KBR
Energy Management

Technical reference

multimess

Three-phase network measuring instrument

4F96 LCD

Your partner for network analysis

System | English

EDEBDA0214-4614-1_EN_400

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1 Introduction

Thank you for choosing this KBR quality product. In order to familiarize yourself with the operation and configuration of the device, we recommend that you read this manual thoroughly, so that you are able to make use of the entire range of functions of this high-quality product. The individual chapters serve to explain the technical details of the device and show how to avoid damage by means of proper installation and start-up.

1.1 User manual

This user manual describes the device version **multimess 4F96**.

This user manual must be accessible for the user at all times (e.g. in the switchgear cabinet). Even when the device is resold to third parties, the manual remains part of the device.

Although we used the utmost care in assembling this user manual, we would like to thank you in advance for notifying us about any errors or ambiguous descriptions you might notice. You will find a form for corrections in the appendix.

1.2 Intended use

This device serves for the monitoring of all important parameters in a three-phase network.

In addition to the Basic version multimess 4F96-0, you can choose from additional device versions with extended interface and storage capacity. For a detailed description, see the following section.

Note that the device does not replace close monitoring of the respective parameters by the operator.

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1.2.1 Depending on the optional board (Opt.), the device has the following functionality:

Note

multimess 4F96 LCD is available with different optional boards. Thus, this user manual describes all options possible. To see which device version you have, please refer to the nameplate.

- **Option 0:**
no optional board

- **Option 1:**
optional board with Modbus RS485, real-time clock, buffer capacitor, 2 relay outputs

- **Option 2:**
optional board with Modbus RS485

- **Option 3:**
optional board with KBR eBus RS485, Modbus RS485

- **Option 4:**
optional board with Modbus Ethernet, real-time clock, buffer capacitor, 2 relay outputs

- **Option 5:**
optional board with Profibus DP, real-time clock, buffer capacitor

- **Option 6:**
optional board with KBR eBus Ethernet, real-time clock, buffer capacitor, 2 relay outputs

- **Option 7:**
optional board with KBR eBus RS485, Modbus RS485, real-time clock, buffer capacitor, 2 relay outputs

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1.3 Explanation of safety relevant symbols

This user manual contains notes that must be observed for your personal safety and to avoid damage to equipment. These notes are identified by a warning sign or information symbol, depending on the degree of hazard they represent.

Warning

"Warning" means that death, major injuries or damage may occur in case the appropriate safety measures are not taken.

Caution

"Caution" means that minor injuries or damage may occur in case the appropriate safety measures are not taken.

Note

"Note" is an important information on the product, its operation or the respective part of the user manual to which special reference is made.

1.3.1 Disclaimer

The contents of this user manual have been carefully reviewed in terms of the hardware and software described. Certain deviations, however, cannot be excluded, and the manufacturer is not liable for complete conformity. The specifications made in this user manual are checked on a regular basis, necessary corrections will be included in the next revision.

1.4 Safety notes

In order to prevent operating errors, operation of this device is kept as simple as possible. This way, you will be able to quickly start working with the device.

In your own interest, however, you should read the following safety notes carefully.

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During assembly, the applicable DIN / VDE regulations must be observed!

Power supply connection, setup and operation of the device must only be performed by qualified personnel. In accordance with the safety notes in this user manual, qualified personnel are persons authorized to set up, ground and mark devices, systems and circuits in accordance with applicable standards and regulations.

To avoid fire and electrical shock, the device must not be exposed to rain or humidity!

Before connecting the device to the power supply, check whether the local power supply conditions comply with the specifications on the nameplate.

Caution

A wrong connection can lead to the destruction of the device!

When connecting the device, observe the connection chart (see chapter "Connection chart") and make sure that no voltage is applied to the connection lines. Only use proper wiring material and observe the correct polarity when wiring!

In order to ensure proper and safe operation of the product, it must be transported, stored, installed and assembled in accordance with the specifications and operated and maintained carefully.

A visibly damaged device must generally be considered unfit for use and disconnected from the power supply! Error detection, repairs and maintenance work may only be carried out in our facilities or after contacting our service team. Unauthorized opening of the device voids any warranty. Correct operation can no longer be guaranteed!

Opening the device may expose live parts. Capacitors in the device may still be loaded, even if the device has been disconnected from all voltage sources. It is generally not allowed to operate an open device!

In systems susceptible to lightning, lightning protection must be provided for all input and output lines (recommendations see chapter "Protective measures")!

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1.5 Product liability

You have acquired a high-quality product. Only components of the highest reliability and quality are used.

Each device is subject to endurance testing before it is delivered.

Regarding product liability, we refer you to our general terms and conditions for electronic equipment, which you can find at **www.kbr.de**

The warranted characteristics of the device only apply to operation in accordance with its intended use!

1.6 Disposal

Defective or outdated devices or ones no longer in use must be properly disposed of. At your request, we will be pleased to dispose of the devices for you.

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2 Range of functions

The electronic network measuring devices of the multimess 4F96 series measure and monitor all important parameters in a three-phase network and are available in different versions. All device versions are equipped with a pulse output.

Aside from the 4F96-0… entry level model, the load profile (P+ P- / Q+ Q-) can be saved with all device versions and later be read out via eBus. Network voltage can be monitored in accordance with EN 61000-T4-30. In case of a violation, the voltage and current history is saved and can be analyzed on the LCD display. Different optional interfaces and protocols allow various applications.

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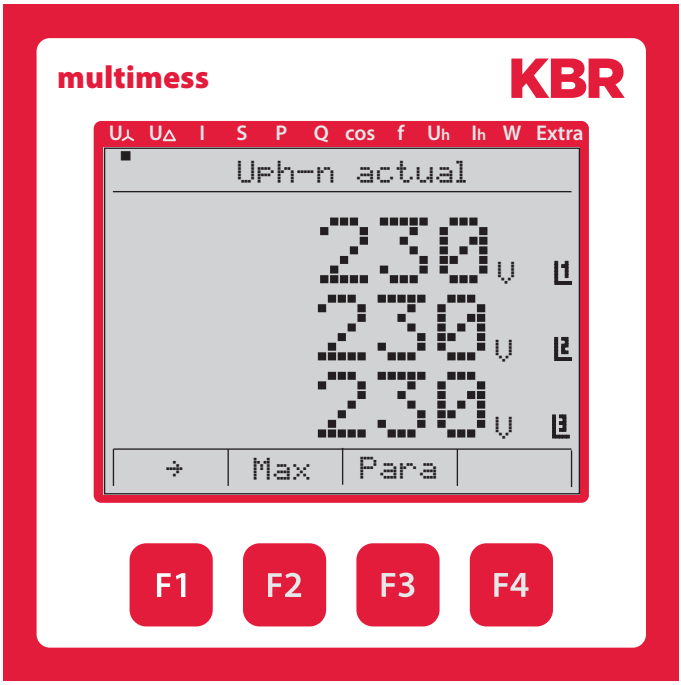
3 Device overview



3.1 Operating structure

The following section gives you an overview of the entire operating structure at a glance. For a detailed description, please refer to “Menu overview”.

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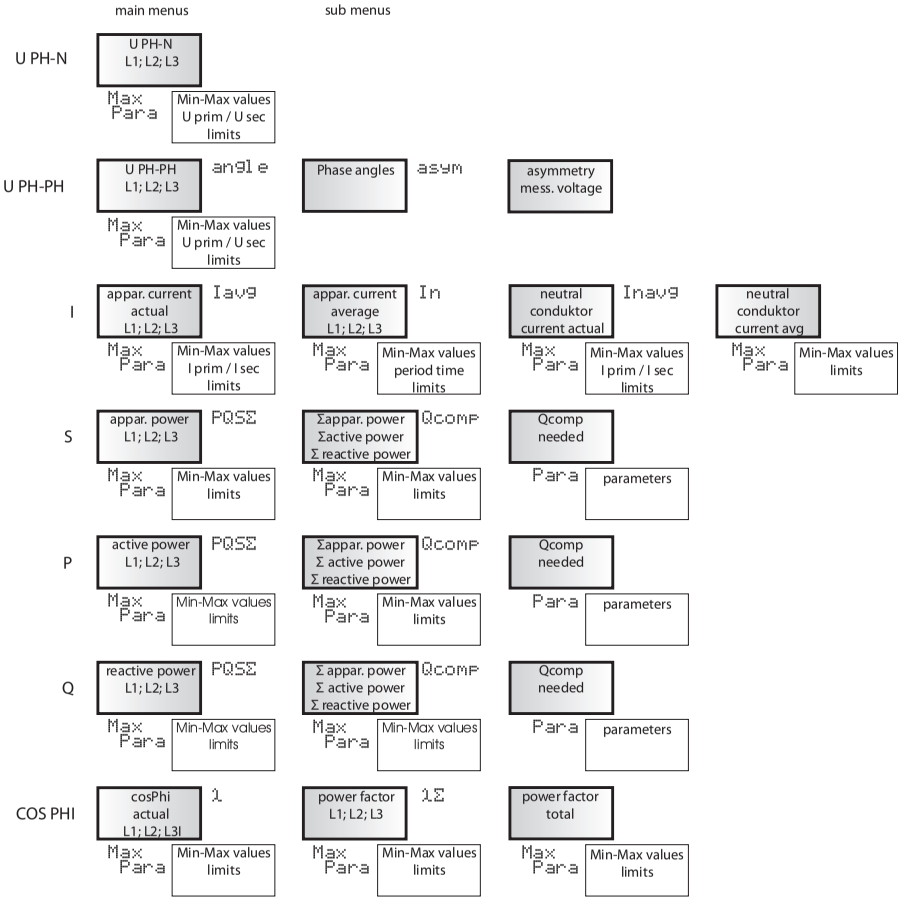
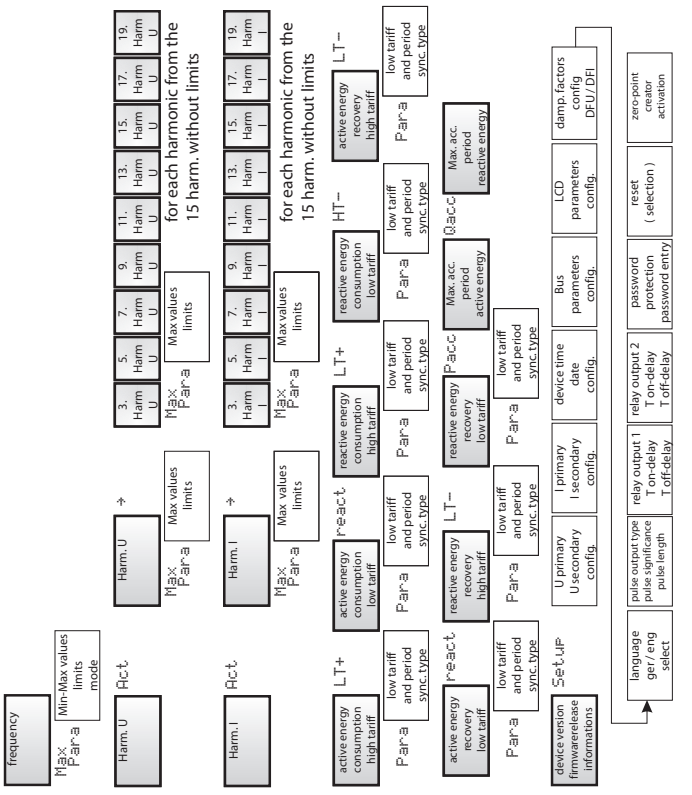

main menus
sub menus
U PH-N
U PH-N L1; L2; L3
Max Para
Min-Max values U prim / U sec limits
U PH-PH
U PH-PH L1; L2; L3
angle
Phase angles
asym
asymmetry mess. voltage
Max Para
Min-Max values U prim / U sec limits
I
appar. current actual L1; L2; L3
Iavg
appar. current average L1; L2; L3
In
neutral conduktor current actual
Inavg
neutral conduktor current avg
Max Para
Min-Max values I prim / I sec limits
Min-Max values period time limits
Min-Max values limits
S
appar. power L1; L2; L3
PQS
Σappar. power Σactive power Σ reactive power
Qcomp
Qcomp needed
Para
parameters
Min-Max values limits
P
active power L1; L2; L3
Σappar. power Σ active power Σ reactive power
Q
reactive power L1; L2; L3
Σ appar. power Σ active power Σ reactive power
COS PHI
cosPhi actual L1; L2; L3I
λ
power factor L1; L2; L3
λΣ
power factor total


F
frequency
Max Para
Min-Max values limits mode
HARMON. U
Harm. U
Act.
Harm. U →
Max Para
Max values limits
3. Harm U
5. Harm U
7. Harm U
9. Harm U
11. Harm U
13. Harm U
15. Harm U
17. Harm U
19. Harm U
Max Para
Max values limits
for each harmonic from the 15 harm. without limits
HARMON. I
Harm. I
Act.
Harm. I →
Max Para
Max values limits
3. Harm I
5. Harm I
7. Harm I
9. Harm I
11. Harm I
13. Harm I
15. Harm I
17. Harm I
19. Harm I
Max Para
Max values limits
for each harmonic from the 15 harm. without limits
energy W
active energy consumption high tariff
LT+
active energy consumption low tariff
react.
reactive energy consumption high tariff
LT+
reactive energy consumption low tariff
HT−
active energy recovery high tariff
LT−
Para
low tariff and period sync. type
Para
low tariff and period sync. type
Para
low tariff and period sync. type
Para
low tariff and period sync. type
Para
low tariff and period sync. type
active energy recovery low tariff
react.
reactive energy recovery high tariff
LT−
reactive energy recovery low tariff
Pacc
Max. acc. period active energy
Qacc
Max. acc. period reactive energy
EXTRA
device version firmwarerelease informations
Set.uP
language ger / eng select
U primary U secondary config.
pulse output type pulse significance pulse length
I primary I secondary config.
relay output 1 T on-delay T off-delay
device time date config.
relay output 2 T on-delay T off-delay
Bus parameters config.
password protection password entry
LCD parameters config.
reset (selection)
damp. factors config DFU / DFI
zero-point creator activation

4 Installation

In this chapter, you will find a description of:

- "Device assembly"
- "Connection diagram"
- "Terminal assignment"
- "Buffered long-term memory"

4.1 Device assembly

During installation, the applicable DIN / VDE regulations must be observed! Before the device is connected to the power supply, check whether the local power supply conditions comply with the specifications on the nameplate. A wrong connection may destroy the device. A different power frequency influences the measurement accordingly.

The device must be connected in accordance with the connection diagram.

In case the system is subject to lightning hazard, lightning protection measures for the power supply input must be implemented.

Caution

The control voltage as well as the applied measurement voltage of the device must be protected by means of a back-up fuse. When connecting the current transformer, the direction of the energy flow and the correct assignment to the voltage path must be observed!

For the wiring of the pulse output, we recommend to exclusively use shielded twisted pair material, to avoid disturbance (e.g. installation line I-Y(ST) Y 2x2x0.8mm, whereas the shielding may only be connected on one side).

During installation, please also observe our notes on safety measures against overvoltage and lightning in the chapter "Protective measures" of this manual.

Note

You should take the following points into consideration when connecting the device to the three-phase network to be measured:

- Energy flow direction
- Assignment of measuring voltage input / current transformer input

4.1.1 Rotating field

The unit can be operated in a clockwise or a counter-clockwise rotating field. When switching on the device's power supply, multimess 4F96 LCD automatically checks the rotation direction. Rotating field check:

1. Connect only the measuring voltage to the device (Umeas see nameplate).
2. Switch on the device by applying voltage to the power supply connections (L and N). Immediately after the device has been switched on, it will check the power supply rotation direction.
3. The rotating field is displayed in the menu UPH-PH, submenu Angle.
4. For a clockwise rotating field, the display shows L1 0, L2 120 and L3 240 degrees.
5. If you want to change the rotation direction from clockwise to counter-clockwise, you only have to exchange two terminals, i.e. two phases. Then, switch the device OFF and ON again. The display now shows the correct voltage and the device starts measuring automatically.
6. Then, check again whether the assignment of voltage path L1 and current path L1, as well as for all other phases, is still correct.

4.1.2 Asymmetry

The rotating field is displayed in the menu UPH-PH, submenu Angle / asym.

The voltage asymmetry is displayed according to standard EN 6100-4-30:2003.

Shows the asymmetric load of the three phase network.

Asymmetry is shown in the display and the value is displayed in %.

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4.1.3 Current transformer connection

■ **Energy flow direction**
When mounting the transformer, observe the current flow or energy flow direction. If the current transformer is mounted the wrong way, the measured value will be negative.
Prerequisite is that energy is consumed.

■ **Assignment of measuring voltage input / current transformer input**
The current transformer on terminal 20/21 (k1/l1) must be arranged in the phase where the measuring voltage for terminal 10 (L1) is measured. The same applies to the other transformer and measuring voltage connections.

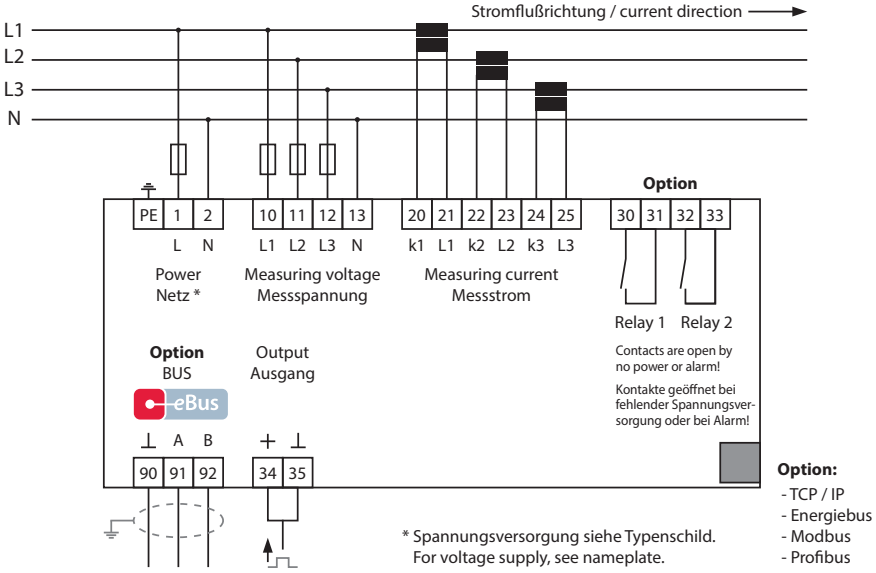
The phase sequence can be checked with the **multimess 4F96 LCD** as follows:

1. Switch back to the main menu "I".
2. Connect the current transformer to the corresponding wires.
3. The device will display only positive currents when connection and energy flow direction are correct.
4. If connections are wrong, all currents will be negative.
   Interchange the connections until the display shows correct values.

Caution

Before any interchanging, the current transformers must be shorted out!

4.2 Connection diagram



4.3 Terminal assignment

Terminals 1 (L) and 2 (N):	**Power supply connection** A control voltage is required to supply the device with power. The unit is equipped with a multi-range power supply and may be supplied by voltages of 85 – 265V AC/ DC.
Terminal 10 (L1): 11 (L2): 12 (L3): 13 (N):	**Voltage measuring input** Three-phase voltage measurement in three-wire as well as four-wire rotary current networks. Direct measurement for 3x5…100…120V or 3x20…500…600V AC The measuring range is configurable. Exceeding the measuring interval results in an error message. For higher voltages, the unit needs to be connected via a voltage transformer. For IT networks, a zero-point creator is required.
Terminal 20 (k1) and 21 (I1): 22 (k2) and 23 (I2) 24 (k3) and 25 (I3)	**Current measuring inputs** The measuring inputs for current must be connected via current transformers x/1A AC or x/5A AC. When connecting transformers, pay attention to the energy flow direction and the correct assignment of measuring voltage inputs to the current transformers.
Terminals 30 and 31:	**Floating relay contact relay 1** This contact serves as a message or alarm output. During operation, an audible or visual message may be activated, or a consumer switched off. The contact is open as long as the device is currentless and when there is an active message. Maximum switching capacity of 2A at 250V AC.
Terminals 32 and 33:	**Floating relay contact relay 2** Refer to the description of the floating relay contact relay 1

Terminals 34 (+) and 35 (-):	**Pulse output** Output of energy-proportional pulses via a digital contact (S0 interface in accordance with DIN 43864). Paying attention to the correct polarity is important for this output. The output signals can be processed by a maximum demand monitor or a master central process control, for example.
Terminal 90 (ground): 91 (A) 92 (B)	**Interface connection** For communication on the eBus or Modbus

4.4 Buffered long-term memory

The device is equipped with an internal data memory, which is buffered to preserve long-term data. After an uninterrupted charging time (device connected to the supply voltage) of approx. 100 hours, the charging of the buffer capacitor is sufficient to protect the internal clock and the memory element for long-term data from failure due to missing operating voltage for approx 7 days.

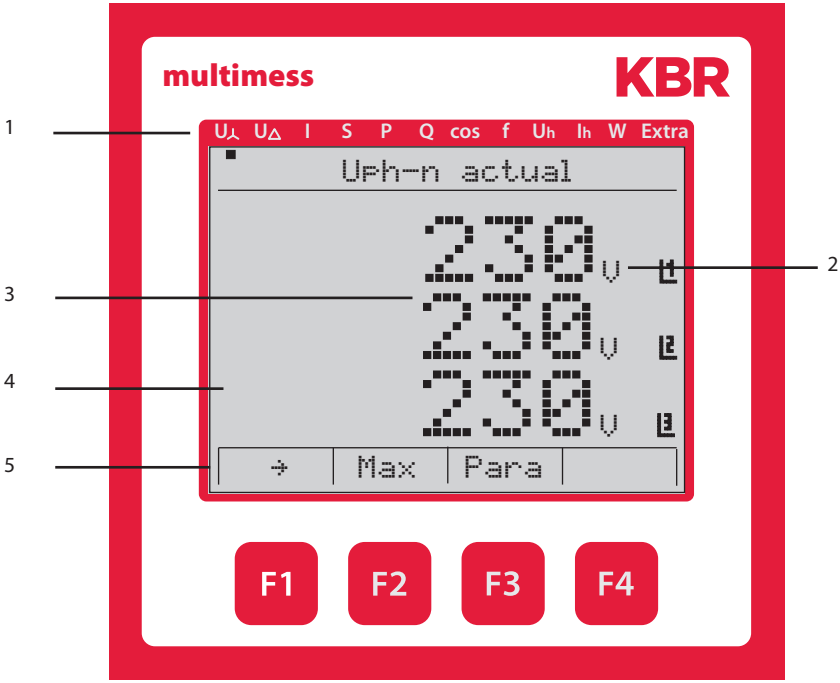
Caution

When the buffer capacitor is discharged and there is no supply voltage, not only the storage data are lost, but the time settings are incorrect as well and have to be reset.

5 System operation

In this chapter, you will find instructions on how to operate the multimess 4F96 in daily use. Furthermore, you will find references to its complete range of functions.

5.1 Control and display panel



5.1.1 Description of buttons and displays

1 Display navigation panel

The navigation panel shows the main menu selected, considerably simplifying operation of the device. The operator can immediately see which menu he is in.

2 Unit display

The DOT matrix display is normally used to show measured values. Each phase has its own display. In some submenus, this display area is used to show additional information to assist operation.

3 Measured values area

These displays are used to show measured, stored and programmed values. In some submenus, they are also used to simplify configuration with simple text output.

4 Additional information area

Additional information is conveyed with simple and self-explanatory icons. This additional information makes it easier for the operator to interpret the recorded values.

5 Hot key area

The text line corresponds to the button keys lying below it and is used to issue messages and text. The interaction of key and accompanying display enables convenient and self-explanatory operation.

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5.2 Setting range

The following setting ranges are available for the configuration of the unit:

Measuring voltage, primary	1 V to 9999 kV
Measuring voltage, secondary	100 V to 500 V
Measuring current, primary	1A to 99.99 kA
Measuring current, secondary	1 A to 5 A
Limits	depending on the configured transformer values
Current average time	1 to 15 minutes
Target Cos φ for missing compensation power	inductive 0.00 to capacitive 0.00
Limits Cosφ	inductive 0.00 to capacitive 0.00
Frequency correction	Automatic - 50 Hz - 60 Hz
Limits frequency	00.00 Hz to 70 Hz
Limits voltage harmonics	00.0% to 99.99%
Limits current harmonics	0 to 300 A
Attenuation coefficient voltage (display)	0 to 6
Attenuation coefficient current (display)	0 to 6
Working pulse output	Active and reactive energy 0.001 to 9990 pulses per KWH or kvar
Energy pulse duration	30 to 999 milliseconds
Signaling relay ON-delay	0 to 255 seconds
Signaling relay shutdown delay	0 to 255 seconds
Measuring period synchronization	Internal, KBR eBus, for tariff switching
Tariff switching	Internal, KBR eBus

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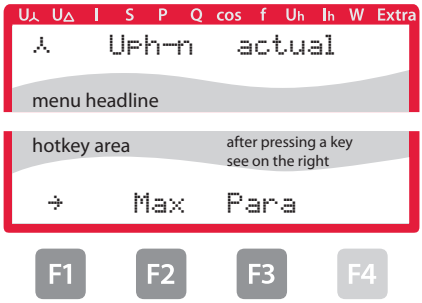
5.3 Basic device programming

The menu navigation of the **multimess 4F96 LCD** is self-explanatory.

The operator is guided and supported by the device through operating instructions displayed for the respective situation.

As an example of the basic configuration procedure, the functions in the **U phase - N** menu will be looked at more closely in the following section.

Menu: U phase - N



F1 Scroll through main menu

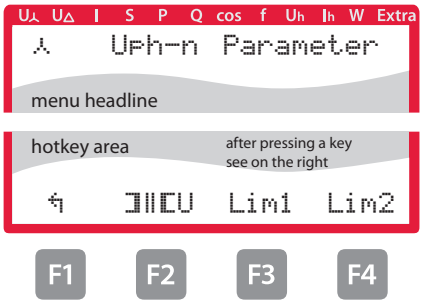
F2 Display and editing of minimum and maximum values

F3 Entry for configuration => limits and voltage transformer

5.3.1 Setting the limits

After pressing the F3 (Para) button, the following is displayed in the hot key area:

Menu: U phase - N



F1 Return

F2 Display and editing for voltage transformer

F3 Configuration limit 1

F4 Configuration limit 2

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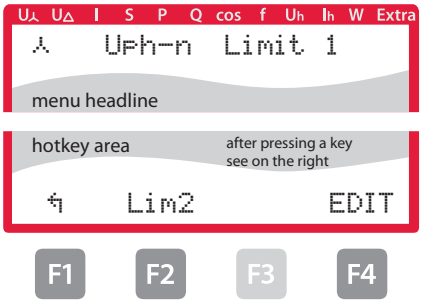
After pressing the F3 (GW1) button, the following display appears in the hot key area of the display:

Menu: U phase - N

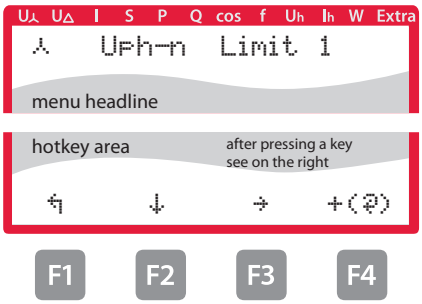


F1 Return

F2 Change to editing of limit 2

F4 Configuration limit 1

After pressing the F4 (Edit) button, the following display appears in the hot key area of the display:



F1 Return

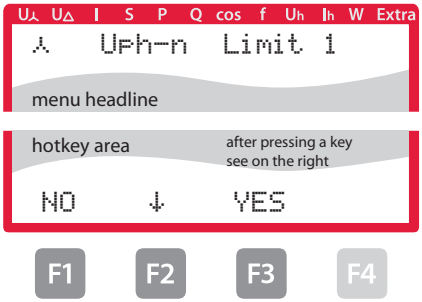
F2 Scroll through lines in the value area

F3 Continue to next digit

F4 + Value input (? function selection)

If the setting was changed, the following display appears after the third line in the hot key area of the display if the ↓ key (scrolling function) is pressed:

Menu: U phase - N



F1 Leave setting menu without saving

F2 Scroll through lines in the value area

F3 Leave settings menu and save

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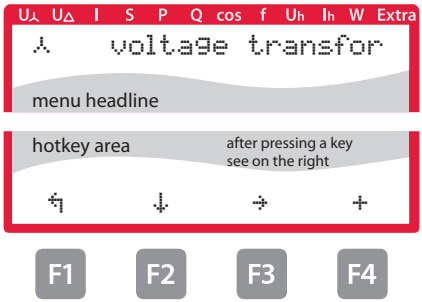
After pressing the F3 (EDIT) button, the following display appears in the hot key area of the display:

Menu: U phase - N



F1 Return

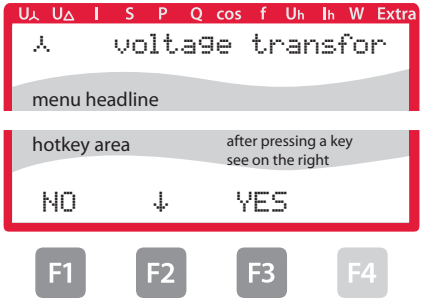
F2 Scroll through lines in the value area

F3 Continue to next digit

F4 + Value input

If the setting was changed, the following display appears after the third line in the hot key area of the display if the ↓ key (scrolling function) is pressed:

Menu: U phase - N



F1 Leave setting menu without saving

F2 Scroll through lines in the value area

F3 Leave settings menu and save

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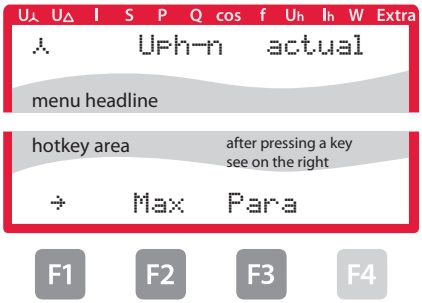
6 Menu overview

In this chapter, you will find a complete overview of all menus and menu items of the multimess.

6.1 Main menu Uph-n voltage

Menu: U phase - N



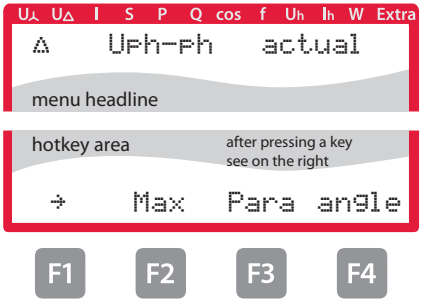
F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Entry for configuration => limits and voltage transformer

6.2 Main menu Uph-ph voltage

Menu: U phase - phase



F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Configuration => limits and voltage transformer

F4 Display of phase angle and measuring voltage asymmetry

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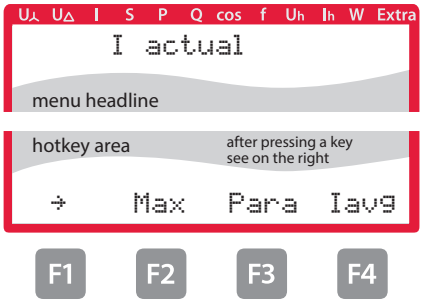
6.3 Main menu I current

Menu: I instantaneous



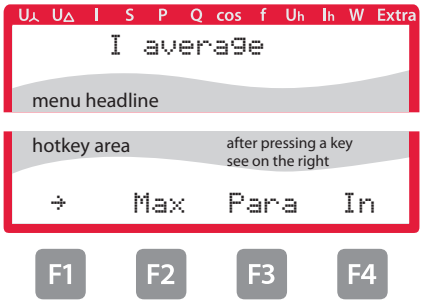
F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Configuration => limits and voltage transformer

F4 Continue to submenu current – average

6.3.1 Submenu Iavg current average



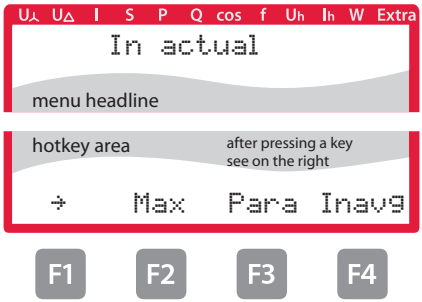
F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Configuration of limits and In average value time

F4 Continue to neutral conductor current menu

6.3.2 Submenu In neutral conductor current



F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Configuration of limits and current transformer

F4 Continue to submenu neutral conductor current – average

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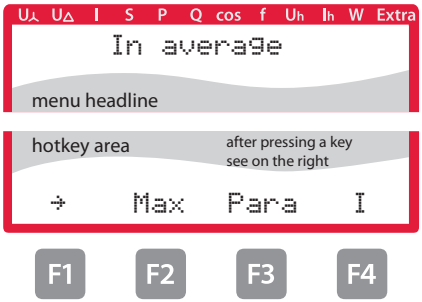
6.3.3 Submenu Inavg average neutral conductor current



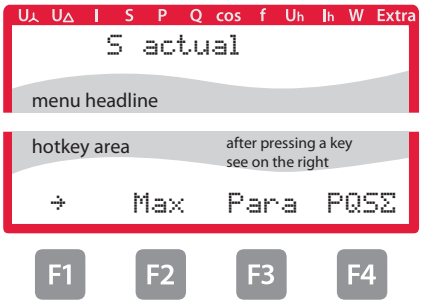
F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Configuration of limits

F4 Return to main menu

6.4 Main menu S apparent power



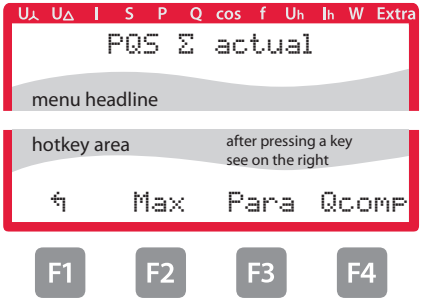
F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Entry for configuration => limits

F4 Submenu totals for active, reactive and apparent power

6.4.1 Submenu PQS display of totals for active, reactive and apparent power



F1 Return

F2 Display and editing of minimum and maximum values

F3 Configuration of limits

F4 Display and editing of missing compensation power

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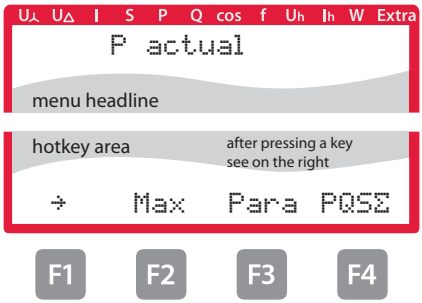
6.5 Main menu P active power:

Menu: P instantaneous value



F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Configuration => limits

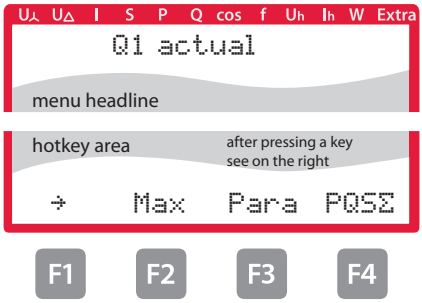
F4 Submenu totals for active, reactive and apparent power

6.5.1 Submenu PQS display of totals for active, reactive and apparent power

For a description, see "Submenu PQS display of totals for active, reactive and apparent power".

6.6 Main menu Q reactive power (fundamental)

Menu: Q1 instantaneous value



F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Entry for configuration => limits

F4 Submenu totals for active, reactive and apparent power

6.6.1 Submenu PQS display of totals for active, reactive and apparent power

For a description, see "Submenu PQS display of totals for active, reactive and apparent power".

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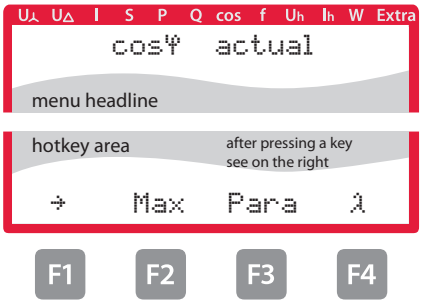
6.7 Main menu Cos Phi

Menu: cosφ instantaneous value



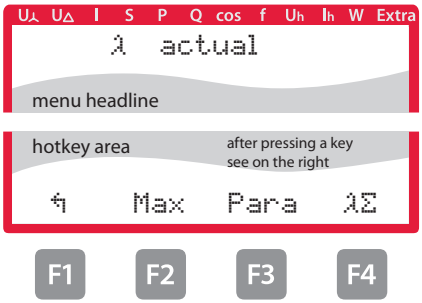
F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Entry for configuration => limits

F4 Submenu power factor

6.7.1 Submenu power factor



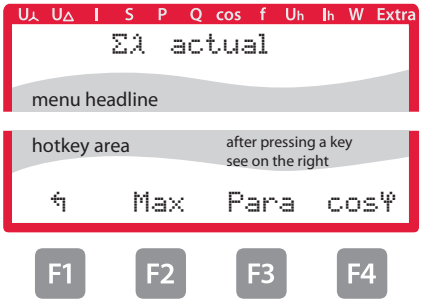
F1 Return

F2 Display and editing of minimum and maximum values

F3 Configuration of limits

F4 Submenu power factor, total

6.7.2 Submenu totals of power factors



F1 Return

F2 Display and editing of minimum and maximum values

F3 Configuration of limits

F4 Return to main menu

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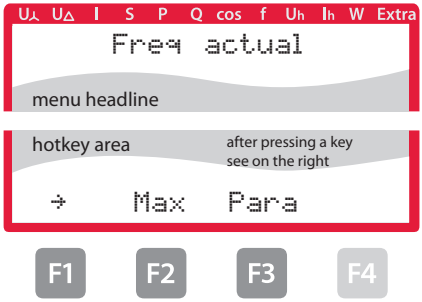
6.8 Main menu F frequency

Menu: F instantaneous value



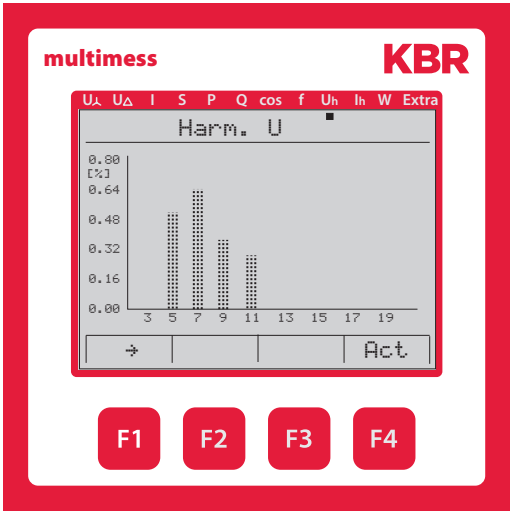
F1 Scroll through main menu

F2 Display and editing of minimum and maximum values

F3 Entry for configuration => limits

6.9 Main menu U_h voltage distortion factor

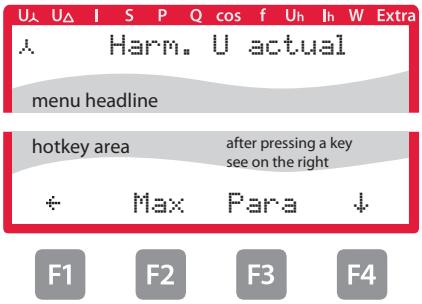
Menu: U_h instantaneous value



F1 Scroll through main menu

F4 Continue to individual harmonics

6.9.1 Submenu 3rd Harm. U



F1 Back to main menu

F2 Display and editing of maximum values

F3 Entry for configuration => limits

F4 Continue to next harmonic oscillation

Note

Display up to 19th harmonic same as for 3rd harmonic

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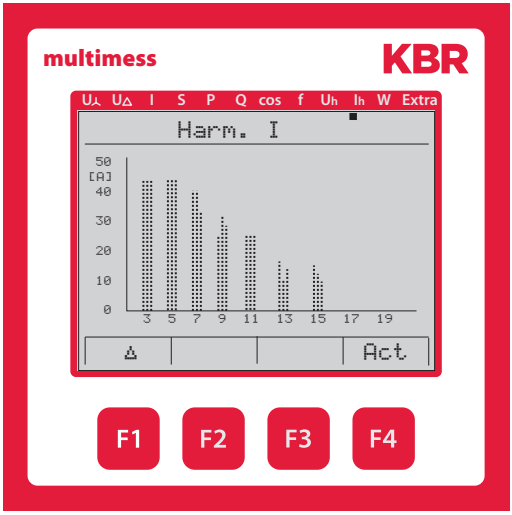
6.10 Main menu Ih distortion current strength

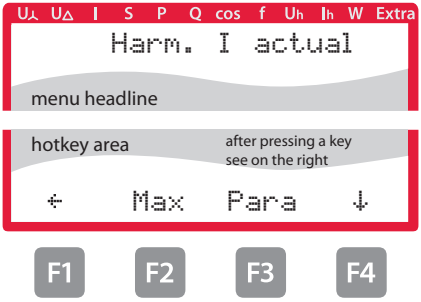
Menu: U_h instantaneous value



F1 Scroll through main menu

F4 Continue to individual harmonics

6.10.1 Submenu 3rd Harm. I



F1 Back to main menu

F2 Display and editing of maximum values

F3 Entry for configuration => limits

F4 Continue to next harmonic oscillation

Note

Display up to 19th harmonic same as for 3rd harmonic

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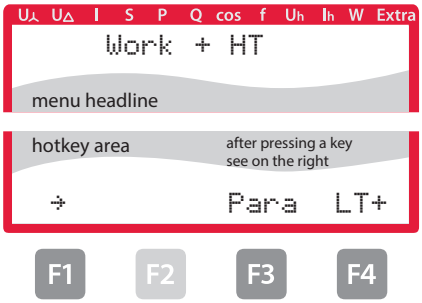
6.11 Main menu W - active and reactive energy / consumption and recovery

Menu: W active and reactive energy

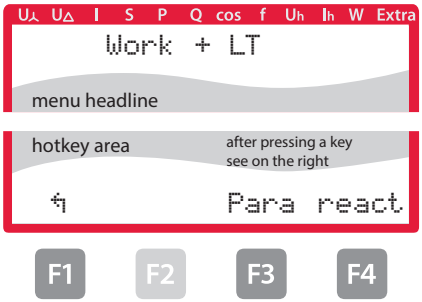


F1 Scroll through main menu

F3 Entry for configuration => tariff and synchronization

F4 Submenu active energy low tariff consumption

6.11.1 Submenu W active energy low tariff consumption

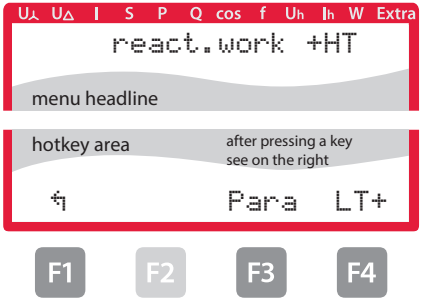


F1 Return

F3 Entry for configuration => limits

F4 Submenu reactive energy high tariff consumption

6.11.2 Submenu W reactive energy high tariff consumption

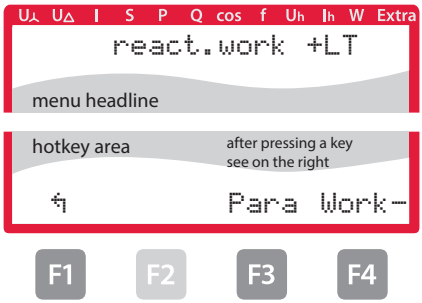


F1 Return

F3 Entry for configuration => tariff and synchronization

F4 Submenu reactive energy low tariff consumption

6.11.3 Submenu W reactive energy low tariff consumption

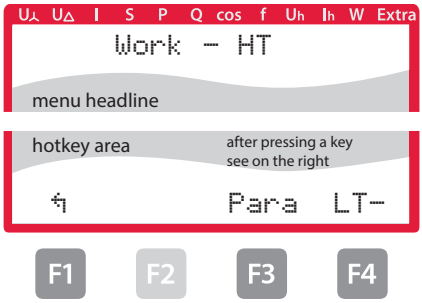


F1 Return

F3 Entry for configuration
=> tariff and synchronization

F4 Submenu active energy
high tariff recovery

6.11.4 Submenu W active energy high tariff recovery

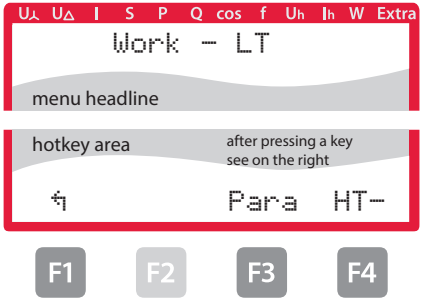


F1 Return

F3 Entry for configuration
=> tariff and synchronization

F4 Submenu active energy
low tariff recovery

6.11.5 Submenu W active energy low tariff recovery



F1 Return

F3 Entry for configuration
=> tariff and synchronization

F4 Submenu reactive energy
high tariff recovery

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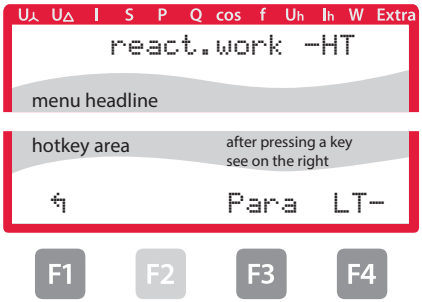
6.11.6 Submenu W reactive energy high tariff recovery

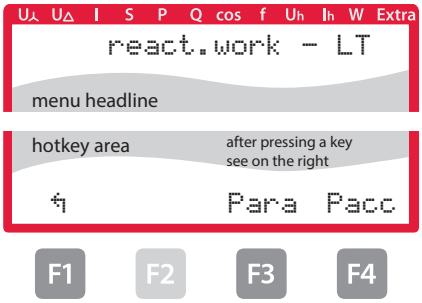


F1 Return

F3 Entry for configuration
=> tariff and synchronization

F4 Submenu reactive energy
low tariff recovery

6.11.7 Submenu W reactive energy low tariff recovery

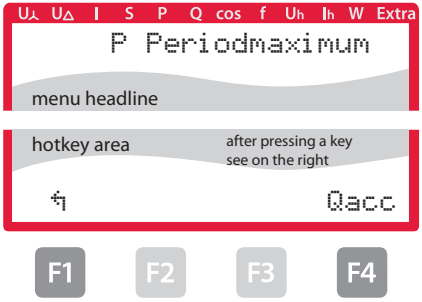


F1 Return

F3 Entry for configuration
=> tariff and synchronization

F4 Display of maximum active energy of
the period consumption

6.11.8 Submenu W maximum cumulated active power of the period



F1 Return

F4 Display of maximum reactive energy
of the period consumption

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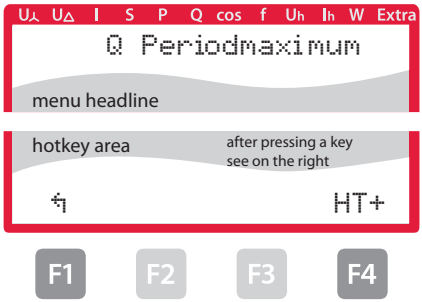
6.11.9 Submenu Q maximum cumulated reactive power of the period

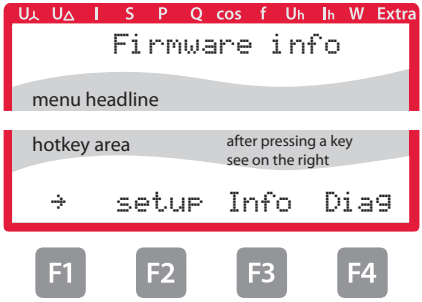


F1 Return

F4 Return to main menu

6.12 Main menu Extras

Firmware information



F1 Scroll through main menu

F2 Device configuration

F3 Message

F4 Diagnosis for measuring voltage dip, available after voltage dip only

In versions option 6 and 7, the device can record measuring voltage dips. They can be displayed calling up the Diag (F4) menu item in the Extras window.

Configuration of this function is only possible with the visual energy computer software.

The measuring voltage dips recorded are not saved and are deleted in case of a power failure.

A detailed description of this function is given in the document **EDEKZA0018_XXXX_multimess4F96LCD-Diagnosis**, which is available on request (German Language).

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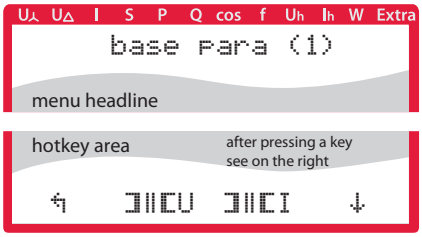
6.12.1 Setting transformer ratio



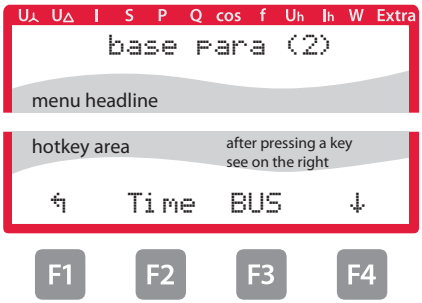
F1 Return

F2 Voltage transformer ratio configuration

F3 Current transformer ratio configuration

F4 Continue with basic para (2)

6.12.2 Time and bus communication



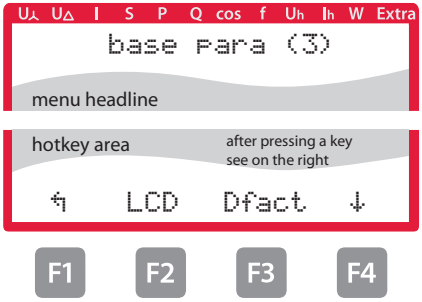
F1 Return

F2 Set time
(time, date, daylight saving time)

F3 Set bus parameters (baud rate, address, protocol etc.), see attachment

F4 Continue with basic para (3)

6.12.3 Set display and attenuation coefficient



F1 Return

F2 Contrast setting, display test, dimmer

F3 Set attenuation coefficient for current and voltage

F4 Continue with basic para (4)

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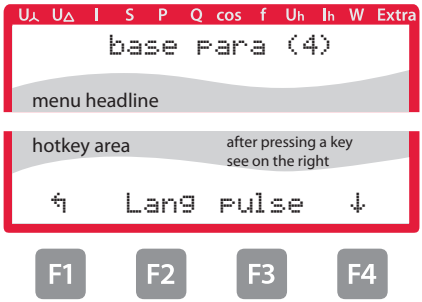
6.12.4 Set language and pulse output



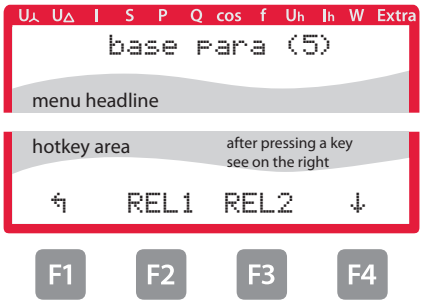
F1 Return

F2 Set user language (German / English)

F3 Configure pulse output

F4 Continue with basic para (5)

6.12.5 Configure relay outputs



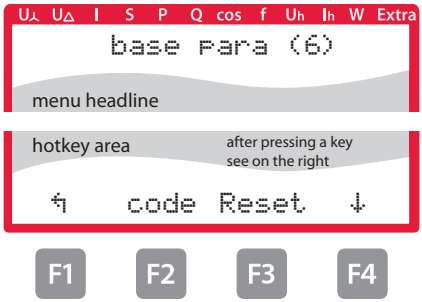
F1 Return

F2 Configure relay output 1

F3 Configure relay output 1

F4 Continue with basic para (6)

6.12.6 Password and reset



F1 Return

F2 Password entry / password protection

F3 Reset limits, extreme values, meters or reset to default settings

F4 Continue with basic para (7)

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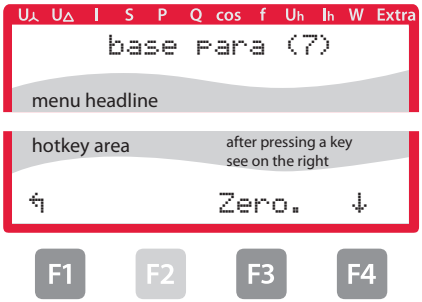
6.12.7 Zero-point creator

Configuration as described below:

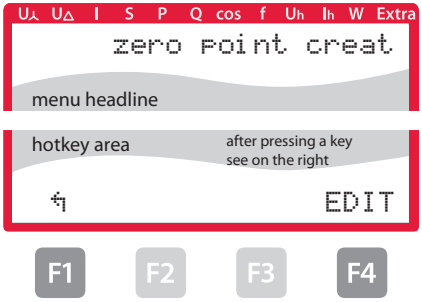


F1 Return

F3 Activate/deactivate zero-point creator:

F4 Continue with basic para (1)

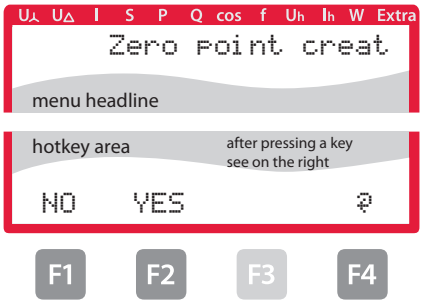
After pressing the F3 (Zero.) button, the following is displayed in the hot key area:



F1 Return

F4 Activation and selection zero-point creator on/off

After pressing the F4 (EDIT) button, the following is displayed in the hot key area:

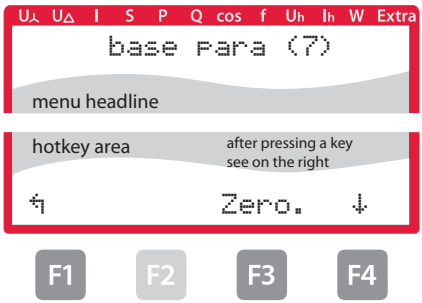


F1 Discard changes

F2 Confirm and save settings

F4 Selection off / on

After confirming to save your settings by pressing F2 and returning with the F1 (↰) button, the following is displayed in the hot key area:



F1 Return

F3 Activate/deactivate zero-point creator:

F4 Continue with basic para (1)

6.13 Reset to default settings

Reset should only be carried out during setup and when the device is completely reprogrammed.

Caution

Caution! Reset will reset all programmed values to their default settings!

Reset is carried out in the menu **Extras - sub menu Reset / Default settings**.

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The device is reset to its **default settings**, i.e. all stored data is lost!

This includes all operating parameters, limits and extreme values as well as the OFF delay of the signaling relays.

The memory for limit violations is deleted.

The settings for time, date and bus address are not affected by a reset.

Warning

Check all operating parameters for correctness!

7 Technical data multimess 4F96

7.1 Measuring and display values

Wave form for U and I		any
Voltage	RMS value of a measuring interval	Phase - 0: U_{L1-N}; U_{L2-N}; U_{L3-N} / phase - phase: U_{L1-2}; U_{L2-3}; U_{L3-1}
	Units	[V, kV] display is switched over automatically
	Measuring range	0.00kV to 999.9 kV
Current (apparent current)	RMS value of a measuring interval	$I_{L1\ Inst}$; $I_{L2\ Inst}$; $I_{L3\ Inst}$; instantaneous value for each phase
	Average value determination	$I_{L1\ Av}$; $I_{L2\ Av}$; $I_{L3\ Av}$; floating average value from RMS values over a configurable period of time
	Units	[A;kA;MA] display is switched over automatically
	Measuring range	0.00A to 999.9 kA
Neutral conductor current	RMS value of a measuring interval	$I_{N\ Inst}$ / $I_{N\ Avg}$ instantaneous and average value
	Units	[VA; kVA; MVA, TVA]; display is switched over automatically
	Measuring range	0.00A to 1.2 MA
Frequency	Power frequency measurement	f_{Net} ; measured with network correction
	Units	[Hz]
	Measuring range	40.....63 Hz
Apparent power	Calculation	S_{L1}, S_{L2}, S_{L3}, Stot
	Units	[VA; kVA; MVA] display is switched over automatically
	Measuring range	0.00VA to 999MVA
Active power	Calculation	P_{L1}, P_{L2}, P_{L3}, P_{total};
	Units	[W; kW; MW] display is switched over automatically
	Measuring range	0.00W to 999MW

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Reactive power	Calculation -> ind. & cap.	Q_{L1}, Q_{L2}, Q_{L3}, Q_{total}; distinction between ind./cap.
	Units	[Var; kvar; Mvar]; display is switched over automatically
	Measuring range	0.00VAr to 999Mvar
Power factor	Calculation -> ind. & cap.	$cos\varphi_{L1}$; $cos\varphi_{L2}$; $cos\varphi_{L3}$; LF_{L1}; LF_{L2}; LF_{L3}; LFtot.; distinction between ind./cap. cosφ in the display
	Measuring range	CosPhi 0.1ind.←1 → 0.1cap., LF 0.1 - 1
Active energy	Calculation	W (HT/LT); $P_{average\ max.\ of\ a\ measuring\ period}$
	Units	[Wh; kWh; MWh] display is switched over automatically
	Measuring range	0.0kWh to 9999999999.9kWh
Reactive energy	Calculation	Wreact (HT/LT) ind. or cap. $Q_{average\ max.\ of\ a\ measuring\ period}$;
	Units	[varh; kvarh; Mvarh]; display is switched over automatically
	Measuring range	0.0kvarh to 9999999999.9kvarh
Harmonics	Distortion factor (THD) for voltage	Voltage: DF-U_{L1}; DF-U_{L2}; DF-U_{L3};
	Partial distortion factors	3rd; 5th; 7th; 9th; 11th; 13th; 15th; 17th and 19th harmonic of the voltage
	Units	[%]
	Measuring range	0.00% to 100%
Harmonics of the current	Current harmonics	3rd; 5th; 7th; 9th; 11th; 13th; 15th; 17th and 19th harmonic for each phase
	Total of current harmonics	Current: $ISum_{L1}$; $ISum_{L2}$; $ISum_{L3}$; for each phase separately
	Units	[A]
	Measuring range	0.00A to 999.9kA

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7.2 Measuring accuracy

Current	± 0.5 % / ± 1 digit
Voltage	± 0.5 % / ± 1 digit
Apparent power	± 1 % / ± 1 digit
Active power	± 1 % / ± 1 digit
Reactive power	± 1 % / ± 1 digit
Frequency	± 0.1 Hz / ± 1 digit

7.3 Measuring principle

Reading	64 measured values per period
A/D converter	10 bit
Measurement of U and I	simultaneous recording of measured values for U and I;
Update speed (complete measuring cycle)	~ 500 ms
Harmonics calculation	DFT with 256 points over four measuring periods
Frequency measurement	Mode: Voltage measured between phase L1, L2, L3 - N;
	correct frequency measurement due to power supply correction

7.4 Device memory

Main and data memory	1MB RAM buffered
Program and parameter memory	256 kB flash
Memory type	Ring buffer
Long-term memory (1 year)	Daily values for active and reactive energy (HT and LT)
Long-term memory for 160 / 80 / 40 days / 64 hours	60 / 30 / 15 / 1 minute – average values of: P_{total}; Q_{total}, adjustable via bus
Extreme values (max./min.)	Extreme values that occurred after connection to the power supply or after the extreme value memory has been deleted (maximum indicator function) manually including date and time
Event memory: Memory size	4096 events including date and time they occurred
Limit violations: Time for acquisition	≥ 550 ms
Measuring voltage dips, acquisition time:	≥ 20 ms; threshold can be set using the computer, value after reset 85% of rated voltage (according to EN 61000-4-30).

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7.5 Power supply

Power supply	85 to 265V AC/DC 50/60 Hz; 15VA see nameplate

7.6 Hardware inputs and outputs

7.6.1 Hardware inputs

Voltage measuring inputs	$U_{L1-L}2$; U_{L2-L3}; U_{L3-L1}	3 x 5V....**100V**...120V AC (measuring range 1) 3 x 20V... **500V**...600V AC (measuring range 2)
	Input impedance	1.5 MOhm (Ph-Ph)
	Measuring range	programmable
Current measuring input		3 x 0.01A...**1A**...1.2A AC (measuring range 1) 3 x 0.05A...**5A**...6A AC (measuring range 2)
	Power consumption	≤ 0.3VA per input at 6A
	Measuring range	programmable

7.6.2 Hardware outputs

Signaling relay for limit violations	Number	2 (option)
	Contact	floating
	Reaction speed	programmable
	Switching capacity	250V AC / 2A;
Pulse output	Output type	in proportion to active or reactive energy ► programmable on the device from 0.001 to 9990 Imp/kWh
	Optocoupler output	15 mA at max. 35V; S0 compatible
	Accuracy class	2
	Pulse duration	programmable, min. 30 ms
	Power supply	external
Interface (option)	BUS	RS485 for connection to the energy bus; max. 32 devices
	Baud rate	38,400
	Addressing	Can be addressed up to address 9999; automatically via software or manually on the device
	LAN	IEEE 802.3
	speed	10 Mbit / 100 Mbit
	Connection	IEEE 802.3 10base-t / 10base-TX, cable CAT5

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7.7 Electrical connection

Connection elements		Screw terminals
Permissible cross section of the connection lines		2.5 mm²
Measurement voltage inputs	Fuse protection	max. 6 A
Measuring current inputs	Fuse protection	NONE!!! Always short-circuit current transformer terminals k and l prior to opening the circuit!
Input control voltage	Fuse protection	max. 6 A
Relay output	Fuse protection	max 2A medium time-lag
BUS connection	Connection material	For proper operation, please only use shielded twisted-pair cables; e.g. I-Y-St-Y 2x2x0.8
Pulse output	Connection and cables	ensure proper polarity! For proper operation, please only use shielded twisted-pair cables; e.g. I-Y-St-Y 2x2x0.8
Transformer connection	Connections	see connection chart
BUS connection	Pins for BUS connection via RS485	Terminal 90 (⊥) Terminal 91 (A) Terminal 92 (B)

7.8 Mechanical data

Flush-mounted device	Housing dimensions	96 x 96 x 65 mm (H x W x D)
	Assembly cut-out	92 x 92 mm
	Protection type	Front IP51 (with optionally available front door max. IP54), terminals IP20
	Weight	min. 300g, max. 350g, depending on optional board

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7.9 Standards and miscellaneous

Ambient conditions	Standards	DIN EN 60721-3-3/A2: 1997-07; 3K5+3Z11; (IEC721-3-3; 3K5+3Z11)
	Operating temperature	- 5°C ….+55°C
	Humidity	5% ….....95% non-condensing
	Storage temperature	-25°C ….+70°C
Electrical safety	Standards	DIN EN 61010-1 2002-08 + correction 2002-11 + correction 2004-01
	Protection class	
	Overvoltage category	CAT III:U_{PH-PH} to 400V CAT II:U_{PH-PH} to 600V
Electrical safety	Protection type	Front IP 51 (with optionally available front door max. IP 54) Terminals IP 20 improved protection type possible via additional seals on request; DIN EN 40050 part 9: 1993-05
	Electromagnetic compatibility	DIN EN 50081-1: 1993-03 DIN EN 61000-6-2: 2000-03; (IEC 61000-6-2)
Password protection	4 digit code	Deleting and programming parameters on the device is not enabled if password protection is active.
EMC	standard	DIN EN 61000-6-1 2007 DIN EN 61000-4-2 2005
Synchronization	Types	internal, tariff switching or via energy bus

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7.10 Default settings after reset

Primary voltage / secondary voltage	400 V
Primary current / secondary current	5 A
Zero-point creator	off
Measuring period duration	15 minutes measuring period
Current average time	10 minutes
Target Cos φ for missing compensation power	inductive 0.98
Daylight saving time	from months 03 to 10
Frequency correction	automatic
Tariff switching	via KBR eBus
Low tariff time	programmed time for internal switching of HT and LT: 22:00-6:00 (10pm to 6am)
Attenuation coefficient for current and voltage	dF 0 (no attenuation)
Energy pulse	P. (active power for consumption), 1 pulse /kWh, pulse duration 100 ms
Alarm relay	On-delay tON = 0 sec Off-delay tOFF = 0 sec
Measuring period synchroniza-tion	internal
Password	9999 / all functions can be accessed
Number of period entries in the load profile memory	4*3840 (for P+, P-, Q+, Q

Unaffected by a RESET:
1. Bus address
2. Time
3. Language

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ERKLÄRUNG DER KONFORMITÄT
DECLARATION OF CONFORMITY
DÉCLARATION DE CONFORMITÉ

Wir
We/Nous

KBR GmbH Schwabach

(Name des Anbieters / supplier´s name / norm du fournisseur)

Am Kiefernschlag 7
D-91126 Schwabach

(Anschrift / address / addresse)

erklären in alleiniger Verantwortung, dass das (die) Produkt(e) /
declare under our sole responsibility that the product(s) / Déclarons sous notre seule responsabilité, ques le(s) produit(s)

multimess 4F96 LCD ...

(Bezeichnung, Typ oder Modell oder Seriennummer / name, type or model or serial number / nom, type ou modèle, N° de lot ou de série)

mit folgenden Europäischen Richtlinien übereinstimmt (übereinstimmen)
is (are) in conformity with the following directives / Répondet(ent) aux directives suivantes

Niederspannungsrichtline Nr. **Low Voltage Directive No.** **Directive Basse Tension N°**	**EMV-Richtlinie Nr.** **EMV Directive No.** **EMV Directive N°**
2006/95/EG **2006/95/EC** **2006/95/CE**	**2004/108/EG** **2004/108/EC** **2004/108/CE**

Dies wird nachgewiesen durch die Einhaltung folgender Norm(en)
This is documented by the accordance with the following standard(s) / Justifié par le respect de la (des) norme(s) suivante(s)

DIN EN 61010-1-2002-08;
DIN EN 61010-1/B1:2002
DIN EN 61010-1/B2:2004

DIN EN 61000-6-1:2007
DIN EN 61000-6-2:2005
DIN EN 61000-6-3:2007
DIN EN 61000-6-4:2007

(Titel und/oder Nr. sowie Ausgabedatum der Norm(en)
Title and/or number and date of issue of the standard(s)
Titre et/ou numéro et date d´édition de la (des) norme(s)

CE

Schwabach, 29.08.2011

(Ort und Datum der Ausstellung
Place and date of issue
Lieu et date de l´édition)

Geschäftsführer
General manager

8 Attachment: Modbus interface

Note

Availability of data points depends on the device version.

8.1 Description Modbus interface for Modbus RTU or ASCII

The multimess 4F96 is optionally available with a Modbus RTU or ASCII interface. In order to use these, the bus protocol has to be changed from KBR eBus to Modbus RTU or ASCII.

To do so, proceed as follows:

8.1.1 Main menu Extras

Firmware info				Menu heading
F1	F2	F3	F4	
→	Setup	Info		Display hot-key area
		Messages about limit violations		
	Device configuration menu			
Scroll through main menu				

Press the F2 and then the F4 button.

8.1.2 Change bus protocol

base para (2)				Menu heading
F1	F2	F3	F4	
↰	Time	Bus	↓	Display hot-key area
			Other basic para (3)	
		Set bus parameters (baud rate, address, protocol etc.)		
	Set time (time, date, daylight saving time)			
Return				

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After confirmation with the F3 button, the following display appears:

Bus parameters				Menu heading
F1	F2	F3	F4	
↰		eBus	EDIT	Display hot-key area
			I	
			Change bus protocol (Modbus, eBus)	
		Set Ebus parameters (address)		
Return				

Start the entry with the F4 button and then change the bus protocol with F3 by switching from KBR eBus to Modbus.

para (2)				Menu heading
F1	F2	F3	F4	
NO	YES		EDIT	Display hot-key area
			I	
			Selecting the Modbus bus protocol	
	Save changes			
Discard changes				

Subsequently, save the changes with F2 or discard them with F1.
The device reboots and accepts the new configuration.

Bus parameters				Menu heading
F1	F2	F3	F4	
↰		ModB	EDIT	Display hot-key area
			I	
			Selecting the bus protocol (eBus or Modbus)	
		Call up Modbus settings		
Return				

Use the F3 button to call up the Modbus settings.

<table>
<tr><td colspan="4">ModBus settings</td><td>Menu heading</td></tr>
<tr><td>F1</td><td>F2</td><td>F3</td><td>F4</td><td></td></tr>
<tr><td>↰</td><td></td><td></td><td>EDIT</td><td>Display hot-key area</td></tr>
<tr><td rowspan="4"></td><td rowspan="3"></td><td rowspan="2"></td><td>|</td><td></td></tr>
<tr><td colspan="2">Configuring the Modbus bus protocol</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="5">Return</td></tr>
</table>

By pressing F4, call up the settings menu for the Modbus address and bus protocol.

The following protocols can be set:

4.8k Baud, 9.6k Baud, 19.2k Baud with the respective parity even / odd
or no Parity in RTU or ASCII mode.

8.2 Description Ethernet interface for Modbus TCP

The multimess 4F96 is optionally available with an interface for Modbus TCP .

8.2.1 Main menu Extras

Firmware info				Menu heading
F1	F2	F3	F4	
→	Setup	Info		Display hot-key area
		Messages about limit violations		
	Device configuration menu			
Scroll through main menu				

Press the F2 and then the F4 button.

8.2.1 Change bus protocol

base para (2)				Menu heading
F1	F2	F3	F4	
↰	Time	Bus	↓	Display hot-key area
		Set bus parameters (IP address, netmask (host))	Other basic para (3)	
	Set time (time, date, daylight saving time)			
Return				

Press the F2 and then the F4 button.

Bus parameters				Menu heading
F1	F2	F3	F4	
↰		IPadr		Display hot-key area
		Display / entry IP address and netmask (host)		
Return				

By pressing F3, call up the settings menu for the IP address and netmask.
When entering the netmask, observe the following chart:

Network class	Host bits	Netmask
A	24	255.0.0.0
B	16	255.255.0.0
C	8	255.255.255.0

The default setting is 8 bit (255.255.255.0)

8.3 Modbus TCP configuration via Ethernet interface (Telnet)

The Modbus TCP interface of the multimess 4F96 can be set up using the Ethernet interface via Telnet.

Start the Telnet program:
telnet <IP address> <port number>
with the known device IP address as <IP address>
and the configuration port number of the device (always 9999) as <port number>
Example: telnet 10.66.22.98 9999

If device and computer are part of the same network, the device displays the following text:

```
Modbus/TCP to RTU Bridge
MAC address 00204A840B45
Software version 02.2b1 (040728) XPTEX
Press Enter to go into Setup Mode
```

With the return key, open the configuration menu.

```
Model: Device Server Plus+! (firmware code:XA)
Modbus/TCP to RTU Bridge Setup
1)Network/IP Settings:
IP Address ................. 10.66.22.98
Default Gateway ............ --- not set ---
Netmask .................... 255.255.255.000
2) Serial & Mode Settings:
   Protocol ................... Modbus/RTU,Slave(s) attached
   Serial Interface ........... 19200,8,E,1,RS485
3) Modem/Configurable Pin Settings:
   CP1 ...... RS485 Output Enable
   CP2 ...... Not Used
   CP3 ...... Not used
4) Advanced Modbus Protocol settings:
   Slave Addr/Unit Id Source .. Modbus/TCP header
   Modbus Serial Broadcasts ... Enabled
   (Id=0 used as broadcast)
   MB/TCP Exception Codes ..... Yes (return 00AH and 00BH)
   Char, Message Timeout ...... 00010msec, 00200msec

D)efault settings, S)ave, Q)uit without save
  Select Command or parameter set (1..4) to change:
```

You can change the settings and save them by pressing S.
The device can now be operated using the new parameters.

9 Attachment: Ethernet interface for eBus TCP

The multimess 4F96 is optionally available with an interface for eBus TCP

9.1.1 Main menu Extras

Firmware info				Menu heading
F1	F2	F3	F4	
→	Setup	Info		Display hot-key area
		Messages about limit violations		
	Device configuration menu			
Scroll through main menu				

Press the F2 and then the F4 button.

9.1.2 Change bus protocol

base para (2)				Menu heading
F1	F2	F3	F4	
↰	Time	Bus	↓	Display hot-key area
			Other basic para (3)	
		Set bus parameters		
	Set time (time, date, daylight saving time)			
Return				

After confirmation with the F3 button, the following display appears:

Bus Parameter				Menu heading
F1	F2	F3	F4	
↰		LAN	↓	Display hot-key area
		Call up LAN settings		

Use the F3 button to call up the LAN settings.

LAN setting				Menu heading
F1	F2	F3	F4	
↰	SCAN	IPadr	EDIT	Display hot-key area
			Selecting the bus address	
		Display / entry IP address and netmask (host)		
	SCAN address is activated (for automatic eBus address assignment)			
Return				

By pressing F3, call up the settings menu for the IP address and netmask.

9.2 KBR eBus TCP configuration using the display

On the display, you can display and change the IP address in the menu item LAN and the subnet mask in the menu item Host.

On delivery, the devices are set to the IP address 192.168.0.1. This IP address is also shown in the display.

For this reason, it is recommended to check whether the device responds to this IP address.

When entering the netmask, observe the following chart:

Network class	Host bits	Netmask
A	24	255.0.0.0
B	16	255.255.0.0
C	**8**	255.255.255.0

The default setting is 8 bit (255.255.255.0)

9.3 KBR eBus TCP configuration via Ethernet interface (Telnet)

The eBus TCP interface of the multimess 4F96 can be set up using the Ethernet interface via Telnet.

Example:
Settings of a device with the IP address 192.168.0.1 and change to 10.66.22.98.

Procedure:

1. Connect the device to an existing network using a network cable, or directly connect it to a computer with a crosslink cable.
2. Have the network administrator assign you a free network address.
3. Open a DOS input window (with Start->All programs-Accessories-Command prompt).

Entry: `telnet 192.168.0.1 9999`

Entry: `Enter` **(within 2 seconds)**

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```
MAC address 00204ACC6D65
Software version V6.7.0.1 (100420) XPTEXE

Press Enter for Setup Mode

*** basic parameters
Hardware: Ethernet TPI
IP addr 192.168.0.1, no gateway set,netmask 255.255.255.0
DNS Server not set

*** Security
SNMP is               enabled
SNMP Community Name: public
Telnet Setup is       enabled
TFTP Download is      enabled
Port 77FEh is         enabled
Web Server is         enabled
Web Setup is          enabled
ECHO is               disabled
Enhanced Password is disabled
Port 77F0h is         enabled

*** Channel 1
Baudrate 38400, I/F Mode 7F, Flow 00
Port 08000
Connect Mode : C0
Send ‚+++‘ in Modem Mode enabled
Show IP addr after ‚RING‘ enabled
Auto increment source port disabled
Remote IP Adr: --- none ---, Port 00000
Disconn Mode : 00
Flush   Mode : 80
Pack Cntrl   : 20

*** Expert
TCP Keepalive    : 45s
ARP cache timeout: 600s
CPU performance: Regular
Monitor Mode @ bootup : enabled
RS485 tx enable  : active high
HTTP Port Number : 80
SMTP Port Number : 25
MTU Size: 1400
Alternate MAC: disabled
Ethernet connection type: auto-negotiate
```

```
*** E-mail
Mail server: 0.0.0.0
Unit       :
Domain     :
Recipient 1:
Recipient 2:

- Trigger 1
Serial trigger input: disabled
  Channel: 1
  Match: 00.00
Trigger input1: X
Trigger input2: X
Trigger input3: X
Message :
Priority: L
Min. notification interval: 1 s
Re-notification interval  : 0 s

- Trigger 2
Serial trigger input: disabled
  Channel: 1
  Match: 00.00
Trigger input1: X
Trigger input2: X
Trigger input3: X
Message :
Priority: L
Min. notification interval: 1 s
Re-notification interval  : 0 s

- Trigger 3
Serial trigger input: disabled
  Channel: 1
  Match: 00.00
Trigger input1: X
Trigger input2: X
Trigger input3: X
Message :
Priority: L
Min. notification interval: 1 s
Re-notification interval  : 0 s
```

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```
Change Setup:
  0 Server
  1 Channel 1
  3 E-mail
  5 Expert
  6 Security
  7 Defaults
  8 Exit without save
  9 Save and exit            Your choice 0

IP Address : (192) 10.(168) 66.(000) 22.(001) 98
Set Gateway IP Address (N) N
Netmask: Number of Bits for Host Part (0=default) (0)8
Change telnet config password (N) N

Change Setup:
  0 Server
  1 Channel 1
  3 E-mail
  5 Expert
  6 Security
  7 Factory defaults
  8 Exit without save
  9 Save and exit            Your choice ? 1
  8 Exit without save
  9 Save and exit            Your choice ? 9
```

```
Baudrate (9600) ? 38400
I/F Mode (4C) ?7F          equal to 8 data bits, Parity even,
1 Stopbit
Flow (00) ?
Port No (10001) ? 8000
ConnectMode (C0) ?
Remote IP Address : (000) .(000) .(000) .(000)
Remote Port  (0) ?
DisConnMode (00) ?
FlushMode   (00) ?
DisConnTime (00:00) ?:
SendChar 1  (00) ?
SendChar 2  (00) ?
Change Setup:
  0 Server
  1 Channel 1
  3 E-mail
  5 Expert
  6 Security
  7 Factory defaults
  8 Exit without save
  9 Save and exit             Your choice ? 9

Parameters stored ...

Connection to host lost.
```

You can now change the settings and save them entering 9. The device can now be operated using the new network parameters.

The IP address, default gateway and netmask are set under the menu item **0 Server**.
The serial interface (KBR eBus) is set up under menu item 1 **Channel 1**
(KBR eBus parameters 38.400 baud, 8 data bits, parity even, 1 stop bit).

9.4 Menu point 0 server, setting the IP address:

IP address (10) etc.

Example: 10.66.22.98

Set gateway IP address (N) ? N

Gateway IP addr (0) (0) (0) (0)

Netmask: Number of Bits for Host Part (0=default) (8)

Change telnet config password (N) N

When entering the netmask, observe the following chart:

Network class	Host bits	Netmask
A	24	255.0.0.0
B	16	255.255.0.0
C	**8**	255.255.255.0

9.5 Menu item 1 Channel 1, setting of serial interface (EBUS):

Baud rate (38400) ? 38,400

I/F Mode (7C) ? 7F// the parameters 8 data bits, parity even, 1 stop bit correspond to the 7F coding

Flow (00) ?

Port No (10001) ? 8000

All other parameters of this menu item stay the same.

Change Setup:

0 Server
1 Channel 1
3 E-mail
5 Expert
6 Security
7 Factory defaults
8 Exit without save
9 Save and exit Your choice ? 9

Parameters stored ...

When entering 9, the changes are saved and accepted. The multimess 4F96 can now be accessed using the KBR visual energy computer software.

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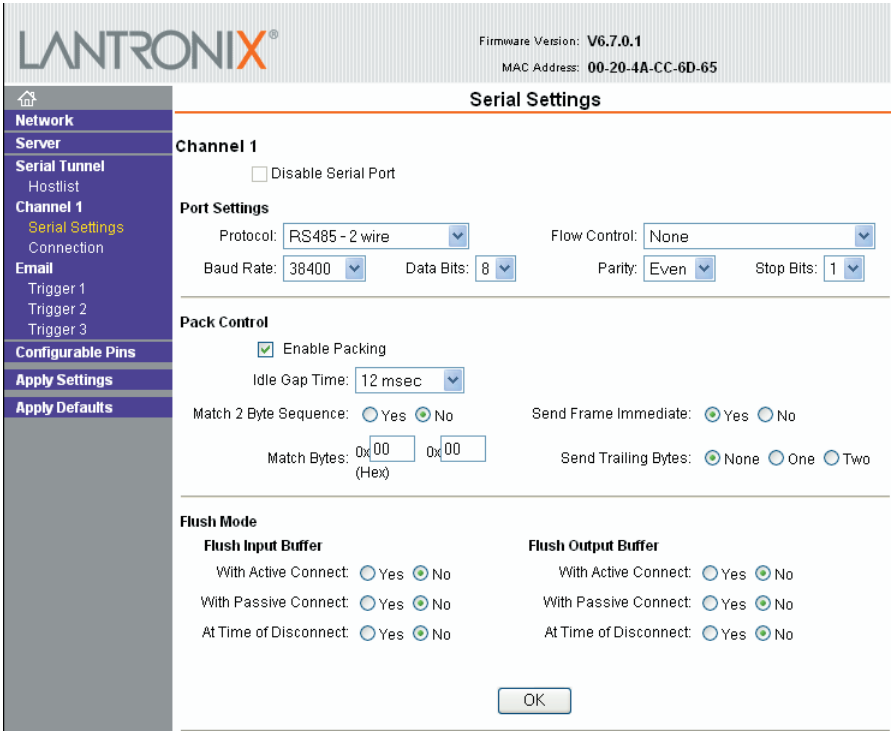
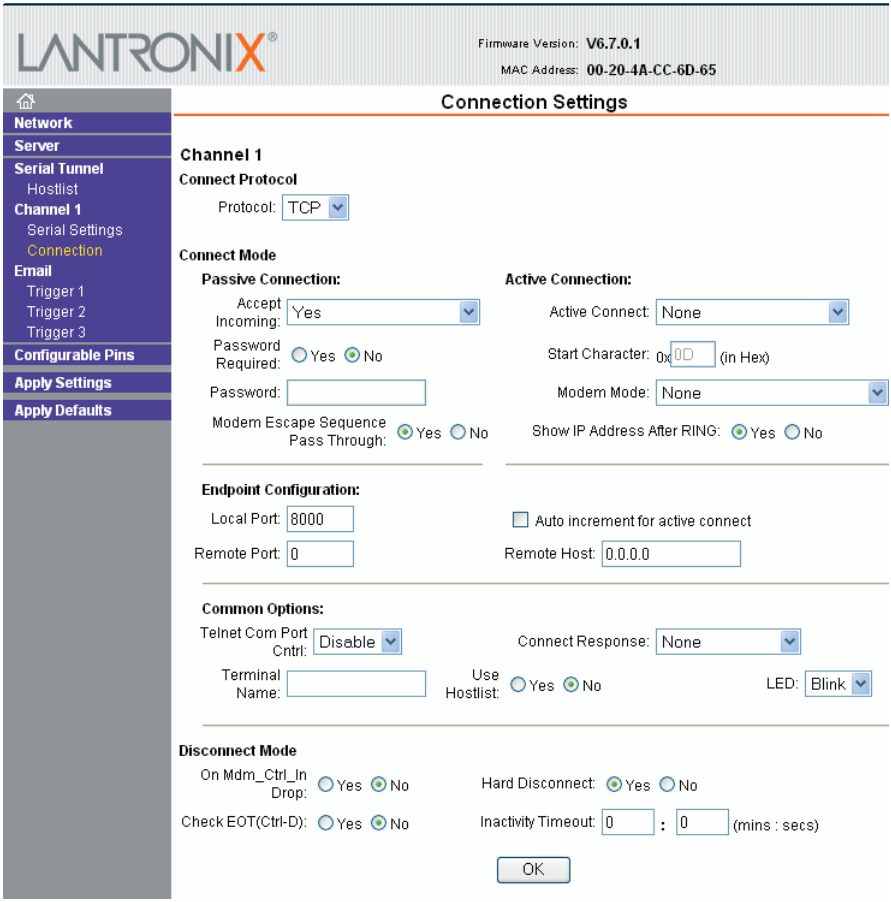
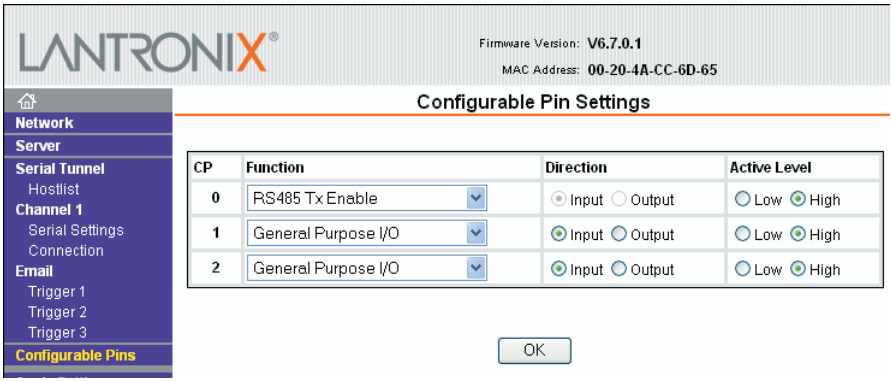
9.6 Settings using web browser:

The settings that can be made using a web browser are documented in the following images:


LANTRONIX
Firmware Version: V6.7.0.1
MAC Address: 00-20-4A-CC-6D-65
Network
Server
Serial Tunnel
Hostlist
Channel 1
Serial Settings
Connection
Email
Trigger 1
Trigger 2
Trigger 3
Configurable Pins
Apply Settings
Apply Defaults
Serial Settings
Channel 1
Disable Serial Port
Port Settings
Protocol: RS485 - 2 wire
Flow Control: None
Baud Rate: 38400
Data Bits: 8
Parity: Even
Stop Bits: 1
Pack Control
Enable Packing
Idle Gap Time: 12 msec
Match 2 Byte Sequence: Yes No
Send Frame Immediate: Yes No
Match Bytes: 0x 00 0x 00 (Hex)
Send Trailing Bytes: None One Two
Flush Mode
Flush Input Buffer
With Active Connect: Yes No
With Passive Connect: Yes No
At Time of Disconnect: Yes No
Flush Output Buffer
With Active Connect: Yes No
With Passive Connect: Yes No
At Time of Disconnect: Yes No
OK


LANTRONIX
Firmware Version: V6.7.0.1
MAC Address: 00-20-4A-CC-6D-65
Network
Server
Serial Tunnel
Hostlist
Channel 1
Serial Settings
Connection
Email
Trigger 1
Trigger 2
Trigger 3
Configurable Pins
Apply Settings
Apply Defaults
Connection Settings
Channel 1
Connect Protocol
Protocol: TCP
Connect Mode
Passive Connection:
Accept Incoming: Yes
Password Required: Yes No
Password:
Modem Escape Sequence Pass Through: Yes No
Active Connection:
Active Connect: None
Start Character: 0x 0D (in Hex)
Modem Mode: None
Show IP Address After RING: Yes No
Endpoint Configuration:
Local Port: 8000
Auto increment for active connect
Remote Port: 0
Remote Host: 0.0.0.0
Common Options:
Telnet Com Port Cntrl: Disable
Connect Response: None
Terminal Name:
Use Hostlist: Yes No
LED: Blink
Disconnect Mode
On Mdm_Ctrl_In Drop: Yes No
Hard Disconnect: Yes No
Check EOT(Ctrl-D): Yes No
Inactivity Timeout: 0 : 0 (mins : secs)
OK


LANTRONIX
Firmware Version: V6.7.0.1
MAC Address: 00-20-4A-CC-6D-65
Network
Server
Serial Tunnel
Hostlist
Channel 1
Serial Settings
Connection
Email
Trigger 1
Trigger 2
Trigger 3
Configurable Pins
Configurable Pin Settings
CP
Function
Direction
Active Level
0
RS485 Tx Enable
Input Output
Low High
1
General Purpose I/O
Input Output
Low High
2
General Purpose I/O
Input Output
Low High
OK

10 Attachment: Profibus DP interface

Note

Availability of data points depends on the device version.

10.1 Description Profibus DP interface

The multimess 4F96 is optionally available with an interface for Profibus DP.
In order to use this, the Profibus address has to be set up accordingly.

To do so, proceed as follows:

10.1.1 Main menu Extra

Firmware information				Menu heading
F1	F2	F3	F4	
→	Setup	Info		Display hot-key area
		Messages about limit violations		
	Device configuration menu			
Scroll through main menu				

Press the F2 and then the F4 button.

10.1.2 Change bus protocol

base para (2)				Menu heading
F1	F2	F3	F4	
↰	Time	Bus	↓	Display hot-key area
			Other basic para (3)	
		Set bus parameters (**Profibus address**)		
	Set time (time, date, daylight saving time)			
Return				

After pressing the F3 button, the following display appears:

<table>
<tr><td colspan="4">Bus parameters</td><td>Menu heading</td></tr>
<tr><td>F1</td><td>F2</td><td>F3</td><td>F4</td><td></td></tr>
<tr><td>↰</td><td></td><td>ProB</td><td></td><td>Display hot-key area</td></tr>
<tr><td rowspan="3"></td><td rowspan="3"></td><td rowspan="2"></td><td></td><td></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="3">Display / entry Profibus address 1 to 126</td></tr>
<tr><td colspan="4">Return</td></tr>
</table>

After pressing the F3 and F4 buttons, you can set the Profibus address.

10.1.3 Data formats

(unsigned) short: 0x1234

Address	+0	+1
Contents	0x12	0x34

(unsigned) long: 0x12345678

Address	+0	+1	+2	+3
Contents	0x12	0x34	0x56	0x78

Rule for byte sequence: MSB before LSB

float:

Format	corresponds to the IEEE 754 standard
Representation	4 bytes
Accuracy	24 bits (➢ represents ➢ 7 decimal points)
Composition	24-bit mantissa; 8-bit exponent
Mantissa	23 bits (M) + 1 bit (S) The MSB of the mantissa is always 1 => it is not saved separately! S = sign of the mantissa: S = 1 ➢ negative number; S = 0 ➢ positive number
Exponent	8 bits (0-255); is saved relatively to 127, i.e. the current value of the exponent is deduced by subtracting the number 127 from the value saved. Curr. Exp. = saved value of exp. – 127 => range of numbers from 128 to -127! Number range which can be represented: 1.18E-38 to 3.40E+38

Example 1: -12.5 decimal = 0xC1480000 hex
M: 24 bit-mantissa
E: Exponent with offset of 127
S: Sign for mantissa (S=1 neg.; S=0 pos.)

Address	+0	+1	+2	+3
Format	SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
Binary	1 1 0 0 0 0 0 1	0 1 0 0 1 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
Hex	C1	48	00	00

The byte sequence is defined as follows:
The byte with the "S sign bit" is transmitted as the first byte over the bus.

The sequence of the float bytes of the bus can be reversed, where required, using the "commands" module (see table 1).

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The following information can be derived from this illustration:

The sign bit is 1 => negative mantissa

The value of the exponent amounts to 10000010 bin or 130 dec.
This yields a value for the exponent of: 130 - 127 = 3

The mantissa contains the following value: 10010000000000000000000

The decimal point can be found at the left end of the mantissa, preceded by a 1.
This position does not appear in the hexadecimal numeric notation. If you add 1 and set the decimal point at the beginning of the mantissa, you will obtain the following value:
1.10010000000000000000000

Now, the mantissa must be adjusted to the exponent. A negative exponent shifts the decimal point to the left, a positive exponent shifts it to the right. Since the exponent is 3, this appears in our illustration as: 1100.10000000000000000000

The number obtained corresponds to the binary floating-point number.

Binary digits to the left of the decimal point yield values > 1. In this example,
1100 bin yields the number 12 dec. {(1x23)+ (1x22)+ (0x21)+ (0x20)}

Binary digits to the right of the decimal point yield values < 1. In this example, .
100..... bin yields the number 0.5 dec. {(1x2-1)+ (0x2-2)+ (0x2-3)+ (0x2-4)}

By adding the individual values, 12.5 is obtained. As the sign bit was set, it is a negative value, -12.5. The hexadecimal number 0xC1480000 therefore corresponds to -12.5.

Example 2: -12.55155 decimal = 0xC148D325 hex

Address	+0	+1	+2	+3
Format	SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
Binary	1 1 0 0 0 0 0 1	0 1 0 0 1 0 0 0	1 1 0 1 0 0 1 1	0 0 1 0 0 1 0 1
Hex	C1	48	D3	25

Example 3: 45.354 decimal = 0x42356A7F hex

Address	+0	+1	+2	+3
Format	SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
Binary	1 1 0 0 0 0 0 1	0 1 0 0 1 0 0 0	1 1 0 1 0 0 1 1	0 0 1 0 0 1 0 1
Hex	C1	48	D3	25

Exponent: 10000100 bin = 132 dec.
➢ Exp.= 132-127=5
Mantissa: S=0
➢ Sign=positive
01101010110101001111111 bin
Decimal point added to the first position of the mantissa
➢ .01101010110101001111111
Leading 1 in front of decimal point
➢ 1. 01101010110101001111111
Taking exponent into account (=5)
➢ 101101. 01011010100111111
to the left of the decimal point:
101101 bin = $2^5+2^3+2^2+2^0$ = 45 dec. to the right of the decimal point:
01011010100111111 bin =
$2^{-2}+2^{-4}+2^{-5}+2^{-7}+2^{-9}+2^{-12}+2^{-13}+2^{-14}+2^{-15}+2^{-16}+2^{-17}+2^{-18}$ = 0.3540001 dec. **Final result: +45.3540001 dec.**

double:

Format	corresponds to the IEEE 754 standard
Representation	8 bytes
Accuracy	52 bits (➢ represents ➢ 15 decimal points)
Composition	52-bit mantissa; 11-bit exponent
Mantissa	52 bits (M) + 1 bit (S) The MSB of the mantissa is always 1 => it is not saved separately! S = sign of the mantissa: S = 1 ➢ negative number; S = 0 ➢ positive number
Exponent	11 bits (0-2047); is saved relatively to 1023, i.e. the current value of the exponent is deduced by subtracting the number 1023 from the value saved. Number range which can be represented: 2.23E-308 to 1.80E+308}

Example:

45.354 decimal = 0x4046AD4FDF3B645A hex
M: 52 bit-mantissa
E: Exponent with offset of 1023
S: Sign for mantissa (S=1 neg.; S=0 pos.)

Address	+0	+1	+2	+3
Format	SEEEEEEE	EEEEMMMM	MMMMMMMM	MMMMMMMM
Binary	0 1 0 0 0 0 0 0	0 1 0 0 0 1 1 0	1 0 1 0 1 1 0 1	0 1 0 0 1 1 1 1
Hex	40	46	AD	4F

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Address	+4	+5	+6	+7
Format	MMMMMMMM	MMMMMMMM	MMMMMMMM	MMMMMMMM
Binary	1 1 0 1 1 1 1 1	0 0 1 1 1 0 1 1	0 1 1 0 0 1 0 0	0 1 0 1 1 0 1 0
Hex	DF	3B	64	5A

Exponent: 10000000100 bin = 1028 dec.
➢ Exp.= 1028-1023=5

Mantissa: S=0
➢ Sign is positive
01101010110101001111110111110011101101100100010110 10 bin
Decimal point added to the first position of the mantissa
➢ . 01101010110101001111110111110011101101100100010110 10
Leading 1 in front of decimal point
➢ 1. 01101010110101001111110111110011101101100100010110 10
Taking exponent into account (=5)
➢ 1 01101.01011010100111111011111001110110110010001011010
to the left of the decimal point: 101101 bin = 25+ 23+ 22+20 = 45 dec.
to the right of the decimal point:
01011010100111111011111001110110110010001011010 bin =
$2^{-2} + 2^{-4} + 2^{-5} + 2^{-7} + 2^{-9} + 2^{-12} + 2^{-13} + 2^{-14} + 2^{-15} + 2^{-16} + 2^{-17} + 2^{-19} + 2^{-20} + 2^{-21} + 2^{-22} + 2^{-23} + 2^{-26} + 2^{-27} + 2^{-28} + 2^{-30} + 2^{-31} + 2^{-33} + 2^{-34} + 2^{-37} + 2^{-41} + 2^{-43} + 2^{-44} + 2^{-46}$ = 0.35400000000000 dec

Final result: +45. 35400000000000 dec.

The byte sequence is defined as follows:
The byte with the "S sign bit" is transmitted as the first byte over the bus.

The sequence of the double bytes of the bus can be reversed, where required, using the "commands" module (see table 1).

Timestamp time_t (is transmitted as unsigned long)
The timestamp describes a point in time. The value is defined as follows:
Seconds since 1/1/1970 0°° hours (with respect to the appropriate time zone)

The values are transmitted over the bus as unsigned long (for byte sequence, see above). All values are to be interpreted as standard time (winter time), i.e. if you want to set the device clock in Germany to 11 o'clock in May, then the setting command via the bus must be done, by definition, with winter time 10 o'clock.

The following applies:
All time stamps which are transmitted via the bus are to be interpreted as standard (winter) time.

The device itself must be parametrized according to country-specific parameters.
Possible settings here:
e.g. Germany ->daylight saving time from end of March to end of October
e.g. China -> daylight saving time not activated

10.1.4 GSD file

The functionality of the device is described by the GSD file. The multimess 4F96 option Profibus DP is a modular device. By lining up the desired modules using the configuration data, the input and output data can be put together any way you like. The offset for the respective values in the input data is derived from the length of the data formats specified in each case.

```
;-------------------------------------------------------------------------;

; GSD Profimess 3 network measuring device for PROFIBUS DP
;

; Fa. KBR GmbH, Am Kiefernschlag 7 , 91126 Schwabach                 ;

; Tel.: 09122/6373-0                                                 ;

; Date: 03/10/2004                                                  ;

;-------------------------------------------------------------------------;

#Profibus_DP
; <Prm-Text-Def-List>
PrmText=1
Text(0)= „do not rotate float/REAL“
Text(1)= „rotate float/REAL“
EndPrmText
; <Ext-User-Prm-Data-Def-List>
ExtUserPrmData=1 „float/REAL byte rotation“
Bit(0) 0 0-1
Prm_Text_Ref=1
EndExtUserPrmData
;

GSD_Revision        = 2

Vendor_Name         = „KBR GmbH, Schwabach“   ; company name
Model_Name          = „PROFIMESS 3“           ; device name
Revision            = „1.0“                   ; device release
Ident_Number        = 0x08C4                  ; Ident number
Protocol_Ident      = 0                       ; PROFIBUS_DP Protokoll
Station_Type        = 0                       ; slave station

Hardware_Release    = „V1.0“                  ;
Software_Release    = „V1.00“                 ;
```

```
9.6_supp              = 1                  ; Baudrate 9.6kB supported
19.2_supp             = 1                  ; Baudrate 19.2kB supported
93.75_supp            = 1                  ; Baudrate 93.75kB supported
187.5_supp            = 1                  ; Baudrate 187.5kB supported
500_supp              = 1                  ; Baudrate 500kB supported
1.5M_supp             = 1                  ; Baudrate 1.5MB supported
3M_supp               = 1                  ; Baudrate 3MB supported
6M_supp               = 1                  ; Baudrate 6MB support
12M_supp              = 1                  ; Baudrate 12 MB supported

MaxTsdr_9.6           = 60
MaxTsdr_19.2          = 60
MaxTsdr_93.75         = 60
MaxTsdr_187.5         = 60
MaxTsdr_500           = 100
MaxTsdr_1.5M          = 150
MaxTsdr_3M            = 250
MaxTsdr_6M            = 450
MaxTsdr_12M           = 800

Freeze_Mode_supp      = 0                  ; no Freeze Mode
Sync_Mode_supp        = 0                  ; no Sync Mode
Auto_Baud_supp        = 1                  ; automatic baudrate
Set_Slave_Add_supp    = 0                  ; no addressing over BUS
Min_Slave_Intervall   = 6                  ; min. slave-poll-cycle
Modular_Station       = 1                  ; modular concept
Redundancy            = 0
Repeater_Ctrl_Sig     = 0
24V_Pins              = 0

Max_Diag_Data_Len     = 30                 ;
Max_Module            = 51                 ; 3 Bytes Output
                                             + 37 4-Byte modules
                                             + 11 8-Byte-Modules
Slave_Family          = 0                  ;
Max_Data_Len          = 247                ;
Max_Input_Len         = 244                ;
Max_Output_Len        = 3                  ;

;
; <Parameter-Definition-List>
;User_Prm_Data_Len     = 4
;User_Prm_Data         = 0x00,0x00,0x00,0x00
```

```
Max_User_Prm_Data_Len = 4
Ext_User_Prm_Data_Ref(3)=1

Module="device status (read and reset)" 0x91,
  0xA0 ; reset status with <> 0 in Outputdata
EndModule
Module="clear-commands"
  0xA0 ; Bit0: reset extreme values (maxima)
       ; Bit1: reset extreme values (minima)
       ; Bit2: reset endless active work counter HT/LT consumption
       ; Bit3: reset endless reactive work counter HT/LT consumption
       ; Bit4: reset endless active work counter HT/LT supply
         (only comfort devices)
       ; Bit5: reset endless reactive work counter HT/LT supply
         (only comfort devices)
       ; Bit6: reset daily work counters
       ; Bit7: reserved
EndModule
Module="switch-commands"
  0x20 ; Bit0: switch to HT (bit must go from 0 to 1)
       ; Bit1: switch to LT (bit must go from 0 to 1)
       ; Bit2: switch to reverse float byte order
         (bit must go from 0 to 1)
       ; Bit3: switch to standard float byte order
         (bit must go from 0 to 1)
       ; Bit4:
       ; Bit5:
       ; Bit6:
       ; Bit7:
EndModule
;       0123456789abcdef0123456789ABCDEF"      Unit  Format      Size
Module="voltage PH-N L1-L3"      0x41,0x8B,  1  ;  V     float      12
EndModule
Module="voltage PH-PH L1-L3"     0x41,0x8B,  2  ;  V     float      12
EndModule
Module="current L1-L3"           0x41,0x8B,  3  ;  A     float      12
EndModule
Module="current average. L1-L3"  0x41,0x8B,  4  ;  A     float      12
EndModule
Module="appearent power L1-L3"   0x41,0x8B,  5  ;  VA    float      12
EndModule
Module="active power L1-L3"      0x41,0x8B,  6  ;  W     float      12
EndModule
Module="reactive power L1-L3"    0x41,0x8B,  7  ;  var   float      12
```

```
EndModule
Module="cos Phi L1-L3"           0x41,0x8B,  8  ;  -     float      12
EndModule
Module="powerfactor L1-L3"       0x41,0x8B,  9  ;  -     float      12
EndModule
Module="THD voltage L1-L3"       0x41,0x8B, 10  ;  %     float      12
EndModule
Module="voltage 3.Harm. L1-L3"   0x41,0x8B, 11  ;  %     float      12
EndModule
Module="voltage 5.Harm. L1-L3"   0x41.0x8B, 12  ;  %     float      12
EndModule
Module="voltage 7.Harm.L1-L3"    0x41,0x8B, 13  ;  %     float      12
EndModule
Module="voltage 9.Harm.L1-L3"    0x41,0x8B, 14  ;  %     float      12
EndModule
Module="voltage 11.Harm.L1-L3"   0x41,0x8B, 15  ;  %    float       12
EndModule
Module="voltage 13.Harm.L1-L3"   0x41,0x8B, 16  ;  %     float      12
EndModule
Module="voltage 15.Harm.L1-L3"   0x41,0x8B, 17  ;  %     float      12
EndModule
Module="voltage 17.Harm.L1-L3"   0x41,0x8B, 18  ;  %     float      12
EndModule
Module="voltage 19.Harm.L1-L3"   0x41,0x8B, 19  ;  %     float      12
EndModule
Module="distortion-currentL1-L3" 0x41,0x8B, 20  ;  A     float      12
EndModule
Module="current 3.Harm. L1-L3"   0x41,0x8B, 21  ;  A     float      12
EndModule
Module="current 5.Harm. L1-L3"   0x41.0x8B, 22  ;  A     float      12
EndModule
Module="current 7.Harm.L1-L3"    0x41,0x8B, 23  ;  A     float      12
EndModule
Module="current 9.Harm.L1-L3"    0x41,0x8B, 24  ;  A     float      12
EndModule
Module="current 11.Harm.L1-L3"   0x41,0x8B, 25  ;  A     float      12
EndModule
Module="current 13.Harm.L1-L3"   0x41,0x8B, 26  ;  A     float      12
EndModule
Module="current 15.Harm.L1-L3"   0x41,0x8B, 27  ;  A     float      12
EndModule
Module="current 17.Harm.L1-L3"   0x41,0x8B, 28  ;  A     float      12
EndModule
Module="current 19.Harm.L1-L3"   0x41,0x8B, 29  ;  A     float      12
```

```
EndModule
Module="max: voltage PH-N L1-L3"      0x41,0x8B, 30  ;  V    float  12
EndModule
Module="max: voltage PH-PH L1-L3"     0x41,0x8B, 31  ;  V    float  12
EndModule
Module="max: current L1-L3"           0x41,0x8B, 32  ;  A    float  12
EndModule
Module="max: current average. L1-L3"  0x41,0x8B, 33  ;  A    float  12
EndModule
Module="max: appearent power L1-L3"   0x41,0x8B, 34  ;  VA   float  12
EndModule
Module="max: active power L1-L3"      0x41,0x8B, 35  ;  W    float  12
EndModule
Module="max: reactive power L1-L3"    0x41,0x8B, 36  ;  var  float  12
EndModule
Module="max: cos Phi L1-L3"           0x41,0x8B, 37  ;  -    float  12
EndModule
Module="max: powerfactor L1-L3"       0x41,0x8B, 38  ;  -    float  12
EndModule
Module="max: THD voltage L1-L3"       0x41,0x8B, 39  ;  %    float  12
EndModule
Module="max: voltage 3.Harm. L1-L3"   0x41,0x8B, 40  ;  %    float  12
EndModule
Module="max: voltage 5.Harm. L1-L3"   0x41.0x8B, 41  ;  %    float  12
EndModule
Module="max: voltage 7.Harm.L1-L3"     0x41,0x8B, 42  ;  %    float  12
EndModule
Module="max: voltage 9.Harm.L1-L3"     0x41,0x8B, 43  ;  %     float  12
EndModule
Module="max: voltage 11.Harm.L1-L3"    0x41,0x8B, 44  ;  %     float  12
EndModule
Module="max: voltage 13.Harm.L1-L3"    0x41,0x8B, 45  ;  %     float  12
EndModule
Module="max: voltage 15.Harm.L1-L3"    0x41,0x8B, 46  ;  %     float  12
EndModule
Module="max: voltage 17.Harm.L1-L3"    0x41,0x8B, 47  ;  %     float  12
EndModule
Module="max: voltage 19.Harm.L1-L3"    0x41,0x8B, 48  ;  %     float  12
EndModule
Module="max: distortion currentL1-L3"  0x41,0x8B, 49  ;  A     float  12
EndModule
Module="max: current 3.Harm. L1-L3"    0x41,0x8B, 50  ;  A     float  12
```

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```
EndModule
Module="max: current 5.Harm. L1-L3"    0x41.0x8B, 51  ;  A     float  12
EndModule
Module="max: current 7.Harm.L1-L3"     0x41,0x8B, 52  ;  A     float  12
EndModule
Module="max: current 9.Harm.L1-L3"     0x41,0x8B, 53  ;  A     float  12
EndModule
Module="max: current 11.Harm.L1-L3"    0x41,0x8B, 54  ;  A     float  12
EndModule
Module="max: current 13.Harm.L1-L3"    0x41,0x8B, 55  ;  A     float  12
EndModule
Module="max: current 15.Harm.L1-L3"    0x41,0x8B, 56  ;  A     float  12
EndModule
Module="max: current 17.Harm.L1-L3"    0x41,0x8B, 57  ;  A     float  12
EndModule
Module="max: current 19.Harm.L1-L3"    0x41,0x8B, 58  ;  A     float  12
EndModule
Module="min: voltage PH-N L1-L3"       0x41,0x8B, 59  ;  V     float  12
EndModule
Module="min: voltage PH-PH L1-L3"      0x41,0x8B, 60  ;  V     float  12
EndModule
Module="min: current L1-L3"            0x41,0x8B, 61  ;  A     float  12
EndModule
Module="min: current average. L1-L3"   0x41,0x8B, 62  ;  A     float  12
EndModule
Module="min: appearent power L1-L3"    0x41,0x8B, 63  ;  VA    float  12
EndModule
Module="min: active power L1-L3"       0x41,0x8B, 64  ;  W     float  12
EndModule
Module="min: reactive power L1-L3"     0x41,0x8B, 65  ;  var   float  12
EndModule
Module="min: cos Phi L1-L3"            0x41,0x8B, 66  ;  -     float  12
EndModule
Module="min: powerfactor L1-L3"        0x41,0x8B, 67  ;  -     float  12
EndModule
Module="max-date: voltage PH-N L1-L3"
                              0x41,0x8B, 68  ;  -     unsigned long 12
EndModule
Module="max-date: voltage PH-PH L1-L3"
                              0x41,0x8B, 69  ;  -     unsigned long 12
EndModule
Module="max-date: current L1-L3"
                              0x41,0x8B, 70  ;  -     unsigned long 12
EndModule
```

```
Module="max-date: current average L1-L3"
                  0x41,0x8B, 71  ;  -                  unsigned long 12
EndModule
Module="max-date: appearent power L1-L3"
                  0x41,0x8B, 72  ;  -                  unsigned long 12
EndModule
Module="max-date: active power L1-L3"
                  0x41,0x8B, 73  ;  -                  unsigned long 12
EndModule
Module="max-date: reactive power L1-L3"
                  0x41,0x8B, 74  ;  -                  unsigned long 12
EndModule
Module="max-date: cos Phi L1-L3"
                  0x41,0x8B, 75  ;  -                  unsigned long 12
EndModule
Module="max-date: powerfactor L1-L3"
                  0x41,0x8B, 76  ;  -                  unsigned long 12
EndModule
Module="max-date: THD voltage L1-L3"
                  0x41,0x8B, 77  ;  -                  unsigned long 12
EndModule
Module="max-date: voltage 3.Harm. L1-L3"
                  0x41,0x8B, 78  ;  -                  unsigned long 12
EndModule
Module="max-date: voltage 5.Harm. L1-L3"
                  0x41.0xx8B, 79  ;  -                   unsigned long
12
EndModule
Module="max-date: voltage 7.Harm.L1-L3"
                  0x41,0x8B, 80  ;  -                  unsigned long 12
EndModule
Module="max-date: voltage 9.Harm.L1-L3"
                  0x41,0x8B, 81  ;  -                  unsigned long 12
EndModule
Module="max-date: voltage 11.Harm.L1-L3"
                  0x41,0x8B, 82  ;  -                  unsigned long 12
EndModule
Module="max-date: voltage 13.Harm.L1-L3"
                  0x41,0x8B, 83  ;  -                  unsigned long 12
EndModule
Module="max-date: voltage 15.Harm.L1-L3"
                  0x41,0x8B, 84  ;                     unsigned long 12
EndModule
Module="max-date: voltage 17.Harm.L1-L3"
```

```
                0x41,0x8B, 85  ;  -                 unsigned long 12
EndModule
Module="max-date: voltage 19.Harm.L1-L3"
                0x41,0x8B, 86  ;  -                 unsigned long 12
EndModule
Module="max-date: dist. currentL1-L3"
                0x41,0x8B, 87  ;  -                 unsigned long 12
EndModule
Module="max-date: current 3.Harm. L1-L3"
                0x41,0x8B, 88  ;  -                 unsigned long 12
EndModule
Module="max-date: current 5.Harm. L1-L3"
                0x41.0xx8B, 89  ;  -                 unsigned long
12
EndModule
Module="max-date: current 7.Harm.L1-L3"
                0x41,0x8B, 90  ;  -                 unsigned long 12
EndModule
Module="max-date: current 9.Harm.L1-L3"
                0x41,0x8B, 91  ;  -                 unsigned long 12
EndModule
Module="max-date: current 11.Harm.L1-L3"
                0x41,0x8B, 92  ;  -                 unsigned long 12
EndModule
Module="max-date: current 13.Harm.L1-L3"
                0x41,0x8B, 93  ;  -                 unsigned long 12
EndModule
Module="max-date: current 15.Harm.L1-L3"
                0x41,0x8B, 94  ;  -                 unsigned long 12
EndModule
Module="max-date: current 17.Harm.L1-L3"
                0x41,0x8B, 95  ;  -                 unsigned long 12
EndModule
Module="max-date: current 19.Harm.L1-L3"
                0x41,0x8B, 96  ;  -                 unsigned long 12
EndModule
Module="min-date: voltage PH-N L1-L3"
                0x41,0x8B, 97  ;  -                 unsigned long 12
EndModule
Module="min-date: voltage PH-PH L1-L3"
                0x41,0x8B, 98  ;  -                 unsigned long 12
EndModule
Module="min-date: current L1-L3"
```

```
                  0x41,0x8B, 99  ;  -                  unsigned long 12
EndModule
Module="min-date: current avg L1-L3"
                                  0x41,0x8B,100 ; - unsigned long  12
EndModule
Module="min-date: appearent power L1-L3"
                                  0x41,0x8B,101 ; - unsigned long  12
EndModule
Module="min-date: active power L1-L3"
                                  0x41,0x8B,102 ; - unsigned long  12
EndModule
Module="min-date: reactive power L1-L3"
                                  0x41,0x8B,103 ; - unsigned long  12
EndModule
Module="min-date: cos Phi L1-L3"    0x41,0x8B,104 ; - unsigned long  12
EndModule
Module="min-date: powerfactor L1-L3"
                                  0x41,0x8B,105 ; - unsigned long  12
EndModule
Module="frequency"                      0x41,0x83,106  ;  Hz   float  4
EndModule
Module="zero conductor current"         0x41,0x83,107  ;  A    float  4
EndModule
Module="average zero conductor current" 0x41,0x83,108  ;  A    float  4
EndModule
Module="total active power"             0x41,0x83,109  ;  W    float  4
EndModule
Module="total reactive power"           0x41,0x83,110  ;  var  float  4
EndModule
Module="total appearent power"          0x41,0x83,111  ;  VA   float  4
EndModule
Module="powerfactor"                    0x41,0x83,112  ;  -    float  4
EndModule
Module="error status"                0x41,0x83,113 ; - unsigned long  4
EndModule
Module="time"                        0x41,0x83,114 ; - unsigned long  4
EndModule
Module="max: frequency"                 0x41,0x83,115  ;  Hz   float  4
EndModule
Module="max: zero conductor current"    0x41,0x83,116  ;  A    float  4
EndModule
Module="max: avg zero conductor current" 0x41,0x83,117  ;  A    float  4
EndModule
Module="max: total active power"        0x41,0x83,118  ;  W    float  4
```

```
EndModule
Module="max: total reactive power"       0x41,0x83,119  ;  var  float  4
EndModule
Module="max: total appearent power"      0x41,0x83,120  ;  VA   float  4
EndModule
Module="max: powerfactor"                0x41,0x83,121  ;  -    float  4
EndModule
Module="min: frequency"                  0x41,0x83,122  ;  Hz   float  4
EndModule
Module="min: zero conductor current"     0x41,0x83,123  ;  A    float 4
EndModule
Module="min: avg zero conductor current" 0x41,0x83,124  ;  A    float  4
EndModule
Module="min: total active power"         0x41,0x83,125  ;  W    float  4
EndModule
Module="min: total reactive power"       0x41,0x83,126  ;  var  float  4
EndModule
Module="min: total appearent power"      0x41,0x83,127  ;  VA   float  4
EndModule
Module="min: powerfactor"                0x41,0x83,128  ;  -    float  4
EndModule
Module="max-date: frequency"
                                  0x41,0x83,129  ;  -    unsigned long  4
EndModule
Module="max-date: zero cond. current"
                                0x41,0x83,130  ;  -     unsigned long  4
EndModule
Module="max-date: avg zero cond.current"
                                0x41,0x83,131  ;  -     unsigned long  4
EndModule
Module="max-date: total active power"
                                0x41,0x83,132  ;  -     unsigned long  4
EndModule
Module="max-date: total reactive power"
                                0x41,0x83,133  ;  -     unsigned long  4
EndModule
Module="max-date: total appearent power"
                                0x41,0x83,134  ;  -     unsigned long  4
EndModule
Module="max-date: powerfactor"
                                0x41,0x83,135  ;  -     unsigned long  4
EndModule
Module="min-date: frequency"
```

```
                              0x41,0x83,136  ;  -     unsigned long  4
EndModule
Module="min-date: zero cond. current"
                              0x41,0x83,137  ;  -     unsigned long  4
EndModule
Module="min-date: avg zero cond.current"
                              0x41,0x83,138  ;  -     unsigned long  4
EndModule
Module="min-date: total active power"
                              0x41,0x83,139  ;  -     unsigned long  4
EndModule
Module="min-date: total reactive power"
                              0x41,0x83,140  ;  -     unsigned long  4
EndModule
Module="min-date: total appearent power"
                              0x41,0x83,141  ;  -     unsigned long  4
EndModule
Module="min-date: powerfactor"
                              0x41,0x83,142  ;  -     unsigned long  4
EndModule
Module="tariff index"
                              0x41,0x83,143  ;  -     unsigned long  4
EndModule
Module="act. work HT/LT consumption"
                               0x41,0x87,144  ;  Wh    float          8
EndModule
Module="react. work HT/LT cons."
                               0x41,0x87,145  ;  varh  float          8
EndModule
Module="today: act.Work HT/LT cons."
                               0x41,0x87,146  ;  Wh    float          8
EndModule
Module="today: react.Work HT/LT cons."
                               0x41,0x87,147  ;  varh  float          8
EndModule
Module="y'day: act.Work HT/LT cons."
                               0x41,0x87,148  ;  Wh    float          8
EndModule
Module="y'day: react.Work HT/LT cons."
```

```
                                0x41,0x87,149  ;  varh  float          8
EndModule
Module="t'month:act.work HT/LT cons."
                                0x41,0x87,150  ;  Wh    float          8
EndModule
Module="t'month:react.work HT/LT cons."
                                0x41,0x87,151  ;  varh  float          8
EndModule
Module="last month:act.work HT/LT cons."
                                0x41,0x87,152  ;  Wh    float          8
EndModule
Module="last month:react.work HT/LT con."
                                0x41,0x87,153  ;  varh  float          8
EndModule
Module="act. work HT/LT recovery"
                                0x41,0x87,154  ;  Wh    float          8
EndModule
Module="react. work HT/LT recovery"
                                0x41,0x87,155  ;  varh  float          8
EndModule
Module="today: act.Work HT/LT recovery"
                                0x41,0x87,156  ;  Wh    float          8
EndModule
Module="today: react.Work HT/LT recovery"
                                0x41,0x87,157  ;  varh  float          8
EndModule
Module="y'day: act.Work HT/LT recovery"
                                0x41,0x87,158  ;  Wh    float          8
EndModule
Module="y'day: react.Work HT/LT recovery"
                                0x41,0x87,159  ;  varh  float          8
EndModule
Module="t'month:act.work HT/LT recovery"
                                0x41,0x87,160  ;  Wh    float          8
EndModule
Module="t'month:react.work HT/LT recov."
                                0x41,0x87,161  ;  varh  float          8
EndModule
Module="last month:act.work HT/LT recov."
                                0x41,0x87,162  ;  Wh    float          8
EndModule
Module="last month:react.work HT/LT rec."
                                0x41,0x87,163  ;  varh  float          8
EndModule
```

```
Module="status of relay 1 & 2"
                              0x41,0x87,164  ;  -     unsigned long  8
EndModule
Module="status of inputs 1 & 2(bitcoded)"
                              0x41,0x83,169  ;  -     unsigned long  4
EndModule
Module="act.period value P consumption"
                               0x41,0x83,170  ;  W    float          4
EndModule
Module="act.period value Q consumption"
                               0x41,0x83,171  ;  var  float          4
EndModule
Module="act.period value P recovery"
                               0x41,0x83,172  ;  W    loat           4
EndModule
Module="act.period value Q recovery"
                               0x41,0x83,173  ;  var  float          4
EndModule
Module="act.period closing timestamp"
                               0x41,0x83,174  ;       unsigned long  4
EndModule
Module="mom.period value P consumption"
                               0x41,0x83,175  ;  W    float          4
EndModule
Module="mom.period value Q consumption"
                               0x41,0x83,176  ;  var  float          4
EndModule
Module="mom.period value P recovery"
                               0x41,0x83,177  ;  W    float          4
EndModule
Module="mom.period value Q recovery"
                               0x41,0x83,178  ;  var  float          4
EndModule
Module="remaining time to close period"
                               0x41,0x83,179  ;  s    unsigned long  4
EndModule
Module="period time"           0x41,0x83,180  ;  min  unsigned long  4
EndModule
Module="phase-angle U L12"     0x41,0x83,181  ;  degree float        4
EndModule
Module="phase-angle U L23"     0x41,0x83,182  ;  degree float        4
EndModule
Module="phase-angle U L31"     0x41,0x83,183  ;  degree float        4
EndModule
```

```
Module="voltage asymmetric"     0x41,0x83,184  ;  %     float          4
EndModule

; modules for double-precision work-counter readouts
Module="act. work HT/LT cons. precision"
                              0x41,0x8F,165  ;  Wh    double         16
EndModule
Module="react. work HT/LT cons. precis."
                              0x41,0x8F,166  ;  varh  double         16
EndModule
Module="act. work HT/LT rec. precision"
                              0x41,0x8F,167  ;  Wh    double         16
EndModule
Module="react. work HT/LT rec. precis."
                              0x41,0x8F,168  ;  varh  double         16
EndModule

; modules for checking violated limit-values
Module= „limit Violations Bytes 0..3"                  0x41, 0x83, 200
EndModule
Module= „limit Violations Bytes 4..7"                  0x41, 0x83, 201
EndModule
Module= „limit Violations Bytes 8..11"                 0x41, 0x83, 202
EndModule
Module= „limit Violations Bytes 12..15"                0x41, 0x83, 203
EndModule
Module= „limit Violations Bytes 16..19"                0x41, 0x83, 204
EndModule
```

10.1.5 Output data

3 modules exist with output data which can be used if required.
The status flags of the device can be read and deleted, various measuring values such as extreme values or counter states can be reset and certain switching operations can be performed.

Module name	Configuration	Description
device status (read and reset)	0x91,0xA0	Output data byte <> 0: Deleting status bytes Input data 2 status bytes (see tables 3 and 4)
clear-commands	0xA0	Output data byte: Bit0: Reset of extreme values (only maxima) Bit1: Reset of extreme values (only minima) Bit2: Reset endless active energy counter HT/NT consumption Bit3: Reset endless reactive energy counter HT/NT consumption Bit4: Reset endless active energy counter HT/NT recovery (only for Comfort devices) Bit5: Reset endless reactive energy counter HT/NT recovery (only for Comfort devices)
		Bit 6 and 7: reserved
switch-commands	0x20	Bit0: to high tariff (bit must move from 0 to 1) Bit1: to low tariff (bit must move from 0 to 1) Bit2: Switch byte sequence of floating comma numbers to "reverse" (bit must move from 0 to 1) Bit3: Switch byte sequence of floating comma numbers to "standard" (bit must move from 0 to 1) Bit 4, 5, 6 and 7: reserved

Table 2

The following tables describe the meaning of the error flags.

Error status high byte

Bit	Explanation
0	Power supply failure has occurred
1	A limit has been violated
2	Reserved
3	External synchronous pulse is missing
4	Reset has been performed
5	Reserved
6	Reserved
7	Reserved

Table 3

If the device is operated with an external synchronous pulse, BIT3 is set if the external synchronous pulse was not available when a period value was saved.
In general, all global error BITS set are reset by the master.

Error status low byte

Bit	Explanation
0	Rotating field error
1	Phase angle variation
2	I-Dir (k and l of the current transformer were mixed up)
3	Set pulse length for the pulse output is not possible
4	Battery voltage critical
5	Parameter error (default value replaces incorrect value)
6	At least one input is overloaded
7	Reserved

Table 4

10.2 Input data

The desired input data for the Profibus slave can be defined through any combination of the modules listed below.

					Unit	Format
Module name	voltage PH-N L1-L3				V	float
Config.	0x41.0x8B, 1					
Description	Voltage PH-N	**L1**	**L2**	**L3**		
Module name	voltage PH-PH L1-L3				V	float
Config.	0x41.0x8B, 2					
Description	Voltage PH-N	**L1**	**L2**	**L3**		
Module name	current L1-L3				V	float
Config.	0x41.0x8B, 3					
Description	Current	**L1**	**L2**	**L3**		
Module name	current average. L1-L3				A	float
Config.	0x41.0x8B, 4					
Description	Current average value	**L1**	**L2**	**L3**		
Module name	apparent power L1-L3				VA	float
Config.	0x41.0x8B, 5					
Description	Apparent power	**L1**	**L2**	**L3**		
Module name	active power L1-L3				W	float
Config.	0x41.0x8B, 6					
Description	Active power	**L1**	**L2**	**L3**		
Module name	reactive power L1-L3				var	float
Config.	0x41.0x8B, 7					
Description	Reactive power	**L1**	**L2**	**L3**		
Module name	cos Phi L1-L3					float
Config.	0x41.0x8B, 8					
Description	cos Phi	**L1**	**L2**	**L3**		
Module name	powerfactor L1-L3					float
Config.	0x41.0x8B, 9					
Description	Power factor	**L1**	**L2**	**L3**		
Module name	THD voltage L1-L3				%	float
Config.	0x41.0x8B, 10					
Description	Voltage distortion factor	**L1**	**L2**	**L3**		
Module name	voltage 3.Harm. L1-L3				%	float
Config.	0x41.0x8B, 11					
Description	Voltage 3rd harmonic	**L1**	**L2**	**L3**		

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					Unit	Format
Module name	voltage 5.Harm. L1-L3				%	float
Config.	0x41.0x8B, 12					
Description	Voltage 5th harmonic	**L1**	**L2**	**L3**		
Module name	voltage 7.Harm.L1-L3				%	float
Config.	0x41.0x8B, 13					
Description	Voltage 7th harmonic	**L1**	**L2**	**L3**		
Module name	voltage 9.Harm.L1-L3				%	float
Config.	0x41.0x8B, 14					
Description	Voltage 9th harmonic	**L1**	**L2**	**L3**		
Module name	voltage 11.Harm.L1-L3				%	float
Config.	0x41.0x8B, 15					
Description	Voltage 11th harmonic	**L1**	**L2**	**L3**		
Module name	voltage 13.Harm.L1-L3				%	float
Config.	0x41.0x8B, 16					
Description	Voltage 13th harmonic	**L1**	**L2**	**L3**		
Module name	voltage 15.Harm.L1-L3				%	float
Config.	0x41.0x8B, 17					
Description	Voltage 15th harmonic	**L1**	**L2**	**L3**		
Module name	voltage 17.Harm.L1-L3				%	float
Config.	0x41.0x8B, 18					
Description	Voltage 17th harmonic	**L1**	**L2**	**L3**		
Module name	voltage 19.Harm.L1-L3				%	float
Config.	0x41.0x8B, 19					
Description	Voltage 19th harmonic	**L1**	**L2**	**L3**		
Module name	distortion-currentL1-L3				A	
Config.	0x41.0x8B, 20					
Description	Total harmonic currents	**L1**	**L2**	**L3**		
Module name	current 3.Harm. L1-L3				A	float
Config.	0x41.0x8B, 21					
Description	Current 3rd harmonic	**L1**	**L2**	**L3**		
Module name	current 5.Harm. L1-L3				A	float
Config.	0x41.0x8B, 22					
Description	Current 5rd harmonic	**L1**	**L2**	**L3**		
Module name	current 7.Harm.L1-L3				A	float
Config.	0x41.0x8B, 23					
Description	Current 7th harmonic	**L1**	**L2**	**L3**		

					Unit	Format
Module name	current 9.Harm.L1-L3				A	float
Config.	0x41.0x8B, 24					
Description	Current 9th harmonic	**L1**	**L2**	**L3**		
Module name	current 11.Harm.L1-L3				A	float
Config.	0x41.0x8B, 25					
Description	Current 11th harmonic	**L1**	**L2**	**L3**		
Module name	current 13.Harm.L1-L3				A	float
Config.	0x41.0x8B, 26					
Description	Current 13th harmonic	**L1**	**L2**	**L3**		
Module name	current 15.Harm.L1-L3				A	float
Config.	0x41.0x8B, 27					
Description	Current 15th harmonic	**L1**	**L2**	**L3**		
Module name	current 17.Harm.L1-L3				A	float
Config.	0x41.0x8B, 28					
Description	Current 17th harmonic	**L1**	**L2**	**L3**		
Module name	current 19.Harm.L1-L3				A	float
Config.	0x41.0x8B, 29					
Description	Current 19th harmonic	**L1**	**L2**	**L3**		
Module name	max: voltage PH-N L1-L3				V	float
Config.	0x41.0x8B, 30					
Description	Maximum: Voltage PH-N	**L1**	**L2**	**L3**		
Module name	max: voltage PH-PH L1-L3				V	float
Config.	0x41.0x8B, 31					
Description	Maximum: Voltage PH-PH	**L1**	**L2**	**L3**		
Module name	max: current L1-L3				A	
Config.	0x41.0x8B, 32					
Description	Maximum: Current	**L1**	**L2**	**L3**		
Module name	max: current average. L1-L3				A	float
Config.	0x41.0x8B, 33					
Description	Maximum: Current average value	**L1**	**L2**	**L3**		
Module name	max: apparent power L1-L3				VA	float
Config.	0x41.0x8B, 34					
Description	Maximum: Apparent power	**L1**	**L2**	**L3**		
Module name	max: active power L1-L3				W	float
Config.	0x41.0x8B, 35					
Description	Maximum: Active power	**L1**	**L2**	**L3**		

					Unit	Format
Module name	max: reactive power L1-L3				var	float
Config.	0x41.0x8B, 36					
Description	Maximum: Reactive power	**L1**	**L2**	**L3**		
Module name	Max: cos Phi L1-L					float
Config.	0x41.0x8B, 37					
Description	Maximum: cos Phi	**L1**	**L2**	**L3**		
Module name	Max: powerfactor L1-L3					float
Config.	0x41.0x8B, 38					
Description	Maximum: Power factor	**L1**	**L2**	**L3**		
Module name	max: THD voltage L1-L3				%	float
Config.	0x41.0x8B, 39					
Description	Maximum: Voltage distortion factor	**L1**	**L2**	**L3**		
Module name	max: voltage 3.Harm. L1-L3				%	float
Config.	0x41.0x8B, 40					
Description	Max.: Voltage 3rd harmonic	**L1**	**L2**	**L3**		
Module name	max: voltage 5.Harm.L1-L3				%	float
Config.	0x41,0x8B, 41					
Description	Max.: Voltage 5rd harmonic	**L1**	**L2**	**L3**		
Module name	max: voltage 7.Harm.L1-L3				%	float
Config.	0x41,0x8B, 42					
Description	Max.: Voltage 7rd harmonic	**L1**	**L2**	**L3**		
Module name	max: voltage 9.Harm.L1-L3				%	float
Config.	0x41,0x8B, 43					
Description	Max.: Voltage 9rd harmonic	**L1**	**L2**	**L3**		
Module name	max: voltage 11.Harm.L1-L3				%	float
Config.	0x41,0x8B, 44					
Description	Max.: Voltage 11th harmonic	**L1**	**L2**	**L3**		
Module name	max: voltage 13.Harm.L1-L3				%	float
Config.	0x41,0x8B, 45					
Description	Max.: Voltage 13th harmonic	**L1**	**L2**	**L3**		
Module name	max: voltage 15.Harm.L1-L3				%	float
Config.	0x41,0x8B, 46					
Description	Max.: Voltage 15th harmonic	**L1**	**L2**	**L3**		
Module name	max: voltage 17.Harm.L1-L3				%	float
Config.	0x41,0x8B, 47					
Description	Max.: Voltage 17th harmonic	**L1**	**L2**	**L3**		

					Unit	Format
Module name	max: voltage 19.Harm.L1-L3				%	float
Config.	0x41.0x8B, 48					
Description	Maximum: Voltage 19th harmonic	**L1**	**L2**	**L3**		
Module name	max: distortion currentL1-L3				A	float
Config.	0x41.0x8B, 49					
Description	Maximum: Total harmonic currents	**L1**	**L2**	**L3**		
Module name	max: current 3.Harm. L1-L3				A	float
Config.	0x41.0x8B, 50					
Description	Maximum: Current 3rd harmonic	**L1**	**L2**	**L3**		
Module name	max: current 5.Harm. L1-L3				A	float
Config.	0x41.0x8B, 51					
Description	Maximum: Current 5th harmonic	**L1**	**L2**	**L3**		
Module name	max: current 7.Harm.L1-L3				A	float
Config.	0x41.0x8B, 52					
Description	Maximum: Current 7th harmonic	**L1**	**L2**	**L3**		
Module name	max: current 9.Harm.L1-L3				A	float
Config.	0x41.0x8B, 53					
Description	Maximum: Current 9th harmonic	**L1**	**L2**	**L3**		
Module name	max: current 11.Harm.L1-L3				A	float
Config.	0x41.0x8B, 54					
Description	Maximum: Current 11th harmonic	**L1**	**L2**	**L3**		
Module name	max: current 13.Harm.L1-L3				A	float
Config.	0x41.0x8B, 55					
Description	Maximum: Current 13th harmonic	**L1**	**L2**	**L3**		
Module name	max: current 15.Harm.L1-L3				A	float
Config.	0x41.0x8B, 56					
Description	Maximum: Current 15th harmonic	**L1**	**L2**	**L3**		
Module name	max: current 17.Harm.L1-L3				A	float
Config.	0x41.0x8B, 57					
Description	Maximum: Current 17th harmonic	**L1**	**L2**	**L3**		
Module name	max: current 19.Harm.L1-L3				A	float
Config.	0x41.0x8B, 58					
Description	Maximum: Current 19th harmonic	**L1**	**L2**	**L3**		
Module name	min: voltage PH-N L1-L3				V	float
Config.	0x41.0x8B, 59					
Description	Minimum: Voltage PH-N	**L1**	**L2**	**L3**		

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					Unit	Format
Module name	min: voltage PH-PH L1-L3				V	float
Config.	0x41.0x8B, 60					
Description	Minimum: Voltage PH-PH	**L1**	**L2**	**L3**		
Module name	min: current L1-L3				A	float
Config.	0x41.0x8B, 61					
Description	Minimum: Current	**L1**	**L2**	**L3**		
Module name	min: current average. L1-L3				A	float
Config.	0x41.0x8B, 62					
Description	Minimum: Current average value	**L1**	**L2**	**L3**		
Module name	min: appearent power L1-L3				VA	float
Config.	0x41.0x8B, 63					
Description	Minimum: Apparent power	**L1**	**L2**	**L3**		
Module name	min: active power L1-L3				W	float
Config.	0x41.0x8B, 64					
Description	Minimum: Active power	**L1**	**L2**	**L3**		
Module name	min: reactive power L1-L3				var	float
Config.	0x41.0x8B, 65					
Description	Minimum: Reactive power	**L1**	**L2**	**L3**		
Module name	min: cos Phi L1-L3					float
Config.	0x41.0x8B, 66					
Description	Minimum: cos Phi	**L1**	**L2**	**L3**		
Module name	min: powerfactor L1-L3					float
Config.	0x41.0x8B, 67					
Description	Minimum: Power factor	**L1**	**L2**	**L3**		
Module name	max-date: voltage PH-N L1-L3					unsigned long
Config.	0x41.0x8B, 68					
Description	Maximum date: Voltage PH-N	**L1**	**L2**	**L3**		
Module name	max-date: voltage PH-PH L1-L3					unsigned long
Config.	0x41.0x8B, 69					
Description	Maximum date: Voltage PH-PH	**L1**	**L2**	**L3**		
Module name	max-date: current L1-L3					unsigned long
Config.	0x41.0x8B, 70					
Description	Maximum date: Current	**L1**	**L2**	**L3**		
Module name	max-date: current average L1-L3					unsigned long
Config.	0x41.0x8B, 71					
Description	Maximum date: Current average value	**L1**	**L2**	**L3**		

					Unit	Format
Module name	max-date: apparent power L1-L3					unsigned long
Config.	0x41.0x8B, 72					
Description	Maximum date: Apparent power	**L1**	**L2**	**L3**		
Module name	max-date: active power L1-L3					unsigned long
Config.	0x41.0x8B, 73					
Description	Maximum date: Active power	**L1**	**L2**	**L3**		
Module name	max-date: reactive power L1-L3					unsigned long
Config.	0x41.0x8B, 74					
Description	Maximum date: Reactive power	**L1**	**L2**	**L3**		
Module name	max-date: cos Phi L1-L					unsigned long
Config.	0x41.0x8B, 75					
Description	Maximum date: cos Phi	**L1**	**L2**	**L3**		
Module name	max-date: powerfactor L1-L3					unsigned long
Config.	0x41.0x8B, 76					
Description	Maximum date: Power factor	**L1**	**L2**	**L3**		
Module name	max-date: THD voltage L1-L3					unsigned long
Config.	0x41.0x8B, 77					
Description	Maximum date: Voltage distortion factor	**L1**	**L2**	**L3**		
Module name	max-date: voltage 3.Harm. L1-L3					unsigned long
Config.	0x41.0x8B, 78					
Description	Maximum date: Voltage 3rd harmonic	**L1**	**L2**	**L3**		
Module name	max-date: voltage 5.Harm. L1-L3					unsigned long
Config.	0x41.0x8B, 79					
Description	Maximum date: Voltage 5th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: voltage 7.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 80					
Description	Maximum date: Voltage 7th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: voltage 9.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 81					
Description	Maximum date: Voltage 9th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: voltage 11.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 82					
Description	Maximum date: Voltage 11th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: voltage 13.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 83					
Description	Maximum date: Voltage 13th harmonic	**L1**	**L2**	**L3**		

					Unit	Format
Module name	max-date: voltage 15.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 84					
Description	Maximum date: Voltage 15th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: voltage 17.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 85					
Description	Maximum date: Voltage 17th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: voltage 19.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 86					
Description	Maximum date: Voltage 19th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: dist. currentL1- L3					unsigned long
Config.	0x41.0x8B, 87					
Description	Max-date: Total harmonic currents	**L1**	**L2**	**L3**		
Module name	max-date: current 3.Harm. L1-L3					unsigned long
Config.	0x41.0x8B, 88					
Description	Maximum date: Current 3rd harmonic	**L1**	**L2**	**L3**		
Module name	max-date: current 5.Harm. L1-L3					unsigned long
Config.	0x41.0x8B, 89					
Description	Maximum date: Current 5th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: current 7.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 90					
Description	Maximum date: Current 7th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: current 9.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 91					
Description	Maximum date: Current 9th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: current 11.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 92					
Description	Maximum date: Current 11th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: current 13.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 93					
Description	Maximum date: Current 13th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: current 15.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 94					
Description	Maximum date: Current 15th harmonic	**L1**	**L2**	**L3**		
Module name	max-date: current 17.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 95					
Description	Maximum date: Current 17th harmonic	**L1**	**L2**	**L3**		

					Unit	Format
Module name	max-date: current 19.Harm.L1-L3					unsigned long
Config.	0x41.0x8B, 96					
Description	Maximum date: Current 19th harmonic	**L1**	**L2**	**L3**		
Module name	min-date: voltage PH-N L1-L3					unsigned long
Config.	0x41.0x8B, 97					
Description	Minimum date: Voltage PH-N	**L1**	**L2**	**L3**		
Module name	min-date: voltage PH-PH L1-L3					unsigned long
Config.	0x41.0x8B, 98					
Description	Minimum date: voltage PH-PH L1	**L1**	**L2**	**L3**		
Module name	min-date: current L1-L3					unsigned long
Config.	0x41.0x8B, 99					
Description	Minimum date: Current	**L1**	**L2**	**L3**		
Module name	min-date: current avg L1-L3					unsigned long
Config.	0x41.0x8B, 100					
Description	Minimum date: Current average value	**L1**	**L2**	**L3**		
Module name	min-date: apparent power L1-L3					unsigned long
Config.	0x41.0x8B, 101					
Description	Minimum date: Apparent power	**L1**	**L2**	**L3**		
Module name	min-date: active power L1-L3					unsigned long
Config.	0x41.0x8B, 102					
Description	Minimum date: Active power	**L1**	**L2**	**L3**		
Module name	min-date: reactive power L1-L3					unsigned long
Config.	0x41.0x8B, 103					
Description	Minimum date: Reactive power	**L1**	**L2**	**L3**		
Module name	min-date: cos Phi L1-L3					unsigned long
Config.	0x41.0x8B, 104					
Description	Minimum date: cos Phi	**L1**	**L2**	**L3**		
Module name	min-date: powerfactor L1-L3					unsigned long
Config.	0x41.0x8B, 105					
Description	Minimum date: Power factor	**L1**	**L2**	**L3**		

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Module name	Config.	Description	Unit	Format
frequency	0x41.0x83, 106	Network frequency	Hz	float
zero conductor current	0x41.0x83, 107	Neutral conductor current	A	float
average zero conductor current	0x41.0x83, 108	Average value neutral conductor current	A	float
total active power	0x41.0x83, 109	Total active power	W	float
total reactive power	0x41.0x83, 110	Total reactive power	var	float
total apparent power	0x41.0x83, 111	Total apparent power	VA	float
powerfactor	0x41.0x83, 112	Power factor		float
error status	0x41.0x83, 113	Error state		unsigned long
time	0x41.0x83, 114	Time		unsigned long
max: frequency	0x41.0x83, 115	Maximum: Network frequency	Hz	float
max: zero conductor current	0x41.0x83, 116	Maximum: Neutral conductor current	A	float
max: avg zero conductor current	0x41.0x83, 117	Maximum: Average value neutral conductor current	A	float
max: total active power	0x41.0x83, 118	Maximum: Total active power	W	float
max: total reactive power	0x41.0x83, 119	Maximum: Total reactive power	var	float
max: total apparent power	0x41.0x83, 120	Maximum: Total apparent power	VA	float
max: powerfactor	0x41.0x83, 121	Maximum: Power factor		float
min: frequency	0x41.0x83, 122	Minimum: Network frequency	Hz	float
min: zero conductor current	0x41.0x83, 123	Minimum: Neutral conductor current	A	float
min: avg zero conductor current	0x41.0x83, 124	Minimum: Average value neutral conductor current	A	float
min: total active power	0x41.0x83, 125	Minimum: Total active power	W	float
min: total reactive power	0x41.0x83, 126	Minimum: Total reactive power	var	float
min: total apparent power	0x41.0x83, 127	Minimum: Total apparent power	VA	float

Module name	Config.	Description	Unit	Format
min: powerfactor	0x41.0x83, 128	Minimum: Power factor		float
max-date: frequency	0x41.0x83, 129	Maximum date: Network frequency		unsigned long
max-date: zero cond. current	0x41.0x83, 130	Maximum date: Neutral conductor current		unsigned long
max-date: avg zero cond.current	0x41.0x83, 131	Maximum date: Average value neutral conductor current		unsigned long
max-date: total active power	0x41.0x83, 132	Maximum date: Total active power		unsigned long
max-date: total reactive power	0x41.0x83, 133	Maximum date: Total reactive power		unsigned long
max-date: total apparent power	0x41.0x83, 134	Maximum date: Total apparent power		unsigned long
max-date: power-factor	0x41.0x83, 135	Maximum date: Power factor		unsigned long
min-date: frequency	0x41.0x83, 136	Minimum date: Network frequency		unsigned long
min-date: zero cond. current	0x41.0x83, 137	Minimum date: Neutral conductor current		unsigned long
min-date: avg zero cond.current	0x41.0x83, 138	Minimum date: Average value neutral conductor current		unsigned long
min-date: total active power	0x41.0x83, 139	Minimum date: Total active power		unsigned long
min-date: total reactive power	0x41.0x83, 140	Minimum date: Total reactive power		unsigned long
min-date: total apparent power	0x41.0x83, 141	Minimum date: Total apparent power		unsigned long
min-date: powerfactor	0x41.0x83, 142	Minimum date: Power factor		unsigned long
tariff index	0x41.0x83, 143	Tariff index		unsigned long
act. work HT/LT consumption	0x41.0x87, 144	Active energy meter count (HT/consumption)	Wh	float
		Active energy meter count (LT/consumption)	Wh	float
react. work HT/LT cons.	0x41.0x87, 145	reactive energy meter count (HT/consumption)	varh	float
		reactive energy meter count (NT/consumption)	varh	float

Module name	Config.	Description	Unit	Format
today: act.Work HT/LT cons.	0x41.0x87, 146	Today: active energy HT/ consumption	Wh	float
		Today: active energy LT/ consumption	Wh	float
today: react.Work HT/LT cons.	0x41.0x87, 147	Today: reactive energy HT/ consumption	varh	float
		Today: reactive energy LT/ consumption	varh	float
y'day: act.Work HT/LT cons.	0x41.0x87, 148	Previous day: active energy HT/consumption	Wh	float
		Previous day: active energy LT/consumption	Wh	float
y'day: react.Work HT/LT cons.	0x41.0x87, 149	Previous day: reactive energy HT/consumption	varh	float
		Previous day: reactive energy LT/consumption	varh	float
t'month:act.work HT/LT cons.	0x41.0x87, 150	Current month: active energy HT/consumption	Wh	float
		Current month: active energy LT/consumption	Wh	float
t'month:react. work HT/LT cons.	0x41.0x87, 151	Current month: reactive energy HT/consumption	varh	float
		Current month: reactive energy LT/consumption	varh	float
last month:react. work HT/LT con.	0x41.0x87, 153	Last month: reactive energy HT/consumption	varh	float
		Last month: reactive energy LT/consumption	varh	float
act. work HT/LT recovery	0x41.0x87, 154	active energy meter count (HT/recovery)	Wh	float
		active energy meter count (LT/recovery)	Wh	float
react. work HT/LT recovery	0x41.0x87, 155	reactive energy meter count (HT/recovery)	varh	float
		reactive energy meter count (LT/recovery)	varh	float
today: act.Work HT/LT recovery	0x41.0x87, 156	Today: active energy HT recovery	Wh	float
		Today: active energy LT recovery	Wh	float

Module name	Config.	Description	Unit	Format
today: react.Work HT/LT recovery	0x41.0x87, 157	Today: reactive energy HT recovery	varh	float
		Today: reactive energy LT recovery	varh	float
y'day: act.Work HT/LT recovery	0x41.0x87, 158	Previous day: active energy HT recovery	Wh	float
		Previous day: active energy LT recovery	Wh	float
y'day: react.Work HT/LT recovery	0x41.0x87, 159	Previous day: reactive energy HT recovery	varh	float
		Previous day: reactive energy LT recovery	varh	float
t'month:act.work HT/LT recovery	0x41.0x87, 160	Current month: active energy HT recovery	Wh	float
		Current month: active energy LT recovery	Wh	float
t'month:react. work HT/LT recov.	0x41.0x87, 161	Current month: reactive energy HT recovery	varh	float
		Current month: reactive energy LT recovery	varh	float
last month:act. work HT/LT recov.	0x41.0x87, 162	Last month: active energy HT recovery	Wh	float
		Last month: reactive energy LT recovery	Wh	float
last month:react. work HT/LT rec.	0x41.0x87, 163	Last month: reactive energy HT recovery	varh	float
		Last month: reactive energy LT recovery	varh	float
status of relay 1 & 2	0x41.0x87, 164	Condition relay 1		unsigned long
		Condition relay 2		
status of inputs 1 & 2 (bitcoded)	0x41.0x83, 169	Bit 0: Status of input 1 (sync)		unsigned long
		Bit 1: Status of input 2 (tariff)		
act.period value P consumption	0x41.0x83, 170	Period value last saved active power consumption	W	float
act.period value Q consumption	0x41.0x83, 171	Period value last saved reactive power consumption	var	float
act.period value P recovery	0x41.0x83, 172	Period value last saved active power recovery	W	float
act.period value Q recovery	0x41.0x83, 173	Period value last saved reactive power recovery	var	float

Module name	Config.	Description	Unit	Format
act.period closing timestamp	0x41.0x83, 174	Timestamp of the period values last saved	s	unsigned long
mom.period value P consumption	0x41.0x83, 175	Instantaneous value of the current period active power consumption	W	float
mom.period value Q consumption	0x41.0x83, 176	Instantaneous value of the current period reactive power consumption	var	float
mom.period value P recovery	0x41.0x83, 177	Instantaneous value of the current period active power recovery	W	float
mom.period value Q recovery	0x41.0x83, 178	Instantaneous value of the current period reactive power recovery	var	float
remaining time to close period	0x41.0x83, 179	Remaining period time	s	unsigned long
period time	0x41.0x83, 180	period duration	min	unsigned long
phase-angle U L12	0x41.0x83, 181	Phase angle U L12	De-gree	float
phase-angle U L23	0x41.0x83, 182	Phase angle U L23	De-gree	float
phase-angle U L31	0x41.0x83, 183	Phase angle U L31	De-gree	float
voltage asymmetric	0x41.0x83, 184	Voltage asymmetry	%	float
act. work HT/LT cons. precision	0x41.0x8F, 165	Active energy meter count (HT/consumption)	Wh	double
		Active energy meter count (LT/consumption)	Wh	double
react. work HT/LT cons. precis.	0x41.0x8F, 166	Reactive energy meter count (HT/consumption)	varh	double
		Reactive energy meter count (NT/consumption)	varh	double
act. work HT/LT rec. precision	0x41.0x8F, 167	Active energy meter count (HT/recovery)	Wh	double
		Active energy meter count (LT/recovery)	Wh	double
react. work HT/LT rec. precis.	0x41.0x8F, 168	reactive energy meter count (HT/recovery)	varh	double
		reactive energy meter count (LT/recovery)	varh	double

Module name	Config.	Description	Unit	Format
limit Violations Bytes 0..3	0x41.0x83, 200	Limit bytes 0 to 3 (bit-encoded) see table 6		DWORD
limit Violations Bytes 4..7	0x41.0x83, 201	Limit bytes 4 to 7 (bit-encoded) see table 6		DWORD
limit Violations Bytes 8..11	0x41.0x83, 202	Limit bytes 8 to 11 (bit-encoded) see table 6		DWORD
limit Violations Bytes 12..15	0x41.0x83, 203	Limit bytes 12 to 15 (bit-encoded) see table 6		DWORD
limit Violations Bytes 16..19	0x41.0x83, 204	Limit bytes 16 to 19 (bit-encoded) see table 6		DWORD

Table 5

Encoding of the limit violations is described in table 6.

Limit	Value	Explanation
0	BIT-ENCODED	.0: 1st limit voltage PH-N L1 .1: 1st limit voltage PH-N L2 .2: 1st limit voltage PH-N L3 .3: 2nd limit voltage PH-N L1 .4: 2nd limit voltage PH-N L2 .5: 2nd limit voltage PH-N L3 .6: 1st limit voltage PH-PH L1 .7: 1st limit voltage PH-PH L2
1	BIT-ENCODED	.0: 1st limit voltage PH-PH L3 .1: 2nd limit voltage PH-PH L1 .2: 2nd limit voltage PH-PH L2 .3: 2nd limit voltage PH-PH L3 .4: 1st limit current L1 .5: 1st limit current L2 .6: 1st limit current L3 .7: 2nd limit current L1
2	BIT-ENCODED	.0: 2nd limit current L2 .1: 2nd limit current L3 .2: 1st limit current average value L1 .3: 1st limit current average value L2 .4: 1st limit current average value L3 .5: 2nd limit current average value L1 .6: 2nd limit current average value L2 .7: 2nd limit current average value L3
3	BIT-ENCODED	.0: 1st limit apparent power L1 .1: 1st limit apparent power L2 .2: 1st limit apparent power L3 .3: 2nd limit apparent power L1 .4: 2nd limit apparent power L2 .5: 2nd limit apparent power L3 .6: 1st limit active power L1 .7: 1st limit active power L2

Limit	Value	Explanation
4	BIT-ENCODED	.0: 1st limit active power L3 .1: 2nd limit active power L1 .2: 2nd limit active power L2 .3: 2nd limit active power L3 .4: 1st limit reactive power L1 .5: 1st limit reactive power L2 .6: 1st limit reactive power L3 .7: 2nd limit reactive power L1
5	BIT-ENCODED	.0: 2nd limit reactive power L2 .1: 2nd limit reactive power L3 .2: 1st limit cos Phi L1 .3: 1st limit cos Phi L2 .4: 1st limit cos Phi L3 .5: 2nd limit cos Phi L1 .6: 2nd limit cos Phi L2 .7: 2nd limit cos Phi L3
6	BIT-ENCODED	.0: 1st limit power factor L1 .1: 1st limit power factor L2 .2: 1st limit power factor L3 .3: 2nd limit power factor L1 .4: 2nd limit power factor L2 .5: 2nd limit power factor L3 .6: 1st limit voltage distortion factor L1 .7: 1st limit voltage distortion factor L2
7	BIT-ENCODED	.0: 1st limit voltage distortion factor L3 .1: 2nd limit voltage distortion factor L1 .2: 2nd limit voltage distortion factor L2 .3: 2nd limit voltage distortion factor L3 .4: 1st limit voltage 3rd harmonic L1 .5: 1st limit voltage 3rd harmonic L2 .6: 1st limit voltage 3rd harmonic L3 .7: 2nd limit voltage 3rd harmonic L1
8	BIT-ENCODED	.0: 2nd limit voltage 3rd harmonic L2 .1: 2nd limit voltage 3rd harmonic L3 .2: 1st limit voltage 5th harmonic L1 .3: 1st limit voltage 5th harmonic L2 .4: 1st limit voltage 5th harmonic L3 .5: 2nd limit voltage 5th harmonic L1 .6: 2nd limit voltage 5th harmonic L2 .7: 2nd limit voltage 5th harmonic L3

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Limit	Value	Explanation
9	BIT-ENCODED	.0: 1st limit voltage 7th harmonic L1 .1: 1st limit voltage 7th harmonic L2 .2: 1st limit voltage 7th harmonic L3 .3: 2nd limit voltage 7th harmonic L1 .4: 2nd limit voltage 7th harmonic L2 .5: 2nd limit voltage 7th harmonic L3 .6: 1st limit voltage 9th harmonic L1 .7: 1st limit voltage 9th harmonic L2
10	BIT-ENCODED	.0: 1st limit voltage 9th harmonic L3 .1: 2nd limit voltage 9th harmonic L1 .2: 2nd limit voltage 9th harmonic L2 .3: 2nd limit voltage 9th harmonic L3 .4: 1st limit voltage 11th harmonic L1 .5: 1st limit voltage 11th harmonic L2 .6: 1st limit voltage 11th harmonic L3 .7: 2nd limit voltage 11th harmonic L1
11	BIT-ENCODED	.0: 2nd limit voltage 11th harmonic L2 .1: 2nd limit voltage 11th harmonic L3 .2: 1st limit voltage 13th harmonic L1 .3: 1st limit voltage 13th harmonic L2 .4: 1st limit voltage 13th harmonic L3 .5: 2nd limit voltage 13th harmonic L1 .6: 2nd limit voltage 13th harmonic L2 .7: 2nd limit voltage 13th harmonic L3
12	BIT-ENCODED	.0: 1st limit total harmonic currents L1 .1: 1st limit total harmonic currents L2 .2: 1st limit total harmonic currents L3 .3: 2nd limit total harmonic currents L1 .4: 2nd limit total harmonic currents L2 .5: 2nd limit total harmonic currents L3 .6: 1st limit current 3rd harmonic L1 .7: 1st limit current 3rd harmonic L2
13	BIT-ENCODED	.0: 1st limit current 3rd harmonic L3 .1: 2nd limit current 3rd harmonic L1 .2: 2nd limit current 3rd harmonic L2 .3: 2nd limit current 3rd harmonic L3 .4: 1st limit current 5th harmonic L1 .5: 1st limit current 5th harmonic L2 .6: 1st limit current 5th harmonic L3 .7: 2nd limit current 5th harmonic L1

Limit	Value	Explanation
14	BIT-ENCODED	.0: 2nd limit current 5th harmonic L2 .1: 2nd limit current 5th harmonic L3 .2: 1st limit current 7th harmonic L1 .3: 1st limit current 7th harmonic L2 .4: 1st limit current 7th harmonic L3 .5: 2nd limit current 7th harmonic L1 .6: 2nd limit current 7th harmonic L2 .7: 2nd limit current 7th harmonic L3
15	BIT-ENCODED	.0: 1st limit current 9th harmonic L1 .1: 1st limit current 9th harmonic L2 .2: 1st limit current 9th harmonic L3 .3: 2nd limit current 9th harmonic L1 .4: 2nd limit current 9th harmonic L2 .5: 2nd limit current 9th harmonic L3 .6: 1st limit current 11th harmonic L1 .7: 1st limit current 11th harmonic L2
16	BIT-ENCODED	.0: 1st limit current 11th harmonic L3 .1: 2nd limit current 11th harmonic L1 .2: 2nd limit current 11th harmonic L2 .3: 2nd limit current 11th harmonic L3 .4: 1st limit current 13th harmonic L1 .5: 1st limit current 13th harmonic L2 .6: 1st limit current 13th harmonic L3 .7: 2nd limit current 13th harmonic L1
17	BIT-ENCODED	.0: 2nd limit current 13th harmonic L2 .1: 2nd limit current 13th harmonic L3 .2: 1st limit power frequency .3: 2nd limit power frequency .4: 1st limit neutral conductor current .5: 2nd limit neutral conductor current .6: 1st limit average value neutral conductor current .7: 2nd limit average value neutral conductor current
18	BIT-ENCODED	.0: 1st limit total active power .1: 2nd limit total active power .2: 1st limit total reactive power .3: 2nd limit total reactive power .4: 1st limit total apparent power .5: 2nd limit total apparent power .6: 1st limit power factor .7: 2nd limit power factor
19		reserved

Table 6

10.3 Example for the integration into a Simatic S7-300 control

Since the 300-type controls from Siemens cannot process any consistent data of 3 or >4 bytes, the data have to be read using SFC14. The following example is for clarification:

```
// In the hardware configurator, the "Frequency" module was projected
to the input address 24.
// This module is 4-bytes in length (consistent) and can therefore be
// evaluated immediately
        L     ED     24                  // Frequency
        T     MD     24
// The module "Voltage PH-N L1-L3" was projected to the input address
0 and
// the module "Current L1-L3" was projected to the input address 12.
// These modules each have 12 bytes of consistent length (3 * 4 bytes
real) and can
// be read out using SFC14.
      CALL "DPRD_DAT"       // SFC 14
       LADDR :=W#16#0       // projected e-address of the module
       RET_VAL:=MW120       // any measured value for possible error
codes
       RECORD :=P#DB4.DBX0.0 BYTE 12 // Pointer target area of data
        L     DB4.DBD   0   // U L1
        T     MD      0
        L     DB4.DBD   4   // U L2
        T     MD      4
        L     DB4.DBD   8   // U L3
        T     MD      8
      CALL "DPRD_DAT"       // SFC 14
       LADDR :=W#16#C       // projected e-address of the module
       RET_VAL:=MW120       // any measured value for possible error
codes
       RECORD :=P#DB4.DBX12.0 BYTE 12
                            // Pointer target area of data
        L     DB4.DBD   12  // I L1
        T  MD   12
        L     DB4.DBD   16  // I L2
        T     MD      16
        L     DB4.DBD   20  // I L3
        T     MD      20
```

11 Attachment: Data point description for the Modbus protocol

11.1 Supported Modbus commands

0x02	Read Discrete Inputs
0x04	Read Input Registers
0x06	Write Single Input Register
0x10	Write Multiple Registers
0x2B	Read Device Identification

The multimess Comfort does not support broadcast commands.
All described Modbus commands are device specific commands.

11.2 Data formats

(unsigned) short: 0x1234

Address	+0	+1
Contents	0x12	0x34

Rule for byte sequence: MSB before LSB

(unsigned) long: 0x12345678

Address	+0	+1	+2	+3
Contents	0x12	0x34	0x56	0x78

Rule for byte sequence: MSB before LSB

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float:

Format	corresponds to the IEEE 754 standard
Representation	4 bytes
Accuracy	24 bits (➢ represent >7 decimal points)
Composition	24-bit mantissa; 8-bit exponent
Mantissa	24 bits (M) + 1 bit (S) The MSB of the mantissa is always 1 => it is not saved separately! S = sign of the mantissa: S = 1 ➢ negative number; S = 0 ➢ positive number
Exponent	8 bits (0-255); is saved relatively to 127, i.e. the current value of the exponent is deduced by subtracting the number 127 from the value saved. Curr. Exp. = saved value of exp. – 127 => range of numbers from 128 to -127!

Example 1: -12.5 decimal = 0xC1480000 hex

M: 24 bit-mantissa
E: Exponent with offset of 127
S: Sign for mantissa (S=1 neg.; S=0 pos.)

Address	+0	+1	+2	+3
Format	SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
Binary	1 1 0 0 0 0 0 1	0 1 0 0 1 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
Hex	C1	48	00	00

The byte sequence is defined as follows:

The byte with the "S sign bit" is transmitted as the first byte over the bus.

The sequence of the float bytes of the bus can be reversed, where required, using the device parameter 0xD02C (see table 1).

The register value 0xD02C in this case means:

- with 1 -> sign bit S in 1st byte (sequence according to definition)
- with 0 -> sign bit S in 4th byte (sequence reversed)

The following information can be derived from this:

The sign bit is 1 => negative mantissa

The value of the exponent amounts to 10000010 bin or 130 dec.

This yields a value for the exponent of: 130 - 127 = 3

The mantissa contains the following value: 10010000000000000000000

The decimal point can be found at the left end of the mantissa, preceded by a 1. This position does not appear in the hexadecimal numeric notation. If you add 1 and set the decimal point at the beginning of the mantissa, you will obtain the following value:

1.10010000000000000000000

Now, the mantissa must be adjusted to the exponent. A negative exponent shifts the decimal point to the left, a positive exponent shifts it to the right. Since the exponent is 3, this appears in our illustration as: 1100.10000000000000000000

The number obtained corresponds to the binary floating-point number.

Binary digits to the left of the decimal point yield values > 1. In this example, 1100 bin yields the number 12 dec. {(1x23)+ (1x22)+ (0x21)+ (0x20)}

Binary digits to the right of the decimal point yield values < 1. In this example, . 100..... bin yields the number 0.5 dec. {(1x2-1)+ (0x2-2)+ (0x2-3)+ (0x2-4)}

By adding the individual values, 12.5 is obtained. As the sign bit was set, it is a negative value, -12.5. The hexadecimal number 0xC1480000 therefore corresponds to -12.5.

Example 2: -12.55155 decimal = 0xC148D325 hex

Address	+0	+1	+2	+3
Format	SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
Binary	1 1 0 0 0 0 0 1	0 1 0 0 1 0 0 0	1 1 0 1 0 0 1 1	0 0 1 0 0 1 0 1
Hex	C1	48	D3	25

Example 3: 45.354 decimal = 0x42356A7F hex

Address	+0	+1	+2	+3
Format	SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
Binary	0 1 0 0 0 0 1 0	0 0 1 1 0 1 0 1	0 1 1 0 1 0 1 0	0 1 1 1 1 1 1 1
Hex	42	35	6A	7F

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Exponent: 10000100 bin = 132 dec.
➢ Exp.= 132-127=5

Mantissa: S=0

➢ Sign=positive
01101010110101001111111 bin
Decimal point added to the first position of the mantissa

➢ .01101010110101001111111
Leading 1 in front of decimal point

➢ 1. 01101010110101001111111
Taking exponent into account (=5)

➢ 101101. 010110101001111111
To the left of the decimal point:
101101 bin = 25+ 23+ 22+20 = 45 dec.
To the right of the decimal point:
010110101001111111 bin =
2-2 + 2-4 + 2-5 + 2-7 + 2-9 + 2-12 + 2-13 + 2-14 + 2-15 + 2-16 + 2-17 + 2-18 = 0.3540001 dec.

Final result: +45.03540001 dec.

Timestamp time_t (is transmitted as unsigned long)
The timestamp describes a point in time. The value is defined as follows: Seconds since 1/1/1970 0°° hours (with respect to the appropriate time zone)

The values are transmitted over the bus as unsigned long (for byte sequence, see above). All values are to be interpreted as standard time (winter time), i.e. if you want to set the device clock in Germany to 11 o'clock in May, then the setting command via the bus must be done, by definition, with winter time 10 o'clock.

The following applies:
All time stamps which are transmitted via the bus are to be interpreted as standard time (winter time).

The device itself must be parametrized according to country-specific parameters.
Possible settings here:
e.g. Germany -> daylight saving time from end of March to end of October
e.g. China -> daylight saving time not activated

11.3 Interface parameters

Setting options for Modbus RTU

Baud rate (Baud)	Parity	Data bits	Stop bits
4800,9600,19200	even,odd,none	8	2 for parity none 1 otherwise

Setting options for Modbus ASCII

Baud rate (Baud)	Parity	Data bits	Stop bits
4800,9600,19200	even,odd,none	7	2 for parity none 1 otherwise

The number of data bits and stop bits is defined in the Modbus definition.
Baud rates smaller than 4800 baud are possible by definition, but not implemented at the moment. The interface parameters can only be set on the device. (not via the bus).

11.4 Optional boards

Depending on the optional board (Opt.), the device has the following functionality:

- **Option 0:** no optional board
- **Option 1:** optional board with Modbus RS485, real-time clock, buffer capacitor, 2x relay outputs
- **Option 2:** optional board with Modbus RS485
- **Option 3:** optional board with KBR eBus RS485, Modbus RS485
- **Option 4:** optional board with Modbus Ethernet, real-time clock, buffer capacitor, 2x relay outputs
- **Option 5:** optional board with Profibus DP, real-time clock, buffer capacitor
- **Option 6:** optional board with KBR eBus Ethernet, real-time clock, buffer capacitor, 2x relay outputs
- **Option 7:** optional board with KBR eBus RS485, Modbus RS485, real-time clock, buffer capacitor, 2x relay outputs

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11.5 Device settings

Device settings are performed via the Modbus command 0x10 (Write Multiple Registers) in accordance with table 1. These settings can also be read with the Modbus command 0x04.

Address	Words	Description	Value	Format
0xD002	2	Measuring voltage primary transformer	1-1000000	unsigned long
0xD004	2	Measuring voltage secondary transformer	1-600	unsigned long
0xD006	2	Primary transformer measuring current	1-1000000	unsigned long
0xD008	2	Secondary transformer measuring current	1 ->1A 5 ->5A	unsigned long
0xD00A	2	Frequency correction	0 automatic 1 50Hz fixed 2 60Hz fixed	unsigned long
0xD00C	2	Average current value, averaging time in min	0-255	unsigned long
0xD00E	2	Attenuation voltage (0-9)	0-9	unsigned long
0xD010	2	Attenuation current (0-9)	0-9	unsigned long
0xD012	2	Synchronization type	0 only by internal clock 1 by external synchronized pulse 2 by bus 3 by tariff change	unsigned long
0xD014	2	Tariff switching	0 by digital input 1 by bus 2 switching times saved in the device	unsigned long
0xD016	2	Switch on low tariff clock time (in minutes per day)	0 to 1440	unsigned long
0xD018	2	Switch off low tariff clock time (in minutes per day)	0.1	unsigned long

Address	Words	Description	Value	Format
0xD01A	2	0 daylight saving time off, 1 daylight saving time active	0.1	unsigned long
0xD01C	2	Switch standard time → daylight saving time	1 – 12	unsigned long
0xD01E	2	Switch daylight saving time → standard time	1 – 12	unsigned long
0xD020	2	Set continuous counter active energy HT	new value	float
0xD022	2	Set continuous counter active energy LT	new value	float
0xD024	2	Set continuous counter reactive energy HT	new value	float
0xD026	2	Set continuous counter reactive energy LT	new value	float
0xD028	2	Set time	Time as time stamp	unsigned long
0xD02A	2	Factor for default response times	Default setting 10 corresponds to factor 1.0 Factor 1.0 corresponds to >3.5 byte times Factor 2.0 corresponds to >7 byte times 0-255 correspond to factors 0 to 25.5	unsigned long
0xD02C	2	Byte sequence for float on the Modbus	1 according to definition 0 reversed	unsigned long
0xD02E	2	Energy form synchronized pulse or tariff switching	0-63	unsigned long
0xD030	2	Pulse output pulse type	0 proportional to active energy consumption 1 proportional to reactive energy consumption 2 proportional to active energy recovery 3 proportional to reactive energy recovery	unsigned long

Address	Words	Description	Value	Format
0xD032	2	Pulse output Pulse value	1 to 999999 pulses/kW 0 means no pulse output	float
0xD034	2	Pulse length in ms	30-990ms in steps of 10	unsigned long
0xD036	2	ON delay relay 1 in s)	0-255	unsigned long
0xD038	2	OFF delay relay 1 in s	0-255	unsigned long
0xD03A	2	ON delay relay 2 in s)	0-255	unsigned long
0xD03C	2	OFF delay relay 2 in s	0-255	unsigned long
0xD03E	2	Analog interface TYPE (not supported)	0 corresponds to 0-20mA 1 corresponds to 4-20mA 2 corresponds to 0-10V 3 corresponds to 2-10V	unsigned long
0xD040	2	Analog interface 1 proportionality (not supported)	ID according to table	unsigned long
0xD042	2	Analog interface 1 maximum value (not supported)	Maximum value corresponds to this value	float
0xD044	2	Analog interface 1 minimum value (not supported)	Minimum value corresponds to this value	float
0xD046	2	Analog interface 2 proportionality (not supported)	ID according to table	unsigned long
0xD048	2	Analog interface 2 maximum value (not supported)	Maximum value corresponds to this value	float
0xD04A	2	Analog interface 2 minimum value (not supported)	Minimum value corresponds to this value	unsigned long

Address	Words	Description	Value	Format
0xD04C	2	Analog interface 3 proportionality (not supported)	ID according to table	unsigned long
0xD04E	2	Analog interface 3 maximum value (not supported)	Maximum value corresponds to this value	unsigned long
0xD050	2	Analog interface 3 minimum value (not supported)	Minimum value corresponds to this value	float
0xD052	2	Set continuous meter active energy HT recovery	new value	float
0xD054	2	Set continuous meter active energy LT recovery	new value	float
0xD056	2	Set continuous meter reactive energy HT recovery	new value	float
0xD058	2	Set continuous meter re-active energy LT recovery	new value	unsigned long
0xD05A	2	Relay modes	**Bit0:** 0: Relay 1 acts as limit relay 1: Relay 1 is operated by bus **Bit1:** 0: Relay 2 acts as limit relay 1: Relay 2 is operated by bus **Bit2**..31 not used => should be 0	unsigned long

Table 1

The following table describes the IDs that are used to configure the analog interfaces. The value output takes place proportionally to the measured quantity selected.
(not supported)

Value output	ID
OFF	0
U_PH_N_L1_V	1
U_PH_N_L2_V	2
U_PH_N_L3_V	3
U_PH_PH_L1_V	4
U_PH_PH_L2_V	5
U_PH_PH_L3_V	6
IS_L1_A	7
IS_L2_A	8
IS_L3_A	9
IS_MW_L1_A	10
IS_MW_L2_A	11
IS_MW_L3_A	12
S_L1_KVA	13
S_L2_KVA	14
S_L3_KVA	15
P_L1_KVA	16
P_L2_KVA	17

Value output	ID
P_L3_KVA	18
Q_L1_KVAR	19
Q_L2_KVAR	20
Q_L3_KVAR	21
COS_L1	22
COS_L2	23
COS_L3	24
LF_L1	25
LF_L2	26
LF_L3	27
NETFREQUENCY_HZ	28
IN_A	29
IN_MW_A	30
P_TOT_KVA	31
Q_TOT_KVA	32
S_TOT_KVA	33
PF_TOT	34

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Example Modbus RTU

01 10 D0 1F 00 02 04 42 C9 00 00 EB 60
in which

01	Device address
10	Command
D0 1F	Register 0xD020 continuous counter active energy consumption HT (in accordance with Modbus definition, the required address must be set to -1 in the request telex)
00 02	Write 2 registers
04	Write 4 bytes
42 C9 00 00	Set to value 100.5
EB 60	CRC code

Response: 01 10 D0 1F 00 02 48 CE
in which

01	Device address
10	Command
D0 1F	Write from register 0xD0020
00 02	2 words written
48 CE	CRC code

Example Modbus ASCII

Request: 3A 30 31 31 30 44 30 30 31 30 30 30 34 30 38 30 30 30 30 30 31 39 30 30 30 30 30 30 31 39 30 46 30 0D 0A
in which

3A	Start telex (colon)
30 31	Device address 0x01
31 30	Command 0x10
44 30 30 31	Set registers 0xD002 to 0xD005 (in accordance with the Modbus definition, the required address must be set to -1 in the request telex)
30 30 30 34	Set 4 registers (primary voltage transformer 2 words and secondary 2 words)
30 38	Write number of bytes (8 bytes)
30 30 30 30 30 31 39 30	Primary voltage transformer 0x190 corresponds to dec. 400 V
30 30 30 30 30 31 39 30	Secondary voltage transformer 0x190 corresponds to dec. 400 V
46 30	LRC code
0D 0A	Telex end (CR LF)

Response:
3A 30 31 31 30 44 30 30 31 30 30 30 34 31 41 0D 0A
in which

3A	Start telex (colon)
30 31	Device address 0x01
31 30	Command 0x10
44 30 30 31	Registers 0xD002 to 0xD005 set
30 30 30 34	4 data bytes written
30 30 30 30	No limit violated with address 4 to 13
	Last 6 bits in byte 00 are without meaning
31 41	LRC code
0D 0A	Telex end (CR LF)

11.6 Commands

Commands can only be executed via the input 0x06 (Write Single Register) in accordance with table 2.

Address	Words	Description	Value	Format
0xF001	1	Device reset	42	unsigned short
0xF002	1	Reset all maximum values	0	unsigned short
0xF003	1	Reset all minimum values	0	unsigned short
0xF004	1	Tariff switching to HT	Energy type 0-63	unsigned short
0xF005	1	Tariff switching to LT	Energy type 0-63	unsigned short
0xF006	1	Delete error status	0	unsigned short
0xF007	1	Delete daily energy meter (not supported)	0	unsigned short
0xF008	1	Switch relay - Example: 0x0201 switches on relay 2 - Relay must be set to bus mode with the device setting 0xD05A	MSB: 1: Relay 1 2: Relay 2 LSB: 0: Relay off 1: Relay on	unsigned short

Example Modbus RTU

Request: 01 06 F0 05 00 00 AA CB
in which

01	Device address
06	Command
F0 05	Register 0xF006 delete error status (in accordance with Modbus definition, the required address must be set to -1 in the request telex)
00 00	Value 0 (in accordance with definition table 2)
AA CB	CRC code

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Response: 01 06 F0 05 00 00 AA CB, in which

01	Device address
06	Command
F0 05	Register 0xF006 delete error status (in accordance with Modbus definition, the required address must be set to -1 in the request telex)
00 00	Value 0 (in accordance with definition table 2)
AA CB	CRC code

Example Modbus ASCII

Request: 3A 30 31 31 30 44 30 30 31 30 30 30 34 30 38 30 30 30 30 30 31 39 30 30 30 30 30 30 31 39 30 46 30 0D 0A, in which

3A	Start telex (colon)
30 31	Device address 0x01
31 30	Command 0x10
44 30 30 31	Set registers 0xD002 to 0xD005 (in accordance with the Modbus definition, the required address must be set to -1 in the request telex)
30 30 30 34	Set 4 registers (primary voltage transformer 2 words and secondary 2 words)
30 38	Write number of bytes (8 bytes)
30 30 30 30 30 31 39 30	Primary voltage transformer 0x190 corresponds to dec. 400 V
30 30 30 30 30 31 39 30	Secondary voltage transformer 0x190 corresponds to dec. 400 V
46 30	LRC code
0D 0A	Telex end (CR LF)

Response: 3A 30 31 31 30 44 30 30 31 30 30 30 34 31 41 0D 0A
in which

3A	Start telex (colon)
30 31	Device address 0x01
31 30	Command 0x10
44 30 30 31	Registers 0xD002 to 0xD005 set
30 30 30 34	4 data bytes written
30 30 30 30	No limit violated with address 4 to 13
	Last 6 bits in byte 00 are without meaning
31 41	LRC code
0D 0A	Telex end (CR LF)

11.7 Limit violations

Limit violations are read via the command 0x02 (Read Discrete Inputs) in accordance with table 3

Address	Description of limit violations
0x0001	1st limit voltage PH-N L1
0x0002	1st limit voltage PH-N L2
0x0003	1st limit voltage PH-N L3
0x0004	2nd limit voltage PH-N L1
0x0005	2nd limit voltage PH-N L2
0x0006	2nd limit voltage PH-N L3
0x0007	1st limit voltage PH-PH L1
0x0008	1st limit voltage PH-PH L2
0x0009	1st limit voltage PH-PH L3
0x000a	2nd limit voltage PH-PH L1
0x000b	2nd limit voltage PH-PH L2
0x000c	2nd limit voltage PH-PH L3
0x000d	1st limit current L1
0x000e	1st limit current L2
0x000f	1st limit current L3
0x0010	2nd limit current L1
0x0011	2nd limit current L2
0x0012	2nd limit current L3
0x0013	1st limit current average value L1
0x0014	1st limit current average value L2
0x0015	1st limit current average value L3
0x0016	2nd limit current average value L1
0x0017	2nd limit current average value L2
0x0018	2nd limit current average value L3
0x0019	1st limit apparent power L1
0x001a	1st limit apparent power L2
0x001b	1st limit apparent power L3
0x001c	2nd limit apparent power L1

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Address	Description of limit violations
0x001d	2nd limit apparent power L2
0x001e	2nd limit apparent power L3
0x001f	1st limit active power L1
0x0020	1st limit active power L2
0x0021	1st limit active power L3
0x0022	2nd limit active power L1
0x0023	2nd limit active power L2
0x0024	2nd limit active power L3
0x0025	1st limit reactive power L1
0x0026	1st limit reactive power L2
0x0027	1st limit reactive power L3
0x0028	2nd limit reactive power L1
0x0029	2nd limit reactive power L2
0x002a	2nd limit reactive power L3
0x002b	1st limit cos Phi L1
0x002c	1st limit cos Phi L2
0x002d	1st limit cos Phi L3
0x002e	2nd limit cos Phi L1
0x002f	2nd limit cos Phi L2
0x0030	2nd limit cos Phi L3
0x0031	1st limit power factor L1
0x0032	1st limit power factor L2
0x0033	1st limit power factor L3
0x0034	2nd limit power factor L1
0x0035	2nd limit power factor L2
0x0036	2nd limit power factor L3
0x0037	1st limit voltage THD (%f) L1
0x0038	1st limit voltage THD (%f) L2
0x0039	1st limit voltage THD (%f) L3
0x003a	2nd limit voltage THD (%f) L1
0x003b	2nd limit voltage THD (%f) L2
0x003c	2nd limit voltage THD (%f) L3

Address	Description of limit violations
0x003d	1st limit voltage 3rd harmonic L1
0x003e	1st limit voltage 3rd harmonic L2
0x003f	1st limit voltage 3rd harmonic L3
0x0040	2nd limit voltage 3rd harmonic L1
0x0041	2nd limit voltage 3rd harmonic L2
0x0042	2nd limit voltage 3rd harmonic L3
0x0043	1st limit voltage 5th harmonic L1
0x0044	1st limit voltage 5th harmonic L2
0x0045	1st limit voltage 5th harmonic L3
0x0046	2nd limit voltage 5th harmonic L1
0x0047	2nd limit voltage 5th harmonic L2
0x0048	2nd limit voltage 5th harmonic L3
0x0049	1st limit voltage 7th harmonic L1
0x004a	1nd limit voltage 7th harmonic L2
0x004b	1st limit voltage 7th harmonic L3
0x004c	2nd limit voltage 7th harmonic L1
0x004d	2nd limit voltage 7th harmonic L2
0x004e	2nd limit voltage 7th harmonic L3
0x004f	1st limit voltage 9th harmonic L1
0x0050	1st limit voltage 9th harmonic L2
0x0051	1st limit voltage 9th harmonic L3
0x0052	2nd limit voltage 9th harmonic L1
0x0053	2nd limit voltage 9th harmonic L2
0x0054	2nd limit voltage 9th harmonic L3
0x0055	1st limit voltage 11th harmonic L1
0x0056	1st limit voltage 1th harmonic L2
0x0057	1st limit voltage 11th harmonic L3
0x0058	2nd limit voltage 11th harmonic L1
0x0059	2nd limit voltage 11th harmonic L2
0x005a	2nd limit voltage 11th harmonic L3
0x005b	1st limit voltage 13th harmonic L1
0x005c	1st limit voltage 13th harmonic L2

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Address	Description of limit violations
0x005d	1st limit voltage 13th harmonic L3
0x005e	2nd limit voltage 13th harmonic L1
0x005f	2nd limit voltage 13th harmonic L2
0x0060	2nd limit voltage 13th harmonic L3
0x0061	1st limit total harmonic currents L1
0x0062	1st limit total harmonic currents L2
0x0063	1st limit total harmonic currents L3
0x0064	2nd limit total harmonic currents L1
0x0065	2nd limit total harmonic currents L2
0x0066	2nd limit total harmonic currents L3
0x0067	1st limit current 3rd harmonic L1
0x0068	1st limit current 3rd harmonic L2
0x0069	1st limit current 3rd harmonic L3
0x006a	2nd limit current 3rd harmonic L1
0x006b	2nd limit current 3rd harmonic L2
0x006c	2nd limit current 3rd harmonic L3
0x006d	1st limit current 5th harmonic L1
0x006e	1st limit current 5th harmonic L2
0x006f	1st limit current 5th harmonic L3
0x0070	2nd limit current 5th harmonic L1
0x0071	2nd limit current 5th harmonic L2
0x0072	2nd limit current 5th harmonic L3
0x0073	1st limit current 7th harmonic L1
0x0074	1st limit current 7th harmonic L2
0x0075	1st limit current 7th harmonic L3
0x0076	2nd limit current 7th harmonic L1
0x0077	2nd limit current 7th harmonic L2
0x0078	2nd limit current 7th harmonic L3
0x0079	1st limit current 9th harmonic L1
0x007a	1st limit current 9th harmonic L2
0x007b	1st limit current 9th harmonic L3
0x007c	2nd limit current 9th harmonic L1

Address	Description of limit violations
0x007d	2nd limit current 9th harmonic L2
0x007e	2nd limit current 9th harmonic L3
0x007f	1st limit current 11th harmonic L1
0x0080	1st limit current 11th harmonic L2
0x0081	1st limit current 11th harmonic L3
0x0082	2nd limit current 11th harmonic L1
0x0083	2nd limit current 11th harmonic L2
0x0084	2nd limit current 11th harmonic L3
0x0085	1st limit current 13th harmonic L1
0x0086	1st limit current 13th harmonic L2
0x0087	1st limit current 13th harmonic L3
0x0088	2nd limit current 13th harmonic L1
0x0089	2nd limit current 13th harmonic L2
0x008a	2nd limit current 13th harmonic L3
0x008b	1st limit power frequency
0x008c	2nd limit power frequency
0x008d	1st limit neutral conductor current
0x008e	2nd limit neutral conductor current
0x008f	1st limit average value neutral conductor current
0x0090	2nd limit average value neutral conductor current
0x0091	1st limit total active power
0x0092	2nd limit total active power
0x0093	1st limit total reactive power
0x0094	2nd limit total reactive power
0x0095	1st limit total apparent power
0x0096	2nd limit total apparent power
0x0097	1st limit power factor
0x0098	2nd limit power factor

Table 3

Example Modbus RTU

Request: 01 02 00 00 00 07 79 CC
in which

01	Device address
02	Command
00 00	Address 1st limit U-PhN L1 (in accordance with the Modbus definition, the required address must be set to -1 in the request telex)
00 07	Number of addresses to be evaluated (addresses 1 to 7)
79 CC	CRC code

Response: 01 02 01 07 E0 4A
in which

01	Device address
02	Command
01	Number of data bytes
07	1st limit U-PhN-L1 violated 1st limit U-PhN-L2 violated 1st limit U-PhN-L2 violated 2nd limit U-PhN-L1 not violated 2nd limit U-PhN-L2 not violated 2nd limit U-PhN-L3 not violated 1st limit U-PhPh L1 not violated Last bit in byte is without meaning
E0 4A	CRC code

Example Modbus ASCII

Request: 3A 30 31 30 32 30 30 30 33 30 30 30 41 46 30 0D 0A
in which

3A	Start telex (colon)
30 31	Device address 0x01
30 32	Command 0x02
30 30 30 33	Address 4th limit U-PhPh L1 (in accordance with the Modbus definition, the required address must be set to -1 in the request telex)
30 30 30 41	Number of addresses to be evaluated 0x0A
46 30	LRC code
0D 0A	Telex end (CR LF)

Response: 3A 30 31 30 32 30 32 30 30 30 30 46 42 0D 0A
in which

3A	Start telex (colon)
30 31	Device address 0x01
30 32	Command
30 32	Number of data bytes 0x02
30 30 30 30	No limit violated with address 4 to 13
	Last 6 bits in byte 00 are without meaning
46 42	LRC code
0D 0A	Telex end (CR LF)

11.8 Data points

Data points are read via the command 0x04 (Read Input Registers) in accordance with table 4

Address	Words	Description	Unit	Format
0x0002	2	Voltage PH-N L1	V	float
0x0004	2	Voltage PH-N L2	V	float
0x0006	2	Voltage PH-N L3	V	float
0x0008	2	Voltage PH-PH L1	V	float
0x000a	2	Voltage PH-PH L2	V	float
0x000c	2	Voltage PH-PH L3	V	float
0x000e	2	Current L1	A	float
0x0010	2	Current L2	A	float
0x0012	2	Current L3	A	float
0x0014	2	Current average value L1	A	float
0x0016	2	Current average value L2	A	float
0x0018	2	Current average value L3	A	float
0x001a	2	Apparent power L1	VA	float
0x001c	2	Apparent power L2	VA	float
0x001e	2	Apparent power L3	VA	float
0x0020	2	Active power L1	W	float
0x0022	2	Active power L2	W	float
0x0024	2	Active power L3	W	float
0x0026	2	Reactive power L1	var	float
0x0028	2	Reactive power L2	var	float
0x002a	2	Reactive power L3	var	float
0x002c	2	cos Phi L1		float
0x002e	2	cos Phi L2		float
0x0030	2	cos Phi L3		float
0x0032	2	Power factor L1		float
0x0034	2	Power factor L2		float
0x0036	2	Power factor L3		float
0x0038	2	Voltage THD (%f) L1	%	float

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Address	Words	Description	Unit	Format
0x003a	2	Voltage THD (%f) L2	%	float
0x003c	2	Voltage THD (%f) L3	%	float
0x003e	2	Voltage 3rd harmonic L1	%	float
0x0040	2	Voltage 3rd harmonic L2	%	float
0x0042	2	Voltage 3rd harmonic L3	%	float
0x0044	2	Voltage 5th harmonic L1	%	float
0x0046	2	Voltage 5th harmonic L2	%	float
0x0048	2	Voltage 5th harmonic L3	%	float
0x004a	2	Voltage 7th harmonic L1	%	float
0x004c	2	Voltage 7th harmonic L2	%	float
0x004e	2	Voltage 7th harmonic L3	%	float
0x0050	2	Voltage 9th harmonic L1	%	float
0x0052	2	Voltage 9th harmonic L2	%	float
0x0054	2	Voltage 9th harmonic L3	%	float
0x0056	2	Voltage 11th harmonic L1	%	float
0x0058	2	Voltage 11th harmonic L2	%	float
0x005a	2	Voltage 11th harmonic L3	%	float
0x005c	2	Voltage 13th harmonic L1	%	float
0x005e	2	Voltage 13th harmonic L2	%	float
0x0060	2	Voltage 13th harmonic L3	%	float
0x0062	2	Voltage 15th harmonic L1	%	float
0x0064	2	Voltage 15th harmonic L2	%	float
0x0066	2	Voltage 15th harmonic L3	%	float
0x0068	2	Voltage 17th harmonic L1	%	float
0x006a	2	Voltage 17th harmonic L2	%	float
0x006c	2	Voltage 17th harmonic L3	%	float
0x006e	2	Voltage 19th harmonic L1	%	float
0x0070	2	Voltage 19th harmonic L2	%	float
0x0072	2	Voltage 19th harmonic L3	%	float
0x0074	2	Total harmonic currents L1	A	float
0x0076	2	Total harmonic currents L2	A	float
0x0078	2	Total harmonic currents L3	A	float

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Address	Words	Description	Unit	Format
0x007a	2	Current 3rd harmonic L1	A	float
0x007c	2	Current 3rd harmonic L2	A	float
0x007e	2	Current 3rd harmonic L3	A	float
0x0080	2	Current 5th harmonic L1	A	float
0x0082	2	Current 5th harmonic L2	A	float
0x0084	2	Current 5th harmonic L3	A	float
0x0086	2	Current 7th harmonic L1	A	float
0x0088	2	Current 7th harmonic L2	A	float
0x008a	2	Current 7th harmonic L3	A	float
0x008c	2	Current 9th harmonic L1	A	float
0x008e	2	Current 9th harmonic L2	A	float
0x0090	2	Current 9th harmonic L3	A	float
0x0092	2	Current 11th harmonic L1	A	float
0x0094	2	Current 11th harmonic L2	A	float
0x0096	2	Current 11th harmonic L3	A	float
0x0098	2	Current 13th harmonic L1	A	float
0x009a	2	Current 13th harmonic L2	A	float
0x009c	2	Current 13th harmonic L3	A	float
0x009e	2	Current 15th harmonic L1	A	float
0x00a0	2	Current 15th harmonic L2	A	float
0x00a2	2	Current 15th harmonic L3	A	float
0x00a4	2	Current 17th harmonic L1	A	float
0x00a6	2	Current 17th harmonic L2	A	float
0x00a8	2	Current 17th harmonic L3	A	float
0x00aa	2	Current 19th harmonic L1	A	float
0x00ac	2	Current 19th harmonic L2	A	float
0x00ae	2	Current 19th harmonic L3	A	float
0x00b0	2	Network frequency	Hz	float
0x00b2	2	Neutral conductor current	A	float
0x00b4	2	Average value neutral conductor current	A	float
0x00b6	2	Total active power	W	float
0x00b8	2	Total reactive power	var	float

Address	Words	Description	Unit	Format
0x00ba	2	Total apparent power	VA	float
0x00bc	2	Power factor		float
0x00be	2	Condition relay 1		unsigned long
0x00c0	2	Condition relay 2		unsigned long
0x00c2	2	Error state		unsigned long
0x00c4	2	Time		unsigned long
0x00c6	2	Maximum: Voltage PH-N L1	V	float
0x00c8	2	Maximum: Voltage PH-N L2	V	float
0x00ca	2	Maximum: Voltage PH-N L3	V	float
0x00cc	2	Maximum: voltage PH-PH L1	V	float
0x00ce	2	Maximum: Voltage PH-PH L2	V	float
0x00d0	2	Maximum: Voltage PH-PH L3	V	float
0x00d2	2	Maximum: Current L1	A	float
0x00d4	2	Maximum: Current L2	A	float
0x00d6	2	Maximum: Current L3	A	float
0x00d8	2	Maximum: Current average value L1	A	float
0x00da	2	Maximum: Current average value L2	A	float
0x00dc	2	Maximum: Current average value L3	A	float
0x00de	2	Maximum: Apparent power L1	VA	float
0x00e0	2	Maximum: Apparent power L2	VA	float
0x00e2	2	Maximum: Apparent power L3	VA	float
0x00e4	2	Maximum: Active power L1	W	float
0x00e6	2	Maximum: Active power L2	W	float
0x00e8	2	Maximum: Active power L3	W	float
0x00ea	2	Maximum: Reactive power L1	var	float
0x00ec	2	Maximum: Reactive power L2	var	float
0x00ee	2	Maximum: Reactive power L3	var	float
0x00f0	2	Maximum: cos Phi L1		float
0x00f2	2	Maximum: cos Phi L2		float
0x00f4	2	Maximum: cos Phi L3		float
0x00f6	2	Maximum: Power factor L1		float
0x00f8	2	Maximum: Power factor L2		float

Address	Words	Description	Unit	Format
0x00fa	2	Maximum: Power factor L3		float
0x00fc	2	Maximum: Voltage THD (%f) L1	%	float
0x00fe	2	Maximum: Voltage THD (%f) L2	%	float
0x0100	2	Maximum: Voltage THD (%f) L3	%	float
0x0102	2	Maximum: Voltage 3rd harmonic L1	%	float
0x0104	2	Maximum: Voltage 3rd harmonic L2	%	float
0x0106	2	Maximum: Voltage 3rd harmonic L3	%	float
0x0108	2	Maximum: Voltage 5th harmonic L1	%	float
0x010a	2	Maximum: Voltage 5th harmonic L2	%	float
0x010c	2	Maximum: Voltage 5th harmonic L3	%	float
0x010e	2	Maximum: Voltage 7th harmonic L1	%	float
0x0110	2	Maximum: Voltage 7th harmonic L2	%	float
0x0112	2	Maximum: Voltage 7th harmonic L3	%	float
0x0114	2	Maximum: Voltage 9th harmonic L1	%	float
0x0116	2	Maximum: Voltage 9th harmonic L2	%	float
0x0118	2	Maximum: Voltage 9th harmonic L3	%	float
0x011a	2	Maximum: Voltage 11th harmonic L1	%	float
0x011c	2	Maximum: Voltage 11th harmonic L2	%	float
0x011e	2	Maximum: Voltage 11th harmonic L3	%	float
0x0120	2	Maximum: Voltage 13th harmonic L1	%	float
0x0122	2	Maximum: Voltage 13th harmonic L2	%	float
0x0124	2	Maximum: Voltage 13th harmonic L3	%	float
0x0126	2	Maximum: Voltage 15th harmonic L1	%	float
0x0128	2	Maximum: Voltage 15th harmonic L2	%	float
0x012a	2	Maximum: Voltage 15th harmonic L3	%	float
0x012c	2	Maximum: Voltage 17th harmonic L1	%	float
0x012e	2	Maximum: Voltage 17th harmonic L2	%	float
0x0130	2	Maximum: Voltage 17th harmonic L3	%	float
0x0132	2	Maximum: Voltage 19th harmonic L1	%	float
0x0134	2	Maximum: Voltage 19th harmonic L2	%	float
0x0136	2	Maximum: Voltage 19th harmonic L3	%	float
0x0138	2	Maximum: Total harmonic currents L1	A	float

Address	Words	Description	Unit	Format
0x013a	2	Maximum: Total harmonic currents L2	A	float
0x013c	2	Maximum: Total harmonic currents L3	A	float
0x013e	2	Maximum: Current 3rd harmonic L1	A	float
0x0140	2	Maximum: Current 3rd harmonic L2	A	float
0x0142	2	Maximum: Current 3rd harmonic L3	A	float
0x0144	2	Maximum: Current 5th harmonic L1	A	float
0x0146	2	Maximum: Current 5th harmonic L2	A	float
0x0148	2	Maximum: Current 5th harmonic L3	A	float
0x014a	2	Maximum: Current 7th harmonic L1	A	float
0x014c	2	Maximum: Current 7th harmonic L2	A	float
0x014e	2	Maximum: Current 7th harmonic L3	A	float
0x0150	2	Maximum: Current 9th harmonic L1	A	float
0x0152	2	Maximum: Current 9th harmonic L2	A	float
0x0154	2	Maximum: Current 9th harmonic L3	A	float
0x0156	2	Maximum: Current 11th harmonic L1	A	float
0x0158	2	Maximum: Current 11th harmonic L2	A	float
0x015a	2	Maximum: Current 11th harmonic L3	A	float
0x015c	2	Maximum: Current 13th harmonic L1	A	float
0x015e	2	Maximum: Current 13th harmonic L2	A	float
0x0160	2	Maximum: Current 13th harmonic L3	A	float
0x0162	2	Maximum: Current 15th harmonic L1	A	float
0x0164	2	Maximum: Current 15th harmonic L2	A	float
0x0166	2	Maximum: Current 15th harmonic L3	A	float
0x0168	2	Maximum: Current 17th harmonic L1	A	float
0x016a	2	Maximum: Current 17th harmonic L2	A	float
0x016c	2	Maximum: Current 17th harmonic L3	A	float
0x016e	2	Maximum: Current 19th harmonic L1	A	float
0x0170	2	Maximum: Current 19th harmonic L2	A	float
0x0172	2	Maximum: Current 19th harmonic L3	A	float
0x0174	2	Maximum: Network frequency	Hz	float
0x0176	2	Maximum: Neutral conductor current	A	float
0x0178	2	Maximum: Average value neutral conductor current	A	float

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Address	Words	Description	Unit	Format
0x017a	2	Maximum: Total active power	W	float
0x017c	2	Maximum: Total reactive power	var	float
0x017e	2	Maximum: Total apparent power	VA	float
0x0180	2	Maximum: Power factor		float
0x0182	2	Minimum: Voltage PH-N L1	V	float
0x0184	2	Minimum: Voltage PH-N L2	V	float
0x0186	2	Minimum: Voltage PH-N L3	V	float
0x0188	2	Minimum: voltage PH-PH L1	V	float
0x018a	2	Minimum: Voltage PH-PH L2	V	float
0x018c	2	Minimum: Voltage PH-PH L3	V	float
0x018e	2	Minimum: Current L1	A	float
0x0190	2	Minimum: Current L2	A	float
0x0192	2	Minimum: Current L3	A	float
0x0194	2	Minimum: Current average value L1	A	float
0x0196	2	Minimum: Current average value L2	A	float
0x0198	2	Minimum: Current average value L3	A	float
0x019a	2	Minimum: Apparent power L1	VA	float
0x019c	2	Minimum: Apparent power L2	VA	float
0x019e	2	Minimum: Apparent power L3	VA	float
0x01a0	2	Minimum: Active power L1	W	float
0x01a2	2	Minimum: Active power L2	W	float
0x01a4	2	Minimum: Active power L3	W	float
0x01a6	2	Minimum: Reactive power L1	var	float
0x01a8	2	Minimum: Reactive power L2	var	float
0x01aa	2	Minimum: Reactive power L3	var	float
0x01ac	2	Minimum: cos Phi L1		float
0x01ae	2	Minimum: cos Phi L2		float
0x01b0	2	Minimum: cos Phi L3		float
0x01b2	2	Minimum: Power factor L1		float
0x01b4	2	Minimum: Power factor L2		float
0x01b6	2	Minimum: Power factor L3		float
0x01b8	2	Minimum: Network frequency	Hz	float

Address	Words	Description	Unit	Format
0x01ba	2	Minimum: Neutral conductor current	A	float
0x01bc	2	Min.: Average value neutral conductor current	A	float
0x01be	2	Minimum: Total active power	W	float
0x01c0	2	Minimum: Total reactive power	var	float
0x01c2	2	Minimum: Total apparent power	VA	float
0x01c4	2	Minimum: Power factor		float
0x01c6	2	Max date: Voltage PH-N L1		unsigned long
0x01c8	2	Max date: Voltage PH-N L2		unsigned long
0x01ca	2	Max date: Voltage PH-N L3		unsigned long
0x01cc	2	Max date: voltage PH-PH L1		unsigned long
0x01ce	2	Max date: Voltage PH-PH L2		unsigned long
0x01d0	2	Max date: Voltage PH-PH L3		unsigned long
0x01d2	2	Max date: current L1		unsigned long
0x01d4	2	Maximum date: Current L2		unsigned long
0x01d6	2	Maximum date: Current L3		unsigned long
0x01d8	2	Max date: Current average value L1		unsigned long
0x01da	2	Max date: Current average value L2		unsigned long
0x01dc	2	Max date: Current average value L3		unsigned long
0x01de	2	Max date: Apparent power L1		unsigned long
0x01e0	2	Max date: Apparent power L2		unsigned long
0x01e2	2	Max date: Apparent power L3		unsigned long
0x01e4	2	Maximum date: Active power L1		unsigned long
0x01e6	2	Maximum date: Active power L2		unsigned long
0x01e8	2	Maximum date: Active power L3		unsigned long
0x01ea	2	Maximum date: Reactive power L1		unsigned long
0x01ec	2	Maximum date: Reactive power L2		unsigned long
0x01ee	2	Maximum date: Reactive power L3		unsigned long
0x01f0	2	Maximum date: cos Phi L1		unsigned long
0x01f2	2	Maximum date: cos Phi L2		unsigned long
0x01f4	2	Maximum date: cos Phi L3		unsigned long
0x01f6	2	Maximum date: Power factor L1		unsigned long
0x01f8	2	Maximum date: Power factor L2		unsigned long

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Address	Words	Description	Unit	Format
0x01fa	2	Max date: Power factor L3		unsigned long
0x01fc	2	Max date: Voltage THD (%f) L1		unsigned long
0x01fe	2	Max date: Voltage THD (%f) L2		unsigned long
0x0200	2	Max date: Voltage THD (%f) L3		unsigned long
0x0202	2	Max date: Voltage 3rd harmonic L1		unsigned long
0x0204	2	Max date: Voltage 3rd harmonic L2		unsigned long
0x0206	2	Max date: Voltage 3rd harmonic L3		unsigned long
0x0208	2	Max date: Voltage 5th harmonic L1		unsigned long
0x020a	2	Max date: Voltage 5th harmonic L2		unsigned long
0x020c	2	Max date: Voltage 5th harmonic L3		unsigned long
0x020e	2	Max date: Voltage 7th harmonic L1		unsigned long
0x0210	2	Max date: Voltage 7th harmonic L2		unsigned long
0x0212	2	Max date: Voltage 7th harmonic L3		unsigned long
0x0214	2	Max date: Voltage 9th harmonic L1		unsigned long
0x0216	2	Max date: Voltage 9th harmonic L2		unsigned long
0x0218	2	Max date: Voltage 9th harmonic L3		unsigned long
0x021a	2	Max date: Voltage 11th harmonic L1		unsigned long
0x021c	2	Max date: Voltage 11th harmonic L2		unsigned long
0x021e	2	Max date: Voltage 11th harmonic L3		unsigned long
0x0220	2	Max date: Voltage 13th harmonic L1		unsigned long
0x0222	2	Max date: Voltage 13th harmonic L2		unsigned long
0x0224	2	Max date: Voltage 13th harmonic L3		unsigned long
0x0226	2	Max date: Voltage 15th harmonic L1		unsigned long
0x0228	2	Max date: Voltage 15th harmonic L2		unsigned long
0x022a	2	Max date: Voltage 15th harmonic L3		unsigned long
0x022c	2	Max date: Voltage 17th harmonic L1		unsigned long
0x022e	2	Max date: Voltage 17th harmonic L2		unsigned long
0x0230	2	Max date: Voltage 17th harmonic L3		unsigned long
0x0232	2	Max date: Voltage 19th harmonic L1		unsigned long
0x0234	2	Max date: Voltage 19th harmonic L2		unsigned long
0x0236	2	Max date: Voltage 19th harmonic L3		unsigned long

Address	Words	Description	Unit	Format
0x0238	2	Maximum date: Total harmonic currents L1		unsigned long
0x023a	2	Maximum date: Total harmonic currents L2		unsigned long
0x023c	2	Maximum date: Total harmonic currents L3		unsigned long
0x023e	2	Maximum date: Current 3rd harmonic L1		unsigned long
0x0240	2	Maximum date: Current 3rd harmonic L2		unsigned long
0x0242	2	Maximum date: Current 3rd harmonic L3		unsigned long
0x0244	2	Maximum date: Current 5th harmonic L1		unsigned long
0x0246	2	Maximum date: Current 5th harmonic L2		unsigned long
0x0248	2	Maximum date: Current 5th harmonic L3		unsigned long
0x024a	2	Maximum date: Current 7th harmonic L1		unsigned long
0x024c	2	Maximum date: Current 7th harmonic L2		unsigned long
0x024e	2	Maximum date: Current 7th harmonic L3		unsigned long
0x0250	2	Maximum date: Current 9th harmonic L1		unsigned long
0x0252	2	Maximum date: Current 9th harmonic L2		unsigned long
0x0254	2	Maximum date: Current 9th harmonic L3		unsigned long
0x0256	2	Maximum date: Current 11th harmonic L1		unsigned long
0x0258	2	Maximum date: Current 11th harmonic L2		unsigned long
0x025a	2	Maximum date: Current 11th harmonic L3		unsigned long
0x025c	2	Maximum date: Current 13th harmonic L1		unsigned long
0x025e	2	Maximum date: Current 13th harmonic L2		unsigned long
0x0260	2	Maximum date: Current 13th harmonic L3		unsigned long
0x0262	2	Maximum date: Current 15th harmonic L1		unsigned long
0x0264	2	Maximum date: Current 15th harmonic L2		unsigned long
0x0266	2	Maximum date: Current 15th harmonic L3		unsigned long
0x0268	2	Maximum date: Current 17th harmonic L1		unsigned long
0x026a	2	Maximum date: Current 17th harmonic L2		unsigned long
0x026c	2	Maximum date: Current 17th harmonic L3		unsigned long
0x026e	2	Maximum date: Current 19th harmonic L1		unsigned long
0x0270	2	Maximum date: Current 19th harmonic L2		unsigned long

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Address	Words	Description	Unit	Format
0x0272	2	Maximum date: Current 19th harmonic L3		unsigned long
0x0274	2	Maximum date: Network frequency		unsigned long
0x0276	2	Maximum date: Neutral conductor current		unsigned long
0x0278	2	Max date: Average value neutral conductor current		unsigned long
0x027a	2	Max date: Total active power		unsigned long
0x027c	2	Max date: Total reactive power		unsigned long
0x027e	2	Max date: Total apparent power		unsigned long
0x0280	2	Maximum date: Power factor		unsigned long
0x0282	2	Minimum date: Voltage PH-N L1		unsigned long
0x0284	2	Minimum date: Voltage PH-N L2		unsigned long
0x0286	2	Minimum date: Voltage PH-N L3		unsigned long
0x0288	2	Minimum date: voltage PH-PH L1		unsigned long
0x028a	2	Minimum date: Voltage PH-PH L2		unsigned long
0x028c	2	Minimum date: Voltage PH-PH L3		unsigned long
0x028e	2	Minimum date: current L1		unsigned long
0x0290	2	Minimum date: Current L2		unsigned long
0x0292	2	Minimum date: Current L3		unsigned long
0x0294	2	Minimum date: Current average value L1		unsigned long
0x0296	2	Minimum date: Current average value L2		unsigned long
0x0298	2	Minimum date: Current average value L3		unsigned long
0x029a	2	Minimum date: Apparent power L1		unsigned long
0x029c	2	Minimum date: Apparent power L2		unsigned long
0x029e	2	Minimum date: Apparent power L3		unsigned long
0x02a0	2	Minimum date: Active power L1		unsigned long
0x02a2	2	Minimum date: Active power L2		unsigned long
0x02a4	2	Minimum date: Active power L3		unsigned long
0x02a6	2	Minimum date: Reactive power L1		unsigned long
0x02a8	2	Minimum date: Reactive power L2		unsigned long
0x02aa	2	Minimum date: Reactive power L3		unsigned long
0x02ac	2	Maximum date: cos Phi L1		unsigned long
0x02ae	2	Maximum date: cos Phi L2		unsigned long
0x02b0	2	Maximum date: cos Phi L3		unsigned long

Address	Words	Description	Unit	Format
0x02b2	2	Minimum date: Power factor L1		unsigned long
0x02b4	2	Minimum date: Power factor L2		unsigned long
0x02b6	2	Minimum date: Power factor L3		unsigned long
0x02b8	2	Minimum date: Network frequency		unsigned long
0x02ba	2	Minimum date: Neutral conductor current		unsigned long
0x02bc	2	Minimum date: Average value neutral conductor current		unsigned long
0x02be	2	Minimum date: Total active power		unsigned long
0x02c0	2	Minimum date: Total reactive power		unsigned long
0x02c2	2	Minimum date: Total apparent power		unsigned long
0x02c4	2	Minimum date: Power factor		unsigned long
0x02c6	2	Active power meter count (HT/consumpt.)	Wh	float
0x02c8	2	Active energy meter count (LT/consumpt.)	Wh	float
0x02ca	2	reactive energy meter count (HT/cons.)	varh	float
0x02cc	2	reactive energy meter count (LT/cons.)	varh	float
0x02ce	2	Today: active energy HT/consumption	Wh	float
0x02d0	2	Today: active energy LT/consumption	Wh	float
0x02d2	2	Today: reactive energy HT/consumption	varh	float
0x02d4	2	Today: reactive energy LT/consumption	varh	float
0x02d6	2	Previous day: active energy HT/consumpt.	Wh	float
0x02d8	2	Previous day: active energy LT/consumpt.	Wh	float
0x02da	2	Previous day: reactive energy HT/consumpt.	varh	float
0x02dc	2	Previous day: reactive energy LT/consumpt.	varh	float
0x02de	2	Current month: active energy HT/consumpt.	Wh	float
0x02e0	2	Current month: active energy LT/consumpt.	Wh	float
0x02e2	2	Current month: reactive energy HT/cons.	varh	float
0x02e4	2	Current month: reactive energy LT/cons.	varh	float
0x02e6	2	Last month: active energy HT/consumpt.	Wh	float
0x02e8	2	Last month: reactive energy LT/consumpt.	Wh	float
0x02ea	2	Last month: reactive energy HT/consumpt.	varh	float
0x02ec	2	Last month: reactive energy LT/consumpt.	varh	float
0x02ee	2	Tariff index		unsigned long
0x02f0	2	Active energy meter count (HT/recovery)	Wh	float

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Address	Words	Description	Unit	Format
0x02f2	2	active energy meter count (LT/recovery)	Wh	float
0x02f4	2	reactive energy meter count (HT/recovery)	varh	float
0x02f6	2	reactive energy meter count (LT/recovery)	varh	float
0x02f8	2	Today: active energy HT recovery	Wh	float
0x02fa	2	Today: active energy LT recovery	Wh	float
0x02fc	2	Today: reactive energy HT recovery	varh	float
0x02fe	2	Today: reactive energy LT recovery	varh	float
0x0300	2	Previous day: active energy HT recovery	Wh	float
0x0302	2	Previous day: active energy LT recovery	Wh	float
0x0304	2	Previous day: reactive energy HT recovery	varh	float
0x0306	2	Previous day: reactive energy LT recovery	varh	float
0x0308	2	Current month: active energy HT recovery	Wh	float
0x030a	2	Current month: active energy LT recovery	Wh	float
0x030c	2	Current month: reactive energy HT recovery	varh	float
0x030e	2	Current month: reactive energy LT recovery	varh	float
0x0310	2	Last month: active energy HT recovery	Wh	float
0x0312	2	Last month: active energy LT recovery	Wh	float
0x0314	2	Last month: reactive energy HT recovery	varh	float
0x0316	2	Last month: reactive energy LT recovery	varh	float
0x0318	2	Status of digital inputs Bit 0: IN0 (sync input) (1 = active) Bit 1: IN1 (tariff input) (1 = active) (not supported)	-	unsigned long
0x031a	2	Phase angle U L12	Degree	float
0x031c	2	Phase angle U L23	Degree	float
0x031e	2	Phase angle U L31	Degree	float
0x0320	2	Voltage asymmetry (not supported)	%	float
0x1002	2	Period value last saved active power consumption	W	float
0x1004	2	Period value last saved reactive power consumption	var	float

Address	Words	Description	Unit	Format
0x1006	2	Period value last saved active power recovery	W	float
0x1008	2	Period value last saved reactive power recovery	var	float
0x100A	2	Timestamp of the period values last saved	s	unsigned long
0x100C	2	Instantaneous value of the current period active power consumption	W	float
0x100E	2	Instantaneous value of the current period reactive power consumption	var	float
0x1010	2	Instantaneous value of the current period active power recovery	W	float
0x1012	2	Instantaneous value of the current period reactive power recovery	var	float
0x1014	2	Remaining period time	s	unsigned long
0x1016	2	Period duration	min	unsigned long
0xE002	4	Active power meter count (HT/consumption)	Wh	double
0xE006	4	Active energy meter count (LT/consumption)	Wh	double
0xE00A	4	Reactive energy meter count (HT/consumption)	varh	double
0xE00E	4	Reactive energy meter count (LT/consumption)	varh	double
0xE012	4	Active energy meter count (HT/recovery)	Wh	double
0xE016	4	Active energy meter count (LT/recovery)	Wh	double
0xE01A	4	Reactive energy meter count (HT/recovery)	varh	double
0xE01E	4	Reactive energy meter count (LT/recovery)	varh	double

Table 4

Example Modbus ASCII

Request: 3A 30 31 30 34 30 31 31 31 30 30 30 32 45 37 0D 0A, in which

3A	Start telex (colon)
30 31	Device address 0x01
30 34	Command 0x40
30 31 31 31	Read from register 0x0112 (in accordance with the Modbus definition, the required address must be set to -1 in the request telex)
30 30 30 32	Read 2 registers, i.e. read 1 measured value (maximum: Voltage 7th harmonic L3)
45 37	LRC code
0D 0A	Telex end (CR LF)

Response: 3A 30 31 30 34 30 34 34 30 30 38 42 34 41 35 35 36 0D 0A, in which

3A	Start telex (colon)
30 31	Device address 0x01
30 34	Command 0x40
30 34	4 data bytes
34 30 30 38 42 34 41 35	Maximum: Voltage 7th harmonic L3 2.14%
35 46	LRC code
0D 0A	Telex end (CR LF)

Example Modbus RTU

Request: 01 04 00 1F 00 32 40 19, in which

01	Device address
04	Command
00 1F	Read active power L1 from register 0x0020 (in accordance with the Modbus definition, the required address must be set to -1 in the request telex)
00 32	Read 50 registers, i.e. read 25 data points
40 19	CRC code

Response: 01 04 64 40 DC E6 64 40 E0 04 82 40 DE 3A B9 BF D3 93 AA BF EC A4 F6 BF E1 4E A1 BF 75 D5 91 BF 73 31 3C BF 74 6B 27 3E E5 63 6C 3E E5 63 6C 3E E5 63 6C 3F A8 F5 B7 3F 95 42 3D 3F A9 37 D3 3D 47 37 08 3A 5B 37 38 3D 18 1C 8C 3F 9E CB 1C 3F 8A 47 2F 3F 9F 01 93 3E A6 01 35 3E 9F 01 97 3E A7 86 3D 3E 9E CB 1C FE B3, in which

01	Device address	
04	Command	
64	100 data bytes	
40 DC E6 64	Active power L1	6.90 W
40 E0 04 82	Active power L2	7.00 W
40 DE 3A B9	Active power L3	6.94 W
BF D3 93 AA	Reactive power L1	-1.65 var
BF EC A4 F6	Reactive power L2	-1.85 var
BF E1 4E A1	Reactive power L3	-1.76 var
BF 75 D5 91	cos Phi L1	-0.96
BF 73 31 3C	cos Phi L2	-0.95
BF 74 6B 27	cos Phi L3	-0.95
3E E5 63 6C	Power factor L1	0.45
3E E5 63 6C	Power factor L2	0.45
3E E5 63 6C	Power factor L3	0.45
3F A8 F5 B7	Voltage THD (%f) L1	1.32 %
3F 95 42 3D	Voltage THD (%f) L2	1.17 %
3F A9 37 D3	Voltage THD (%f) L3	1.32 %
3D 47 37 08	Voltage 3rd harmonic L1	0.05 %
3A 5B 37 38	Voltage 3rd harmonic L2	0.00 %
3D 18 1C 8C	Voltage 3rd harmonic L3	0.04 %
3F 9E CB 1C	Voltage 5th harmonic L1	1.24 %
3F 8A 47 2F	Voltage 5th harmonic L2	1.08 %
3F 9F 01 93	Voltage 5th harmonic L3	1.24 %
3E A6 01 35	Voltage 7th harmonic L1	0.32 %
3F 9F 01 97	Voltage 7th harmonic L2	0.31 %
3E A7 86 3D	Voltage 7th harmonic L3	0.33 %
3F 9E CB 1C	Voltage 9th harmonic L1	0.31 %
FE B3	CRC code	

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11.9 Device information

The device information is read via the command 0x2B (Read Device Identification)

Information about manufacturer, device code and device version is gathered in the process. The device supplies the "Basic Device Identification". "Regular" and "Extended Device Identification" are optional in accordance with the Modbus definition. They are not used in the Multimess Comfort.

Example Modbus RTU

Request: 01 2B 0E 01 00 70 77
in which

01	Device address
2B	Command
0E	MEI type in accordance with Modbus definition always 0x0E
01	Device ID Code for "Basic Device Identification" (see Modbus definition)
00	Object ID -> in our example manufacturer name, product name and version
70 77	CRC code

Response: 01 2B 0E 01 01 00 00 03 00 08 4B 42 52 20 47 6D 62 48 01 11 4D 75 6C 74 69 6D 65 73 73 20 43 6F 6D 66 6F 72 74 02 09 20 31 2E 30 32 72 30 30 36 0C A8, in which

01	Device address
2B	Command
0E	MEI type (see Modbus definition)
01	"basic identification" (see Modbus definition)
01	"conformity level“ (see Modbus definition)
00	No further information follows (no additional telex required)
00	Next object ID
03	Number of objects
00	Object ID 00
08	Length of the text of ID 00
4B 42 52 20 47 6D 62 48	"KBR GmbH"
01	Object ID 01
11	Length of the text of ID 01
4D 75 6C 74 69 6D 65 73 73 20 43 6F 6D 66 6F 72 74	"Multimess Comfort“
02	Object ID 02
09	Length of the text of ID 02
20 31 2E 30 32 72 30 30 36	" 1.02r006“
0C A8	CRC code

Example Modbus ASCII

3A 30 31 32 42 30 45 30 31 30 32 43 33 0D 0A
in which

3A	Start telex (colon)
30 31	Device address 0x01
32 42	Command 0x2B
30 45	MEI type in accordance with Modbus definition always 0x0E
30 31	Device ID Code for "Basic Device Identification" (see Modbus definition)
30 32	Object ID -> in our example 02 read Version and Release
43 33	LRC code
0D 0A	Telex end (CR LF)

Response: 3A 30 31 32 42 30 45 30 31 30 31 30 30 30 32 30 31 30 32 30 39 32 30 33 31 32 45 33 30 33 32 37 32 33 30 33 30 33 36 43 44 0D 0A
in which

3A	Start telex (colon)
30 31	Device address 0x01
32 42	Command
30 45	MEI type (see Modbus definition)
30 31	"basic identification" (see Modbus definition)
30 31	"conformity level" (see Modbus definition)
30 30	No further information follows (no additional telex required)
30 32	Next object ID
30 31	Number of objects
30 32	Object ID 02
30 39	Length of the text of ID 02
32 30 33 31 32 45 33 30 33 32 37 32 33 30 33 30 33 36	" 1.02r006“
43 44	LRC code
0D 0A	Telex end (CR LF)

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KBR Kompensationsanlagenbau GmbH

Am Kiefernschlag 7
D-91126 Schwabach,
Germany

T +49 (0) 9122 6373 - 0
F +49 (0) 9122 6373 - 83
E info@kbr.de

www.kbr.de

EDEBDA0214-4614-1_EN_400