

# DCi/DCMi/DCOi/DCMOi

## Digital industrial meter

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### **EN** Instructions for use

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## Scope of delivery

Please check that the contents of the packing box are complete before starting the installation and start-up procedure.

- 1 DCi, DCMi, DCOi or DCMOi device
- 1 Instructions for use
- Accessory (optional):
  - Path separator

If the contents are incomplete or damaged, please contact your supplier. Store, use and transport the device in such a way that it is protected against moisture, dirt and damage.

## Important information

These instructions for use are part of the documentation.

These instructions list all the different device versions. Some of the features described herein may not be applicable to your particular device.



Please see the product manual for more comprehensive information about the device. Please also observe all the documents included with other components.

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## Target audience

These instructions are intended for technicians who are responsible for the installation, connection and servicing of the devices.

The device must be installed and put into operation only by qualified electricians in accordance with generally accepted rules of technology and the regulations, which are relevant for the installation of telecommunications equipment and end devices.

## Intended use

The meter is intended to be used solely for the measurement of electrical energy, and it must not be operated outside the specified technical data (see name plate).

## Maintenance and warranty instructions

The device requires zero maintenance. It is not permitted to make any repairs in the event of any damage (e.g. due to transport or storage).

If the device is opened, the warranty and the Declaration of Conformity will be rendered null and void. The same applies where a defect is caused by external factors (e.g. lightning, water, fire, extreme temperatures and weather conditions), or by improper or careless use or handling.

The seals may only be broken by authorised personnel.

## Care and disposal information

### **DANGER**

#### **Risk of fatal injury in case of contact with live parts!**

Before the housing of the meter is cleaned, all conductors that the meter is connected to must be de-energised.

Use a dry cloth to clean the device housing. Do not use any chemical cleaning agents!

The following table names the components and how they are to be treated at the end of their life cycle.

Components	Waste collection and disposal
Printed circuit boards	<b>Electronic waste:</b> Dispose of such waste in accordance with the local regulations.
LEDs, LC display	<b>Hazardous waste:</b> Dispose of such waste in accordance with the local regulations.
Metal parts	<b>Recyclable material:</b> Sort such material and send it for recycling.
Plastic parts	Send sorted plastic parts to a recycling plant (regranulation) or, where applicable, to a waste incineration plant (thermal energy generation).

Components	Waste collection and disposal
Battery	Take safety precautions against short circuits before disposing of the batteries. Dispose of the batteries in their original packaging or insulate the terminals. Do not dispose of batteries with the domestic waste. Instead, observe the locally applicable waste and environmental protection standards.

## Basic safety instructions

- Read all the enclosed instructions and information.
- Observe the warnings on the device and in the documents.
- Always be aware of safety issues and hazards when working on the device.
- The customary local occupational health and safety regulations for electrical installations must be observed during assembly, installation and removal of the device.
- Make sure that the installation and operating location of the device meets the specifications in the technical data.
- Before assembly, check the devices for any transport damage and other externally visible damage.
- Only use the device if it is in a technically flawless state, and solely in line with its intended use.
- The connection cables used to connect a meter must be selected for type, cross section, voltage and temperature. In the process, the maximum load on the meter and the installation environment must be considered.
- Attach ferrules to flexible wires.
- Observe the maintenance and warranty instructions.
- If the mains power fails and then returns, there is no need to do anything to the meter.

## General description

This device is a digital single-rate, two-rate or four-rate tariff meter for measuring positive and negative effective and reactive energy in 2, 3 and 4-wire networks. Tariff switching is performed via the internal real time clock (RTC) or an external control input.

The device is primarily designed for use in energy data collection for industrial engineering and building technology, and for use in the utility sector.

In the transformer version, the meter has an adjustable transformer ratio for recording the actual energy consumption. The transformer ratio can be adjusted directly on the meter with the control button.

If the meter is to be used for billing purposes, the editing menu must be locked irrevocably. The transformer factors can then no longer be modified.

Furthermore, the energy consumption values can be output via secondary or primary pulse outputs and/or via an electrical two-wire (M-Bus) or RS485 (M-Bus, SML, Modbus-RTU®) interface.

The pulse constant and pulse length can be adjusted, depending on the version of the meter.

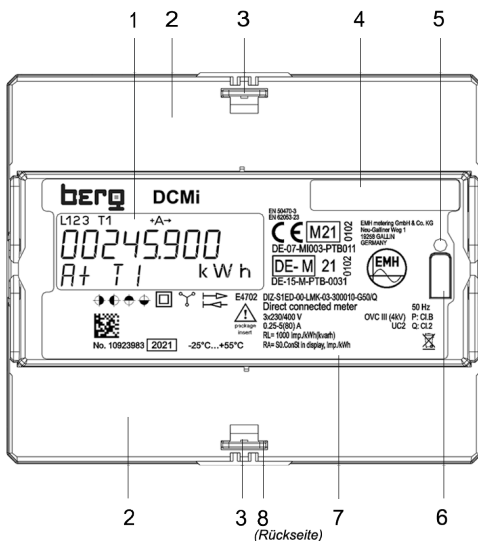
The meter can be operated as a secondary meter (energy measured on the secondary side of the transformers) or, by setting the transformer factors, as the primary meter (actual energy on the primary side of the transformers).

## Technical data

Voltage, current	See name plate
Utilisation category	UC2 (direct metering meter)
Overvoltage category Rated peak withstand voltage	OVC III (as per EN 62052-31) 4 kV (as per EN 62052-31)
Frequency	50 Hz, 60 Hz

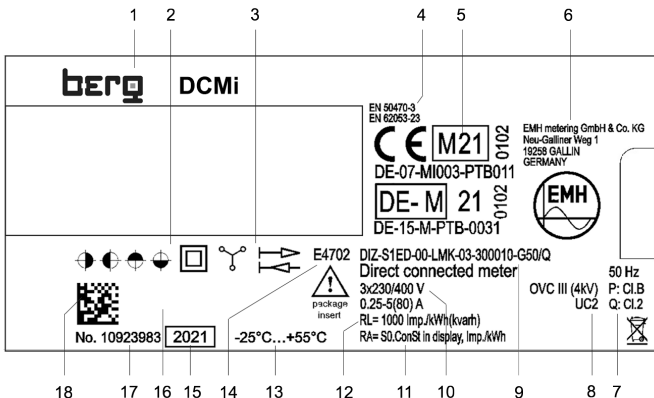
Control input Low voltage System voltage	5...40 V AC 58...230 V AC
Output S0 output Opto-MOSFET	max. 27 V DC, 27 mA (passive) max. 250 V AC/DC, 100 mA
Power consumption per phase Voltage circuit Current path	< 2.0 VA / 1.0 W < 2.5 VA
Temperature range	Defined operating range: -25 °C...+55 °C  Limit range for operation, storage and transport: -40 °C...+70 °C
Humidity	Maximum 95%, non-condensing, as per EN 62052-11, EN 50470-1 and EN 60068-2-30
Altitude	up to 3,000 m
Protection class	II
Degree of protection	Housing, terminal block: IP30
Installation environment	The device may only be used in switch and meter cabinets with a degree of protection of IP51 (or higher). This ensures protection against penetration by dust and water as specified by the relevant standards (EN 50470-1, EN 62052-31).
Fire properties	As per EN 62052-31
Environmental conditions	Mechanical: M1 according to the Measuring Instruments Directive (2014/32/EU)  Electromagnetic: E2 according to the Measuring Instruments Directive (2014/32/EU)  Intended operating location: Interior as per EN 50470-1
Weight	Approx. 450 g

## Housing, display and control elements



- 1 - Display
- 2 - Folding terminal cover
- 3 - Sealing eye
- 4 - Field for transformer plate (for transformer connected meters only)
- 5 - Test LED
- 6 - Call-up button for operating the meter
- 7 - Name plate
- 8 - Catch mechanism on the back of the meter

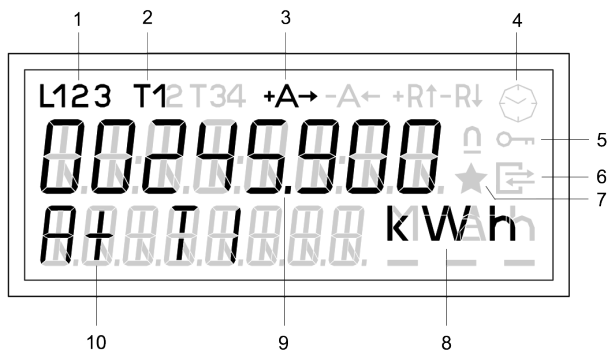
## Name plate



- 1 - Space for ownership labelling
- 2 - Registered quadrants
- 3 - Safety and application information
- 4 - Product standards
- 5 - Conformity and certification marking
- 6 - Manufacturer's address
- 7 - Frequency, accuracy classes
- 8 - Overvoltage category, utilisation category
- 9 - Type designation and type code
- 10 - Voltage, current
- 11 - Output pulse constant
- 12 - LED pulse constant
- 13 - Operating temperature
- 14 - Circuit number
- 15 - Year of construction
- 16 - Space for server ID (for SML) or neuron ID (for LON®)
- 17 - Serial number
- 18 - Bar code



## Display



- 1 - Phase indication
- 2 - Display of the active tariff
- 3 - Energy direction indicator
- 4 - Clock symbol
- 5 - Locking symbol (key)
- 6 - Communication symbol
- 7 - Test mode symbol (star)
- 8 - Display of units
- 9 - Value area
- 10 - Information area

### **Phase indication**

L1, L2, L3 are permanently on:	Phase voltages are present
L1, L2, L3 flash:	Rotating field of the voltage is wrong

### **Display of the active tariff**

T1, T2, T3 or T4:	Tariff 1, 2, 3 or 4 is active
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### **Energy direction indicator**

+A is permanently on:	Meter has started and is registering positive active energy.
+R is permanently on:	Meter has started and is registering positive reactive energy.
-A is permanently on:	Meter has started and is registering negative active energy.
-R is permanently on:	Meter has started and is registering negative reactive energy.
Symbol flashing:	Return lock active. The energy is not registered.

### **Clock symbol**

Permanently on:	Tariff control is performed by the tariff timer.
Flashes:	Clock is defective or power reserve is exhausted.
Off:	Tariff control deactivated or performed via an external signal (control input).

### **Locking symbol (key)**

Flashes:	Editing mode is active or was exited without locking. It is still possible to modify editing data (not permitted for billing).
Off:	Editing mode is permanently locked and cannot be activated again (permitted for billing).

## Communication symbol

Lit: Communication active via the electrical interface.

Symbol frame flashes: Parametrisation status is activated.

## Test mode symbol (star)

Permanently on: Test mode active. Pulse output of the active power on test LED with increased pulse value.

Flashes: Test mode active. Output of the reactive power on test LED with increased pulse value.

## Display of units

Unit of the value displayed in the value area.

## Value area

Display of register contents or action destinations during menu navigation.

## Information area

Additional description of the displayed value.

## Illuminated display (optional)

The illumination is activated by briefly pressing the call-up button in the standard operating display.

The illumination goes out:

- When the call-up menu is exited.
- When the call-up button is pressed for a longer time ( $t \geq 5 \text{ s}$ ).
- If the call-up button is not pressed:
  - In the standard operating display, automatically after 30 s
  - In the menus, automatically after 5 mins.



In battery mode, no illumination of the display is possible.

## Interfaces

### M-Bus interface

The M-Bus interface is designed as per DIN EN 13757-2, -3.

The M-Bus interface is galvanically isolated from the meter and is located on additional terminals 23 and 24.

The following parameters can be transferred via the M-Bus:

- Manufacturer identification
- Medium
- Primary and secondary address of the M-Bus
- Energy values
- Instantaneous values:
  - PTotal
  - Individual power values (P1, P2, P3)
  - Currents
  - Voltages (U1, U2, U3, U12, U23, U13)
  - Reactive power values (Q)
  - Apparent power values (S)
  - Frequency
  - Power factors (PF)
  - Neutral conductor current
- U and I transformer factors
- Error status
- Load profile

Further functions and details are described in the M-Bus description for this meter.

### RS485 interface (M-Bus, SML, Modbus-RTU®)

The electrical RS485 interface is a symmetrical two-wire interface (half-duplex) as per TIA/EIA-485/ITU-T V.11.

The RS485 interface is galvanically isolated from the meter and is located on additional terminals 14 and 16.

The data protocols used are the M-Bus protocol (see also M-Bus interface on page 12), SML (as per SML specification version 1.03) or Modbus-RTU® (Remote Terminal Unit).

Properties		
Number of connected devices	up to 32	
Maximum cable length	up to 1,000 m	
Data transfer rate	300...38400 baud, depending on the protocol	
Signal as per TIA/EIA-485/ITU-T V.11	Logical "1" -0.3 V to -6 V	Logical "0" +0.3 V to +6 V

### RS485 standard bus

An RS485 bus can be used to operate up to 31 meters and 1 modem.

The first and last devices are each terminated with a terminator between the lines to eliminate line reflections. If a terminator is already contained, no additional resistor is necessary on this side of the bus. This device must be installed on the start or end of the bus.

For further functions and details, see the protocol descriptions for this meter.

### SML (Smart Message Language)

The energy meter readings can be read out as a table by means of "SML\_GetList.Request".

It is not possible to read out the load profile.



Please see the product manual for the values that can be read out.

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### Modbus-RTU® (Remote Terminal Unit)

Only the master is permitted to initiate a data exchange.

Every interconnection can contain only one master but up to 247 slaves.

The settings for the serial interface are described as the transfer mode. The following options are available:

- 1 start, 8 data, 1 stop bit, even parity (8E1)
- 1 start, 8 data, 1 stop bit, uneven parity (8O1)
- 1 start, 8 data, 2 stop bit, no parity (8N2)
- 1 start, 8 data, 1 stop bit, no parity (8N1)

The transfer mode can be changed via Modbus® or the call-up buttons. Supported baud rates: 1200, 2400, 4800, 9600, 19200 and 38400 baud.

## **Inputs and outputs**

### **Input**

In the two-tariff version, the meter can be equipped with a control input for tariff switching.

### **Outputs**

The meter has 2 potential-free S0 pulse outputs (as per EN 62053-31) or 2 potential-free MOSFET pulse outputs (semiconductor relay).

The MOSFET outputs are designed as normally open contacts.

### **Secondary pulse outputs**

Set transformer factors do not affect the pulse outputs.

The pulse duration is 30, 50, 100 or 500 ms, depending on the device version.

Depending on the device version, the energy pulses ( $R_A$ ) are 1, 10, 50, 100, 500, 1 000, 5 000, 10 000, 50 000 or 100 000 pulses/kWh or pulses/kvarh and are always obtained in secondary form.

### **Primary pulse outputs**

Set transformer factors affect the pulse outputs.

The pulse duration is 100 or 500 ms, depending on the device version and the set transformer factors.

The pulse value can be set to 1, 10, 100 or 1 000 pulses/kWh or pulses/kvarh.



For a meter with a configured primary pulse output, the functionality of the pulse output also depends on the set total transformer factor.

Choose the transformer factors so that a sufficiently large pulse pause is ensured when the meter is under maximum load.

## Configuration of pulse outputs

The configuration of the pulse outputs is permanently set for the meters when they are delivered and cannot be modified.

Out 1	Out 2
P	None
P	Q
+P	None
+P	-P
+P	+Q

## Test LED

Set transformer factors do not affect the test LEDs.

The LED constant ( $R_L$ ) depends on the device version and is always obtained in secondary fashion.

## Battery

### WARNING

#### **Risk of explosion if battery is not replaced properly!**

If the meter contains a battery, this battery can only be exchanged by the manufacturer as it is in the sealed area. Batteries can leak or self-ignite.

- Never short-circuit, damage, heat or force open batteries.



The meter can optionally be equipped with an internal battery that allows the display to be read even when the meter is in voltage-free condition.

The internal battery allows at least 250 readings with a duration of 1 min each to be performed. These readings can be performed over a period of 8 years; however, the service life of the battery can change due to the user profile.

In battery mode, the display automatically goes out 20 s after the call-up button was pressed for the last time.

The following is not available in battery mode:

- Optical/electrical interface
- Measuring element
- Data storage
- Pulse counting
- Input
- Outputs
- Display lighting
- Symbols are shown on the display

Next to the standard operating display, the call-up menu contains the list menu as its only submenu.

The measurements list is hidden in the list menu.

The alternating display of the standard operating display shows the energy values for the current tariff.



If the battery is not used for a longer time, the read-out can pause for technological reasons.

In this case, press and hold the call-up button for a longer time ( $\leq 30$  s) so that the meter can be operated again.

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## Real time clock

The real time clock (RTC) is used for tariff switching and for synchronisation of the load profile.

During operation, the real time clock has a running accuracy within  $\pm 5$  ppm (at 23 °C). After a 24-hour charging period (minimum) for the gold cap, the device clock will continue to run with a power reserve of at least 168 hours (7 days) in the event of a voltage failure.

The time and date can be set via the data interface and the set menu ("Setmenu").



## Installation and start-up

### Mounting the meter

The meter can be mounted on TH 35-7.5 cap rails as per EN 60715. The following figures show the dimensions (in mm) relevant for mounting.



The device may only be used in switch and meter cabinets with a degree of protection of IP51 (or higher). This ensures the requisite protection against penetration by dust and water.

### DANGER

#### **Risk of fatal injury in case of contact with live parts!**

During installation or when replacing the meter, all wires connected to the meter must be de-energised.

- Remove the corresponding pre-fuses, on the mains side and on the creation side in case of a two-sided feed.
- Store them in a secure location to ensure that no one else can insert them again without being noticed.
- If you use selective automatic circuit breakers for system disconnection, secure them to prevent them from being switched on again without being noticed.
- Before the installation of a meter, make sure that the consequences of disconnecting the electrical system will not result in immediate danger to the life or health of persons or cause any economic damage.
- To avoid any immediate hazards or damage, take appropriate measures to prevent malfunctions before disconnection of the system.
- Use only the specified screw-type terminals for installation and connection of the meter.

### ATTENTION

#### **Damage to meter due to missing pre-fuse on Opto-MOSFET output!**

- Fuse-protect the Opto-MOSFET output with a pre-fuse of 0.1 A.

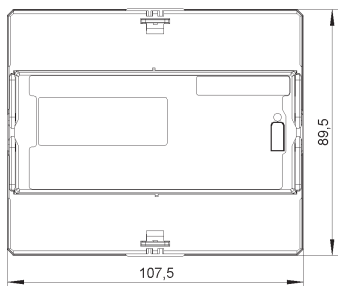
## ATTENTION

**Damage to meter due to missing pre-fuse on control input!**

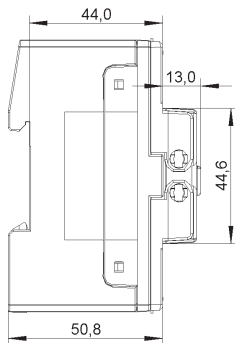
- Fuse-protect the control input with a pre-fuse of 0.5 A.

All measurements in the following drawings are given in mm.

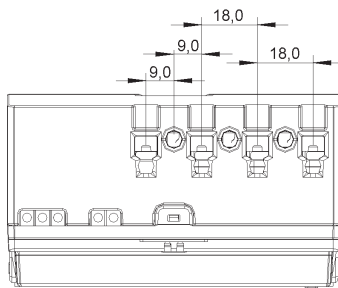
**Front view**



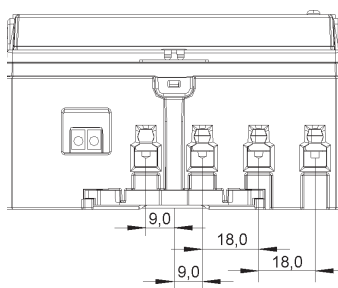
**Left side view**



**View from above**



**View from below**



## **DANGER**

### **Risk of fatal injury due to arcing, fire and electric shock!**

The voltage taps in the meter are not fuse-protected, and are connected directly to the main voltage.

- External devices that are operated using the meter's voltage taps must be fuse-protected with a pre-fuse of  $\leq 0.5$  A in accordance with the applicable technical regulations.

## **DANGER**

### **Risk of fatal injury due to arcing and electric shock!**

The inputs and outputs for the additional terminals are not fuse-protected in the meter.

- Fuse-protect the inputs with a pre-fuse of  $\leq 0.5$  A in accordance with the applicable technical regulations.
- Fuse-protect the outputs as per the current specification on the meter name plate, and the Opto-MOSFET output with a pre-fuse of 0.1 A in accordance with the applicable technical regulations.

## **Removing the meter**

To remove the meter, it is possible to undo the catch mechanism on the underside of the meter with a suitable screwdriver.

## **Connecting the meter**



When connecting the meter, always observe the connection diagram in the terminal cover of the meter. If there is no connection diagram, contact your supplier.

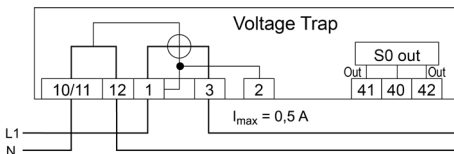
## **Example connection diagrams**

## **DANGER**

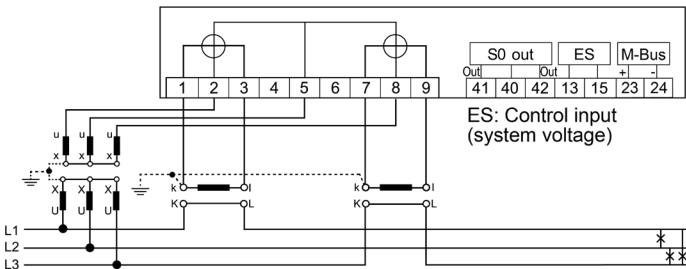
### **Improper installation endangers life and health, and can lead to malfunctions and material damage!**

- When connecting the meter, make sure that the neutral conductor terminals 10/11 and 12 are on the left.

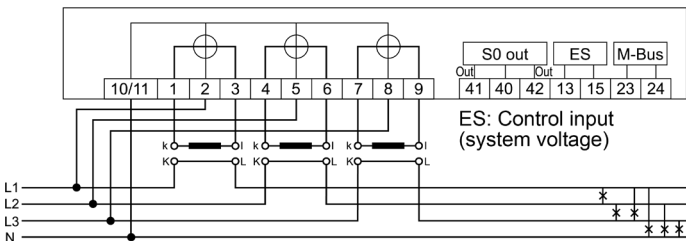
## 2-wire version, connected directly



## 3-wire version, connected to current and voltage transformers

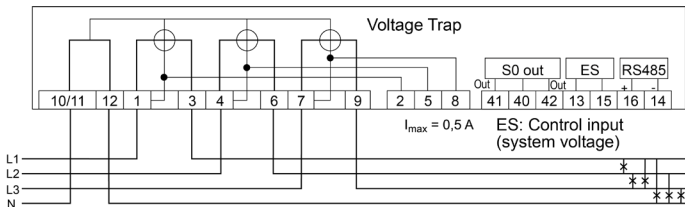


## 4-wire version, connected to current transformers

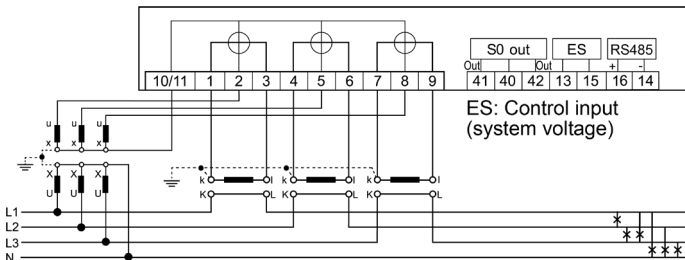


The voltage variant 3x290/500V must not be used in 3-wire networks without N being connected.

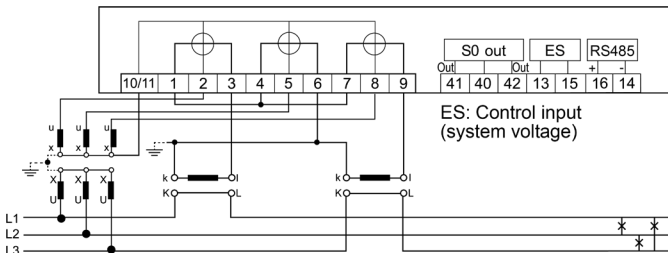
### 4-wire version, connected directly



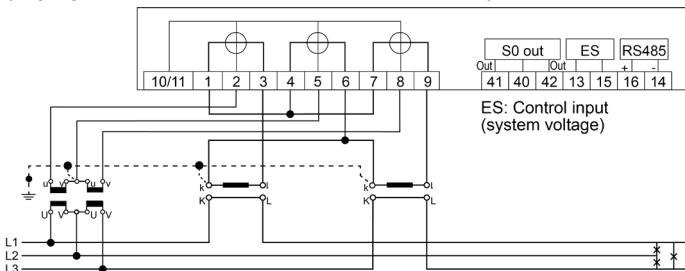
#### 4-wire version, connected to current and voltage transformers



**4-wire version, connected to current and voltage transformers  
(3 voltage transformers) (superposed circuit with 2 current trans-  
formers)**



## 4-wire version, connected to current and voltage transformers (superposed circuit with 2 current transformers)



## Terminal blocks

### ATTENTION

**Application of excessive torque will damage the connection terminals!**

The appropriate torque is dependent on the type of connection line involved and its maximum current.

- Tighten the connection terminals to the corresponding torque as per EN 60999-1.

## For transformer connected meters up to 5 A

### DANGER

**Danger to life due to excess voltages on the terminals of the current paths!**

The voltages on the terminals of the current paths must not be higher than the rated voltages of the voltage circuits of the meter. Excess voltages can lead to fires or electric shock.

- Use the meter only with suitable current transformers to avoid exceeding the voltage limits.  
If necessary, the secondary side of the transformers must be earthed.

## **DANGER**

### **Risk of fatal injury from high voltage when secondary circuits of power transformers are interrupted!**

In transformer connected meters, the high voltage generated on an interrupted secondary circuit of a power transformer can cause fatal injuries, and will destroy the power transformer.

- Before disconnecting the current paths, short-circuit the secondary circuits of the power transformer at its testing terminals.

## **DANGER**

### **Risk of fatal injury in case of contact with live parts!**

- Fuse-protect transformer connected meters in the voltage circuit with a pre-fuse of  $\leq 6$  A in accordance with the applicable technical regulations.

## **For meters with direct connection up to 80 A**

## **DANGER**

### **Improper installation endangers life and health, and can lead to malfunctions and material damage!**

- Use an overcurrent protection device rated for a maximum of 65 A or maximum 80 A upstream of a meter with direct connection.
- The connecting paths must be fuse-protected as per the applicable technical regulations and in accordance with the current specification on the meter's name plate.
- The installer bears responsibility for coordinating the rated values and parameters of the supply-side overcurrent protection devices with the maximum rated currents as well as the rated consumption category of the meter system for directly connected meters.
- The connection cables used to connect a meter must be selected to match the maximum load of the meter and the installation environment in terms of type, cross section, voltage and temperature.

Dimensions, cross sections, torques	Current terminals / N terminal		Voltage terminals	Auxiliary terminals
	up to 80 A	up to 5 A	up to 80 A/ up to 5 A	
Terminal dimensions W x H or d (mm)	6.9 x 7.9	d = 3.1	d = 3.1	d = 2.5
Minimum connection cross sections (mm <sup>2</sup> )	2.5	0.5**	0.5**	0.5**
Maximum connection cross sections (mm <sup>2</sup> )*	25.0 ***	4.0 ****	2.5	2.5
Maximum torques (Nm)	3.0	0.5	0.5	0.5
Screw type	Cross slot combination screw type PZ2 (Pozidriv)	Cross slot combination screw type PH1 (Phillips)	Cross slot combination screw type PH1 (Phillips)	Slotted screw type SL 0.6 x 4
Thread size	M5	M3	M3	M3

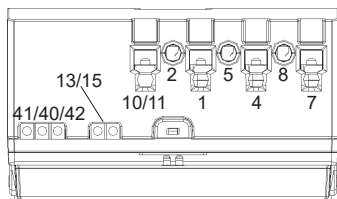
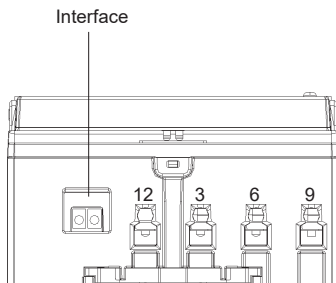
\* Rated connection capacity based on EN 60999-1

\*\* Rated connection capacity based on EN 60999-1, minimum 0.5 mm<sup>2</sup> flexible

\*\*\* Rated connection capacity based on EN 60999-1, maximum 16.0 mm<sup>2</sup> flexible

\*\*\*\* Rated connection capacity based on EN 60999-1, maximum 2.5 mm<sup>2</sup> flexible



**Terminal layout, top****Terminal layout, bottom**

Connections valid for transformer connected meter	Terminal number
S0 outputs	41, 40, 42
Control input	13, 15
Neutral conductor N	10/11
Voltage input U1	2
Current input I1	1
Voltage input U2	5
Current input I2	4
Voltage input U3	8
Current input I3	7
Electrical interface, M-Bus	23, 24
Electrical interface, RS485	14, 16
Neutral conductor N	12
Current output I1	3
Current output I2	6
Current output I3	9



## Terminal cover

To protect the meter from unauthorised access, fit each sealing eye (see page 7) with a seal.

## Meter operation

### Display control

The following applies to operation by means of the call-up button:

- ** Pressing briefly ( $t < 2 \text{ s}$ ):**
  - Moves to the next list value, menu item or setting value
  - Activates the illumination of the display if the meter is equipped in this way
- ** Pressing for a long time ( $2 \text{ s} \leq t < 5 \text{ s}$ ):**
  - Activates the currently displayed menu item
  - Confirms the adoption of the changed settings
- **Pressing for a longer time ( $t \geq 5 \text{ s}$ ):**
  - The display returns to the standard operating display at any time

### Error display

When an error occurs, it appears on the standard operating display. In case of multiple errors, the sum of the relevant error codes is displayed in hexadecimal format.

Error code	Meaning
00000001	Program code faulty
00000002	Parametrisation data faulty
00000004	Editing data faulty
00000008	Data backup faulty
00000010	Synchronisation data faulty



If an error is displayed, the meter data must no longer be used for billing.

Operation of the device can be affected.

### Start list

Once voltage is applied, the display shows the firmware version number and the firmware checksum for 5 s each. It is not possible to operate the meter. Then the standard operating display appears.

## Standard operating display

The standard operating display appears in normal operation.

If the display is in a different state, the display automatically returns to the standard operating display 5 mins after the last time the button was pressed.

The standard operating display shows the configuration-specific energy registers for the current tariff one by one at 5 s intervals (scrolling).




In battery mode, the configuration-specific energy registers for tariffs T0 and T1 appear one after the other at 5 s intervals (scrolling).

### Meaning of symbols in the following table:

**K** pressing briefly ( $t < 2$  s)

**L** pressing for a long time ( $2 \text{ s} \leq t < 5$  s)

Menu item	Display	Button
Error display (only if an error has occurred)		Appears for 60 s when an error has occurred <b>K</b> or <b>L</b> Enter the call-up menu
Energy register for positive active energy in the current tariff (if configured)		Appears for 5 s* <b>K</b> or <b>L</b> Enter the call-up menu
Energy register for negative active energy in the current tariff (if configured)		Appears for 5 s* <b>K</b> or <b>L</b> Enter the call-up menu
Energy register for positive reactive energy in the current tariff (if configured)		Appears for 5 s* <b>K</b> or <b>L</b> Enter the call-up menu
Energy register for negative reactive energy in the current tariff (if configured)		Appears for 5 s* <b>K</b> or <b>L</b> Enter the call-up menu

Menu item	Display	Button
Display test		<p>Appears for 5 s</p> <p> or </p> <p>Enter the call-up menu</p>

\* If the meter has only 1 energy register, it is displayed for 10 s.

## Call-up menu

The call-up menu is activated by pressing the call-up button in the standard operating display.

This list shows tariff information T1 and T2 (active energy) and values for checking the installation of the device.

Subsequently the following submenus can be called up:

- The list menu, divided into
  - Tariff list (display of further tariff registers)
  - Measurements (display of extended instantaneous values, measuring instrument function)
  - Device settings (display of further device settings)
- Test menu (provides test modes for testing purposes)
- Editing menu (for modifying the lockable device settings)
- Set menu (for modifying the device settings that can be changed at any time)



In battery mode, only the tariff registers and the transformer factors are displayed.

The following illustrations are provided to aid comprehension and can differ from the actual display on your meter.

Menu item	Display	Button
Tariff 1, positive active energy (if configured)		<p>[K] Next menu item</p> <p>[L] Return to standard operating display</p>
Tariff 2, positive active energy (if configured)		<p>[K] Next menu item</p> <p>[L] Return to standard operating display</p>
Tariff 1, negative active energy (if configured)		<p>[K] Next menu item</p> <p>[L] Return to standard operating display</p>
Tariff 2, negative active energy (if configured)		<p>[K] Next menu item</p> <p>[L] Return to standard operating display</p>
List menu		<p>[K] Next menu item</p> <p>[L] Enter the list menu</p>
Test menu		<p>[K] Next menu item</p> <p>[L] Enter the editing menu</p>
Set menu (only for meters with a communication inter- face and/or tariff timer)		<p>[K] Next menu item</p> <p>[L] Enter the set menu</p>
Go to start of menu or to standard operating display		<p>[K] Go to start of menu</p> <p>[L] Return to standard operating display (scrolling)</p>

### Further possible displays:

- Voltage transformer constant (U-Const)
- Current (I)
- Current transformer constant (I-Const)
- Current on L1 (I1)
- Active power (P)
- Current on L2 (I2)
- Total active power ( $P_{total}$ )
- Current on L3 (I3)
- Active power on L1 (P1)
- S0 pulse constant
- Active power on L2 (P2)
- S0 pulse length
- Active power on L3 (P3)
- M-Bus address 1
- Voltage (U)
- M-Bus address 2
- Voltage on L1 (U1)
- M-Bus baud rate
- Voltage on L2 (U2)
- Modbus address
- Voltage on L3 (U3)
- Modbus baud rate

### List menu (“LISTMENU”)

The list menu provides access to further submenus, display values and device settings.



The “Meterlist” submenu is always hidden in battery mode.

Menu item	Display	Button
Tariff list		Next menu item Enter the tariff list
Measurements list		Next menu item Enter the measurements list
Device settings		Next menu item Enter the device settings

Menu item	Display	Button
Go to start of menu or to call-up menu		<b>[K]</b> Go to start of menu <b>[L]</b> Return to call-up menu

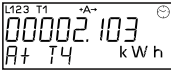


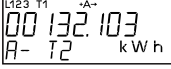
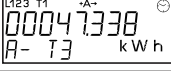
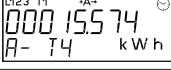
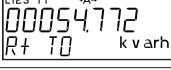
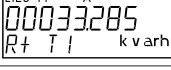
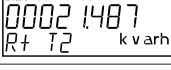
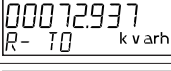


## Tariff list ("TARIFLST")

The tariff list contains all energy registers.

The following energy registers and amount of tariffs are possible:

Meter type	Power direction	Energy register	Amount of tariffs
Single-direction meter as consumption meter	+P	+A	maximum 4 (T0 - T4)
Combi meter as reference meter	+P +Q	+A +R	maximum 2 (T0 - T2)
Two-direction meter	+P -P	+A -A	maximum 4 (T0 - T4)
4-quadrant meter	+P -P +Q -Q	+A -A +R -R	maximum 2 (T0 - T2)

Menu item	Display	Button
Tariff-free, positive active energy		<b>[K]</b> or <b>[L]</b> Next menu item
Tariff 1, positive active energy (if configured)		<b>[K]</b> or <b>[L]</b> Next menu item
Tariff 2, positive active energy (if configured)		<b>[K]</b> or <b>[L]</b> Next menu item
Tariff 3, positive active energy (if configured)		<b>[K]</b> or <b>[L]</b> Next menu item

Menu item	Display	Button
Tariff 4, positive active energy (if configured)		<b>K</b> or <b>L</b> Next menu item
Tariff-free, negative active energy		<b>K</b> or <b>L</b> Next menu item
Tariff 1, negative active energy (if configured)		<b>K</b> or <b>L</b> Next menu item
Tariff 2, negative active energy (if configured)		<b>K</b> or <b>L</b> Next menu item
Tariff 3, negative active energy (if configured)		<b>K</b> or <b>L</b> Next menu item
Tariff 4, negative active energy (if configured)		<b>K</b> or <b>L</b> Next menu item
Tariff-free, positive reactive energy		<b>K</b> or <b>L</b> Next menu item
Tariff 1, positive reactive energy (if configured)		<b>K</b> or <b>L</b> Next menu item
Tariff 2, positive reactive energy (if configured)		<b>K</b> or <b>L</b> Next menu item
Tariff-free, negative reactive energy		<b>K</b> or <b>L</b> Next menu item
Tariff 1, negative reac- tive energy (if configured)		<b>K</b> or <b>L</b> Next menu item
Tariff 2, negative reac- tive energy (if configured)		<b>K</b> or <b>L</b> Next menu item



Menu item	Display	Button
Go to start of menu or to call-up menu		<b>[K]</b> Go to start of menu <b>[L]</b> Return to call-up menu

## Measurements list ("METERLST")

The measurements list contains the recorded instantaneous values and represents the measuring instrument function of the meter.

If transformer factors have been set, they are included in the instantaneous values and represent the primary-side values.

The measurements list can be accessed via the list menu.



In battery mode, the measurements list is hidden in the list menu.

Menu item	Display	Button
Voltage L1-N (only for 2-wire meters)		<b>[K]</b> or <b>[L]</b> Next menu item
Voltage L1-N (only for 4-wire meters)		<b>[K]</b> or <b>[L]</b> Next menu item
Voltage L2-N (only for 4-wire meters)		<b>[K]</b> or <b>[L]</b> Next menu item
Voltage L3-N (only for 4-wire meters)		<b>[K]</b> or <b>[L]</b> Next menu item
Voltage L1-L2 (only for 3- or 4-wire meters)		<b>[K]</b> or <b>[L]</b> Next menu item
Voltage L2-L3 (only for 3- or 4-wire meters)		<b>[K]</b> or <b>[L]</b> Next menu item

Menu item	Display	Button
Voltage L3-L1 (only for 3- or 4-wire meters)		[K] or [L] Next menu item
Current L1 (only for 2-wire meters)		[K] or [L] Next menu item
Current L1 (only for 3- or 4-wire meters)		[K] or [L] Next menu item
Current L2 (only for 4-wire meters)		[K] or [L] Next menu item
Current L3 (only for 3- or 4-wire meters)		[K] or [L] Next menu item
Current neutral conductor (calculated, only for 4-wire meters)		[K] or [L] Next menu item
Active power (only for 2-wire meters)		[K] or [L] Next menu item
Total active power		[K] or [L] Next menu item
Active power L1 (only for 4-wire meters)		[K] or [L] Next menu item
Active power L2 (only for 4-wire meters)		[K] or [L] Next menu item
Active power L3 (only for 4-wire meters)		[K] or [L] Next menu item
Reactive power (only for 2-wire meters)		[K] or [L] Next menu item

Menu item	Display	Button
Total reactive power	<div> L123 T1 <div> 23465 </div> <div> Q<sub>total</sub> </div> </div>	<div> K or L </div> Next menu item
Reactive power L1 (only for 4-wire meters)	<div> L123 T1 <div> 78.73 </div> <div> Q1 </div> </div>	<div> K or L </div> Next menu item
Reactive power L2 (only for 4-wire meters)	<div> L123 T1 <div> 80.54 </div> <div> Q2 </div> </div>	<div> K or L </div> Next menu item
Reactive power L3 (only for 4-wire meters)	<div> L123 T1 <div> 75.38 </div> <div> Q3 </div> </div>	<div> K or L </div> Next menu item
Apparent power (only for 2-wire meters)	<div> L1 T1 <div> 1777.15 </div> <div> S </div> </div>	<div> K or L </div> Next menu item
Total apparent power	<div> L123 T1 <div> 2650.41 </div> <div> S<sub>total</sub> </div> </div>	<div> K or L </div> Next menu item
Apparent power L1 (only for 4-wire meters)	<div> L123 T1 <div> 883.51 </div> <div> S1 </div> </div>	<div> K or L </div> Next menu item
Apparent power L2 (only for 4-wire meters)	<div> L123 T1 <div> 893.64 </div> <div> S2 </div> </div>	<div> K or L </div> Next menu item
Apparent power L3 (only for 4-wire meters)	<div> L123 T1 <div> 873.26 </div> <div> S3 </div> </div>	<div> K or L </div> Next menu item
Total power factor (only for meters with reactive power recording)	<div> L123 T1 <div> 0.95 </div> <div> PF </div> </div>	<div> K or L </div> Next menu item
Power factor L1 (only for 4-wire meters)	<div> L123 T1 <div> 0.95 </div> <div> PF 1 </div> </div>	<div> K or L </div> Next menu item
Power factor L2 (only for 4-wire meters)	<div> L123 T1 <div> 0.94 </div> <div> PF 2 </div> </div>	<div> K or L </div> Next menu item

Menu item	Display	Button
Power factor L3 (only for 4-wire meters)		<b>K</b> or <b>L</b> Next menu item
Frequency		<b>K</b> or <b>L</b> Next menu item
Go to start of menu or to call-up menu		<b>K</b> Go to start of menu <b>L</b> Return to call-up menu

### Device settings (“SETLIST”)

The settings of the meter can be viewed in the device settings list. Some of the settings can be changed in the editing menu as long as it is available and not locked.

Menu item	Display	Button
State of the device clock		<b>K</b> or <b>L</b> Next menu item
Source of tariff control (possible displays: Intern, Remote or Off)		<b>K</b> or <b>L</b> Next menu item
Time switch program number		<b>K</b> or <b>L</b> Next menu item
Amount of tariffs		<b>K</b> or <b>L</b> Next menu item
Load profile channels		<b>K</b> or <b>L</b> Next menu item
Period length of load profile		<b>K</b> or <b>L</b> Next menu item

Menu item	Display	Button
Recording direction of energies	L123 T1 -A- A+A-R+R- EnDIRECT	[K] or [L] Next menu item
Electrical interface (possible displays: MbuS SER, Modb SER (for Modbus), SML SER or Lon, if configured)	L123 T1 -A- MbuS SER IntFACE	[K] or [L] Next menu item
Pulse constant S0 outputs in pulses/kWh	L123 T1 -A- 0000 10 S0-Const	[K] or [L] Next menu item
Pulse length S0 outputs in milliseconds	L123 T1 -A- 100 mSec S0-LENG	[K] or [L] Next menu item
Configuration S0 output 1	L123 T1 -A- P+ S0 1	[K] or [L] Next menu item
Configuration S0 output 2	L123 T1 -A- P- S0 2	[K] or [L] Next menu item
U transformer factor	L123 T1 -A- 00 1 U-Const	[K] or [L] Next menu item
I transformer factor	L123 T1 -A- 000 1 I-Const	[K] or [L] Next menu item
Number of digits before and after the decimal points in the energy register display	L123 T1 -A- 55555.333 SCALE	[K] or [L] Next menu item
Go to start of menu or to call-up menu	L123 T1 -A- -ESCAPE- SETLIST	[K] Go to start of menu [L] Return to call-up menu

## Editing menu (“Edit”)

The state of the editing menu is indicated on the display by the locking symbol (see description of the display on page 9).



As long as the editing menu is unlocked, the meter must not be used for billing!

---

### Modifiable parameters

If the editing menu is not locked (flashing key symbol on the display), the following parameters can be changed:

- Transformer factors
- Arities of the energy registers
- Settings of the pulse outputs

#### a) Changing transformer factors:

- Voltage transformer ratio VT (for transformer connected meters):
    - Integer values from 1 to 999 (default value 1)
  - Current transformer ratio CT (for transformer connected meters):
    - Integer values from 1 to 9999 (default value 1)
- The product of CT x VT can be 999999 at maximum.

If transformer factors have been set, the measurement result (secondary side of the transformers) is multiplied in the meter by these transformer factors and the meter functions as the primary meter.



Changing the transformer factors always results in a zero position for the energy registers.

The register resolution and the pulse constants are reset to the specified value.

---

## b) Arities of the energy registers:

The register resolution can be modified via the display control or the data interface. Possible values:

- Direct metering meters:
  - 8.0 (default value), 7.1, 6.2, 5.3
- Transformer connected meters:
  - Secondary meters: 8.0, 7.1, 6.2, 5.3 (default value), 4.4
  - Primary meters: 8.0, 7.1, 6.2, 5.3, 4.4



According to the Measuring Instruments Directive MID, the registers must not overrun in case of operation for 4,000 hours at maximum power.

If register resolutions are chosen that do not ensure this, the meter must not be used for billing!

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### Example:

Meter with 3 x 230/400 V, direct metering 80 A

$$\begin{aligned}P_{\text{Max}} &= 3 \times U_{\text{Ref}} \times I_{\text{Max}} \\&= 3 \times 230 \text{ V} \times 80 \text{ A} \\&= 55.2 \text{ kW}\end{aligned}$$

- Registered energy after 4000 h = 220,800 kWh
- There must be at least 6 digits before the decimal point.

For this reason, the register resolutions must be chosen in line with the following restrictions:

- Direct metering meters:
  - 8.0 (default value), 7.1, 6.2
- Transformer connected meters:
  - Secondary meters: 6.2, 5.3 (default value)
  - Primary meters: The available arity and the unit result from the transformer factors set for voltage (VT) and current (CT).

Possible register resolutions for a primary meter with 3 x 230/400 V:

Transformer factor (VT x CT)	Register resolution	Unit
1 - 5	8.0, 7.1, 6.2, 5.3	kWh/kvarh
6 - 59	8.0, 7.1, 6.2	kWh/kvarh
60 - 599	8.0, 7.1	kWh/kvarh
600 - 999	8.0	kWh/kvarh
1000 - 5 999	8.0, 7.1, 6.2, 5.3	MWh/Mvarh
6 000 - 59 999	8.0, 7.1, 6.2	MWh/Mvarh
60 000 - 599 999	8.0, 7.1	MWh/Mvarh
600 000 - 999 999	8.0	MWh/Mvarh

You will find further lists in the product manual.

If an energy register has a display overrun, the leading digits are cropped. The internal register figure is retained.

### c) Changing the settings of the pulse outputs:

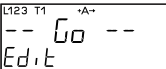
As not every pulse length can be realised with the corresponding pulse frequency (pulse constant and registered energy per time), some settings may not be permitted. In case of a non-permitted pulse length, the following displays appear:

- w.SETTING: the pulse length must be adjusted
- no.CHOICE: the pulse length cannot be displayed, the pulse value must be adjusted

### Editing menu - example:

The I transformer factor is changed from 0001 to 0100 via the editing menu.

The steps to be performed are in **bold font** in the example.

Menu item	Display	Button
Activates the editing menu		<b>[K]</b> Next menu item <b>[L]</b> Enter the editing menu



Menu item	Display	Button
U transformer factor		<b>K</b> Next menu item <b>L</b> Edit value
I transformer factor		<b>K</b> Next menu item <b>L</b> Edit value
Edit the first digit (digit flashes)		<b>K</b> Count digit up by 1 <b>L</b> Edit next digit
Edit the second digit (digit flashes)		<b>K</b> Count digit up by 1 <b>L</b> Edit next digit
Edit the second digit (digit flashes)		<b>K</b> Count digit up by 1 <b>L</b> Edit next digit
Edit the third digit (digit flashes)		<b>K</b> Count digit up by 1 <b>L</b> Edit next digit
Edit the fourth digit (digit flashes)		<b>K</b> Count digit up by 1 <b>L</b> Go to adopt value
Edit the fourth digit (digit flashes)		<b>K</b> Count digit up by 1 <b>L</b> Go to adopt value
Adopt value (all digits flash)		<b>K</b> Edit the first digit <b>L</b> Adopt the edited value, go to next menu item

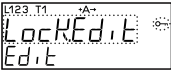


The same procedure applies in principle to changing the arities of the registers, the S0 constants and the pulse length.

## Check the transformer factors:

Menu item	Display	Button
Transformer factor too large: VT x CT > 999999		<p><b>[K]</b> Overwrite the transformer factors</p> <p><b>[L]</b> Enter new transformer factors, set values are rejected</p>
Total transformer factor okay: VT x CT ≤ 999999	No display	Adopt the values, default value for register resolution is selected automatically

## Change the register arity and pulse transmitter parameters:

Menu item	Display	Button
Arity of the energy registers		<p><b>[K]</b> Next menu item</p> <p><b>[L]</b> Edit value</p>
Output constant in pulses/kWh or pulses/kvarh		<p><b>[K]</b> Next menu item</p> <p><b>[L]</b> Edit value</p>
Pulse length in milli-seconds		<p><b>[K]</b> Next menu item</p> <p><b>[L]</b> Edit value</p>
Exit editing menu without final locking ("Off" must be activated)		<p><b>[K]</b> Next menu item</p> <p><b>[L]</b> Edit value</p>
Go to start of menu or to call-up menu		<p><b>[K]</b> Go to start of menu</p> <p><b>[L]</b> Return to call-up menu</p>
Exit editing menu with final locking ("On" must be activated)		<p><b>[K]</b> Next menu item</p> <p><b>[L]</b> Edit value</p>
Confirm locking		<p><b>[K]</b> Return to previous menu item</p> <p><b>[L]</b> Next menu item</p>

Menu item	Display	Button
Finally lock and exit editing mode (Lock. Edit flashes)		<p> Return to previous menu item</p> <p> <b>Exit and irrevocably lock editing mode, go to call-up menu and adopt all values</b></p>



Press the call-up button for a long time irrevocably locks the editing mode, i.e. no more data can be edited!

## Determining the transformer factors

The transformer factors are the quotient of the primary current or voltage data by the secondary current or voltage data, e.g.  $100 \text{ A} / 5 \text{ A} = 20$ .

► In this case, factor 20 must be entered in the editing menu.

## Set menu (“SETMENU”)

The set menu is only available on meters with an electrical interface or clock. This includes settings for the system time, addresses and baud rate.

Factory settings:

- Primary address: 001
- Secondary address: 8-digit with leading zeros, e.g. 01234567 (serial number)
- Server ID (SML): In the format 06, 08 or 09
- Baud rate: 2400 baud or 9600 baud (SML)

## Set menu – example:

The value for the primary address is changed from 001 to 002.  
The same procedure applies when changing other values.

Menu item	Display	Button
Activate the set menu		<b>[K]</b> Next menu item <b>[L]</b> Enter the set menu
Set the date (format: dd.mm.yyyy)		<b>[K]</b> Next menu item <b>[L]</b> Edit value
Set the time (format: hh:mm:ss)		<b>[K]</b> Next menu item <b>[L]</b> Edit value
Specification whether the clock is net- work-guided		<b>[K]</b> Next menu item <b>[L]</b> Edit value
Primary address (ad- justable from 001-250; only for meters with M-Bus)		<b>[K]</b> Next menu item <b>[L]</b> Edit value
Edit the first digit (digit flashes; only for meters with M-Bus)		<b>[K]</b> Count digit up by 1 <b>[L]</b> Edit next digit
Edit the second digit (digit flashes; only for meters with M-Bus)		<b>[K]</b> Count digit up by 1 <b>[L]</b> Edit next digit
Edit the third digit (digit flashes; only for meters with M-Bus)		<b>[K]</b> Count digit up by 1 <b>[L]</b> Edit next digit
Edit the third digit (digit flashes; only for meters with M-Bus)		<b>[K]</b> Count digit up by 1 <b>[L]</b> Go to adopt value
Adopt value (all digits flash; only for meters with M-Bus)		<b>[K]</b> Edit the first digit <b>[L]</b> Adopt the edited value, go to next menu item

Menu item	Display	Button
Secondary address (adjustable from 00000000-99999999; only for meters with M-Bus)		<b>[K] Next menu item</b> [L] Edit value
Baud rate of M-Bus (can be set to 0300, 2400 and 9600 bd; only for meters with M-Bus)		<b>[K] Next menu item</b> [L] Edit value
Address of Modbus® (can be set from 001- 247; only for meters with Modbus®)		<b>[K] Next menu item</b> [L] Edit value
Baud rate of Modbus® (can be set to 1200, 2400, 4800, 9600, 19200 and 38400 bd; only for meters with Modbus®)		<b>[K] Next menu item</b> [L] Edit value
Transfer rate of Modbus® (can be set to 8E1, 8O1, 8N1 and 8N2 – see also page 12; only for me- ters with Modbus®)		<b>[K] Next menu item</b> [L] Edit value
Go to start of menu or to call-up menu		<b>[K] Go to start of menu</b> <b>[L] Return to call-up menu</b>



For meters with SML, the baud rate is permanently set to 9600 baud.

## Abbreviations

A	Active energy
+A	Positive active energy (customer obtains from utility company)
-A	Negative active energy (customer supplies to utility company)
DIN	Deutsches Institut für Normung e.V. (German Standardisation Institute)
EN	European Norm
EVU	Utility company
HP	Unit of division according to DIN 43880
I	Current
ID	Identification
IP	Ingress Protection
ISO	International Standard Organisation
L1, L2, L3	External conductor
LC	Liquid Crystal
LED	Light emitting diode
MID	Measurement Instruments Directive (EU)
N	Neutral conductor
OVC	Over Voltage Category
P	Active power
+P	Positive active power (customer obtains from utility company)
-P	Negative active power (customer supplies the utility company)
Q	Reactive power
+Q	Positive reactive power
-Q	Negative reactive power
R	Reactive energy
+R	Positive reactive energy
-R	Negative reactive energy
RTC	Real Time Clock
RTU	Remote Terminal Unit
SML	Smart Message Language
S0	Interface as per EN 62053-31
t	Actuation duration
U	Voltage
UC	Utilisation Category

