuring value is indicated as follows:

	byte	Type	range	Description
Total current	0 HighByte 1 LowByte	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

fig. 11: Total current

8.2. 2 Submodule circuit protectors

Each circuit protector has up to two channels. The input and output data are always transmitted for both possible channels.

Depending on the number of the configured circuit protectors, in this submodule, 10 bytes input data will be exchanged with the status of the channel, the load current and the load voltage as well as 2 bytes output data for controlling the circuit protector. It the circuit protector used has only one channel, the status of the second channel is marked as not available (0xFF) and the load current and the load voltage are set to 0.

Input data circuit protectors:

Design of the input bytes per circuit protector is as follows:

	byte	type	range	description
Status channel	0	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.
Load current channel 1	1 HighByte 2 LowByte	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
Load voltage way 1	3 HighByte 4 LowByte	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
Status channel 2	5	byte	0 ... 255	0xFF (255) =^ no device available, wrong configuraiton or 1-channel device used 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.
Load current channel 2	6 HighByte 7 LowByte	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
Load voltage way 2	8 HighByte 9 LowByte	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

fig. 12: Input data circuit protector

Output data circuit protectors:

Design of the output bytes per circuit protector is as follows:

	byte	type	range	description
Control channel 1	0	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.
Control channel 2	1	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.

fig. 13: Output data circuit protector

Sample configuration:

In the sub-module circuit protectors, 8 REX with 16 channels are configured. This results in 80 byte input bytes for status information and measuring values as well as 16 byte output data.

Addressing of the output data is corresponding to the REX sequence.
circuit protector 1: channel 1.1 control input byte address[0]
circuit protector 1: channel 1.2 control input byte address[1]
circuit protector 2: channel 2.1 control input byte address[2]
circuit protector 2: channel 2.2 control input byte address[3]
circuit protector 3: channel 3.1 control input byte address[4]
…….

Addressing of the input data data is corresponding to the REX sequence.
circuit protector 1: channel 1.1 status: address [0], load current: address [1..2], load voltage: address [3..4]
circuit protector 1: channel 1.2 status: address [5], load current: address [6..7], load voltage: address [8..9]
circuit protector 2: channel 2.1 status: address [10], load current: address [11..12], load voltage: address [13..14]
circuit protector 2: channel 2.2 status: address [15], load current: address [16..17], load voltage: address [18..19]
…….

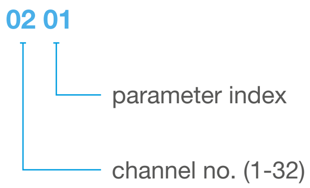
9 Non-cyclical data

Non-cyclical PROFINET services allow exchange of more data with the CPC12 controller and the circuit protectors. Access also allows direct addressing of a circuit protector. PROFINET - index and slot number are used for this. For reading and editing CPC12 data, slot 1 is used. Slot 2 is used for reading and editing the of circuit protectors. The access to the circuit protectors is divided into channels. Two channels are provided per circuit protector.

The PROFINET index is set up as follows:

range	index digit	description
Channel no. on **ELBus** ®	Decimal numbers 10^3 and 10^2	Number of channel to be queried. Valid value range: 01… 32.
Parameter index	Decimal numbers 10^1 and 10^0	The parameter index defines the data range and the data type of the data to be read/written. Valid value range: 01… 10.

fig. 14: set-up of PROFINET index



The non-cyclical access to the data of CPC12 is divided as follows:

slot	parameters Index	channel number	number of data bytes	reading (R) writing (W)	description
1	02	0	19	R	Device information of CPC12 controller (see chapter 9.1.1).
1	03	0	5	R/W	configuration data of CPC12 controller (see chapter 9.1.2).
1	05	0	1	W	action commands for all channels and the CPC12 controller (see chapter 9.1.3).
1	06	0	4	R	dynamic information of CPC12 controller (see chapter 9.1.4).

fig. 15: Division of parameter index CPC12

The non-cyclical access to the data of circuit protectors and/or channels is divided as follows:

slot	parame-ters Index	channel number	number of data bytes	reading (R) writing (W)	description
2	01	01… 32	2	R/W	device parameters of a channel (see chapter 9.2.1).
2	02	01… 32	19	R	device information of a channel (see chapter 9.2.2).
2	03	01… 32	2	R/W	configuration data of a channel (see chapter 9.2.3).
2	04	01… 32	1	R	event message of a channel (see chapter 9.2.4).
2	05	01… 32	1	W	action commands for a channel (see chapter 9.2.5).
2	06	01… 32	22	R	diagnosis data of a channel (see chapter 9.2.6).

fig. 16: Division of parameter index channel

9.1 CPC12 controller

The non-cyclical parameters of the controller are described in the following chapters.

9.1.1 Device information CPC12 Controller

The device information of the controller consists of 19 bytes.

Access: slot = 1, channel = 0 and parameter index = 2

All device information with possible conditions are described in the following table.

	byte	type	range	description
Circuit breaker p/n	0 HighByte 1 LowByte	UInt16	0 ... 65535	16405 = CPC12PN-T1 This list may be extended by future controllers.
Hardware version	2 HighByte 3 LowByte	UInt16	0 ... 65535	holds the hardware version of the installed product
Internal assembly order numbers	4 HwHb 5 HwLB 6 LwHB 7 LwLB	UInt32	0 ... 4294967295	holds the assembly order number of the installed product
Production facilities number	8 HwHb 9 HwLB 10 LwHB 11 LwLB	UInt32	0 ... 4294967295	holds the production facilities number of the installed product
Serial number	12 HwHb 13 HwLB 14 LwHB 15 LwLB	UInt32	0 ... 4294967295	holds the serial number of the installed product
Software version (major.x.x)	16	byte	0 ... 255	holds the major software version of the installed product
Software version (x.minor.x)	17	byte	0 ... 255	holds the major software version of the installed product
Software version (x.x.build)	18	byte	0 ... 255	holds the build software version of the installed product

fig. 17: Device information CPC12

9.1.2 Configuration data CPC12 controller

The device configuration data for the controller consists of 5 bytes.

Access: slot = 1, channel = 0 and parameter index = 3

All configuration data with possible conditions are described in the following table.

	byte	type	range	description
Configuration data of the CPC	0	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 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.
Control commands disable **ELBus®** 1 on CPC channel 1 ... 16	1 HighByte 2 LowByte	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.
Control commands disable **ELBus®** 1 on CPC channel 17 ... 32	3 HighByte 4 LowByte	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.
Reserve	5 HighByte 6 LowByte	UInt16	0	reserve
Reserve	7 HighByte 8 LowByte	UInt16	0	reserve

fig. 18: Configuration data CPC12

9.1.3 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.

Access: slot = 1, channel = 0 and parameter index = 5

Action commands with possible conditions are described in the following table.

	byte	type	range	description
Action commands	0	byte	0 ... 255	116 = reset trip counter 118 = reset device parameters to factory settings including CPC12[1)] 131 = back to box [2)] 132 = Adjust device configuration to connected device type (cf. chapter 9.2.3) 192 = reset statistics minimum values 196 = reset statistics maximum values 220 = reset statistics mean values Other values will not be accepted.

fig. 19: Action commands CPC12

[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
  - behaviour of load outputs in the event of field bus 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
  - Energy saving mode = False = LEDs normal
  - Behaviour of the load outputs on fieldbus interruption = True = Status is maintained
  - Writing via web server allowed = 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
  - Name = »admin«
  - Password = »admin«

9.1.4 Dynamic information CPC12 controller

	byte	type	range	description
cycle time **ELBus®** 1	0 HighByte 1 LowByte	UInt16	0 ... 65535	Holds the internal cycle time of the **ELBus®** in milliseconds [ms].
reserve	2 HighByte 3 LowByte	UInt16	0 ... 65535	reserve

fig. 20: Dynamic information CPC12

9.2 Circuit protectors/channels

The parameters of the circuit protectors are described in the following chapters. The parameters are organised in channels.

9.2.1 Device parameters for one channel

The device parameters for one channel consist of 2 bytes.

Access: Slot = 2 , channel = 1 ... 32 and parameter index = 1

All device parameters with possible conditions are described in the following table.

	byte	type	range	description
Rated current	0	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	6	byte	50 ... 100	Determines at which percentage of the current rating of a channel the limit value is exceeded. Exceedance is signalled with a bit in the »status channel« of the cyclical data. The range is from 50 % to 100 %. The default value is 80 %.

fig. 21: Device parameters channel

9.2.2 Device information for one channel

The device information for one channel consists of 19 bytes.

Access: Slot = 2 , channel = 1 ... 32 and parameter index = 2

All device information with possible conditions are described in the following table.

	byte	type	range	description
Circuit breaker p/n	0 HighByte 1 LowByte	UInt16	0 ... 65535	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	2 HighByte 3 LowByte	UInt16	0 ... 65535	holds the hardware version of the installed product
Internal assembly order	4 HwHb 5 HwLB 6 LwHB 7 LwLB	UInt32	0 ... 4294967295	holds the assembly order number of the installed product
Production facilities number	8 HwHb 9 HwLB 10 LwHB 11 LwLB	UInt32	0 ... 4294967295	holds the production facilities number of the installed product
Serial number	12 HwHb 13 HwLB 14 LwHB 15 LwLB	UInt32	0 ... 4294967295	holds the serial number of the installed product

Software version (major.x.x)	16	byte	0 ... 255	holds the major software version of the installed product
Software version (x.minor.x)	17	byte	0 ... 255	holds the major software version of the installed product
Software version (x.x.build)	18	byte	0 ... 255	holds the build software version of the installed product

fig. 22: Device information channel

9.2.3 Configuration data for one channel

The configuration data for one channel consist of 2 bytes.

Access: Slot = 2 , channel = 1 ... 32 and parameter index = 3

All configuration data with possible conditions are described in the following table.

	byte	type	range	description
Circuit breaker p/n	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 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.

fig. 23: Configuration data channel

9.2.4 Event message for one channel

The event messages for one channel consist of 1 byte.

Access: Slot = 2 , channel = 1 ... 32 and parameter index = 4

All event messages with possible conditions are described in the following table.

	byte	type	range	description
Event	0	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.

fig. 24: Event messages channel

9.2.5 Action commands for one channel

The action commands for one channel consist of 1 byte.

Access: Slot = 2 , channel = 1 ... 32 and parameter index = 5

All action commands with possible conditions are described in the following table.

	byte	type	range	description
Action commands	0	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.

fig. 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

9.2.6 Diagnostic data for one channel

The dynamic information for one channel consists of 22 bytes.

Access: Slot = 2 , channel = 1 ... 32 and parameter index = 6

All dynamic information with possible conditions is described in the following table.

	byte	type	range	description
Error memory	0 HighByte 1 LowByte	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 2 = reserve bit 3 = reserve bit 4 = reserve bit 5 = reserve »True« means the status is active.
Trip counter	2 HighByte 3 LowByte	UInt16	0 ... 65535	The number of trippings since the last reset of is shown here.
Reason for trip	4	byte	0 ... 255	0 = no trip 1 = short circuit 2 = overload 3 = device temperature too high 4 = internal device failure
Min. Load voltage	5 HighByte 6 LowByte	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
Max. Load voltage	7 HighByte 8 LowByte	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	9 HighByte 10 LowByte	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
Min. load current	11 HighByte 12 LowByte	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

	byte	type	range	description
Max. load current:	13 HighByte 14 LowByte	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	15 HighByte 16 LowByte	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
Supply voltage / actuator voltage	17 HighByte 18 LowByte	UInt16	0 ... 65535	Holds the supply voltage / actuator voltage of the channel. 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
Reserve	19 HighByte 20 LowByte	UInt16	0 ... 65535	reserve
Diagnostic information of the channel	21	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

fig. 26: Dynamic information

10 Appendix

10.1 List of pictures

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Bedienungsanleitung/Instruction manual BA_CPC12PN_Y31348202_ENG_081220
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