

PKE-COM-RTU

Modbus RTU

Communication interface for PKE12/32/65



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Original Operating Manual

The German-language edition of this document is the original operating manual.

Translation of the original operating manual.

All editions of this document other than those in German language are translations of the original operating manual.

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Authors: Jan Berchtold

Production: CoE Pune

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Danger! **Dangerous electrical voltage!**

Before starting with the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally retriggered.
- Verify isolation from the supply.
- Ground and short-circuit.
- Cover or enclose neighboring units that are live.
- Follow the installation instructions (IL) for the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalizing. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 V supply. Only use power supply units complying with IEC 60364-4-41 or HD 384.4.41 S2 (VDE 0100 Part 410).
- Deviations of the mains voltage from the nominal value must not exceed the tolerance limits given in the specifications, otherwise this may result in malfunction and hazardous states.
- Emergency-Stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency switching off devices must not cause restart.
- Built-in devices for enclosures or cabinets must only be run and operated in an installed state; desktop devices and portable devices only when the housing is closed.
- Measures should be taken to ensure the proper restarting of programs interrupted after a voltage dip or outage. This should not result in dangerous operating states even for a short time. If necessary, emergency switching off devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks, etc.).
- The electrical installation must be carried out in accordance with the relevant regulations (e.g. with regard to cable cross sections, fuses, PE).
- All transport, installation, commissioning and maintenance work must only be carried out by trained personnel (observe IEC 60364, HD 384 or DIN VDE 0100 and national accident prevention regulations).
- Keep all covers and doors closed during operation.

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0 About this manual

0.1 Target group

This manual describes the Modbus RTU interface connection for the PKE12/32/65 motor and circuit breaker

It is intended for experienced drive specialists and automation engineers and technicians. It also assumes that readers are thoroughly familiar with the Modbus RTU field bus and with how to program a Modbus master. In addition, knowledge of the handling of the PKE12/32/65 is required.

Please read this manual carefully before commissioning a Modbus RTU network.

We assume that you have a good knowledge of engineering fundamentals, and that you are familiar with handling electrical systems and machines, as well as with reading technical drawings. The installation instruction IL122022ZU is used as additional documentation.

0.2 Change log

The following significant amendments have been introduced since previous issues:

Publication date	Page	Keyword	new	modified	deleted
03/20		First edition			

0.3 Reading conventions

Symbols used in this manual have the following meanings:

► indicates actions to be taken.

→ draws your attention to interesting tips and supplementary information.

0.3.1 Hazard warnings concerning material damage

ATTENTION

Warns about possible material damage.

0.3.2 Hazard warnings concerning personal injury



CAUTION

Warns about hazardous situations that may cause slight injury.



WARNING

Warns about hazardous situations that could result in serious injury or death.



DANGER

Warns about hazardous situations that will result in serious injury or death.

- For greater clarity, the name of the current chapter and the name of the current section are shown in the page header.
- To make it easier to understand some of the images included in this manual, the housing and other safety-relevant parts have been left out. The components described here must be used only with a properly fitted housing and all necessary safety-relevant parts.
- Please follow the installation instructions in the relevant instruction leaflets.
- All the specifications in this manual refer to the hardware and software versions documented in it.
- More information on the devices described here can be found online at: www.eaton.eu/documentation

1 PKE-COM-RTU, interface connection for the motor or circuit breaker, PKE12/32/65

1.1 Introduction

1 PKE-COM-RTU, interface connection for the motor or circuit breaker, PKE12/32/65

1.1 Introduction

The PKE-COM-RTU module is used to control the PKE motor or circuit breaker via a programmable logic controller and to record the information from the PKE. The PKE-COM-RTU is connected directly to the PKE12, PKE32 and PKE65.



The operation and installation of the PKE electronic motor or circuit breaker is described in the document MN03402004Z-DE.

ATTENTION

The combination of the PKE-COM-RTU is only possible with PKE-XTU(W)A(CP)-type "Extended" trip blocks.

1.2 Surface mounting

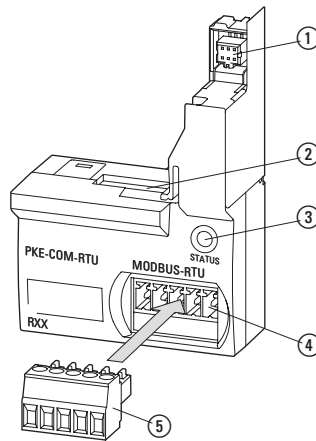


Figure 1: PKE-COM-RTU connections

- 1 Data interface for PKE trip block "Extended"
- 2 DIP switches for setting the Modbus RTU slave address
- 3 Status LED
- 4 Connector for device plug
- 5 Modbus RTU device plugs

The Modbus RTU device plug (5) with adapted Modbus RTU connection cable and 24VDC connection is connected to the device plug (4) with the module PKE-COM-RT. The RTU slave address must be set prior to installation via the DIP switches (2).

The status LED (3) indicates the communication status of the module via Modbus RTU and the communication status to the PKE trip block.

The mechanical fixing of the PKE-COM-RTU with the corresponding PKE basic devices is carried out via the locking hook. This must be operated before the PKE-COM-RTU is removed. When installing the PKE-COM-RTU, the PKE basic device must not be fitted with a PKE trip block.

The communication of the PKE-COM-RTU with the PKE trip block is carried out via the data interface (1).

1 PKE-COM-RTU, interface connection for the motor or circuit breaker, PKE12/32/65

1.3 Projection

1.3 Projection

The PKE-COM-RTU can be combined with the motor or circuit breakers PKE12, PKE32 and PKE65. The trip blocks used, which can be combined with the PKE basic devices, must be of type PKE-XTUA or PKE-XTUWA. For each PKE-COM-RTU, a PKE with PKE trip block can be connected. The following PKE trip blocks of the type "Extended" can be combined with the PKE basic devices PKE12, PKE32 and PKE65.

The following PKE trip blocks of the type "Extended" can be combined with the PKE basic devices PKE12, PKE32 and PKE65.

The PKE-COM-RTU obtains its power for the communication electronics as well as for

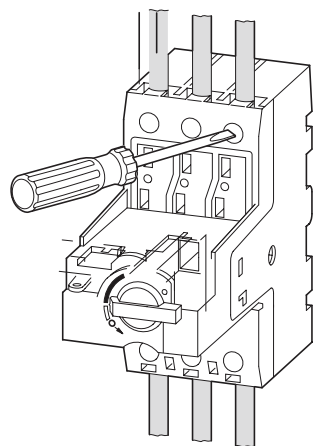
	PKE-XTUA-1.2	PKE-XTUA-4	PKE-XTUA-12	PKE-XTUA-32	PKE-XTUWA-32	PKE-XTUACP-36	PKE-XTUWACP-36	PKE-XTUA(CP)-65
PKE12	✓	✓	✓	X	X	X	X	X
PKE32	X	X	✓	✓	X	✓	X	X
PKE65	X	X	X	X	✓	X	✓	✓

controlling the LED from the 24 V DC supply on the device plug.

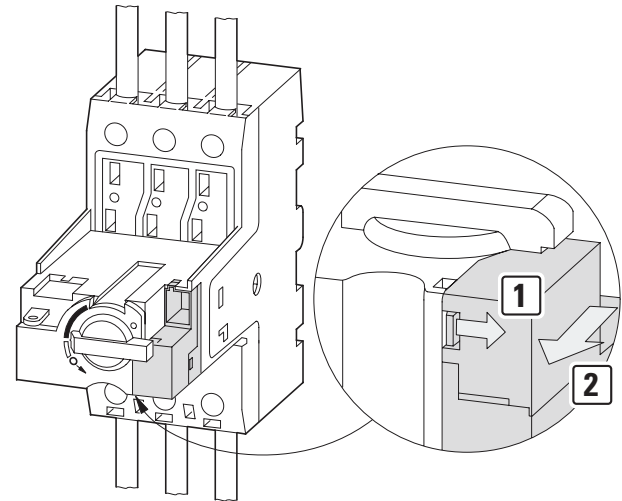
➔ The specifications for the control voltage supply can be found in the technical data in the appendix.

1.4 Installation

► Wire the main circuits of the PKE device.



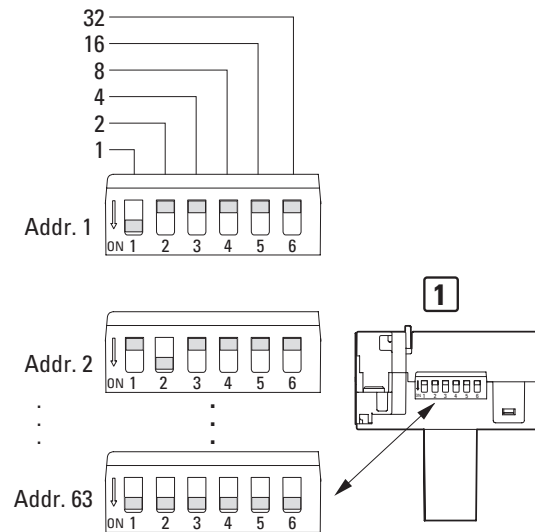
► Remove the empty module on the PKE basic device.



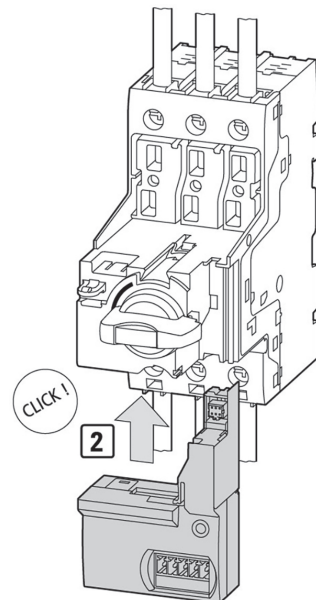
1 PKE-COM-RTU, interface connection for the motor or circuit breaker, PKE12/32/65

1.4 Installation

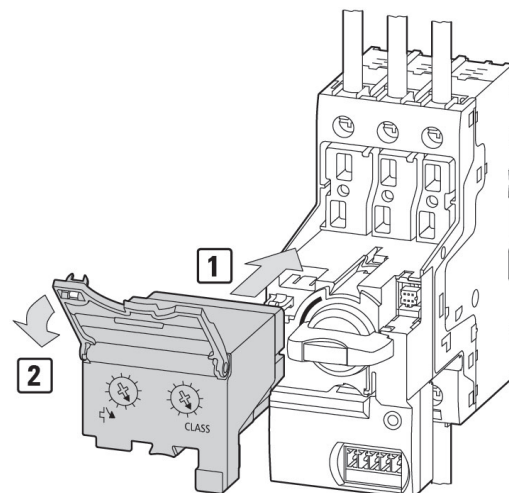
- Set the slave address on the device.



- Connect the PKE-COM-RTU to the PKE basic device.



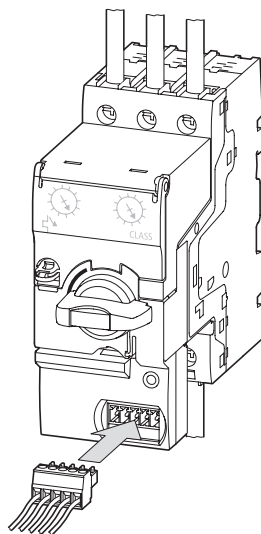
- Install the PKE "Extended" type trip block (PKE-XTUA-...).



1 PKE-COM-RTU, interface connection for the motor or circuit breaker, PKE12/32/65

1.5 Addressing

- At the PKE trip block, set the corresponding values for the overload trip or the time lag setting to overcome current peaks.
- Connect the Modbus RTU device plug with an adapted Modbus RTU connection cable.



1.5 Addressing

Addressing is carried out via the DIP switches and can only be performed at an unmounted module. The existing 6 DIP switches can be used to set addresses up to 63. The DIP switches specify the address in binary form, with DIP switch 1 setting the lowest value and DIP switch 6 setting the highest value. For example, to set the address to 41, set DIP switches 1, 4, and 6 to "ON".

All DIP switches set to 0 will reset the device to the factory setting after it has been supplied with power.

1.6 Changing modules



DANGER

Replacing the module or the PKE is only permissible after the entire Modbus RTU system has been switched off.

1 PKE-COM-RTU, interface connection for the motor or circuit breaker, PKE12/32/65

1.7 Device status

1.7 Device status

The status LED can assume the following states:

Table 1: Diagnostic messages of the Modbus RTU status LED

Color	State	Message
Green	Continuous light	Standard operation mode
	Flashing (1 Hz)	Modbus RTU communication
Red	Continuous light	PKE tripped
	Flashing (1 Hz)	Communication error

1.8 Parameterization

The module is parameterized via the connected Modbus RTU master.

2 Modbus RTU

2.1 General

Modbus is a centrally polled bus system in which a so-called master (PLC) controls the entire data transfer on the bus. Internode communication between the individual modules (slaves) is not possible.

Every single data transfer operation is initiated by the master with a request. Only one request can be sent on the cable at a time. Slaves are not able to initiate transfers, and are only able to respond to requests.

Two types of dialog are possible between master and slave:

- The master sends a request to a slave and waits for a response.
- The master sends a request to all slaves and does not wait for a response (broadcast).

➔ More information on the topic can be found at
www.modbus.org.

2.2 Communication

Figure 2: Modbus line with PKE

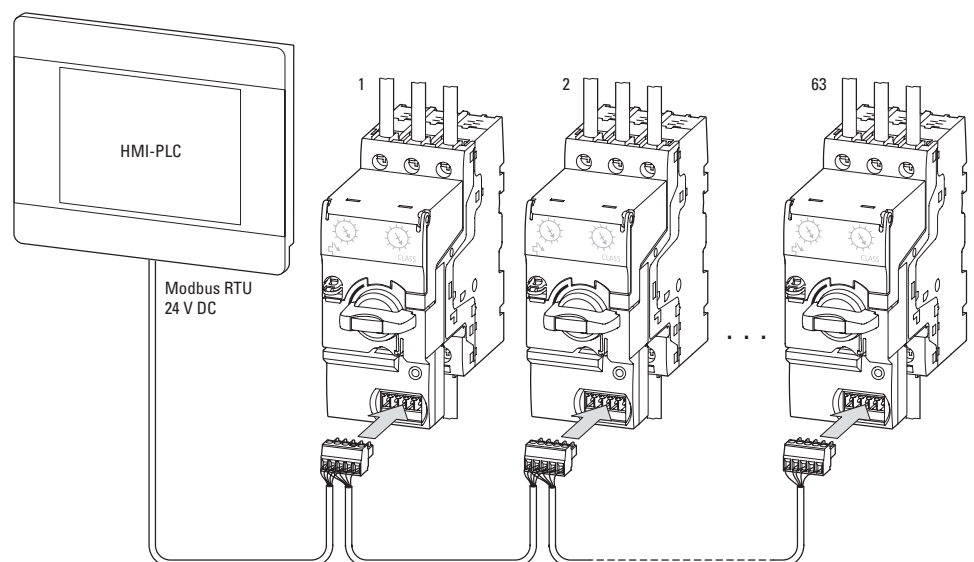


Figure 2 shows a typical setup with a host computer (master) and any number (a maximum of 63 modules) of PKE (slaves). Each PKE has a unique address on the network.

Addressing is performed individually for each PKE via the DIP switches on the respective PKE-COM-RTU module. It is independent of the physical connection (position) in the network.

A bus termination resistor is required at the last module on the Modbus line.

2 Modbus RTU

2.3 Device plug

2.3 Device plug

The network cable must be wired at each physical end (last module) with a bus termination resistance of 120 Ω in order to prevent signal reflections and the associated transfer errors.

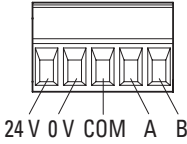
	PIN	Meaning
	24 V	+ 24 V DC supply voltage (external)
	0V	GND supply voltage (external)
	COM	GND Modbus RTU
	A	RS485 Modbus RTU -
	B	RS485 Modbus RTU +

Figure 3: Assignment of the device plug

2.3.1 Communication parameters

For the PKE COM RTU, the communication parameters can be changed via registers 44001 - 44003. The settings in the tabs are applied after restarting the device or if a 1 has been sent in register 44004.

The default setting is as follows:

- 44002: even parity
- 44003: 1 stop bit
- 44001: 9600 bit/s

The factory setting can be restored by setting all DIP switches to 0 and switching on the unit. A new Modbus RTU slave address can then be set again via the DIP switches.

2.4 Modbus RTU operating mode

Operating mode Modbus RTU (Remote Terminal Unit) transfers the data in binary format (faster data rate) and determines the transfer format for the data request and the data response. Each message byte that is sent contains two hexadecimal characters (0- 9, A- F). Data is transferred between a master (SPS) and the PKE according to the following sequence:

- Master request: The master sends a protocol frame (Modbus frame) to the PKE.
- Slave response: The PKE sends a protocol frame (Modbus frame) to the master in response.

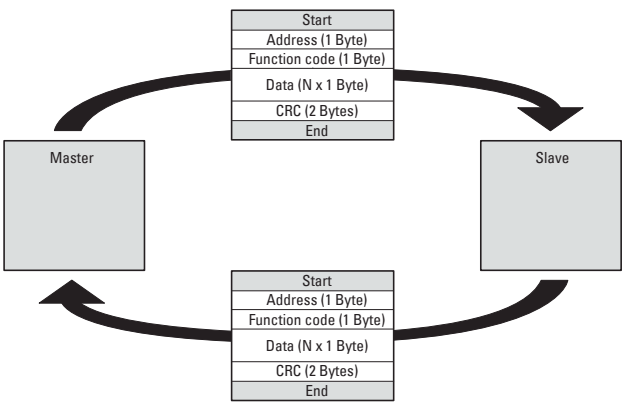


Figure 4: Data exchange between master and slave

The PKE (slave) only sends a response if it has received a request from the master beforehand.

2.5. Structure of the master request

2.5.1. Address

- The address of the slave (1 to 63) to which the request goes is set via the DIP switches at the PKE-COM-RTU. Only the PKE with this address can respond to the request.
- Address 0 is used as a so-called Broadcast (message to all bus users) from the master. In this mode, individual modules cannot be addressed and data cannot be output from the slaves.

2.5.2 Function code

The function code defines the type of message.

The following actions can be performed:

Function code [hex]	Designation	Description
04	Read input registers	Reading the input registers (process data, parameters and configuration) in the slave.
05	Force single coil	Writing a single bit in the slave
06/16	Write single/multiple registers	Write one or more holding registers in the slave. In the case of a general telegram (broadcast), the corresponding holding register is written in all slaves. The register is read back for comparison.

2.5.3 Data

The length of the data block (Data: N x 1 Byte) depends on the function code. The function code is made up of two hexadecimal values and has a range of 00 to FF. The data block contains additional information for the slave that will enable the latter to perform the operation specified by the master in the function code (this information may specify the parameters that need to be processed, for example).

2.5.4 Cyclic redundancy check (CRC)

Telegrams in the Modbus RTU operating mode include a cyclic redundancy check (CRC). The CRC field is made up of two bytes that contain a binary 16-bit value. The CRC check is always run independently of the parity check for the individual characters of the telegram. The CRC result is appended to the frame by the master. The slave recalculates while receiving the telegram and compares the calculated value with the actual value in the CRC field. If both values are not identical, an error is set.

2.6 Structure of the slave response

2.6.1 Required transmission time

- The time between receiving a request from the master and the PKE's response is at least 3.5 characters (idle period).
- Once the master has received a response from the PKE, it must wait for at least the idle period before it can send a new request.

2.6.2 Normal slave response

- If the master request contains a write register function (function code 05/06/16), the PKE immediately returns the request as a response.
- If the master request contains a read register function (function code 04), the PKE sends back the read data with the slave address and the function code as a response.

2 Modbus RTU

2.6.3 Structure of the slave response

2.6.3 No slave response

In the following cases, the PKE ignores the request and does not send a response:

- if the request contains a transmission error.
 - If the slave address in the request does not match that of the PKE.
 - with a CRC or parity error.
- If the time interval between the messages is less than 3.5 characters.
The master must be programmed to repeat the request if it does not receive a response within a specified time.

2.6.4 Modbus: Register mapping

Register mapping makes it possible to process the contents listed in the following table in PKE via Modbus RTU.

Group	Register
Input Register	30001 - 31034
Single coil	3
Output register	44001 - 44005

- For some controls (e.g. PLC) it is possible that these contain an offset of +1 in the interface driver for Modbus RTU communication.

2.7 Programming

2.7.1 Inputs

Table 2: Input register for PKE-COM-RTU

Register (FC04)	Description	Meaning	Note
3 0001	TYPE	Type of trip block	→ 2.7.7 Type of trip block (TYPE)
3 0002	I _r	Set value I _r	→ 2.7.3 Set value (I _r)
3 0003	CLASS	Set time lag or set short-circuit release	→ 2.7.8 Setting for time lag (CLASS) and short-circuit release (I >) (CLASS)
3 0004	PKE ON/OFF	Current switching position, PKE	0: PKE switched off 1: PKE switched on
3 0005	TRIPR = Trip reason	Trip reason	→ 2.7.4 Differential trip indication (TRIPR)
3 0006	TH	Thermal motor image [%]	→ 2.7.6 Thermal motor image (TH)
3 0007	I _r (real value)	Set value I _r as real value	33 ± 330 mA
3 0008	CLASS (real value)	Set time lag or set short-circuit release as real value	5, 10, 15, 20, 99-TestTrip / PKE-CP 50, 65, 80, 99-Test Trip
3 0009	I-REL-MAX	Relative current value of the highest phase current [%], for PKE-XTU(W)A-... only	→ 2.7.5 Relative current value (I-REL)
3 0010	I-REL-MAX (real value)	Real current value of the highest phase current, for PKE-XTU(W)A-... only	33 ± 330 mA
3 0011	I-REL-L1	Relative phase current L1 [%], for PKE-...CP-... only	→ 2.7.5 Relative current value (I-REL)
3 0012	I-REL-L2	Relative phase current L2 [%], for PKE-...CP-... only	→ 2.7.5 Relative current value (I-REL)
3 0013	I-REL-L3	Relative phase current L3 [%], for PKE-...CP-... only	→ 2.7.5 Relative current value (I-REL)
3 0014	I-REL-L1 (real value)	Real phase current L1 [%], for PKE-...CP-... only	33 ± 330 mA
3 0015	I-REL-L2 (real value)	Real phase current L2 [%], for PKE-...CP-... only	33 ± 330 mA
3 0016	I-REL-L3 (real value)	Real phase current L3 [%], for PKE-...CP-... only	33 ± 330 mA
3 0017	Ar-TH	Arithmetic average thermal motor image [%]	Always available
3 0018	Ar-I-REL-MAX	Arithmetic average value of the relative current value of the highest phase current [%], for PKE-XTU(W)A-... only	Always available
3 0019	Ar-I-REL-L1	Arithmetic average value of the relative phase current L1 [%], for PKE-...CP-... only	Always available
3 0020	Ar-I-REL-L2	Arithmetic average value of the relative phase current L2 [%], for PKE-...CP-... only	Always available
3 0021	Ar-I-REL-L3	Arithmetic average value of the relative phase current L3 [%], for PKE-...CP-... only	Always available
-	-	-	-

2 Modbus RTU

2.7 Programming

Register (FC04)	Description	Meaning	Note
3 0025	LOG-MAX-TH	Maximum thermal motor image protocol [%]	Always available
3 0026	LOG-MAX-I-REL-MAX	Maximum value relative current value protocol of the highest phase current [%], for PKE-XTU(W)A-... only	Always available
3 0027	LOG-MAX-I-REL-L1	Protocol of maximum value relative phase current L1 [%], only for PKE-...CP-... only	Always available
3 0028	LOG-MAX-I-REL-L2	Protocol of maximum value relative phase current L2 [%], for PKE-...CP-... only	Always available
3 0029	LOG-MAX-I-REL-L3	Protocol of maximum value relative phase current L3 [%], for PKE-...CP-... only	Always available
3 0030	LOG-PKE ON	Specifies how often the PKE has been switched from OFF to ON	Always available
3 0031	LOG-PKE overload	Specifies how often the PKE has switched off with overload	Always available
3 0032	LOG-PKE overcurrent	Specifies how often the PKE has switched off with a short circuit	Always available
3 0033	LOG-PKE phase loss	Specifies how often the PKE has switched off with phase failure	Always available
3 0034	LOG-PKE test trip	Specifies how often the PKE has been switched off with test trip	Always available
3 0035	LOG-PKE remote trip	Specifies how often the PKE has been switched off with remote tripping	Always available
3 0036	LOG-PKE flash	Specifies how often the memory has been written	Always available
-	-	-	-
3 0041	R-I-REL-L1	Relative phase current L1 [raw data %], for PKE-...CP-... only	
3 0042	R-I-REL-L2	Relative phase current L2 [raw data %], for PKE-...CP-... only	
3 0043	R-I-REL-L3	Relative phase current L3 [raw data %], for PKE-...CP-... only	
-	-	-	-
3 1024	Vendor_ID	Unique manufacturer ID	0x01
3 1025	Device_ID	Unique device identifier	0x22
3 1026	sw_ver	Software version	100 - 999
3 1027	hw_ver	Hardware version	100 – 999
3 1028	stack_ver	Modbus stack version number	0x0102 = v1.2
3 1029	build_ver	Modbus build number	0x71AA = from GIT
3 1030	App_ver	Application number	0x0102 = v1.2
3 1031	AppBuild_ver	Application build number	100-999
3 1032	ASIC2_ver	ASIC2 version number	0xFFEF
3 1033	ASIC2_serialLW	Individual ASIC2 serial number, low word	
3 1034	ASIC2_serialHW	Individual ASIC2 serial number, high word	

2.7.2 Outputs

Table 3: Output coils and registers for PKE-COM-RTU

Coil (FC05)	Description	Meaning	Note
0 0003	R-TRIP	Remote tripping, PKE basic device	0: no remote tripping 1: Remote tripping
Register (FC06/16)			
4 4001	Baud rate	Modbus RTU baud rate	000 = 9600 bit/s (factory setting) 001 = 19200 bit/s 010 = 38400 bit/s 011 = 57600 bit/s 100 = 115200 bit/s
4 4002	Parity	Modbus RTU parity	00 = none 01 = odd 02 = even (factory setting)
4 4003	Stop bit	Modbus RTU stop bit	00 = 1 bit (default setting) 01 = 2 bits
4 4004	SW reset	Saves the new baud rate, parity and stop bit settings without restarting the device.	0: no Reset 1: Reset
4 4005	Activate boot loader	Activates the boot loader by writing the value from ASIC2_serialLW.	

Remote tripping through output bit R-TRIP causes a trip if a phase current of at least 85 % of the minimum mark of the variable overload release on the PKE control unit flows through all three main circuits (for example PKE-XTUA-4 → → $I_{min} = 0.85 \times 1 \text{ A} = 0.85 \text{ A}$).

ATTENTION

The command "Remote trip PKE basic unit" is supported from the following versions of the PKE trip blocks:

	PKE-XTUA-1.2/4/12/32	PKE-XTUWA-32	PKE-XTUA-65
Release designation	05	01	01

2 Modbus RTU

2.7 Programming

2.7.3 Set value (Ir)

The overload release value set on the PKE basic unit is indicated via bit field Ir (register 30002). The value of this bit field indicates the absolute current value of the overload release, which depends on the PKE trip block selected. Bit field Ir has the following meaning for the different PKE trip blocks:

Table 4: Set value (Ir)

Ir value	PKE-XTU(A)-1,2 Ir [A]	PKE-XTU(A)-4 Ir [A]	PKE-XTU(A)-12 Ir [A]	PKE-XTU(W)(A)-32 Ir [A]	PKE-XTU(W)(A)CP-36 Ir [A]	PKE-XTUA-36A Ir [A]	PKE-XTU(A)-65 Ir [A]	PKE-XTU(A)CP-65 Ir [A]
0x0	0.30	1.00	3.00	8.00	15.00	8.00	16.00	30.00
0x1	0.33	1.10	3.30	8.80	16.30	9.90	17.60	32.30
0x2	0.36	1.20	3.60	9.70	17.70	11.80	19.30	34.60
0x3	0.40	1.30	4.00	10.50	19.00	13.50	21.30	37.00
0x4	0.43	1.42	4.30	11.50	20.30	15.50	23.00	39.30
0x5	0.47	1.55	4.70	12.50	21.70	17.40	24.80	41.60
0x6	0.50	1.70	5.00	13.50	23.00	19.00	26.80	44.00
0x7	0.56	1.90	5.60	15.00	24.30	21.00	30.00	46.30
0x8	0.63	2.10	6.30	17.00	25.70	23.00	33.60	48.30
0x9	0.70	2.40	7.00	19.00	27.00	25.00	37.70	51.00
0xA	0.77	2.60	7.70	20.50	28.30	26.50	40.90	53.30
0xB	0.83	2.80	8.30	22.00	29.70	28.50	44.40	55.60
0xC	0.90	3.00	9.00	24.00	31.00	30.00	48.10	58.00
0xD	1.00	3.30	10.00	27.00	32.70	32.00	53.30	60.30
0xE	1.10	3.70	11.00	29.00	34.30	34.00	58.60	62.60
0xF	1.20	4.00	12.00	32.00	36.00	36.00	65.00	65.00

2.7.4 Differential trip indication (TRIPR)

In the event of a malfunction or interruption of the main circuits due to a fault scenario, the trip reason of the interruption is indicated via the TRIPR bit field.

The following trip reasons are shown by the TRIPR bit array:

Field	Value	Explanation	Note
TRIPR	0x0	Not defined	–
	0x1	Overload	PKE has switched off
	0x2	Short circuit	PKE has switched off
	0x3	Phase failure/phase imbalance	Disconnection at: 100 % of the thermal motor image (TH)
	0x4	Test position on PKE-XTU(W)A-...	PKE has switched off
	0x5	Not defined	–
	0x6	Remote tripping through output bit	PKE has switched off
	0x7	Not defined	–

Table 5: Differential trip indication TRIPR

The transmitted trip reasons are reset when the main contacts of the PKE are closed again and a current flow through the PKE trip block is detected.

The message 0x3 “Phase loss/phase unbalance” is set if there is a phase current difference of 50 % between the highest phase current measured and phase affected. This message is reset if the phase current difference is below 25%.

The “phase failure/phase unbalance” does not force the interruption of the main circuits. To protect the connected motor in the event of phase loss/phase unbalance, the tripping time in the event of an overcurrent is reduced to 40 % compared to when the phase load is symmetrical.

The interruption of the main circuits is executed early if the thermal motor image reaches 100 %.



The test position on the PKE trip block and remote tripping through output bit R-TRIP cause a trip when a phase current of at least 85 % of the minimum mark of the variable overload release on the PKE trip block flows through all three main circuits (for example PKE-XTUA-4 → $I_{min} = 0.85 \times 1 \text{ A} = 0.85 \text{ A}$).

2.7.5 Relative current value (I-REL)

The PKE motor protection switch provides the current motor current via register 30009. The motor current is shown as a relative value in the ranges 0 % (0x00) to 120 % (0x78). The transferred relative value is calculated from the value of the highest phase current measured in relation to the set current value of the overload release. The PKE circuit breaker provides the actual phase currents L1, L2, L3 via registers 30010- 30012. It will be represented as a relative value within a range of 0 % (0x00) to 120 % (0x78). The transferred relative value refers to the set current value of the overload release. The accuracy of the relative current indication depends on the measured phase current in relation to the current range of the PKE trip block. In order to measure the phase current with sufficient accuracy, a phase current of at least 85 % of the minimum mark of the variable overload release on the PKE trip block (e.g. trip block PKE-XTUA-4 → $I_{min} = 0.85 \times 1 \text{ A} = 0.85 \text{ A}$) must be present.

The maximum measuring accuracy of the transferred relative current value is 5 %.

2.7.6 Thermal motor image (TH)

Depending on the current range and the actual current flow, the PKE motor-protective circuit-breaker calculates the thermal state of the motor and provides it as a data byte. The thermal load of the motor is mapped via register 30006. It will be represented as a relative value within a range of 0 % (0x00) to 120 % (0x78).

The main circuits are interrupted as a result of a motor overload if the thermal motor image is 110 %. In the event of phase failure or phase unbalance, the main circuits are interrupted at a value of 100 % of the thermal motor image. In the event of a phase unbalance and trip caused by an overload, the value of the thermal motor image is raised from 100 % to 110 %.

2.7.7 Type of trip block (TYPE)

The modular system of the PKE electronic motor protection switch enables several different current ranges to be covered. A different PKE trip block is inserted into the PKE basic device depending on the current range required. The following PKE trip blocks of the type "Extended" can be combined with the PKE basic devices PKE12, PKE32 and PKE65.

Table 6: Combination options for the PKE basic device with the PKE trip block

The type of PKE trip block is mapped via the bit field TYPE register 30001. The values of this bit field are assigned to the following PKE trip blocks:

Basic device	PKE-XTUA-1.2	PKE-XTUA-4	PKE-XTUA-12	PKE-XTUA-32	PKE-XTUWA-32	PKE-XTUACP-36	PKE-XTUWACP-36	PKE-XTUA-65
PKE12	✓	✓	✓	X	X	X	X	X
PKE32	X	X	✓	✓	X	✓	X	X
PKE64	X	X	X	X	✓	X	✓	✓

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Table 7: Bit array XTUA

Field	Value	Type of trip block
XTUA	0x0	PKE-XTUA-1.2
	0x1	PKE-XTUA-4
	0x2	PKE-XTUA-12
	0x3	PKE-XTUA-32
	0x4	PKE-XTUWA-32
	0x5	PKE-XTUA-65
	0x6	PKE-XTUACP-36
	0x7	PKE-XTUACP-65
	0x8	PKE-XTUA-36A
	0x9	PKE-XTUWACP-36

2.7.8 Setting for time lag (CLASS) and short-circuit release (I >) (CLASS)

The CLASS bit field shows the value of the setting dial on the PKE trip block for the time lag class of the overload release. The setting points of the time lag adjuster or short-circuit trigger adjuster are assigned to the following values of the bit field CLASS.

Table 8: Bit array CLASS

Field	Value	Set time lag PKE-XTU(W)A-...	PKE-...CP-...
CLASS	0xF	Class 5	5
	0xE	Class 10	6.5
	0xD	Class 15	8
	0xC	Class 20	Test position
	0xB	Test position	Not defined
	0xA	Not defined	Not defined
	0x9	Not defined	Not defined

2.7.9 Remote tripping, PKE basic device (R-TRIP)

Remote tripping of the PKE basic device through output bit R-TRIP causes a trip if a phase current of at least 85 % of the minimum mark of the variable overload release on the PKE trip block flows through all three main circuits (for example PKE-XTUA-4 → $I_{min} = 0.85 \times 1 \text{ A} = 0.85 \text{ A}$). The maximum duration of the tripping process from the time the PKE-RTU receives the trip signal to the actual time of tripping of the PKE basic device is 700 ms.

3 Technical data

		PKE-COM-RTU
General		
Standards		IEC/EN 61131-2, EN 50178, EN 60529, EN 50581, EN 61000-6-2/3, UL 61010-2-201
Dimensions (L x H x D)	mm	45 x 46,8x 65,9
Weight	g	30
Assembly		at PKE12/32/65
Mounting position		as PKE12/32/65
Ambient mechanical conditions		
Protection type (IEC/EN 60529, EN50178, VBG 4)		IP20
Vibrations (IEC/EN 61131-2:2008)		
Constant amplitude 3.5 mm	Hz	5 - 8,4
Constant acceleration 1 g	Hz	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms	Shocks	3 per axle
Drop to IEC/EN 60068-2-31	mm	50
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3
Electromagnetic compatibility (EMC)		
Overvoltage category		II
Degree of pollution		2
Electrostatic discharge (IEC/EN 61131-2:2008)		
Air discharge (Level 3)	kV	8
Contact discharge (Level 2)	kV	4
Electromagnetic fields (IEC/EN 61131-2:2008)		
80 - 1000 MHz	V/m	10
1.4 - 2 GHz	V/m	3
2 - 2.7 GHz	V/m	1
Radio interference suppression		EN 55011 Class A
Burst (IEC/EN 61131-2:2008, Level 3)		
Fieldbus cable	kV	1
Inflow (IEC/EN 61131-2:2008, Level 3)	V	10
Ambient climatic conditions		
Operating ambient temperature (IEC 60068-2)	°C	-25 to +60
Condensation		prevent with suitable measures
Storage	°C	-30 to +70
relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95
Modbus RTU interface		
Function		Modbus RTU module (slave)
Duplex		half
Modbus RTU status	LED	green/red
Maximum cable length	m	600
Maximum branch length	m	10
Wire type		Twisted pair, shielded / unshielded
Number of users		63 maximum
24 V DC supply		
Rated voltage		24 V DC, - 15 % - + 20 %
Ripple		≤ 5 %
Protection against polarity reversal		yes
Maximum input current	mA	110
Connector cross sections		
single-wire	mm ²	0.05 - 1.5 (AWG30 - 14)
flexible with ferrule	mm ²	0.05 - 1,5
Stripping length	mm	5 - 6
Tightening torque	Nm (lbf in)	0.25 (2.21)

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