

Power Analyzer

MULTIMESS - Comfort



Your Partner For
Network Analyzing

Dear Customer

We would like to thank you for choosing a **KBR GmbH** quality product.

In order to familiarize yourself with the operation and programming of the device and always be able to use the whole functionality of this high-quality product, we recommend that you read this manual thoroughly.

The individual chapters serve to explain the technical details of the device and show how to avoid damage by means of proper installation and commissioning.

The manual is included in the scope of delivery of the device and 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 manual, we would like to thank you in advance for notifying us about any errors or ambiguous descriptions that might be in it. You will find a form for corrections in the appendix.

Sincerely,

KBR GmbH Schwabach

Safety Precautions

Safety Precautions



This manual contains notes that must be observed for your personal safety and to avoid damage to equipment. Notes are identified by a warning sign or an info symbol according to the degree of hazard they represent.



Danger

means that death, major injuries or damage **will** occur in case the appropriate safety measures are not performed.



Warning

means that death, major injuries or damage **may** occur in case the appropriate safety measures are not performed.



Caution

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



Note

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

Disclaimer

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

We appreciate your corrections and comments.

KBR GmbH
Subject to change

General Safety Precautions

In order to prevent operating errors, handling of the device is kept as simple as possible. This way, you will be able to use the device very soon.

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



Warning

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

Mains connection, setup and operation of the device must only be performed by **qualified personnel**. Qualified personnel as understood in the safety precautions of this manual are persons authorized to setup, ground and mark equipment, systems and wiring systems in accordance with applicable standards.

To avoid the hazard of fire and electrical shock, the device must not be subjected to rain or other humidity!

Before the device is connected to the mains, you will have to check whether the local mains conditions comply with the specifications on the manufacturer's label. A wrong connection may destroy the device!

When connecting the device, the connection chart must be observed (see chapter "Connection chart") and the connection lines must be powerless. Only use proper line material and watch the correct polarity when wiring!

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

A device showing visible damage must by all means be considered as unfit for operation and must be disconnected from the mains!

Error detection, repairs and maintenance work may only be carried out in our facilities or after contacting our service team. Every warranty obligation of the manufacturer expires if the device is opened without written consent from our service team. Proper operation can no longer be guaranteed!

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

In facilities subject to hazard of lightning, lightning protection must be provided for all input and output lines (recommendations see chapter "Protective measures")!

Product Liability / Disposal

Product Liability

With these product, you have acquired a quality product.

In its manufacture, only components of the highest reliability and quality were used. Each device is subject to long-term testing before it is delivered.

For information on product liability, please refer to our General Terms and Conditions for electronic devices.

The warranted properties of the device apply only if it is operated in accordance with its intended use!

Disposal

Please dispose of defective, outdated or no longer used devices properly.
At your request, we will be pleased to dispose of the devices for you.

Table of Contents

| | | |
|----------|--|-----------|
| 1 | DEFINITION OF TERMS | 3 |
| 2 | IMPLEMENTATION/FUNCTION | 4 |
| 3 | MULTIMESS-COMFORT CONNECTION..... | 6 |
| 3.1 | INSATALLATION AND MOUNTING | 6 |
| 3.2 | CONNECTION DIAGRAM | 8 |
| 3.3 | TERMINAL ASSIGNMENT..... | 8 |
| 3.4 | CONTROL AND DISPLAY PANEL..... | 10 |
| 3.4.1 | DESCRIPTION OF BUTTONS AND DISPLAYS..... | 10 |
| 4 | OPERATION | 11 |
| 4.1 | MENU STRUCTURE OF MULTIMESS-COMFORT | 11 |
| 4.2 | NAVIGATION AND DEVICE DISPLAYS..... | 12 |
| 5 | SETTING PARAMETERS | 13 |
| 5.1 | GENERAL PROGRAMMING SCHEME..... | 13 |
| 5.2 | U_{PH-N} - MEASURING REFERENCE VOLTAGE/RATED NETWORK VOLTAGE | 13 |
| 5.3 | I - CURRENT TRANSFORMER TRANSFER RATIO..... | 15 |
| 6 | DISPLAY FUNCTIONS | 16 |
| 6.1 | U_{PH-N} - VOLTAGE PHASE TO NEUTRAL, FREQUENCY..... | 16 |
| 6.2 | U_{PH-PH} - VOLTAGE PHASE TO PHASE, ROTARY FIELD DISPLAY | 16 |
| 6.3 | I / I_N - CURRENT / NEUTRAL CONDUCTOR CURRENT, INSTANTANEOUS – AVERAGE VALUE SWITCH-OVER..... | 17 |
| 6.4 | S - APPARENT POWER / TOTAL APPARENT POWER..... | 18 |
| 6.5 | P - ACTIVE POWER / TOTAL ACTIVE POWER | 18 |
| 6.6 | Q - REACTIVE POWER / TOTAL REACTIVE POWER..... | 19 |
| 6.7 | $\cos \phi$ - FIRST HARMONIC POWER FACTOR, PF, CUMULATED PF | 20 |
| 6.8 | kWh - ACTIVE ENERGY HT/LT CONSUMPTION AND RECOVERY, MAXIMUM CUMULATED ACTIVE ENERGY OF THE PERIOD..... | 21 |
| 6.9 | kVarh - REACTIVE ENERGY COUNTER HT/LT CONSUMPTION AND RECOVERY, MAXIMUM CUMULATED REACTIVE POWER OF THE PERIOD..... | 22 |
| 6.10 | HARMON. - DISTORTION FACTOR AND PARTIAL OSCILLATION OF THE NETWORK HARMONICS FOR CURRENT AND VOLTAGE..... | 24 |
| 6.11 | EXTRA..... | 25 |
| 6.12 | MAXIMUM / MINIMUM VALUES DISPLAY | 27 |
| 6.13 | DISPLAYING LIMITING VALUES..... | 29 |
| 7 | PROGRAMMING..... | 31 |
| 7.1 | PERIOD TIME FOR AVERAGE CURRENT VALUE | 31 |
| 7.2 | TARIFF SWITCHING METHOD | 32 |
| 7.3 | MEASURING PERIOD SYNCHRONIZATION..... | 33 |
| 7.4 | PROGRAMMING LIMITING VALUES..... | 34 |
| 7.5 | SETTING CLOCK AND DATE | 35 |
| 7.6 | SETTING BUS ADDRESS AND BAUDRATE | 36 |
| 7.7 | SETTING THE BUS PROTOCOL | 37 |
| 7.8 | SET BUS ADDRESS AND BAUDRATE FOR MOD BUS..... | 38 |
| 7.9 | SETTING PICKUP AND RELEASE DELAY OF THE RELAYS | 39 |
| 7.10 | ACTIVATING DAYLIGHT SAVING TIME | 40 |

| | | |
|-----------|--|-----------|
| 7.11 | LANGUAGE SETTINGS | 41 |
| 7.12 | PASSWORD..... | 42 |
| 7.13 | PROGRAMMING THE PULSE OUTPUT | 42 |
| 8 | RESET AND DELETE FUNCTIONS | 46 |
| 8.1 | RESET | 46 |
| 8.2 | DELETE ENERGY COUNT | 46 |
| 8.2.1 | DELETE ENERGY COUNT MANUALLY | 46 |
| 8.2.2 | DELETE ENERGY COUNT CENTRALLY..... | 46 |
| 8.3 | DELETING EXTREME VALUES | 47 |
| 8.3.1 | DELETE EXTREME VALUES MANUALLY | 47 |
| 8.3.2 | DELETE EXTREME VALUES CENTRALLY..... | 47 |
| 8.4 | DELETING LIMITING VALUE SETTINGS..... | 47 |
| 8.4.1 | DELETE LIMITING VALUE SETTINGS MANUALLY | 47 |
| 8.4.2 | DELETE LIMITING VALUE SETTINGS CENTRALLY..... | 47 |
| 9 | MEMORY FUNCTIONS | 48 |
| 9.1 | DEVICE SETTINGS..... | 48 |
| 9.1.1 | DEVICE BASIC PARAMETERS..... | 48 |
| 9.1.2 | LONG-TERM MEMORY..... | 49 |
| 9.1.2.1 | LOAD PROFILE MEMORY | 49 |
| 9.1.2.2 | ANNUAL ENERGY MEMORY | 49 |
| 9.1.2.3 | EVENT MEMORY | 50 |
| 9.1.3 | MEASURING PERIOD SYNCHRONIZATION..... | 51 |
| 9.1.3.1 | SYNCHRONIZATION ONLY BY INTERNAL CLOCK..... | 51 |
| 9.1.3.2 | SYNCHRONIZING WITH ENERGY SUPPLIER SYNCHRONOUS PULSE | 51 |
| 9.1.3.3 | SYNCHRONIZATION BY KBR ENERGY BUS | 51 |
| 9.1.3.4 | SYNCHRONIZATION WHEN TARIFFS ARE CHANGED | 52 |
| 10 | TECHNICAL DATA..... | 53 |
| 10.1 | MEASURING AND DISPLAY VALUES | 53 |
| 10.2 | MEASURING ACCURACY | 54 |
| 10.3 | MEASURING PRINCIPLE..... | 54 |
| 10.4 | DEVICE MEMORY | 54 |
| 10.5 | POWER SUPPLY | 54 |
| 10.6 | HARDWARE – INPUTS AND OUTPUTS | 55 |
| 10.6.1 | INPUTS..... | 55 |
| 10.6.2 | OUTPUTS | 55 |
| 10.7 | ELECTRICAL CONNECTION | 55 |
| 10.8 | MECHANICAL DATA..... | 56 |
| 10.9 | STANDARDS AND AMENDMENTS | 56 |
| 10.10 | DEFAULT SETTINGS AFTER RESET | 57 |
| 11 | SERIAL INTERFACE | 57 |
| 11.1 | RS 485 BUS OPERATION..... | 57 |
| 12 | OVERVOLTAGE AND LIGHTNING PROTECTION | 58 |
| 13 | TROUBLE SHOOTING | 58 |

1 DEFINITION OF TERMS

Following you will find brief explanations of the terminology used in this manual.

| | |
|---|--|
| Effective value: | According to definition, an effective value is the RMS value of an alternating or <i>pulsating quantity</i> . MULTIMESS-Comfort only uses the effective values of pure periodic quantities for calculation (RMS). |
| Instantaneous effective value: | The value determined by the MULTIMESS-Comfort within the measuring interval. |
| Measuring interval: | During a measuring interval, the electrical quantity "Voltage" or "Current" of one phase is scanned. The resulting scanning spots are available for further calculations. This interval is mainly determined by the A/D conversion. |
| Measuring cycle: | The measuring cycle is the time the device needs for measuring all possible quantities for all three phases. |
| Firmware: | Operating system software implemented in the MULTIMESS's microcontroller |
| Load profile memory: | Saves the actual values of the measuring periods with timestamp. |
| Measuring period max: | The measuring period containing the highest (maximum) value that occurred. |
| Active / reactive power periods: | Actual active or reactive power within a measuring period. |
| Measuring period: | The period of time used to determine the power average values. Typical intervals: e.g. 15, 30, 60 minutes. |

2 IMPLEMENTATION/FUNCTION

The MULTIMESS-Comfort is an affordable network measuring device for flush mounting for the measurement of all important values in three-phase networks.

The MULTIMESS-Comfort micro processor records mains voltage and current consumption of the measuring point for all three phases – via analog/digital converter inputs – and calculates the relation of active, reactive and apparent power in the three-phase network.

Convenient operation and display

The LED displays serve to either display the measured values directly or enter the respective parameters and configuration data. In addition, eleven LEDs serve to indicate menus and the status. Six buttons facilitate clearly structured navigation through the menus.

For 100 / 400 V networks

The MULTIMESS-Comfort can be applied in three-wire as well as four-wire networks. The unit can be implemented in 100 V as well as in 400 V networks for direct measurement. Higher voltages can only be connected via external voltage transformers; primary and secondary voltage can be programmed. The measuring voltage inputs of the device measure directly, i. e. they are not metallically separated by a voltage transformer!

In case of a supply system with a non-zero earth potential outer conductor, a suitable isolating device (e.g. voltage transformer) must be used.

x/5A or x/1A freely programmable

The measuring inputs for current **must always** be fed via current transformers, while the transformer ratio is programmable. The primary current value as well as the secondary current value can be selected.

Determining the neutral conductor current

The neutral conductor current is determined and displayed.

Harmonic oscillation analysis

Harmonic oscillation analysis via Fourier transform

MULTIMESS-Comfort measures the harmonic oscillation of the 3rd / 5th / 7th / 9th / 11th / 13th / 15th / 17th and 19th network harmonics of the voltage and the current and calculates their partial oscillation as well as the total distortion factor of the voltage or the distortion reactive current.

Two-tariffs counter function (HT/LT)

Consumption during high tariff and low tariff times is saved separately. Switching from high to low tariff times and vice versa is either carried out by means of a digital signal to be applied externally, e.g. from the energy supplier, or via an internal clock. When operated with the KBR Energy Bus, switching can also be carried out centrally via the MULTIMASTER or PC.

Programmable pulse output

Active energy or reactive energy proportional pulses can be output via a programmable output laid out as S_0 interface. The pulse output type (in proportion to active or reactive energy) as well as the pulse values (number of pulses per kWh or per kVARh) and the pulse length can be programmed. These pulses can be processed by e.g. a master system for data acquisition or optimization, a maximum-demand monitor or a central process control.

Serial interface

In its default configuration, the MULTIMESS-Comfort has a serial port (RS485) for operation with the KBR Energy Bus.

A large amount of information that cannot be shown on the display can be read from the device via the Energy Bus.

Numerous online measuring values as well as a considerable amount of data can be read from the long-term memory.

Extensive storage functions

In addition to its measuring and counting functions, the MULTIMESS-Comfort offers extensive storage functions.

- a **load profile memory** to record the cumulated active and reactive power
- a memory to record the **daily energy values** for 365 days
- and an **event memory** that records defined actions of the measuring device as e.g. mains failures, tariff switching actions, delete functions and many more.

The storage functions are exclusively available via the KBR Energy Bus.

Synchronization

To synchronize the load profile memory, an individual digital input was integrated in the MULTIMESS-Comfort. The synchronization signal of the energy supplier counter can be connected there, for example. Synchronization as well as high / low tariff switching can be controlled centrally via the KBR Energy Bus as well as via the internal clock.

Analog outputs

At these outputs, different parameters can be output as analog values either between 0-20mA or 4-20mA or 0-10 Volt or 2-10 Volt.

Depending on which quantity should be output, you can assign it for a certain phase (L1, L2, L3) or or its total value to the analog output.

Caution! Parameterization can only be performed via the Energy Bus!

Software (optional)

A number of software products that can be run on most Microsoft® Windows® operating systems is available for the convenient programming and storage of long-term data.

Separate power supply

The device requires a separate auxiliary voltage for operation (see nameplate).

For questions on this device or on our products please don't hesitate to contact us. We will be glad to assist you.

Please see the cover sheet of this manual for your contact.

3 MULTIMESS-COMFORT CONNECTION

3.1 Installation and mounting

- Current VDE regulations must be observed for mounting.
- Prior to connecting the device to the mains, check whether the local mains properties correspond to the requirements on the nameplate. A wrong connection may result in destruction of the device. A different mains frequency influences the measurement.
- Connect the device according to the chart.
- In case the plant is subject to lightning hazard, provide lightning protection for the power supply input. You will find suggestions and suppliers in the appendix.



Caution

The control voltage as well as the applied measuring voltage of the device must be protected by means of a back-up fuse.

When connecting the current transformers, the direction of the energy flow and the correct assignment to the voltage paths must be observed!

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

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



Note

Take the following into consideration when connecting the device to the three-phase network to be measured:

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

Rotary field:

The unit can be operated in a clockwise or an anti-clockwise rotating field. When switching on the device's power supply MULTIMESS-Comfort automatically checks the rotary direction. Rotary field check:

- Connect **only** the **measuring voltage** to the device (U_{Meas} see nameplate) for this purpose.
- 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 mains rotary direction.
- The rotary field is displayed in the menu U_{PH-PH} , submenu rotary field. For a clockwise rotary field, the display shows L1 **0**, L2 **120** and L3 **240** degrees.
- If you want to change the rotary direction, 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.

Then check again whether the association of the voltage path L1 and the current path L1 as well as for all other phases still is correct.

Current transformation connection:

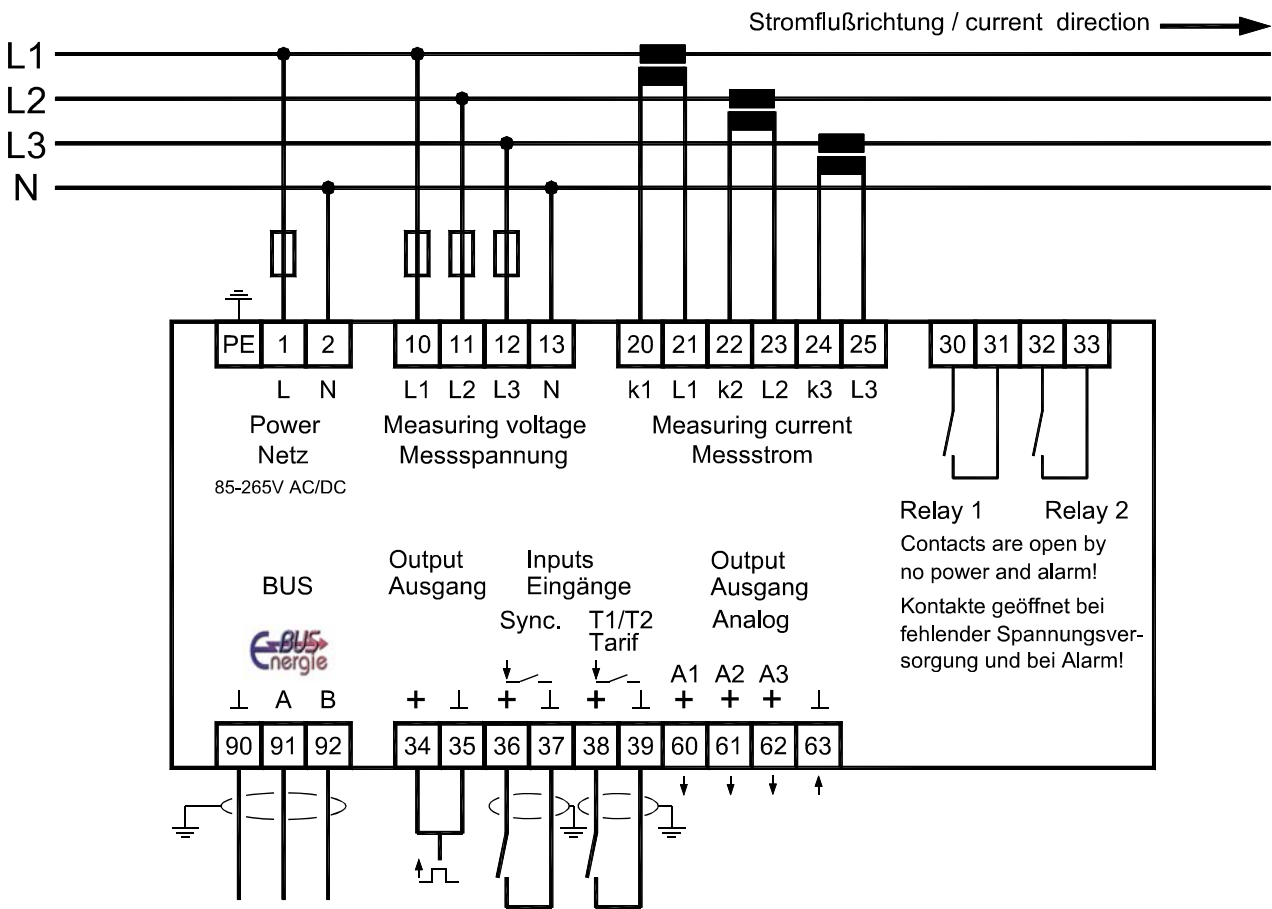
- ***Energy flux direction:***
When mounting the transformers, observe the current flow or energy flow direction. If the current transformer is mounted the wrong way, the measured value will be negative.
Prerequisite is that energy is consumed.
 - ***Assigning measuring voltage input/current transformer input:***
The current transformer on terminal 20/21 (k1/l1) must be arranged in the phase where the measuring voltage for the 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-Comfort as follows:
- Switch to the main menu "I".
 - Connect the current transformer to the corresponding wires.
 - The device will display only positive currents when connection and energy flux direction are correct.
 - If connections are wrong all currents will be negative. Interchange the connections until the display shows correct values.



Caution

Before any interchanging the transformers must be shorted out!

3.2 Connection diagram



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3.3 Terminal assignment

Terminal 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 multirange power supply and may be supplied by voltages of 85 – 265V AC/DC or 20 – 70V AC/DC resp. (Equipment tension see type signpost).

Terminal 10 (L1) :
11 (L2) :
12 (L3) :
13 (N):

Measuring input for voltage

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 Measuring intervals are programmable. Exceeding the measuring interval results in an error message.
 For higher voltages, the unit needs to be connected via a voltage transformer.

**Terminal 20 (k1) and 21 (l1)
22 (k2) and 23 (l2)
24 (k3) and 25 (l3)**

Measuring inputs for current

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 to the correct assignment of measuring voltage inputs to current transformers.

Terminal 30 and 31:

Floating relay contact relay 1

This contact serves as message or alarm output. During operation, an audible or visual message may be activated or a consumer shut down. The contact is open as long as the device is de-energized and in case of an active message. Maximum switching capacity of 2A at 250V AC

Terminal 32 and 33:

Floating relay contact relay 2

Refer to the description of the floating relay contact relay 1

**Terminal 90 (ground):
91 (A)
92 (B)**

Bus connection

For communication at the Energy Bus

Terminal 34 (+) and 35 (-):

Pulse output

Output of energy-proportional pulses via a digital contact (S_0 interface in accordance with DIN 43864). Polarity is important for this output. The output signals can be processed e.g. by a maximum demand monitor or a master central process control.

Terminal 36 and 37:

Synchronization input

A floating contact, e.g. from the energy supplier for synchronizing the measuring period, can be connected to this input.

Terminal 38 and 39:

Tariff input

A floating contact, e.g. from the energy supplier for switching from high to low tariff, can be connected to this input.

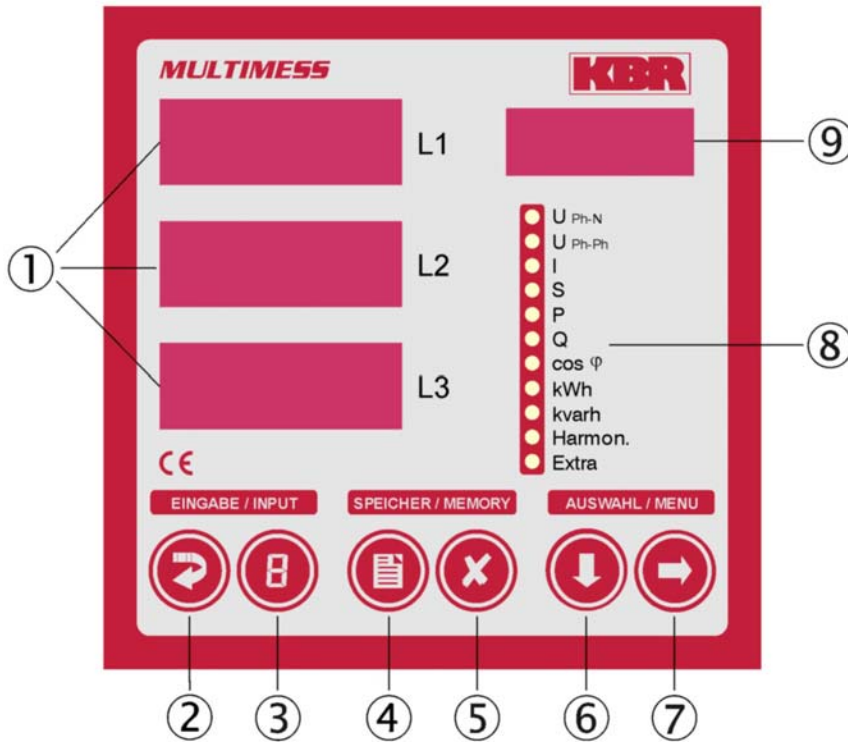
Terminal 60, 61, 62 and 63:

Analog outputs

At these outputs, different parameters can be output as analog values either between 0-20mA or 4-20mA or 0-10 Volt or 2-10 Volt. Depending on which quantity should be output, you can assign it for a certain phase (L1, L2, L3) or its total value to the analog output.

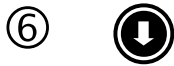
Caution! Parameterization can only be performed via the Energy Bus!

3.4 Control and display panel





3.4.1 Description of buttons and displays

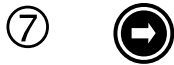
- ① L1 Three four-digit 7-segment displays for displaying measured, stored and programmed values (3-phase; L1-L2-L3)
 L2
 L3
- ② Starts the programming mode and switches between the places to be edited in ① and ⑨. Programmable places are flashing.
- ③ Changes the value of the flashing place in programming mode in ① or the decimal point in ① and the prefix of units in ⑨.
- ④ Display for saved minimum and maximum values.
 In programming mode, it enables saving the parameters or values that were entered..
- ⑤ Deletes the values displayed by , such as extreme values, energy etc. In programming mode you can use this button to cancel programming without applying any changes.



Selects one of the 11 main menus or jumps back to the current main menu item from a sub menu. Keep the key depressed to switch between the individual main menus automatically.

In programming mode you can use this button to switch between the input fields L1, L2 and L3.

Keep the button  depressed and press the button  to navigate backwards.



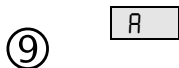
Jumps to the corresponding sub menus.



11 green LEDs indicate the main menus.

A permanent LED indicates the currently selected menu.

If an LED is flashing this indicates a limiting value violation in the corresponding menu. The LED is not flashing, however, if the limiting value violation occurred in the menu that is currently displayed.



The 4-digit 14-segment display for displaying information and dimensions of the values displayed in ①.

The display switches between the unit and the display MIN for minimum value or MAX for maximum value when reading the saved extreme values. This principle applies to other menus as well and will be described in the corresponding sections in this manual.

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4 OPERATION

4.1 Menu structure of MULTIMESS-Comfort

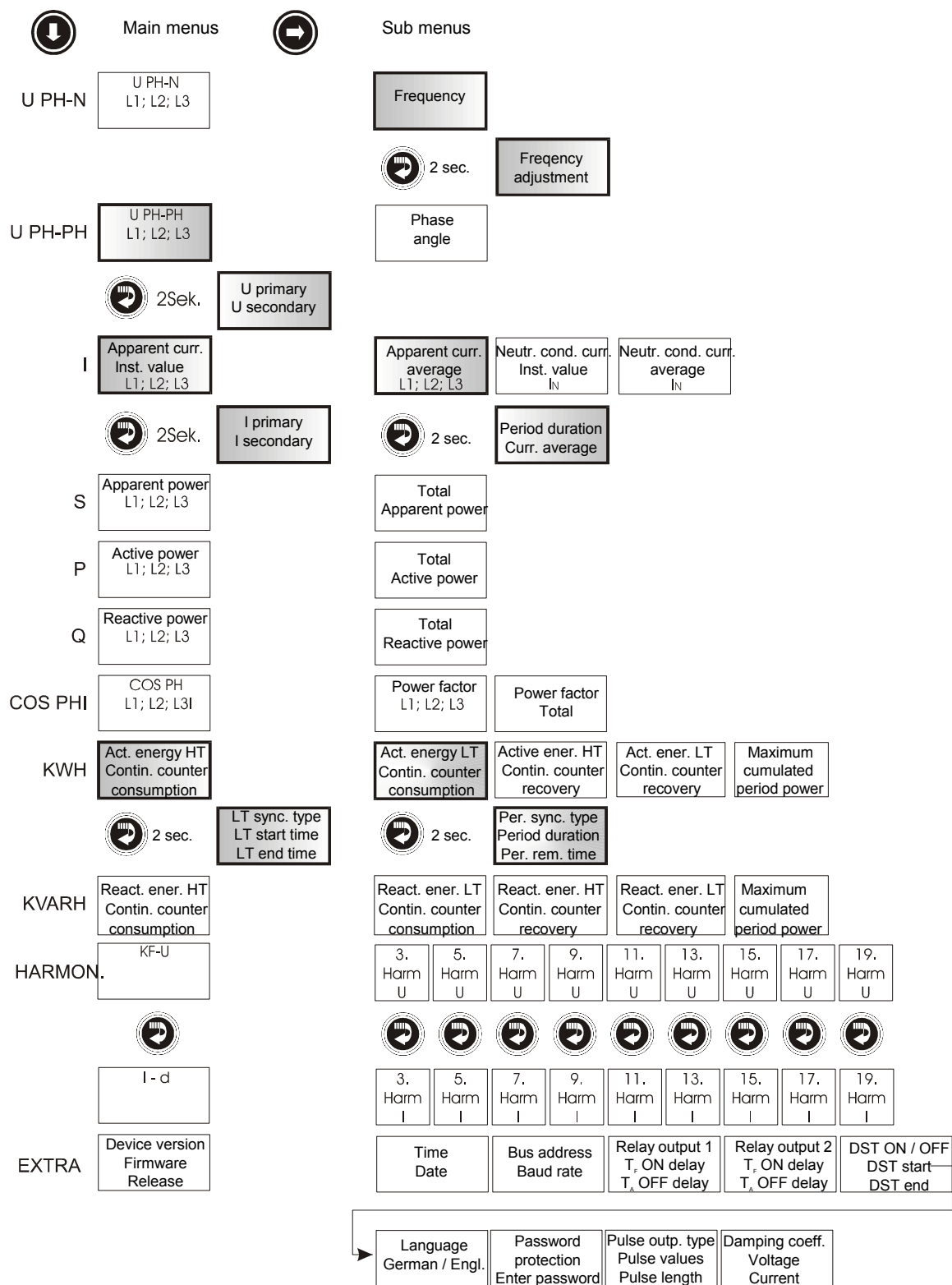


- Switches the main menus
They are indicated by a permanent LED
- The main menus are switched automatically if you keep the button depressed.
- Pressing this button within a submenu will return you immediately to the associated main menu and discards all modifications.



- Switches to the desired sub menu.
- Press this key to switch from the last sub menu back to the corresponding main menu.

4.2 Navigation and device displays



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5 SETTING PARAMETERS

5.1 General programming scheme

The programming scheme displayed below applies to all parameters to be programmed in each menu.



- Press this button for 2 seconds to switch to programming mode from a main or sub menu. The parameters that are set are displayed.
- Press this button again to activate the input mode for parameters.
- This button is also used for switching from one place to the next when entering values.



- Value input



- Press this button in programming mode to switch the input fields L1, L2 and L3.
- Also press this button to return to the main menu after you have saved changes or cancelled programming mode.





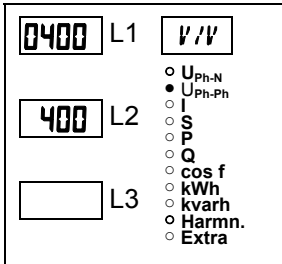
- This button is used to save changes.



- Press this button if you want to cancel the programming mode without applying any changes.

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5.2 U_{Ph-N} - Measuring reference voltage/Rated network voltage

| Menu | Button | Device display | Description |
|--|---|--|--|
| Main menu U_{Ph-Ph} Sub menu Voltage Set transformer ratio |  Keep button depressed for 2 seconds  Start input mode |  | When calling the menu, the following text will be displayed in the unit display: $V \cdot V$ VOLTAGE TRANSFORMER RATIO $UPRI \cdot USEC$ The display L1 displays the primary voltage. The display L2 displays the secondary voltage. |

| Menu | Button | Device display | Description |
|---|--|----------------|---|
| Sub menu Voltage Set transformer ratio | next digit cancel or save | | The first digit is flashing in display L1. Press the button to set the value of this digit. Press the button to switch to the next digit. If all digits have been set, the display L1 will be flashing. To move the decimal point, press the button . |
| Main menu U _{Ph-Ph} | or | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |

| Menu | Button | Device display | Description |
|--|--|----------------|--|
| Sub menu Voltage Set transformer ratio secondary | next digit cancel or save | | The first digit is flashing in display L2. Press the button to set the value of this digit. Press the button to switch to the next digit. Values between 1V and 600V are permissible. |
| Main menu U _{Ph-Ph} | or | | |

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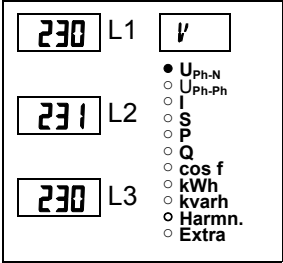
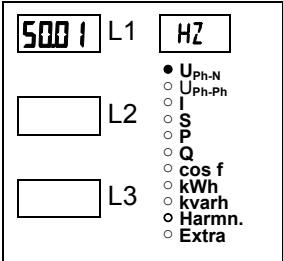


5.3 I – Current transformer transfer ratio

| Menu | Button | Device display | Description |
|--|---|----------------|---|
| Main menu | | | |
| Sub menu Current Set transformer ratio | Keep button depressed for 2 seconds | | When calling the menu, the following text will be displayed in the unit display: A A CURRENT TRANSFORMER IPRI I SEC The display L1 shows the primary current. The display L2 displays the secondary current. angezeigt |
| | | | |
| Sub menu Current Set transformer ratio primary | ... next digit cancel or save | | The first digit is flashing in display L1. Press the button to set the value of this digit. Press the button to switch to the next digit. If all digits have been set, the display L1 will be flashing. To move the decimal point, press the button . |
| Main menu | or | | |
| Note | or | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |
| Sub menu Current Set transformer ratio secondary | select ... cancel or save | | The first digit is flashing in display L2. Press to switch from 1A to 5A. |
| Main menu | or | | |


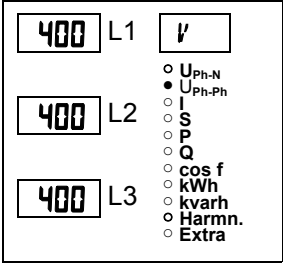
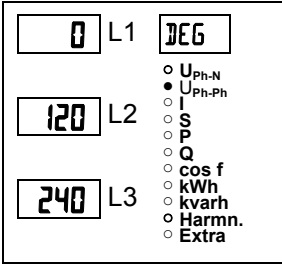


EDEBDA0046 / 2706-1 GB

6 DISPLAY FUNCTIONS


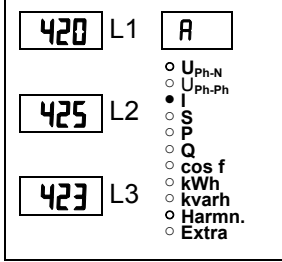


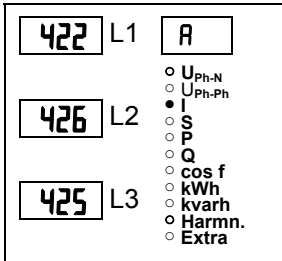
6.1 U_{PH-N} – Voltage phase to neutral, frequency

| Menu | Button | Device display | Description |
|--------------------------------|--|--|---|
| Main menu U _{Ph-N} |  next |  | <p>The three neutral conductor voltages UL1-N, UL2-N and UL3-N are shown in the displays L1 to L3.</p> <p>The unit display shows the unit for the voltage.</p> <p>The device switches from V to KV automatically.</p> |
| Sub menu Frequency | |  | Shows the current frequency in the display L1. |
| Main menu U _{Ph-N} |  or  | | |

6.2 U_{PH-PH} – Voltage phase to phase, Rotary field display

| Menu | Button | Device display | Description |
|---------------------------------|--|---|---|
| Main menu U _{Ph-Ph} |  next |  | <p>The three phase voltages U_{L1-L2}, U_{L2-L3} and U_{L3-L1} are shown in the displays L1 to L3.</p> <p>The unit display shows the unit for the voltage.</p> <p>The device switches from V to KV automatically.</p> |
| Sub menu Rotary field | |  | <p>The three rotary field angles of the voltages against each other are displayed.</p> <p>The unit display shows the unit "DEG".</p> |
| Main menu U _{Ph-Ph} |  or  | | |



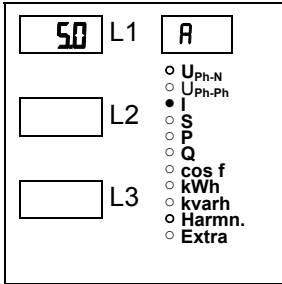


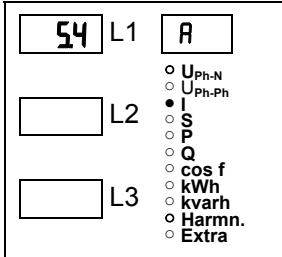
6.3 I / I_N – Current / Neutral conductor current, Instantaneous – Average value switch-over

| Menu | Button | Device display | Description |
|------------------------------------|---|---|---|
| Main menu I Instantaneous value |  |  | Displays the three conductor currents in the phases L1, L2 and L3. The values displayed are instantaneous values. The unit display switches from ACT to A . |
| Sub menu I Average value |  next or  back to the main menu |  | Anzeige der drei Leiterströme in den Phasen L1, L2 und L3. The values displayed are average values. The unit display switches from AVG to A . |


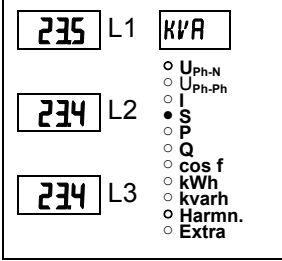

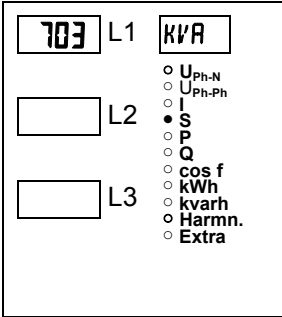




Note


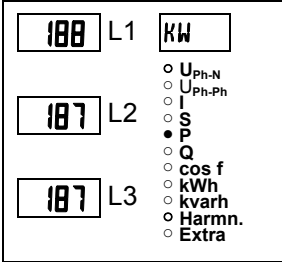

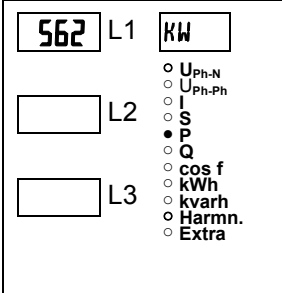


The signs in front of the value determine the energy flux direction.
A positive sign indicates energy consumption.
A negative sign indicates energy recovery.

| Menu | Button | Device display | Description |
|---|---|--|---|
| Sub menu I _N Neutral conductor current Instantaneous value |  oder  |  | The display L1 shows the instantaneous neutral conductor current. The unit display switches from NACT to A . |
| Main menu I Instantaneous value | | | |
| Sub menu I _N Neutral conductor current Average value |  next or  back to the main menu |  | The display L1 shows the average value of the neutral conductor current. The unit display switches from NAV to A . |

6.4 S – Apparent power / Total apparent power


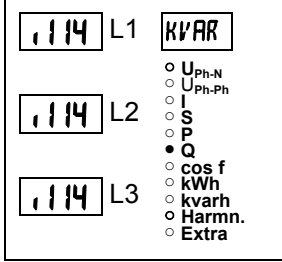

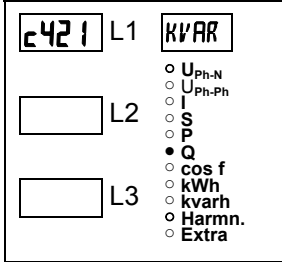


| Menu | Button | Device display | Description |
|----------------------------------|--|--|--|
| Main menu S Apparent power |  |  | <p>The apparent power of the three phases is shown in the displays L1 to L3.</p> <p>The unit display shows the unit "KVA".</p> <p>The device switches from VA to KVA or MVA automatically.</p> |
| Sub menu Total apparent power |  next |  | <p>Shows the total apparent power in the display L1.</p> <p>The unit display switches from STOT to KVA.</p> <p>The device switches from VA to KVA or MVA automatically.</p> |
| Main menu S Apparent power |  oder  | | |

6.5 P – Active power / Total active power

| Menu | Button | Device display | Description |
|--------------------------------|--|---|--|
| Main menu P Active power |  |  | <p>The active power of the three phases is shown in the displays L1 to L3.</p> <p>The unit display shows the unit "KW".</p> <p>The device switches from W to KW or MW automatically.</p> |
| Sub menu Total active power |  next |  | <p>Shows the total active power in the display L1.</p> <p>The unit display switches from PTOT to KW.</p> <p>The device switches from W to KW or MW automatically.</p> |
| Main menu P Active power |  or  | | |


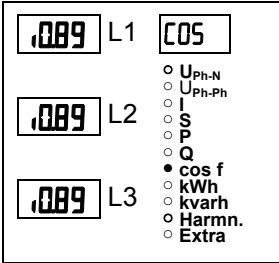



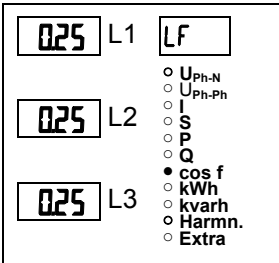
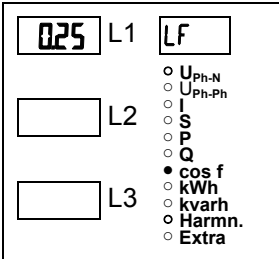


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6.6 Q – Reactive power / Total reactive power

| Menu | Button | Device display | Description |
|----------------------------------|--|---|--|
| Main menu Q Reactive power |  |  | The reactive power of the three phases is shown in the displays L1 to L3. An "i" in front of the value indicates inductive, a "c" capacitive reactive power. The unit display shows the unit "KVAR". The device switches from VAR to KVAR or MVAR automatically. |
| Sub menu Total reactive power |  next |  | Shows the total reactive power in the display L1. An "i" in front of the value indicates inductive, a "c" capacitive reactive power. The unit display switches from TOT to KVAR. The device switches from VAR to KVAR or MVAR automatically. |
| Main menu P Active power |  or  | | |


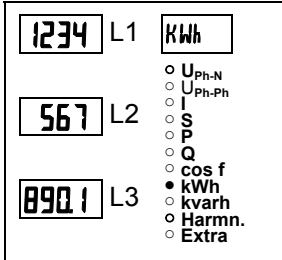


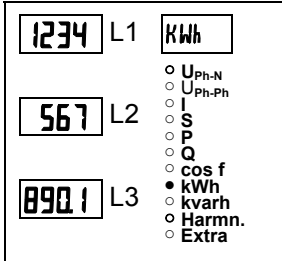


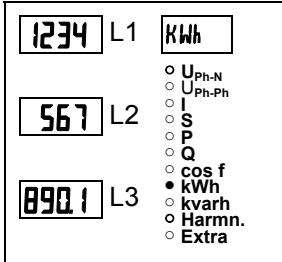


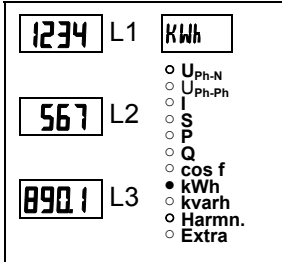
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6.7 Cos f - First harmonic power factor, PF, Cumulated PF

| Menu | Button | Device display | Description |
|--------------------------|---|---|---|
| Main menu cos φ |  |  | <p>Displays the cos f.</p> <p>Display L1 shows the cos f for the phase L1. (ι inductive, ϵ capacitive)</p> <p>Display L2 shows the cos f for the phase L2. (ι inductive, ϵ capacitive)</p> <p>Display L3 shows the cos f for the phase L3. (ι inductive, ϵ capacitive)</p> <p>The unit display shows COS.</p> <p>(The displayed cos f always refers to the fundamental harmonic)</p> |
| Sub menu PF |  weiter  next or  back to the main menu |  | <p>Display of the power factor PF.</p> <p>Display L1 shows the power factor 1 for the phase L1.</p> <p>Display L2 shows the power factor 2 for the phase L2.</p> <p>Display L3 shows the power factor 3 for the phase L3.</p> <p>The unit display shows PF.</p> |
| Sub menu Cumulated PF | |  | <p>Displays the cumulated power factor.</p> <p>The display L1 shows the cumulated power factor.</p> <p>The unit display switches from TOT to PF.</p> |
| Main menu cos φ |  or  | | |

EDED0046 / 2705-1 GB

6.8 kWh – Active energy HT/LT consumption and recovery, maximum cumulated active energy of the period

| Menu | Button | Device display | Description |
|--|---|--|--|
| Main menu kWh Active energy High tariff Consumption |  |  | Active energy counter for high tariff; The display L3-L1 shows the value of the continuous energy counter. The unit display switches from HT to kWh. 1234 Display L1 G Wh 456 Display L2 M Wh 789.1 Display L 3 k Wh |
| Sub menu kWh Active energy Low tariff Consumption |  next or  back to the main menu |  | Active energy counter for low tariff consumption The display L3-L1 shows the value of the continuous energy counter. The unit display switches from LT to kWh. 1234 Display L1 G Wh 456 Display L2 M Wh 789.1 Display L 3 k Wh |
| Sub menu kWh Active energy Recovery |  next or  back to the main menu |  | Active energy counter for high tariff recovery; The display L3-L1 shows the value of the continuous energy counter. The unit display alternates between HT and kWh. 1234 Display L1 G Wh 456 Display L2 M Wh 789.1 Display L 3 k Wh |
| Sub menu kWh Active energy Recovery |  next or  back to the main menu |  | Active energy counter for low tariff recovery; The display L3-L1 shows the value of the continuous energy counter. The unit display alternates between LT and kWh. 1234 Display L1 G Wh 456 Display L2 M Wh 789.1 Display L 3 k Wh |

EDEBDA0046 / 2706-1 GB

| Menu | Button | Device display | Description |
|--|--------|----------------|--|
| Sub menu Qcum-max Maximum cumulated period power | | | <p>When calling the menu, the following text will be displayed in the unit display: PCMX MAXIMUM CUMULATED POWER IN PERIOD</p> <p>Then the display alternates between PCMX and KWh.</p> <p>The display L1 shows the period value. The display L2 shows the exact time the maximum occurred (hh:mm) The display L3 shows day and month alternately with the year (dd.mm.yyyy).</p> |



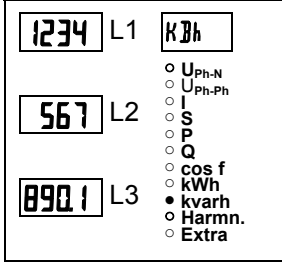


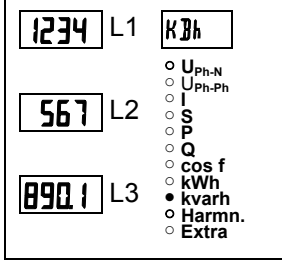
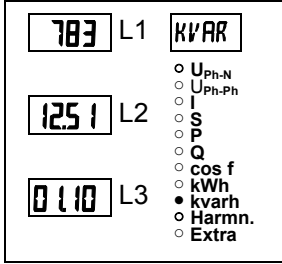


Main menu
kWh

or

6.9 kvarh – Reactive energy counter HT/LT consumption and recovery, maximum cumulated reactive power of the period

| Menu | Button | Device display | Description |
|---|--|----------------|--|
| Main menu kvarh Reactive energy High tariff Consumption | | | <p>Active energy counter for high tariff consumption</p> <p>The display L3-L1 shows the value of the continuous energy counter.</p> <p>The unit display alternates between HT and kWh.</p> <p>1234 Display L1 G Wh 456 Display L2 M Wh 789.1 Display L 3 k Wh</p> |
| Sub menu kvarh Reactive energy Low tariff Consumption | <p> next</p> <p>or</p> <p> back to the main menu</p> | | <p>Active energy counter for low tariff consumption;</p> <p>The display L3-L1 shows the value of the continuous energy counter.</p> <p>The unit display alternates between LT (L T) and kWh.</p> <p>1234 Display L1 G Wh 456 Display L2 M Wh 789.1 Display L 3 k Wh</p> |

EDED0046 / 2705-1 GB

| Menu | Button | Device display | Description |
|---|--|--|--|
| Submenu kvarh Reactive energy Recovery |  next or  back to the main menu |  | Reactive energy counter for high tariff recovery; The display L3-L1 shows the value of the continuous energy counter. The unit display alternates between NT (LT) and KWh . 1234 Display L1 G Wh 456 Display L2 M Wh 7891 Display L 3 k Wh |
| Submenu kvarh Reactive energy Low tariff Recovery |  next or  back to the main menu |  | Reactive energy counter for low tariff recovery; The display L3-L1 shows the value of the continuous energy counter. The unit display alternates between NT (LT) and KWh . 1234 Display L1 G Wh 456 Display L2 M Wh 7891 Display L 3 k Wh |
| Sub menu Qcum-max Maximum cumulated period power | |  | When calling the menu, the following text will be displayed in the unit display: QCMX MAXIMUM CUMULATED POWER IN PERIOD Then the display switches from QCMX to KVAR . The display L1 shows the period value. The display L2 shows the exact time the maximum occurred (hh:mm) The display L3 shows day and month alternately with the year (dd.mm.yyyy). |
| Main menu kWh |  or  | | |

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Note

The daily energy counters (active and reactive) of the unit may only be read out via the KBR Energy Bus by means of an optionally available software.

6.10 Harmon. – Distortion factor and partial oscillation of the network harmonics for current and voltage

| Menu | Button | Device display | Description |
|---|---|----------------|---|
| Main menu Harmon. Voltage Distortion factor | | | <p>The display L1 shows the distortion factor in % for the voltage of phase L1. The display L2 shows the distortion factor in % for the voltage of phase L2. The display L3 shows the distortion factor in % for the voltage of phase L3. The unit display switches from KF (\overline{IF}) to $\overline{A/A}$.</p> |
| | <p> next</p> <p>or</p> <p> switch to the harmonics of the current</p> | | |
| Sub menu 3 rd – 19 th harmon. | | | <p>Displays the 3rd harmonics. The display L1 shows the 3rd harmonics in % for the voltage of phase L1. The display L2 shows the 3rd harmonics in % for the voltage of phase L2. The display L3 shows the 3rd harmonics in % for the voltage of phase L3. The unit display switches from \overline{U} to $\overline{A/A}$. The following harmonics (5th – 19th) are displayed in the same manner. If e.g. the harmonics of current is displayed, the display switches from \overline{I} to \overline{A} or from \overline{Id} to \overline{A} if the distortion current is displayed.</p> |
| | <p> next</p> <p>or</p> <p> switch to the harmonics of the current</p> | | |
| | | | back to the main menu |


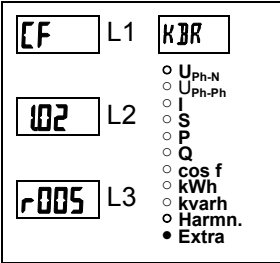



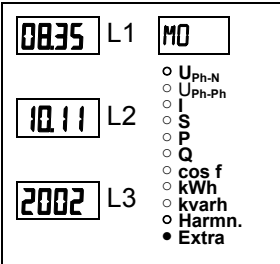


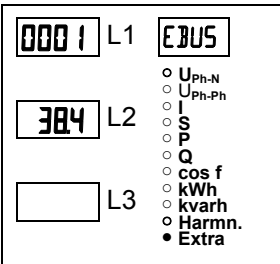


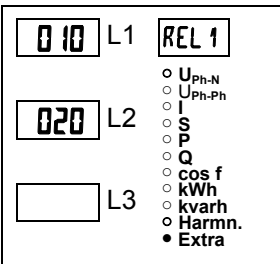


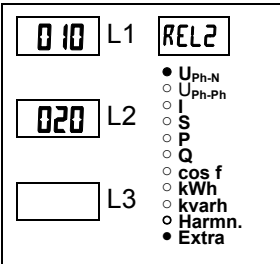
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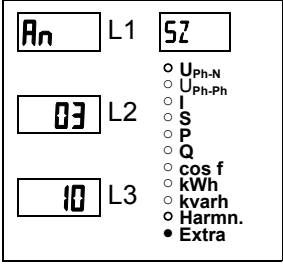


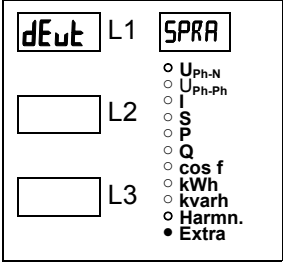


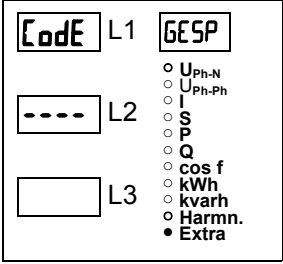


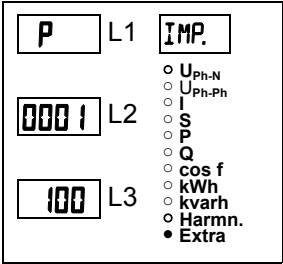


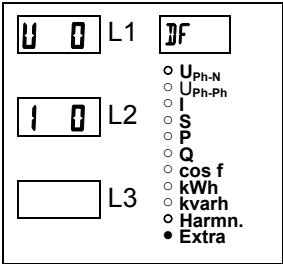


Note

Use the button to switch from the harmonics of the current to the harmonics of the voltage at any position in the menu.
 The current harmonics are displayed with the unit Ampere.

6.11 Extra




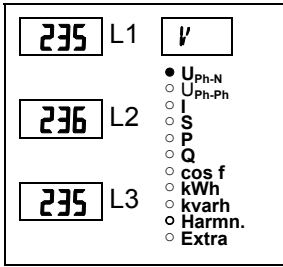


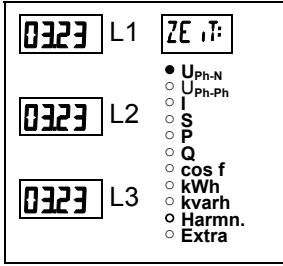


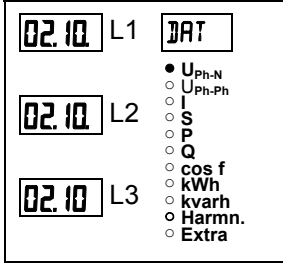


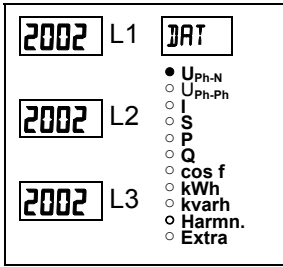

| Menu | Button | Device display | Description |
|---------------------------|---|--|--|
| Main menu Extra |  |  | <p>The display L1 shows the device type (here: Basic).</p> <p>The display L2 shows the version number.</p> <p>The display L3 shows the release number.</p> <p>The unit display shows the name of the device.</p> |
| |  next | | |
| Sub menu Date and time |  next or  back to the main menu |  | <p>The display L1 shows the time (hh.mm).</p> <p>The display L2 shows the date (dd.mm).</p> <p>The display L3 shows the year (yyyy).</p> <p>The unit display shows the day of the week.</p> |
| Sub menu E Bus |  next or  back to the main menu |  | <p>The display L1 shows the device address.</p> <p>The display L2 shows the baudrate.</p> <p>The unit display shows E BUS.</p> |
| Sub menu REL 1 |  next or  back to the main menu |  | <p>The display L1 shows the pickup delay for the relay 1 in seconds.</p> <p>The display L2 shows the release delay for the relay 25.40 mm seconds.</p> <p>The unit display switches from REL 1 to RELIN (REL).</p> |
| Sub menu REL 2 |  next or  back to the main menu |  | <p>The display L1 shows the pickup delay for the relay 2 in seconds.</p> <p>The display L2 shows the release delay for the relay 2 in seconds.</p> <p>The unit display switches from REL2 to RELIN (REL).</p> |

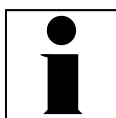
| Menu | Button | Device display | Description |
|----------------------------------|--|---|---|
| Sub menu Daylight saving time | <p>  next or  back to the main menu </p> |  | <p>The display L1 indicates whether daylight saving time is activated or not (here: An = yes).</p> <p>The display L2 shows the month daylight saving time begins.</p> <p>The display L3 shows the month daylight saving time ends.</p> <p>The unit display shows SOMMERZEIT (Daylight saving time) and then 5Z.</p> |
| Sub menu Language | <p>  next or  back to the main menu </p> |  | <p>The display L1 shows the device language.</p> <p>For German: dEut</p> <p>For English: EnGL</p> <p>The unit display shows SPRA if German is selected as the device language. LANG will be displayed for English.</p> |
| Sub menu Password | <p>  next or  back to the main menu </p> |  | <p>The display L1 shows Code.</p> <p>The unit display shows GESP or F rEI.</p> <p>In L2, the password can be entered. (4-digit code)</p> <p>The device is defaulted with the code 9999, i.e. all functions of the device are available.</p> |
| Sub menu Pulse output | <p>  next or  back to the main menu </p> |  | <p>The display L1 indicates whether the pulse output is deactivated (AUS) or configured for active (P) or reactive (Q) energy.</p> <p>The display L2 shows the pulse value, i.e. pulse/kWh or kVARh.</p> <p>The display L3 displays the energy pulse duration in msec.</p> |
| Sub menu Damping coefficient | <p>  or  </p> |  | <p>The display L1 shows the damping coefficient for acquiring the voltage.</p> <p>The display L2 shows the damping coefficient for calculating the current.</p> |

EDEBD00046 / 2705-1 GB


6.12 Maximum / Minimum values display

The following description shows the procedure for displaying extreme values using the display of maximum and minimum values for the phase voltage.

| Menu | Button | Device display | Description |
|--|--|--|---|
| Main menu U _{Ph-N} Voltage Maximum |   next or  back to the main menu |  | The maximum values that occurred for the phase voltages are displayed in the displays L1 to L3 for each phase. The unit display switches from MAX to V . |
| Voltage Maximum |  next or  back to the main menu |  | The time the maximum values occurred for the phase voltages are displayed in the displays L1 to L3. The unit display switches from MAX to TIME . |
| Voltage Maximum |  next or  back to the main menu |  | The day the maximum values occurred for the phase voltages are displayed in the displays L1 to L3. The unit display switches from MAX to DAT . |
| Voltage Maximum |  oder  |  | The year the maximum values occurred for the phase voltages are displayed in the displays L1 to L3. The unit display switches from MAX to DAT . |
| Main menu U _{Ph-N} |  | | |



Note

Use the button  to switch from maximum to minimum values at any position in the menu. Operation for reading the minimum values corresponds to reading the maximum values.


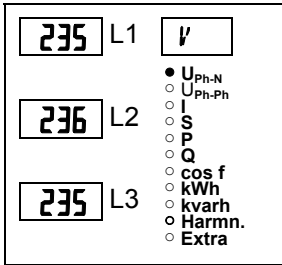

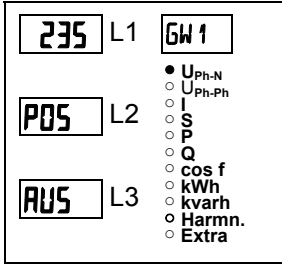


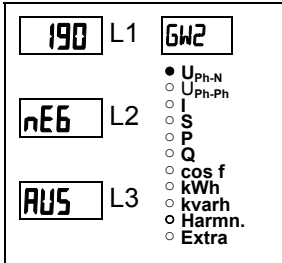
The following table gives an overview of all extreme values stored in MULTIMESS-Comfort.

Stored extreme values with date and time they occurred.

| Menu | Measured quantity | Stored extreme values | Text output in German and English |
|-----------------------------|--|--|-----------------------------------|
| Main menu U_{Ph-N} | Phase-to-neutral voltage | Minimum and maximum value for L1 – L2 – L3 with date and time | Min and Max |
| Sub menu F_{mains} | Netzfrequenz | Minimum and maximum value for L1 with date and time | Min and Max |
| Main menu U_{Ph-Ph} | Phase-to-phase voltage | Minimum and maximum value for L1 – L2 – L3 with date and time | Min and Max |
| Main menu I_{inst} | Instantaneous values for phase current | Minimum and maximum value for L1 – L2 – L3 with date and time | Min and Max |
| Sub menu $I_{average}$ | Average values for phase current | Minimum and maximum value for L1 – L2 – L3 with date and time | Min and Max |
| Sub menu I_{Ninst} | Instantaneous value of neutral conductor current | Minimum and maximum value for neutral conductor with date and time | Min and Max |
| Sub menu $I_{Naverage}$ | Average value of neutral conductor current | Minimum and maximum value for neutral conductor with date and time | Min and Max |
| Main menu S | Apparent power | Minimum and maximum value for L1 – L2 – L3 with date and time | Min and Max |
| Sub menu S_{tot} | Total apparent power | Minimum and maximum value for total apparent power with date and time | Min and Max |
| Main menu P | Active power | Minimum and maximum value for L1 – L2 – L3 with date and time | Min and Max |
| Sub menu P_{tot} | Total active power | Minimum and maximum value for total active power with date and time | Min and Max |
| Main menu Q | Blindleistung | Minimum and maximum value for L1 – L2 – L3 with date and time | Min and Max |
| Sub menu Q_{tot} | Total reactive power | Minimum and maximum value for total reactive power with date and time | Min and Max |
| Main menu $\cos \varphi$ | Fundamental power factor | Minimum and maximum value for L1 – L2 – L3 with date and time | Min and Max |
| Sub menu PF | Power factor | Minimum and maximum value for L1 – L2 – L3 with date and time | Min and Max |
| Sub menu Cumulated PF | Cumulated power factor | Minimum and maximum value for cumulated power factor with date and time | Min and Max |
| Main menu Harmon. | Harmonics | Maximum values of the distortion factor of the voltage and the 3rd – 19th harmonic as well as the current harmonic contents and their sum; L1–L3 | Max |

6.13 Displaying limiting values

The following section explains how to display the limiting values; the limiting values 1 and 2 of the phase-to-neutral voltage serve as an example.

| Menu | Button | Device display | Description |
|---|---|--|---|
| Main menu U _{Ph-N} Submenu Voltage Maximum |  |  | The maximum values that occurred for the phase voltages are displayed in the displays L1 to L3 for each phase. The unit display switches from MAX to V . |
| Sub menu Limiting value 1 |  Keep button depressed for 2 seconds |  | The display L1 shows the limiting value. The display L2 shows the direction of the limiting value. POS: Value may not exceed this limit NEG: Value may not fall below this limit OFF: Limiting value deactivated The display L3 shows the message type for the limiting value. OFF : Message only via the KBR Energy Bus rEL 1 : Additional message to relay 1 rEL 2 : Additional message to relay 2 A limit violation is always indicated by a flashing LED in the corresponding main menu. |
| Sub menu Limiting value 2 |  go to limiting value 2 or  back to the main menu |  | Corresponds to limiting value 1 |

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Note

If a relay is not configured as alarm relay, but as all-or-nothing relay (setting only possible via E Bus), L3 does not display anything.



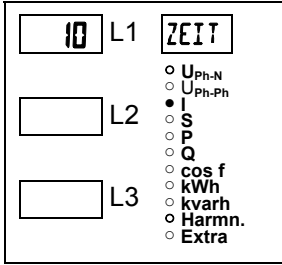




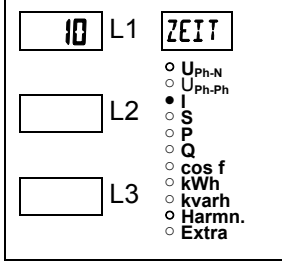




The following table gives an overview of all limiting values available in MULTIMESS-Comfort.

Programmable limiting values

| Menu | Measured quantity | Stored extreme values | Text output in German and English |
|-----------------------------|--|---|-----------------------------------|
| Main menu U_{Ph-N} | Phase-to-neutral voltage | Limit 1 and limit 2 for L1 – L2 – L3 | GW 1 and GW 2 Lim 1 and Lim 2 |
| Sub menu F_{mains} | Mains frequency | Limit 1 and limit 2 | GW 1 and GW 2 Lim 1 and Lim 2 |
| Main menu U_{Ph-Ph} | Phase-to-phase voltage | Limit 1 and limit 2 for L1 – L2 – L3 | GW 1 and GW 2 Lim 1 and Lim 2 |
| Main menu I_{inst} | Phase current instantaneous values | Limit 1 and limit 2 for L1 – L2 – L3 | GW 1 and GW 2 Lim 1 and Lim 2 |
| Sub menu $I_{average}$ | Average values for phase current | Limit 1 and limit 2 for L1 – L2 – L3 | GW 1 and GW 2 Lim 1 and Lim 2 |
| Sub menu I_{Ninst} | Instantaneous value of neutral conductor current | Limit 1 and limit 2 for neutral conductor current | GW 1 and GW 2 Lim 1 and Lim 2 |
| Sub menu $I_{Naverage}$ | Average value of neutral conductor current | Limit 1 and limit 2 for neutral conductor current | GW 1 and GW 2 Lim 1 and Lim 2 |
| Main menu S | Apparent power | Limit 1 and limit 2 for L1 – L2 – L3 | GW 1 and GW 2 Lim 1 and Lim 2 |
| Sub menu S_{tot} | Total apparent power | Limit 1 and limit 2 for total apparent power | GW 1 and GW 2 Lim 1 and Lim 2 |
| Main menu P | Active power | Limit 1 and limit 2 for L1 – L2 – L3 | GW 1 and GW 2 Lim 1 and Lim 2 |
| Sub menu P_{tot} | Total active power | Limit 1 and limit 2 for total active power | GW 1 and GW 2 Lim 1 and Lim 2 |
| Main menu Q | Reactive power | Limit 1 and limit 2 for L1 – L2 – L3 | GW 1 and GW 2 Lim 1 and Lim 2 |
| Sub menu Q_{tot} | Total reactive power | Limit 1 and limit 2 for total reactive power | GW 1 and GW 2 Lim 1 and Lim 2 |
| Main menu $\cos \varphi$ | Fundamental power factor | Limit 1 and limit 2 for L1 – L2 – L3 | GW 1 und GW 2 Lim 1 und Lim 2 |
| Sub menu PF | Power factor | Limit 1 and limit 2 for L1 – L2 – L3 | GW 1 and GW 2 Lim 1 and Lim 2 |
| Sub menu Cumulated PF | Cumulated power factor | Limit 1 and limit 2 for cumulated power factor | GW 1 and GW 2 Lim 1 and Lim 2 |
| Main menu Harmon. | Harmonics | Limit 1 and 2 of the distortion factor of the voltage and the 3 rd to 19 th mains harmonic for L1-L3 as well as the current harmonic contents and their sum L1-L3 | GW 1 and GW 2 Lim 1 and Lim 2 |



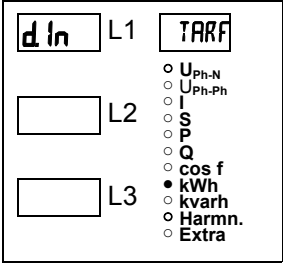
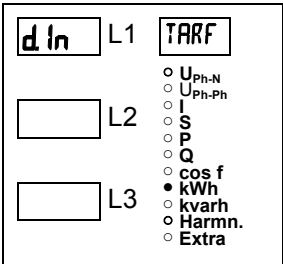








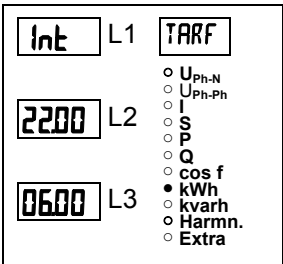





7 PROGRAMMING

7.1 Period time for average current value

| Menu | Button | Device display | Description |
|--|--|---|---|
| Sub menu I Average value | | | |
| Sub menu I Average value Period time |  Keep button depressed for 2 seconds  Start input mode |  | When calling the menu, the following text will be displayed in the unit display: TIME AVERAGE CURRENT TIME The period time in minutes is displayed in display 1. |
| Sub menu I Average value Set period time |   next digit  cancel or  save |  | The first digit is flashing in display L1. Press the button  to set the value of this digit. Press the button  to switch to the next digit. Value can be set between 1 and 15 minutes. |
| Main menu I |  or  | | |


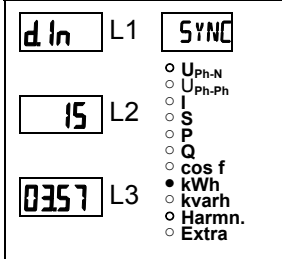






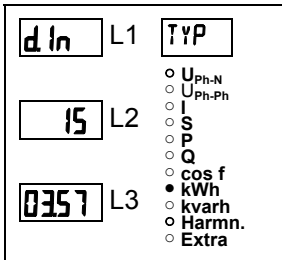

EDEBDA0046 / 2706-1 GB

7.2 Tariff switching method

| Menu | Button | Device display | Description |
|---|--|---|---|
| Main menu kWh / HT Sub menu kWh / HT Tariff switching method |  Keep button depressed for 2 seconds  Start input mode |  | When calling the menu, the following text will be displayed in the unit display: TARF LT TARIFF TIMES TARF The tariff switching method is displayed in the display L1. The following switching methods can be selected: |
| - d In by external pulse (Only MULTIMESS-Comfort) - bUS via Energy Bus command (Only MULTIMESS-Comfort) - Int by internal time program | <p style="text-align: center;">Only MULTIMESS-Comfort</p> Sub menu kWh / HT Set tariff switching method |  | The display L1 is flashing. Press  to switch the tariff switching modes mentioned above. The unit display switches from TARF to TYPE . |
| Main menu kWh |  cancel or  save  or  | | |
| Main menu kWh / HT Sub menu kWh / HT Set tariff switching time |  Set start time  L3 flashes  Set end time |  | The display L2 is flashing. Press the button  to set the start or end time. |
| Main menu kWh |  cancel or  save  or  | | |

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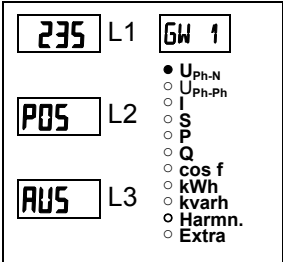




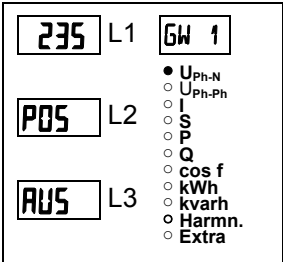










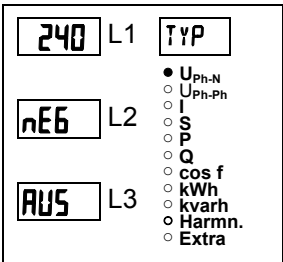




7.3 Measuring period synchronization

| Menu | Button | Device display | Description |
|---|--|--|---|
| Sub menu kWh / LT Sub menu kWh / LT Measuring period |  Keep button depressed for 2 seconds |  | <p>When calling the menu, the following text will be displayed in the unit display: SYNC PARAMETER SYNC</p> <p>The synchronization type will be displayed in the display L1.</p> <p>The display L2 displays the measuring period in minutes.</p> <p>The time remaining until the next synchronization will take place is indicated in the display L3 in minutes and seconds.</p> <p>The following synchronization types can be selected:</p> <ul style="list-style-type: none"> - Int by internal clock - d In by external contact - bUS by Energy Bus command - tARrF by tariff switching <p>Refer to chapter Measuring period synchronization.</p> |
| Sub menu kWh / LT Set measuring period synchronization |  Start input mode  nächster Modus  abbrechen oder  speichern  oder  |  | <p>The display L1 is flashing.</p> <p>Press  to switch the tariff switching modes mentioned above.</p> |
| Main menu kWh | | | |

EDEBDA0046 / 2706-1 GB

7.4 Programming limiting values

The following section explains how to parameterize the limiting values; the limiting values 1 and 2 of the phase-to-neutral voltage serve as an example.

| Menu | Button | Device display | Description |
|--|--|---|---|
| Sub menu Voltage U _{Ph-N} maximum |  Keep button depressed for 2 seconds  Start input mode |  | The display L1 shows the limiting value. The display L2 shows the direction of the limiting value. POS: Value may not exceed this limit NEG: Value may not fall below this limit OFF: Limiting value deactivated |
| Sub menu Voltage U _{Ph-N} Limiting value 1 Set value |   next digit  cancel or  save |  | The first digit is flashing in display L1. Press the button  to set the value of this digit. Press the button  to switch to the next digit. If all digits have been set, the display L1 will be flashing. To move the decimal point, press the button  . |
| Main menu U _{Ph-N} |  or  | | The unit display switches from GW 1 to V . |
| Note |  or  | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |
| Sub menu Voltage U _{Ph-N} Limiting value 1 Set direction |  . next mode  cancel or  save |  | The display L2 is flashing. Press the button Z to select whether the limiting value is to be activated when exceeded (POS) or when the value falls below the limit (NEG) or whether it should be locked (OFF). |
| Main menu U _{Ph-N} |  or  | | |
| Note |  or  | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |

| Menu | Button | Device display | Description |
|---|--|----------------|---|
| Sub menu Voltage U _{Ph-N} Limiting value 1 Set message type | next mode cancel or speichern | | The display L3 is flashing. Use the button to determine the message type for a limit violation: - Alarm on relay 1 (rEL 1) - Alarm on relay 2 (rEL 2) - Alarm only via KBR Energy Bus (OFF) |
| Main menu U _{Ph-N} | oder | | |




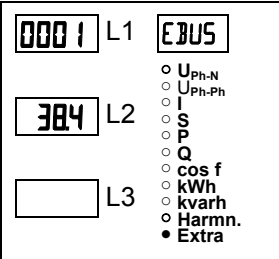

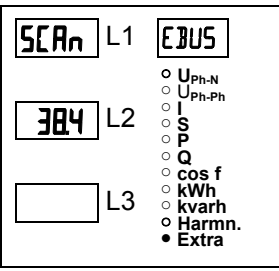






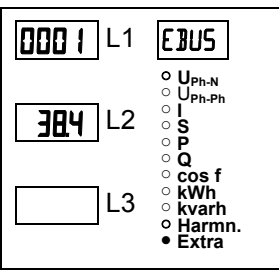







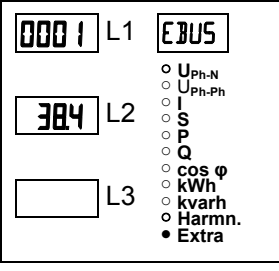



Note

f a relay is not configured as alarm relay, but as all-or-nothing relay, (can only be set via E Bus) L3 does not display anything.

7.5 Setting clock and date


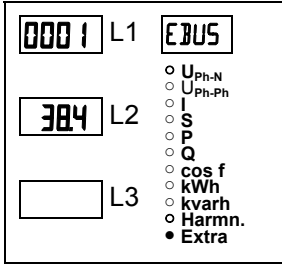

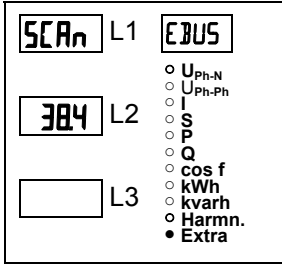




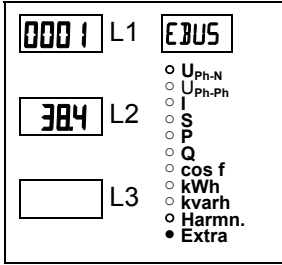



| Menu | Button | Device display | Description |
|-------------------------------|--|----------------|--|
| Sub menu Date and time | Start input mode | | The display L1 shows the time (hh.mm). The display L2 shows the date (dd.mm). The display L3 shows the year (yyyy). The unit display shows the day of the week. |
| Sub menu Set date and time | next digit cancel or save | | The first two digits in the display L1 are flashing. Use the button to set the values for these digits. Press the button to switch to the next digit. Proceed as described above to set the day of the week and the month in the display L2. The same applies to the year in the display L3. |
| Main menu Extra | or next | | |
| Note | or | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |

7.6 Setting bus address and baudrate

| Menu | Button | Device display | Description | | | | | | | | | | | | | | | | |
|---|--|---|---|-----|--------|-----|--------|------|--------|------|--------|------|--------|------|--------|-----|--------|--|--|
| Sub menu E Bus |  Start input mode (BUS Scan) |  | <p>The display L1 shows the device address.</p> <p>The baudrate is displayed in display L2.</p> | | | | | | | | | | | | | | | | |
| Sub menu E Bus Assign address |  Start input mode |  | <p>The display L1 indicates that the device is in scan mode.</p> <p>As soon as the device is recognized at the Bus, an address is assigned automatically by the software and the address is entered in the device memory.</p> <p>The baudrate is displayed in display L2.</p> | | | | | | | | | | | | | | | | |
| Note |  or  | | Use these buttons to switch the individual displays in input mode (a digit is flashing). | | | | | | | | | | | | | | | | |
| Sub menu Assign E Bus address manually |   next digit  cancel or  save |  | <p>The first digit is flashing in display L1.</p> <p>Press the button  to set the value of this digit.</p> <p>Press the button  to switch to the next digit.</p> | | | | | | | | | | | | | | | | |
| Main menu Extra |  or  next | | | | | | | | | | | | | | | | | | |
| Sub menu E Bus Assign baudrate |  next baudrate  cancel or  save |  | <p>The display L2 is flashing.</p> <p>Press the button  to select the baudrate.</p> <table border="0"> <tr> <td>4.8</td> <td>k Baud</td> <td>9.6</td> <td>k Baud</td> </tr> <tr> <td>14.4</td> <td>k Baud</td> <td>19.2</td> <td>k Baud</td> </tr> <tr> <td>38.4</td> <td>k Baud</td> <td>57.6</td> <td>k Baud</td> </tr> <tr> <td>115</td> <td>k Baud</td> <td></td> <td></td> </tr> </table> | 4.8 | k Baud | 9.6 | k Baud | 14.4 | k Baud | 19.2 | k Baud | 38.4 | k Baud | 57.6 | k Baud | 115 | k Baud | | |
| 4.8 | k Baud | 9.6 | k Baud | | | | | | | | | | | | | | | | |
| 14.4 | k Baud | 19.2 | k Baud | | | | | | | | | | | | | | | | |
| 38.4 | k Baud | 57.6 | k Baud | | | | | | | | | | | | | | | | |
| 115 | k Baud | | | | | | | | | | | | | | | | | | |
| Main menu Extra |  or  next | | | | | | | | | | | | | | | | | | |


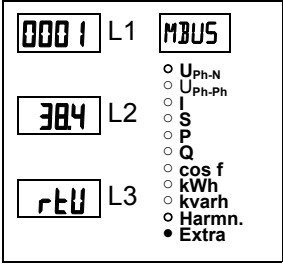






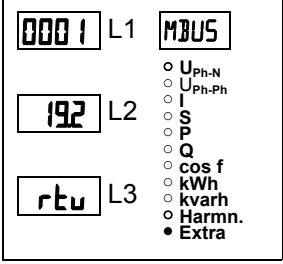







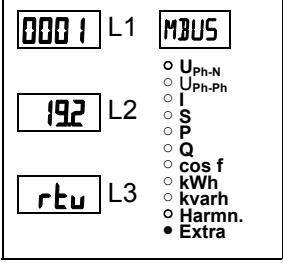







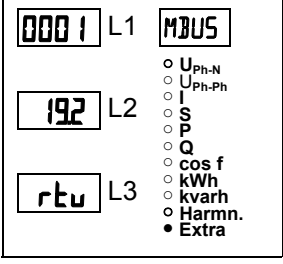

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7.7 Setting the bus protocol

| Menu | Button | Device display | Description |
|--|--|---|--|
| Sub menu E Bus |  Start input mode (BUS Scan) |  | <p>The display L1 shows the device address.</p> <p>Display L2 shows shows the baudrate</p> <p>The Unit display shows the current bus protocol. (z. B. E-Bus)</p> |
| Sub menu E Bus Assign address |  Start input mode |  | <p>The first digit is flashing in display L1.</p> <p>The input mode to set the bus protocol is started using the button .</p> |
| Sub menu E Bus Assign bus protocol |   ...  Selection |  | <p>The display L1 shows the device address.</p> <p>The baudrate is displayed in display L2.</p> <p>The unit display flashes. Using the button  four different bus protocols can be chosen. (E-Bus or Mod-Bus)</p> |
| Main menu Extra |  cancel or  save | | |

EDEBDA0046 / 2706-1 GB

7.8 Set bus address and baudrate for MOD Bus

| Menu | Button | Device display | Description |
|--|---|---|--|
| Sub menu MOD Bus |  Start input mode |  | <p>The display L1 shows the device address.</p> <p>Display L2 shows the baudrate</p> <p>Display L3 shows the configured bus protocol (RTU or ASC)</p> |
| Sub menu MOD Bus assign address |   next digit  cancel or  save  or  next |  | <p>The first digit is flashing in display L1.</p> <p>Press the button  to set the value of this digit.</p> <p>Press the button  to switch to the next digit.</p> |
| Main menu Extra | | | |
| Sub menu MOD Bus Assign baudrate |  next baudrate  cancel or  save  or  next |  | <p>The display L2 is flashing.</p> <p>Using the button  different baudrates with the respective parity event / odd or no Parity can be selected.</p> <p>4.8 k Baud 9.6 k Baud 19.2 K Baud</p> |
| Main menu Extra | | | |
| Submenu MOD Bus Assign transfer mode |  next baudrate  cancel or  selection  save  or  next |  | <p>The display L3 is flashing.</p> <p>Use the  button to select the different modes (RTU or ASC).</p> |
| Main menu Extra | | | |

EDEBD00046 / 2705-1 GB

7.9 Setting pickup and release delay of the relays

| Menu | Button | Device display | Description |
|--|--|----------------|--|
| Sub menu REL 1 | Start input mode | | <p>The display L1 shows the pickup delay for the relay 1 in seconds.</p> <p>The display L2 shows the release delay for the relay 25.40 mm seconds.</p> <p>The unit display switches from REL 1 to LEIN (LEIN).</p> |
| Sub menu REL 1 Set pickup delay | next digit cancel or save | | <p>The first digit is flashing in display L1.</p> <p>Press the button to set the value of this digit. (Max 255 sec.)</p> <p>Press the button to switch to the next digit.</p> |
| Main menu Extra | or next | | |
| Note | or | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |
| Sub menu REL 1 Set release delay | next digit cancel or save | | <p>The first digit is flashing in display L2.</p> <p>Press the button to set the value of this digit. (Max 255 sec.)</p> <p>Press the button to switch to the next digit.</p> |
| Main menu Extra | or next | | <p>When assigned as all-or-nothing relay, display L1 shows ----, while L2 shows ---- and L3 shows bUS.</p> <p>Parameters can only be set via E Bus with optional software.</p> |


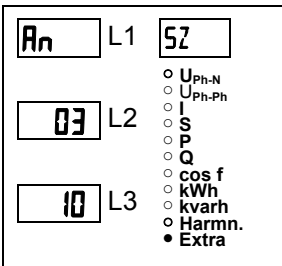




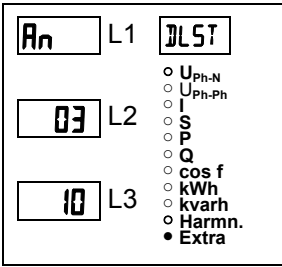









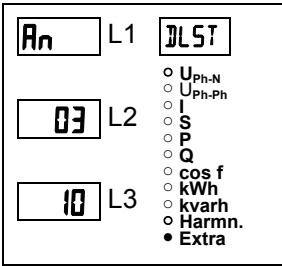





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Note

The settings for the relay 2 correspond to that of the relay 1 described above.

7.10 Activating daylight saving time

| Menu | Button | Device display | Description |
|---|--|---|---|
| Sub menu Daylight saving time |  |  | <p>The display L1 indicates whether daylight saving time is activated or not (here: An = yes).</p> <p>The display L2 shows the month daylight saving time begins.</p> <p>The display L3 shows the month daylight saving time ends.</p> <p>The unit display shows SOMMERZEIT (Daylight saving time) and then SZ.</p> |
| Sub menu Set daylight saving time |   next display  cancel or  save |  | <p>The display L1 is flashing.</p> <p>Press the button  to activate (On) or deactivate (OFF) daylight saving time.</p> |
| Main menu Extra |  or  next | | |
| Note |  or  | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |
| Sub menu Set daylight saving time Begin |   next display  cancel or  save |  | <p>The display L2 is flashing.</p> <p>Press the button  to set the month daylight saving time begins.</p> <p>The unit display alternately shows DEG and DST.</p> |
| Main menu Extra |  or  next | | |
| Note |  or  | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |

EDEBDAA0046 / 2705-1 GB


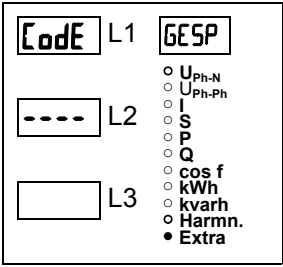





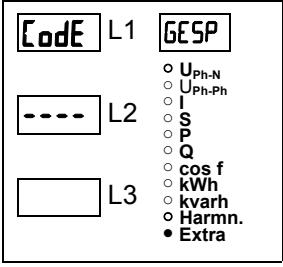




| Menu | Button | Device display | Description |
|---|--|----------------|--|
| Sub menu Set daylight saving time End | next display cancel or save | | The display L3 is flashing. Press the button to set the month daylight saving time ends. The unit display alternately shows EN and DLST . |
| Main menu Extra | or next | | |

7.11 Language settings

| Menu | Button | Device display | Description |
|--------------------------|----------------------------------|----------------|---|
| Sub menu Language | Start input mode | | The display L1 is flashing. For German: dEut For English: EnGL The unit display shows SPRA for German user interface language. LANG will be displayed for English. |
| Sub menu Set language | cancel or save | | The display L1 shows the device language. Press the button to select the operating language. For German: dEut For English: EnGL The unit display shows SPRA if German is selected as the device language. LANG will be displayed for English. |
| Main menu Extra | or next | | |


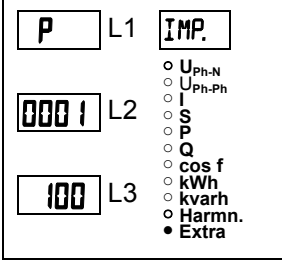
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7.12 Password

| Menu | Button | Device display | Description |
|-------------------------------|---|---|--|
| Sub menu Password |  |  | <p>The display L1 shows Code.</p> <p>The unit display shows GESP or F rEI.</p> <p>L2 shows ----.</p> <p>The device is defaulted with the code 9999, i.e. all functions of the device are available.</p> |
| Sub menu Password Input |    or  or  |  | <p>The display L1 shows Code.</p> <p>The unit display shows GESP or F rEI.</p> <p>L2 shows 9999.</p> <p>The display L2 is flashing.</p> <p>Press the button  to set the value of this digit.</p> <p>Press the button  to switch to the next digit.</p> |
| Main menu Extra |  or  | | |

EDEBD00046 / 2705-1 GB

7.13 Programming the pulse output

| Menu | Button | Device display | Description |
|--------------------------|---|---|--|
| Sub menu Pulse output |  |  | <p>Display L1 zeigt ob der Impulsausgang deaktiviert (AUS) oder für Wirk- (P) bzw. für Blindarbeit (Q) konfiguriert ist</p> <p>The display L2 shows the pulse value, i.e. pulse/kWh or kVARh.</p> <p>The display L3 displays the energy pulse duration in msec.</p> |

| Menu | Button | Device display | Description |
|--|--|----------------|--|
| Sub menu Pulse output Set pulse source | next mode cancel or save | | When calling the menu, the following text will be displayed in the unit display: SOUR SOURCE SOUR The display L1 will be flashing. Press the button to select the active energy (P consumption or recovery), the reactive energy (Q consumption or recovery) or deactivate (OFF) the energy pulse. |
| Main menu Extra | or next | | |
| Note | or | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |
| Sub menu Pulse output Set pulse value | next digit cancel or save | | When calling the menu, the following text will be displayed in the unit display: VAL VALUE VAL The first digit is flashing in display L2. Press the button to set the value of this digit. Press the button to switch to the next digit. |
| Main menu Extra | or next | | |
| Note | or | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |
| Sub menu Pulse output Set pulse duration | next digit cancel or save | | When calling the menu, the following text will be displayed in the unit display: DUR DURATION DUR The first digit is flashing in display L3. Press the button to set the value of this digit. Press the button to switch to the next digit. |
| Main menu Extra | or next | | |

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Note

If the LED "Extra" flashes after entering the pulse values, please observe the following procedure.


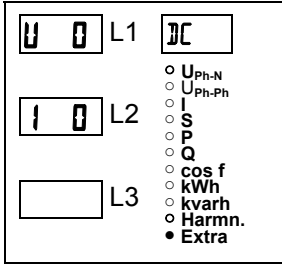





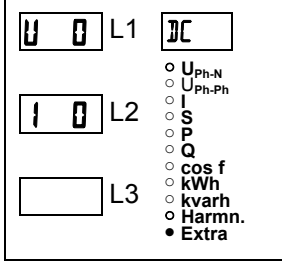








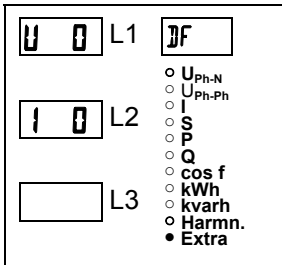

Check the pulse significance with reference to the pulse duration. Correct the pulse length or the pulse significance, if required.

The active or reactive energy that can be processed at the max. can be estimated by means of the following calculation.

$$\frac{3600s}{2 * IL * IP / kWh(k var h)} = \textit{Maximal Wert}$$

Explanation:

- 3600 Constant [s]
- IL Required pulse length [s]
- IP/kWh(kvarh) Required pulse length per kWh or per kvarh [P/kWh or P/kvarh]
- Maximum Maximum output active or reactive energy [kWh or kvarh]. Damping coefficient

| Menu | Button | Device display | Description |
|---|---|--|---|
| Sub menu Damping coefficient |  Start input mode |  | The display L1 shows the damping coefficient for acquiring the voltage. The display L2 shows the damping coefficient for acquiring the current. |
| Sub menu Damping coefficient Set voltage |   cancel or  save  or  next |  | When calling the menu, the following text will be displayed in the unit display: DAMPING COEFFICIENT DC The first digit is flashing in display L1. Press the button  to set the value of this digit. Range of values: 0 – 8 |
| Main menu Extra | | | |
| Note |  or  | | Use these buttons to switch the individual displays in input mode (a digit is flashing). |
| Sub menu Damping coefficient Set current |   cancel or  save  or  next |  | The last digit is flashing in display L2. Press the button  to set the value of this digit. Range of values: 0 – 8 |
| Main menu Extra | | | |

EDEBDA0046 / 2706-1 GB

8 RESET AND DELETE FUNCTIONS

8.1 Reset



Reset should only be carried out during setup and when the device is completely reprogrammed. Caution! Reset will reset all programmed values to their default settings!!!

Disconnect the device from supply voltage!

Keep the buttons depressed and connect the device to the supply voltage. The 14-segment display will alternately show ---- -> KILL -> ----

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

This includes all operating parameters, limiting and extreme values as well as the release 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.

Check all operating parameters for correctness!

Default settings can be found in chapter 10.10

8.2 Delete energy count

8.2.1 Delete energy count manually


Keep the button  depressed for approximately 2 seconds to delete the value that is currently displayed in the continuous energy count (active or reactive energy, HT or LT, consumption or recovery).

8.2.2 Delete energy count centrally



All energy counters at a time can only be deleted by a device reset or with the software optionally available via the KBR Energy Bus.

8.3 Deleting extreme values

8.3.1 Delete extreme values manually

Press the button  for approximately 2 seconds to delete the extreme values (minimum or maximum values) currently displayed.

8.3.2 Delete extreme values centrally

If you want to delete all minimum and maximum values, keep the buttons  and  depressed for approximately 2 seconds while any minimum or maximum value is being displayed. The function is also available via the KBR Energy Bus.

8.4 Deleting limiting value settings

8.4.1 Delete limiting value settings manually

Deactivating individual limiting values is only enabled in programming mode. Set the type of the limiting value you want to deactivate to "OFF" while in programming mode.

8.4.2 Delete limiting value settings centrally

If you want to delete all limiting values, keep the buttons  and  depressed for approximately 2 seconds while any limiting value is being displayed. The function is also available via the KBR Energy Bus.

9 MEMORY FUNCTIONS

9.1 Device settings

All device settings and parameter data for storage utilization are stored in the device.

9.1.1 Device basic parameters

| Parameters | Stored by user |
|--|---|
| Measuring voltage | programmable by user from 0001V ... 999.9 kV |
| Measuring current; transformer primary current | programmable by user from 0001A ... 999.9 kA |
| Measuring current (at device input, i.e. transformer secondary!) | can be selected by user: 1A or 5A |
| Pulse output type / pulse significance / pulse length | acc. to user settings |
| Tariff switching | user can select digital input, switching via Energy Bus or at times programmed in the device |
| Synchronization settings | Options for settings – cf. chapter 9.1.3 Measuring period synchronization |
| Bus address | acc. to user settings between 0001 and 9999 |
| Time | acc. to user settings in hh:mm:ss |
| Password | acc. to user settings Password is a 4-digit number (leading zeros) 9999 means: Device is not password-protected |
| Device name | any name chosen by the user ^{1*)} |
| Event name | an individual designation is assigned to every event ^{1*)} |
| Measuring period | 1 / 15 / 30 / 60 min. ^{1*)} |
| Analog outputs | Can be set by user as 0-10V, 2-10V, 0-20mA or 4-20mA. ^{1*)} |

1*) This function can only be set by means of the PC with optionally available software (e.g. Visual Energy).

9.1.2 Long-term memory

The MULTIMESS-Comfort offers the user the long-term memory described in the following section.

9.1.2.1 Load profile memory

The measuring device disposes of a load profile memory which can record up to a maximum of 35040 entries depending on the number of parameters to be saved (active power periods for HT and LT, consumption and recovery, reactive power periods for HT and LT, capacitive and inductive) and a measuring period that can be selected by the user (possible period values 60 / 30 / 15 / 1 minutes).

This means that a period of 15 min. results in a storage duration of 365 days max.

The measuring period and the selection of the parameters to be saved can be parameterized via the PC with optionally available software.



Note

Setting the device internal clock

If the time of the MULTIMESS-Comfort is adjusted by less than the duration of one period, the measurement for the instantaneous period is finished at the next synchronization event and saved. If the time of the MULTIMESS-Comfort is adjusted by more than the duration of one period, the load profile memory is deleted and restarted.

In both cases, a clock adjustment event is created and saved in the event memory.

Adjusting the period duration

If the period duration is adjusted, the load profile memory is deleted and restarted.

An adjustment event (adjustment of the parameters) is created and entered in the event memory.

9.1.2.2 Annual energy memory

The daily energy values of the past 365 days for W_{Act} consumption, W_{Act} output, W_{React} inductive and W_{React} capacitive are stored in an annual energy memory separated for high and low tariff.

9.1.2.3 Event memory

The event memory saves 4096 events with date, time and status in a ring buffer.

The following events are acquired:

| Event | Acquisition |
|--|--|
| | |
| Tariff input | Switchover signal HT => LT with date and time Switchover signal LT => HT with date and time |
| Sync input | Intermediate synchronization with date and time, specification of synchronization type |
| Mains failures | with date, time and duration of the mains failure |
| Error | Error type with date and time |
| Changes in the settings / deletions (Powerfail entry) | e.g. reset via EBUS / set clock / deletions / parameter changes leading to deletions |
| Measuring voltage failures | In case the failure lasts for more than 20 ms and results in a 100% voltage dip |



Note

The described memories can only be read or parameterized via the Energy Bus by means of optionally available software (e.g. Visual Energy).

9.1.3 Measuring period synchronization

Measuring period synchronization of the MULTIMESS-Comfort can be carried out in four ways, while the measuring period duration can be adjusted as described in chapter 9.1.2.1 Load profile memory. The measuring period duration and the synchronization always affect all period values.

The following 4 types of synchronization are possible:

9.1.3.1 Synchronization only by internal clock.

The synchronization by internal clock is started with the manufacturer's reset. From this time onwards, the clock synchronizes the measuring period every 15 minutes.

9.1.3.2 Synchronizing with energy supplier synchronous pulse

If the synchronous pulse is available as floating contact from the energy supplier, it can be connected to the synchronization input. If the contact closes for at least 30 ms, it will be recognized as synchronous pulse and the measuring period is restarted.

Under certain operating conditions, the energy supplier may carry out an intermediate synchronization while a measuring period is still running. The MULTIMESS-Comfort will terminate the running period measurement and save the period value with a time stamp. The time pattern is shifted to the new start time and a new measurement is started immediately.

Example:

Period duration is set to 15 min

i.e. 20 kW input power results in a period value of 20 kW (15 min period)

if there is an intermediate synchronization 3 min after period start and this 3 min period is saved, the period value to be recorded will be 4 kW.

If the energy supplier's synchronous pulse is not available the status message "ext. synchronous pulse missing" is issued and the internal clock continues the time frame.

9.1.3.3 Synchronization by KBR ENERGY BUS

Synchronization is carried out via a telegram created either by the PC or by the MULTIMASTER and sent via the KBR ENERGY BUS to the selected recipients.

Under certain operating conditions, an intermediate synchronization may be carried out while a measuring period is still running. The MULTIMESS-Comfort will terminate the running period measurement and save the period value with a time stamp. The time pattern is shifted to the new start time and a new measurement is started immediately.

Example:

Period duration is set to 15 min

i.e. 20 kW input power results in a period value of 20 kW (15 min period)

if there is an intermediate synchronization 3 min after period start and this 3 min period is saved, the period value to be recorded will be 4 kW.

If the bus's synchronous pulse is not available the status message "ext. synchronous pulse missing" is issued and the internal clock continues the time frame.

9.1.3.4 Synchronization when tariffs are changed

This type of synchronization makes it possible for the measuring unit to change tariffs immediately after the tariff HT/LT has been switched instead of waiting until the end of the measuring period.

The internal clock synchronizes the measuring period. If the tariff is changed, depending on the configuration by contact at the HT/LT input or by bus signal, this event will additionally synchronize the measuring period.

Under certain operating conditions, the synchronization pulse and the internal measuring period synchronization may not be in accordance with the same time pattern. The MULTIMESS-Comfort will terminate the running period measurement and save the period value with a time stamp. The time pattern is shifted to the new start time and a new measurement is started immediately.

Example:

Period duration is set to 15 min

i.e. 20 kW input power results in a period value of 20 kW (15 min period)

if synchronization is carried out 3 min after period start and if this 3 min period is saved,

the period value to be recorded will be 4 kW.

10 TECHNICAL DATA

10.1 Measuring and display values

| | | |
|--------------------------------|--------------------------------------|--|
| Waveform for U and I | | any |
| Voltage | Actual 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 automatically |
| | Measuring range | 0.00kV to 999.9kV |
| Current (apparent current) | Actual value of a measuring interval | $I_{L1\ Inst}; I_{L2\ Inst}; I_{L3\ Inst}$; Instantaneous value for each phase |
| | Average value formation | IL1 Av; IL2 Av; IL3 Av; floating average value from actual values over a programmable period of time. |
| | Units | [A;kA;MA] display is switched automatically |
| | Measuring range | 0.00A to 999.9kA |
| Neutral conductor current | Actual value of a measuring interval | IN Inst / IN Av Instantaneous and average value – cf. "Phase current" |
| | Units | [A;kA;MA] display is switched automatically |
| | Measuring range | 0.00A to 1.2 MA |
| Frequency | Mains frequency measurement | f_{Netz} ; measured with mains correction |
| | Units | [Hz] |
| | Measuring range | 40....70Hz |
| Apparent power | Calculation | $S_{L1}; S_{L2}; S_{L3}; S_{tot}$ |
| | Units | [VA; kVA; MVA] display is switched 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 automatically |
| | Measuring range | 0.00W to 999MW |
| Reactive power | Calculation → ind. & cap. | $Q_{L1}; Q_{L2}; Q_{L3}; Q_{tot}$; ind./cap. differentiated |
| | Units | [VAR; kVA; MVAR] display is switched automatically |
| | Measuring range | 0.00VAR to 999MVAR |
| Power factor | Calculation → ind. & cap. | $\cos\phi_{L1}; \cos\phi_{L2}; \cos\phi_{L3}; LF_{L1}; LF_{L2}; LF_{L3}; LF_{tot}$; ind./cap. differentiated on the display |
| | Measuring range | CosPhi 0.1ind. ← 1 → 0.1cap., PF 0.1 - 1 |
| Active energy | Calculation | W (HT/LT); $P_{average\ max.}$ of a measuring period |
| | Units | [Wh; kWh; MWh] display is switched automatically |
| | Measuring range | 0.0kWh to 9999999999.9kWh |
| Reactive energy | Calculation | $W_{react.}$ (HT/LT); $Q_{average\ max.}$ of a measuring period; |
| | Units | [VARh; kVARh; MVARh] display is switched automatically |
| | Measuring range | 0.0kvarh to 9999999999.9kvarh |
| Harmonics | Distortion factor for voltage | Voltage: $DF-U_{L1}; DF-U_{L2}; DF-U_{L3}$ |
| | Partial distortion factors | 3.; 5.; 7.; 9.; 11.; 13.; 15.; 17. and 19 th harmonic of the voltage |
| | Units | [%] |
| | Measuring range | 0.00% to 100% |
| Harm. Harmonics of the current | Current harmonics | 3.; 5.; 7.; 9.; 11.; 13.; 15.; 17. and 19 th harmonics for each phase |
| | Total of the current harmonics | Current: $I_{totL1}; I_{totL2}; I_{totL3}$ for each phase separately |
| | Units | [A] |
| | Measuring range | 0.00A to 999.9kA |

10.2 Measuring accuracy

| | |
|----------------|------------------------------|
| Current | $\pm 0.5\%$ / ± 1 digit |
| Voltage | $\pm 0.5\%$ / ± 1 digit |
| Apparent power | $\pm 1\%$ / ± 1 digit |
| Active power | $\pm 1\%$ / ± 1 digit |
| Reactive power | $\pm 1\%$ / ± 1 digit |
| Power factor | $\pm 1\%$ / ± 1 digit |
| Frequency | ± 0.1 Hz / ± 1 digit |

10.3 Measuring principle

| | |
|---|---|
| Reading | 128 values per period |
| A/D converter | 10 Bit |
| Measuring U and I | acquiring measuring values for U and I simultaneously; |
| Update speed (complete measurement cycle) | ~ 330 ms |
| Calculation of harmonics | DFT with 128 points over one period |
| Frequency measurement | Mode: Voltage measured between phase L1, L2, L3 – N; correct frequency measurement due to mains correction |

10.4 Device memory

| | |
|---|--|
| Main and data memory | 2 MB RAM battery 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) for consumption and recovery |
| Long-term memory for 1460 / 730 / 365 days / 583 hours | 60 / 30 / 15 / 1-minute – average values of: P_{total} ; Q_{total} |
| Extreme values (Max./Min.) | extreme values that occurred after connection to mains or after the extreme value memory has been deleted manually including date and time |
| Event memory: | Memory size |
| | 4096 events including date and time they occurred |
| Limit violation | Time for acquisition |
| | ≥ 550 ms |
| Voltage dips | Time for acquisition |
| | > 20 ms, in case of a power failure, threshold can be set via PC, default after reset 93 V |
| Battery life | approx. 5 years, according to manufacturer |

10.5 Power supply

| | |
|--------------|-----------------------|
| Power supply | 85 – 265V AC/DC; 15VA |
|--------------|-----------------------|

10.6 Hardware – Inputs and outputs

10.6.1 Inputs

| | | |
|------------------------------|---|---|
| Measuring input for voltage | U_{L1-L2} ; U_{L2-L3} ; U_{L3-L1} | 3 x 5V... 100V ...120V AC; (Measuring range 1) 3 x 20V... 500V ...600V AC; (Measuring range 2) |
| | Direct impedance | 1.2 MOHM (Ph-Ph) |
| | Measuring range | programmable |
| Measuring inputs for current | I_{L1} ; I_{L2} ; I_{L3} | 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 |

10.6.2 Outputs

| | | |
|--------------------------------------|---------------------------|--|
| Signalling relay for Limit violation | Number | 2 |
| | 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 |
| | Opto coupler output | 15 mA at max. 35 V, S ₀ interface |
| | Accuracy class | 2 |
| | Pulse duration | programmable, at least 30 ms |
| | Power supply | external |
| Analog output | Number | 3 |
| | Current carrying capacity | 20mA max for current output 10mA max. for voltage output (max. load 500 Ohm) (min. load 1000 Ohm) |
| | Signal | Can be set to 0-10V, 2-10V or 0-20mA, 4-20 mA |
| Serial interface | BUS | RS485 for connection to the Energy Bus; max. 32 devices, up to 1000 devices with bus amplifier |
| | Baud rate | 38400, may be selected on the device |
| | Addressing | Can be addressed up to address 9999; automatically via software or manually on the device |

EDEBDA0046 / 2706-1 GB

10.7 Electrical connection

| Connection elements | | Plug-in terminals |
|---|---------------------|--|
| Permissible cross section of the connection lines | | 2.5 mm ² |
| Measuring 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 power supply | 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 EIB |
| Pulse output | Connection & Cables | Watch 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 |
| Analog output | Wiring and lines | Watch proper polarity! |

| | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------------------|--|--------|---------------------|-------------|----|-------------------|-----------------|---|-------|---|---------------------|-----------------|---|-------|---|---------------------|-----------------|---|-------|---|---------------------|
| | | For proper operation please only use shielded twisted-pair cables; e.g. I-Y-St-Y 2x2x0.8 | | | | | | | | | | | | | | | | | | | | |
| Interface connection | Pins for BUS connection via RS485 | <table border="0"> <tr> <td>Device</td> <td></td> <td>MULTIMASTER</td> <td>or</td> <td>Interface adaptor</td> </tr> <tr> <td>Terminal 90 (⊥)</td> <td>→</td> <td>Pin ⊥</td> <td>→</td> <td>cf. software manual</td> </tr> <tr> <td>Terminal 91 (A)</td> <td>→</td> <td>Pin A</td> <td>→</td> <td>cf. software manual</td> </tr> <tr> <td>Terminal 92 (B)</td> <td>→</td> <td>Pin B</td> <td>→</td> <td>cf. software manual</td> </tr> </table> | Device | | MULTIMASTER | or | Interface adaptor | Terminal 90 (⊥) | → | Pin ⊥ | → | cf. software manual | Terminal 91 (A) | → | Pin A | → | cf. software manual | Terminal 92 (B) | → | Pin B | → | cf. software manual |
| Device | | MULTIMASTER | or | Interface adaptor | | | | | | | | | | | | | | | | | | |
| Terminal 90 (⊥) | → | Pin ⊥ | → | cf. software manual | | | | | | | | | | | | | | | | | | |
| Terminal 91 (A) | → | Pin A | → | cf. software manual | | | | | | | | | | | | | | | | | | |
| Terminal 92 (B) | → | Pin B | → | cf. software manual | | | | | | | | | | | | | | | | | | |

10.8 Mechanical data

| | | |
|----------------------|--------------------|---|
| Flush-mounted device | Housing measures | 144 x 144 x 60 mm (H x W x D) |
| | Mounting cutout | 138 x 138 mm |
| | Mode of protection | Front IP51 (with optionally available front door max. IP54), terminals IP20 |
| | Weight | approx. 780 g |

10.9 Standards and amendments

| | | |
|--------------------------|-------------------------------|---|
| Environmental conditions | Standards and amendments | DIN EN 60721-3-3/A2: 1997-07; 3K5+3Z11; (IEC721-3-3; 3K5+3Z11) |
| | Operating temperature | -5°C ... +55°C |
| | Humidity | 5% ... 95% |
| | Storage temperature | -25°C ... +70°C |
| Electrical safety | Standards and amendments | DIN EN 61010-1/A2: 1996-05; (IEC1010-1/A2) |
| | Protection class | II, in accordance with DIN EN 61010-/A2: 1996-05 |
| | Overvoltage category | CAT III: U_{PH-PH} up to 400V CAT II: U_{PH-PH} up to 600V |
| | Mode of protection | Front IP51 (with optional front door max. IP54) terminals IP20 improved mode of protection 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 | Deleting and programming parameters on the device is not enabled if password protection is active. |
| EMC | Compatibility | |
| | complies with | EN 61010-1; EN 50081-1 |
| Synchronization | Types | internal, manually, tariff switching or via Energy Bus (e.g. MULTIMASTER) |
| Synchronization time | selectable | manually once per measuring period if the internal synchronization type is selected on the device. |

10.10 Default settings after reset

| | |
|---|---|
| Primary voltage / Secondary voltage | 400 V |
| Primary current / Secondary current | 5 A |
| Measuring period duration | 15Min. Measuring period |
| Daylight saving time | from March to October |
| Niedertarifzeit (Low tariff time) | Switching activated via hardware input on the device, programmed time for internal switching of HT and LT: int. 00.00 to 00.00 (no low tariff time activated) |
| Language | deut. (German text display) |
| Damping coefficient for current and voltage | DC 0 (no damping) |
| Energy pulse | P (active power for consumption) 1 pulse/kWh, pulse duration 100 ms |
| Error message relay | On-delay tON = 0 sec Off-delay tOFF = 0 sec |
| Analog output | deaktiviert (deactivated) |
| Measuring period synchronization | internal clock |
| Password | 9999 / all functions can be accessed |

Unchanged by a RESET:

1. Bus address
2. Time

11 SERIAL INTERFACE

11.1 RS 485 Bus operation

The RS485 port **of the MULTIMESS-Comfort** is designed for operation at the KBR Energy Bus. You can operate **one** or **several MULTIMESS-Comfort devices** together with the **Energy Bus** across **great distances**. The bus is connected to the PC via the interface converter RS -232/-485 or the **MULTIMASTER**. With the according Windows® Software, all bus devices can be parameterized and visualized. On demand, we will be glad to provide information on which other devices you can connect to the Energy Bus and on the functions of our software.

Information on the structure and the technical parameters of the Energy Bus can be found in our installation guide for the KBR Energy Bus. Just send a request for this installation guide.

12 OVERVOLTAGE AND LIGHTNING PROTECTION

We recommend installing overvoltage protection in order to prevent damage to our high-quality electronic products. It is recommended to protect control voltage inputs, pulse and bus lines.

Manufacturer: DEHN + SÖHNE, Hans-Dehn-Straße 1, 92318 Neumarkt, Germany
Phone: +49 (0) 9181-9060, Fax: +49 (0) 9181-906100

13 TROUBLE SHOOTING

No function.

Check power supply, back-up fuse and supply line.

The measuring voltage of a phase is 0V.

Check back-up fuse of the phase.

A phase of the current display has a different sign.

Check k and l of current measurement and correct, if required.

The measured values for energy and power differ, compared to the power supplier measurement.

Check k and l of the current measurement as well as the correctness of the phases of the transformers, adjust, if required.

An LED of @ flashes.

The most recent limit violation occurred in the menu indicated.

ErrU OVERLOAD or ErrI OVERLOAD.

ErrU: Overload at the voltage input of the measuring amplifier.

Switch off measuring voltage and check programmed transformer ratio. In case of direct measurement, the programmed value must be identical with the mains voltage.

Note: The device chooses the measuring range depending on the programmed secondary voltage. MULTIMESS-Comfort works in the measuring range 1 if the programmed value of the secondary voltage does not exceed 110V. If it does, MULTIMESS-Comfort will work in the measuring range 2.

ErrI: Overload at the current input of the measuring amplifier.

Adjust programming and select wider measuring range. Other than that, switch off measuring current and check transformer ratio.

Note: The device chooses the measuring range depending on the programmed secondary current, i.e. either measuring range 1 for 1A or measuring range 2 for 5A.

