KUHSE
Powerful Solutions

MANUAL

Kuhse Gateway Module
KGM - KEA

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HB-KGM-KEA_EN Version 01

Dear Customer!

Congratulations on your decision to use this product from Alfred Kuhse GmbH in your company.

Note

Due to the continuous further development of our products, there may be minor differences between the images/text of this documentation and the equipment that it accompanies. We reserve the right to change designs and the scope of deliveries as well as the right to technical development and the right to translate the documentation.

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1 Revision history

Date	Changed	Name
28/10/2016	Creation of the document	C.Behr
18/01/2017	Modbus TCP server data point list added	C.Behr
17/02/2017	Menu point and data point list for PROFINET added	C.Behr
23/02/2017	Data point list for PROFIBUS added	C.Behr
23/02/2017	Data point list KEA1xx for Modbus TCP/RTU added	C.Behr
20/04/2017	Change measure of right view	C.Behr
24/04/2017	Change the pictures of the webserver	C.Behr
22/05/2017	KEA1xx – delete “effective work” from ZLT	C.Behr
31/05/2017	Change scale factor “generator apparent/effective power”	C.Behr
02/06/2017	Menu point for Profibus DP added	C.Behr
15/11/2017	Contact data adjusted	Twesten
25/11/2017	Correct the address range for Profibus DP	C.Behr
22/01/2018	Slave address (Profibus) is entered in the decimal number system	C.Behr
23/01/2018	Correct pinout from CanBus (GND)	C.Behr
30/01/2018	Change LED description (CanBus)	C.Behr

2 Introduction

The KGM is a latest-technology, micro-processor controlled device and brings together different functionalities within a single hardware and software platform.

The device can be used as:

- Protocol converter (Gateway) for different communication protocols
- Interface converter for connected peripheral devices
- Data collection point and router in connection with central and decentralised control rooms
- System control and monitoring in energy systems

The device is integrated into an industrial housing. It has a wide input voltage range of 9-36VDC for the internal power supply. All inputs and outputs are isolated. Alongside numerous communications interfaces, the device also has additional digital inputs and relay signalling outputs. Furthermore, a GSM/UMTS/LTE modem can also be installed in a device insertion slot for communication via a mobile telephony network. All inputs and outputs are implemented via plug-in connectors.

The following interfaces are available in the device:

- Power supply input: 9-36VDC (isolated)
- 2x Ethernet 10/100/1000Mbit
- 2x RS232
- 2x RS485
- 2x CAN bus
- 1x SD card
- 5x Digital input
- 4x Relay output
- 1x Radio modem slot

3 Safety regulations

These installation instructions and operating instructions contain all important information for installing, configuring and commissioning the product. Please read through the document carefully and ensure that it is available to all personnel who remove the product from the packaging, connect it, configure it and commission it.

Please note: The product shall be unpacked, installed and commissioned only by authorised specialist personnel. In the event of improper handling, erroneous wiring of connections or improper use in general, this can result in the failure of the product.

The manufacturer accepts no warranty or guarantee claims for damage resulting from improper use of the product or erroneous wiring.

Please note: The product shall not be used with the housing open. In this case the product can be permanently damaged through contact with conductor tracks and electronic components. In addition, all warranty or guarantee claims shall be void in the event that the housing has been opened without the knowledge of the manufacturer.

This product contains sensitive electronic components. Please only remove the product from its packaging immediately before its integration into an energy system. Please follow the rules for good ESD practice during the installation and commissioning of electronic products. Please avoid any impermissibly high mechanical stresses on the device. An unprotected installation in environments that do not represent the technical operating conditions, is not permitted. Use in outdoor areas and humid rooms is forbidden. Please protect the product from direct or indirect moisture.

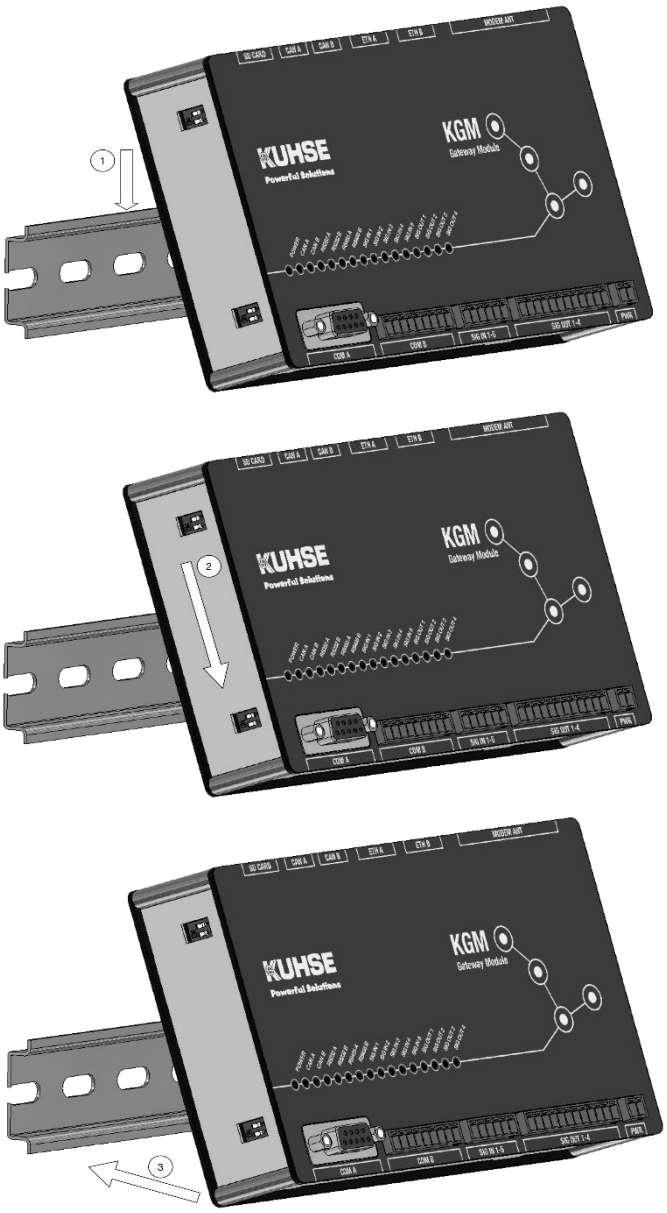
Please note: Please use the input and output connectors provided with the product exclusively. Please follow the recommendations for minimum cable cross-sections for the specified connections.

Defective devices should be immediately removed from operation and submitted for fault analysis along with a written description of the fault that occurred.

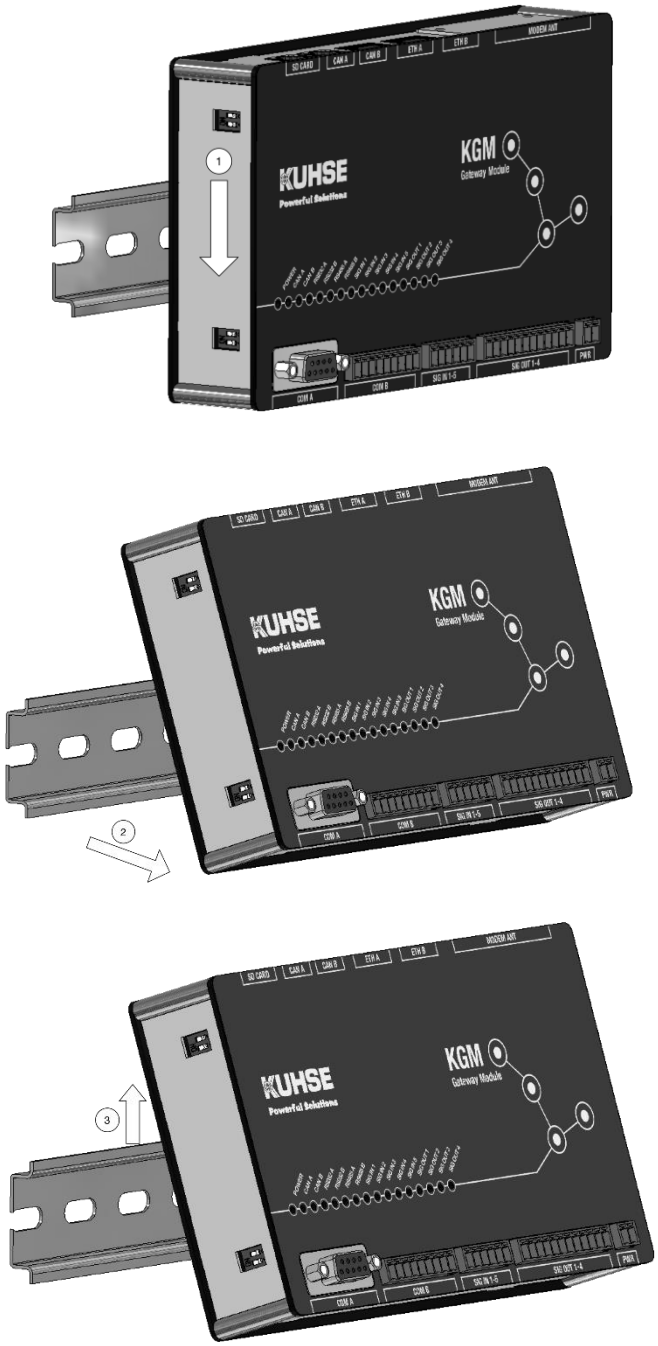
4 Mounting and installation

The mechanical installation of the product is very simple. The device is equipped with a rear panel adapter for DIN rail mounting (NS 35mm). It can be installed on DIN rails with a height of 7.5 and 15mm.

Remove the device from the packaging. Hold the device at a slight angle and hang it into the DIN rails from above (1). Guide it downwards (2) with light pressure and move the underside of the device towards the DIN rail (3). Once the device is parallel to the DIN rail, you can release the device. It now latches onto the underside of the DIN rail automatically.



If a device is to be removed, first press it downwards (1) and then after that the underside must be tilted forwards (2). The device is now hanging only from the top edge of the DIN rail and can be removed from there (3).



5 Inputs and outputs / interfaces

5.1 Power supply

The power supply for the device can be implemented directly from a DC source (e.g. batteries), an external DC/DC converter or an external AC/DC converter (mains adapter).

The positive pole of the input is protected internally with a current-limiting polyfuse. The input is also protected against reverse polarity connection with a diode. However, the internal device protection does not replace the cable protection required for the supply line (important with direct battery connection) and for the external mains adapter.

The input is protected against short-term voltage spikes. However, continuous application of excessive voltage can result in the internal protection heating up severely and to the device failing. For this reason, the permissible input voltage range (see "Technical data") must always be complied with!

If the power supply has been correctly connected and switched on, the internal auxiliary power supply of the device is activated. The correct condition is indicated with the green

"Power" LED on the front face. The internal power supply is isolated from the supply feed.

The supply feed is implemented with a two-pole plug-in connector and identified with "PWR".

"PWR" power supply (isolated, 9-36 V DC / 1 A)	
Pin	**Function**
1	DC voltage (+)
2	DC voltage (-/GND)
Connector MC 1.5/2-ST-3.5; Phoenix Contact 1840366; min. 2 x 0.75mm2	

5.2 Relay outputs

4 controllable relay outputs are integrated into the device for potential-free signalling of alarm messages and for controlling external devices and modules.

The relay outputs are wired as changeover contacts (COM, NC, NO) to the external connection.

"SIG OUT 1-4" connector - relay outputs (isolated, 30 V / 1 A max.)	
Pin	Function
1	Relay 1 - NC
2	Relay 1 - COM
3	Relay 1 - NO
4	Relay 2 - NC
5	Relay 2 - COM
6	Relay 2 - NO
7	Relay 3 - NC
8	Relay 3 - COM
9	Relay 3 - NO
10	Relay 4 - NC
11	Relay 4 - COM
12	Relay 4 - NO
Connector MC 1.5/12-ST-3.5; Phoenix Contact 1840463; min. 12 x 0.5mm2	

In relaxed condition (relay coil not energised) the COM and NC contacts are closed.

In activated condition (relay coil energised) the COM and NO contacts are closed. In addition, this active condition is indicated separately with a green LED for each relay output (SIG OUT 1-4).

A delay time for the relay reporting can be set in the configuration interface.

5.3 Digital inputs

5 digital inputs are integrated into the device for the polling of external signal reporting loops.

The inputs use a common signal voltage of 5V. The signal voltage as well as the inputs themselves are internally isolated.

Only potential-free signal loops are permitted to be connected. The minimum contact conductance of the signalling circuits (auxiliary switches, relays, contactors, etc.) connected must not drop below 10 mA.

"SIG IN 1-5" connector - digital inputs (isolated, 5 V / 10 mA)	
Pin	Function
1	Digital input 1
2	Digital input 2
3	Digital input 3
4	Digital input 4
5	Digital input 5
6	Signal voltage +5V DC
Connector MC 1.5/6-ST-3.5; Phoenix Contact 1840405; min. 6 x 0.5mm2	

In closed condition, that means that if the 5V supply voltage is present at the respective digital input, an internal reporting signal is generated. In addition, this active condition is indicated separately with a green LED for each digital input (SIG IN 1-5).

5.4 Serial interfaces

The RS232 and RS485 serial interfaces are each available via identical plug-in connectors.

However, the connector pins are not double-assigned, i.e. it is possible to use the respective interfaces simultaneously on one connector.

5.4.1 COM A

Devices that communicate via the RS232 or RS485 (half-duplex) interfaces can be connected to serial port A. The interfaces are isolated.

5.4.2 COM A - RS232

Connector "COM A" - Serial interface RS232	
Pin	Function
1	RS232 A - RXD
2	RS232 A - TXD
4	RS232 A - RTS
7	RS232 A - CTS
9	RS232 A - GND
3,5,6,8	RS232 A - CTS
Connector Sub-D9; male, 5 x 0.25mm2	

The following parameters can be configured for the serial interface COM A - RS232 A:

- Activate/deactivate interface
- Baud rate, data bits, parity, stop bits, sequence control

If the interface is active, the green "RS232 A" LED illuminates.

5.4.3 COM A - RS485

Connector "COM A" - Serial interface RS485	
Pin	Function
3	RS485 A - B
5	GND ISO (only for external termination)
6	5 V ISO (only for external termination)
8	RS485 A - A
1,2,4,7,9	Not relevant
Connector Sub-D9; male, 3 x 0.25mm2	

The following parameters can be configured for the serial interface COM A - RS485 A:

- Activate/deactivate interface
- Baud rate, data bits, parity, stop bits

If the interface is active, the green "RS485 A" LED illuminates.

5.4.4 COM B

Devices that communicate via the RS232 or RS485 (half-duplex) interfaces can be connected to serial port B. The interfaces are isolated.

5.4.5 COM B - RS232

Connector "COM B" - Serial interface RS232	
Pin	Function
1	RS232 B - GND
2	RS232 B - CTS
3	RS232 B - TXD
4	RS232 B - RTS
5	RS232 B - RXD
6,7,8,9	Not relevant
Connector MC 1.5/9-ST-3.5; Phoenix Contact 1840434, 5 x 0.25mm2	

The following parameters can be configured for the serial interface COM B - RS232 B:

- Activate/deactivate interface
- Baud rate, data bits, parity, stop bits, sequence control

If the interface is active, the green "RS232 B" LED illuminates.

5.4.6 COM B - RS485

Connector "COM B" - Serial interface RS485	
Pin	Function
1-6	Not relevant
7	RS485 B - B
8	RS485 B - A
9	Termination RS485 B
Connector MC 1.5/9-ST-3.5; Phoenix Contact 1840434, 3 x 0.5mm2	

If bus termination is required, pin 7 must be externally linked to pin 9. Resistance circuitry is already installed in the device.

The following parameters can be configured for the serial interface COM B - RS485 B:

- Activate/deactivate interface
- Baud rate, data bits, parity, stop bits

If the interface is active, the green "RS485 B" LED illuminates.

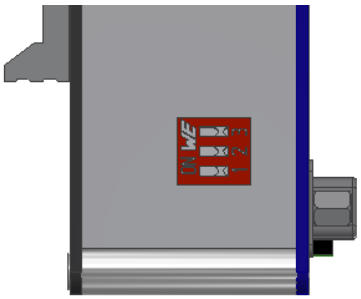
5.4.7 RS485 bus termination

For correct operation of the RS485 bus, it is necessary to fit a termination resistor at both ends of the bus. If the device is installed at the end of the bus, an internal termination resistor can be activated via DIP switch. This simplifies the installation as there is no need to wire an external resistor. If a PROFIBUS connector with integrated termination is used, the internal termination should be deactivated on the DIP switch!

ATTENTION

There must always be two termination resistors (each 220 Ohm) installed in an RS485 bus. However, there must never be more than two resistors active. If the device is installed in the middle of a system configuration and external resistors are active at both extremities of the bus, the internal resistor must be deactivated. If the termination is incorrect, the RS485 bus communication may be occasionally disrupted or the RS485 bus may fail completely.

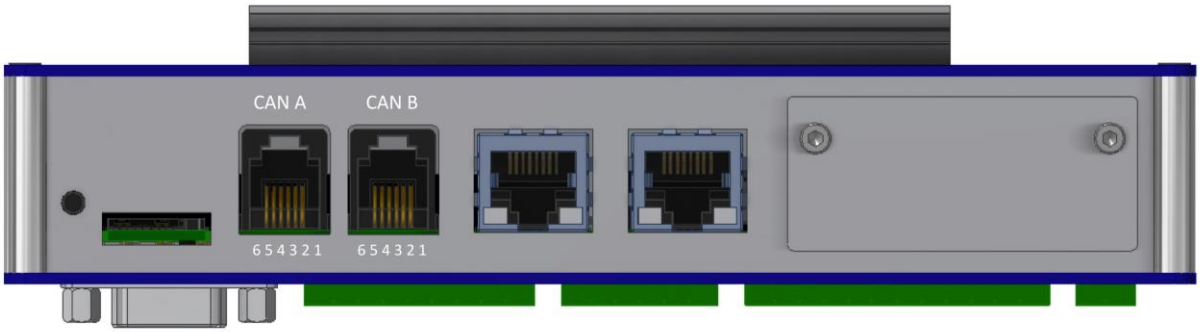
The 3-pole DIP switch for the RS485 bus termination is located at the left, bottom side of the device.



RS485 bus termination	
DIP switch	Function
1-3	ON = RS485 A termination active; OFF = RS485 A termination deactivated

5.5 CAN bus

The device has 2 CAN bus interfaces that operate independently of one another. The interfaces are isolated. The interfaces can be operated with CAN protocol 1.0A or 1.0B (proprietary). In doing so, each interface can have its own protocol and its own baud rate.



Connector "COM A" - CAN bus A (isolated)	
Pin	Function
1,6	Not relevant
3	CAN - high
4	CAN - low
2,5	GND
Connector RJ12 6p/6c, 6 x 0.5mm2	

Connector "B" - CAN bus B (isolated)	
Pin	Function
1,6	Not relevant
3	CAN - high
4	CAN - low
2,5	GND
Connector RJ12 6p/6c, 6 x 0.5mm2	

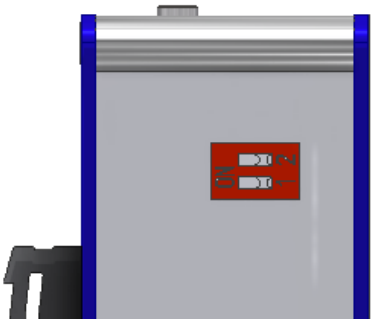
The respective CAN protocol and the CAN bus data rate can be selected or configured.

5.5.1 CAN bus termination

For correct operation of the CAN bus, it is necessary to fit a termination resistor at both ends of the bus. If the device is installed at the end of the bus, an internal termination resistor can be activated via DIP switch. This simplifies the installation as there is no need to wire an external resistor.

ATTENTION

There must always be two termination resistors (each 120 Ohm) installed in a CAN bus. However, there must never be more than two resistors active. If the device is installed in the middle of a CAN configuration and external resistors are active at both extremities of the bus, the internal resistor must be deactivated. If the termination is incorrect, the CAN bus communication may be occasionally disrupted or the CAN bus may fail completely.



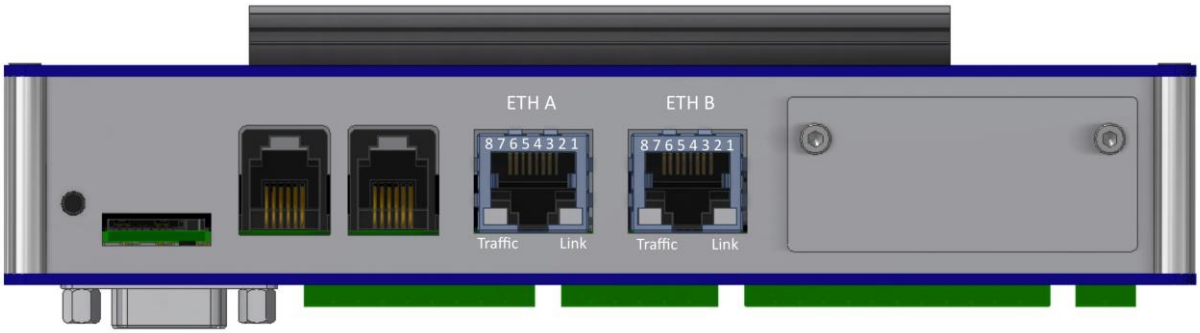
The DIP switch for the CAN termination is located at the left, top side of the device.

CAN bus termination	
DIP switch	Function
1	ON = CAN A termination active; OFF = CAN A termination deactivated
2	ON = CAN B termination active; OFF = CAN B termination deactivated

5.6 Ethernet

The device has 2 Ethernet ports that operate independently of one another with separate physical MAC addresses and their own IP address space. The interfaces are isolated.

Two LEDs on the respective port indicate an existing link (green, steadily illuminated LED) and active communication "Traffic" (yellow, flashing LED).



Connector "ETH A" - Ethernet Port A	
Pin	Function
1	TRP0+
2	TRN0-
3	TRP1+
4	TRP2+
5	TRN2-
6	TRN1-
7	TRP3+
8	TRN3-
Connector RJ45 8p/8c, 8 x 0.5mm2 (Standard CAT 5)	

Connector "ETH B" - Ethernet Port B	
Pin	Function
1	TRP0+
2	TRN0-
3	TRP1+
4	TRP2+
5	TRN2-
6	TRN1-
7	TRP3+
8	TRN3-
Connector RJ45 8p/8c, 8 x 0.5mm2 (Standard CAT 5)	

The Ethernet ports differ with regard to the ability to configure them and with regard to their use in LAN/WANs. So, for example, ETH A is always used for device configuration and works exclusively in the IP range of an internal LAN, whereas ETH B can be used as a routing port for WAN/VPN access with its own integrated firewall.

The following parameters can be configured for Ethernet ports ETH A and ETH B:

- IP address assignment (static/DHCP)
- IP address
- SubNet mask
- Gateway address

More detailed information can be found in the "Configuration" chapter.

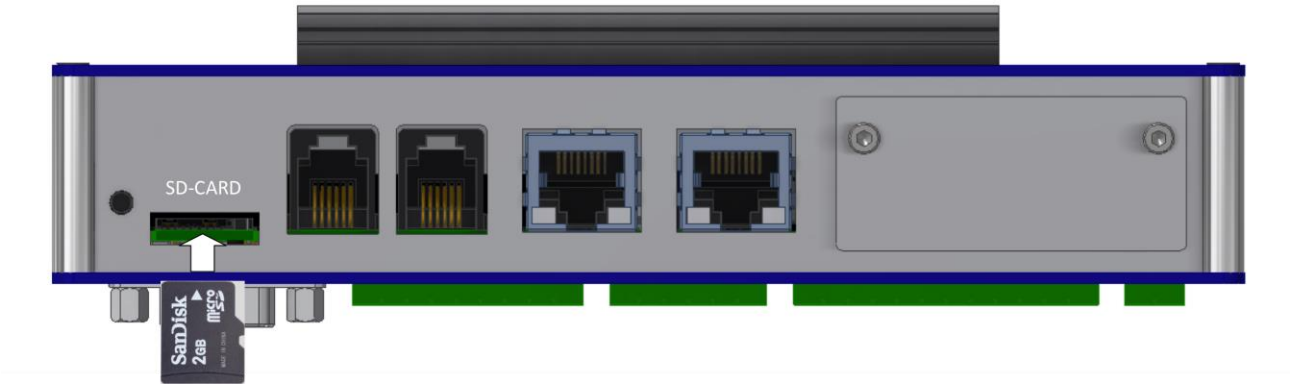
5.7 SD card

The device is equipped with an SD card interface. The SD card can be used as a storage medium for measurement data in order to be able to store larger quantities of data over the long-term, for example. In addition, an SD card with a security key is required to carry out local firmware updates on the device. More detailed information can be found in the "Firmware update" chapter.

Only Micro-SD format memory cards up to a capacity of 32GB can be used.

ATTENTION

Although the memory access and the minimum reading and writing speed for SD cards of this type are standardised, not all manufacturers' variants are compatible! Ask your supplier about compatible and tested manufacturers.

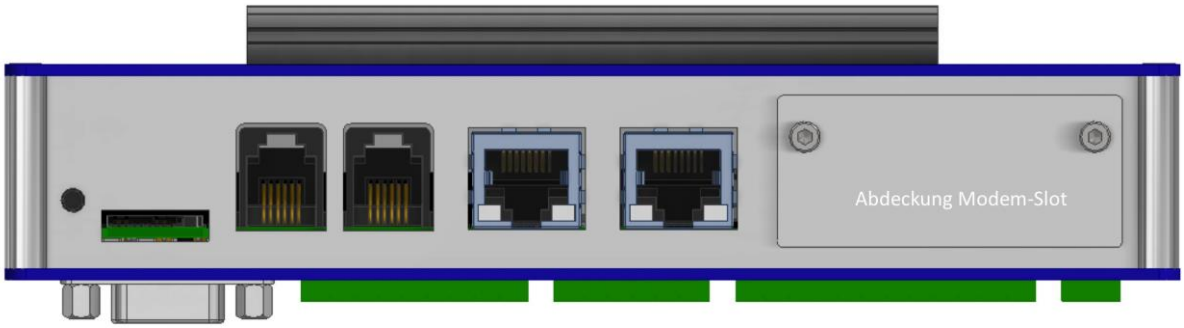


The SD card interface operates in accordance with the Push-Push principle, i.e. the card is inserted into the slot and latched into place with a light push. Another push on the card unlatches it and allows it to be withdrawn again.

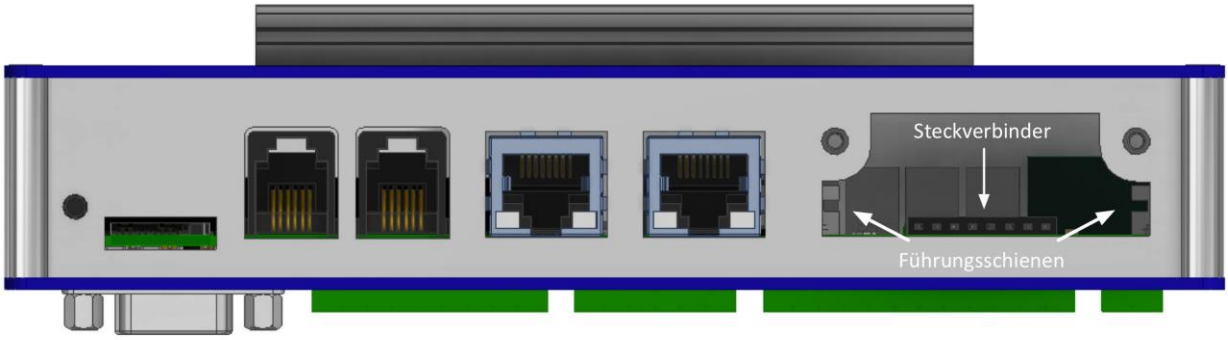
5.8 Modem slot

The device can be equipped with a radio modem for remote data transmission. There is a dedicated plug-in card slot provided for this. The plug-in modem card can also be retrospectively integrated into the device in the field without having to remove and open the device.

View with slot cover installed (standard delivered state):



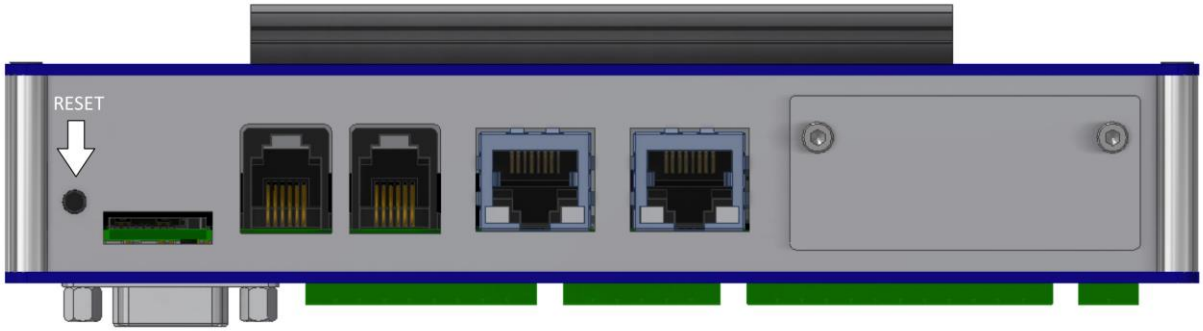
View without slot cover installed:



There are two plug-in modem cards available for the radio data networks GSM/HSPA/UMTS and LTE. More detailed information can be found in the "Modem installation" chapter.

5.9 RESET button

In order to be able to reboot the device without having to disconnect it from the power supply, a RESET button has been provided. The button is aligned flush with the surface of the housing in order to prevent erroneous operation due to accidental contact. It can be operated with a pointed object (e.g. a ballpoint pen).



After a brief press of the button, the device reboots.

More detailed information on the boot process can be found in the "Commissioning and configuration" chapter.

6 Commissioning and configuration

After the device has been mounted on the DIN rails and all of the inputs and outputs have been connected, it can be commissioned. To do so, it is only necessary to switch on the power supply. Please note that only voltages within the permissible input voltage range are allowed to be connected!

6.1 Boot process

Once the internal auxiliary power supply is operational (green Power LED), the processor module starts with the initialisation and the boot process. While this is happening, some of the LEDs may blink briefly as individual processor ports are polled during initialisation, changing their status. After the boot process is complete, all interfaces that have been configured are switched on and the respective LEDs illuminate green.

The complete boot process takes approximately 30 seconds, depending on the configuration.

After the boot process is complete, the device is ready for operation and operates in accordance with the configuration. In order to adapt the configuration, the user can implement all important settings in a web browser.

6.2 LED signalling

The device is equipped with a line of LED indicators in order to signal all necessary status information for the hardware inputs and outputs. This offers the user the advantage of a quick overview of activated interfaces as well as of the status of the digital inputs and the relay signalling outputs.

The device has a total of 16 LEDs on the front. The Ethernet ports ETH A and ETH B have their own LEDs for "Link" and "Traffic", directly at the Ethernet sockets.

LED	Colour	Function
POWER	Green	Internal auxiliary power supply active; device functional
CAN A	Green	CAN bus interface A activated
CAN B	Green	CAN bus interface B activated
RS232 A	Green	RS232 interface A activated
RS232 B	Green	RS232 interface B activated
RS485 A	Green	RS485 interface A activated
RS485 B	Green	RS485 interface B activated
SIG IN1	Green	Digital input 1 active (monitoring circuit closed)
SIG IN2	Green	Digital input 2 active (monitoring circuit closed)
SIG IN3	Green	Digital input 3 active (monitoring circuit closed)
SIG IN4	Green	Digital input 4 active (monitoring circuit closed)
SIG IN5	Green	Digital input 5 active (monitoring circuit closed)
SIG OUT1	Green	Relay output 1 active (relay coil activated)
SIG OUT2	Green	Relay output 2 active (relay coil activated)
SIG OUT3	Green	Relay output 3 active (relay coil activated)
SIG OUT4	Green	Relay output 4 active (relay coil activated)

6.3 Device configuration

The device can be configured via the internal web server.

6.3.1 Device connection and web browser call-up

- Device must be switched on
- Device must have completed the boot process
- Connection of a laptop/PC with a network cable (CAT 5) to the Ethernet port ETH A; the green "Link" LED on port ETH A must be steadily illuminated
- Start the web browser on the laptop/PC
- Enter the standard address of the device in the web browser "https://192.168.1.1:8443"

Standard parameters in delivery condition:

Standard address: 192.168.1.1

SubNet: 255.255.0.0

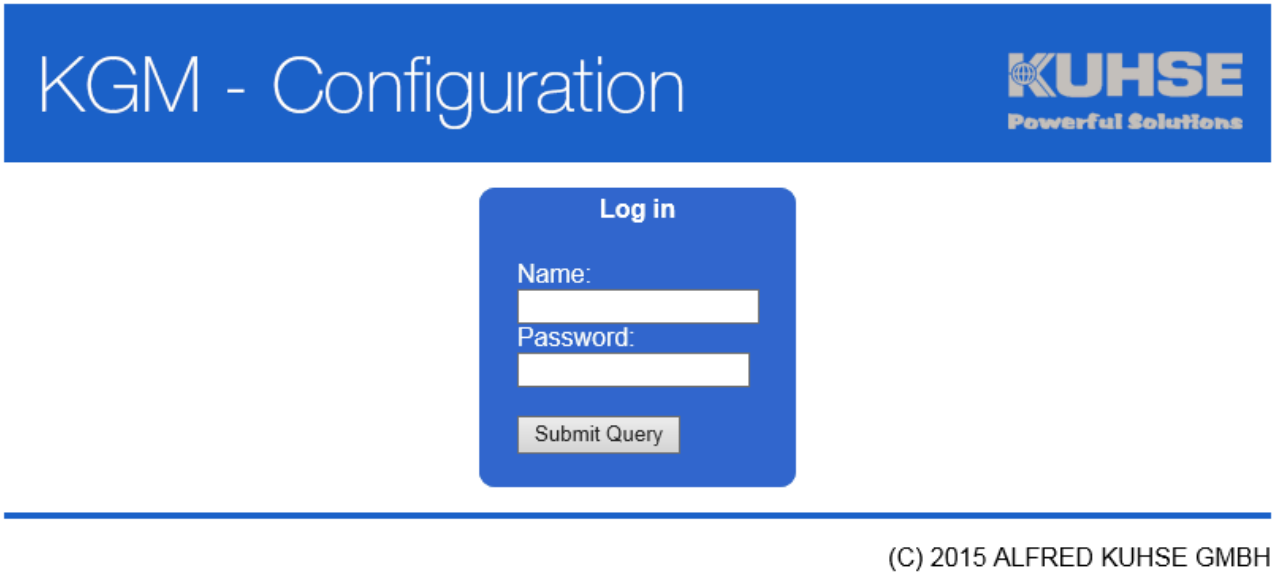
Standard port: 8443

Standard protocol: https

Please note that the network settings on the laptop/PC must be in the same address range and SubNet range as the standard address of the device. If this is not the case, no communication can take place.

6.3.2 Log-in

After the connection has been correctly established, a log-in window appears in the web browser: The username and password must be entered in this window in order to be able to change to the configuration area.



There are two standard users available for configuration.

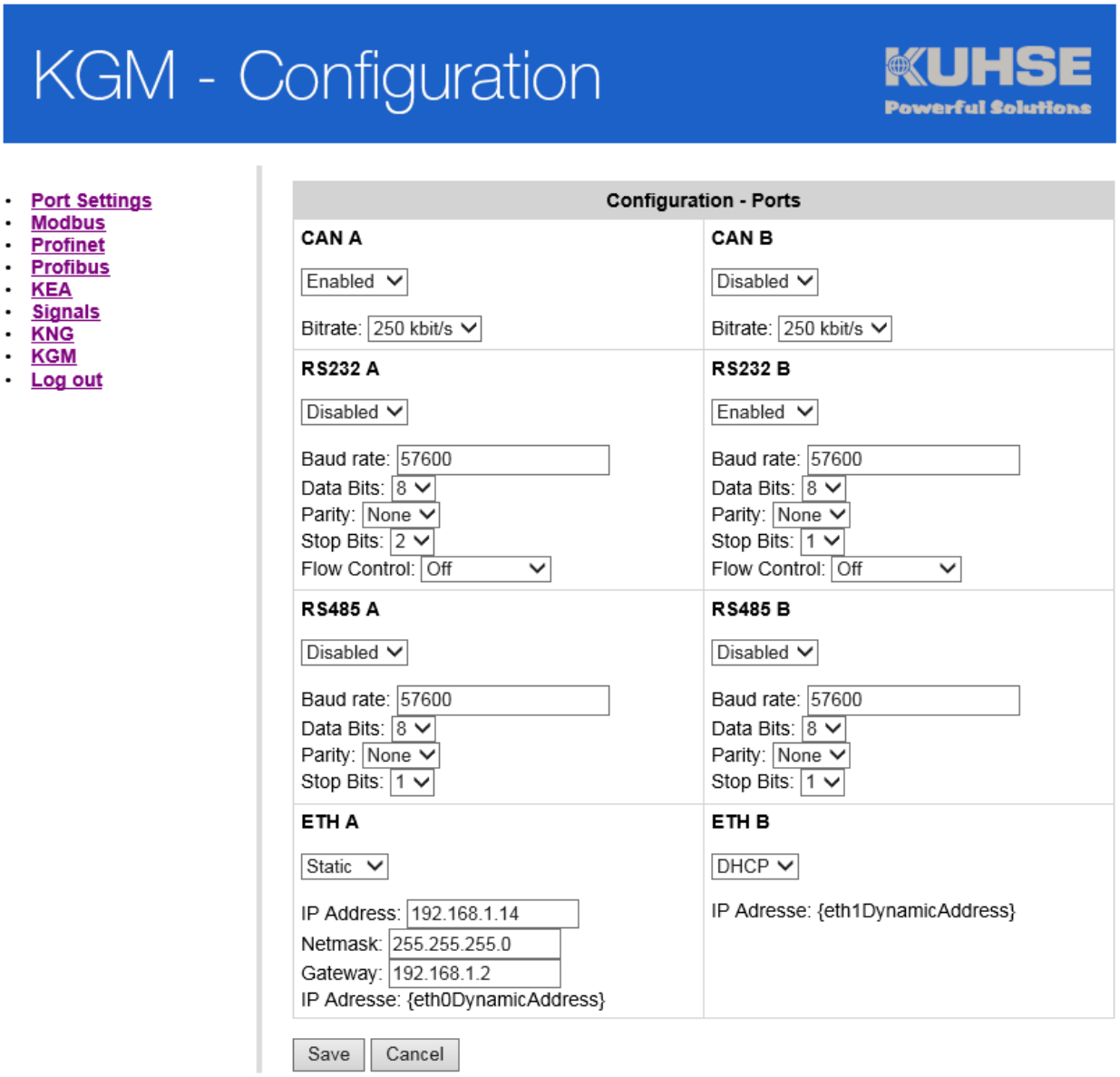
- User 1: Only read rights in order to be able to view the configuration
- User 2: Read and write rights for changing the configuration

User	User rights	Username	Password
User 1	Read only	KH395738	*******
User 2	Read/write	KH432482	*******

The exact log-in data is included in the delivery content. The password for the user should be changed with the initial commissioning. The changing of the password is described under "KGM configuration" in chapter 6.3.11.

6.3.3 Start screen - interface configuration

The main screen is divided into two areas, the menu area for selecting the configuration screen in the left part and the configuration screen itself in the right part.



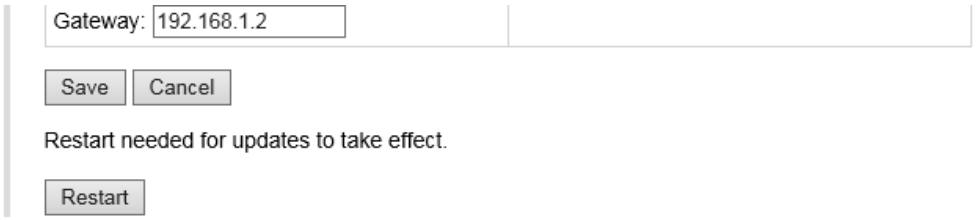
6.3.4 Configuration - interfaces

All hardware interfaces can be activated and deactivated in this window. It is recommended to permanently deactivate any unused interfaces.

Select the respective interface required for the application conditions and activate/deactivate this via the drop-down field.

After changing parameters, the change must be permanently saved by clicking on the "Save" button. If accidental changes are to be discarded, these changes can be rescinded by clicking the "Cancel" button. Several parameters can be changed at the same time before needing to be saved.

Changes that include intervention into the hardware initialisation may require a reboot of the device. The system automatically detects whether a change necessitates a reboot and informs the user accordingly. The user can now restart the device by clicking the "Restart" button. These changes will then only be active after the device has restarted.



CAN bus parameters

The following parameters can be set for each CAN interface (CAN A / CAN B):

- Activated/deactivated (= on/off)
- Bit rate (=25/50/100/125/250/500 kBit/s)

RS232 parameters

The following parameters can be set for each RS232 interface (RS232 A / RS232 B):

- Activated/deactivated (= on/off)
- Baud rate (e.g. 57600)
- Data bits (5/6/7/8)
- Parity (None/Even/Odd)
- Stop bits (1/2)
- Process control (Off; RTS/CTS;XON/XOFF)

RS485 parameters

The following parameters can be set for each RS485 interface (RS485 A / RS485 B):

- Activated/deactivated (= on/off)
- Baud rate (e.g. 57600)
- Data bits (5/6/7/8)
- Parity (None/Even/Odd)
- Stop bits (1/2)

Please note that the bus system must be properly terminated for correct operation of the RS485 and CAN bus interfaces

Ethernet parameters

The following parameters can be set for each Ethernet port (ETH A / ETH B):

- Address assignment in the network (static = fixed, defined IP/DHCP = port adopts an address from a DHCP server during the boot process)
- IP address (e.g. 192.168.1.1)
- SubNet mask (e.g. 255.255.255.0)
- Gateway address (e.g. 192.168.1.2)

Ethernet port ETH A is fundamentally provided for the configuration and for connection in the internal (unsecured) network. Ethernet port ETH B can also be used for configuration and is additionally intended as an external WAN port. Only this port will be provided with firewall functions in the future.

Attention! If the settings of both Ethernet ports must be adapted to customer-specific requirements, the IP address and the SubNet mask must be permanently documented by the user or service personnel so that it is still possible to configure the device via a web browser! Otherwise, the device would only be able to be recommissioned by the manufacturer.

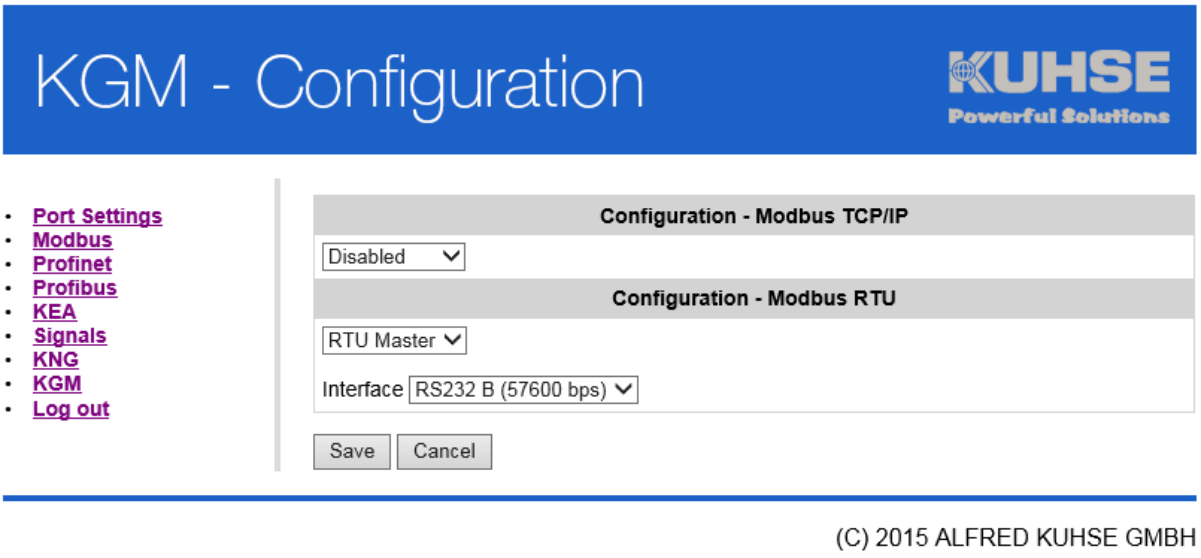
6.3.5 ModBus configuration

The ModBus protocol can be selected and assigned to an interface for the device in this dialogue. RTU mode and TCP mode are each available as Slave or as Master.

The selection of the protocol type is covered in this section. Further selection options are restricted depending on the protocol type.

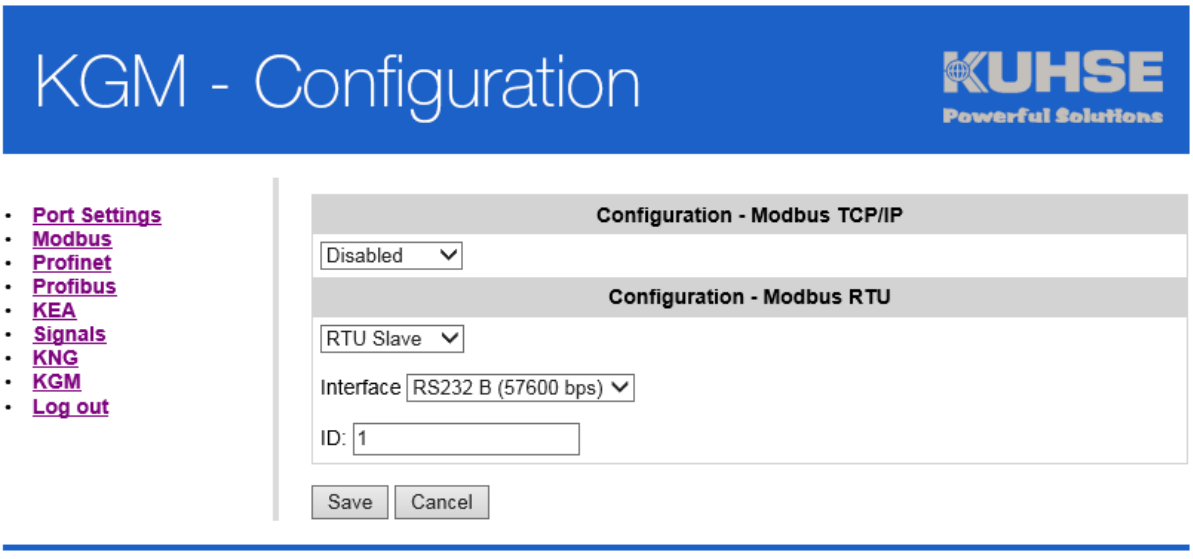
6.3.5.1 ModBus RTU Master

A serial interface (RS232) that has already been configured must be selected.
The new setting is adopted with the "Save" button.



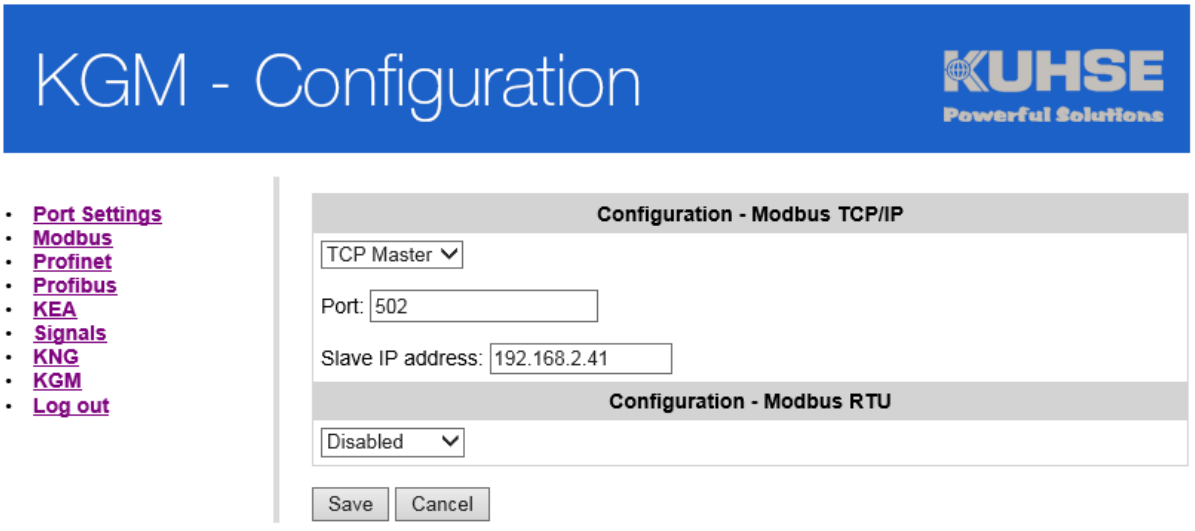
6.3.5.2 ModBus RTU Slave

A serial interface (RS232) that has already been configured must be selected. A device ID must also be assigned. The new setting is adopted with the "Save" button.



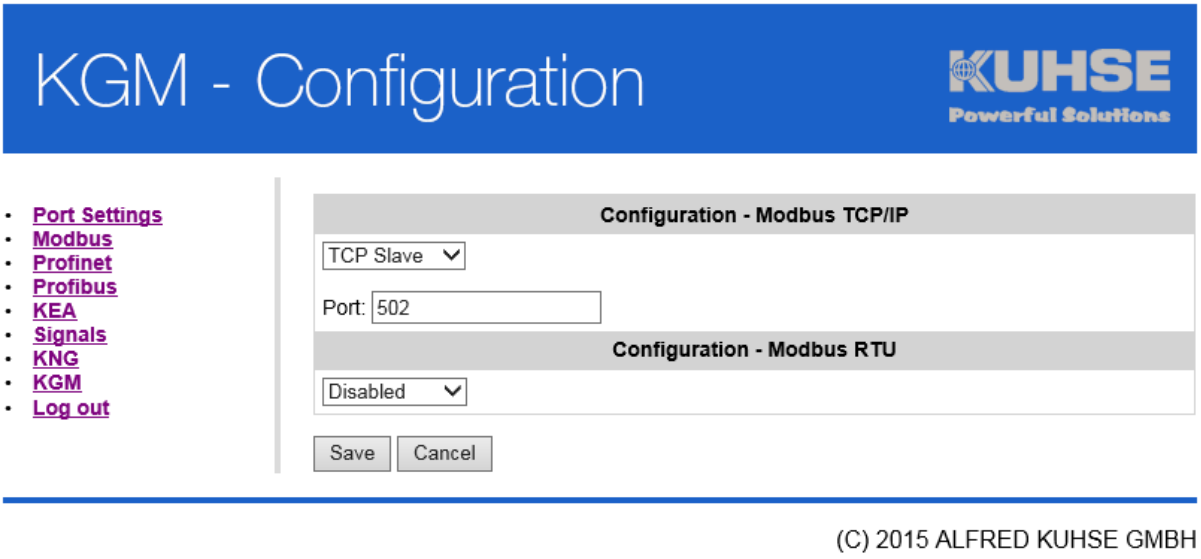
6.3.5.3 ModBus TCP Master

For the ModBus TCP Master protocol, the communication port must first be entered (standard = 502). The Slave IP address for the counterpart must also be entered. The new setting is adopted with the "Save" button.



6.3.5.4 ModBus TCP Slave

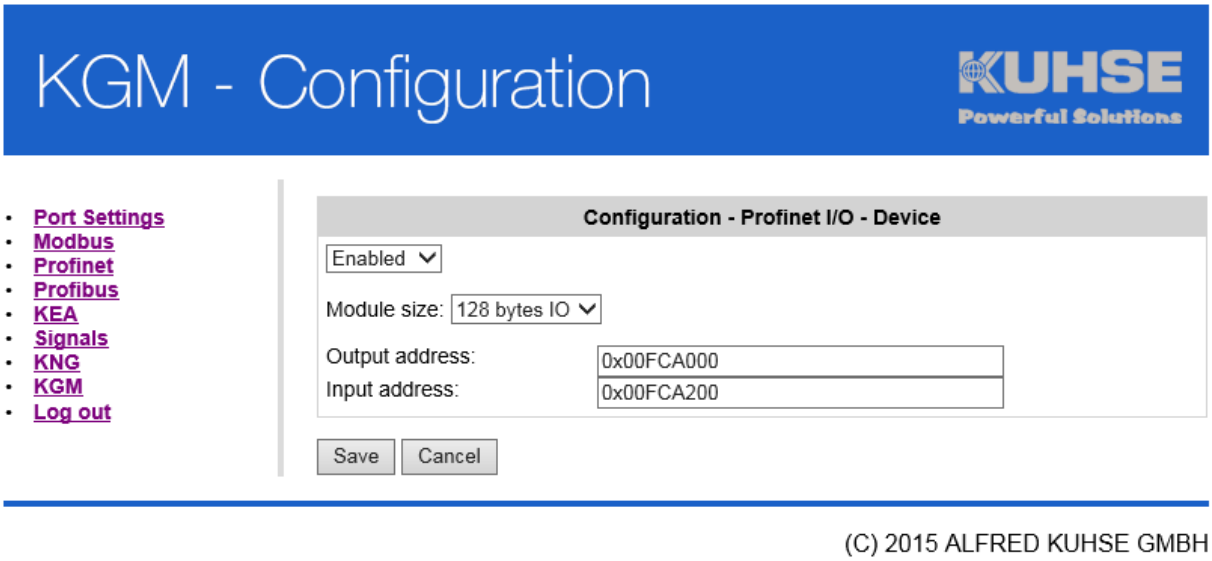
For the ModBus TCP Slave protocol, only the communication port need be entered (standard = 502). The new setting is adopted with the "Save" button.



6.3.6 PROFINET configuration

The PROFINET settings are implemented under this menu point. The PROFINET connection is implemented exclusively via Ethernet interface B (ETH B). 128 bytes IO is set as the module size.

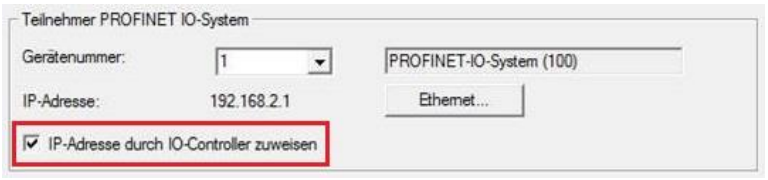
ATTENTION!
The settings for the KEA PROFINET Gateway are already pre-configured and must not be changed.



The name and IP assignment for the KGM are implemented with the development environment of the IO controller.

Many IO controllers can also assign an IP address to the respective IO device by means of the configured name. In the case of Siemens, this is possible by ticking in the hardware configuration.
Assign device name:

Assign IP address through IO controller:

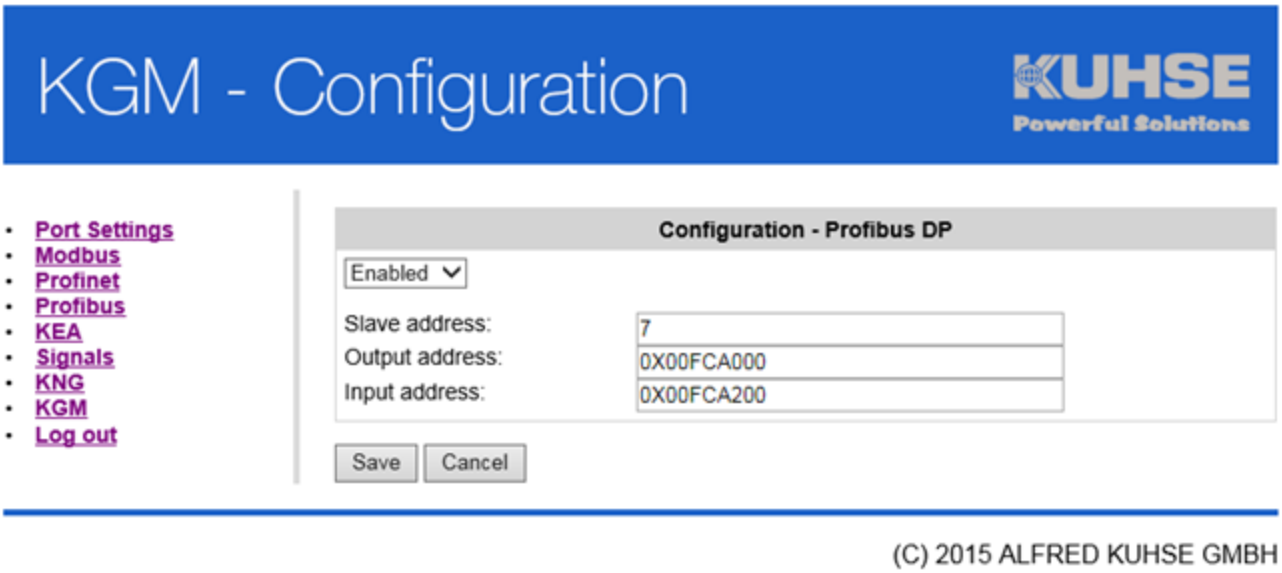


Module size as 128 bytes IO:

6.3.7 Profibus DP configuration

A separate configuration page is available for the connection of the KGM as Profibus DP slave within a Profibus system.

ATTENTION!
The settings for the input and output addresses are already pre-configured for the KEA Profibus gateway and may not be changed.



Within the KGM configuration, the Profibus interface must first be activated in the “Profibus” window. The slave address can now be individually entered. The slave address is entered in the decimal number system.

The addresses for the data storage (output address) and the start of the data reading area (input address) must be parameterised. The new setting is adopted with the "Save" button.

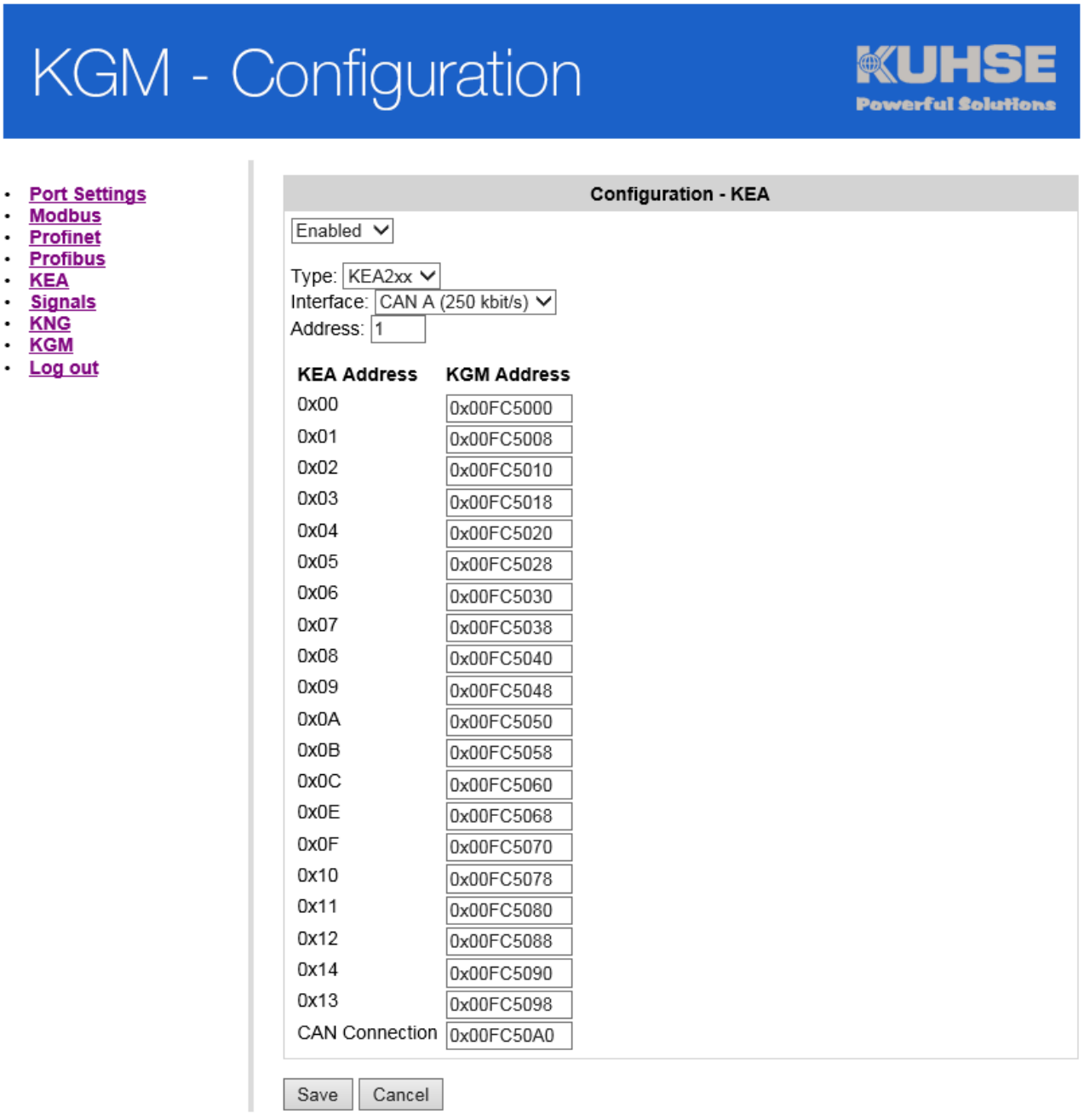
The Profibus network can be connected to the Sub-D socket (COM A) with a standard Profibus connector. The end termination is to be activated on the plug. The internal termination is to be deactivated in this case (see point 5.4.3 COM A - RS485).

When the Profibus DP interface has been activated, an entry in the “Interface” submenu appears in field RS485 A: “Profibus DP activated”. The interface then cannot be used for other forms of communication.

The valid GSD file is to be incorporated in the respective master. Depending on the master device used, additional device-specific parameterisations may be necessary. These can be found in the operating and parameterisation instructions for the master device.

6.3.8 KEA configuration

There is a dedicated configuration screen provided for the connection and configuration of a KEA.



First, the KEA polling must be activated. Then the selection of the KEA type (KEA1xx or KEA2xx). This selection is important as the communication protocol for both units is different. For the communication with a K-ATS U/S, KEA2xx must be selected.

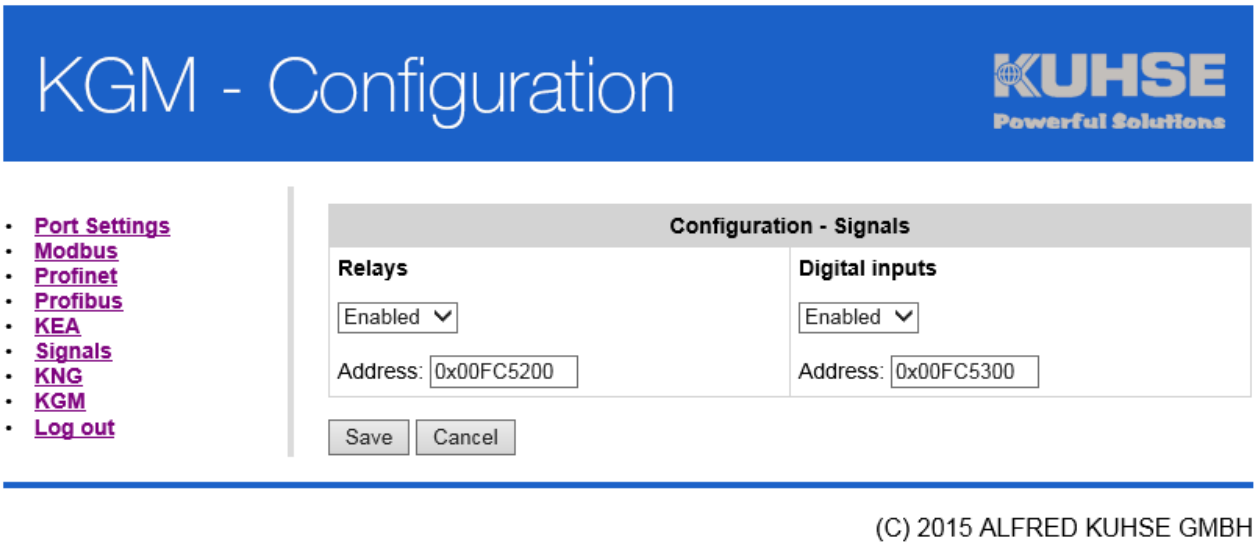
After the KEA type has been selected, the previously configured CAN interface (CAN A or CAN B) must be assigned. Now the correct CAN-ID for the KEA must be entered in the "Address" field.

The assignment of the individual KEA memory addresses to the respective KGM memory address is implemented in the following table. There has been no facility to change a memory address until now - this is a feature of the new device.

After all parameters have been selected, the configuration must then be saved.

6.3.9 Configuring inputs and outputs

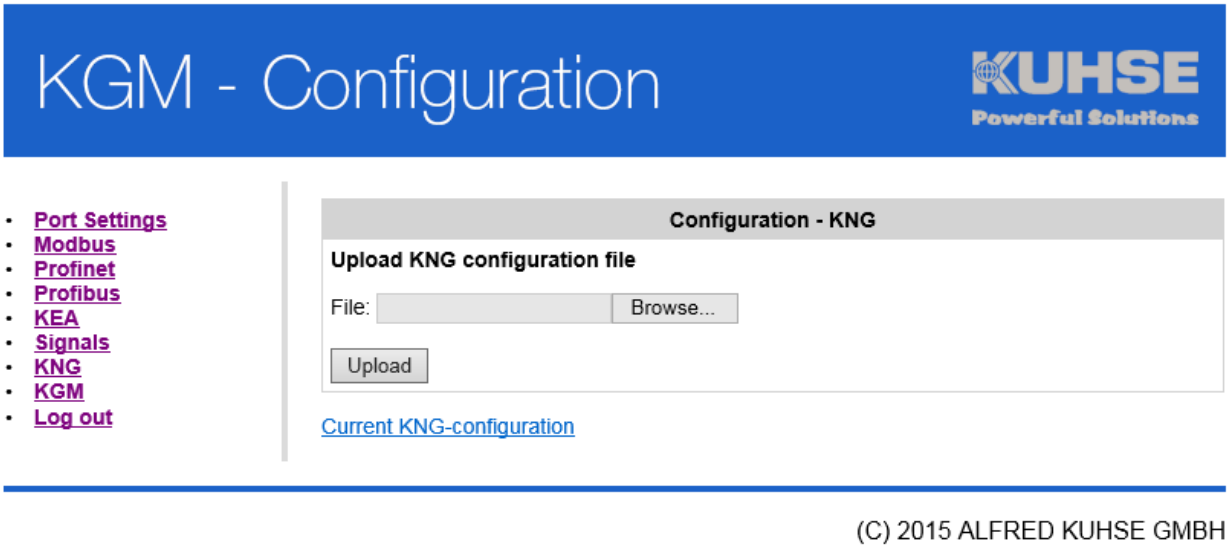
In the KGM there are 5 digital inputs that can be assigned to external signal loops. The status signals of these ports can then be transmitted via telecontrol protocol. The KGM also has 4 relay outputs. A bit sequence transmitted via telecontrol protocol can be used to switch a specific relay. First, the respective signal must be activated. The start address is predefined but can be manually adapted.



After all parameters have been selected, the configuration must then be saved.

6.3.10 KNG configuration

The configuration file for the KGM can be selected in the configuration window of the KNG configuration screen and read in via the "Upload" button. The configuration file has the file extension ".ini".

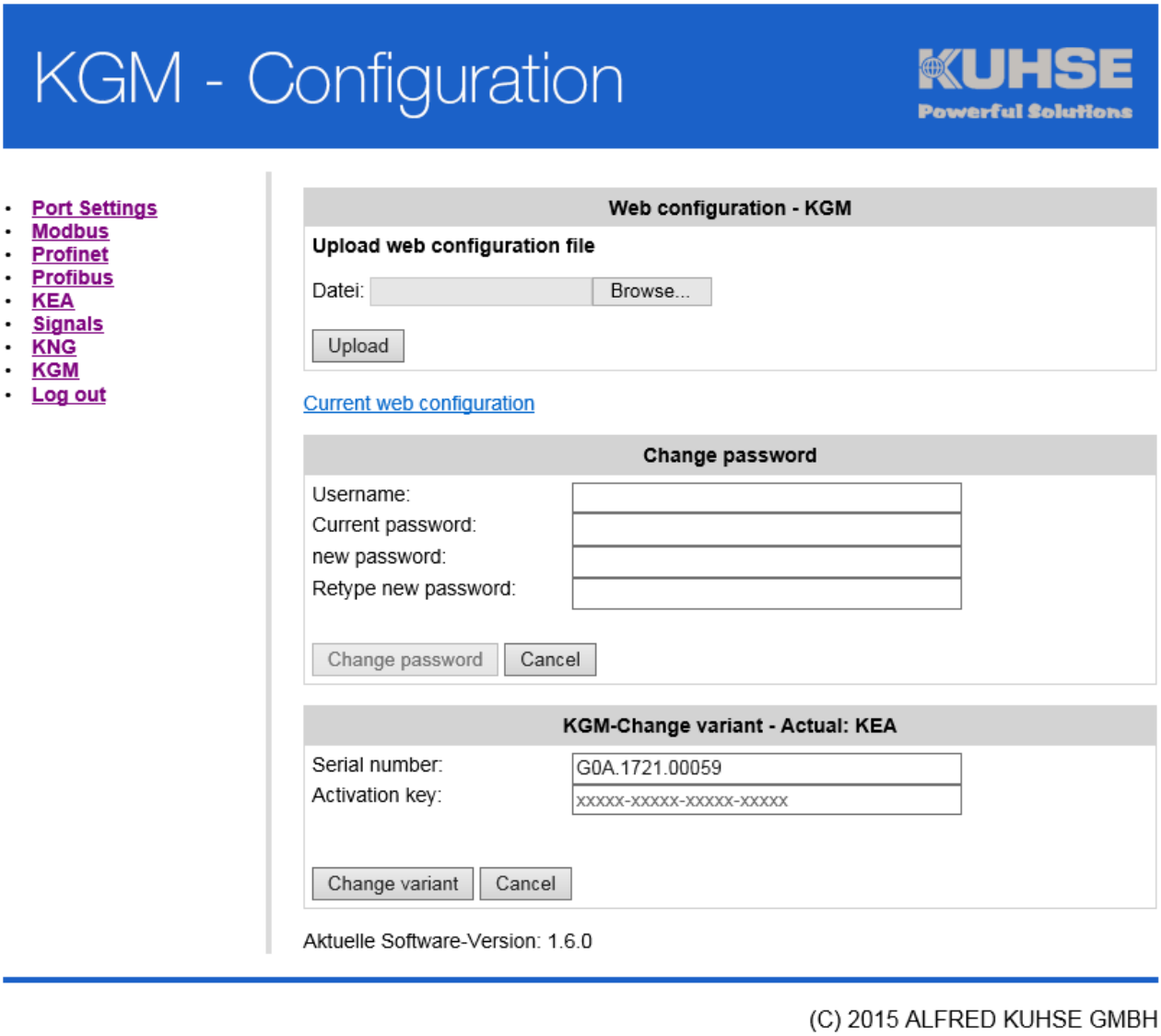


Attention! Configuration files for the old KNG hardware must not be used.

It is possible to view the configuration file loaded in plain text in the browser window by clicking on the "Show current KNG configuration".

6.3.11 KGM configuration

A web configuration can be selected and read in the configuration window of the KGM. The current version number installed can also be seen in the window. The configuration file has the file extension ".ini".



It is possible to view the configuration file loaded in plain text in the browser window by clicking on the "Show current web configuration".

In addition, the user can replace the current password with a new one. To do so, enter the username from the log-in and the current password. After that, you can enter a new password.

The new password is saved with the “Change password“ button. All entries can be deleted with the "Cancel" button enabling the process to be started again if desired.

Attention!

If the current password has been forgotten, the KGM must be returned to the manufacturer to have the password reset!

A different software variant (KGM-VHP, KGM-TC-U) can be loaded within the KGM configuration. The current software variant is shown in the header. In order to change the software, the activation key, appropriate to the respective serial number and software variant, must be entered. Click on the "Change variant" button to apply the change. If an incorrect key is entered, this will be reported.

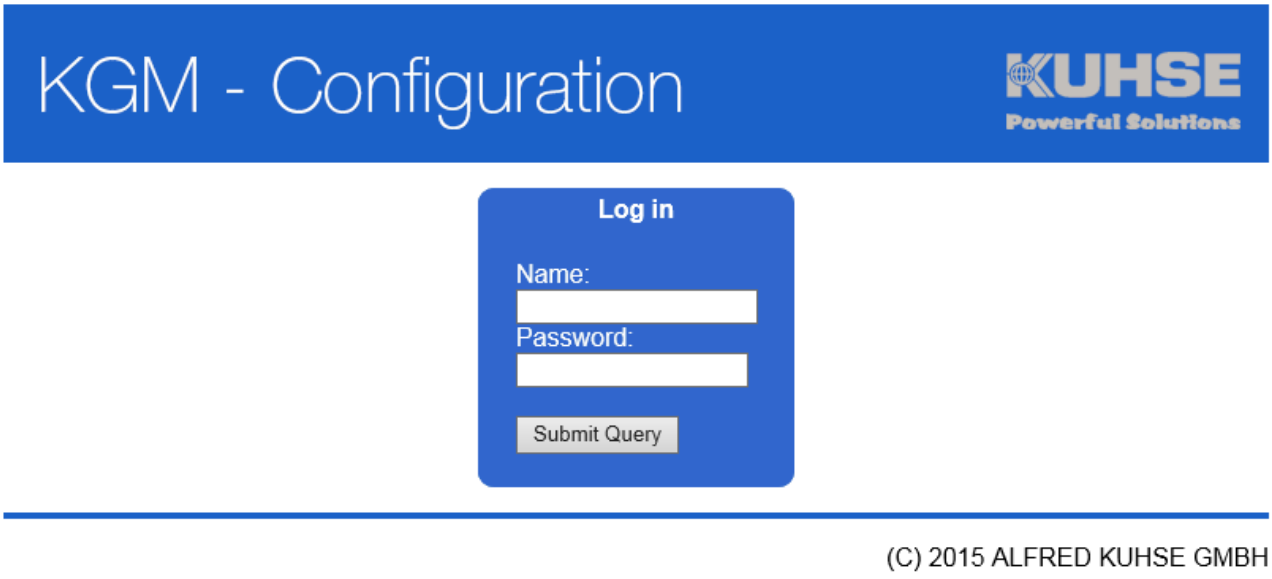
A manual reboot of the KGM is required after successfully changing the variant. The new variant is displayed once the device starts up again.

6.3.12 Log-out

After the configuration has been implemented, it is necessary to log out of the system manually. This prevents unauthorised access to the configuration.

After a waiting time (no user inputs registered) of approximately 10 minutes, the web session will be automatically ended and the user will be logged out. This prevents unauthorised access by other users in the event that active "logging out" is forgotten.

After the log-out, the user is automatically taken back to the log-in screen.



7 Data point list KEA1xx

7.1 Modbus TCP-Slave / RTU-Slave

Direction	Data	Number	Input (register)	Output (register)
From KGM **FC03**	Fault messages	4 register	47001 …47004	-
	Status messages	2 register	47005 … 47006	-
	Analogue values	36 register	47101 … 47136	-
	Counter values	10 register	47201 … 47210	-
	Status values	1 register	47401	-
To the KGM **FC16**	Commands*	16 register		47301…47308

Direction	Data	Number	Input (register)	Output (register)
From KGM **FC03**	Digital inputs KGM	1 register	47501	-
To the KGM **FC16**	Digital inputs KGM	1 register	-	47601

Notation of individual bits within a register:

Bit 15 = MSB ("left" in the register), Bit 00 = LSB

	H-Byte								L-Byte							
Bit no.	**15**	14	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**

Example notation, Siemens:

	H-Byte								L-Byte							
Bit no.	**0.7**	0.6	0.5	0.4	0.3	0.2	0.1	0.0	1.7	1.6	1.5	1.4	1.3	1.2	1.1	**1.0**

Some analogue values, e.g. network current and network power, are only valid if they are recorded by the automated system. This is dependent on the KEA type and can be looked up in the operating instructions for the KEA.

7.1.1 Digital signals KEA1xx

7.1.1.1 Fault messages KEA1xx (FC03)

Register	47001	47002
Bit 15	Fault 8 - e.g. COLLECTIVE FAULT A	Power controller impeded
Bit 14	Fault 7 - e.g. COLLECTIVE FAULT W	Overspeed
Bit 13	Fault 6 - e.g. OVERSPEED	Failed start
Bit 12	Fault 5 - e.g. INADEQUATE COOLANT	Engine does not switch off
Bit 11	Fault 4 - e.g. GEN. OVERTEMP.	Battery undervoltage
Bit 10	Fault 3 - e.g. EMERGENCY STOP PRESSED	Parameterised fault 19
Bit 09	Fault 2 - e.g. COOLANT TEMP. MAX.	Parameterised fault 18
Bit 08	Fault 1 - e.g. INSUFFICIENT OIL PRESSURE	Parameterised fault 17
Bit 07	Parameterised fault 16	Gen. phase sequence
Bit 06	Fault 15 - e.g. MAINS SWITCH	Mains phase sequence
Bit 05	Fault 14 - e.g. LEAKAGE	Gen. Switch instance
Bit 04	Fault 13 - e.g. TANK OVERFILLING	Mains switching event
Bit 03	Fault 12 - e.g. SOOT FILTER BYPASS.	Gen. off impeded
Bit 02	Fault 11 - e.g. STORAGE TANK MIN.	Mains off impeded
Bit 01	Fault 10 - e.g. DAY TANK MIN.	Synchronisation impeded
Bit 00	Fault 9 - e.g. OVERVOLTAGE TRIG.	Reverse power

Faults 1-16 are dependent on the parameterisation of the KEA fault inputs!

Register	47003	47004
Bit 15	Gen. thermal overload	Fault 56
Bit 14	Gen. asymmetric load	Fault 55
Bit 13	Gen. overcurrent II	Fault 54
Bit 12	Gen. overcurrent I	Fault 53
Bit 11	Mains thermical overload	Fault 52
Bit 10	Mains asymmetric load	Fault 51
Bit 09	Mains overcurrent II	Fault 50
Bit 08	Mains overcurrent I	Fault 49
Bit 07	Gen. overfrequency	Fault 64
Bit 06	Gen. underfrequency	Fault 63
Bit 05	Gen. overvoltage	Fault 62
Bit 04	Gen. undervoltage	Fault 61
Bit 03	Mains overfrequency	Fault 60
Bit 02	Mains underfrequency	Fault 59
Bit 01	Mains overvoltage	Fault 58
Bit 00	Mains undervoltage	Fault 57

7.1.1.2 Zustandsmeldungen KEA1xx (FC03)

Register	47005	47006
Bit 15	n.a.	Message 16
Bit 14	n.a.	Message 15
Bit 13	n.a.	Message 14
Bit 12	n.a.	Message 13
Bit 11	Collective fault all Alarms	External quick stop
Bit 10	Collective fault shutdown	Remote start
Bit 09	Collective fault warning	Peak load demand
Bit 08	Cos phi regulator fault	Mains failure
Bit 07	TEST operating mode	Message 24
Bit 06	AUTO operating mode	Message 23
Bit 05	MANUAL operating mode	Message 22
Bit 04	OFF operating mode	Message 21
Bit 03	Generator circuit breaker is on	Message 20
Bit 02	Mains circuit breaker is on	Message 19
Bit 01	Genset is running	Message 18
Bit 00	Genset is available	Message 17

7.1.1.3 Analogue values KEA1xx (FC03)

Register	Analogue values	Dimension	Wertigkeit
47101	Mains voltage L1	V	1
47102	Mains voltage L2	V	1
47103	Mains voltage L3	V	1
47104	Mains frequency	Hz	0,01
47105	Mains current L1	A	1
47106	Mains current L2	A	1
47107	Mains current L3	A	1
47108	Mains effective power	kW	1
47109	Generator voltage L1	V	1
47110	Generator voltage L2	V	1
47111	Generator voltage L3	V	1
47112	Generator frequency	Hz	0,01
47113	Generator current L1	A	1
47114	Generator current L2	A	1
47115	Generator current L3	A	1
47116	Generator effective power	kW	0,1
47117	Battery voltage	V	0,1
47118	Engine speed	rpm	1
47119	Analogue value 1	Temperatures without, oil pressure with decimal place	
47120	Analogue value 2		
47121	Analogue value 3		
47122	Analogue value 4		
47123	Mains Cos phi L1		0,01
47124	Mains Cos phi L2		0,01
47125	Mains Cos phi L3		0,01
47126	Mains apparent power	kVA	1
47127	Cos phi generator L1	-	0,01
47128	Cos phi generator L2	-	0,01
47129	Cos phi generator L3	-	0,01
47130	Generator apparent power	kVA	0,1
47131	Mains load	%	1
47132	Generator load	%	1
47133	Consumer power	kW	1
47134	Consumer apparent power	kVA	1
47135	Reserve	-	-
47136	Reserve	-	-

7.1.2 Counter values KEA1xx (FC03)

Register	Counter values	Dimension	Value
47201	Operating hours MSW	h	65536
47202	Operating hours LSW	h	1
47203	Start counter MSW	-	65536
47204	Start counter LSW	-	1
47205	Reserve MSW	-	65536
47206	Reserve LSW	-	1
47207	Reserve MSW	-	65536
47208	Reserve LSW	-	1
47209	Reserve MSW	-	65536
47210	Reserve LSW	-	1

7.1.3 Commands to KEA 1xx (FC16)

Register	Command and parameter	Value
47301	Command #0 : Target value from ZLT	**$243C**
47302	Parameter #0 : Power specification	In **kW**, without commas
47303	Command #1: n/a	$0000
47304	Parameter #1: n/a	0
47305	Command #2 : Command from ZLT	**$2850**
47306	Parameter #2 : Bit commands (Bef. 8…1 / 16…9)	e.g. Central control system (ZLT) command 1: $0100
47307	n/a	0
47308	n/a	0
47309	n/a	0
47310	n/a	0
47311	n/a	0
47312	n/a	0
47313	n/a	0
47314	n/a	0
47315	n/a	0
47316	n/a	0

To ensure that the commands will be accepted by the KEA, the value cited in the table for the respective command must be transmitted in the data word.

The transmission of command values that are not stipulated (other than zero) can result in undesired reactions by the KEA!

7.1.4 Connection status KEA1xx (FC03)

Register	Value
47401	L-Byte: Data traffic (0=OK, 1 = disrupted)

7.1.5 Example telegram

Function code 03	Read multiple registers (here: all analogue values)
Exampe: 38 register	Register address 47001 == Initial address 7000 Master telegram: 07 03 **1B 58** 0026 [CRC] | -> (Start address 1B58 hex = 7000 dec)

7.1.6 KGM inputs and outputs (FC03 / FC16)

Register	47501 (FC03)
Bit 15	Reserve
Bit 14	Reserve
Bit 13	Reserve
Bit 12	Digital input 5
Bit 11	Digital input 4
Bit 10	Digital input 3
Bit 09	Digital input 2
Bit 08	Digital input 1
Bit 07	
Bit 06	
Bit 05	
Bit 04	
Bit 03	
Bit 02	
Bit 01	
Bit 00	

Register	47601 (FC16)
Bit 15	Reserve
Bit 14	Reserve
Bit 13	Reserve
Bit 12	Reserve
Bit 11	Relay output 4
Bit 10	Relay output 3
Bit 09	Relay output 2
Bit 08	Relay output 1
Bit 07	Reserve
Bit 06	Reserve
Bit 05	Reserve
Bit 04	Reserve
Bit 03	Reserve
Bit 02	Reserve
Bit 01	Reserve
Bit 00	Reserve

8 Data point list KEA2xx

8.1 Modbus TCP Slave / RTU Slave

Direction	Data	Number	Input (register)	Output (register)
From KGM **FC03**	Fault messages	4 register	47001 - 47004	-
	Status messages	4 register	47005 - 47008	-
	Analogue values	38 register	47101 - 47136	-
	Counter values	10 register	47201 - 47210	-
	Status values	1 register	47401	-
To the KGM **FC16**	Commands*	8 register		47301 - 47308

Direction	Data	Number	Input (register)	Output (register)
From KGM **FC03**	Digital inputs KGM	1 register	47501	-
To the KGM **FC16**	Digital outputs KGM	1 register	-	47601

Notation of individual bits within a register:

Bit 15 = MSB ("left" in the register), Bit 00 = LSB

	H-Byte								L-Byte							
Bit no.	**15**	14	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**

Example notation, Siemens:

	H-Byte								L-Byte							
Bit no.	**0.7**	0.6	0.5	0.4	0.3	0.2	0.1	0.0	1.7	1.6	1.5	1.4	1.3	1.2	1.1	**1.0**

Some analogue values, e.g. network current and network power, are only valid if they are recorded by the automated system. This is dependent on the KEA type and can be looked up in the operating instructions for the KEA.

8.1.1 Digital signals KEA2xx

8.1.1.1 Fault messages (FC03)

Register	47001	47002
Bit 15	Fault 8 - e.g. COLLECTIVE FAULT A	Power controller impeded
Bit 14	Fault 7 - e.g. COLLECTIVE FAULT W	Overspeed
Bit 13	Fault 6 - e.g. OVERSPEED	Failed start
Bit 12	Fault 5 - e.g. INADEQUATE COOLANT	Engine does not switch off
Bit 11	Fault 4 - e.g. GEN. OVERTEMP.	Battery undervoltage
Bit 10	Fault 3 - e.g. EMERGENCY STOP PRESSED	Parameterised fault 19
Bit 09	Fault 2 - e.g. COOLANT TEMP. MAX.	Parameterised fault 18
Bit 08	Fault 1 - e.g. INSUFFICIENT OIL PRESSURE	Parameterised fault 17
Bit 07	Parameterised fault 16	Gen. phase sequence
Bit 06	Fault 15 - e.g. MAINS SWITCH	Mains phase sequence
Bit 05	Fault 14 - e.g. LEAKAGE	Gen. Switch instance
Bit 04	Fault 13 - e.g. TANK OVERFILLING	Mains switching event
Bit 03	Fault 12 - e.g. SOOT FILTER BYPASS.	Gen. off impeded
Bit 02	Fault 11 - e.g. STORAGE TANK MIN.	Mains off impeded
Bit 01	Fault 10 - e.g. DAY TANK MIN.	Synchronisation impeded
Bit 00	Fault 9 - e.g. OVERVOLTAGE TRIG.	Reverse power

Faults 1-16 are dependent on the parameterisation of the KEA fault inputs!

Register	47003	47004
Bit 15	Gen. thermal overload	Fault 56
Bit 14	Gen. asymmetric load	Fault 55
Bit 13	Gen. overcurrent II	Fault 54
Bit 12	Gen. overcurrent I	Fault 53
Bit 11	Alarm 36	Fault 52
Bit 10	Alarm 35	Fault 51
Bit 09	Alarm 34	Fault 50
Bit 08	Alarm 33	Fault 49
Bit 07	Gen. overfrequency	Fault 64
Bit 06	Gen. underfrequency	Fault 63
Bit 05	Gen. overvoltage	Fault 62
Bit 04	Gen. undervoltage	Fault 61
Bit 03	Mains overfrequency	Fault 60
Bit 02	Mains underfrequency	Fault 59
Bit 01	Mains overvoltage	Fault 58
Bit 00	Mains undervoltage	Fault 57

8.1.1.2 Status messages (FC03)

Register	47005	47006
Bit 15	**Collective fault, all alarms**	TEST operating mode
Bit 14	**Collective fault switch-off**	AUTO operating mode
Bit 13	**Collective fault warning**	MANUAL operating mode
Bit 12	Gen. Voltage is good	OFF operating mode
Bit 11	Parameterisation is on	Generator circuit breaker is on
Bit 10	Triggering vector shift	Mains circuit breaker is on
Bit 09	Triggering df/dt	Genset is running
Bit 08	Triggering du/dt	Genset available
Bit 07	Not assigned	Monitoring VDE (only PA)
Bit 06	Not assigned	Parallel operation (only PA)
Bit 05	Not assigned	Automatic system locked
Bit 04	Not assigned	External quick stop
Bit 03	**Collective fault, all alarms**	Manual quick stop
Bit 02	**Collective fault switch-off**	Remote start
Bit 01	**Collective fault warning**	Peak load demand
Bit 00	Cos phi controller impeded	Mains failure

Register	47007	47008
Bit 15	Gen. overfrequency	CanOpen input module 1, input 8
Bit 14	Gen. underfrequency	CanOpen input module 1, input 7
Bit 13	Gen. overvoltage	CanOpen input module 1, input 6
Bit 12	Gen. undervoltage	CanOpen input module 1, input 5
Bit 11	Mains overfrequency	CanOpen input module 1, input 4
Bit 10	Mains underfrequency	CanOpen input module 1, input 3
Bit 09	Mains overvoltage	CanOpen input module 1, input 2
Bit 08	Mains undervoltage	CanOpen input module 1, input 1
Bit 07	Waving flag*	CanOpen input module 2, input 8
Bit 06	Gen. asymmetric load	CanOpen input module 2, input 7
Bit 05	Gen. overcurrent II	CanOpen input module 2, input 6
Bit 04	Gen. overcurrent I	CanOpen input module 2, input 5
Bit 03	Horn*	CanOpen input module 2, input 4
Bit 02	Mains asymmetric load	CanOpen input module 2, input 3
Bit 01	Mains overcurrent II	CanOpen input module 2, input 2
Bit 00	Mains overcurrent I	CanOpen input module 2, input 1

8.1.1.3 Analogue values KEA2xx (FC03)

Register	Analogue value	Dimension	Value
47101	Mains voltage L1	V	1
47102	Mains voltage L2	V	1
47103	Mains voltage L3	V	1
47104	Mains frequency	Hz	0.01
47105	Reserve	-	-
47106	Reserve	-	-
47107	Reserve	-	-
47108	Reserve	-	-
47109	Generator voltage L1	V	1
47110	Generator voltage L2	V	1
47111	Generator voltage L3	V	1
47112	Generator frequency	Hz	0.01
47113	Generator current L1	A	1
47114	Generator current L2	A	1
47115	Generator current L3	A	1
47116	Generator effective power	kW	0.1
47117	Battery voltage	V	0.1
47118	Speed	rpm	1
47119	Analogue value 1	Temperatures without, oil pressure with decimal place	
47120	Analogue value 2		
47121	Analogue value 3		
47122	Analogue value 4		
47123	Reserve	-	-
47124	Reserve	-	-
47125	Reserve	-	-
47126	Reserve	-	-
47127	Cos phi generator L1	-	0.01
47128	Cos phi generator L2	-	0.01
47129	Cos phi generator L3	-	0.01
47130	Generator apparent power	kVA	0,1
47131	Reserve	-	-
47132	Generator load	%	1
47133	Reserve	-	-
47134	Reserve	-	-
47135	Reserve	-	-
47136	Reserve	-	-

8.1.2 Counter values KEA2xx (FC03)

Register	Counter value	Dimension	Value
47201	Operating hours MSW	h	65536
47202	Operating hours LSW	h	1
47203	Start counter MSW	-	65536
47204	Start counter LSW	-	1
47205	Reserve MSW	-	-
47206	Reserve LSW	-	-
47207	Reserve MSW	-	65536
47208	Reserve LSW	-	1
47209	Reserve MSW	-	65536
47210	Reserve LSW	-	1

8.1.3 Commands to KEA 2xx (FC16)

Register	Command and parameter	Value
47301	Command #1: Target value from ZLT	**$243C**
47302	Parameter #1a: Power specification	0 - 1100‰
47303	Parameter #1b: Release target value from ZLT	$0100 ($0000 = no release)
47304	Repeat parameter #1b:	$0100
47305	Command #2: Command from ZLT	**$2850**
47306	Parameter #2: Bit commands (com. 8 - 1 / 16 - 9)	e.g. Central control system (ZLT) command 1: $0100
47307	n/a	0
47308	n/a	0
47309	n/a	0
47310	n/a	0
47311	n/a	0
47312	n/a	0
47313	n/a	0
47314	n/a	0
47315	n/a	0
47316	n/a	0

To ensure that the commands will be accepted by the KEA, the value cited in the table for the respective command must be transmitted in the data word.

The transmission of command values that are not stipulated (other than zero) can result in undesired reactions by the KEA!

8.1.4 Example telegram

Function code 03	Read multiple registers (here: all analogue values)
Example: 38 register	Register address 47001 == Initial address 7000 Master telegram: 07 03 **1B 58** 0026 [CRC] | -> (Start address 1B58 hex = 7000 dec)

8.1.5 KGM inputs and outputs (FC03 / FC16)

Register	47501 (FC03)
Bit 15	Reserve
Bit 14	Reserve
Bit 13	Reserve
Bit 12	Digital input 5
Bit 11	Digital input 4
Bit 10	Digital input 3
Bit 09	Digital input 2
Bit 08	Digital input 1
Bit 07	
Bit 06	
Bit 05	
Bit 04	
Bit 03	
Bit 02	
Bit 01	
Bit 00	

Register	47601 (FC16)
Bit 15	Reserve
Bit 14	Reserve
Bit 13	Reserve
Bit 12	Reserve
Bit 11	Relay output 4
Bit 10	Relay output 3
Bit 09	Relay output 2
Bit 08	Relay output 1
Bit 07	Reserve
Bit 06	Reserve
Bit 05	Reserve
Bit 04	Reserve
Bit 03	Reserve
Bit 02	Reserve
Bit 01	Reserve
Bit 00	Reserve

8.2 PROFINET

PROFINET .GSDML file: GSDML-V2.31-Kuhse-KNG-YYYYMMDD.xml

The .GSDML file as well as a Siemens example project can be found under www.kuhse.de/download/software.html.

Direction	Data	Number	Input bytes	Output bytes
From KGM	Fault messages	4 word input	0 - 7	-
	Status messages	4 word input	8 - 15	-
	Analogue values I	16 word input	16 - 47	-
	Analogue values II	16 word input	48 - 79	-
	Analogue values III	4 word input	80 - 87	-
	Counter values	8 word input	88 - 103	-
	Status values	1 word input	104 - 105	-
To KGM	Transmission data	8 word output		0 - 15

Direction	Data	Number	Input bytes	Output bytes
From KGM	Digitaleingänge KGM	1 Wort	106 … 107	-
To KGM	Relaisausgänge KGM	1 Wort	-	16 … 17

Notation of individual bits within a data word:

Bit 15 = MSB ("left" in the data word), Bit 00 = LSB

	H-Byte								L-Byte							
Bit no.	**15**	14	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**

Example notation, Siemens:

	H-Byte								L-Byte							
Bit no.	**0.7**	0.6	0.5	0.4	0.3	0.2	0.1	0.0	1.7	1.6	1.5	1.4	1.3	1.2	1.1	**1.0**

Some analogue values, e.g. network current and network power, are only valid if they are recorded by the automated system. This is dependent on the KEA type and can be looked up in the operating instructions for the KEA.

The address of the data is stipulated in bytes (Siemens notation), e.g. Data word DW 02 comprises byte 02 and byte 03.

8.2.1 Digital signals KEA2xx

8.2.1.1 Fault messages

Bit	DW 00	DW 02
Bit 15	Fault 8 - e.g. COLLECTIVE FAULT A	Power controller impeded
Bit 14	Fault 7 - e.g. COLLECTIVE FAULT W	Overspeed
Bit 13	Fault 6 - e.g. OVERSPEED	Failed start
Bit 12	Fault 5 - e.g. INADEQUATE COOLANT	Engine does not switch off
Bit 11	Fault 4 - e.g. GEN. OVERTEMP.	Battery undervoltage
Bit 10	Fault 3 - e.g. EMERGENCY STOP PRESSED	Parameterised fault 19
Bit 09	Fault 2 - e.g. COOLANT TEMP. MAX.	Parameterised fault 18
Bit 08	Fault 1 - e.g. INSUFFICIENT OIL PRESSURE	Parameterised fault 17
Bit 07	Parameterised fault 16	Gen. phase sequence
Bit 06	Fault 15 - e.g. MAINS SWITCH	Mains phase sequence
Bit 05	Fault 14 - e.g. LEAKAGE	Gen. Switch instance
Bit 04	Fault 13 - e.g. TANK OVERFILLING	Mains switching event
Bit 03	Fault 12 - e.g. SOOT FILTER BYPASS.	Gen. off impeded
Bit 02	Fault 11 - e.g. STORAGE TANK MIN.	Mains off impeded
Bit 01	Fault 10 - e.g. DAY TANK MIN.	Synchronisation impeded
Bit 00	Fault 9 - e.g. OVERVOLTAGE TRIG.	Reverse power

Faults 1-16 are dependent on the parameterisation of the KEA fault inputs!

Bit	DW 04	DW 06
Bit 15	Gen. thermal overload	Fault 56
Bit 14	Gen. asymmetric load	Fault 55
Bit 13	Gen. overcurrent II	Fault 54
Bit 12	Gen. overcurrent I	Fault 53
Bit 11	Alarm 36	Fault 52
Bit 10	Alarm 35	Fault 51
Bit 09	Alarm 34	Fault 50
Bit 08	Alarm 33	Fault 49
Bit 07	Gen. overfrequency	Fault 64
Bit 06	Gen. underfrequency	Fault 63
Bit 05	Gen. overvoltage	Fault 62
Bit 04	Gen. undervoltage	Fault 61
Bit 03	Mains overfrequency	Fault 60
Bit 02	Mains underfrequency	Fault 59
Bit 01	Mains overvoltage	Fault 58
Bit 00	Mains undervoltage	Fault 57

8.2.1.2 Status messages

Bit	DW 08	DW 10
Bit 15	**Collective fault, all alarms**	TEST operating mode
Bit 14	**Collective fault switch-off**	AUTO operating mode
Bit 13	**Collective fault warning**	MANUAL operating mode
Bit 12	Gen. Voltage is good	OFF operating mode
Bit 11	Parameterisation is on	Generator circuit breaker is on
Bit 10	Triggering vector shift	Mains circuit breaker is on
Bit 09	Triggering df/dt	Genset is running
Bit 08	Triggering du/dt	Genset available
Bit 07	Not assigned	Monitoring VDE (only PA, from v07)
Bit 06	Not assigned	Parallel operation (only PA, from v07)
Bit 05	Not assigned	Automatic system locked
Bit 04	Not assigned	External quick stop
Bit 03	**Collective fault, all alarms**	Manual quick stop
Bit 02	**Collective fault switch-off**	Remote start
Bit 01	**Collective fault warning**	Peak load demand
Bit 00	Cos phi controller impeded	Mains failure

Bit	DW 12	DW 14
Bit 15	Gen. overfrequency	CanOpen input module 1, input 8
Bit 14	Gen. underfrequency	CanOpen input module 1, input 7
Bit 13	Gen. overvoltage	CanOpen input module 1, input 6
Bit 12	Gen. undervoltage	CanOpen input module 1, input 5
Bit 11	Mains overfrequency	CanOpen input module 1, input 4
Bit 10	Mains underfrequency	CanOpen input module 1, input 3
Bit 09	Mains overvoltage	CanOpen input module 1, input 2
Bit 08	Mains undervoltage	CanOpen input module 1, input 1
Bit 07	Waving flag*	CanOpen input module 2, input 8
Bit 06	Gen. asymmetric load	CanOpen input module 2, input 7
Bit 05	Gen. overcurrent II	CanOpen input module 2, input 6
Bit 04	Gen. overcurrent I	CanOpen input module 2, input 5
Bit 03	Horn*	CanOpen input module 2, input 4
Bit 02	Mains asymmetric load	CanOpen input module 2, input 3
Bit 01	Mains overcurrent II	CanOpen input module 2, input 2
Bit 00	Mains overcurrent I	CanOpen input module 2, input 1

8.2.1.3 Analogue values KEA2xx

DW	Analogue value	Dimension	Value
DW 16	Mains voltage L1	V	1
DW 18	Mains voltage L2	V	1
DW 20	Mains voltage L3	V	1
DW 22	Mains frequency	Hz	0.01
DW 24	Reserve	-	-
DW 26	Reserve	-	-
DW 28	Reserve	-	-
DW 30	Reserve	-	-
DW 32	Generator voltage L1	V	1
DW 34	Generator voltage L2	V	1
DW 36	Generator voltage L3	V	1
DW 38	Generator frequency	Hz	0.01
DW 40	Generator current L1	A	1
DW 42	Generator current L2	A	1
DW 44	Generator current L3	A	1
DW 46	Generator effective power	kW	0.1
DW 48	Battery voltage	V	0.1
DW 50	Speed	rpm	1
DW 52	Analogue value 1	Temperatures without, oil pressure with decimal place	
DW 54	Analogue value 2		
DW 56	Analogue value 3		
DW 58	Analogue value 4		
DW 60	Reserve	-	-
DW 62	Reserve	-	-
DW 64	Reserve	-	-
DW 66	Reserve	-	-
DW 68	Cos phi generator L1	-	0.01
DW 70	Cos phi generator L2	-	0.01
DW 72	Cos phi generator L3	-	0.01
DW 74	Generator apparent power	kVA	0,1
DW 76	Reserve	-	-
DW 78	Generator load	%	1
DW 80	Reserve	-	-
DW 82	Reserve	-	-
DW 84	Reserve	-	-
DW 86	Reserve	-	-

8.2.2 Counter values KEA2xx

DW	Counter value	Dimension	Value
DW 88	Operating hours MSW	h	65536
DW 90	Operating hours LSW	h	1
DW 92	Start counter MSW	-	65536
DW 94	Start counter LSW	-	1
DW 96	Reserve MSW	-	-
DW 98	Reserve LSW	-	-
DW 100	Reserve MSW	-	-
DW 102	Reserve LSW	-	-

8.2.3 Connection status to KEA 2xx

DW	Value		
DW 104	H-Byte: Reserve	L-Byte: Data traffic (0=OK, 1 = disrupted)	

8.2.4 Commands to KEA 2xx

DW	Command and parameter	Value
DW 00	Command #1: Target value from ZLT	**$243C**
DW 02	Parameter #1a: Power specification	0 - 1100‰
DW 04	Parameter #1b: Release target value from ZLT	$0100 ($0000 = no release)
DW 06	Repeat parameter #1b:	$0100
DW 08	Command #2: Command from ZLT	**$2850**
DW 10	Parameter #2: Bit commands (com. 8 - 1 / 16 - 9)	e.g. Central control system (ZLT) command 1: $0100
DW 12	Reserve	
DW 14	Reserve	

To ensure that the commands will be accepted by the KEA, the value cited in the table for the respective command must be transmitted in the data word. The transmission of command values that are not stipulated (other than zero) can result in undesired reactions by the KEA!

8.2.5 KGM inputs and outputs

	Input: DW 106
Bit 15	Reserve
Bit 14	Reserve
Bit 13	Reserve
Bit 12	Digital input 5
Bit 11	Digital input 4
Bit 10	Digital input 3
Bit 09	Digital input 2
Bit 08	Digital input 1
Bit 07	
Bit 06	
Bit 05	
Bit 04	
Bit 03	
Bit 02	
Bit 01	
Bit 00	

	Output: DW 16
Bit 15	Reserve
Bit 14	Reserve
Bit 13	Reserve
Bit 12	Reserve
Bit 11	Relay output 4
Bit 10	Relay output 3
Bit 09	Relay output 2
Bit 08	Relay output 1
Bit 07	Reserve
Bit 06	Reserve
Bit 05	Reserve
Bit 04	Reserve
Bit 03	Reserve
Bit 02	Reserve
Bit 01	Reserve
Bit 00	Reserve

8.3 PROFIBUS

PROFIBUS .GSD file: KGM0C17.GSD

The .GSD file can be found under www.kuhse.de/download/software.html.

Direction	Data	Number	Input bytes	Output bytes
From KGM	Fault messages	4 word input	0 - 7	-
	Status messages	4 word input	8 - 15	-
	Analogue values I	16 word input	16 - 47	-
	Analogue values II	16 word input	48 - 79	-
	Analogue values III	4 word input	80 - 87	-
	Counter values	8 word input	88 - 103	-
	Status values	1 word input	104 - 105	-
To the KGM	Transmission data	8 word output		0 - 15

Direction	Data	Number	Input bytes	Output bytes
From KGM	Digital inputs KGM	1 word	106 - 107	-
To the KGM	Digital outputs KGM	1 word	-	16 - 17

Notation of individual bits within a data word:
Bit 15 = MSB ("left" in the data word), Bit 00 = LSB

	H-Byte								L-Byte							
Bit no.	**15**	14	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**

Example notation, Siemens:

	H-Byte								L-Byte							
Bit no.	**0.7**	0.6	0.5	0.4	0.3	0.2	0.1	0.0	1.7	1.6	1.5	1.4	1.3	1.2	1.1	**1.0**

Some analogue values, e.g. network current and network power, are only valid if they are recorded by the automated system. This is dependent on the KEA type and can be looked up in the operating instructions for the KEA.

The address of the data is stipulated in bytes (Siemens notation), e.g. Data word DW 02 comprises byte 02 and byte 03.

8.3.1 Digital signals KEA2xx

8.3.1.1 Fault messages

Bit	DW 00	DW 02
Bit 15	Fault 8 - e.g. COLLECTIVE FAULT A	Power controller impeded
Bit 14	Fault 7 - e.g. COLLECTIVE FAULT W	Overspeed
Bit 13	Fault 6 - e.g. OVERSPEED	Failed start
Bit 12	Fault 5 - e.g. INADEQUATE COOLANT	Engine does not switch off
Bit 11	Fault 4 - e.g. GEN. OVERTEMP.	Battery undervoltage
Bit 10	Fault 3 - e.g. EMERGENCY STOP PRESSED	Parameterised fault 19
Bit 09	Fault 2 - e.g. COOLANT TEMP. MAX.	Parameterised fault 18
Bit 08	Fault 1 - e.g. INSUFFICIENT OIL PRESSURE	Parameterised fault 17
Bit 07	Parameterised fault 16	Gen. phase sequence
Bit 06	Fault 15 - e.g. MAINS SWITCH	Mains phase sequence
Bit 05	Fault 14 - e.g. LEAKAGE	Gen. Switch instance
Bit 04	Fault 13 - e.g. TANK OVERFILLING	Mains switching event
Bit 03	Fault 12 - e.g. SOOT FILTER BYPASS.	Gen. off impeded
Bit 02	Fault 11 - e.g. STORAGE TANK MIN.	Mains off impeded
Bit 01	Fault 10 - e.g. DAY TANK MIN.	Synchronisation impeded
Bit 00	Fault 9 - e.g. OVERVOLTAGE TRIG.	Reverse power

Faults 1-16 are dependent on the parameterisation of the KEA fault inputs!

Bit	DW 04	DW 06
Bit 15	Gen. thermal overload	Fault 56
Bit 14	Gen. asymmetric load	Fault 55
Bit 13	Gen. overcurrent II	Fault 54
Bit 12	Gen. overcurrent I	Fault 53
Bit 11	Alarm 36	Fault 52
Bit 10	Alarm 35	Fault 51
Bit 09	Alarm 34	Fault 50
Bit 08	Alarm 33	Fault 49
Bit 07	Gen. overfrequency	Fault 64
Bit 06	Gen. underfrequency	Fault 63
Bit 05	Gen. overvoltage	Fault 62
Bit 04	Gen. undervoltage	Fault 61
Bit 03	Mains overfrequency	Fault 60
Bit 02	Mains underfrequency	Fault 59
Bit 01	Mains overvoltage	Fault 58
Bit 00	Mains undervoltage	Fault 57

8.3.1.2 Status messages

Bit	DW 08	DW 10
Bit 15	**Collective fault, all alarms**	TEST operating mode
Bit 14	**Collective fault switch-off**	AUTO operating mode
Bit 13	**Collective fault warning**	MANUAL operating mode
Bit 12	Gen. Voltage is good	OFF operating mode
Bit 11	Parameterisation is on	Generator circuit breaker is on
Bit 10	Triggering vector shift	Mains circuit breaker is on
Bit 09	Triggering df/dt	Genset is running
Bit 08	Triggering du/dt	Genset available
Bit 07	Not assigned	Monitoring VDE (only PA, from v07)
Bit 06	Not assigned	Parallel operation (only PA, from v07)
Bit 05	Not assigned	Automatic system locked
Bit 04	Not assigned	External quick stop
Bit 03	**Collective fault, all alarms**	Manual quick stop
Bit 02	**Collective fault switch-off**	Remote start
Bit 01	**Collective fault warning**	Peak load demand
Bit 00	Cos phi controller impeded	Mains failure

Bit	DW 12	DW 14
Bit 15	Gen. overfrequency	CanOpen input module 1, input 8
Bit 14	Gen. underfrequency	CanOpen input module 1, input 7
Bit 13	Gen. overvoltage	CanOpen input module 1, input 6
Bit 12	Gen. undervoltage	CanOpen input module 1, input 5
Bit 11	Mains overfrequency	CanOpen input module 1, input 4
Bit 10	Mains underfrequency	CanOpen input module 1, input 3
Bit 09	Mains overvoltage	CanOpen input module 1, input 2
Bit 08	Mains undervoltage	CanOpen input module 1, input 1
Bit 07	Waving flag*	CanOpen input module 2, input 8
Bit 06	Gen. asymmetric load	CanOpen input module 2, input 7
Bit 05	Gen. overcurrent II	CanOpen input module 2, input 6
Bit 04	Gen. overcurrent I	CanOpen input module 2, input 5
Bit 03	Horn*	CanOpen input module 2, input 4
Bit 02	Mains asymmetric load	CanOpen input module 2, input 3
Bit 01	Mains overcurrent II	CanOpen input module 2, input 2
Bit 00	Mains overcurrent I	CanOpen input module 2, input 1

8.3.1.3 Analogue values KEA2xx

DW	Analogue value	Dimension	Value
DW 16	Mains voltage L1	V	1
DW 18	Mains voltage L2	V	1
DW 20	Mains voltage L3	V	1
DW 22	Mains frequency	Hz	0.01
DW 24	Reserve	-	-
DW 26	Reserve	-	-
DW 28	Reserve	-	-
DW 30	Reserve	-	-
DW 32	Generator voltage L1	V	1
DW 34	Generator voltage L2	V	1
DW 36	Generator voltage L3	V	1
DW 38	Generator frequency	Hz	0.01
DW 40	Generator current L1	A	1
DW 42	Generator current L2	A	1
DW 44	Generator current L3	A	1
DW 46	Generator effective power	kW	0.1
DW 48	Battery voltage	V	0.1
DW 50	Speed	rpm	1
DW 52	Analogue value 1	Temperatures without, oil pressure with decimal place	
DW 54	Analogue value 2		
DW 56	Analogue value 3		
DW 58	Analogue value 4		
DW 60	Reserve	-	-
DW 62	Reserve	-	-
DW 64	Reserve	-	-
DW 66	Reserve	-	-
DW 68	Cos phi generator L1	-	0.01
DW 70	Cos phi generator L2	-	0.01
DW 72	Cos phi generator L3	-	0.01
DW 74	Generator apparent power	kVA	0,1
DW 76	Reserve	-	-
DW 78	Generator load	%	1
DW 80	Reserve	-	-
DW 82	Reserve	-	-
DW 84	Reserve	-	-
DW 86	Reserve	-	-

8.3.2 Counter values KEA2xx

DW	Counter value	Dimension	Value
DW 88	Operating hours MSW	h	65536
DW 90	Operating hours LSW	h	1
DW 92	Start counter MSW	-	65536
DW 94	Start counter LSW	-	1
DW 96	Reserve MSW	-	-
DW 98	Reserve LSW	-	-
DW 100	Reserve MSW	-	-
DW 102	Reserve LSW	-	-

8.3.3 Connection status to KEA 2xx

DW	Value		
DW 104	H-Byte: Reserve	L-Byte: Data traffic (0=OK, 1 = disrupted)	

8.3.4 Commands to KEA 2xx

DW	Command and parameter	Value
DW 00	Command #1: Target value from ZLT	**$243C**
DW 02	Parameter #1a: Power specification	0 - 1100‰
DW 04	Parameter #1b: Release target value from ZLT	$0100 ($0000 = no release)
DW 06	Repeat parameter #1b:	$0100
DW 08	Command #2: Command from ZLT	**$2850**
DW 10	Parameter #2: Bit commands (com. 8 - 1 / 16 - 9)	e.g. Central control system (ZLT) command 1: $0100
DW 12	Reserve	
DW 14	Reserve	

To ensure that the commands will be accepted by the KEA, the value cited in the table for the respective command must be transmitted in the data word. The transmission of command values that are not stipulated (other than zero) can result in undesired reactions by the KEA!

8.3.5 KGM inputs and outputs

	Input: DW 106
Bit 15	Reserve
Bit 14	Reserve
Bit 13	Reserve
Bit 12	Digital input 5
Bit 11	Digital input 4
Bit 10	Digital input 3
Bit 09	Digital input 2
Bit 08	Digital input 1
Bit 07	
Bit 06	
Bit 05	
Bit 04	
Bit 03	
Bit 02	
Bit 01	
Bit 00	

	Output: DW 16
Bit 15	Reserve
Bit 14	Reserve
Bit 13	Reserve
Bit 12	Reserve
Bit 11	Relay output 4
Bit 10	Relay output 3
Bit 09	Relay output 2
Bit 08	Relay output 1
Bit 07	Reserve
Bit 06	Reserve
Bit 05	Reserve
Bit 04	Reserve
Bit 03	Reserve
Bit 02	Reserve
Bit 01	Reserve
Bit 00	Reserve

9 Firmware update

The device can be updated with new firmware locally via a web browser. A dedicated software program runs in the background in the device in order to carry out firmware updates.

For safety reasons an update can only be carried out locally. The following prerequisites are required for this:

- Device must be switched on
- Device must have completed the boot process
- Connection of a laptop/PC with a network cable (CAT 5) to the Ethernet port ETH A; the green "Link" LED on port ETH A must be steadily illuminated
- Start the web browser on the laptop/PC
- Enter the current IP address of the device in the web browser, e.g. "https://192.168.1.1:8449"

Standard parameters in delivery condition:

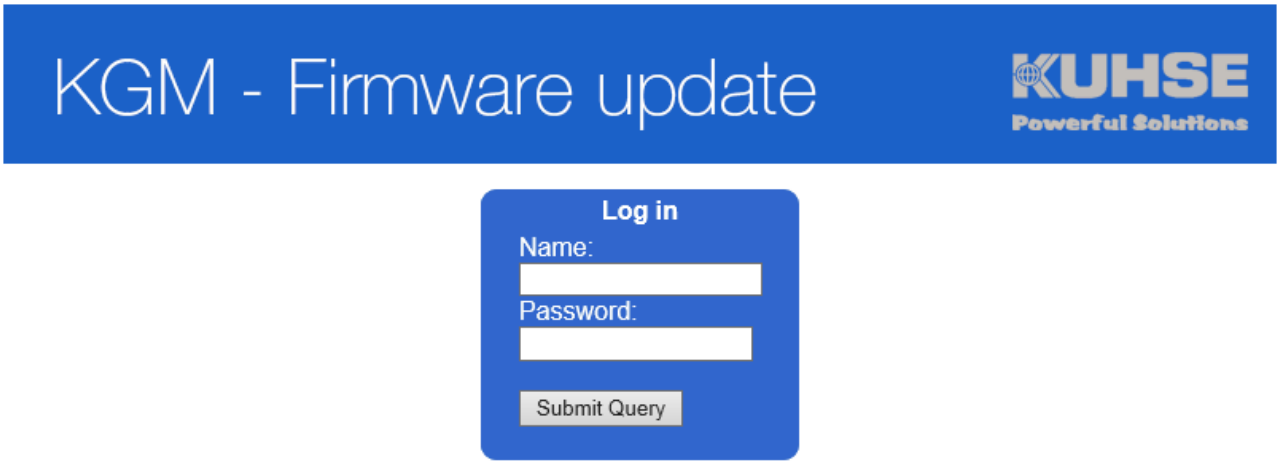
Standard address: 192.168.1.1

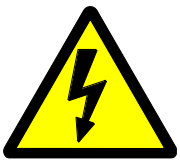
SubNet: 255.255.0.0

Standard port for firmware updates: 8449
Standard protocol: https

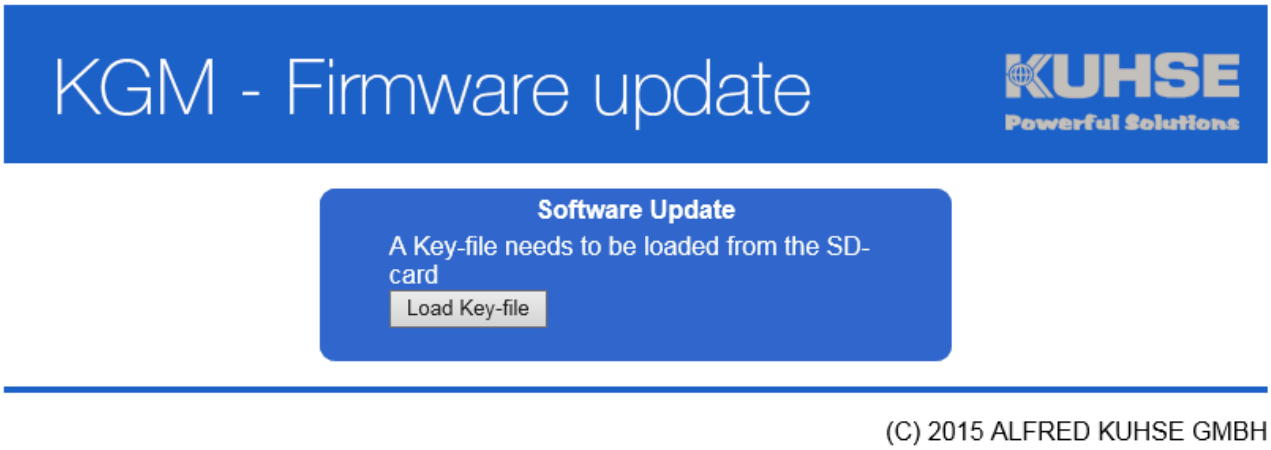
Please note that the network settings on the laptop/PC must be in the same address range and SubNet range as the currently configured IP address of the device. If this is not the case, no communication can take place.

Please also note that the https port for an update differs from the https port for configuration.



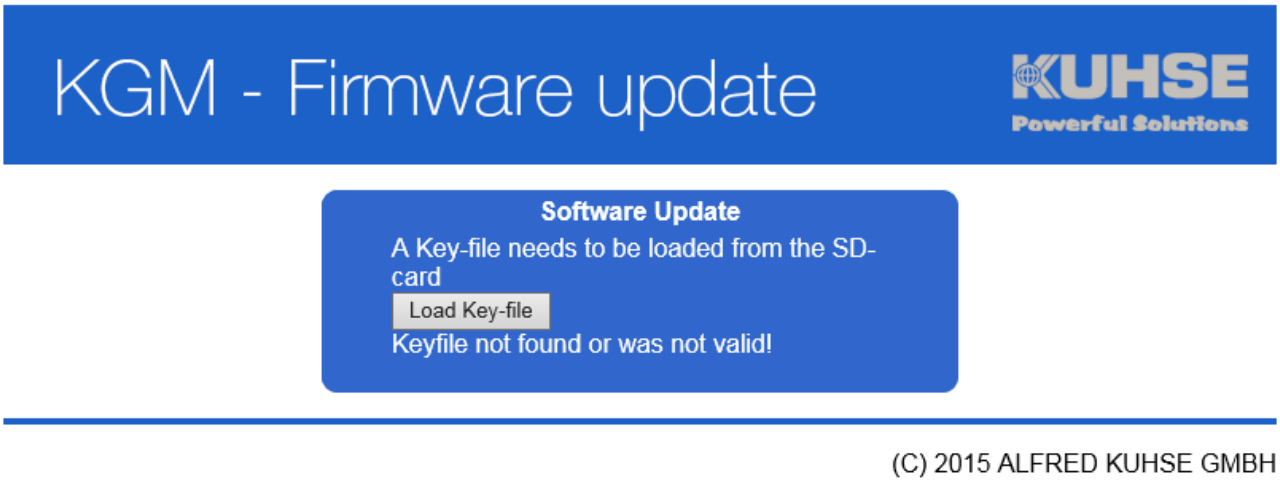


Attention! *There is a dedicated user as well as the associated password with update authorisation. The user data and passwords from the "Configuration" area are not valid here. In addition, the person with update authorisation also requires an SD card with a special key file. It is not possible to carry out firmware updates without this file!*

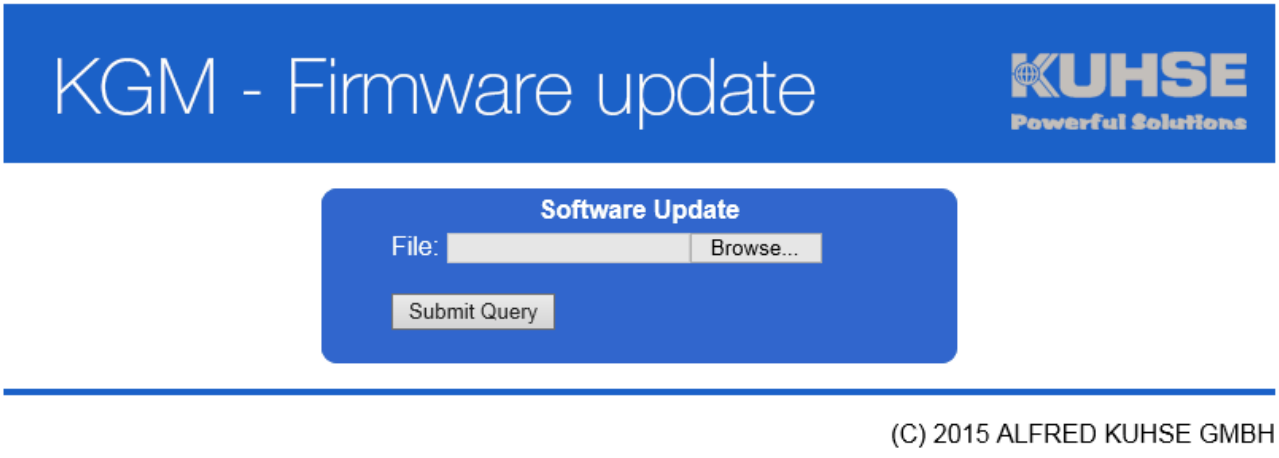


After the user has entered the username and the password, the following message appears: The user is now requested to insert the SD card and to load the key file by clicking on the "Load key file" button.

If the SD card is not detected, if no key file can be found or if the key file is defective, the following message appears:

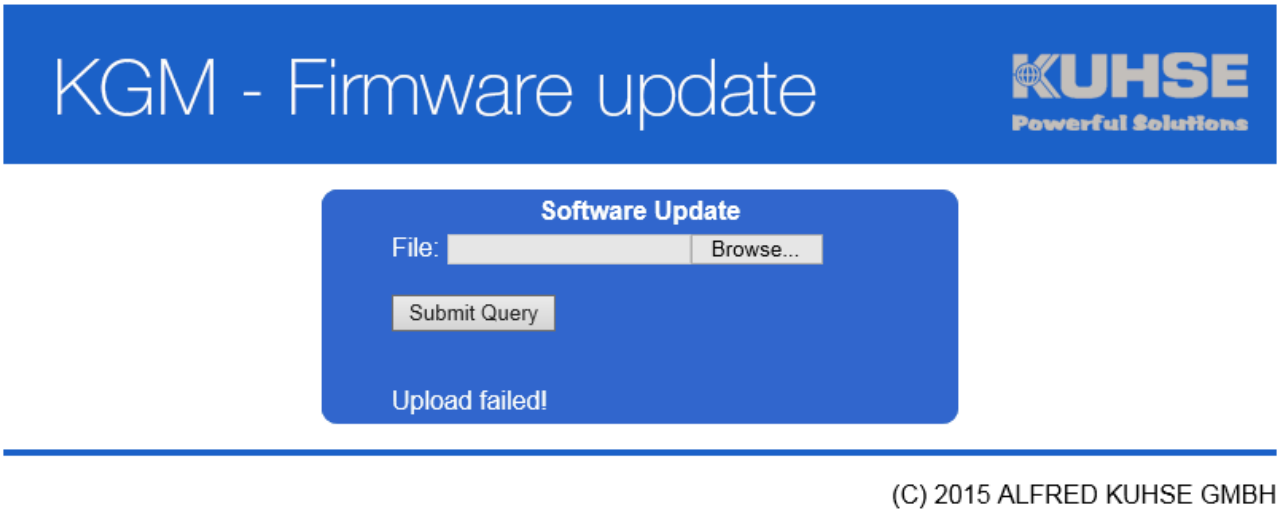


If a valid key file is detected and loaded, the user will be requested to select the new firmware bundle:



By clicking the "Select file" button, a file dialogue opens for selecting the new firmware bundle. The file has the file extension ".kgm".

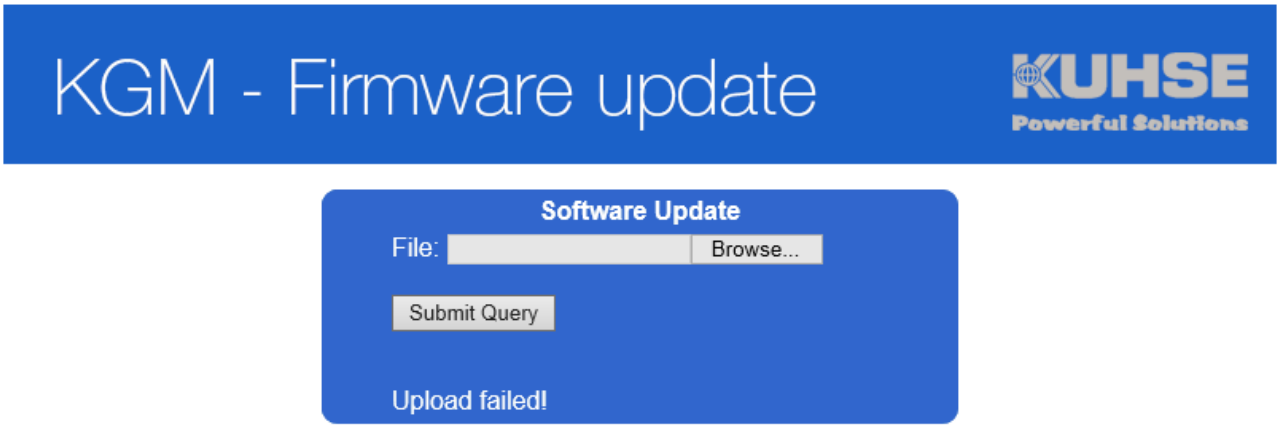
If an incorrect file is selected for upload, the following message appears:



In this case, select the correct file or use a back-up of the new firmware file.

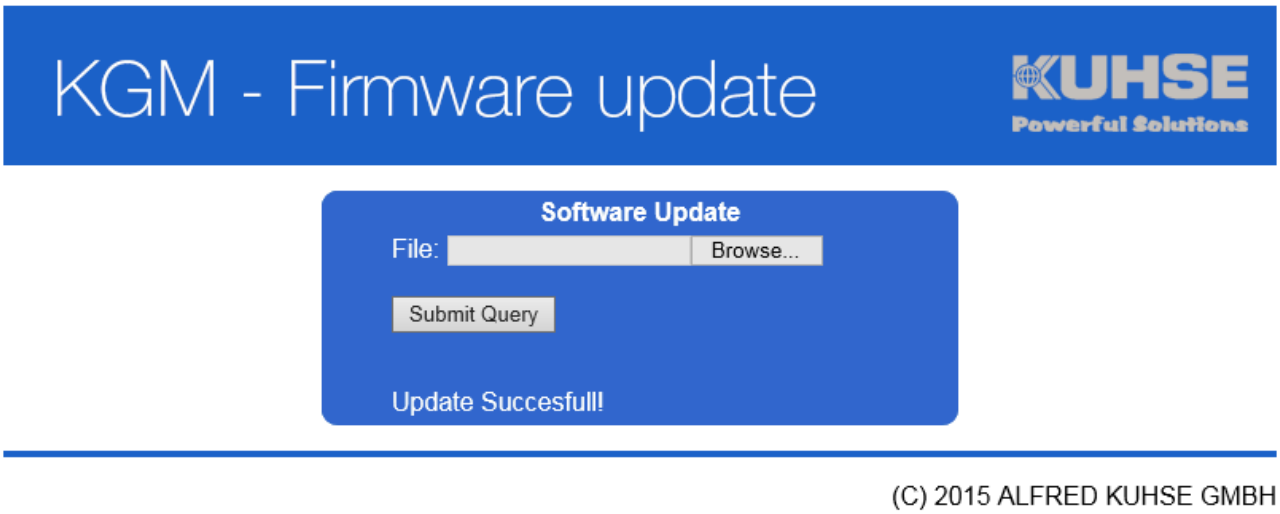
After uploading the correct firmware file, the checksum is determined in order to prevent a corrupt file being erroneously loaded as an update.

If the checksum fails, the following message appears:



In this case, repeat the uploading or use a back-up of the new firmware file.

If the firmware file is correctly loaded and installed, the following message appears:



After the successful update, the user should log in to the configuration area and check the software version in the "KGN" window once again!

If there are still unexpected problems with the functionality of the new update, the old (previous) software version can be transferred again and started with this tool. So, downgrades are also possible.

Because there are two separate software programs on the device, which operate independently of one another, a firmware update is possible at any time. For example, if the main software is not working correctly or if it has crashed.

The internal update tool has multiple safety mechanisms in order to guarantee a correct firmware update at any time:

1. First the checksum of the newly uploaded firmware bundle is checked.

2. If this is correct, a back-up of the currently installed firmware (main software) is created.
3. Then the main software is stopped and deleted from the working directory.
4. Now the new firmware is unpacked, installed in the working directory and then started as the main software.
5. The update tool now monitors the functional capability of the new software.
6. If there are problems with the software start of if the main software crashes within a stipulated period of time, the software is automatically de-installed and the old back-up is re-installed and started.

These mechanisms ensure a high degree of safety during the update process.

10 Technical data

10.1 Kuhse Gateway Module (KGM - KEA)

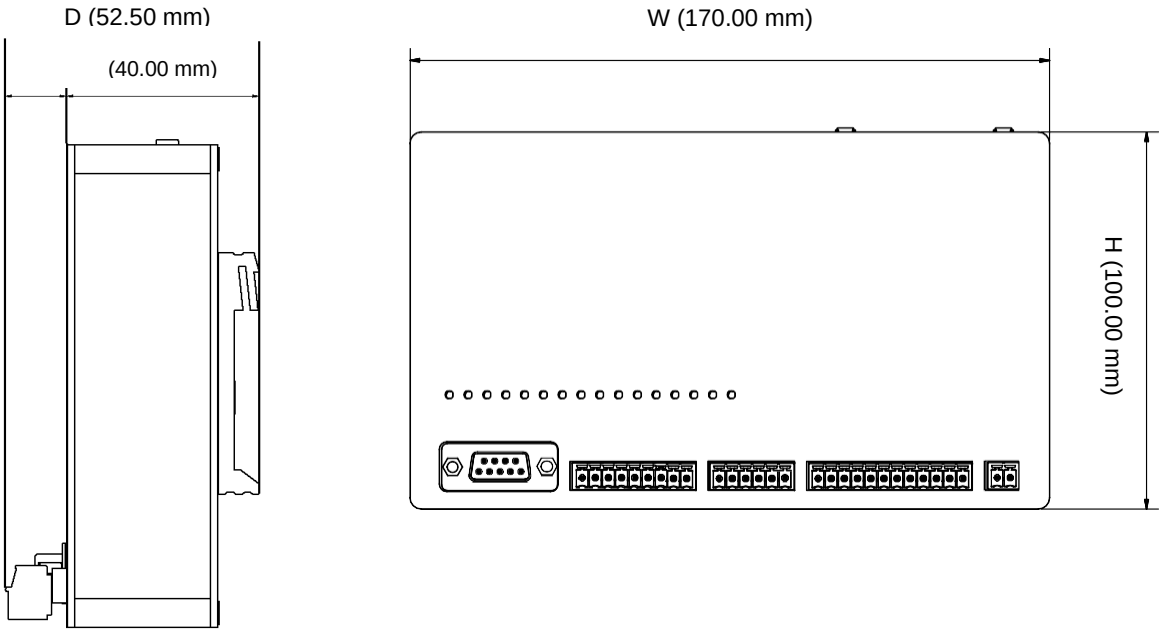
Feature	Functional specification
Designation	Kuhse Gateway Module (KGM - KEA)
Article number	2KGMKG0000
Type	DIN rail module in metal housing
Dimensions	170 x 100 x 52,5 mm (W x H x D)
Weight	1.1 Kg
Colouring	Housing: powder-coated blue/white Front label: blue DIN rail adapter, rear: anodised aluminium
Control/reporting outputs	4 x relay outputs (changeover contacts; isolated; contact load 30V/1A max.)
Signal inputs	5 x digital inputs (loop 5V/10mA; isolated)
Communication interfaces	2 x RS232 (transmission parameters can be configured) 2 x RS485 (transmission parameters can be configured) 2 x CAN bus (transmission parameters can be configured) 2 x Ethernet (10/100/1000 Mbit; IP address can be configured; 2 x separate MAC addresses)
Connections	2 x RJ12 (CAN bus) 2 x RJ45 (Ethernet) 1 x SD slot 1 x Sub-D 9-pole (COM A) 1 x MC plug-in connector 9-pole (COM B) 1 x MC plug-in connector 6-pole (5 x digital inputs, 1 x 5V) 1 x MC plug-in connector 12-pole (relay outputs) 1 x MC plug-in connector 2-pole (supply) 1 x Modem slot (internal)
Protocols	Modbus RTU (Master/Slave) Modbus TCP (Master/Slave) CAN bus, proprietary TCP/IP UDP Profibus DP ProfiNET Kuhse protocol
Indications	16 x LED front-side (green) 2 x LED for each Ethernet port (yellow/green)
Operating voltage	9 – 36V DC / 1A, isolated
Ambient temperature	Operation: -10 to +50°C, non-condensing Storage: -25 to +75°C
Climatic conditions	IEC 721-3-3 Class 3K3/3Z1/3B1/3C2/3S2/3M2
Protection type/class	IP20, protection class II
Safety	Per EN60950, VDE0100-T410
EMC	Per EN55011/22 class B
CE conformity	Yes

10.2 Kuhse Gateway Module - Modem

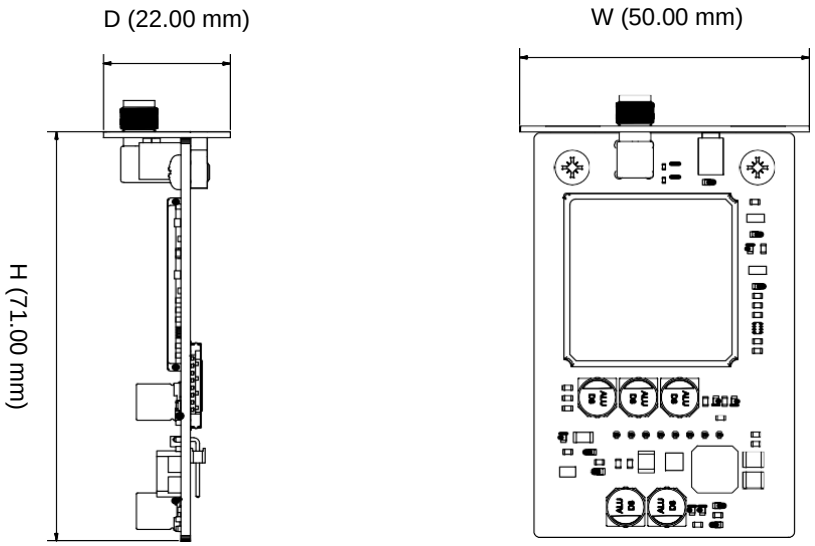
Feature	Functional specification
Designation	Kuhse Gateway Module - Modem
Article number	Modem type 1: 2KGMGSM000 (GSM/HSPA/UMTS) Modem type 2: 2KGMLTE000 (LTE)
Type	Open-frame plug-in card with external antenna connection, type SMA
Dimensions	50 x 71 x 22mm (W x H x D)
Weight	0.1 Kg
Colouring	Finishing: powder-coated white
Communication interface	USB (internal)
Modem type 1: Transmitting/receiving frequencies	WCDMA/HSDPA/HSUPA/HSPA: UMTS band 1 (S1920MHz- 1980MHz/E2110MHz-2170MHz) UMTS band 2 (S1850MHz-1910MHz/E1930MHz-1990MHz) UMTS band 5 (S824MHz-849MHz/E869MHz-894MHz) UMTS band 8 (S880MHz-915MHz/E925MHz-960MHz) GSM/GPRS/EDGE: 850 MHz/900 MHz/1800 MHz/1900 MHz
Modem type 2: Transmitting/receiving frequencies	LTE: Band 1 (S1920MHz-1980MHz/E2110MHz-2170MHz) Band 2 (S1850MHz-1910MHz/E1930MHz-1990MHz) Band 3 (S1710MHz- 1785MHz/E1805MHz-1880MHz) Band 5 (S824MHz-849MHz/E869MHz-894MHz) Band 7 (S2500MHz-2570MHz/E2620MHz-2690MHz) Band 8 (S880MHz-915MHz/E925MHz-960MHz) Band 20 (832MHz-862MHz/E791MHz-821MHz)
Connections	1 x Antenna connection SMA socket, gold-plated 1 x USB (internal)
Indications	1 x LED front-side (green)
Operating voltage	5V DC / 0.5A internal
Ambient temperature	Operation: -10 to +50°C, non-condensing Storage: -25 to +75°C
Climatic conditions	Per IEC 721-3-3 class 3K3/3Z1/3B1/3C2/3S2/3M2
Protection type	IP00, IP20 when inserted
CE conformity	Yes

10.3 Dimensions

10.3.1 Kuhse Gateway Module (KGM - KEA)



10.3.2 Kuhse Gateway Module - Modem

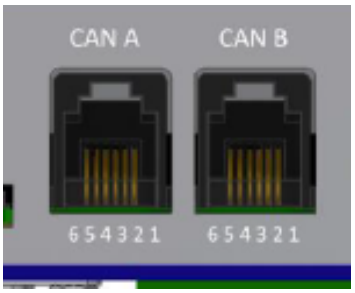


11 RJ12 – CAN bus connection cable

A 2.5 metre long connection cable is provided for the connection between KEA and KGM. This is equipped with an RJ12 plug on the KGM end and 4 flying leads on the KEA end.

11.1 RJ12 pin allocation on the KGM

Connector "CAN A/B" – KGM	
Pin	Function
1,6	Not relevant
3	CAN - high
4	CAN - low
2,5	GND
Connector RJ12 6p/6c, 6 x 0.5mm2	



11.2 CAN bus pin allocation on the KEA

Connector "CAN 0" – KEA	
Pin	Function
1	GND
2	CAN – low
3	GND
4	CAN – high
Connector Phoenix Contact; 4 x 0.5mm2	

11.3 Connecting KGM - KEA

From the pin allocation for the KGM and the KEA above, we have:

- ➔ KGM Pin 3 to KEA Pin 4 (colour: green)
- ➔ KGM Pin 4 to KEA Pin 2 (colour: yellow)
- ➔ KGM Pin 2 to KEA Pin 1 (colour: pink)
- ➔ KGM Pin 5 to KEA Pin 3 (colour: grey)

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