KBR Energy Management

User manual
Technical parameters

multimess

Three-phase network measuring device

F144-2-LED-ESMSETMT-5

Your partner for network analysis

In our download centre you will find the appropriate instructions for KBR devices.

https://www.kbr.de/en/download/operating instructions/

System | English

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Dear customer,

We would like to thank you for choosing one of our products.

To familiarize yourself with the operation and configuration of the device, we recommend that you read this manual carefully. This will enable you to make use of the full range of functions that this high-quality product has to offer.

The individual chapters explain the technical details of the device and show how damage can be avoided through proper installation and commissioning.

This user manual is included in the scope of delivery of the device and must be accessible to the user at all times (e.g., in the switchgear cabinet). Even if the device is resold to third parties, the manual remains an inherent part of it.

Although the utmost care has been taken in writing this user manual, errors may still occur. We would be very grateful if you would notify us of any errors or unclear descriptions you may notice.

Yours sincerely,

Your KBR EnergyManagement GmbH

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

DANGEROUS VOLTAGE

means that death, serious physical injury or considerable property damage will occur if the appropriate safety precautions are not taken.

CAUTION

means that minor injuries or property damage may occur if the appropriate safety precautions are not taken.

NOTE

involves important information about the product, the handling of the product or the relevant part of the user manual to which particular attention should be drawn.

Disclaimer

We have reviewed the contents of the documentation together with the hardware and software described. Nevertheless, deviations cannot be ruled out, and therefore no guarantee can be given for complete conformity. The information in this publication is checked regularly; necessary corrections will be made in subsequent editions.

We appreciate any suggestions for improvement.

Safety instructions

In order to prevent operating errors, handling of the device has been kept as simple as possible. This will enable you to start to use the device quickly. It is in your own interest to read the following safety instructions carefully.

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DANGEROUS VOLTAGE

Observe the applicable DIN/VDE regulations when installing the product!

Connection to the mains, commissioning and operation of the device may only be carried out by qualified personnel. Qualified personnel, in the sense of the safety instructions in this manual, are persons with electrical training and knowledge of national accident prevention regulations, safety engineering and installation standards, as well as the commissioning and operation of the device.

To prevent fire and electric shock, do not expose the device to rain or moisture!

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

A faulty connection may result in the destruction of the device!

When connecting the device, the wiring diagram (see chapter 'Wiring Diagram') must be followed, and care must be taken to ensure that the connection cables are de-energised. Use only flawless cabling material and

always ensure the correct polarity when wiring!

Proper and safe operation of the product requires correct transport, storage, installation and assembly as well as careful operation and maintenance.

If the device has any visible damage, it is considered unfit for use and must be disconnected from the mains! Troubleshooting, repairs, commissioning and maintenance work may only be carried out at our plant or after contacting our customer service team.

If the device is opened without authorization, any warranty or guarantee claim is forfeited. Correct functioning can then no longer be guaranteed!

Opening the device may expose live parts. Capacitors in the device may still be charged, even if the device has been disconnected from all power sources. Do not operate open devices under any circumstances!

Systems that are at risk from lightning strikes must be fitted with lightning protection for all input and output cables (see chapter 'Overvoltage and lightning protection'for recommendations)!

No external voltage source may be connected to terminals 36-39, 60-63, and 90-92. Only a non-hazardous low voltage as defined in UL/CSA/IEC 61010-1 may be connected to terminals 34 and 35. See Technical Data for maximum values.

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Product liability

You have purchased a high-quality product.

Only components of the highest quality and maximum reliability are used.

Each device undergoes a long-term test before delivery.

Regarding product liability, we refer here to our
general terms and conditions for electronic devices.

The warranty on device characteristics only applies if the device is operated in accordance with its intended use!

Disposal

Please dispose of defective, out-of-date or no longer used devices properly.

If you wish, we can dispose of the device for you.

Scope of delivery

Included in the scope of delivery:

- Measuring device
- Connector set
- Quick-start guide
- Mounting material for the housing

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1 Device Memory

The device is equipped with an internal data memory (flash). After an uninterrupted charging time (device connected to the supply voltage) of approx. 100 hours, the buffer capacitor will have a sufficient charge to protect the internal clock from failure due to lack of operating voltage for approx. 7 days.

NOTE

If the capacitor is discharged and it is not connected to a power source, the time settings will be lost and will need to be reset!

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2 Definition of terms

Below you will find a brief explanation of the terms used in this manual.

Effective value:	By definition, the root mean square of a variable or mixed quantity is called the effective value. The **multimess F144-2-LED-ESMSETMT-5** calculates exclusively with the effective values of pure alternating quantities (RMS).
Instantaneous effective value:	This is the value that the **multimess F144-2-LED-ESMSETMT-5** determines within its measurement interval.
Measurement interval:	Within the measurement interval, the electrical quantity 'voltage' or 'current' of a phase is sampled. The resulting sampling points 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 values for all 3 phases.
Firmware:	Operating software implemented in the microcontroller of the **multimess F144-2-LED-ESMSETMT-5**.
Load profile memory:	Stores the recorded values of the measurement periods with timestamps.
Measurement period (maximum)	is the period that includes the highest value recorded.
Active/reactive power periods: reactive power during	Actual active or a measurement period
Measurement period:	This refers to the period used to calculate average performance values. Typical intervals: e.g., 1, 15, 30, 60 minutes.

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3 Default settings after a reset (delivery state)

Primary voltage/secondary voltage	400 V/400 V
Primary current/secondary current	5 A/5 A
Measuring current averaging time	10 minutes
Primary/secondary neutral conductor	5 A/5 A
Neutral conductor measurement type	Calc (calculated)
Neutral conductor averaging time	10 minutes
Measuring period duration	15 minutes
Daylight savings time	from month 03 to 10
Low tariff time	Changeover via bus communication
Damping coefficient for current and voltage	dF 0 (no damping)
Energy pulse	P (active power for consumption), 1 (1,000) pulses/kWh, pulse duration 100 ms
Alarm relay	On-delay tON = 0 sec. Off-delay tOFF = 0 sec.
Analog outputs	deactivated
Measurement period synchronization	Internal
Password	9999/all functions can be accessed
Button buzzer	On
Limit hysteresis	01 %
Default menu Start selection	deactivated

Unaffected by a RESET:

1. Bus communication
2. Time
3. Language

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4 Setting range

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

Measuring voltage, primary	1 V to 9999 kV
Measuring voltage, secondary	100 V to 600 V
Measuring current, primary	1 A to 99.99 kA
Measuring current, secondary	1 A or 5 A
Average measuring current and neutral conductor current	Averaging period 1 to 15 minutes
Neutral conductor current, primary	1 A to 99.99 kA
Neutral conductor current, secondary	1 A or 5 A
Neutral conductor measurement type	Calculated (calc) or measured (transformer input)
Measuring current Frequency tracking	Auto (automatically 45 to 65 Hz), fixed 50 Hz, fixed 60 Hz
Measuring period duration	1, 15, 30, 60 minutes (via KBR eBus)
Measurement period synchronization	dig. Input, internal clock, KBR eBus, tariff switching
Low tariff time	dig. Input, internal clock, KBR eBus internal: Starting time hh:mm End time hh:mm
Daylight savings time (start or end)	Month 01 to month 12
Language	German, English
Display - damping coefficient: current, voltage	dF 0 (no damping) to 6 (highest damping)
Energy pulse output	Active or reactive power, either consumed or supplied
Pulse value	0.001 to 9999 Imp/kWh or/kBh
Pulse length	30 to 990 ms
Harmonics limits	0 % to 100 %
Alarm relay delay	On delay tON 0 to 254 sec. Off delay tOFF 0 to 254 sec.
Password	4-digit number, 9999 means all functions are freely accessible
Time, date	Setting hh:mm, dd:mm:yyyy

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Continued

Button buzzer	On/Off
Zero-point creator	On/Off
Bus protocol	KBR - eBus serial, Modbus serial, KBR - eBus TCP, Modbus TCP, Profibus
Bus parameters KBR eBus serial	Scan mode, bus address 1 to 9999
Bus parameters Modbus serial	Bus address 1 to 247; Parity no, even, odd; Bus protocol 19200, 9600, 4800 baud; Transmission type RTU or ASCII
Bus parameters Modbus TCP (optional)	Bus address cannot be changed
Bus parameters KBR eBus TCP (optional)	Scan mode, bus address 1 to 9999
Bus parameters Profibus (optional)	Bus address 1 to 126
Analog interfaces 1 to 3 (option)	Output format: 0 to 20 mA, 4 to 20 mA 0 to 10 volts, 2 to 10 volts. See table 'Analog Output Parameterization' (Menu Extra - Analog Outputs) for data points. Lower limit, upper limit
Hysteresis of the limit values (in the 'Limit Value Configuration' sub-menu)	1 % to 99 %
Default menu (start selection)	Menu 01 to 11 (U_{PH-N} to Extra), deactivatable (display ----)

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5 Area of application / Range of functions

The **multimess F144-2-LED-ESMSETMT-5** is an affordable network measuring device for switchboard installation that measures all important parameters in three-phase networks.

The microprocessor of the **multimess F144-2-LED-ESMSETMT-5** records the mains voltage and current consumption of the meter point for all three phases via analog/digital converter inputs and calculates the active, reactive and apparent power ratio in the three-phase network.

Convenient operation and display
The LED Displays L1, L2 and L3 allow you to read the measured values directly and enter the respective parameters and configuration data. In addition, eleven LEDs indicate menus and the status. Six sensor buttons facilitate navigation through the menus.

For 100 to 400 V mains
The **multimess F144-2-LED-ESMSETMT-5** can be used in three-wire and four-wire mains. The device can be used to make measurements directly in 100 V and 400V mains. Higher voltages can only be connected via external voltage transformers, with the primary and secondary voltage being freely programmable. The measuring voltage inputs of the device measure directly,
i.e., they are not galvanically separated by a voltage transformer!

For energy supply networks with an outer conductor to ground potential, suitable ballasts with electrical isolation must be used, e.g., voltage transformers or zero point creators.

x/5A or x/1A freely programmable
The current measurement inputs must always be supplied via current transformers; 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 either calculated or measured via an additionally connected transducer and shown on the display.

Calculating the PE leakage
When the neutral conductor current is measured, the PE leakage is calculated and displayed. When the neutral conductor current is calculated, no PE leakage is displayed.

Harmonic analysis
Harmonic analysis via Fourier transformation.
The **multimess F144-2 LED ESMSETMT-5** measures the harmonics of the 3rd / 5th / 7th / 9th / 11th / 13th / 15th / 17th and 19th-63th voltage network harmonic, calculates their partial harmonic content, the total distortion factor of the voltage and the distortion reactive current.

Dual-tariff meter function (HT/NT)
Consumption during high tariff and low tariff times is recorded separately.

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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 eBus, switching can be done centrally via the VE-Busmaster.

Programmable pulse output
Active energy or reactive energy proportional pulses can be output via a programmable output laid out as an S_0-compatible interface. The pulse output type (proportional to active or reactive energy) as well as the pulse significance (number of pulses per kWh or per kVAR) and the pulse length can be programmed. These pulses can be processed by, for example, 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 F144-2-LED-ESMSETMT-5** has a serial interface (RS485) for operation with the KBR eBus or Modbus.

A variety of information that cannot be shown on the display can be read from the device via the bus.

This makes it possible to read numerous online measurement values as well as a wide range of data from the long-term memory.

Extensive memory functions
In addition to the usual meter functions, the **multimess F144-2-LED-ESMSETMT-5** also has extensive

Storage functions:
- A load profile memory to record the cumulated active and reactive power
- A memory to record the daily energy values for 366 days
- as well as an event log/operational log that records defined actions of the measuring device such as network failures, tariff changes, deletion functions and much more.

These memory functions are only available via the KBR eBus.

Synchronization
For synchronizing the load profile memory, a separate digital input has been integrated into the **multitimess F144-2-LED-ESMSETMT-5,** to which, for example, the synchronization signal of the utility meter can be connected. Synchronization as well as switching between high tariff and low tariff can be done centrally via the KBR eBus or the internal clock.

Analog outputs
Various parameters between 0-20 mA or 4-20 mA and between 0-10 V or 2-10 V can be output as analog values.

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Depending on which parameter you wish to output (e.g., active power), you can assign a certain phase (L1, L2, L3) or its whole value to the analog output.

Software (optional)
A series of software products that run on most Microsoft® Windows® operating systems are 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).

If you have any questions on this device or our software products, please do not hesitate to contact us. It is our pleasure to assist you.

See the end of this user manual for contact details.

6 Connecting the multimess F144-2-LED-ESMSETMT-5

6.1 Installation and assembly

- The applicable VDE regulations must be observed during installation.
- Before the device is connected to the power supply, check whether the local power supply conditions comply with the specifications on the nameplate. Incorrect connection may result in the destruction of the device.
  A different mains frequency can also affect the measurement.
- Connect the device in accordance with the connection diagram.
- The power supply input of systems that are at risk from lightning strikes must be equipped with suitable lightning protection.

6.2 Installation

Installation site: The device is designed to be installed in fixed and weatherproof switchboards. Conductive switchboards must be grounded.

Installation position: vertical

Fixing: Using the clamps provided, the device is attached to the switchboard from behind.

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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, pay attention to the direction of energy flow and the correct
assignment to the voltage paths!

Power supply: The electrical installation of the building must have a disconnector or circuit breaker for the power supply voltage.

The disconnecter must be close to the device and be easily accessible to the user.

It must be marked as an isolating switch for this device.

The isolating switch must be UL/IEC-approved.

Voltage measurement:
The disconnecter must be close to the device and be easily accessible to the user.

The switch must be marked as a disconnecting device for this device.
The disconnecting device must be UL/IEC approved.

CAUTION

- Do not apply DC voltage to the voltage measurement input.
- The device is not suitable for DC voltage measurement.
- Attach the current transformer terminal to the device using the two screws provided.
- Never operate open external unloaded current transformers, always short-circuit them. Risk of injury from high voltages and currents.

For wiring the pulse output, we recommend using only twisted pair and shielded material to keep out interference (for example, installation cable I-Y(ST) Y 2x2x0.8 mm^2, where the shielding may only be connected on one side).

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

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NOTE

The following points must be observed when connecting the device to the three-phase system to be measured:
- Energy flow direction
- Assignment - Measuring voltage input/current transformer input

Rotary field:

The device can be operated with a clockwise or anti-clockwise rotary field.
When the device's power supply is switched on, the **multimess F144-2-LED-ESMSETMT-5** automatically checks the direction of rotation. Rotary field check:

- Only connect the measuring voltage to the device (UMess see nameplate).
- Switch the device on by connecting the power supply cable voltage to the power supply connections (L and N). The device checks the mains direction of rotation immediately after being switched on.
- The rotary field is displayed in the Rotary field submenu of the U_{PH-PH} menu.
- For a clockwise rotary field, the display shows L1 0, L2 120 and L3 240 degrees.
- If you want to change the direction of rotation from clockwise to counter-clockwise, simply swap 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.
- Check again whether the assignment of the voltage path L1 and the current path L1 as well as all other phases are still correct.

Current transformer connection:

- Energy flow direction:

When installing the transformers, observe the direction of current flow or energy flow. If the current transformer is mounted the wrong way, the measured value will be negative.

A prerequisite for this is that energy is supplied to the device.

- Assigning measuring voltage input/current transformer input:

The current transformer on terminal 20/21 (k1/l1) must be installed in the phase in which the measuring voltage for terminal 10 (L1) is measured. The same applies to the other transformer and measuring voltage connections.

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- The phase sequence can be checked using the **multimess F144-2-LED-ESMSETMT-5** as follows:
  - Go to the main menu 'I'
  - Connect the current transformer to the corresponding wires
  - If the connection and direction of energy flow are correct, the device will only display positive currents.
  - If the device is connected incorrectly, all currents displayed will be negative. In this case, swap the connections until the display shows the correct values

CAUTION

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

6.3 Connection diagram

NOTE

When connecting the phase (L1) to terminal 1 and the neutral conductor (N) to terminal 2 at US1 Ph-N 100V – 240V AC 50/60 Hz or US5 Ph-N 22.5V - 64V AC 50/60 Hz, the safety device and the disconnector in the supply line to terminal 2 (N) are not required.

The safety device and the disconnector to terminal 2 (N) are only required for the following connection variants:

Alternating voltage:

Terminal 1 (L1) and terminal 2 (L2):
US1 Phase-Phase 100 V – 240 V AC 50/60 Hz or
US5 Phase-Phase 22.5 V – 64 V AC 50/60 Hz

Direct voltage:

Terminal 1 (+) and terminal 2 (-):
US1 100V - 240V DC or US5 22.5V - 64V DC

Connection variants of the supply voltage:

Terminal 1	Terminal 2	Voltage		Safety device and disconnector to Terminal 2 required
		Power supply unit US1	Power supply unit US5	
Phase L	Neutral conductor N	100 V - 240 V AC 50/60 Hz	22.5 V - 64 V AC 50/60 Hz	No
Phase L1	Phase L2	100 V - 240 V AC 50/60 Hz	22.5 V - 64 V AC 50/60 Hz	Yes
+	-	100 V - 240 V DC	22.5 V - 64 V DC	Yes

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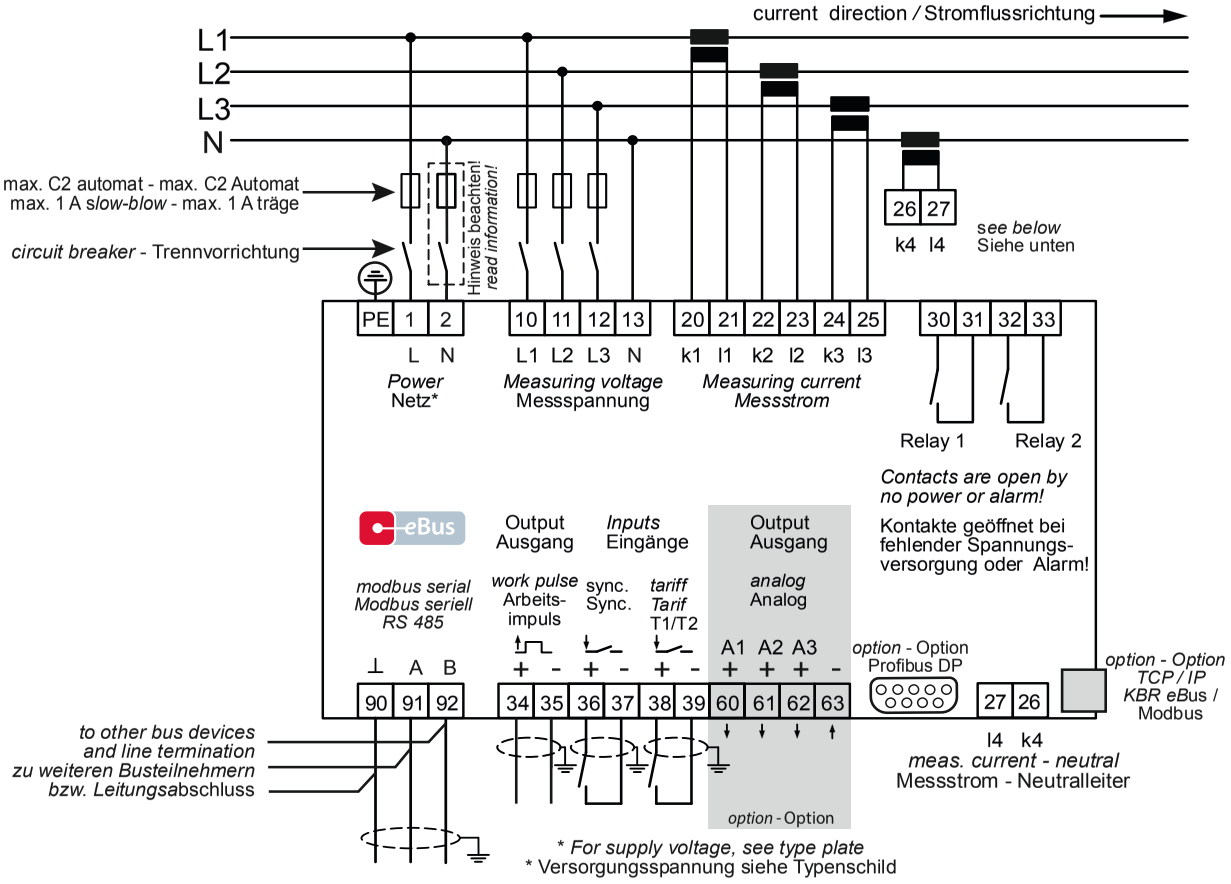
current direction / Stromflussrichtung
L1
L2
L3
N
max. C2 automat - max. C2 Automat
max. 1 A slow-blow - max. 1 A träge
circuit breaker - Trennvorrichtung
Hinweis beachten!
read information!
26 27
k4 I4
see below
Siehe unten
PE 1 2
10 11 12 13
20 21 22 23 24 25
30 31 32 33
L N
L1 L2 L3 N
k1 I1 k2 I2 k3 I3
Power
Netz*
Measuring voltage
Messspannung
Measuring current
Messstrom
Relay 1
Relay 2
Contacts are open by
no power or alarm!
Kontakte geöffnet bei
fehlender Spannungs-
versorgung oder Alarm!
eBus
Output
Ausgang
Inputs
Eingänge
Output
Ausgang
modbus serial
Modbus seriell
RS 485
work pulse
Arbeits-
impuls
sync.
Sync.
tariff
Tarif
T1/T2
analog
Analog
A1 A2 A3
option - Option
Profibus DP
option - Option
TCP / IP
KBR eBus /
Modbus
⊥ A B
90 91 92
34 35 36 37 38 39 60 61 62 63
27 26
I4 k4
meas. current - neutral
Messstrom - Neutralleiter
to other bus devices
and line termination
zu weiteren Busteilnehmern
bzw. Leitungsabschluss
option - Option
* For supply voltage, see type plate
* Versorgungsspannung siehe Typenschild

6.4 Terminal assignment

Terminal	
PE	Protective earth
1 (L) and 2 (N):	**Power supply connection** A control voltage is required to supply the device with power. The device has a multi-range power supply unit and can be supplied with different selectable voltages (see nameplate).
10 (L1) 11 (L2) 12 (L3) 13 (N)	**Voltage measurement inputs** Three-phase voltage measurement in 3-wire and 4-wire three-phase networks. Direct measurement for 3x 5...100...120 V AC or 3x 20...500...600 V AC. The measuring range is configurable. If the measuring range is exceeded, an error message is displayed. For higher voltages, the device needs to be connected via a voltage transformer.
20 (k1) and 21 (I1): 22 (k2) and 23 (I2) 24 (k3) and 25 (I3)	**Measuring inputs for current** The measuring inputs for current must be connected via current transformers x/1 A AC or x/5 A AC. When connecting the transformers, pay attention to the current flow direction and to the correct assignment between the measuring voltage inputs and the current transformers!
26 (k4) and 27 (I4)	**Neutral current measuring input** The neutral current measuring input must be connected via a current transformer x/1 A AC or x/5 A AC.
30 and 31:	**Potential-free relay contact Relay 1** This contact serves as a signal output or alarm output. During operation, an acoustic or visual message can be activated or a consumer switched off using this relay. The contact is open as long as the device is dead as well as when there is an active message. Maximum switching capacity 2 A at 250 V AC (not touch-proof).
32 and 33:	**Potential-free relay contact Relay 2** See description of potential-free relay contact Relay 1
90 (ground) 91 (A) 92 (B):	**Interface connection** For KBR-eBus or Modbus communication.

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Terminal	
34 (+) and 35 (-):	**Pulse output** Output of energy-proportional pulses via a digital contact (S0 interface in accordance with DIN 43864). Ensure that the output has the right polarity. The output signals can be processed by a maximum-demand monitor or a master central process control, for example.
36 (+) and 37 (-):	**Synchronization input** A potential-free contact, e.g., from the energy supplier, can be connected to this input to synchronize the measurement period
38 (+) and 39 (-):	**Tariff input** A potential-free contact, e.g., from the energy supplier, can be connected to this input to switch from peak to off-peak rate.
60, 61, 62 (+) and 63 (-):	**Analog outputs (option)** These three outputs can output various parameters as analog values either between 0-20 mA or 4-20 mA or 0-10 volts or 2-10 volts. Depending on the desired output value, it is possible to assign it to the analog output for a specific phase (L1, L2, L3) or its total value. Further output values can be found in the table under menu item Analog outputs (9.17).

NOTE

The negative pole of the synchronization input, the tariff input and the analog outputs are located internally on the PE (protective earth).

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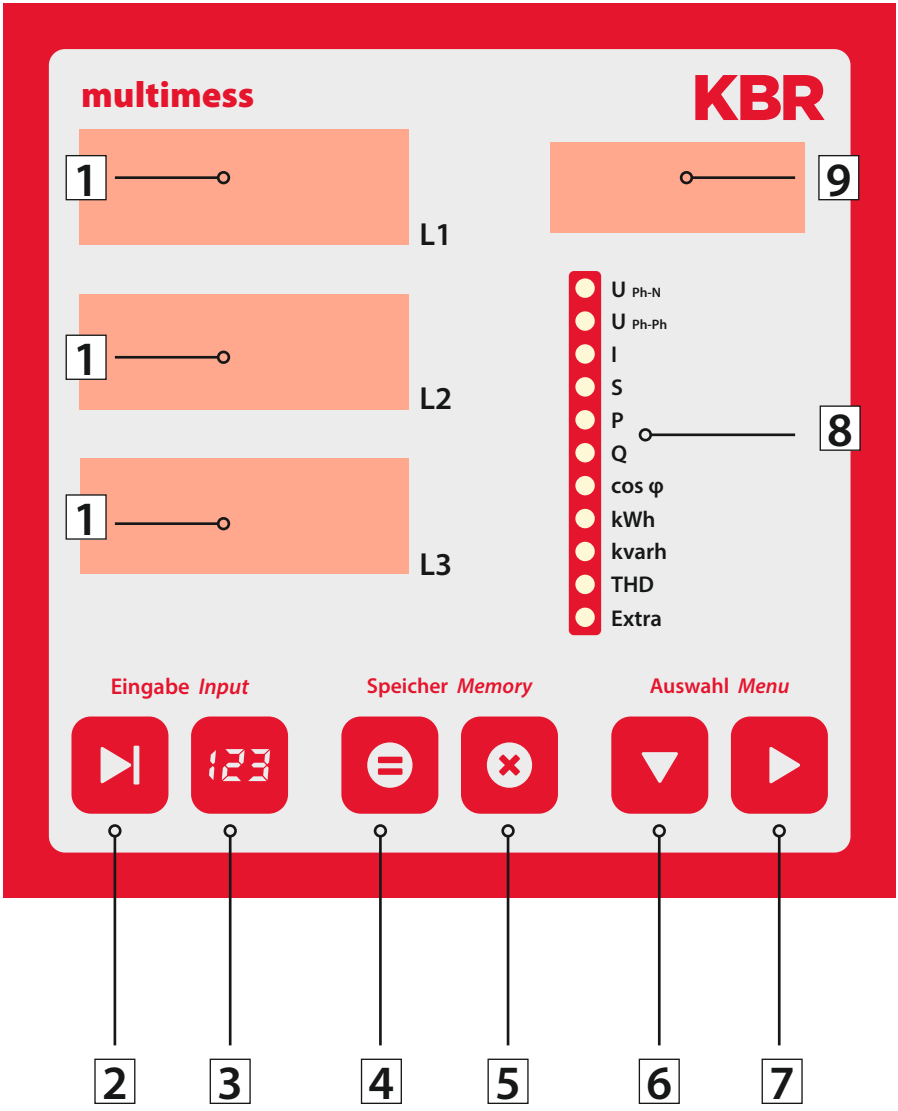
7 Control and display panel



7.1 Description of sensor buttons and displays

1	230 L1 230 L2 230 L3	Three 4-digit 7-segment displays are used to display the measured, stored and programmed values (3-phase; L1-L2-L3).
2		Starts the programming mode and switches between the editable positions 1 and 9. When you select a segment to edit it, it starts flashing.
3		In programming mode, this changes the flashing value to 1 or the decimal point to 1 and the unit prefix to 9.
4		Display of the stored minimum and maximum values. In programming mode, it allows the saving of the entered parameters or numerical values.
5		Deletes the values displayed by pressing , e.g., outliers, energy etc. In programming mode, you can use this button to cancel programming without applying any changes.
6		Selects one of the 11 main menus or jumps back to the current main menu item from a submenu. Keep the button 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.
7		Takes you to the corresponding submenu.
8		11 green LEDs indicate the main menus. A permanently flashing LED indicates the currently selected menu. If an LED is flashing, a limit in the corresponding menu has been violated. If the limit violation, however, occurred in the menu currently displayed, the LED does not flash.
9	A	The 4-digit 15-segment display shows information and the dimensions of the values in 1. When reading the saved outliers, the display switches between the unit and MIN for minimum value or MAX for maximum value. This principle also applies to the other menus and will be described in the respective sections of this manual.

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NOTE

The display on the measuring device has a dimming function (energy saving function).

After a set time has expired (15 minutes), the display brightness is reduced unless the sensor button is pressed (value is not adjustable). If
any button is pressed, the original display brightness is restored.

8 Operation

8.1 Menu structure of multimess F144-2-LED-ESMSETMT-5

Switches between the main menus.

When you are in a menu, the corresponding LED lights up (not flashing).

Keep the button depressed to switch between the individual main menus automatically.

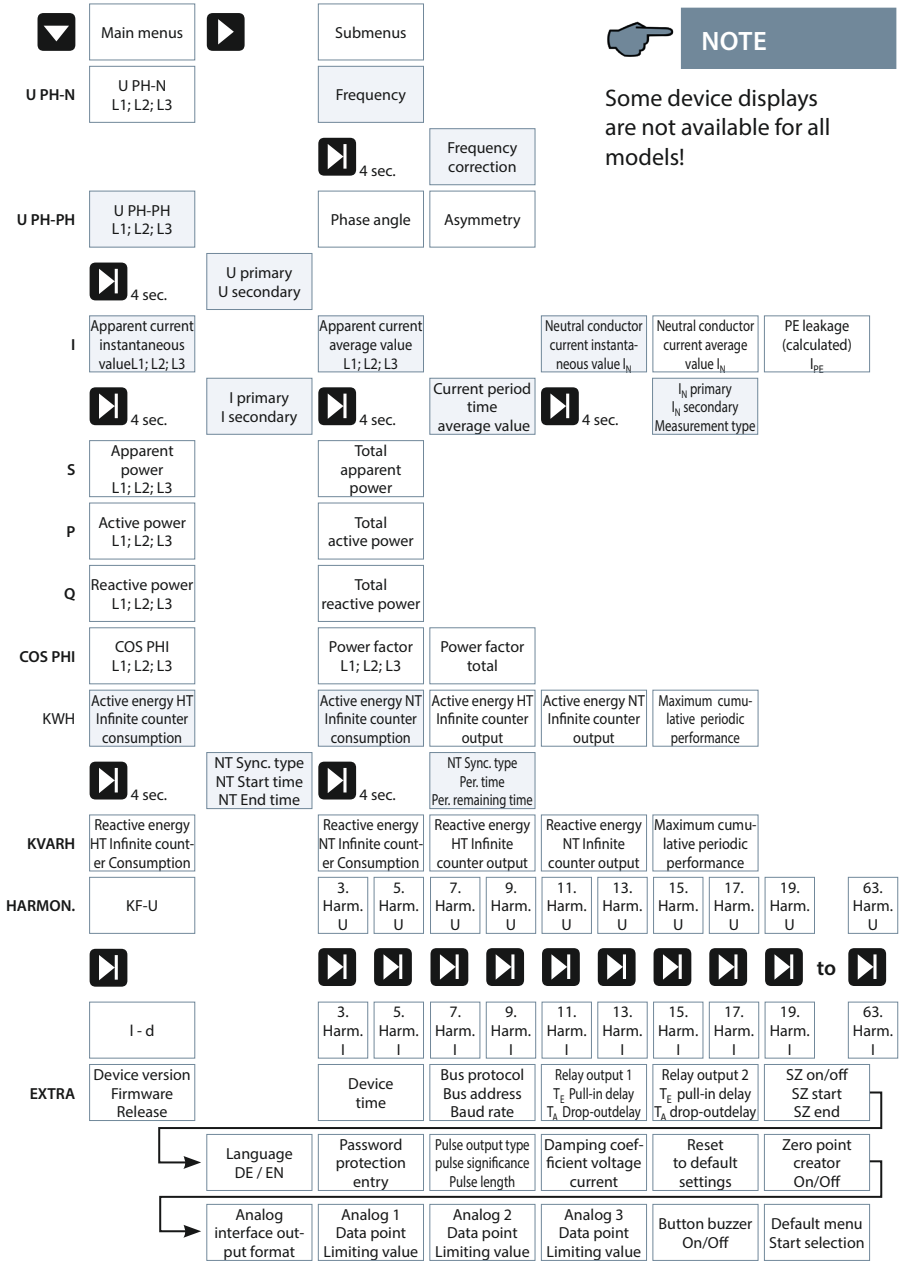
Press this button in a submenu to switch back to the corresponding main menu without applying any
changes.

Switches to the desired submenu.

Press this button to switch from the last submenu back to the corresponding main menu.

Switches to a parameterization menu or to the display submenu Distortion current I_d.

8.2 Navigation and device displays



NOTE

Some device displays are not available for all models!

9 Setting the operating parameters

9.1 General programming scheme

	▪ Pressing the button for 4 seconds takes you from the corresponding main or submenu into programming mode. The current parameters are displayed. ▪ Press this button again to activate parameter input mode. ▪ This button is also used to switch from one segment to the next when entering values.
	▪ Value input.
	▪ In programming mode, switch between input fields L1, L2, L3 or go to the submenu.
	▪ In programming mode, press this button to switch between input fields L1, L2 and L3. ▪ Return to the main menu after saving or canceling.
	▪ Save button, which must be used to confirm all changes.
	▪ Cancel button, which allows you to exit input mode without saving the changed values.

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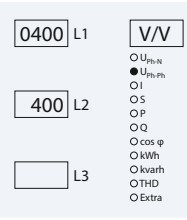
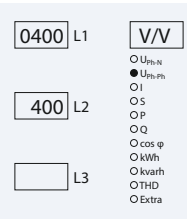
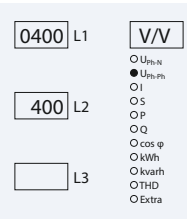
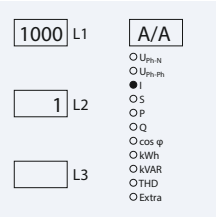
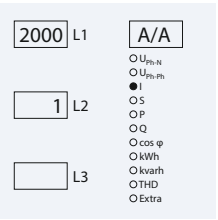
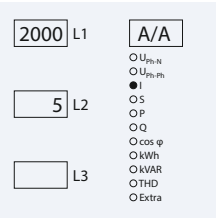
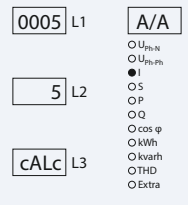
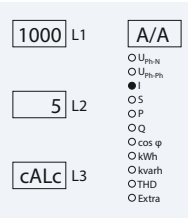
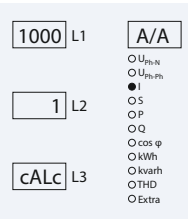
9.2 U_{Ph-Ph} - measuring reference voltage/rated mains voltage

Menu	Button combination	Device display	Description
Main menu UPh-Ph			
Submenu Set voltage transformer ratio	Press and hold button for 4 seconds Start input mode		When you open this menu, the following text is shown on the display: VOLTAGE TRANSFORMER UPRI/USEC V/V The display L1 shows the primary voltage. The display L2 shows the secondary voltage.
Submenu Voltage Converter Ratio Primary	Change value or next digit or cancel or save		The first digit on Display L1 flashes. Press the button to set the number for this segment. Press the button to go to the next digit. Once all of the digits have been set, Display L1 flashes. To move the decimal point, press the button
NOTE	or	Use these buttons to switch between the individual displays in input mode (one digit flashes).	
Submenu Voltage Converter ratio Set secondary	Change value or next digit or cancel or save		The first digit on Display L2 flashes. Press the button to set the value for this segment. Press the button to go to the next digit. The value can be set between 1 V and 600 V.
NOTE	 or	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

9.3 I - Current transformer ratio

Menu	Button combination	Device display	Description
Main menu I			
Submenu Current Set transform-er ratio	Press and hold button for 4 seconds Start input mode		When you open this menu, the following text is shown on the display: A/A CURRENT TRANSFORMER IPRI/ ISEK A\A Display L1 shows the primary current. Display L2 shows the secondary current.
Submenu Current Transformer ratio Set primary	Change value or next digit or cancel or save		The first digit on Display L1 flashes. Press the button to set the value for this segment. Press the button to go to the next digit. Once all of the digits have been set, Display L1 flashes. To move the decimal point, press the button
NOTE	or	Use these buttons to switch between the individual displays in input mode (one digit flashes).	
Submenu Current Set secondary transformer ratio	Change value or cancel or save		The first digit on Display L2 flashes. The button allows switching between 1 A and 5 A.
NOTE	 or	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

9.4 I_N- Current transformer ratio

Menu	Button combination	Device display	Description
Main menu I			
Submenu current I_N Set transformer ratio	Press and hold button for 4 seconds Start input mode		When you open this menu, the following text is shown on the display: A/A CURRENT TRANSFORMER I_N PRI/ISEK A\A Display L1 shows the primary current. Display L2 shows the secondary current. Display L3 shows the measurement type: CALC = calculated IN = transformer output terminal 26 (k4) and 27 (l4)
Submenu current I_N Set primary transformer ratio	Change value or next digit or cancel or save		The first digit on Display L1 flashes. Press the button to set the value for this segment. Press the button to go to the next digit. Once all of the digits have been set, Display L1 flashes. To move the decimal point, press the button.
NOTE	or	Use these buttons to switch between the individual displays in input mode (one digit flashes).	
Submenu current I_N Set secondary transformer ratio	Change value or cancel or save		The first digit in the display L2 is flashing. The button can be used to switch between 1A and 5A.
NOTE	or	Use these buttons to switch between the individual displays in input mode (one digit flashes).	

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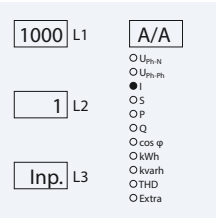
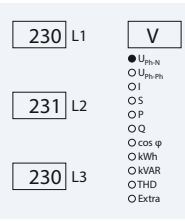
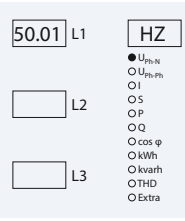
Menu	Button combination	Device display	Description
Submenu current I_N Set measurement type	123 Change value or ⊗ cancel or ⊖ save		Display L3 flashes. Press the 123 button to set the number. Display L3 shows the measurement type: CALC = calculated IN = transformer output terminal 26 (k4) and 27 (l4)
NOTE	▼ ▶ ▶ or ▼	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

10 Display functions

10.1 U_{Ph-N} - Voltage phase to neutral conductor, frequency

Menu	Button combination	Device display	Description
Main menu U_{Ph-N}	▶ next sub-menu		Displays the three phase voltages U_{L1-N}, U_{L2-N} und U_{L3-N} in the displays L1 to L3. The unit display shows the voltage unit. The measuring range automatically switches from V to kV etc.
Submenu Frequency			Shows the instantaneous frequency in Display L1. Pressing the button ▶| for approx. 4 seconds displays the programming menu for frequency correction.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

NOTE

The default setting 'AUTO' means an automatic frequency correction in the range 45 Hz to 65 Hz. It is recommended that this setting be retained.

If necessary however, 'fixed 50Hz' or 'fixed 60 Hz' can be set using the ▶\| and 123 buttons.

The setting is saved by pressing the ⊖ button.

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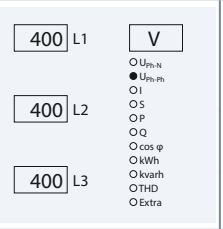
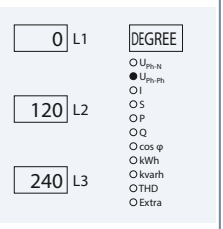
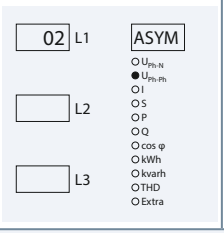
10.2 U_{Ph-Ph} - Voltage phase to phase, rotary field display

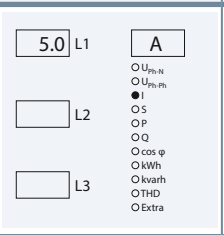
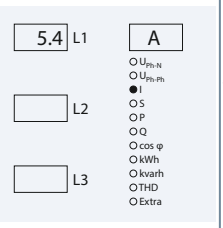
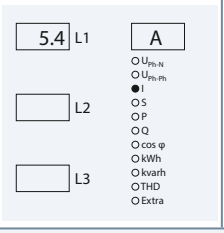
Menu	Button combination	Device display	Description
	▼		
Main menu U_{Ph-Ph}	▶ next submenu		The three phase-to-phase voltages U_{L1-L2}, U_{L2-L3} and U_{L3-L1} are shown in the displays L1 to L3. The unit display shows the voltage unit. The device switches from V to KV etc. automatically.
Submenu Rotary field	▶ next s ubmenu		Displays the three rotary field angles of the voltages. The unit display shows the unit 'DEG'.
Submenu Asymmetry			Display of voltage asymmetry according to the standard EN6100-4-30:2003 Shows the asymmetric load of the three-phase network. The unit display switches between ASYM and %.
NOTE	▼ ▶		Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.

10.3 I/I_N - Current/neutral conductor current, I_{PE} (PE – leakage calculated), instantaneous- average value switching

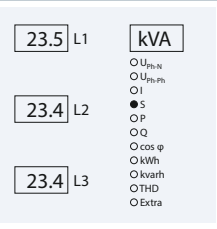
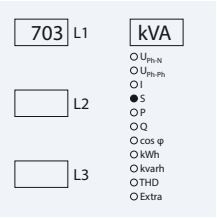
Menu	Button combination	Device display	Description
	▼		
Main menu I Instantaneous value	▶ next submenu	420 L1 425 L2 423 L3 A ○ U_{Ph-N} ○ U_{Ph-Ph} ● I ○ S ○ P ○ Q ○ cos φ ○ kWh ○ kvarh ○ THD ○ Extra	Displays the three conductor currents in phases L1, L2 and L3. The values displayed are instantaneous values. The unit display switches between MOM and A.
Submenu I Average value	▶ next ssubmenu	422 L1 426 L2 425 L3 A ○ U_{Ph-N} ○ U_{Ph-Ph} ● I ○ S ○ P ○ Q ○ cos φ ○ kWh ○ kvarh ○ THD ○ Extra	Displays the three conductor currents in phases L1, L2 and L3. The values displayed are average values. The unit display switches between AVG and A.

NOTE

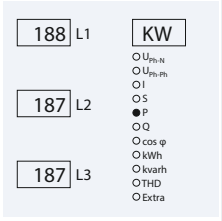
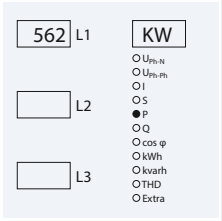
A negative sign in front of the displayed current values indicates a negative current direction.
A positive sign indicates energy consumption.
A negative sign indicates energy recovery.

Menu	Button combination	Device display	Description
Submenu I_N Neutral conductor current	▶ next submenu		Display L1 shows the instantaneous neutral conductor current. The unit display switches between NMOM and A.
Submenu I_N Neutral conductor current Average value	▶ next submenu		Display L1 shows the average value of the neutral conductor current. The unit display switches between NAVG and A.
Submenu I_{PE} (PE leakage current)			Display L1 shows the calculated PE leakage current. The unit display switches between I PE and A.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

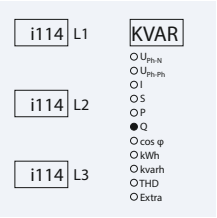
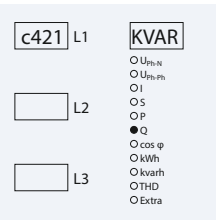
10.4 S - Apparent power/total apparent power

Menu	Button combination	Device display	Description
	▼		
Main menu S Apparent power	▶ next submenu		The displays L1 to L3 show the apparent power of the three phases. The unit display shows the apparent power in kVA. The measuring range automatically switches from VA to KVA and MVA.
Submenu Total apparent power			Shows the total apparent power in display L1. The unit display switches between kVA and SSUM. The measuring range automatically switches from VA to kVA or Mva.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

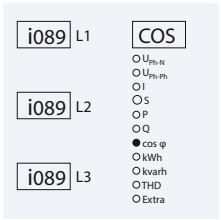
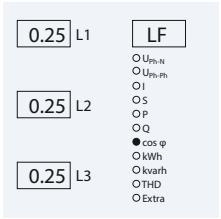
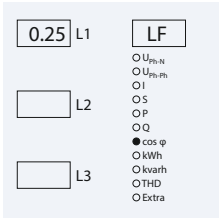
10.5 P - Active power/total active power

Menu	Button combination	Device display	Description
	▼		
Main menu P Active power	▶ next submenu		The displays L1 to L3 show the active power of the three phases. The unit display shows the active power in kW. The device switches from W to kW or MW automatically.
Submenu Total active power			Shows the total active power in display L1. The unit display switches between PSUM and kW. The device switches from W to kW or MW automatically.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

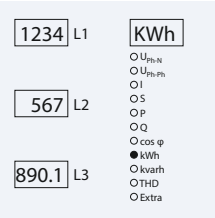
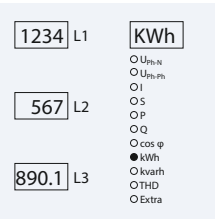
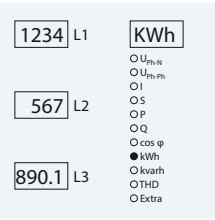
10.6 Q - Reactive power/total reactive power

Menu	Button combination	Device display	Description
	▼		
Main menu Q Reactive power	▶ next submenu		Displays L1 to L3 show the reactive power of the three phases. An 'i' in front of a value indicates inductive, a 'c' indicates capacitive reactive power. The unit display shows the reactive power in kvar. The measuring range automatically switches from var to kvar or mvar.
Submenu Total reactive power			Shows the total reactive power in display L1. The prefix 'i' or 'c' before the measured value indicates that the reactive power is inductive or capacitive, respectively. The unit display switches from QSUM to kvar. The measuring range automatically switches from var to kvar or mvar.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

10.7 Cos φ - Fundamental power factor, PF, total LF

Menu	Button combination	Device display	Description
	▼		
Main menu Cos φ	▶ next submenu		Display of cosφ. The display L1 shows the cosφ for phase L1. (i inductive, c capacitive) The display L2 shows the cosφ for phase L2. (i inductive, c capacitive) The display L3 shows the cosφ for phase L3. (i inductive, c capacitive) The unit display shows COS. (The cosφ displayed refers to the fundamental frequency)
Submenu LF	▶ next submenu		Display of the power factor LF. Display L1 shows the power factor 1 for the phase L1. Display L2 shows the power factor 2 for phase L2. Display L3 shows the power factor 3 for phase L3. The unit display shows LF.
Submenu Total LF			Displays the total power factor. Display L1 shows the total power factor. The unit display switches between TOT and LF.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

10.8 kWh - Active energy HT/NT consumption and recovery, maximum cumulated cycle active power

Menu	Button combination	Device display	Description
	▼		
Main menu kWh Active energy High tariff Consumption	▶ next submenu		Active energy meter for high tariff consumption. Display L3 - L1 shows the value of the continuous energy meter. The unit display switches between HT and kWh. 1234 Display L1 G Wh display 567 Display L2 M Wh display 890.1 Display L3 k Wh display
Submenu kWh Active energy Low tariff Import	▶ next submenu		Active energy meter for low tariff consumption. Display L3 - L1 shows the value of the continuous energy meter. The unit display switches between NT and kWh. 1234 Display L1 G Wh display 567 Display L2 M Wh display 890.1 Display L3 k Wh display
Submenu kWh Active energy High tariff Export	▶ next submenu		Active energy meter for high tariff power export. Display L3 - L1 shows the value of the continuous energy meter. The unit display switches between HT and KWh. 1234 Display L1 G Wh display 567 Display L2 M Wh display 890.1 Display L3 k Wh display

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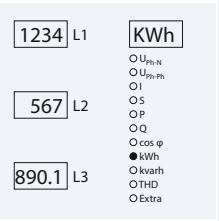
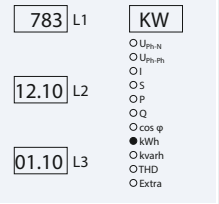
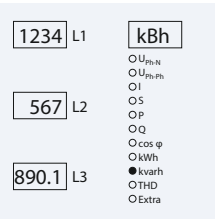
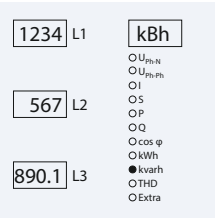
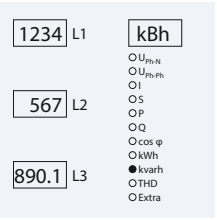
Menu	Button combination	Device display	Description
Submenu kWh Active energy Low tariff Export	▶ next sub-menu		Active energy meter for low tariff power export. Display L3 - L1 shows the value of the continuous energy meter. The unit display switches between NT and KWh. 1234 Display L1 G Wh display 567 Display L2 M Wh display 890.1 Display L3 k Wh display
Submenu PCum-Max Maximum cumulative cycle power			When you open the menu, the following text is shown in the unit display: PC.MX MAXIMUM CUMULATIVE POWER IN PERIOD Then the display switches between PC.MX and KW. Display L1 shows the period value. Display L2 shows the exact time the maximum occurred (hh:mm). Display L3 shows the day and month, alternating with the year, of the maximum (dd.mm.yyyy).
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

10.9 kvarh - Reactive energy meter HT/NT consumption and recovery, maximum cumulative cycle reactive power

Menu	Button combination	Device display	Description
	▼		
Main menu kvarh Reactive energy High tariff import	▶ next submenu		Reactive energy meter for high tariff import. Display L3 - L1 shows the value of the reactive energy continuous meter. The unit display switches between HT and kBh. 1234 Display L1 G varh display 567 Display L2 M varh display 890.1 Display L3 k varh display
Submenu kvarh Reactive energy Low tariff import	▶ next s ubmenu		Reactive energy meter for low tariff import. Display L3 - L1 shows the value of the reactive energy continuous meter. The unit display switches between NT and kBh. 1234 Display L1 G varh display 567 Display L2 M varh display 890.1 Display L3 k varh display
Submenu kvarh Reactive energy High tariff export	▶ next submenu		Reactive energy meter for high tariff power export. Display L3 - L1 shows the value of the reactive energy continuous meter. The unit display switches between HT and kBh. 1234 Display L1 G varh display 567 Display L2 M varh display 890.1 Display L3 k varh display

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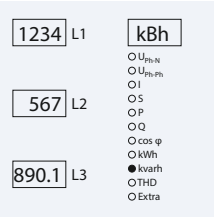
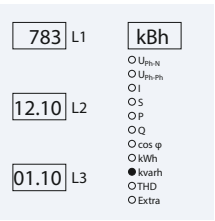
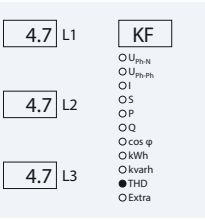
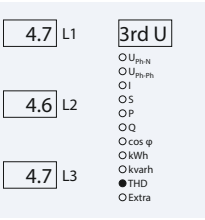
Continuation table 10.9

Menu	Button combination	Device display	Description
Submenu kvarh reactive energy Low tariff export	▶ next submenu		Reactive energy meter for low tariff export. Display L3 - L1 shows the value of the reactive energy continuous meter. The unit display switches between NT and kBh. 1234 Display L1 G varh display 567 Display L2 M varh display 890.1 Display L3 k varh display
Submenu $Q_{Cum\text{-}Max}$ Maximum cumulated cycle power			When you open the menu, the following text is shown in the unit display: QK.MX MAXIMUM CUMULATIVE POWER IN PERIOD Then the display switches between QK.MX and KVAR. Display L1 shows the period value. Display L2 shows the exact time the maximum occurred (hh:mm). Display L3 shows the day and month, alternating with the year, of the maximum (dd.mm.yyyy).
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

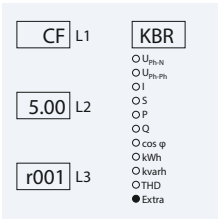
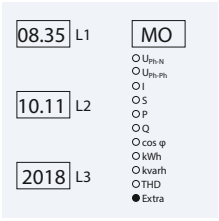
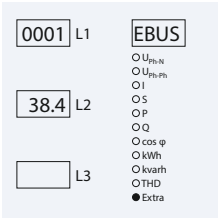
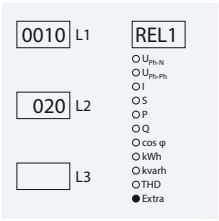
NOTE

The daily energy meters (for active and reactive energy) of the device can only be read out via the KBR eBus with the optionally available software.

10.10 THD- distortion factor and partial harmonic content of the voltage and current network harmonics

Menu	Button combination	Device display	Description
	▼		
Main menu THD voltage distortion factor	▶ next submenu or ▶| Switching between voltage and current harmonics		Display L1 shows the distortion factor in % for the voltage of phase L1. Display L2 shows the distortion factor in % for the voltage of phase L2. Display L3 shows the distortion factor in % for the voltage of phase L3. The unit display switches between KF and %.
Submenu 3-63. Harmonic	▶ next harmonic or ▶| Switching between voltage and current harmonics		Display of the 3rd harmonic. The display L1 shows the 3rd harmonic in % for the voltage in phase L1. The display L2 shows the 3rd harmonic in % for the voltage in phase L2. The display L3 shows the 3rd harmonic in % for the voltage of phase L3. The unit display alternates between displaying 3rd harmonic and %. The subsequent harmonics (5th – 63rd) are displayed in the same way. When displaying current harmonics, the display alternates, for example, between 3. I and A, or when displaying the distortion current, between Id and A.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

10.11 Extra

Menu	Button combination	Device display	Description
	▼		
Main menu Extra	▶ next submenu		Display L1 shows the device type (here: Comfort). Display L2 shows the version number. Display L3 shows the release number. The unit display shows the name of the device.
Submenu Date and time	▶ next submenu		Display L1 shows the time (hh.mm). Display L2 shows the date (dd.mm). Display L3 shows the year (yyyy). The unit display shows the weekday.
Submenu eBus	▶ next submenu		Display L1 shows the device address. The baud rate is displayed on display L2 The unit display shows eBus.
Submenu REL 1	▶ next submenu		Display L1 shows the on-delay for relay 1 in seconds. Display L2 shows the off-delay for relay 1 in seconds. The unit display switches between REL1 and tON.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

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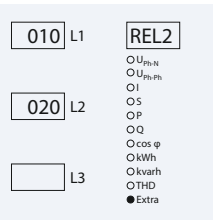
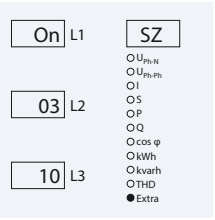
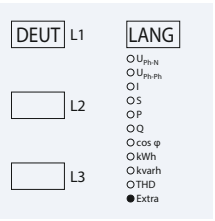
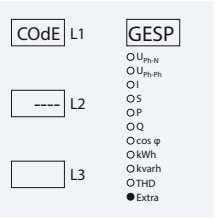
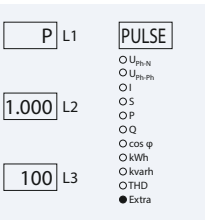
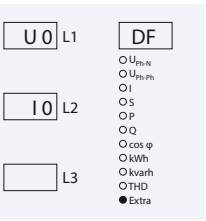
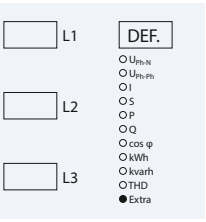
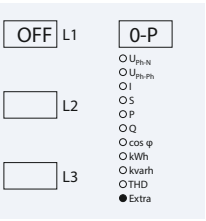
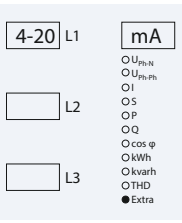
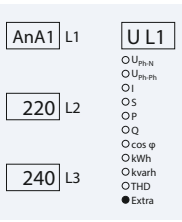
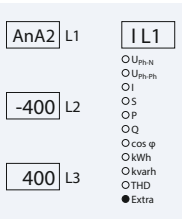
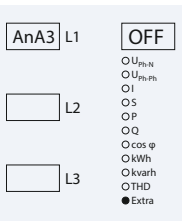
Continuation of table 10.11

Menu	Button combination	Device display	Description
Submenu REL 2	▶ next submenu		Display L1 shows the on-delay for relay 2 in seconds. Display L2 shows the off-delay for relay 2 in seconds. The unit display switches between REL2 and tON.
Submenu Daylight savings time	▶ next ubmenu		Display L1 indicates whether daylight savings time is activated or not. Display L2: shows the month daylight savings time begins. Display L3: shows the month daylight savings time ends. The unit display shows DAYLIGHTSAVINGSTIME and then DST.
Submenu Language	▶ next submenu		Display L1 shows the user language. For German, it displays deut. For English, it displays engl. The unit display shows SPRA if the user language is German. LANG if it is English.
Submenu Password	▶ next submenu		Display L1 shows Code. The unit display shows GESP or FREI. You can enter the password in L2. (4-digit code) The device is defaulted with the code 9999, i.e., all functions of the device are available.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

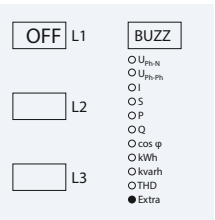
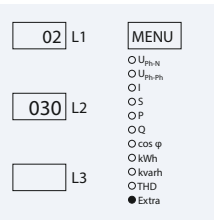
Continuation of table 10.11

Menu	Button combination	Device display	Description
Submenu Pulse output	▶ next submenu		Display L1 indicates whether the pulse output is deactivated (OFF) or configured for active (P) or reactive (Q) energy. Display L2 shows the pulse significance, i.e., pulse/kWh or kvarh. Display L3 displays the energy pulse length in ms.
Submenu damping coefficient	▶ next submenu		Display L1 shows the damping coefficient for voltage measurement. Display L2 shows the damping coefficient for current measurement.
Submenu Reset to default settings	▶ next submenu		The device is reset to the default KBR factory settings. All stored values are lost. The unit display shows DEFAULT PARAMETER and then DEF.
Submenu Zero point creator	▶ next submenu		Display L1 shows OFF if it is deactivated. If the zero point creator is activated, ON is displayed. The unit display shows ZERO-POINT CREATOR and then 0-P.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

Continuation of table 10.11

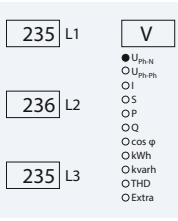
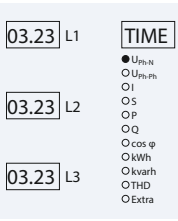
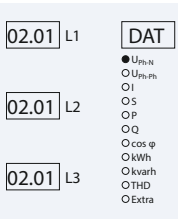
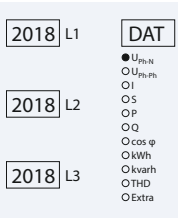
Menu	Button combination	Device display	Description
Submenu Analog interfaces (Option)	▶ next submenu		Display L1 and the unit display show the output type. You can choose from: 0-20 mA, 4-20 mA, 0-10 V and 2-10 V, valid for all 3 outputs. The unit display shows a scrolling text ANALOG TYPE followed by mA or V.
Submenu Analog 1 Data point Limiting value (Option)	▶ next submenu		Display L1 shows the instantaneous analog interface. Display L2 shows the lower limit, display L3 the upper limit. The unit display shows the parameter to be output.
Submenu Analog 2 Data point Limiting value (Option)	▶ next submenu		Display L1 shows the instantaneous analog interface. Display L2 shows the lower limit, Display L3 the upper limit. For current and active power, both positive and negative values (sign in the 1st position) can be programmed. The unit display shows the parameter to be output.
Submenu Analog 3 Data point Limiting value (Option)	▶ next submenu		Display L1 shows the instantaneous analog interface. Display L2 shows the lower limit, Display L3 the upper limit. The unit display shows the parameter to be output.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

Continuation of table 10.11

Menu	Button combination	Device display	Description
Submenu Button buzzer	▶ next submenu		Display L1 shows the state of the button buzzer. You can choose from 'ON' or 'OFF'. The unit display shows a scrolling text 'BUZZER' followed by 'BUZZ' The default setting is 'ON'.
Submenu Default menu Start selection			Display L1 shows the selected default menu (02 = U_{PH-PH}). Display L2 shows the return time in seconds to the default menu. The unit display shows DEFAULT MENU then MENU.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

10.12 Maximum/Minimum extreme values display

The following section explains how to display the extreme values. T
he maximum and minimum values of the phase voltages will be used as an example.

Menu	Button combination	Device display	Description
Main menu U_{Ph-N} Voltage Maximum	Maximum Display the time		The maximum values that occurred for the phase voltages are shown in the Displays L1 to L3 for each phase. The unit display switches between MAX and V.
Voltage Maximum	Display date (dd.mm)		The times the maximum values occurred for the phase to neutral voltages are displayed in the Displays L1 to L3. The unit display switches between MAX and TIME.
Voltage Maximum	Display date (yyyy)		The days the maximum values occurred for the phase to neutral voltages are shown in the Displays L1 to L3. The unit display switches between MAX and DAT.
Voltage Maximum			The years the maximum values occurred for the phase to neutral voltages are displayed in the displays L1 to L3. The unit display switches between MAX and DAT.
NOTE		Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

NOTE

Use the button to switch from maximum to minimum values. The minimum values are read the same way as the maximum values.

The table below shows which extreme values are stored in the **multimess F144-2-LED-ESMSETMT-5**.

Stored extreme values with date and time they occurred.

Menu	Measured value	Stored extreme values	Text displayed in de and en
Main menu U_{Ph-N}	Phase voltage	Minimum and maximum value of L1 – L2 – L3 with date and time	Min and Max
Submenu F_{mains}	Network frequency	Minimum and maximum value for L1 with date and time	Min and Max
Main menu U_{Ph-Ph}	Outer conductor voltage	Minimum and maximum value of L1 - L2 - L3 with date and time	Min and Max
Main menu I_{MOM}	Phase current Instantaneous values	Minimum and maximum value of L1 - L2 - L3 with date and time	Min and Max
Submenu I_{AVG}	Average values for phase current	Minimum and maximum value of L1 - L2 - L3 with date and time	Min and Max
Submenu I_{NMOM}	Neutral current instantaneous value	Minimum and maximum value of the neutral conductor current with date and time	Min and Max
Submenu I_{NMITW}	Average neutral conductor current	Minimum and maximum value of the neutral conductor current with date and time	Min and Max
Submenu I_{PE}	PE Leakage calculated	Minimum and maximum value of the PE leakage with date and time	Min and Max
Main menu S	Apparent power	Minimum and maximum value of L1 - L2 - L3 with date and time	Min and Max
Submenu S_{TOT}	Total apparent power	Minimum and maximum value of the total apparent power with date and time	Min and Max
Main menu P	Active power	Minimum and maximum value of L1 - L2 - L3 with date and time	Min and Max
Submenu P_{TOT}	Total active power	Minimum and maximum value for total active power with date and time	Min and Max
Main menu Q	Reactive power	Minimum and maximum value of L1 - L2 - L3 with date and time	Min and Max
Submenu Q_{TOT}	Total reactive power	Minimum and maximum value for total reactive power with date and time	Min and Max

Continued

Menu	Measured value	Stored extreme values	Text displayed in de and en
Main menu COS φ	Fundamental frequency power factor	Minimum and maximum value of L1 - L2 - L3 with date and time	Min and Max
Submenu power factor	Power factor	Minimum and maximum value of L1 - L2 - L3 with date and time	Min and Max
Submenu Total PF	Total power factor	Minimum and maximum value for cumulative 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 network harmonic as well as the current harmonic contents and their sum; L1-L3.	Max

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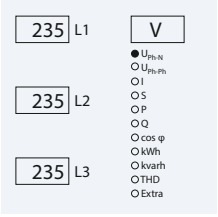
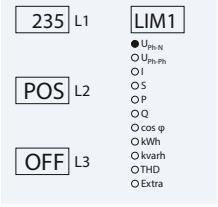
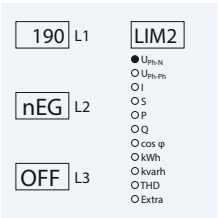
10.13 Displaying limits

Using the example of limits 1 and 2 of the phase voltage, the following section explains how to display limits.

Menu	Button combination	Device display	Description
Main menu U_{Ph-N} Submenu Voltage Maximum	Display max/min value		The maximum values that occurred for the phase voltages are shown in the Displays L1 to L3 for each phase. The unit display switches between MAX and V.
Submenu Limit 1	Press for 4 seconds for limit setting (LIM 1) or further to LIM 2		Display L1 shows the limit. Display L2 shows the direction of the limit. (Limit value active when POS is exceeded or NEG is undershot or blocked OFF. Display L3 shows the message type for the limit: OFF message only via KBR-eBus, REL1 message additionally to relay 1, REL2 message additionally to relay 2 If a limit is violated, the LED of the respective main menu starts to flash.
Submenu Limit 2	further to LIM1		Description see limit 1
NOTE	 	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

NOTE

If a relay is not configured as an alarm relay but as a switching relay (setting only possible via KBR-eBus), the relay concerned cannot be selected in Display L3.

The following table gives an overview of all limits available in the **multimess F144-2-LED-ESMSETMT-5**.

Menu	Measured value	Programmed limits	Text displayed in de and en
Main menu U_{Ph-N}	Phase voltage	Limit 1 and limit 2 for L1 - L2 - L3	Lim 1 and Lim 2 Lim 1 and Lim 2
Submenu F_{mains}	Network f requency	Limit 1 and limit 2	Lim 1 and Lim 2 Lim 1 and Lim 2
Main menu U_{Ph-Ph}	Outer conductor voltage	Limit 1 and limit 2 for L1 - L2 - L3	Lim 1 and Lim 2 Lim 1 and Lim 2
Main menu I_{MOM}	Phase current Instantaneous values	Limit 1 and limit 2 for L1 - L2 - L3	Lim 1 and Lim 2 Lim 1 and Lim 2
Submenu I_{AVG}	Average values for phase current	Limit 1 and limit 2 for L1 - L2 - L3	Lim 1 and Lim 2 Lim 1 and Lim 2
Submenu I_{NMOM}	Neutral current instantaneous value	Limit 1 and limit 2 for the instantaneous value of neutral conductor current	Lim 1 and Lim 2 Lim 1 and Lim 2
Submenu I_{NMITW}	Average neutral conductor current	Limit 1 and limit 2 for the average neutral conductor current	Lim 1 and Lim 2 Lim 1 and Lim 2
Submenu I_{PE}	PE Leakage calculated	Limit 1 and limit 2 calculated for PE leakage	Lim 1 and Lim 2 Lim 1 and Lim 2
Main menu S	Apparent power	Limit 1 and limit 2 for L1 - L2 - L3	Lim 1 and Lim 2 Lim 1 and Lim 2
Submenu S_{TOT}	Total apparent power	Limit 1 and limit 2 for the total apparent power	Lim 1 and Lim 2 Lim 1 and Lim 2
Main menu P	Active power	Limit 1 and limit 2 for L1 - L2 - L3	Lim 1 and Lim 2 Lim 1 and Lim 2
Submenu P_{TOT}	Total active power	Limit 1 and limit 2 for the total active power	Lim 1 and Lim 2 Lim 1 and Lim 2
Main menu Q	Reactive power	Limit 1 and limit 2 for L1 - L2 - L3	Lim 1 and Lim 2 Lim 1 and Lim 2
Submenu Q_{TOT}	Total reactive power	Limit 1 and limit 2 for total reactive power	Lim 1 and Lim 2 Lim 1 and Lim 2

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Continued

Menu	Measured value	Programmed limits	Text displayed in de and en
Main menu COSφ	Fundamental frequency power factor	Limit 1 and limit 2 for L1 - L2 - L3	Lim 1 and Lim 2 Lim 1 and Lim 2
Submenu PF	Power factor	Limit 1 and limit 2 for L1 - L2 - L3	Lim 1 and Lim 2 Lim 1 and Lim 2
Submenu Total PF	Total power factor	Limit 1 and limit 2 for cumulative power factor	Lim 1 and Lim 2 Lim 1 and Lim 2
Main menu THD	Harmonics	Limit 1 and 2 of the distortion factor of the voltage and the 3rd to 13th network harmonic of L1-L3 as well as the current harmonic contents and their sum L1 - L3	Lim 1 and Lim 2 Lim 1 and Lim 2

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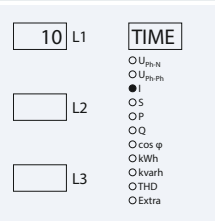
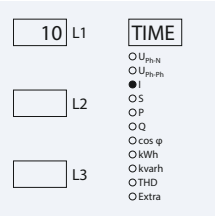
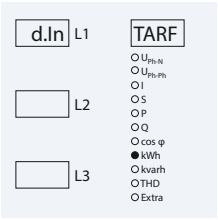
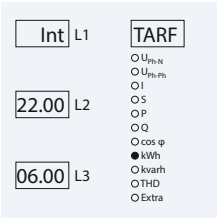
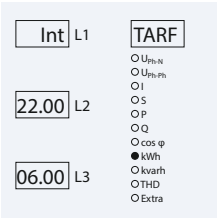
11 Programming

11.1 Period time current average value

Menu	Button combination	Device display	Description
Main menu I_{MOM} Submenu I average Period time	Hold the button for 4 seconds Start input mode		When you open the menu, the following text is shown on the display: TIME AVERAGE CURRENT TIME Display L1 shows the period time in minutes.
Submenu I Average value Setting the period time	Change value or next digit or cancel or save		The first digit on Display L1 flashes. Press the button to set the value for this segment. Press the button to go to the next digit. Settings between 1 and 15 minutes are possible.
NOTE	 	Return to main menu Continue to the next submenu, if available. Otherwise, return to the main menu.	

11.2 Tariff switching method

Menu	Button combination	Device display	Description
Main menu kWh/HT Submenu Tariff input Tariff switching method	▶| Hold the button for 4 seconds ▶| Start input mode		When you open this menu, the following text is shown on the display: TARF NT TARIFF TIMES TARF In Display L1: Display the tariff switching method. The following switching methods can be selected: - d.In by external pulse - BUS via KBR-eBus command - Int by internal time program
Submenu tariff input Set tariff switching method	123 next mode or ⊗ cancel or ⊖ save		Display L1 flashes. The button 123 can be used to switch between the aforementioned operating modes . The unit display switches between TARF and TYP.
NOTE	▶ or ▼	Use these buttons to switch between the individual displays in input mode (one digit flashes).	
Main menu kWh/HT Submenu Tariff input Set tariff switching time	123 Change value or ▶| next digit or ⊗ cancel or ⊖ save		With tariff switching method Int the start time can be set in Display L2 and the end time in Display L3.
NOTE	▼ ▶ ▶ or ▼	Return to main menu. Continue to the next submenu, if available. or: Return to main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

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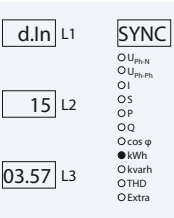
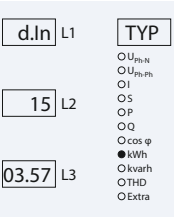
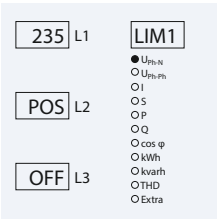
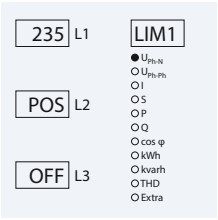
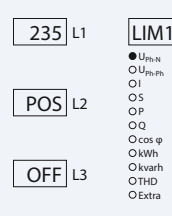
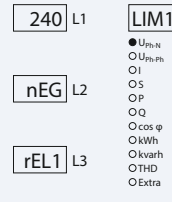
11.3 Measurement period synchronization

Menu	Button combination	Device display	Description
Submenu kWh/LT Submenu Measurement period	▶| Hold the button for 4 seconds ▶| Start input mode		When you open this menu, the following text is shown on the display: SYNC PARAMETER SYNC Display L1 shows the synchronization type. Display L2 shows the measurement period in minutes. The time remaining until the next synchronization is indicated in Display L3 in minutes and seconds. The following synchronization types can be selected: - Int by internal clock - d.In by external contact - BUS via KBR-eBus command - TARF by tariff switching
Submenu Measurement period Set measurement period synchronization	Change value or cancel or save		Display L1 flashes. The button can be used to switch between the aforementioned operating modes.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

11.4 Set limit values

The following section explains how to parameterize the limits. The limits 1 and 2 of the phase voltage serve as an example.

Menu	Button combination	Device display	Description
Submenu Voltage U_{Ph-N} Maximum	Maximum Hold the button for 4 seconds Start input mode		Display L1 shows the limit. Display L2 shows the direction of the limit. Limit value active when POS is exceeded or NEG is undershot or blocked OFF. Display L3 shows how the limit violation is communicated. - Alarm on relay 1 (REL1) - Alarm on relay 2 (REL2) - Alarm only via KBR eBus (OFF)
Submenu Voltage U_{Ph-N} Set limit value 1	Change value or next digit or cancel or save		The first digit on Display L1 flashes. Press the button to set the value for this segment. Press the button to go to the next digit. Once all of the digits have been set, Display L1 flashes. To move the decimal point, press the button . The unit display switches between LIM 1 and V.
NOTE	or	Use these buttons to switch between the individual displays in input mode (one digit flashes).	

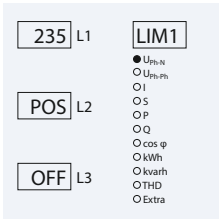
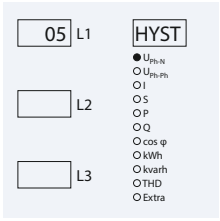
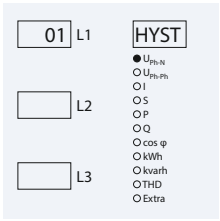
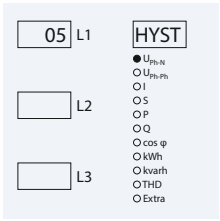
Menu	Button combination	Device display	Description
Submenu Voltage U_{Ph-N} Set Limit 1 direction of action	next digit or cancel or save		Display L2 flashes. Press the button to select whether the limit is to be activated when exceeded (POS) or when the value falls below the limit (NEG) or whether it should be blocked (OFF).
NOTE	or	In input mode (one digit flashes) you can switch between the displays with these buttons.	
Submenu Voltage U_{Ph-N} Set Limit 1 message type	next digit or cancel or save		Display L3 flashes. Use the button to determine the message type for a limit violation. - Alarm on relay 1 (REL1) - Alarm on relay 2 (REL2) - Alarm only via KBR eBus (OFF)
NOTE	 or	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

NOTE

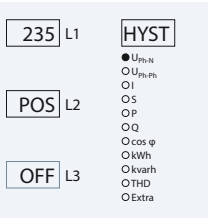
If both relays are not configured as alarm relays but as switching relays (setting only possible via KBR-eBus), the display in L3 (OFF) cannot be changed.

11.4.1 Set hysteresis for limits

The following section explains how to parameterize the hysteresis of the limits. Limit 1 of the phase voltage serves as an example.

Menu	Button combination	Device display	Description
Submenu Voltage U_{Ph-N} Limit 1	Maximum Hold the button for 4 seconds Display hysteresis		
Display hysteresis	Start input mode		Display hysteresis in % (based on the measured value)
Submenu hysteresis Limit 1	Change value or next digit		Change hysteresis value in % for limit 1 (setting range 1 to 99%)
	save or cancel		

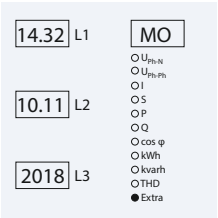
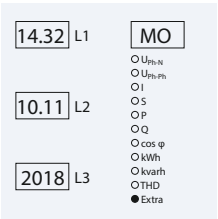
Continued

Menu	Button combination	Device display	Description
	With back to limit input.		

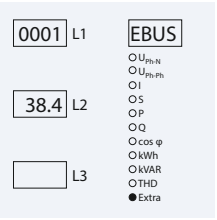
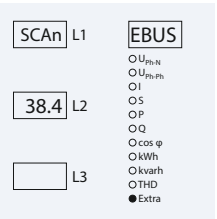
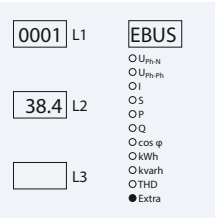
NOTE

Programming the hysteresis for limit 2 is identical.

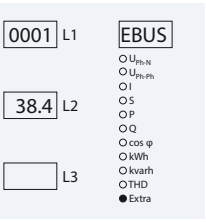
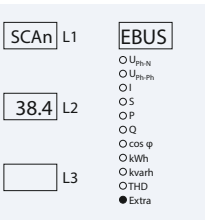
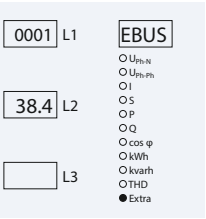
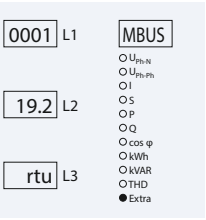
11.5 Set time and date

Menu	Button combination	Device display	Description
Main menu Extra Submenu Date and time	Start input mode		Display L1 shows the time (hh.mm). Display L2 shows the date (dd.mm). Display L3 shows the year (yyyy). The unit display shows the weekday.
Submenu Set date and time	Change value next digit or save or cancel		The first two digits in display L1 flash. Press the button to set the value for this segment. To go to the next Value, press the button . To set the day and month in Display L2, proceed as described for Display L1. The same applies to the year in Display L3.
NOTE	 or	Return to main menu Continue to the next submenu, if available. Otherwise: Return to main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

11.6 Set the bus address

Menu	Button combination	Device display	Description
Main menu Extra eBus submenu	▶| Start input mode (bus scan)		Display L1 shows the device address. The baud rate is displayed on Display L2.
Submenu eBus Assign address	▶| Start input mode		Display L1 indicates that the device is in scan mode. As soon as the device is recognized at the KBR eBus, an address is assigned automatically by the software and the address is entered in the device memory. The baud rate is displayed on Display L2.
NOTE	▶	or ▼	Use these buttons to switch between the individual displays in input mode (one digit flashes).
Submenu eBus Assign address manually	123 Change value or ▶| next digit or ⊗ cancel or ⊖ save		The first digit on Display L1 flashes. Press the 123 button to set the value for this segment. Press the ▶| button to go to the next digit.
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

11.7 Setting the bus protocol

Menu	Button combination	Device display	Description
eBus submenu	▶▌ Start input mode (bus scan)		Display L1 shows the device address. Display L2 shows the baud rate. The unit display shows the current bus protocol (e.g., eBus)
Submenu eBus Assign address	▶▌ Start input mode		Display L1 indicates that the device is in scan mode. Press the ▶▌ button to enter the input mode for setting the bus protocol.
Submenu eBus Change bus protocol	▼ To change the bus protocol 123 Change the bus protocol		The first digit on Display L1 flashes. The bus protocol display flashes (EBUS). The button 123 can be used to change the bus protocol, for example: KBR eBus (serial) Modbus RTU (serial) Modbus TCP (optional) KBR eBus TCP (optional) Profibus (optional)
Submenu eBus Save bus protocol	⊗ cancel or ⊖ save		The display indicates the selected bus protocol, e.g., Modbus RTU. The baud rate is displayed on display 2. Display 3 shows the Modbus protocol (RTU).
NOTE	▼ ▶	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

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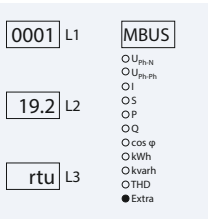
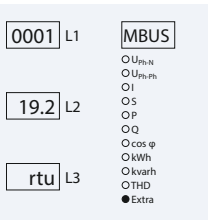
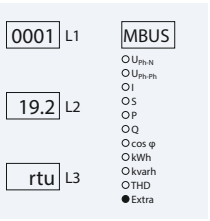
11.8 Setting the Modbus bus address and baud rate

Menu	Button combination	Device display	Description
Submenu Modbus	Start input mode		Display L1 shows the device address. The baud rate is displayed on Display L2. Display L3 shows the selected bus protocol (RTU or ASC).
Submenu Modbus Assign address	Change value or next digit or cancel or save		The first digit on Display L1 flashes. Press the button to set the number for this segment. Press the button to go to the next digit.
NOTE	or	In input mode (one digit flashes) you can switch between the displays with these buttons.	
Submenu Modbus Assign transmission mode	next mode or cancel or save		Display L3 flashes. Press the button to choose between the different modes (RTU or ASC).
NOTE	or	In input mode (one digit flashes) you can switch between the displays with these buttons.	

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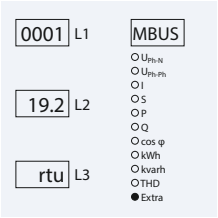
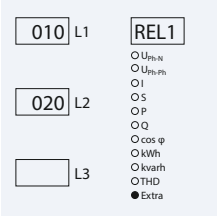
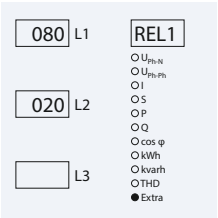
Submenu Modbus Assign baud rate	next Baud rate or cancel or save		Display L2 flashes. Press the button to choose from different baud rates with the respective even/odd parity or no parity. 4.8 k baud 9.6 k baud 19.2 k baud
NOTE	 or		Return to main menu Continue to the next submenu, if available. Otherwise: Return to main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).

11.9 Setting the relay on-delay and off-delay

Menu	Button combination	Device display	Description
Submenu REL 1	Start input mode		Display L1 shows the on-delay for relay 1 in seconds. Display L2 shows the off-delay for relay 1 in seconds. The unit display switches between REL1 and tON.
Submenu REL 1 Set on-delay	Change value or next digit or cancel or save		The first digit on Display L1 flashes. Press the button to set the value for this segment. (max. 255 sec.) Press the button to go to the next digit.
NOTE	or		In input mode (one digit flashes) you can switch between the displays with these buttons.

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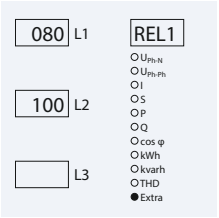
Submenu REL 1 Set off-delay	Change value or next digit or cancel or save		The first digit on Display L2 flashes. Press the button to set the value for this segment. (max. 255 sec.) Press the button to go to the next digit. The assignment as switching relay is shown in display L1 ----, L2 ---- and L3 BUS. Configuration is only possible via KBR eBus using optionally available software.
NOTE	 or	Return to main menu Continue to the next submenu, if available. Otherwise: Return to main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

NOTE

Relay 2 is set the same way as relay 1.

11.10 multimess F144-2 LED ESMSETMT-5 Function extension KBR-eBus TCP

The **multimess F144-2-LED-ESMSETMT-5** is optionally available with an Ethernet interface for KBR-eBus TCP. To use this, the device must be converted to the KBR-eBus TCP bus protocol.

KBR-eBus TCP configuration via the Ethernet interface

The KBR-eBus TCP interface of the **multimess F144-2-LED-ESMSETMT-5** can be set via the Ethernet interface.

1. Directly on the device

2. Using a web browser and the web interface in the LAN port.

The connected device then reports at the factory set
IP address 192.168.0.1.

Directly on the device:

Programming interface activity

To do so, proceed as follows:

Menu	Button combination	Description
Main menu Extra Submenu eBus TCP	 Start Input Mode (Bus Scan)	Display L1 shows the device address. The baud rate is displayed on Display L2.

In the Bus parameters area, you can set the address of the KBR eBus, for example.

1. From the main menu, select > Bus Parameters > Enter.
2. If necessary, start a bus scan using scan.
3. Start programming with Edit.

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Setting on the device:

Menu	Button combination	Description
Main menu Extra Submenu eBus TCP	**Input button,** Start Input Mode	**Display L1 shows the device address.** **Display L2 shows the log** (EBUS TCP).
	Menu button	**Current IP address is displayed**
	Input button	**IP address can be changed** (provided that DHCP is set on **OFF**). If DHCP is**ON in the next but one window, the fallback address is displayed here and cannot be changed.**
	Menu button	NetMask is displayed (**HOST**)

NOTE

When entering the netmask, the following must be observed:

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

Menu	Button combination	Description
Main menu Extra Submenu eBus TCP	Menu button	DHCP setting is displayed: Display L1 (factory setting is OFF) Display L3 (port setting is displayed (E-port) If the On setting is selected, the IP Address Input window displays the LAN port fall-back address, which cannot be changed

11.11 Software Configuration Multimess F144.2 LED ESMSETMT-5

The LAN port is parameterized by means of a web browser and the web interface in the LAN port.

The connected device reports under the factory-set IP address 192.168.0.1

https://www.kbr.de/download/apps-software-gsd-dateien/

NOTE

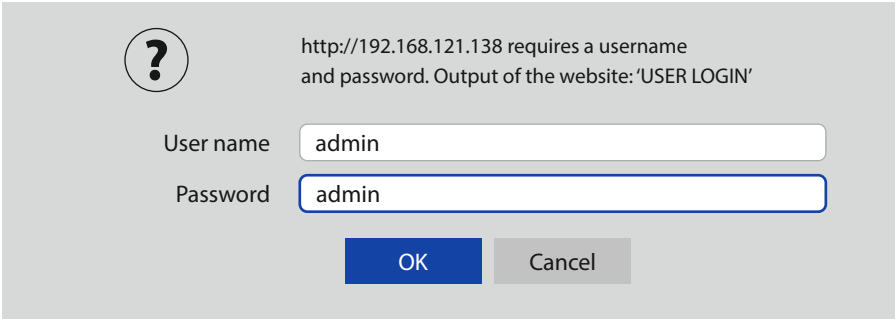
After installing the tool, it is recommended that you use Setting> Software Setting to check for updates.

If the device is set to DHCP and no DHCP server is available, the device will fall back to IP address 169.254.173.207.

NOTE

For security reasons, the IP address of the device should be changed immediately to prevent unauthorized access to the device from outside. In addition, the device should be password protected.

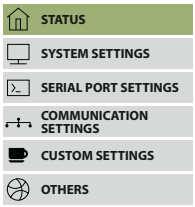
Username/Password



Further settings can be made on the following pages.

11.12 Status

Here you will find information on the status of your system.



Status

System running status overview

system state

Product Name E20	MAC 289C6E8CFDC1
DHCP Disable	IP 192.168.121.60
Subnet Mask 255.255.255.0	Gateway 127.0.0.1
DNS 127.0.0.1	Firmware version 1.34.13
System Time NTP Disabled	Total Running Time 25 Day 2:15:46
Remaining RAM 25076	Max Block Size 21284
Configuration Protected Disable	

Serial Port State

Received bytes 792225	Received frames 72024
Sent bytes 875628	Sent frames 72969
Failed bytes 0	Failed frames 0
Config 19200,8,1,EVEN	

Communication State - 'netp'

Received bytes 875628	Received frames 72969
Sent bytes 792225	Sent frames 72024
Failed bytes 0	Failed frames 0
Protocol TCP SERVER	State Server Created

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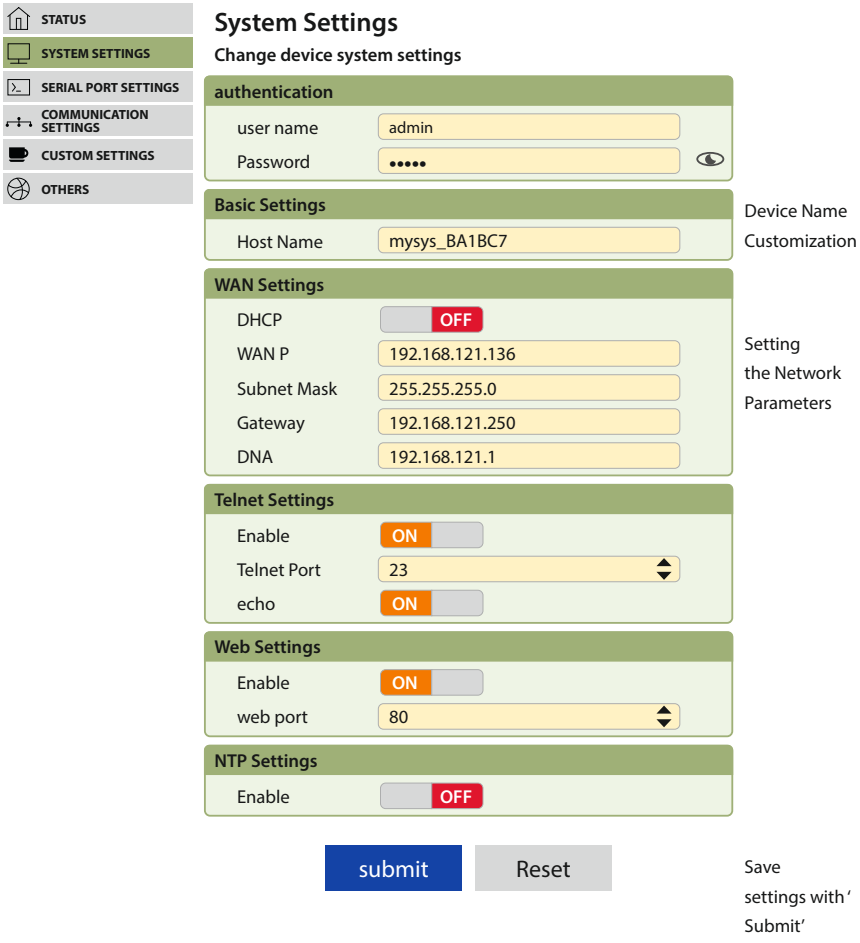
11.13 Setting options



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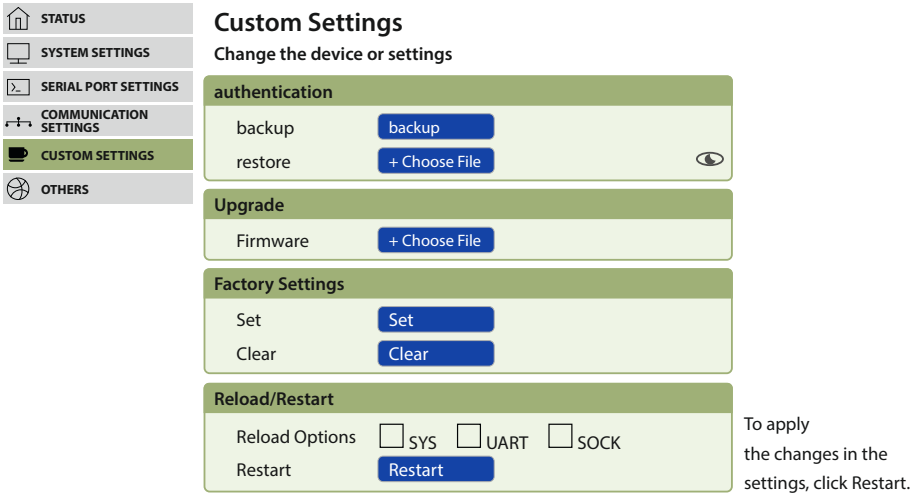
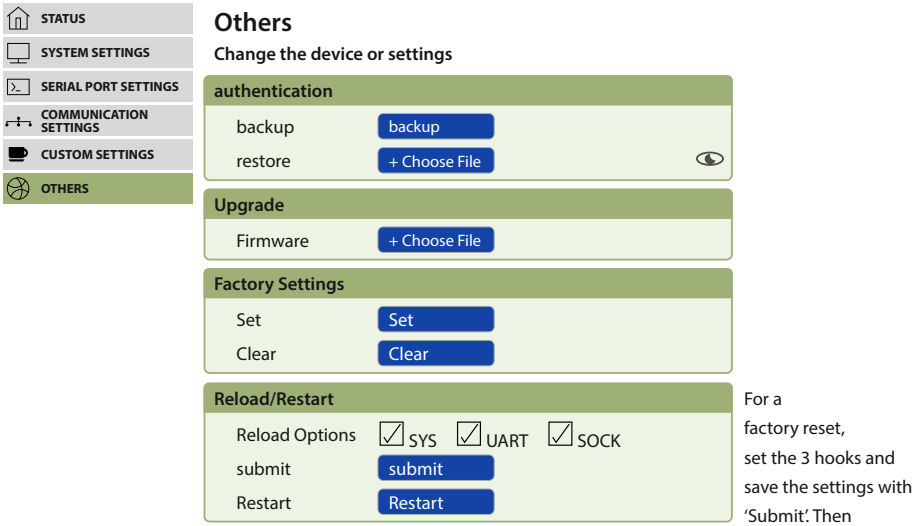
11.14 Applying changes



To apply the changes in the settings, click Restart.

11.15 Resetting to default settings



For a factory reset, set the 3 hooks and save the settings with 'Submit'. Then 'Restart'.

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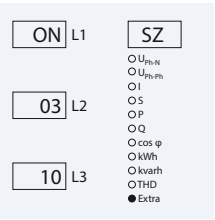
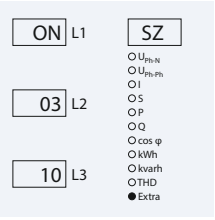
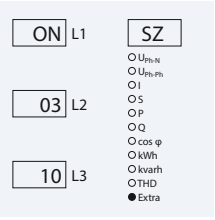
11.16 Activating daylight savings time

Menu	Button combination	Device display	Description
Submenu Daylight savings time	Start input mode		Display L1 indicates whether daylight savings time is activated or not. Display L2: Shows the month daylight savings time begins. Display L3: Shows the month daylight savings time ends. The unit display shows daylight savings and then DST
Submenu Daylight savings time Set	Change value or cancel or Save		Display L1 flashes. Press the button to activate (ON) or deactivate (OFF) daylight savings time.
NOTE	or	In input mode (one digit flashes) you can switch between the displays with these buttons.	
Submenu Daylight savings time set Start	Change value or cancel or save		Display L2 flashes. Press the button to set the month daylight savings time begins. The unit display alternately shows BEG and DST.
NOTE	or	In input mode (one digit flashes) you can switch between the displays with these buttons.	

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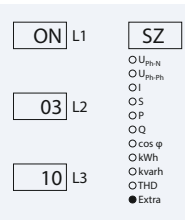
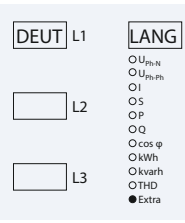
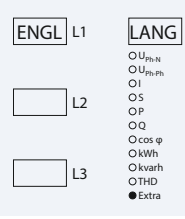
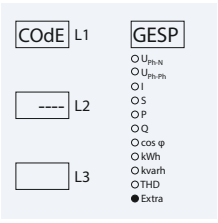
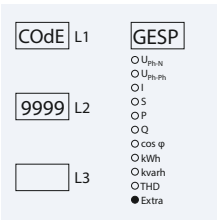
Continued

Menu	Button combination	Device display	Description
Submenu Daylight savings time set End	Change value or cancel or save		Display L3 flashes. The button can be used to set the month in which daylight savings time should end. The unit display switches between END and DST.
NOTE	 or	Return to main menu Continue to the next submenu, if available. Otherwise: Return to main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

11.17 Language settings

Menu	Button combination	Device display	Description
Submenu Language	Start input mode		Display L1 flashes. For German, it displays: DEUT For English, it displays: ENGL The unit display shows SPRA if the user language is German. LANG if it is English.
Submenu Language Set	Change value or cancel or save		Display L1 shows the user language. Press the button to select the operating language. For German, it displays: DEUT For English, it displays: ENGL The unit display shows SPRA if the user language is German. LANG if it is English.
NOTE	 	Return to main menu Continue to the next submenu, if available. Otherwise, return to the main menu.	

11.18 Password

Menu	Button combination	Device display	Description
Submenu Password	Start input mode		Display L1 shows Code. The unit display shows GESP or FREI. L2 shows ---- The device is defaulted with the release code 9999, i.e., all functions of the device are available.
Submenu Password Set	Change value or next digit or cancel or save		Display L1 shows Code. The unit display shows GESP or FREI. Display L2 shows 9999. The first position on Display L2 flashes. Press the button to set the value for this segment. Press the button to go to the next digit.
NOTE		Return to main menu Continue to the next submenu, if available. Otherwise, return to the main menu.	

NOTE

If the password should get lost, the device can be unlocked with the master password 1976.

In the configuration of a password protected device, wait for a maximum of 300 seconds to press the first button after the controller has been unlocked. If no buttons are pressed during this time, the controller is then locked again.

After a power supply failure, the device is password protected again.

After the default settings are reset, the password protection is lifted.

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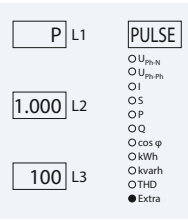
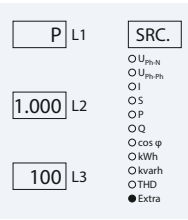
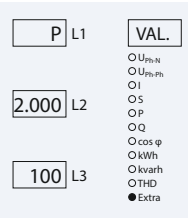
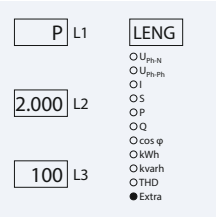
11.19 Setting the pulse output

Menu	Button combination	Device display	Description
Submenu Pulse output	▶ Start input mode		Display L1 indicates whether the pulse output is deactivated (OFF) or configured for active (P) or reactive (Q) energy. Display L2 shows the pulse value, i.e., pulse/kWh or kvarh (e.g., 1,000 for 1 pulse/kWh). Display L3 shows the energy pulse length in ms.
Submenu Pulse output Set pulse source	123 Change value or ⊗ cancel or ⊜ save		When you open the menu, the following text is displayed in the unit display: SRC. SOURCE SRC. Display L1 flashes. Press the button 123 to select the active energy (P active power import or P active power export), the reactive energy (Q reactive power import or Q reactive power export) or deactivate (OFF) the energy pulse.
NOTE	▶ or ▼	In input mode (one digit flashes) you can switch between the displays with these buttons.	
Submenu Pulse output Set pulse significance	123 Change value or ▶ next digit or ⊗ cancel or ⊜ save		When you open the menu, the following text is displayed in the unit display: MAG MAGNITUDE MAG The first digit on Display L2 flashes. Press the 123 button to set the value for this segment. If all digits are flashing, you can move the decimal point with the 123 button.
NOTE	▶ or ▼	In input mode, (one digit flashes) you can switch between the displays with these buttons.	

Continued

Menu	Button combination	Device display	Description
Submenu Pulse output Set pulse length	Change value or next digit or cancel or save		When the menu is called up, a scrolling text appears in the units display with the following text: LENG LENGTH LENG The first digit in the display L3 flashes. Press the button to set the value for this segment.
NOTE	 or	Return to main menu Continue to the next submenu, if available. Otherwise: Return to main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

NOTE

If the 'Extra' LED flashes after the pulse significance is entered, follow the instructions below. The 'Extra' LED flashes until a matching (lower) pulse count or pulse length is entered.

Check the pulse value in relation to the pulse length. Correct the pulse length or the pulse value if required.

The maximum processable active or reactive energy can be estimated with the following calculation.

$$\frac{3600\ s}{2 \times IL \times \text{pulse/kWh (kvarh)}} = \text{Maximum value}$$

Explanation:

3600	Constant [s]
IL	Required pulse length [s]
pulse/kWh (kvarh)	Required pulse count per kWh or per kvarh [pulse/kWh or pulse/kvarh]
Maximum value	Maximum output active or reactive energy [kWh or kvarh].

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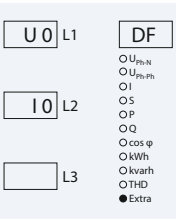
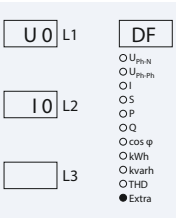
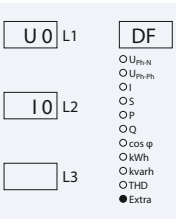
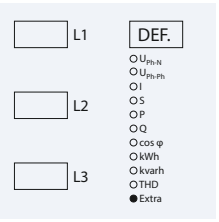
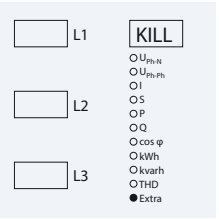
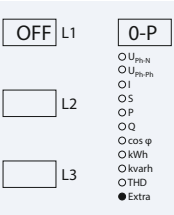
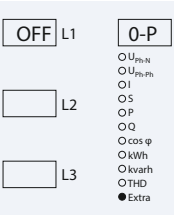
11.20 Damping coefficient

Menu	Button combination	Device display	Description
Submenu Damping coefficient DF	Start input mode		Display L1 shows the damping coefficient for voltage measurement. Display L2 shows the damping coefficient for acquiring the current.
Submenu Damping coefficient Set DF voltage	Change value or cancel or Save		When you open the menu, the following text is displayed in the unit display: DF DAMPING COEFFICIENT DF The first digit on Display L1 flashes. Press the button to set the value for this segment. Range of values: 0 - 6
NOTE	or	In input mode, (one digit flashes) you can switch between the displays with these buttons.	
Submenu Damping coefficient Set DF current	Change value or cancel or save		The first digit on Display L2 flashes. Press the button to set the value for this segment. Range of values: 0 - 6
NOTE	 or	Return to main menu Continue to the next submenu, if available. Otherwise: Return to main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

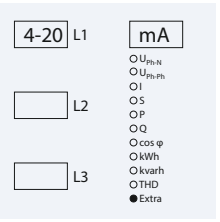
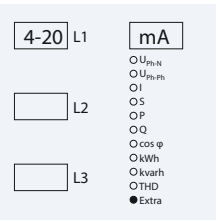
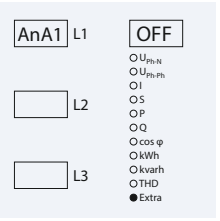
11.21 Default settings

Menu	Button combination	Device display	Description
Submenu Default settings			The unit display shows DEF.
Submenu Default settings Reset to default settings	+ at the same time		When you press these three buttons at the same time, the following text is shown in the unit display: KILL. During this display (duration approx. 10 seconds), the device is reset to its factory settings and a reset is performed (all memory is cleared).
NOTE		Return to main menu Continue to the next submenu, if available. Otherwise, return to the main menu.	

11.22 Zero point creator

Menu	Button combination	Device display	Description
Submenu Zero point creator	Start input mode		Display L1 shows the state of the zero point creator.
Submenu Zero point creator activate	Change value or cancel or Save		When you open the menu: Display L1 flashes. Press the button to activate this function. Range of values: OFF, ON.
NOTE		Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

11.23 **Analog outputs** (option)

Menu	Button combination	Device display	Description
Submenu Analog outputs	Start input mode		Display L1 shows the output value of the analog outputs 1 to 3.
Submenu Analog outputs Set output type	Change value or cancel or Save		When the menu is displayed, the display 4-20 flashes in display L1. Press the The output type can be set. **Adjustable values:** 0 - 20 mA 4 - 20 mA 0 - 10 V 2 - 10 V
NOTE	 	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	
next submenu	Start input mode		
Submenu Analog outputs Activate output 1 and select output data point	Change value or cancel or save		When the menu is called up, the display 'OFF' flashes in the units display. The button can be used to activate the output and set the output data point. **Range of values:** see following output data points
NOTE	or	In input mode, (one digit flashes) you can switch between the displays with these buttons.	

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The following output data points are available:

Off (output deactivated)

Voltage U PH-N L1
Voltage U PH-N L2
Voltage U PH-N L3

Voltage U PH-PH L12
Voltage U PH-PH L23
Voltage U PH-PH L31

Apparent current Is L1
Apparent current Is L2
Apparent current Is L3

Average apparent current L1
Average apparent current L2
Average apparent current L3

Apparent power L1
Apparent power L2
Apparent power L3

Active power L1
Active power L2
Active power L3

Reactive power L1
Reactive power L2
Reactive power L3

CosPhi L1
CosPhi L2
CosPhi L3

Power factor L1
Power factor L2
Power factor L3

Network frequency
Neutral conductor current
Average neutral conductor current

Total apparent power
Total active power
Total reactive power
Total power factor

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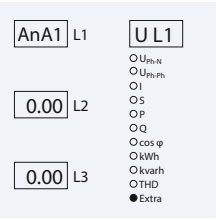
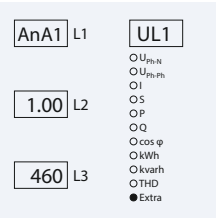
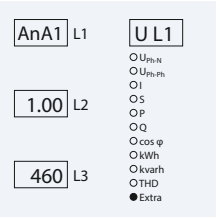
Menu	Button combination	Device display	Description
Submenu Analog outputs Set lower limit			Display L1 shows the analog output 1. Display L2 shows the lower limit and flashes (0. 00) Display L3 shows the upper limit.
NOTE	▶ or ▼	In input mode, (one digit flashes) you can switch between the displays with these buttons.	
Submenu Analog outputs Set lower limit	123 Change value or ⊗ cancel or ⊖ Save		The first digit on Display L2 flashes. Press the 123 button to set the value for this segment. Press the ▶| button to switch between the individual digits. If all digits are flashing, you can move the decimal point with the 123 button. The unit display is also changed.
NOTE	▶ or ▼	In input mode, (one digit flashes) you can switch between the displays with these buttons.	
Submenu Analog outputs Set upper limit	123 Change value or ⊗ cancel or ⊖ Save		The first digit in the L3 display flashes. The button 123 can be used to set the value of this digit. The button ▶| allows switching between the individual digits. When all digits are flashing, the button 123 can be used to move the decimal point. The unit display is also changed.

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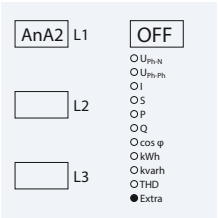
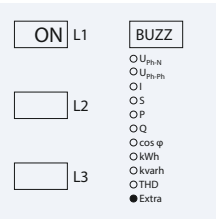
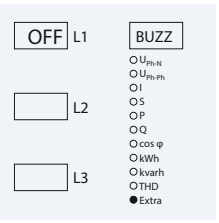
Menu	Button combination	Device display	Description
next submenu	Start input mode		
Submenu Analog outputs Activate output 2 and select output data point	Change value or cancel or Save		When the menu is called up, the display 'OFF' flashes in the units display. The button can be used to set the output data point.

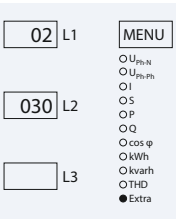
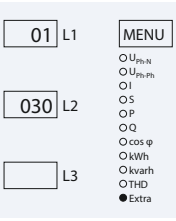
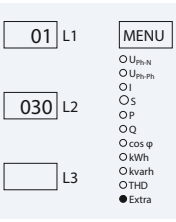
NOTE

The analog outputs AnA.2 and AnA.3 can be set the same way as analog output AnA.1

11.24 Button sounds (button buzzer)

Menu	Button combination	Device display	Description
Submenu button buzzer	Start input mode		Display L1 shows the state of the button buzzer.
Activate/ deactivate submenu button buzzer	Change value or cancel or Save		When you open the menu: Display L1 flashes. Press the button to activate this function. Range of values: ON, OFF
NOTE	 	Return to main menu. Continue to the next submenu, if available. Otherwise, return to the main menu.	

11.25 Default menu (start selection)

Menu	Button combination	Device display	Description
Submenu Default menu (start selection)	▶| Start input mode		Display L1 shows the selected default menu (02 = U_{PH-PH}). Display L2 shows the return time in seconds to the default menu.
Submenu Default menu (start selection)	123 Change value or ⊗ cancel or ⊜ Save		Display L1 flashes. Press the 123 button to select the default menu Range of values: 01 to 11, the LED on the selected menu flashes.
Submenu Default menu (start selection) set return time	123 Change value or ▶| Next digit or ⊗ cancel or ⊜ Save		The first digit on Display L2 flashes. Set the return time to the default menu from 0 seconds (0 = function deactivated) to 255 seconds.
NOTE	▼ ▶ ▶ or ▼	Return to main menu Continue to the next submenu, if available. Otherwise: Return to main menu. Use these buttons to switch between the individual displays in input mode (one digit flashes).	

12 Reset and delete functions

12.1 Reset

+ + Only carry out reset on setup and on complete reprogramming. **Caution!** Reset returns all program values to the default settings!	The reset is performed in the menu Extra - Submenu Factory Settings. Press the buttons digit, delete and right arrow at the same time. The 15-segment display will show 'KILL' during reset. The device is reset to its default settings, i.e., all stored data is lost! This includes all operating parameters, limits and extreme values as well as the off-delay of the signaling relays. The memory for limit violations is deleted. The settings for time, date, language and bus communication are not affected by a reset. Check all operating parameters for correctness!

12.2 Deleting energy meter

12.2.1 Deleting individual energy meters

Hold the button for about 4 seconds to delete the continuous energy meter value currently displayed (active or reactive energy, HT or NT, power import or power export).

12.2.2 Deleting energy meters centrally

To delete energy meters centrally, you can either reset the device or use the optionally available software and KBR eBus.

12.3 Deleting extreme values

12.3.1 Deleting individual extreme values

Press the button for approximately 4 seconds to delete the extreme values (minimum or maximum values) currently displayed.

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12.3.2 Deleting extreme values centrally

To delete all minimum and maximum values, hold the buttons ⊗ and ▶ for about 4 seconds while any minimum or maximum value is displayed. The function is also available via the KBR eBus.

12.4 Deleting limit settings

12.4.1 Deleting individual limit settings

You can only deactivate individual limits in programming mode.

When you are at the corresponding limit value in programming mode, set the limit value to 'OFF' in the type assignment.

12.4.2 Deleting limit settings centrally

To delete all limits, hold the buttons ⊗ and ▶ for about 4 seconds while any limit is displayed. The function is also available via the KBR eBus.

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13 Memory functions

13.1 Device settings

All device settings and configuration data for the memory function are stored in the device.

13.2 Basic device parameters

Parameters	Stored by user
Measuring voltage	can be programmed by user in the range from 0001 V to 999.9 kV programmable
Measuring voltage, secondary	can be programmed by user in the range from 0001 V to 600 V
Measuring current; transformer primary current	can be programmed by user in the range from 0001 A to 999.9 kA
Measuring current (at the input side, i.e., secondary transformer!)	can be selected by user between 1A or 5A
Average current value	Period duration of the average value calculation
Transformer ratio neutral conductor current primary/secondary	Primary can be programmed in the range from 0001 V ... 999.9 kV programmable Secondarily can be selected by user between 1 A or 5 A
Neutral conductor current	measured (inp.) or calculated (calc)
Pulse output type / pulse value / pulse length	according to user settings
Tariff switching	the user can select digital input, switching via eBus or switching at times programmed in the device
Synchronization settings	Setting options - see measurement period synchronization
Bus address	according to user settings between 0001 and 9999
Time	according to user settings in hh:mm:ss
Password	according 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*
Event name	an individual designation is assigned to every event

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Measurement period	1/15/30/60 min*
Analog outputs (option)	can be set by user as 0-10 V, 2-10 V, 0-20 mA or 4-20 mA

* This function can only be set using the PC with optionally available software.

The multimess F144-2-LED-ESMSETMT-5 provides long-term storage as described below.

13.3 Load profile memory

The measuring device has a load profile memory, which can store a maximum of 35,136 entries depending on the number of parameters to be recorded (active power periods for HT and NT, consumption and recovery; reactive power periods for HT and NT, capacitive and inductive) and a user-selectable measurement period (possible period values: 60 / 30 / 15 / 1 minutes).
This means that with a period of 15 minutes, the storage duration is a maximum of 366 days.

The measurement period and the selection of the parameters to be saved can be parameterized using a computer with the optionally available software.

Note

Setting the internal clock:

If the time of the multimess F144-2-LED-ESMSETMT-5 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 F144-2-LED-ESMSETMT-5 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/operation logbook. Adjusting the period duration:

If the period time 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/operation logbook.

13.4 Annual energy memory

The daily energy values for the past 366 days for W_{Active} - consumption, W_{Active} - delivery, $W_{Reactive}$ - inductive, and $W_{Reactive}$ - capacitive are stored in an annual memory, separately for high and low tariff.

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13.5 Event memory/operation logbook

The event memory/operation logbook saves 4,096 events with date, time and status in a ring buffer. The following events are recorded:

Event	Recording
Rate input	Switchover signal HT => LT with date and time Switchover signal LT => HT with date and time
Sync input	Subsequent synchronization with date and time, information on the synchronization type
Power failures	with date, time and duration of the power failure
Error	Error type with date and time
Changed settings/deletions (powerfail entry)	e.g., reset via KBR eBUS/set clock/deletions / parameter changes leading to deletions
Measuring voltage failures	If the power is reduced to 85 % of the rated voltage for longer than 20 ms (can be set using the computer).

NOTE

The described memories can only be read out or configured via the KBR eBus by means of optionally available software.

13.6 Measurement period synchronization

The measurement period of the **multimess F144-2-LED-ESMSETMT-5** can be synchronized in four ways, with the measurement period being adjustable. The measurement period and the synchronization always affect all period significance values.

The following 4 types of synchronization are possible.

13.7 Synchronization only by internal clock

Synchronization by internal clock is started with the factory reset. From this start time, the clock synchronizes the measurement period, for example, every 15 minutes (relative to the full hour and with a set period duration of 15 minutes).

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NOTE

The described memories can only be read out or configured via the KBR eBus by means of optionally available software.

13.8 Synchronization by the energy supplier's synchronous pulse

If the synchronous pulse is available as potential-free contact from the energy supplier, it can be connected to the synchronization input. If the contact closes for at least 250 ms, it is detected as a synchronous pulse and the measurement period is restarted.

Under certain operating conditions, the power supply company may post-synchronize during an ongoing measurement period. The **multimess F144-2-LED-ESMSETMT-5** ends the current period measurement and stores the period value with a timestamp. The time pattern is shifted to the new start time and a new measurement is started immediately.

Example:

The period time is set to 15 minutes, i.e., 20 kW input power results in a period value of 20 kW (15 min period). If an intermediate synchronization is performed 3 minutes after period and this 3-minute period is saved, the period value to be recorded is 4 kW.

If the energy supplier's synchronous pulse does not take place, the error message 'ext. synchronous pulse missing' will be displayed and the internal clock will continue with the time pattern.

13.9 Synchronization by KBR eBus

The synchronization is carried out via a telegram, which is generated either by the PC or by the bus master and sent over the KBR eBus to the desired participants.

Under certain operating conditions, post-synchronization may occur during an ongoing measurement period.
The **multimess F144-2-LED-ESMSETMT-5** 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.

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Example:

The period time is set to 15 minutes, i.e., 20 kW input power results in a period value of 20 kW (15 min period).

If an intermediate synchronization is performed 3 minutes after period start and this 3-minute period is saved, the period value to be recorded is 4 kW.

If the Bus synchronous pulse does not take place, the error message 'ext. synchronous pulse missing' will be displayed and the internal clock will continue with the time pattern.

13.10 Synchronization at tariff change

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

The internal clock synchronizes the measurement period. Depending on the configuration by contact at the HT/NT input or by bus signal, this event will also synchronize the measurement period if the tariff is changed. Under certain operating conditions, the synchronization pulse and the internal measurement period synchronization may not be in accordance with the same time pattern.
The **multimess F144-2-LED-ESMSETMT-5** 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:

The period time is set to 15 minutes, i.e., 20 kW input power results in a period value of 20 kW (15 min period). If a synchronization is performed three minutes after period start and this three-minute period is saved, the period value to be recorded is 4 kW.

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14 Technical data

14.1 Measuring and display values

Wave form for U and I		any
Voltage	RMS value of a measuring interval	Phase - N: U_{L1-N}; U_{L2-N}; U_{L3-N} / Phase - Phase: U_{L1-2}; U_{L2-3}; U_{L3-1}
	Units	[V, kV;] display switches automatically
	Measuring range	0.00 V to 999.9 kV
Current (apparent current)	RMS value of a measuring interval	$I_{L1\ act}$; $I_{L2\ act}$; $I_{L3\ act}$; instantaneous value for each phase
	Average value determination	$I_{L1\ avg}$; $I_{L2\ avg}$; $I_{L3\ avg}$; floating average value of RMS values over a set period of time
	Units	[A;kA;MA]; Display is switched automatically
	Measuring range	0.00 A to 999 kA
Neutral conductor current	RMS value of a measuring interval	$I_{N\ act}$/ $I_{N\ avg}$ Instantaneous and average value - cf. 'Phase current'
	Units	[A;kA;MA]; Display is switched automatically
	Measuring range	0.00 A to 999 kA
Frequency	Power frequency measurement	f_{Mains} ; measured with mains tracking, either 50 Hz fixed or 60 Hz fixed
	Units	[Hz]
	Measuring range	45 - 65 Hz
Apparent power	Calculation	S_{L1}; S_{L2} ; S_{L3} ; S_{tot}
	Units	[VA; kVA; MVA] display is switched automatically
	Measuring range	0.00 VA to 999 MVA
Active power	Calculation	P_{L1}; P_{L2}; P_{L3} ; P_{tot}
	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_{total}; differentiation ind./cap.
	Units	[var; kvar; Mvar]; switching of display is automatic.
	Measuring range	0.00 var to 999 Mvar
Power factor	Calculation ind. & cap.	$\cos_{\varphi L1}$; $\cos_{\varphi L2}$; $\cos_{\varphi L3}$; LF_{L1}; LF_{L2}; LF_{L3}; $LF_{tot.}$; differentiation ind./cap. $\cos_{\varphi}$ in the display
	Measuring range	Cosφ 0.1 ind. - 1 - 0.1 cap., LF 0.1 - 1

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active energy	Calculation	W(HT/NT)
	Units	[Wh; kWh; MWh; GWh]; display switches automatically
	Measuring range	0.0 Wh to 9999 GWh
Reactive energy	Calculation	W_{React} (HT/NT) → ind. or cap.
	Units	[varh; kvarh; Mvarh; Gvarh]; display switches automatically
	Measuring range	0.0 varh to 9999 Gvarh
Harmonics	Distortion factor (THD) for voltage	Voltage: KF-U_{L1}; KF-U_{L2}; KF-U_{L3}
	Partial distortion factors	3rd; 5th; 7th; 9th; 11th; 13th; 15th; 17th to 63rd harmonic of the voltage separated for each phase
	Units	[%]
	Measuring range	0.00 % to 100 %
Current harmonics	Current harmonics, Current harmonics total	3rd; 5th; 7th; 9th; 11th; 13th; 15th; 17th to 63rd harmonic of the current separated for each phase I_{SumL1}; I_{SumL2}; I_{SumL3}
	Units	[A; kA] display is switched automatically
	Measuring range	0.00 A to 999.9 kA

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14.2 Measurement accuracy class (in accordance with DIN EN 61557-12)

Measured value	Symbol	Accuracy class
Voltage	U_{PHN}	0.2 / ± 1 digit
Voltage	U_{PHPH}	0.2 / ± 1 digit
Phase current	I	0.5 / ± 1 digit
Neutral conductor current measured	I_N	0.5 / ± 1 digit
Neutral conductor current calculated	I_{Nc}	2 / ± 1 digit
Power factor	PF_A	1 / ± 1 digit
CosPhi of the fundamental components		1 / ± 1 digit
Frequency	f	0.02 / ± 1 digit
Total apparent power	S_A	1 / ± 1 digit
Total active power	P	1 / ± 1 digit
Total reactive power	E_a	1 / ± 1 digit
Total reactive power fundamental components	Q_a	1 / ± 1 digit
Total reactive energy consumption and recovery	Q_a	1 / ± 1 digit
Voltage harmonics	U_h	1 / ± 1 digit
THD of the voltage	$THD\text{-}R_u$	1 / ± 1 digit
Current harmonics	I_h	1 / ± 1 digit

14.3 Measuring principle

Sampling	205 measuring points per period (50 Hz) 170 measuring points per period (60 Hz)
A/D transformer	16 bit
Measurement of U and I	Simultaneous recording of V and I readings;
Harmonics calculation	FFT with 2048 points over 10 periods (50 Hz) FFT with 2048 points over 12 periods (60 Hz)
Frequency measurement	Consumption: Voltage measurement between phases L1, L2, L3 - N; correct frequency measurement with power supply correction

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14.4 Device Memory

Work, data & parameter memory		2 MB flash
Program memory		512 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 (load profile) for 1464/732/366/24 days		60/30/15/1 minute - values of: Active energy, reactive energy (import and export for each)
Extreme values (max./min.)		Extreme values that occurred after connecting the unit to the power supply or after the outlier memory was deleted manually (maximum indicator function) including date and time
Event memory	Memory size	1500 events including date and time of their occurrence
Operation logbook	Memory size	500 events including date and time of their occurrence
Limit violation	Recording time	≥ 200 ms
Voltage dips of the measuring voltage	Recording time	≥ 20 ms; threshold can be set using the computer, value after reset 85% of rated voltage (in accordance with EN 61000-4-30).

14.5 Power supply

power consumption <18VA, 10W	US1: ≂ 100 - 240 V ±10 % DC/50/60 Hz
power consumption <15VA, 10W	US5: ≂ 22.5 - 64 V ±10 % DC/50/60 Hz

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14.6 Hardware - inputs and outputs

14.6.1 Outputs

Measuring inputs for voltage	U_{L1-L2}; U_{L2-L3}; U_{L3-L1}	3 x 5 V...100 V...120 V AC (Measuring range 1) 3 x 20 V...500 V...600 V AC (Measuring range 2)
	Input impedance	1.2 MOHM (Ph-Ph)
	Measuring range	programmable through Current and voltage transformers
Current measurement inputs	I_{L1}; I_{L2}; I_{L3}; I_N	4 x 0.01 A - 1 A - 1.2 A AC (measuring range 1) 4 x 0.05 A - 5 A - 6 A AC (measuring range 2)
	Power consumption	≤ 0.3VA per input at 6A
	Measuring range	can be configured using voltage and current transformers
Digital inputs	Rate input	Digital input for a potential-free contact for switching between HT/NT, signal e.g. from the utility company: contact open => HT tariff contact closed => NT tariff.
	Synchronous input	Digital input for a potential-free contact for synchronizing the measurement period; pulse length ≥ 250 ms.
	Power supply	27 V/15 mA DC internal supply

14.6.2 Outputs

Signal relay for limit violations	Number	2
	Contact	potential-free, open in case of limit violation
	Reaction speed	programmable, max. 254 sec.
	Switching capacity	250 v (AC) / 2 A potential-free - not touch-proof Both relays must be in the same phase.
Pulse output	Output type	Proportionate to active or reactive energy, configurable on the device from 0.001 to 9990 pulse(s) per kWh
	Optocoupler output	15 mA at max. 35 V; interface S_0-compatible
	Accuracy class	2
	Pulse length	configurable, min. 30 ms, max. 990 ms
	Power supply	external

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Analog output (Option)	Number	3, common negative pole
	Load capacity	Max. 20 mA at current output (max. resistance 500 ohms) Max. 10 V at voltage output (min. resistance 1000 ohms)
	Signal	Parameterizable 0-10 V, 2-10 V or 0-20 mA, 4-20 mA. Accuracy ± 1% of range end value
Serial interface	BUS	RS485 for connection to the KBR eBus or Modbus; max. 32 devices, up to 1000 devices with bus repeater
	Baud rate	38400 fixed at KBR eBus, configurable with Modbus
	Address assignment	For KBR-eBus: can be addressed automatically with software or manually on the device up to address 9999 For Modbus: Adr. 1 to 247 manually on the device.

14.7 Electrical connection

Connection elements		Plug-in terminals
Permissible cross-section of the connecting cables		2.5 mm^2
Measurement voltage inputs	Fuse	max. 1 A slow-blow max. C2 automatic isolating switch UL/IEC-approved
Measurement current inputs	Fuse	NONE!!! Always short-circuit current transformer terminals k and l before opening the circuit!
Input control voltage	Fuse	max. 1 A slow-blow max. C2 automatic isolating switch UL/IEC-approved
Relay output	Fuse	max. 2 A medium sluggish
BUS connection	Connection material	To ensure proper operation, only use shielded twisted-pair cables; e.g., I-Y-St-Y2x2x0.8 EIB
Pulse output	Connection and cables	Observe correct polarity! To ensure proper operation, only use shielded twisted-pair cables; e.g., I-Y-St-Y2x2x0.8 EIB

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Transformer connection	Wiring	See connection diagram
Analog output	Wiring	Observe correct polarity!
Interface connection	RS485 BUS connector pins	Terminal 90 (⊥) Terminal 91 (A) Terminal 92 (B)

14.8 Mechanical data

Switchboard installation	Housing dimensions	144 x 144 x 60 mm (H x W x D)
	Installation cut-out	138 x 138 mm
	Weight	700 g

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14.9 Ambient conditions, electrical safety and standards

Ambient conditions	Standards	DIN EN 60721-3-3:1995-09 + DIN EN 60721-3-3/A2:1997-07; 3K5+3Z11; (IEC721-3-3;3K5+3Z11)	
	Operating temperature	K55 (-5 °C … +55 °C)	
	Air humidity	5 % … 95 %, non-condensing	
	Storage temperature	K55 (-25 °C … +70 °C)	
	Operating height	0 . .. 2000 m above sea level	
Electrical safety	Standards	DIN EN 61010-1:2011-07; DIN EN 61010-2-030:2011-07	
	Protection class	I	
	Overvoltage category, measurement category	Voltage measurement: Current measurement: Power supply:	CAT III: 300 V; CAT II: 400 V CAT III: 300 V CAT III: 300 V
	Rated surge voltage	4 kV	
Protection type	Standards	DIN EN 60529:2014-09	
	Front	IP 40, with IP 51 seal	
	Terminals	IP 20	
EMC	Standards	DIN EN 61000-6-2:2006-03 + amendment 1:2011-03 DIN EN 61326-1:2013-07 **Devices without Profibus DP:** DIN EN 61000-6-3:2011-09 + amendment 1:2012-11 **Devices with Profibus DP:** DIN EN 61000-6-4:2011-09	
Synchronization	Version	internal, manual, tariff switching or by KBR-eBus	
Synchronization time		With internal synchronization based on the full hour	

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15 Serial interface

15.1 RS 485 Bus operation

The RS485 interface of the **multimess F144-2-LED-ESMSETMT-5** is designed for operation on the KBR-eBus. You can operate one or more **multimess F144-2-LED-ESMSETMT-5** devices together over long distances on the KBR-eBus. The bus is connected to the computer via the RS485 interface converter. With the associated Windows® Software, all bus devices can be parameterized and visualized. We will gladly inform you about which devices you can connect to the KBR-eBus and what functionality our Windows® software has.

You can find more information on the structure and technical parameters of the RS 485 bus operation in our KBR eBus installation guide. You are welcome to request this installation guide from us at any time.

16 Overvoltage and lightning protection

To protect your purchased high-quality electronic devices from damage, we strongly recommend that you take overvoltage protection measures. Control voltage inputs, pulse lines, and bus lines should be protected as required.

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17 Troubleshooting

No function.

Check the power supply, back-up fuse, isolating switch and supply line.

The measuring voltage of a phase is 0V.

Check the back-up fuse and isolating switch of the phase.

A phase of the current display has a different sign.

Check k and l of current measurement and correct if necessary.

The energy and power measurements are lower than the values reported by the utility.

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

An LED flashes.

The displayed menu item contains the most recent threshold violation.
Description of the sensor buttons and displays in 8, Chapter 7.1.

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ErrU OVERLOAD or ErrI OVERLOAD.

ErrU: Voltage input of the measuring amplifier overloaded
Switch off measuring voltage and check set 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. The **multimess F144-2-LED-ESMSETMT-5** works in the measuring range 1 if the programmed value of the secondary voltage does not exceed 120 V. Otherwise, the **multimess F144-2-LED-ESMSETMT-5** measures in measuring range 2.

Measuring range 1: 5V to 120V AC, measuring range 2: 20V to 600V AC.

ErrI: Current input of the measuring amplifier overloaded Adjust programming and select larger measuring range. Alternatively, switch off the measuring current and check the transformer ratio.

Note: The device selects the measuring range depending on the secondary current that was set. That is, either measuring range 1 at 1A or measuring range 2 at 5A.

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18 Appendix

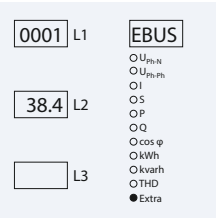
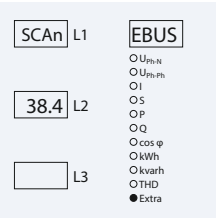
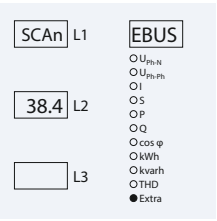
18.1 Function extension: Profibus

The **multimess F144-2-LED-ESMSETMT-5** is available with the Profibus option

The additional functions are described in this appendix (Configuring Profibus).

The Profibus bus protocol is only available if the device is equipped with a Profibus interface.

18.2 Setting the bus protocol

Menu	Button combination	Device display	Description
Main menu Extra			
Submenu eBus	▶| Start input mode (eBus Scan)		Display L1 shows the device address. The baud rate is displayed on Display L2. The unit display shows the current bus protocol (e.g. eBus)
Assign eBus submenu address	▶| Start input mode		Display L1 shows SCAn, i.e., the scan address has been set. Press the ▶| button to enter the input mode for setting the bus address.
Change eBus submenu protocol	▼ Change the bus protocol 123 Change the bus protocol		The first digit on Display L1 flashes. Press the ▼ button to go to the bus protocol display (bus protocol display flashes). The button 123 can be used to change the bus protocol, e.g. from KBR eBus to Profibus

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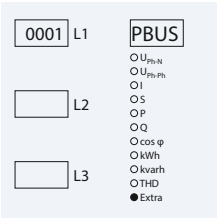
Menu	Button combination	Device display	Description
Submenu eBus Save bus protocol	cancel or save		The unit display shows the selected bus protocol. The bus address is displayed on Display L1.
NOTE	 	Return to main menu Continue to the next submenu, if available. Otherwise, return to the main menu.	

NOTE

Change the bus address with the button (input), select the segment with the button, change the address with the button, press to save.

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