# Table of content

# 1. General notes about these operating instructions

These operating instructions are aimed at trained specialised personnel. Consequently, basic work steps are not listed.

The operating instructions relate to the assembly / installation of the heat meter / cooling meter / heat & cooling meter / cooling & heat meter as a meter assembly and measuring capsule.

## Characters and symbols

These should help to use the operating instructions quickly and reliably.

Indicates important information about the most effective use of the meter.

Indicates important information, warning against incorrect use and possible damage to the meter.

**1.** ... Lists individual handling instructions.

**2.** ...

## General instructions

The operating instructions must be handed over to the end customer upon initial operation.

# 2. Use and function

## Intended use

The mechanical energy meters described here are used to measure the heating or cooling energy consumed in closed systems.

## Non-intended use

A use other than that previously described or a change to the device are classified as non-intended use and must be cleared in writing in advance and specifically approved.

Any manipulation or installation, that is not properly carried out and does not conform to the regulations obviates any responsibility on the part of the manufacturer.

In this case, the responsibility lies solely with the originator.

# 3. Scope of supply

| | Meter assembly | Measuring capsule |
|---|---|---|
| Energy meter | • | • |
| Seal for the coupling housing | - | • |
| Seal for couplings (2 pieces) | • | - |
| Labels for tampering protection | • | • |
| Label for coupling piece identification | - | • |

| | Meter assembly | Measuring capsule |
|---|---|---|
| Connecting cable with plug (for pulse and M-Bus variants) | • | • |
| Operating instructions | • | • |

| For temperature sensor | Meter assembly | Measuring capsule |
|---|---|---|
| Fastening pin | • | • |
| Plug screw | • | • |
| O-rings (2 pieces) | • | • |

# 4. General description

The mechanical energy meters are fully electronic heat meters / cooling meters / heat & cooling meters / cooling & heat meters (hereinafter referred to as meters) with impeller sampling for measuring of billing relevant energy and volume data with maximum accuracy.

## General characteristics

- Electronic sensor control for measuring through flow
- Adjustable reading date for billing
- Rotating calculator
- Reliable meter reading through single row 7 character display

## Measuring capsule

- Can be incorporated in the coupling housing from the accessories or in the housing available in the network with a 2" coupling thread EN 14154 (IST).

- Has one integrated and one free temperature sensor.

**Wireless meter**

- Unidirectional radio transmitter, integrated in the calculator.
- Suitable for mobile or stationary wireless read-out.

**General components:**

- **Flowmeter** (DN 15 - 100) permanently connected to the calculator.
- **Calculator**, contains hardware and software for measuring flow, temperature and energy consumption.
- **Temperature sensor pair,** permanently connected to the calculator.

# 5. Assembly / installation

Assembly / installation must be carried out according to current practice (e.g. EN 1434-6) so that trouble-free measuring can be implemented.

The meter must only be installed in areas free from the risk of frost.

If the meter is thermally insulated, only the flow meter should be insulated, the calculator must not be insulated.

The meter must be fitted in the pipeline so that it is free from mechanical stresses.

The meter should only be removed from the packaging directly before assembly to protect it against damage and dirt.

If several meters are installed in one unit, then the same installation conditions must be ensured.

## Impermissible work

The lead meter seal must not be broken! If the lead seal is broken, the factory guarantee and calibration/conformity are immediately invalidated.

The permanently fitted battery must not be disconnected. Disconnection of the battery terminals leads to loss of saved data.

The temperature sensor cables must not be kinked, shortened or lengthened, nor changed in any other way.

Never carry out hot work (soldering, welding, drilling) close to the meter.

## Medium / temperature

The measurement resistance of the meter is only ensured, if the water quality corresponds to the conditions of the AGFW (The German Energy Efficiency Association for Heating, Cooling and CHP) recommendation FW-510.

The permissible water temperature at the flow sensor must be maintained below the maximum of +90 °C.

### Cleaning

Meter cleaning (only when necessary) must only be carried out from the outside with a cloth that has been slightly moistened with water. Do not use any cleaning agents!

### General assembly information

Assembly and disassembly may only be carried out in depressurised pipework sections.

At least 20 cm distance must be maintained between the meter and any electromagnetic sources of interference such as switches, controllers, pumps, etc.

The display must be accessible at all times and be legible without any external aid.

When selecting the installation location, bear in mind the length of the cables to the free temperature sensor.

Measuring capsules only: The plastic blanking cap is not intended for long-term use.

### Preconditions

- The meter must be protected using suitable means against magnetite and dirt (e.g. strainer, water treatment, filter).
- Shut-off valves must be fitted upstream of the strainer and downstream of the meter.

## 5.1 Preparatory work

1. Thoroughly clean the pipeline.
2. Close the shut-off valves upstream and downstream of the meter and depressurise the pipeline.

## 5.2 Installing the meter

Dependent on the information on the name plate install the meter in the pipeline with lower or higher temperature.

When doing so install the meter so that the flow direction matches the arrow direction on the housing (see **Fig. I**, page 6).

### Meter assembly

1. Remove the spacer or fitted meter (a small amount of water may escape).
2. Remove old seals and clean sealing faces.
3. Thinly grease sealing faces (use acid-free grease).
4. Only fit the newly supplied seals.
5. Fit the meter so it is free from mechanical stresses (observe the meter flow direction). Tighten bolts or flange screws to a torque of approx. 50 Nm.
6. Turn the calculator to an easy-to-read position.

### Measuring capsule

Only fit measuring capsules in coupling pieces designed to EN 14154 (IST).

1. Screw out the blanking cap or fitted meter in an anti-clockwise direction (a small amount of water may escape).

2. Remove old seal and clean sealing faces in the coupling housing.
3. Thinly grease sealing faces and profiled gasket in the coupling housing (use acid-free grease).
4. Only fit the newly supplied seal and check for its correct seating (see page 3, **Fig. 5** on the right side).
5. Screw the measuring capsule into the coupling housing using a hook spanner until hand-tight and then tighten up to the metallic stop (approx. 1/8 to up to 1/4 turn).
6. Turn the calculator to an easy-to-read position.

## 5.3 Fitting location and calming section

- DN 15/20 and measuring capsule: The fitting location is optional (horizontal, vertical or overhead). No calming section is necessary.
- DN 25-40: The fitting location can only be horizontal or riser or downpipe variants are available. With a straight inlet path, a calming section of 3 x D is required, with a 90° elbow upstream of the inlet path, a calming section of 10 x D is necessary.
- DN 50-100: Only a horizontal fitting location is possible. With a straight inlet path, a calming section of 3 x D is required, with a 90° elbow or a T-piece upstream of the inlet, a calming section of 5 x D is necessary.
- With heating systems with no temperature mixing or temperature stratification, an inlet path of 10 x D is necessary.

## 5.4 Fitting the temperature sensors

With meters with 2 free temperature sensors, the temperature sensors are identified with colour name plates.

**RED** - for installing in the high temperature pipe.

**BLUE** - for installing in the low temperature pipe.

For meters with only one free temperature sensor, the labels can also both be grey. The installation location of the meter and the free temperature sensor result from the meter type and the assembly position specified on the name plate.

The free temperature sensors can be fitted in a ball valve or in a labelled pocket tested for conformity for this sensor type. When installed in a pocket, the sensor must be pushed in to the bottom of the sleeve and then secured.

The installation location must be protected by a tampering protection.

Ensure that the sensor is installed symmetrically and preferably directly immersed.

**Info:** For meter assemblies of nominal diameter DN15/20, a temperature sensor is incorporated directly in the coupling housing. With measuring capsules, a temperature sensor is directly tangentially installed in the screw head.

**Installation in a ball valve (See Fig. II, page 7)**

1. Close the shut-off valves in the flow and return.
2. Close the ball valve.
3. Unscrew the plug screw or the old temperature sensor with the seal from the ball valve.
4. Place an O-ring from the attached set ① on the mounting pin ②. The second O-ring serves as a replacement.

5. Insert the O-ring into the hole of the plug screw of the ball valve with the mounting pin using turning movements ③.
6. Position the O-ring in its final position using the other end of the mounting pin ④.
7. Place the two halves of the plastic screw around the temperature sensor ⑤. Press the two halves together so that the two studs on one half of the plastic screw fit into the holes on the other half.
8. Insert the temperature sensor with the plastic screw into the ball valve and tighten the plastic screw by hand (2 - 3 Nm).

## 5.5 Completing work

1. Slowly open the shut-off valves in the flow and return.
2. Check the coupling fittings, meter and temperature sensor for leaks.
3. Press the button on the meter to switch on the display.

- To check the meter, the actual values for energy consumption, temperatures and flow can be viewed on the display (see "7. Display options" at page 56).
- If a fault message is displayed (see "8. Fault" at page 62), it must be cleared.

4. Fit a lead seal to the measuring capsule with housing or the coupling housing and temperature sensors.
5. Fill out the transfer log and hand over to the end user.

# 6. Communication interfaces

## 6.1 Pin assignments

(See **Fig. III**, page 7)

### M-bus or pulse variants

A connecting cable with plug is supplied for the meter variants; 3-pole, cable length 3m.

1. Remove the locking segment.
2. Insert the plug so that the green cable is always on the left.
3. Plug in the locking segment again.

## 6.2 M-Bus

- Polarity reversal protection
- Ground (brown) is not required
- The meter is supplied with power from the M-bus

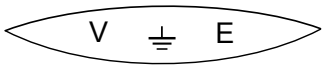
The cabling for an M-Bus system requires no specified cable routing or network (e.g. star, series, etc.).

The preferred read interval should be at least 10 seconds.

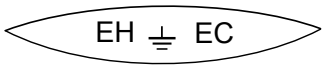
When communicating via the M-Bus, the button and the optical interface cannot be used simultaneously.

## 6.3 Pulse outputs

(See **Fig. III**, page 7)

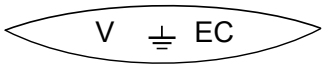


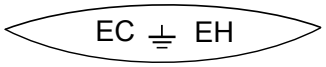

**Heat meter or cooling meter**
**E** = Energy pulse (white)
**V** = Volume pulse (green)
**Ground** (brown)




**Cooling & heat meter**
**EC** = Energy pulse cold (white)
**EH** = Energy pulse heat (green)
**V** = Total volume (green)
**Ground** (brown)

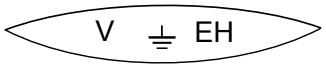
or




**Heat & cooling meter**
**EH** = Energy pulse heat (white)
**EC** = Energy pulse cold (green)
**V** = Total volume (green)
**Ground** (brown)

or




The pulse outputs are open-collector circuits. The collector branch contains only 0 ohm resistance, i.e. there is **no** internal current limiting.

If required, this must be provided by an external protective resistance (see example **Fig. IV**, page 8).

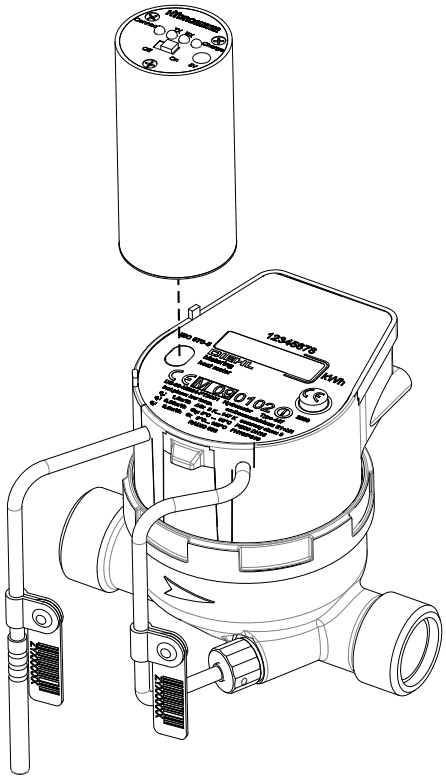
The internal resistance of the switching device must be 5x the resistance value of the protective resistance (see "9. Technical data" at page 64).

The connected switching devices must be suitable for the pulse frequency.

## 6.4 Optical interface

As standard the meter has an integrated optical interface with which the parameters are configured. Please use the HYDRO-SET software for pulse and M-Bus meters or without a communication interface and the IZAR@SET software for wireless meters.

If a fault occurs during configuration, then a new configuration must be implemented via the optical interface.



For correct configuration, the optical head must be placed on the optical interface. We recommend the Bluetooth optical head IZAR OH BT for configuration.

## 6.5 Wireless meter

The meter has an integrated unidirectional radio transmitter, via which the OMS or Real Data radio protocol is transmitted according to EN 13757.

### Distance away upon reading

| Installation location | Typical distance |
|---|---|
| House cellar | 25 m |
| Installation duct or chamber of a house | 30 m |
| Open air | 300 m |

As with any other wireless device, the maximum read distance can be affected by surrounding obstacles or the local topography.

### Activating wireless

Wireless can be activated using the button in the main loop after the display test.

Dependent on the version, either Open Metering or the Real Data radio protocol is programmed.

### Open Metering


Button press > 3 sec

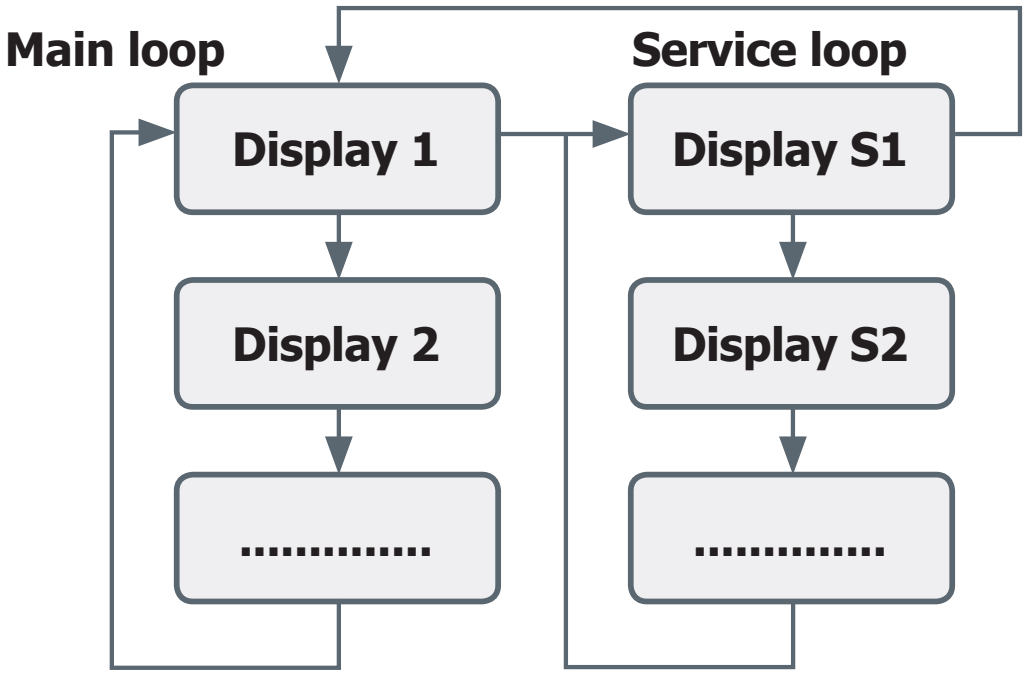
**Real Data**


Deactivating via the button is no longer possible after activation.

The radio system can only be deactivated via the optical interface with IZAR@SET at the Expert user level. In the standard delivery state, wireless is deactivated.

# 7. Display options

## 7.1 Loop overview




The LC display has a power save mode. The display is activated by pressing a button and shows the accumulated energy since initial operation = basic display.

The display switches off automatically and changes to the power save mode if the button is not pressed for 5 minutes. The meter continues measuring without a fault.

- Continue by pressing button < 3 seconds
- Switch from main loop to service loop by pressing button > 3 seconds.

## 7.2 Main loop

**1.** Activate the display by pressing the button.


**Basic display**

If the small "**+**" flashes, then there is a flow. This means that the impeller is turning. Dependent on the flow it may take up to a minute until the "**+**" sign appears again.

The accumulated first mentioned meter energy value (for cooling & heat meters ⇒ cold or for heat & cooling meters ⇒ heat) since initial operation is displayed (conformity declared / calibrated memory).

**Info:** An **H** is shown at the bottom left of the display to indicate a **heat meter**, or a **C** for a **cooling meter**.

**2.** Continue by pressing button < 3 seconds


The accumulated second mentioned energy value since initial operation (non-calibrated memory) is displayed (for meters with heat and cold memories).

**3.** Continue by pressing button < 3 seconds


**Segment test** LCD display
The display switches from "all segments" (3 seconds) to "no segments" (for 1 second).

Then automatically jumps to the next display.
**Attention:** changeover time = 4 sec


Energy value (first named energy value) on the reading date.


The display changes between "first mentioned energy value" (3 seconds) and "reading date" (for 1 second) for a total duration of 5 minutes.
If the first reading date has not yet been reached, the production date is shown.

**4.** Continue by pressing button < 3 seconds


Energy value (second mentioned energy value) on the reading date (for meters with heat and cold memories).


The display changes between "second mentioned energy value" (3 seconds) and "reading date" (for 1 second) for a total duration of 5 minutes.
If the first reading date has not yet been reached, the production date is shown.

## 7.3 Service loop

**1.** Switch to service loop by pressing button > 3 seconds.

**Info:** An **S** is shown at the bottom left of the display to indicate the **service loop** is active.


Actual flow in m³/h ***1**

**2.** Advance in the service loop by pressing button < 3 seconds.


Flow temp., always in °C to 1 decimal place


Return temp., always in °C to 1 decimal place


Temp. difference, always in °C to 1 decimal place (for meters with heat and cold memories with signs)


Current power (always in kW, even if the base display is for example in MWh) ***1**


Accumulated cold volume since initial operation in m³ (for meters with heat and cold memories) ***1**


Accumulated heat volume since initial operation in m³ ***1**


Next reading date cold energy DD. MM. YY (for meters with heat and cold memories)


Next reading date heat energy DD. MM. YY


Secondary address 8 digits (the smallest number after the "S" is also used)

**3.** Continue by pressing button > 3 seconds


204 –> Overall firmware version

04 –> Firmware version for part not requiring calibration

01 –> Firmware version for part requiring calibration

***1** = If the basic display **has no** decimal places, then all indicated displays are shown with **3** decimal places.

***1** = If the basic display **has** decimal places, then all indicated displays are shown according to the basic display.

## 7.4 Diagnostic display

- Activate the display by pressing the button.

If a fault exists, then this is indicated by a corresponding code.

| Code | Fault description |
|---|---|
| C1 | Basic parameter part of RAM damaged. |
| F1 | Sensor short-circuit, sensor break. |
| F2 | Battery lifetime is less than 400 days (RAY Radio only) |
| F3 | Return sensor registers a higher temperature than the flow sensor.<br>Check whether the heat meter/temperature sensors are located in the correct lines. |
| F4 | Flow sensors defective. |
| F5 | Heat meter operating correctly.<br>Communication is not possible to save power (too frequent reading). |
| F6 | Flow sensor is fitted against the flow direction. Install the meter in the correct flow direction (observe the direction arrow on the housing). |

If faults C1, F1 or F4 exist, the meter assembly must be replaced.

# 8. Fault

## 8.1 Check meter

Check the temperature and flow measurement values for plausibility after installation and then at regular intervals.

- Is a flow volume displayed?
- Is a plausible temperature difference displayed (flow and return temperatures)?
- Is a plausible power displayed?

If not, check whether a fault code exists (see "7.4 Diagnostic display" at page 61), or carry out the following checks / troubleshooting.

## 8.2 Troubleshooting

Before checking the meter itself for defects, check the following points:

- Is the heating / cooling operating?
- Is the circulation pump running?
- Are the shut-off valves completely open?
- Is the pipe clear (clean any strainers)?
- Are all the temperature sensors and meter seals intact (tampering)?
- Is the meter rating correct?
- Is the direction arrow on the flow sensor in the flow direction of the heating medium?
- Are the flow and return sensors fitted in the correct line?

- Is the meter fitted in the correct line (flow or return)?
- Is the energy unit (e.g. MWh) printed on the meter correctly selected?

If you have checked the specified points and the meter is still malfunctioning, then please email us (including serial number, meter type, article number) with a detailed fault description and, where necessary, a photo.

| Fault | Rectification |
|---|---|
| Temperature values are displayed, but no flow. | Check and if necessary correct the meter installation direction.<br>Remove meter, blow into meter and check that the impeller turns and the "**+**" sign flashes (active flow) –> meter is OK. Dependent on the flow it may take up to a minute until the "**+**" sign appears again.<br>**Otherwise:**<br>replace the meter. |

# 9. Technical data

## 9.1 Calculator

| Designation | Value |
|---|---|
| Ambient class | EN 1434 class C / MID E1 + M1 |
| Protection class DIN 40050 / IECEN 60529 | IP 54 (heat meter)<br>IP 54 with encapsulated calculator (for cooling meter, heat & cooling meter, cooling & heat meter) |
| Standard interfaces | Optical ZVEI according to IEC 870-5 |
| Optional interfaces | M-Bus, wireless, Pulse (2x) |

## 9.2 Display

| Designation | Value |
|---|---|
| Indicator in the display | LCD, 7-digit |
| Units | MWh - kWh - GJ - MJ - kW - $m^3/h$ - l/h - $m^3$ - l |
| Displayed values | Power - energy - through flow - temperature - reading date value - reading date |
| Display update | Upon button press or every 4 seconds |

## 9.3 Volume measurement

| Designation | Value |
|---|---|
| Measuring cycle | 2 ms |
| Calculation | 125 ms |

## 9.4 Temperature measurement

| Designation | Value |
|---|---|
| Temperature sensor type | Pt 500 / 2 wire |
| Measuring cycle and temperature calculation | 32 s |
| Max. difference temperature | +102 K or +147 K |
| Min. difference temperature | +3 K |
| Energy calculation from | 0.25 K |
| Absolute temperature measuring range | 0 °C ... 105 °C or<br>0 °C ... 150 °C (variant dependent - see name plate) |

## 9.5 Voltage supply

| Designation | Value |
|---|---|
| Operating voltage | 3 V (lithium battery) |
| Battery life | up to 12 years |

## 9.6 Radio / Wireless

| Designation | Value |
|---|---|
| Frequency | 868 MHz |
| Log | Open Metering Standard (OMS) or Real Data (according to EN 13757) |
| Transfer power | 10 mW |
| Transfer interval | 64 s |

## 9.7 Volume / energy impulse open collector

| Designation | Value |
|---|---|
| Max. pulse frequency | 4 Hz |
| Max. input voltage | 30 VDC |
| Max. input current | 27 mA |
| Max. voltage drop at the active output | 2V / 27 mA |
| Max. current through inactive output | 5V / 30 µA |
| Max. reversed voltage without destruction of the outputs | 6 V |
| Min. pulse duration | 125 ms |
| Min. pulse interval | 125 ms |

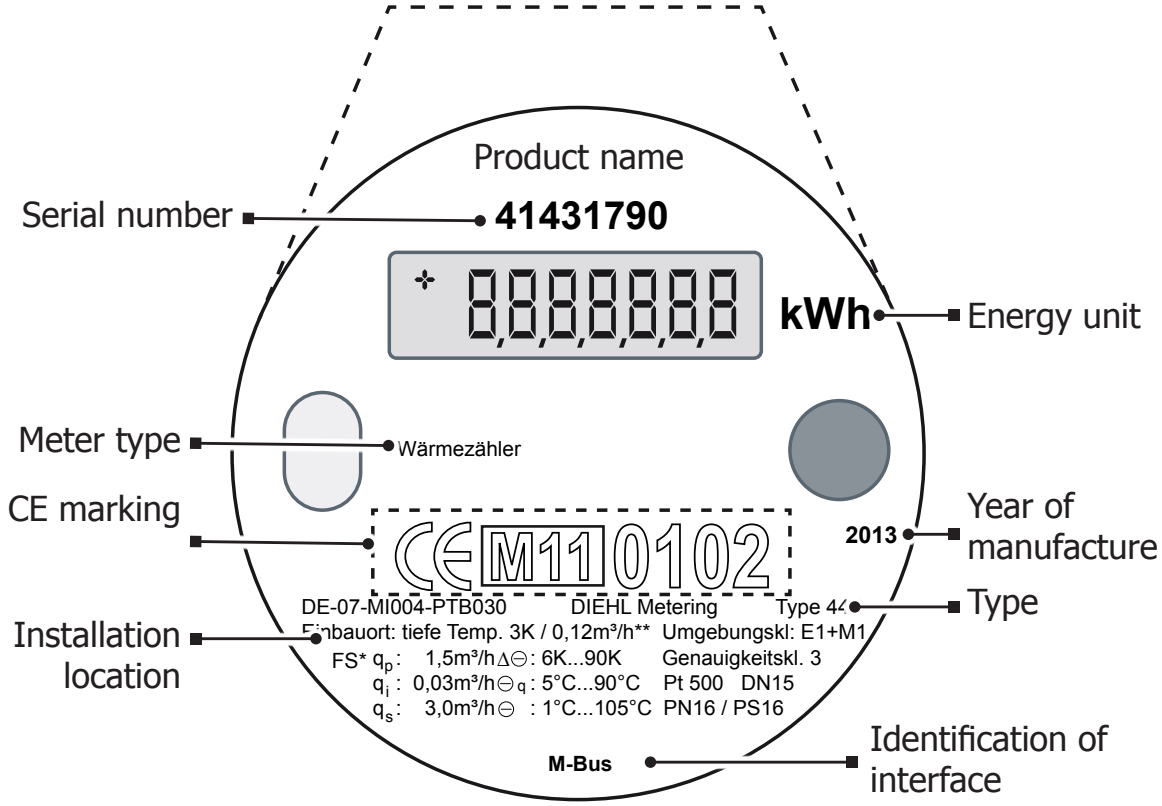
## 9.8 General

| Designation | Value |
|---|---|
| Limits for temporary ambient temperature (operating) | 0 °C ... 55 °C |
| Limits for temporary ambient temperature (storage) | -20 °C ... 55 °C |
| Rated pressure | 16 bar |

# 10. Transport and storage

- Energy measuring devices are precision instruments. Protect against impacts and shocks.
- The permissible temporary temperature limit for storage and transport is between -20 °C and +55 °C.
- Devices with wireless mode activated must not be transported by air.

# 11. Name plate



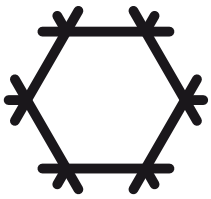

## Additional information

**FS***: Flow sensor data

**3K/0.12 m³/h****: Lower metrological limit of the meter assembly

When using the meter in radiator of floor heating systems, different temperature differences and minimum flows are to be expected!

## Additional marking



Meters with this symbol are fully encapsulated to provide reliable protection against the forming of condensation on the calculator board.