

Installation and Operating Instructions

Compact Heat Meter

Compact Heat/Cooling Meter

Compact Cooling Meter

SensoStar Ultrasonic, Single-Jet and Multi-Jet Heat Meters

DE-16-MI004-PTB025 (MID heat)

DE-16-M-PTB-0097 (national German cooling)

CH-T2-18768-00 (national Swiss cooling)

1 Application and Function

This SensoStar is designed for the measurement of the consumed energy in a closed heating, cooling or heating / cooling system.

2 Contents of the Package

- Heat meter or heat/cooling meter, consisting of a calculator, a flow sensor and two temperature sensors, all permanently connected to each other.
- Mounting accessory pack (depending on the flow sensor type).
- Installation and Operating Instructions including Operating Instructions “Communication Interfaces S3(C)”, Declarations of Conformity.

3 General Information

- Valid standards for the application of heat meters: EN 1434, parts 1-6; the Measuring Instruments Directive 2014/32/EU, Annexes I and MI-004; the respective relevant calibration regulations of the country in which the meter is used.
- For the selection, installation, commissioning, monitoring and maintenance of the instrument observe the standard EN 1434 part 6, as well as the regulations PTB TR K8 + K9 for Germany (and any relevant national verification regulations in other countries).
- National regulations regarding the consumption measurement of amount of cooling must be observed.
- **In devices designed for combined heat and cooling measurement, the cooling register is not calibrated and therefore may not be used for billing purposes in commercial transactions.**
- The technical regulations for electrical installations must be observed.
- The product complies with the essential requirements set forth in the EU Directive on Electromagnetic Compatibility (EMC Directive) for equipment (2014/30/EU).
- The calibration-relevant safety markings on the meter must not be damaged or removed – otherwise the warranty and calibration period of the device are no longer valid!
- The measurement stability of the meter is only guaranteed if the water quality meets the requirements of AGFW recommendation FW-510 and the VDI 2035 (VDI = Association of German Engineers).
- The meter left the factory in conformance with all applicable safety regulations. All maintenance and repair work is to be carried out only by qualified and authorized technical personnel.
- **Instruments with activated radio function are not allowed on air freight.**
- The installation point (inlet flow / outlet flow) of the meter must be observed (see Chapter 3.1 “Pictograms for installation point of the meter (in the display loops)”).
- The temperature sensor cables and the cable between the calculator and flow sensor must not be kinked, rolled up, lengthened or shortened.
- To clean the meter (only if necessary) use a slightly moist cloth.
- To protect against damage and dirt the meter should only be removed from the packaging directly before installation.
- If several meters are installed in one unit, care should be taken to ensure that all meters have as similar installation conditions as possible.
- All instructions listed in the meter’s data sheet and operating manual must be followed. Further information can be obtained at www.engelmann.de.
- The meter has a lithium battery. Do not open the batteries, do not bring the batteries into contact with water or expose them to temperatures above 80 °C. Do not charge them or short-circuit them.



- Replaced or defective parts must be disposed of in an environmentally responsible manner.
- The display is deactivated and can be activated for two minutes by pressing a push-button.
- **The energy display unit and installation point (inlet flow / outlet flow) can be set once in the field by pressing a push-button or, alternatively, using the “Device Monitor” software before commissioning.**
- **Type and concentration of glycol in the medium of those mechanical meter types designed to be used with glycol can be set in the field at any time using the “Device Monitor” software (see Chapter 9.1 for more details).**

3.1 Pictograms for installation point of the meter (in the display loops)

On the right in the meter display in all information loops you will find one of the following two pictograms. The pictogram indicates in which pipe the meter is to be mounted.

	Installation in outlet flow
	Installation in inlet flow

3.2 Pictograms for meter type (on the type plate)

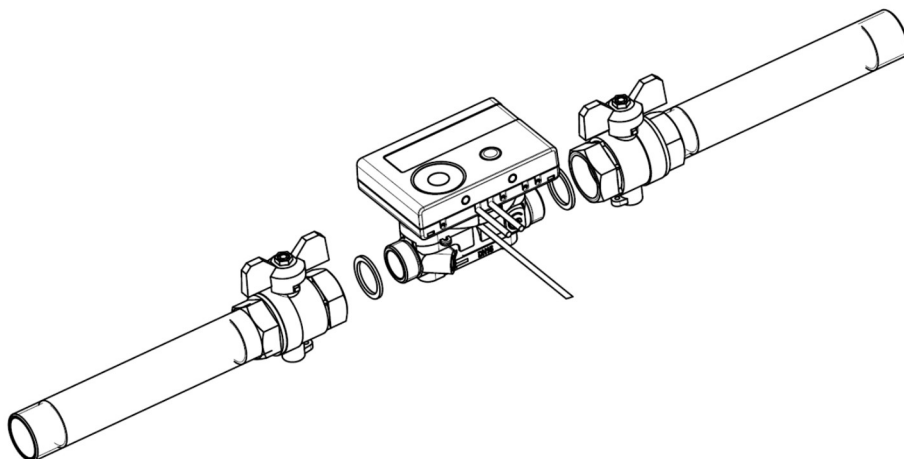
	Heat meter
	Cooling meter

4 Mounting the Flow Sensor

4.1 Mounting of SensoStar E, SensoStar Q and SensoStar U (up to Qp 10)

- Flush the pipes in accordance with accepted engineering practices. Close all shut-off valves.
- Open the drain valve located near the shut-off valve to relieve pressure.
- Drain the shut-off pipe sections.
- Loosen the union nuts on the old heat meter or fitting piece.
- Remove old gaskets and clean the sealing surfaces. Insert new gaskets.
- Position the flow sensor correctly, paying attention to the flow direction (check the arrow on the side of the flow sensor).
- Tighten the union nuts. Ensure a tightening torque of 25-30 Nm.
- Rotate the calculator to the best readout position or detach it and mount it nearby.
- Open the shut-off valve at the meter outlet. Then carefully open the shut-off valve on the supply line and check the meter for leaks.
- **Note: Failure to follow the correct order when opening the valves can cause water hammer, which may damage the meter.**

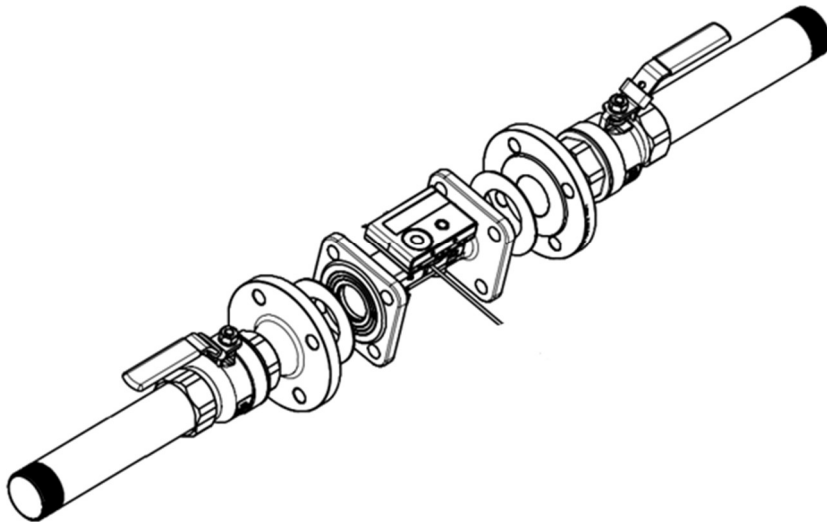
Note concerning SensoStar U: For the mounting in a heating system with a small quantity of air in the medium we recommend to overturn the meter through 90°.



4.2 Mounting of SensoStar U (Qp 15)

- Flush the pipes in accordance with accepted engineering practices. Close all shut-off valves.
- Open the drain valve located near the shut-off valve to relieve pressure.
- Drain the shut-off pipe sections.
- Loosen the screws on the flange of the old flow sensor.
- Remove old gaskets and clean the sealing surfaces. Insert new gaskets.
- Position the flow sensor correctly, paying attention to the flow direction (check the arrow on the side of the flow sensor).
- Tighten the screws on the flange.
- Rotate the calculator to the best readout position or detach it and mount it nearby.
- Open the shut-off valve at the meter outlet. Then carefully open the shut-off valve on the supply line and check the meter for leaks.
- **Note: Failure to follow the correct order when opening the valves can cause water hammer, which may damage the meter.**

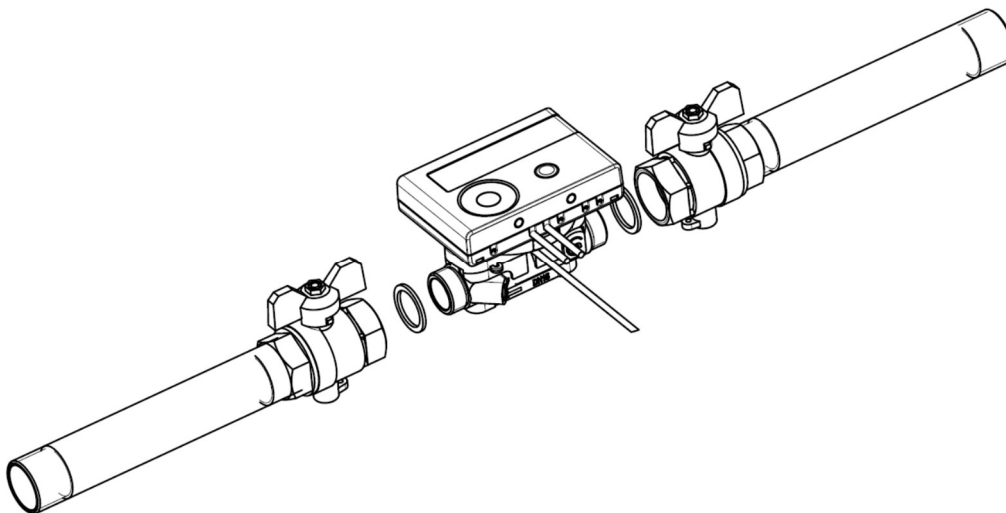
Note concerning SensoStar U: For the mounting in a heating system with a small quantity of air in the medium we recommend to overturn the meter through 90°.



4.3 Mounting of SensoStar UC

- Flush the pipes in accordance with accepted engineering practices. Close all shut-off valves.
- Open the drain valve located near the shut-off valve to relieve pressure.
- Drain the shut-off pipe sections.
- Loosen the union nuts on the old heat meter or fitting piece.
- Remove old gaskets and clean the sealing surfaces. Insert new gaskets.
- Position the flow sensor correctly, paying attention to the flow direction (check the arrow on the side of the flow sensor).
- Tighten the union nuts. **IMPORTANT:** First tighten the union nut at the meter outlet, then the union nut at the inlet. Ensure a tightening torque of 25-30 Nm.
- Rotate the calculator to the best readout position or detach it and mount it nearby.
- Open the shut-off valve at the meter outlet. Then carefully open the shut-off valve on the supply line and check the meter for leaks.
- **Note: Failure to follow the correct order when opening the valves can cause water hammer, which may damage the meter.**

Note concerning SensoStar UC: For the mounting in a heating system with a small quantity of air in the medium we recommend to overturn the meter through 90°. If there is significant offset in the piping, the use of EPDM gaskets is recommended.

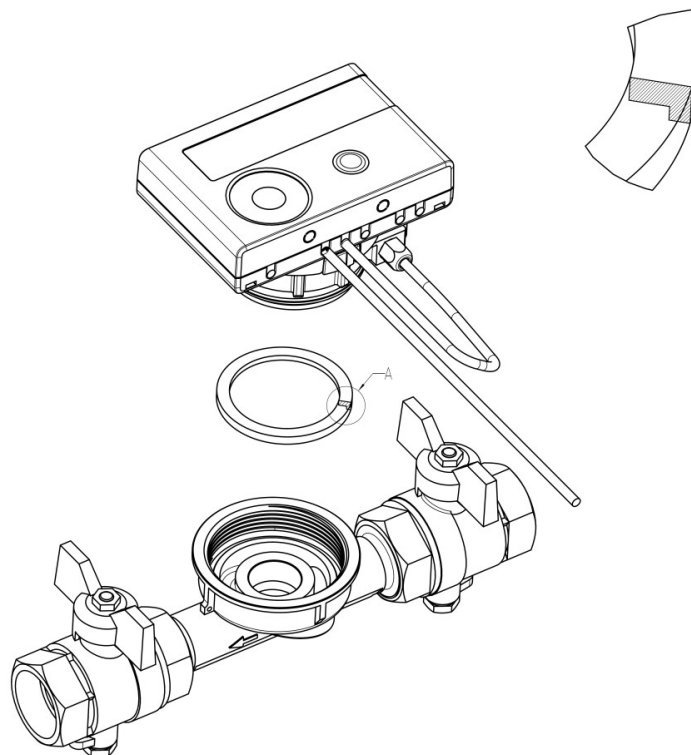


4.4 Installation of SensoStar I in a single-pipe connector

The flow sensor type MSH-IST used has a 2-inch connection in accordance with DIN EN ISO 4064-4 and DIN EN 14154-2 (IST) and must be installed without a transition adapter.

Mounting the flow sensor type MSH-IST in a connector

- Flush the pipes in accordance with accepted engineering practices. Close all shut-off valves.
- Open the drain valve located near the shut-off valve to relieve pressure.
- Drain the shut-off pipe sections.
- Check the flow direction of the connector!
- Remove the overflow cap or the old heat meter from the connector using a hook wrench.
- Remove old gaskets. Check sealing surfaces and threads for perfect condition and clean with suitable tools if necessary.
- Insert the new gasket into the connector with the smooth surface facing upwards.
- Lubricate the external thread of the flow sensor with a thin layer of food-grade silicon grease.
- Check that the O-ring on the outlet of the flow sensor is in the correct position.
- Screw in the heat meter using normal hand force and then tighten it with a hook wrench until it reaches the metallic stop.
- Rotate the calculator to the best readout position or detach it and mount it nearby.
- Open the shut-off valve at the meter outlet. Then carefully open the shut-off valve on the supply line and check the meter for leaks.
- **Note: Failure to follow the correct order when opening the valves can cause water hammer, which may damage the meter.**

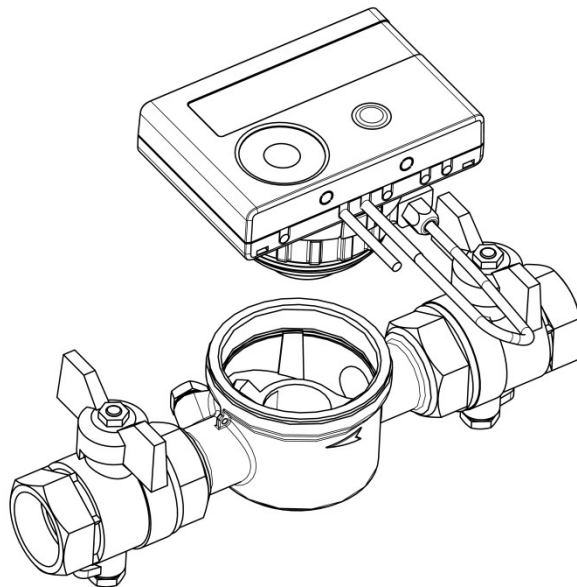


4.5 Installation of SensoStar T in a connection piece

The flow sensor type MSH-TE1 used has an M6x2 thread in accordance with EN ISO 4064-4 and EN 14154-2 (TE1) and must be installed without a transition adapter.

Mounting the flow sensor type MSH-TE1 in a connector

- Flush the pipes in accordance with accepted engineering practices. Close all shut-off valves.
- Open the drain valve located near the shut-off valve to relieve pressure.
- Drain the shut-off pipe sections.
- Check the flow direction of the connector!
- Remove the overflow cap or the old heat meter from the connector using a hook wrench.
- Remove old gaskets. Check sealing surfaces and threads for perfect condition and clean with suitable tools if necessary.
- Lubricate the external thread of the flow sensor with a thin layer of food-grade silicon grease.
- Check that the O-ring on the outlet of the flow sensor is in the correct position.
- Screw in the heat meter using normal hand force and then tighten it with a hook wrench until it reaches the metallic stop.
- Rotate the calculator to the best readout position or detach it and mount it nearby.
- Open the shut-off valve at the meter outlet. Then carefully open the shut-off valve on the supply line and check the meter for leaks.
- **Note: Failure to follow the correct order when opening the valves can cause water hammer, which may damage the meter.**

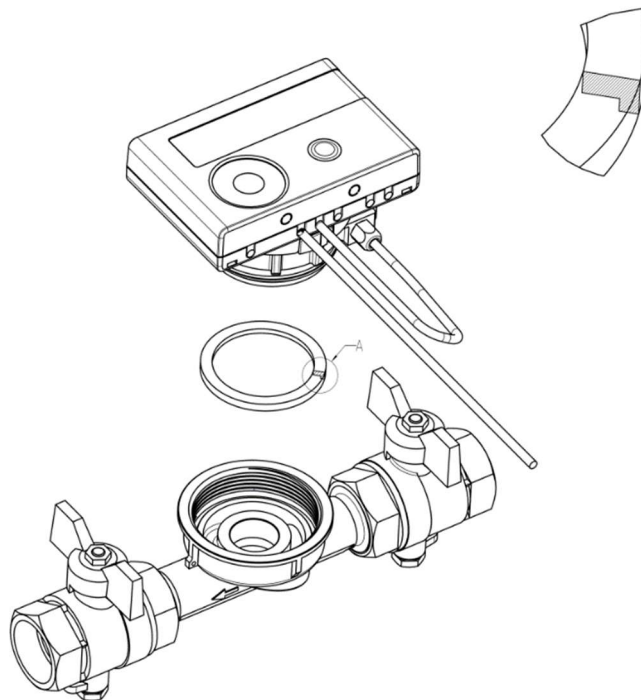


4.6 Installation of SensoStar M in a connector (thread M60x1.5)

The flow sensor type MSH-M60 used has an M60x1.5 thread in accordance with EN ISO 4064-4 and EN 14154-2 (M60) and must be installed without a transition adapter.

Mounting the flow sensor type MSH-M60 in a connector

- Flush the pipes in accordance with accepted engineering practices. Close all shut-off valves.
- Open the drain valve located near the shut-off valve to relieve pressure.
- Drain the shut-off pipe sections.
- Check the flow direction of the connector!
- Remove the overflow cap or the old heat meter from the connector using a hook wrench.
- Remove old gaskets. Check sealing surfaces and threads for perfect condition and clean with suitable tools if necessary.
- Insert the new gasket into the connector with the smooth surface facing upwards.
- Lubricate the external thread of the flow sensor with a thin layer of food-grade silicon grease.
- Check that the O-ring on the outlet of the flow sensor is in the correct position.
- Screw in the heat meter using normal hand force and then tighten it with a hook wrench until it reaches the metallic stop.
- Rotate the calculator to the best readout position or detach it and mount it nearby.
- Open the shut-off valve at the meter outlet. Then carefully open the shut-off valve on the supply line and check the meter for leaks.
- **Note: Failure to follow the correct order when opening the valves can cause water hammer, which may damage the meter.**



4.7 Installation of SensoStar A in a single-pipe connector (M77x1.5)

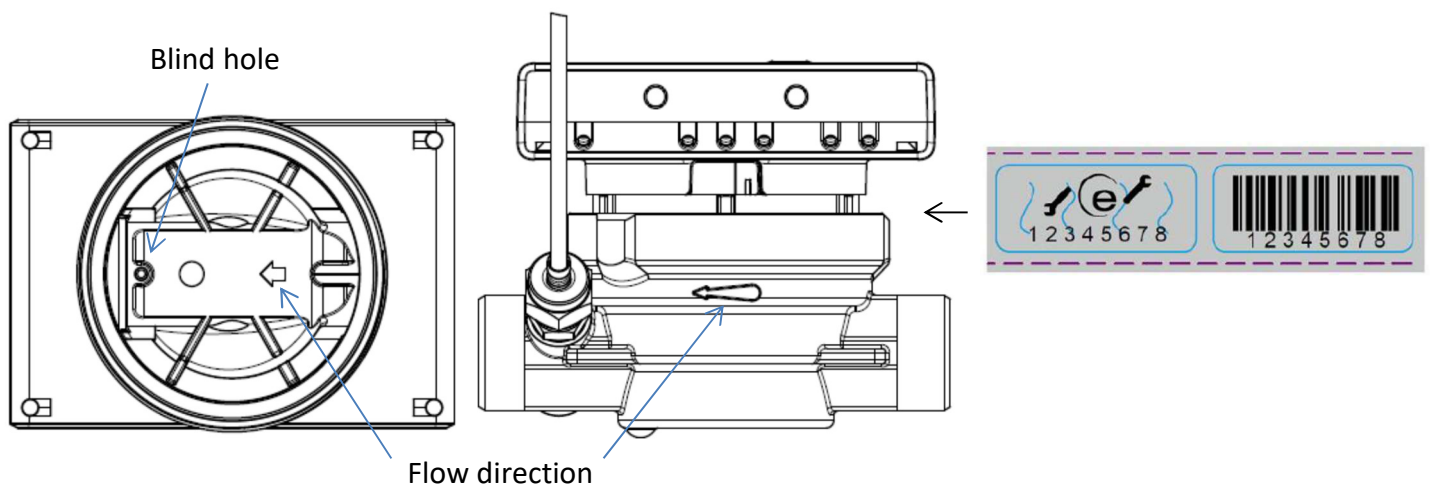
The flow sensor type MSH-A1 used has an M77x1.5 thread in accordance with EN ISO 4064-4 and EN 14154-2 (A1) and must be installed without a transition adapter.

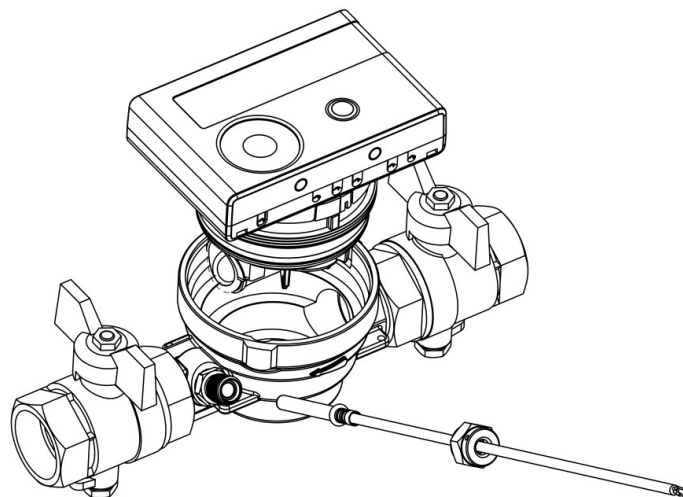
Mounting the flow sensor type MSH-A1 in a connector

- Flush the pipes in accordance with accepted engineering practices. Close all shut-off valves.
- Open the drain valve located near the shut-off valve to relieve pressure.
- Drain the shut-off pipe sections.
- Check the flow direction of the connector!
- Remove the overflow cap or the old heat meter from the connector using a hook wrench.
- If a plastic adapter was mounted together with the old meter, it must also be removed.
- Check sealing surfaces and threads for perfect condition and clean with suitable tools if necessary.
- Lubricate the external thread (M77x1.5) of the flow sensor and the O-ring (66.35x2.62) with a thin layer of food safe silicon grease.
- Screw in the heat meter using normal hand force and then tighten it with a hook wrench until it reaches the metallic stop.
- Rotate the calculator to the best readout position or detach it and mount it nearby.
- Open the shut-off valve at the meter outlet. Then carefully open the shut-off valve on the supply line and check the meter for leaks.
- **Note: Failure to follow the correct order when opening the valves can cause water hammer, which may damage the meter.**
- After installation, the installer must secure the meter against tampering with the enclosed numbered adhesive seal. The seal must be affixed to the connector and flow sensor in such a way that both are connected. The additional barcode sticker can be used for documentation purposes.

Attention!

When installing, ensure that the flow direction matches correctly (arrow on the outside of the connector and on the bottom of the plastic adapter). Ensure that the blind hole in the plastic adapter is correctly secured onto the metal pin inside the bottom of the connector at the flow outlet. (In exceptional cases, the pin may be missing: as long as the flow direction arrows on the connector and the flow sensor match, this does not affect installation or operation.)





5 Separable version

We also provide meters with detachable calculators, in order to simplify mounting in narrow installation spaces. To detach the calculator pull it carefully up off the flow sensor.

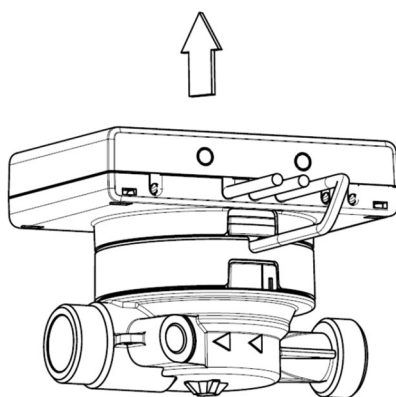
It is generally recommended to detach the heat meter's calculator from the flow sensor.

For cooling meters and heat/cooling meters, the calculator must be detached from the meter.

For the high-temperature heat meter versions **SensoStar U / SensoStar UC (medium temperature up to 130 °C) and for high-temperature heat/cooling meter versions **SensoStar U / SensoStar UC** (medium temperature up to 120 °C), the calculator must also be detached from the flow sensor.**

5.1 Detaching the calculator from the meter with brass hydraulics

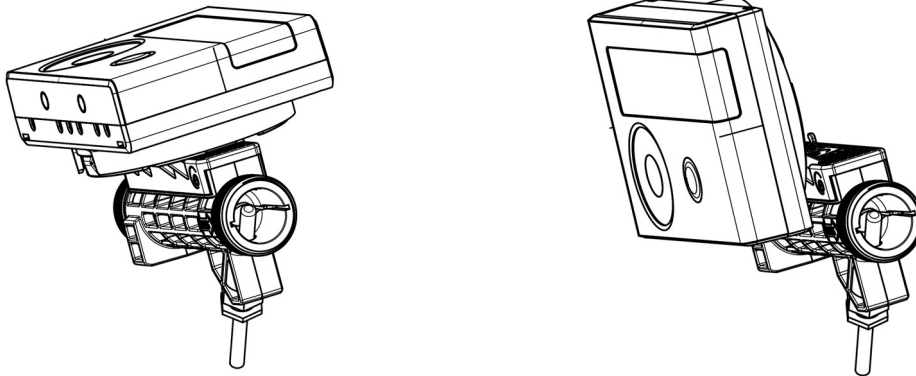
For wall mounting of the calculator, a wall bracket is located between the calculator and the flow sensor, which is snapped into the split adapter of the flow sensor. Remove the calculator. Hold the split adapter of the flow sensor and rotate the wall bracket anticlockwise until you can release it. Then attach the wall bracket to the desired location **with the flat surface towards the wall**.



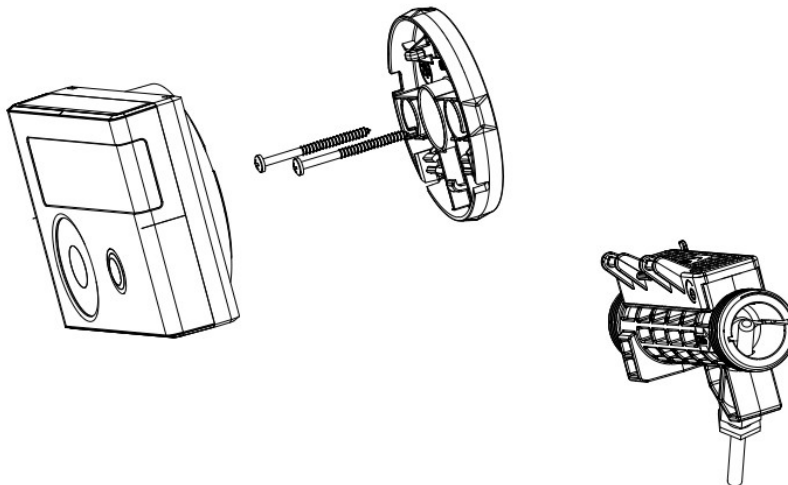
5.2 Detaching the calculator from the meter with composite hydraulics

The calculator of the **SensoStar UC** ultrasonic composite meter can be mounted in various positions.

Thanks to integrated locking hooks, the calculator can be attached to the hydraulics from above, from the side, or rotated by 90°.



To mount the calculator on the wall, remove the calculator including the wall bracket and attach the wall bracket to the desired location **with the flat surface towards the wall**.

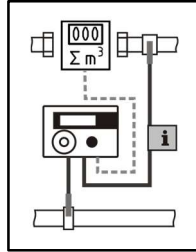


6 Mounting the Temperature Sensors

When installing the temperature sensors in existing thermowells, the thermowell must be determined and marked. The installer is required by law to provide unmarked thermowells with a clear label.

Note: Installation of symmetrical temperature sensors

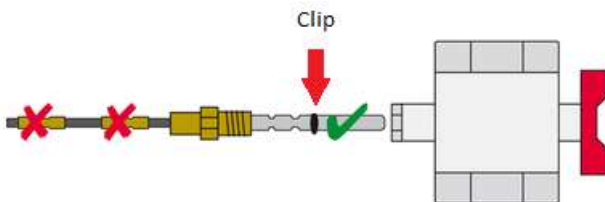
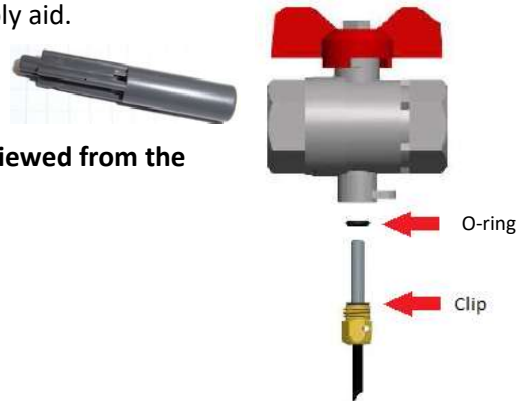
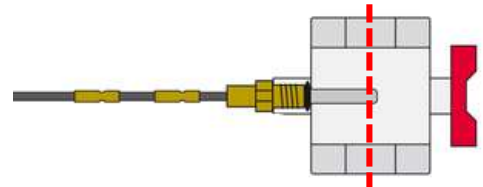
When mounting two external temperature sensors (symmetrical), make sure that the (right) temperature sensor with the following drawing is installed in the same heating train as the flow sensor:



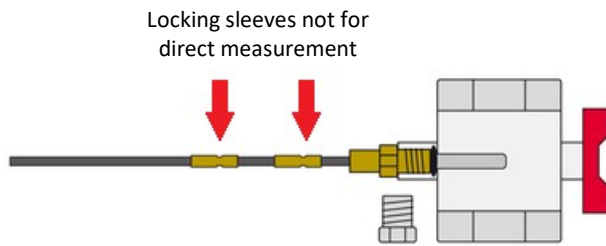
Push the temperature sensor into the thermowell as far as it will go. The outer diameter of the temperature sensor must match the inner diameter of the thermowell [5.0; 5.2; 6.0 mm].

6.1 Direct mounting (ball valve and T-piece)

- The temperature sensor must be installed in the pipeline in such a way that sufficient immersion depth is ensured. The sensor must be immersed at least to the middle of the pipe.
- **Attention:** Starting with flow sensor Qp 10, direct mounting of 5.0 mm temperature sensors is not permitted → only permitted with thermowells.
- Remove blind screw fitting / old temperature sensor and gasket / old O-ring (without leaving any residue).
- **Slide the O-ring off the temperature sensor and insert it into the threaded opening of the ball valve or the T-piece.**
- Insert the O-ring into the threaded opening using the assembly aid.
- The O-ring must not be seated in any of the corrugations. The corrugations only connect the sensor sleeve with the cable.
- **The locking plastic clip must be engaged in the first crimp (viewed from the sensor tip) and must not be displaced.**



- Hold the temperature sensor exclusively by the screw and push it into the ball valve or T-piece and screw it tight.
- When installing the meters, make sure that the flow and return sensors are installed correctly.
- Only the sensor sleeve of the temperature sensor may be immersed in the medium. The locking sleeves, if present, must not extend into the ball valve. If the sensor is inserted too deeply, there is a risk that the temperature sensor will be damaged when the ball valve is shut off.



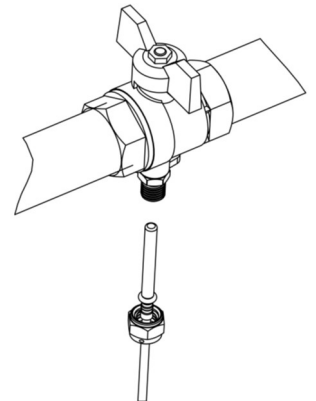
6.2 Installation in short thermowells (smaller than 60 mm)

- MID-compliant thermowells are approved in EU countries (except Germany).
- In Germany, thermowells may not be used in new installations.
Exception: Use of short temperature sensors from heat meters in existing thermowells.
(See the document on "Thermowell tolerance" in the German version of the operating instructions.)
- To insert a temperature sensor into a thermowell, the plastic clip can be adjusted.
- AGFW temperature sensors and needle type temperature sensors may not be installed in thermowells.

6.3 Direct mounting of the 6 mm temperature sensors of the SensoStar A

Important note: Close the shut-off valves and make sure that no (hot) water can escape upon removal of the blind plug or the old temperature sensor!

- Prepare both temperature sensors (flow and return): push the O-ring into the first crimp (viewed from the sensor tip).
- Insert the temperature sensors into the measuring point of the single-pipe connector and ball valve or T-piece and tighten using the brass union nuts.
- Reopen all ball valves and check installation points for leaks.
- Protect the measuring point (flow sensor and temperature sensors) against tampering (seal it).



7 Commissioning

- Slowly open the shut-off valves.
- Check screw connections for leaks.

Check the following points:

- Are all shut-off valves open?
- Is the heat meter properly sized?
- Is the heating line clear (dirt filters not clogged)?
- Is the temperature sensor installed in the flow sensor correctly sealed to the flow sensor (tampering)?
- Does the directional arrow on the connector / flow sensor point in the correct direction?
- Is a flow volume displayed?
- Is a plausible temperature difference displayed?

When the meter is functioning properly, attach the user safety seals to the exterior temperature sensors and the flow sensor (required to protect against manipulation).

8 Completing the Installation (Locking of Adjustable Parameters)

The installation can be completed via the push-button, via the optical interface, or when an energy value (heating or cooling) of more than 10 kWh is reached. As soon as the installation is complete, the operating day counter is activated. Once the installation is complete, the adjustable parameters (device, installation point and units) are locked.

8.1 Pressing a push-button

To complete the installation by pressing a push-button, select the "Operating days" display mode (menu 2-06). Then press and hold the push-button again for 2-3 seconds. As an aid, the "editing pen" icon will appear in the bottom left corner of the LCD after 2 seconds. Once this icon is visible, release the push-button to complete the installation. Afterward, no further changes to the adjustable parameters (device, installation point or units) are possible.

8.2 Optical interface

To complete the installation via the optical ZVEI interface, an optical head and the “Device Monitor“ software are required. Place the optical head on the device and connect it to the PC. Select the menu item “Parameterization“ in the software and click on “Completing the installation“. After your confirmation, the command is written to the device.

8.3 Reaching an energy value > 10 kWh

When an energy value (heating or cooling energy) of more than 10 kWh is reached, the installation is automatically completed.

9 Display Options

The calculator has a liquid crystal display with 8 digits and special characters. The values that can be shown are divided into five display loops. All data is retrieved using the push-button next to the display.

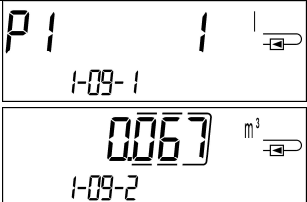
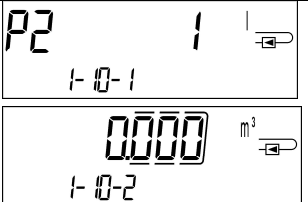
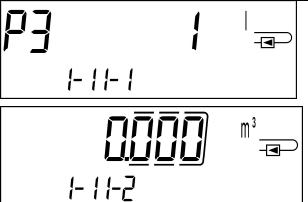
At the start you are automatically in the main loop (first level).

By pressing the push-button longer than 4 seconds you change to the next display loop. Keep the push-button pressed until you reach the desired information loop. Within a display loop, you can retrieve the data of the selected information loop one after another by briefly pressing the push-button.

After 2 minutes of non-use of the push-button, the display will automatically be deactivated.

Level 1 / Main Loop:

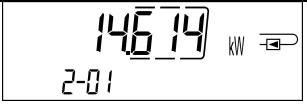
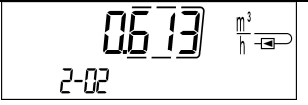

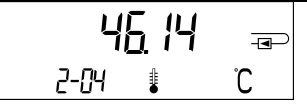

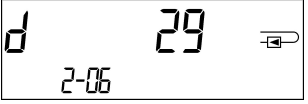
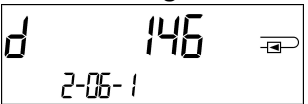
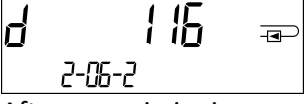

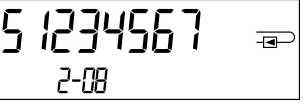
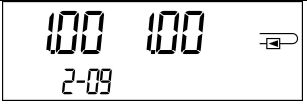
<p>1) Cumulative heat energy since commissioning (standard display); alternating display: cumulative cooling energy (for heat/cooling meters); when negative flow; hint code (if an error was detected)</p>	<p>2) Segment test on/off (all display segments triggered simultaneously)</p>	<p>3) Last billing date alternating with heat energy (cooling energy), volume, value tariff register 1, value tariff register 2 at last billing date.¹⁾ (If the meter has 3 pulse inputs, their values follow.)²⁾</p>	<p>4) Cumulative volume in m³</p>
<p>5) Current date alternating with time</p>	<p>6) Hint message (alternating binary and hexadecimal display)</p>	<p>7) Tariff register 1: value alternating with tariff register and criteria</p>	<p>8) Tariff register 2: value alternating with tariff register and criteria</p>

 <p>9) Pulse counter 1: pulse value alternating with meter reading²⁾</p>	 <p>10) Pulse counter 2: pulse value alternating with meter reading²⁾</p>	 <p>11) Pulse counter 3: pulse value alternating with meter reading²⁾</p>	
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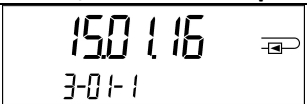




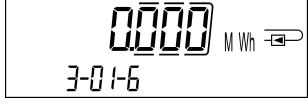
¹⁾ Up to the end of the month / the 15th of the month (for the semi-monthly values) the consumption and date will be shown as 0.

²⁾ Three pulse inputs are an optional feature. Their values can be set using the software “Device Monitor”.

Level 2 / Technician’s Loop:

 <p>1) Current power in kW</p>	 <p>2) Current flow in m³/h. (Return flow: value is displayed negative.)</p>	 <p>3) Inlet flow temperature in °C</p>	 <p>4) Outlet flow temperature in °C</p>
 <p>5) Temperature difference in K. (Cooling metering: value is displayed negative.)</p>	 <p>6) Before commissioning: operating days since manufacturing</p>   <p>After commissioning: operating days since manufacturing alternating with operating days after reaching an amount of energy > 10 kWh</p>	 <p>7) M-bus address</p>	 <p>8) Serial number</p>
 <p>9) Firmware version</p>			

Level 3 / Statistics Loop:

  	  	<p>1) – 30) Semi-monthly values: date alternating with heat energy, cooling energy, volume, value tariff register 1, value tariff register 2.¹⁾ (If the meter has 3 pulse inputs, their values follow.²⁾)</p>	
---	---	---	--

Level 4 / Maximum Values Loop:

<p>1) Maximum power alternating with date and time</p>	<p>2) Maximum flow alternating with date and time</p>	<p>3) Maximum inlet flow temperature alternating with date and time</p>	<p>4) Maximum outlet flow temperature alternating with date and time</p>
<p>5) Maximum temperature difference alternating with date and time</p>			

Level 5 / Parameterization Loop:

<p>1) Parameterization "Unit of energy"</p>	<p>2) Parameterization "Installation point"</p>		

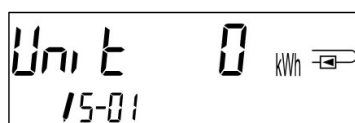
9.1 Parameterization loop

a) The following meter settings can be configured **once** in the field by pressing a push-button or, alternatively, using the "Device Monitor" software:

- **unit of energy** (kWh; MWh; GJ; MMBTU; Gcal),
- **installation point** (inlet flow; outlet flow).

These parameterization options are only available if the amount of energy is still ≤ 10 kWh. Make sure that these meter settings are configured as desired before commissioning the system.

Setting via pressing a push-button: To start the editing mode for parameterization you must select the respective item in the parameterization loop and then press the push-button once again for 2-3 seconds. As an aid, the "editing pen" icon will appear in the bottom left corner of the LCD after 2 seconds (see image). Once this icon is visible, you must release the push-button. The current display will then start to flash.




By pressing the push-button briefly, you can switch to the next menu option. By pressing the push-button longer, the currently displayed menu option will be set. If no option is chosen, no reparameterization takes place and the editing mode ends automatically when the LCD goes out.

b) The following characteristic of those mechanical meter types designed to be used with glycol can be configured **at any time** in the field using the “Device Monitor” software:

- **type and concentration of glycol in the medium** (ethylene glycol; propylene glycol; 20 %; 30 %; 40 %; 50%).

9.2 Detection of flow

As long as the meter detects a flow, the following pictogram will be displayed in the bottom right corner of the display.

	Flow detected
---	---------------

10 Operating Conditions

SensoStar		
Maximum flow Q_s/Q_p		2:1
Mechanical class (MID)		M2
Electromagnetic class (MID)		E2
Environmental class (MID)		C
Protection class flow sensor		IP65
Nominal pressure PN	bar	16
Mounting position		any position, if there is no indication on the type plate
Flow sensor of SensoStar E and SensoStar multi-jet meters		
Temperature range medium heat	°C	15 – 90
Temperature range medium cooling	°C	5 – 50 (Q_p 1.5 and Q_p 2.5)
Flow sensor of SensoStar U/UC		
Temperature range medium heat	°C	15 – 90 15 – 130 high temperature (150; for max. 2000 h) (optional)
Temperature range medium cooling	°C	5 – 50 (from Q_p 0.6 to Q_p 15)
Temperature range medium heat/cooling	°C	15 – 90 heat 15 – 120 high temperature (optional) 5 – 50 cooling
Protection class flow sensor		IP68
Calculator of SensoStar U/UC		
Ambient temperature in the field	°C	5 – 55 at 95 % relative humidity
Transport temperature	°C	-25 – 70 (for max. 168 h)
Storage temperature	°C	-25 – 55
Protection class		IP65

11 Interfaces and Options

11.1 Optical (infrared) interface

For communication with the optical interface an optocoupler is necessary. The optocoupler and the required “Device Monitor” software are available as optional accessories.

The optical infrared interface will be activated by automatically sending a header (according to EN 13757-3). Baud rate: 2400 Bd.

Then you can communicate with the meter for 4 seconds. After every valid communication the meter is open for another 4 seconds. Afterwards the display is deactivated.

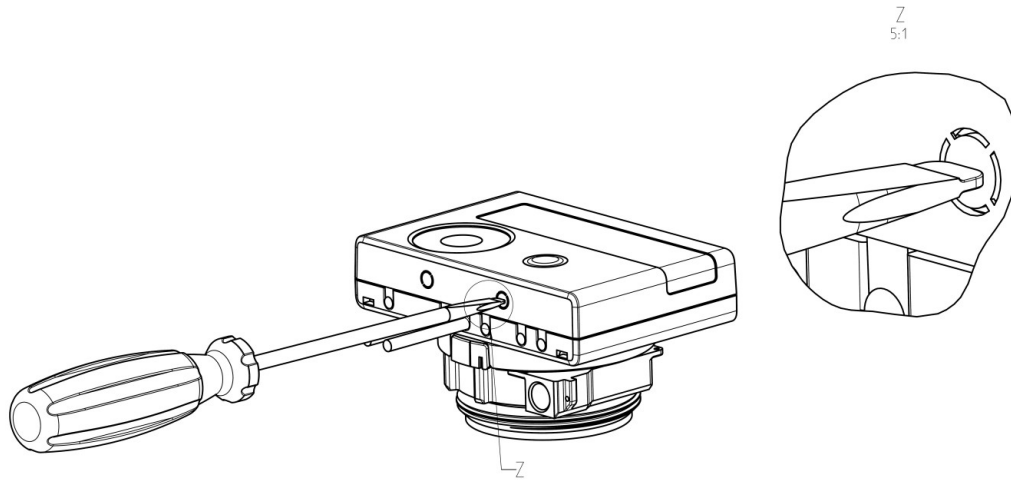
The number of readouts per day via the optical interface is limited. With daily readout, at least 4 communications are possible; with less frequent readout, the possible number of communications increases.

11.2 Retrofitting with an additional communication interface (optional)

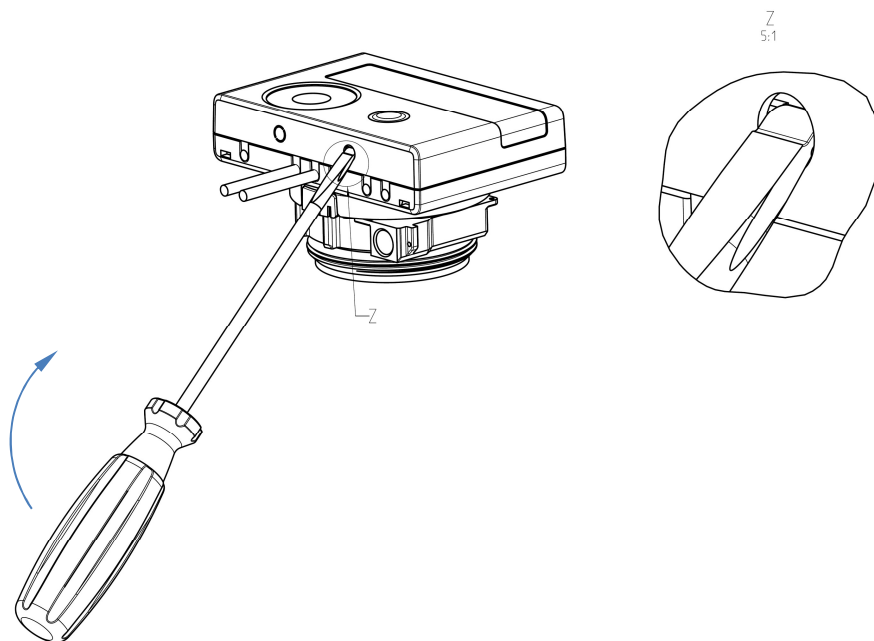
We also offer a retrofittable meter to which communication interfaces can be added later. You will find the description of our optional interfaces in the Operating Instructions “Communication Interfaces S3(C)”.

To retrofit such a meter with an additional communication interface the calculator’s adhesive seal must be cut and the device’s calculator opened. **When the calculator is open, please observe the ESD requirements according to EN 61340-5-1.**

To open, use a screwdriver with a wide tip (4-5 mm) and gently press inward on the two round predetermined breaking points located above the cable feedthroughs (see image 1).



Next, insert the screwdriver into one of the two openings at an angle of approximately 45° and carefully move it upwards to an angle of approximately 90° (see image 2). The upper housing piece of the calculator is no longer latched on this side. Repeat this with the other opening. Now the upper housing piece can be taken off.

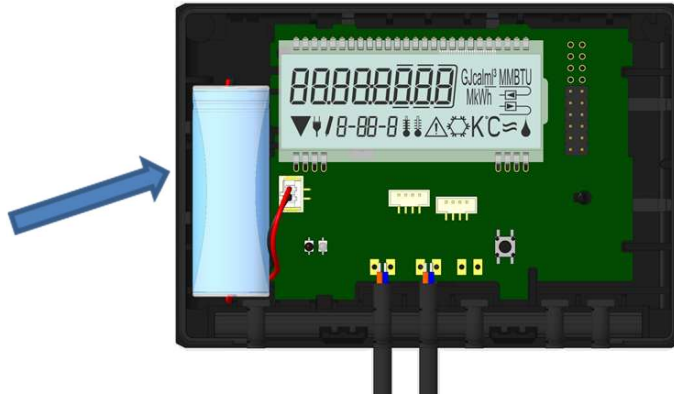


Plug the interface module on the right side of the calculator circuit board. The module cables are to be fed through the rightmost cable feedthroughs into the calculator after removing the blind grommets. Close the calculator. After the module has been installed, the installer must secure the meter against tampering by using one of the numbered adhesive seals supplied with the modules (stick it over the destroyed seal). The added barcode sticker can be used for the purpose of documentation.

11.3 Battery replacement

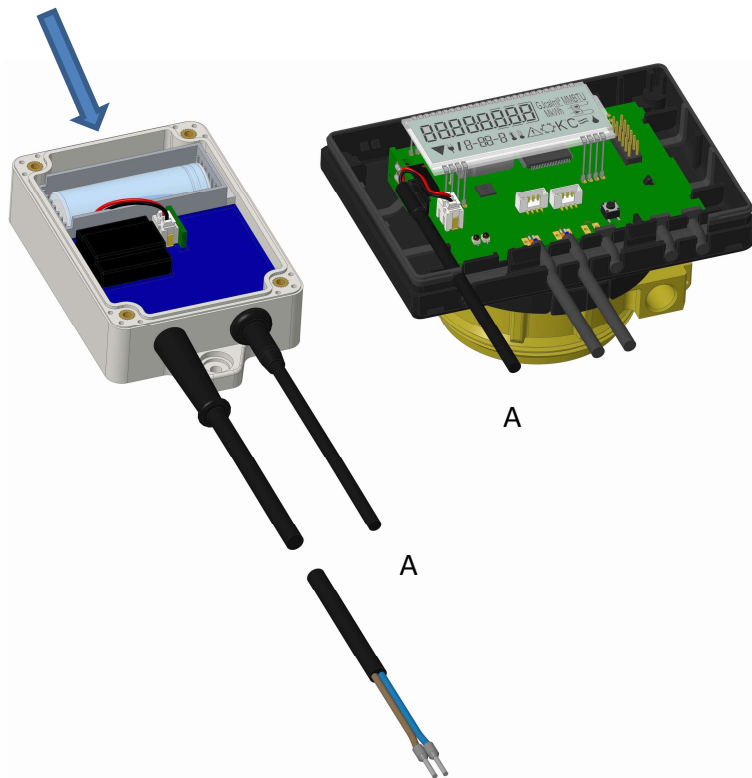
The meter's battery may be replaced by authorized personnel. Only our original batteries may be used. Replaced batteries must be disposed of in an environmentally responsible manner.

To replace the battery, the meter's calculator must be opened (see Chapter 11.2 for a description). After replacing the battery, the installer must secure the meter against tampering by using one of the numbered adhesive seals supplied with the batteries (stick it over the destroyed seal). The added barcode sticker can be used for the purpose of documentation.




11.4 Connecting the power pack

If an external power supply is needed, only the power pack designed for our heat meter may be used. To connect the power pack, open the meter's calculator (see Chapter 11.2 for a description). Then remove the battery from the calculator and plug it into the battery socket in the power pack. Protect the power pack against unauthorized opening using one of the numbered adhesive seals enclosed. The added barcode sticker can be used for the purpose of documentation. (The battery is a backup in case of a power failure.) The power pack cable (A) has two connectors; plug one connector into the contact fingers on the left side of the circuit board. Then feed the cable through the meter's leftmost cable feedthrough (viewed from the front) after removing the blind grommet. The other connector is to be plugged into the battery socket on the circuit board.



The power pack must only be connected to a 230 V AC power source by authorized technical personnel. Secure the power pack.

When the meter detects an external power supply, the pictogram of a mains plug  appears in the lower left corner of the display.

After installing the power pack, the installer must secure the meter against tampering by using one of the numbered adhesive seals supplied with the power pack (stick it over the destroyed seal). The added barcode sticker can be used for the purpose of documentation.

12 Hint Codes

If the device detects an error, the hint symbol  appears on the display.


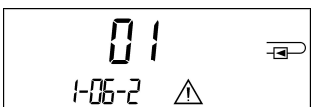
The error can be accessed under menu item 6 “Hint message” in level 1 / main loop (see Chapter 9 “Display Options”). The hint code is displayed alternately in binary and hexadecimal form.

The device recognizes eight hint causes, which can also occur in combination with each other.

Hexadecimal display	Description	Binary display
H 80	Low battery	1 at first place
H 40	Instrument has been reset	1 at second place
H 20	Electronics defective	1 at third place
H 10	Error in flow measurement system	1 at fourth place
H 08	Temperature sensor 2 short circuit	1 at fifth place
H 04	Temperature sensor 2 cable break	1 at sixth place
H 02	Temperature sensor 1 short circuit	1 at seventh place
H 01	Temperature sensor 1 cable break	1 at eighth place

“Temperature sensor 1” is the right temperature sensor (viewed from the front).

Example: Temperature sensor 1 cable break

Hint	Low battery	Reset	Electronics defective	Error in flow measurement system	Temperature sensor 2 short circuit	Temperature sensor 2 cable break	Temperature sensor 1 short circuit	Temperature sensor 1 cable break	Alternating hexadecimal hint displayed (LCD)
Hint bit	7	6	5	4	3	2	1	0	
Display location	1	2	3	4	5	6	7	8	
Alternating binary hint displayed (LCD)									

When a hint  appears in the standard display (cumulative heat energy), with the exception of the hints:

- Low battery (H 80),
- Reset (H 40),
- Error in flow measurement system (H 10; in the case of air in the ultrasonic measuring tube),

the instrument must be exchanged and sent to the supplier for examination.

12.1 Hint description

Display	Hint	Effect	Possible cause
H 80	Low battery	No impact on the calculation. The battery voltage is equal to or lower than 2.5 volts. (The voltage level is measured at the start of each day.)	Adverse environmental conditions; long operating time.
H 40	Reset	No impact on the calculation. The device has been restarted. (Remove via watchdog or battery.)	EMC, electromagnetic interference.
H 20	Electronics defective	No energy calculation is performed. The energy register remains unchanged.	Defective component, defect on the calculator circuit board, moisture in the housing.
H 10	Error in flow measurement system (e.g. no water) / coil error	No calculations are performed. The volume and energy registers remain unchanged.	<u>General:</u> Connecting cable between the electronics housing and flow sensor is damaged. <u>Ultrasonic flow sensor:</u> Air in the system; contaminated flow sensor. <u>Mechanical flow sensor:</u> Volume scanning is faulty.
H 08	Temperature sensor 2 short circuit	No energy calculation is performed. The energy register remains unchanged.	Sensor or sensor cable defective.
H 04	Temperature sensor 2 cable break	No energy calculation is performed. The energy register remains unchanged.	Sensor or sensor cable defective.
H 02	Temperature sensor 1 short circuit	No energy calculation is performed. The energy register remains unchanged.	Sensor or sensor cable defective.
H 01	Temperature sensor 1 cable break	No energy calculation is performed. The energy register remains unchanged.	Sensor or sensor cable defective.

13 Manufacturer

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Operating Instructions

Communication Interfaces S3(C)

1 Interfaces and Options

1.1 Optical (infrared) interface

For communication with the optical interface an optocoupler and the “Device Monitor” software are necessary. The optocoupler and “Device Monitor” are available as accessory equipment.

The optical infrared interface will be activated by automatically sending a header (according to EN 13757-3). Baud rate: 2400 Bd.

Then you can communicate with the meter for 4 seconds. After every valid communication the meter is open for another 4 seconds. Afterwards the display is deactivated.

The number of readouts per day via the optical interface is limited. During daily readout at least 4 communications are possible. If readouts are carried out more rarely, the possible number of communications will increase.

1.2 M-Bus (optional)

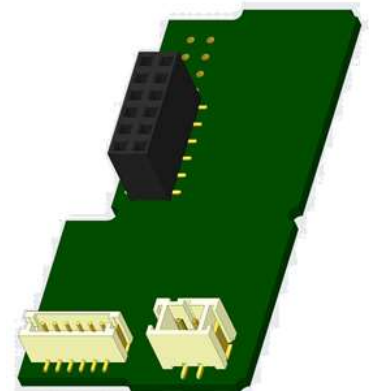
The M-Bus is a galvanically isolated interface for the transmission of meter data (absolute values).

General information about the M-Bus interface:

All recognized rules of technology and the relevant legal regulations (international and local; see “Relevant Norms / Standards / Literature M-Bus”) must be complied with.

Installations may be performed only by a qualified and authorized professional.

The regulations and information in the operating instructions must be strictly adhered to. If this is not the case, or if the installation proves to be faulty, the installation company is responsible for all resulting costs.



Recommended cable type: telephone cable J-Y(ST)Y 2x2x0.8mm².

It is important to make sure that the topology of the M-Bus network (cable length and cable cross-section) is suitable for the **baud rate (2400 Bd)** of the terminal devices.

1.2.1 Relevant Norms / Standards / Literature M-Bus

IEC 60364-4-41 (2005-12)	Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock
IEC 60364-4-44 (2007-08)	Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances
IEC 60364-5-51 (2005-04)	Electrical installations of buildings – Part 5-51: Selection and erection of electrical equipment – Common rules
IEC 60364-5-54 (2011-03)	Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors
EN 50310 (2011)	Application of equipotential bonding and earthing in buildings with information technology equipment
EN 13757-1_2015, -2_2004, -3_2013	Communication systems for meters and remote reading of meters
The M-Bus	A Documentation, Version 4.8, M-Bus Usergroup

1.2.2 Additional technical specifications

The installation must fulfill the requirements of the “Relevant Norms / Standards / Literature M-Bus” and the specifications as follows:

Maximum voltage M-Bus	42 V
Minimum voltage M-Bus	24 V
Maximum ripple voltage	200 mV; EN 13757-2_2004; 4.3.3.6
Maximum voltage potential difference	2 V

1.2.3 Technical data M-Bus

Primary address	0 (factory setting); 1 – 250 (configurable)
Baud rate	2400; 300 (AutoSpeed Detect)
Connecting cable length	1 m
Number of possible readouts	unlimited
Data update rate	120 s; when using the power pack – 2 s
Maximum current consumption	< 1.5 mA (corresponding to 1 unit load)

1.3 Modbus RTU (optional)

The Modbus RTU Module is a galvanically isolated interface for the transmission of meter data (absolute values). It is designed for use with S3 heat meter and S3C calculator to connect them to Modbus RTU network using EIA-485 channel.

1.3.1 Technical data Modbus

Connector A	Power Supply 12 V – 24V DC ± 10 % (SELV power supply only)
Connector B	Modbus Network
Maximum power consumption	500 mW
Communication protocol	Modbus RTU
Channel	EIA-485 (galvanically isolated)
Baud rate	1200, 2400, 4800, 9600, 14400, 19200, 38400, 56000, 57600, 115200

1.3.2 Default factory settings

Communication parameters	9600 bps, 8N1 data format (8 data bits, no parity, 1 stop bit)
Data update rate	600 s
Modbus Slave ID*	1
Automatic Slave ID**	0 (= deactivated)

* Acceptable values: 1 ... 247.

** If the automatic Slave ID is activated (value set to = 1), the M-Bus address – which was previously set in the meter – is used for communication.

1.4 Wireless Interfaces

Engelmann offers the following radio interfaces:

- wireless M-Bus interface EN 13757-3, -4 (see Chapter 1.4.1),
- LoRaWAN communication interface (see Chapter 1.4.2).

General information about the radio interface:

Installation of radio components between or behind heating pipes, or the presence of other bulky metallic obstacles directly over or in front of the housing must be avoided.

The transmission quality (range, telegram processing) of radio components can be negatively influenced by instruments or equipment with electromagnetic emissions, such as telephones (particularly LTE mobile radio standard), Wi-Fi routers, baby monitors, remote control units, electric motors, etc.

In addition, the construction of the building has a strong influence on the transmission range and coverage.

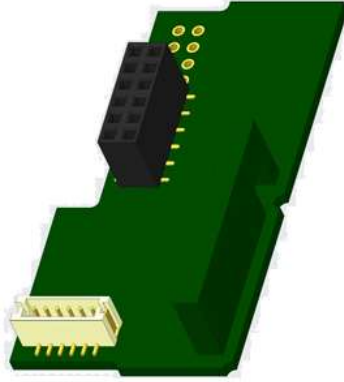
Furthermore, when using installation boxes (substations) they must be equipped with non-metallic covers or doors.

The factory settings of the clock in the meter are standard (winter) Central European Time (GMT +1). There is no automatic changeover to daylight savings (summer) time.

The radio function is deactivated upon delivery (factory settings). See Chapters 1.4.1.3 and 1.4.2.3 “Activation of the radio interface”.

1.4.1 Radio interface wireless M-Bus EN 13757-3, -4 (optional)

The radio interface transmits meter data (absolute values).



1.4.1.1 Technical data radio

Frequency	868 MHz	
Transmission power	up to 14 dBm	
Protocol	wireless M-Bus based on EN 13757-3, -4	
Selectable modes	S1 / T1 (Frame Format A) C1 (Frame Format B)	
Telegrams	short telegram in conformity to AMR (OMS-Spec_Vol2_Primary_v301 and _v402): <ul style="list-style-type: none"> ○ energy (heat/cooling energy, pulse input 1 to pulse input 3) ○ total volume ○ flow ○ power ○ information message ○ outlet flow temperature ○ temperature difference 	long telegram for walk-by readout: <ul style="list-style-type: none"> ○ energy (heat/cooling energy, pulse input 1, pulse input 2, pulse input 3) ○ total volume ○ information message ○ 15 monthly or 30 semi-monthly values (compact mode)
Encryption	AES: Advanced Encryption Standard; key length: 128 bits	

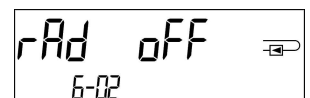
1.4.1.2 Radio configuration

Parameter	Possible settings
Mode	S1 / T1 / C1; unidirectional
Transmission period	00:00 – 24:00; any time period in the day
Transmission interval	10 seconds – 240 minutes
Weekdays	Monday – Sunday
Weeks in a month	1 – 4 (4: uninterrupted, incl. a possible 5th week)
Months	1 – 12
Radio activation date	01.01. – 31.12.
AES-128-Encryption	<ul style="list-style-type: none"> - not encrypted - encrypted according to MODE 5 or MODE 7: <ul style="list-style-type: none"> ○ Master Key ○ key per device
Type of telegram	<ul style="list-style-type: none"> - short telegram in conformity to AMR (OMS-Spec_Vol2_Primary_v301 and _v402) - long telegram for walk-by readout

1.4.1.3 Activation of the radio interface

The radio interface **leaves the factory deactivated** and can be activated in two ways:

a) The radio function can be activated **by pressing the push-button**. Press and hold the push-button to switch to display loop 6 (module loop). Then press the push-button briefly to switch to the second item **rAd(io) oFF** (see image).



To start the editing mode, you must then press the push-button again for 2-3 seconds.

As an aid, after 2 seconds the “editing pen” will be displayed bottom left in the LCD. As soon as it appears, you must release the button. Now the display shows **rAd(io) on** and in all display loops a black triangle (see image).



b) The radio function can also be activated **using the software “Device Monitor”**. This software can be ordered separately as an option.

The radio function can only be deactivated using the software “Device Monitor”.

After activation of the radio interface or modification of the radio parameters, the meter remains in installation mode for 60 minutes. During this time, it sends its telegrams at 36-second intervals.

When using the **compact mode**, the meter alternately sends a format and a compact telegram after the radio interface has been activated during installation mode.

During this time, at least one meter of the device variant being installed (inlet or outlet flow, heat or heat/cooling, pulse inputs, display units) must be read out using the “Engelmann Readout Software Walk-by”. The format of the telegram will be stored locally in the PC in an .xml file.

After completion of the installation mode only compact telegrams will be transmitted.

1.4.1.4 Later activation of the radio encryption

The AES encryption can also be activated later. This can be done in two ways:

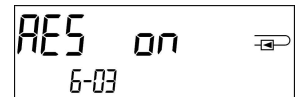
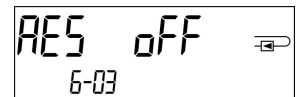
a) The encryption can be activated **by pressing the push-button**.

Press and hold the push-button to switch to display loop 6 (module loop).

Then press the push-button briefly to switch to the third item **AES off** (see image).

To start the editing mode, you must then press the push-button again for 2-3 seconds.

As an aid, after 2 seconds the “editing pen” will be displayed bottom left in the LCD. As soon as it appears, you must release the push-button. Now the display shows **AES on** (see image).

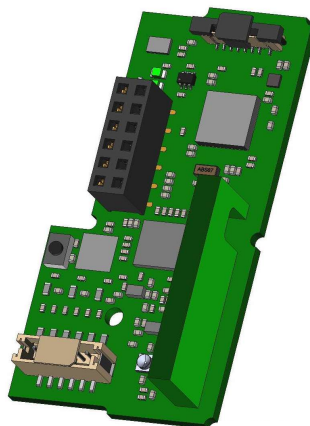


b) The encryption can also be activated **using the software “Device Monitor”**. This software can be ordered separately as an option.

The encryption can only be deactivated using the software “Device Monitor”.

1.4.2 LoRaWAN interface

The LoRaWAN interface is used to transmit meter data (absolute values).



1.4.2.1 Technical data

Radio characteristics

Frequency	868 MHz
Transmission power	14 dBm
Receiving sensitivity	-135 dBm

LoRaWAN characteristics

Device class	class A, bidirectional
Activation	OTAA* or ABP**
Data rate	DR0-DR5 (250 bit/s-5470 bit/s)

* OTAA = Over-the-air activation.

** ABP = Activation by personalization.

1.4.2.2 LoRa module configuration

The module can be configured by using the “Device Monitor” or the OTC App.

Parameter	Possible settings	Factory setting
Power mode	Active Inactive	Inactive
Configuration lock	Open Locked	Open
Synchronize meter time	On Off	Off
Activation type	OTAA ABP	OTAA
EcoMode	Off 6 years 10 years	EcoMode 10 years
Transmission interval* [min.]	10 ... 1440	60
Message format**	Standard Engelmann Compact JSON Scheduled – daily redundant Scheduled – extended Combined heat/cooling	Standard
Pulse input selection	Option to select between 0-3 pulse inputs	0

* The actual transmission interval depends on the type of telegram and the current data rate. The transmission interval is adjusted accordingly in order to ensure the set battery life (Eco Mode 10 or 6 years). You can find more information in the “Manual LoRa Module”.

** For pulse input option, the telegram format “Engelmann” must be selected. Further information on telegram contents can be found in the “Manual LoRa Module”.

1.4.2.3 Activation of the radio interface

The radio interface is **deactivated by default** and can be activated in one of the three following ways:

- a) **NTC interface – via Elvaco OTC App**; further information is available in the operating instructions of the Elvaco OTC App: <https://www.elvaco.se/Image/GetDocument/en/269/elvaco-otc-app-manual-english.pdf>
- b) **Optical interface – via the “Engelmann” configuration software “Device Monitor”** – from version 2.22; further information is available in the operating instructions of the “Device Monitor”. The software can be ordered separately.

c) Via the heat meter menu:

Press and hold the push-button to switch to display loop 6 (= module loop; see Chapter 3 “Display Options in the Module Loop (Optional)”). Then press the push-button briefly to switch to the second loop – 6-02 – **EnA off** (see image).

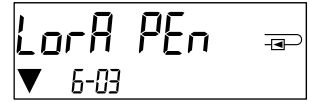


To start the editing mode, you must then press the push-button again for 2-3 seconds. As an aid, after 2 seconds the “editing pen” will be displayed bottom left in the LCD. As soon as it appears, you must release the push-button. The display now shows **EnA on** and a black triangle in all display loops (see image).



1.4.2.4 Connection to the LoRaWAN Network

To check whether the meter has already connected to the LoRaWAN network, change from loop 6-02 to loop 6-03 by briefly pressing the push-button. As long as the meter is searching for the LoRaWAN network, **LorA PEn** appears on the LCD (see image); the time between each connection attempt is gradually reduced to at least once a day.



As soon as the meter has connected to the LoRaWAN network, **LorA Con** appears in the LCD (see image).



1.5 Three additional pulse inputs (optional; only in conjunction with M-Bus or radio)

With this option, additional devices with pulse output can be read out via optical interface, M-Bus or radio.

General information about pulse inputs:

All recognized rules of technology and the relevant legal regulations (international and local; see “Relevant Norms / Standards / Literature Pulse Inputs”) must be complied with.

Installations may be performed only by a qualified and authorized professional.

The regulations and information in the operating instructions must be strictly adhered to. If this is not the case, or if the installation proves to be faulty, the installation company is responsible for all resulting costs.

1.5.1 Relevant Norms / Standards / Literature Pulse Inputs

IEC 60364-4-41 (2005-12)	Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock
IEC 60364-4-44 (2007-08)	Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances
IEC 60364-5-51 (2005-04)	Electrical installations of buildings – Part 5-51: Selection and erection of electrical equipment – Common rules
IEC 60364-5-54 (2011-03)	Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors
EN 50310 (2011)	Application of equipotential bonding and earthing in buildings with information technology equipment
EN 1434-2 (2016)	Heat meters – Part 2: Constructional requirements

1.5.2 Technical data pulse inputs

Pulse inputs class	IB according to EN 1434-2:2016
Connecting cable length	1 m
Power supply	+ 3 V DC
Source current	= 1.5 µA
Switching threshold of the input signal at high level	U ≥ 2 V
Switching threshold of the input signal at low level	U ≤ 0.5 V
Terminal resistance	2 MΩ
Pulse length	≥ 100 ms
Pulse frequency	≤ 5 Hz

1.5.3 Possible combinations of the different input (class IB) and output (class OA) devices

	Class IA	Class IB	Class IC	Class ID	Class IE
Class OA	yes	yes	no	yes	no
Class OB	yes	no	no	yes	yes
Class OC	no	yes	yes	no	no
Class OD	no	no	yes	no	no
Class OE	no	no	no	no	yes

1.5.4 Setting of the three additional pulse inputs

The optional pulse inputs 1 + 2 + 3 for external meters can be set using the “Device Monitor” configuration software. The serial number, manufacturer, version (0 ... 255), medium code, pulse value, unit and initial values of the external meters can be configured.

1.5.5 Setting options

Pulse value	Units
1	liter / kWh / pulse without unit
2.5	liter / kWh / pulse without unit
10	liter / kWh / pulse without unit
25	liter / kWh / pulse without unit
100	liter / kWh / pulse without unit
250	liter / kWh / pulse without unit
1000	liter / kWh / pulse without unit

Installation instructions for pulse inputs:

The pulse cables must not be subjected to external voltage!

The polarity must be observed for pulse generators with “open collector” outputs.

The cable wires must not touch each other during installation, otherwise pulses will be counted in the device.

When setting up the meter, it may be necessary to adjust the meter reading of the connected devices and the pulse value using the “Device Monitor” software.

Radio data transmission for the pulse inputs can be enabled at the factory. Subsequent activation is possible using the “Device Monitor”.

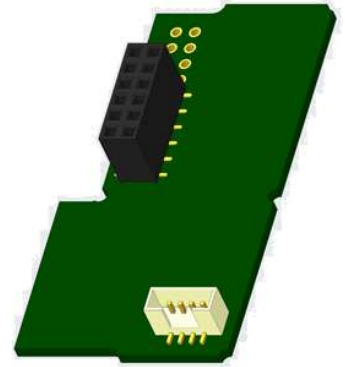
Select the menu item “Parameterization of the module” in the software. Set the radio transmission in the menu item “Transmission of values for the pulse inputs”. (The transmission of these values via M-Bus is always set in the factory setting.)

1.5.6 Pin assignment for 6-wire cable

Color	Connection
Pink	IE1+
Grey	IE1⊥
Yellow	IE2+
Green	IE2⊥
Brown	IE3+
White	IE3⊥

1.6 One potential-free pulse output (optional)

Important note: This module can be used for the compact heat meter S3 from firmware version 1.03 on, for the calculator S3C from firmware version 1.00 on. The potential-free pulse output provides counting pulses of the meter. The pulse output closes corresponding to the pulse value, see item “pulse value / pulse output 1” in display loop 6 (module loop).



	Heat meter	Cooling meter	Heat/cooling meter
Possible settings pulse output 1	Heat energy (factory setting) or volume	Cooling energy (factory setting) or volume	Heat energy (factory setting) or volume

Starting with firmware version 1.03 (for the S3) or firmware version 1.00 (for the S3C), the meter detects the nominal size and energy display and automatically sets the pulse values for energy and volume in accordance with the following notes.

S3 – pulse output for energy:

	Display in kWh / MWh	Display in Gcal	Display in GJ	Display in MMBTU
Qp 0.6 m ³ /h	1 kWh/pulse	1 Mcal/pulse	10 MJ/pulse	10 MMBTU/pulse
Qp 1.5 m ³ /h	1 kWh/pulse	1 Mcal/pulse	10 MJ/pulse	10 MMBTU/pulse
Qp 2.5 m ³ /h	1 kWh/pulse	1 Mcal/pulse	10 MJ/pulse	10 MMBTU/pulse
Qp 3.5 m ³ /h	10 kWh/pulse	10 Mcal/pulse	10 MJ/pulse	10 MMBTU/pulse
Qp 6 m ³ /h	10 kWh/pulse	10 Mcal/pulse	10 MJ/pulse	10 MMBTU/pulse
Qp 10 m ³ /h	10 kWh/pulse	10 Mcal/pulse	10 MJ/pulse	10 MMBTU/pulse

S3 – pulse output for volume:

The pulse value for volume is always determined as follows:
 Display in m³ -> pulse value: 100 l/pulse (0.1 m³/pulse)

S3C – pulse output for energy:

The pulse value for energy is always determined by **the second-to-last place** of the energy display.
 Examples:
 Display: 0 kWh -> pulse value: 10 kWh/pulse
 Display: 0.000 MWh -> pulse value: 0.01 MWh/pulse
 Display: 0.000 GJ -> pulse value: 0.01 GJ/pulse

S3C – pulse output for volume:

The pulse value for volume is always determined by **the third-to-last place** of the volume display.
 Examples:
 Display: 0.000 m³ -> pulse value: 100 l/pulse (0.1 m³/pulse)
 Display: 0 m³ -> pulse value: 100 m³/pulse

1.6.1 Pin assignment for 4-wire cable

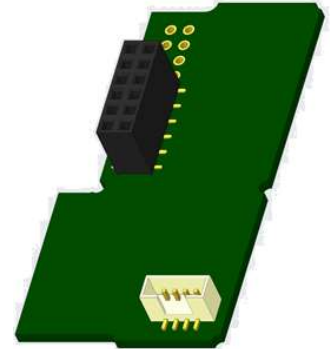
Color	Connection
Yellow	IA1
Green	IA1
Brown/white	not reserved

1.6.2 Technical data for one pulse output and two pulse outputs

Pulse outputs class	OA (electronic switch) according to EN 1434-2:2016
Connecting cable length	1 m
Max. switching voltage	30 V
Max. switching current	27 mA
Max. contact resistance (ON)	74 Ω
Min. contact resistance (OFF)	6 MΩ
Closure time	100 ms
Interval between pulses	100 ms

1.7 Two potential-free pulse outputs (optional)

The potential-free pulse outputs provide counting pulses of the meter. The pulse outputs close corresponding to the pulse value, see items “pulse value / pulse output 1” and “pulse value / pulse output 2” in display loop 6 (module loop).



	Heat meter	Cooling meter	Heat/cooling meter
Pulse output 1	Heat energy	Cooling energy	Heat energy
Pulse output 2	Volume	Volume	Cooling energy

Pulse outputs for energy:

The pulse value for energy is always determined by **the last place** of the energy display.

Examples:

- Display: 0 kWh → pulse value: 1 kWh/pulse
- Display: 0.000 MWh → pulse value: 0.001 MWh/pulse
- Display: 0.000 GJ → pulse value: 0.001 GJ/pulse

Pulse outputs for volume:

The pulse value for volume is always determined by **the second-to-last place** of the volume display.

Example:

- Display: 0.000 m³ → pulse value: 10 l/pulse (0.01 m³/pulse)

1.7.1 Pin assignments for 4-wire cable

Color	Connection
Yellow	IA1
Green	IA1
Brown	IA2
White	IA2

2 Retrofitting with an Additional Communication Interface

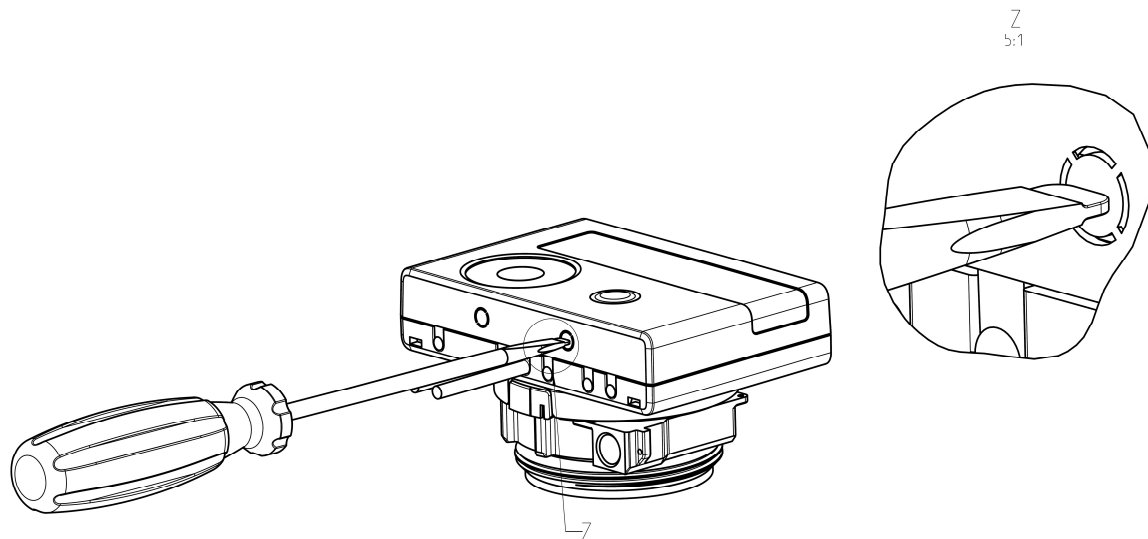
During installation of the retrofitting module observe the ESD requirements according to EN 61340-5-1.

At the installation point of the meter, this means that an antistatic wrist strap (ESD) with an integrated 1 MΩ resistor must be used, which must be connected at a suitable point. This is either an earthed pipe or – only with an appropriate adapter! – the protective contact of a Schuko socket. The antistatic wrist strap must be worn tightly on the skin of the wrist.

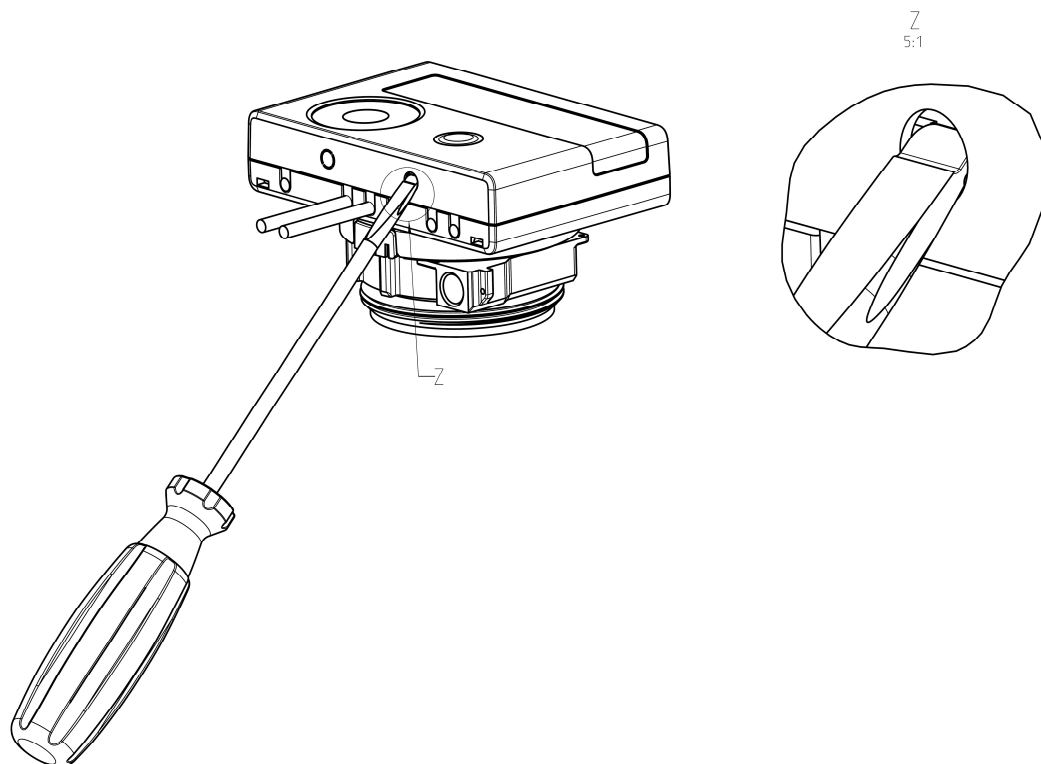
2.1 Retrofitting S3 with an additional communication interface (optional)

We also offer a retrofitting meter to which communication interfaces can be added later.

To retrofit such a meter with an additional communication interface the calculator’s adhesive seal must be cut and the device’s calculator opened. To open, use a screwdriver with a wide tip (4-5 mm) and gently press inward on the two round predetermined breaking points located above the cable feedthroughs (see image 1).

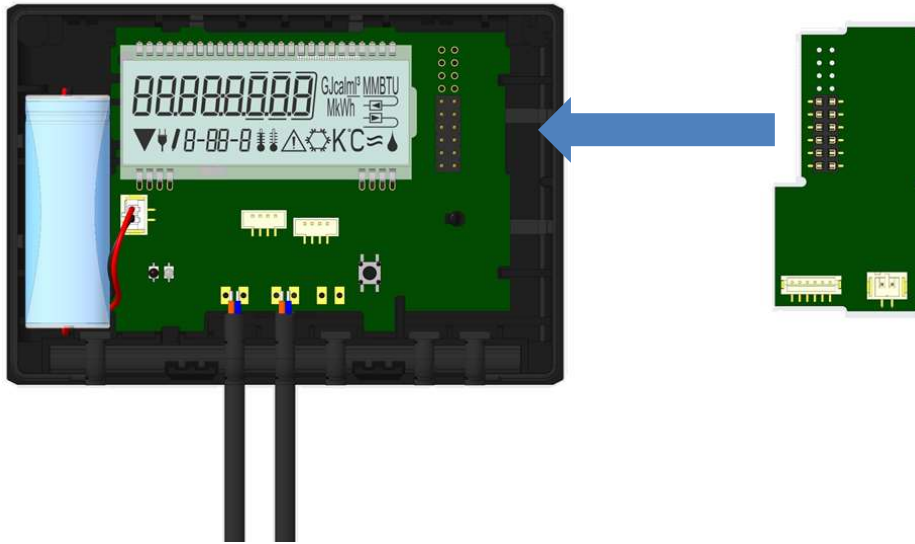


Next, insert the screwdriver into one of the two openings at an angle of approximately 45° and carefully move it upwards to an angle of approximately 90° (see image 2). The upper housing piece of the calculator is then no longer latched on this side. Repeat this with the other opening. Now the upper housing piece can be taken off.



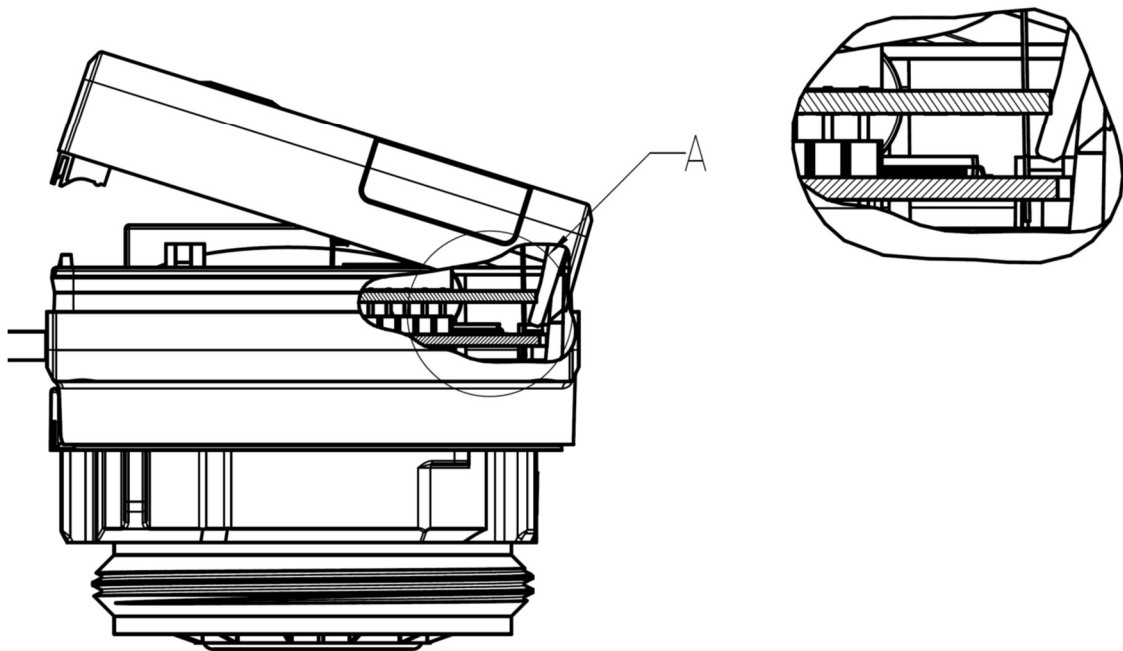
Plug the interface module on the right side of the calculator circuit board (see image 3). The module cables are to be fed through the rightmost cable feedthroughs into the calculator after removing the blind grommets. Close the calculator.

After the module has been installed, the installer must secure the meter against tampering by using one of the numbered adhesive seals supplied with the modules (stick it over the destroyed seal). The added barcode sticker can be used for the purpose of documentation.




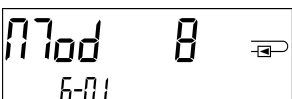
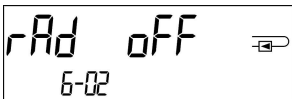
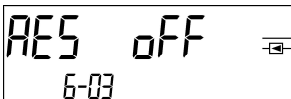



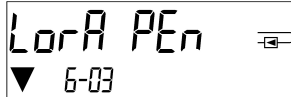


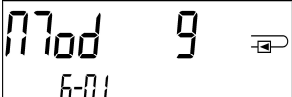
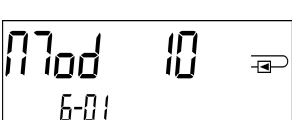

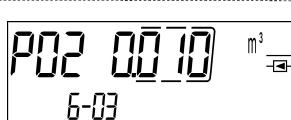
To remove a module the upper housing piece must be carefully pressed against the rear panel of the lower housing piece during opening the calculator. Thus, the two rear snap-fits of the upper housing piece lever out the module of the circuit board (see image 4).

A
2:1



3 Display Options in the Module Loop (Optional)

Level 6 / Module Loop:

		
		
		
	<p>or:</p> 	<p>or:</p> 
		
		
		
<p>1) Display of plugged module (alternatively):</p>	<p>2) Display depending on plugged module and setup:</p>	<p>3) Display depending on plugged module and setup:</p>
<p>5 = 1 pulse output</p>		
<p>8 = radio + optional 3 pulse inputs</p>	<p>wireless M-Bus (radio) off/ wireless M-Bus (radio) on;</p>	<p>wireless M-Bus encryption (AES) off/ wireless M-Bus encryption (AES) on;</p>
	<p>LoRa on/ LoRa off</p>	<p>LoRa pending/ LoRa connected</p>
<p>9 = M-Bus + optional 3 pulse inputs; 9 = Modbus</p>		
<p>10 = 2 pulse outputs</p>	<p>pulse value/ pulse output 1</p>	<p>pulse value/ pulse output 2</p>

4 Imprint

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