

EN

Installation and Operating Instructions

i

Target group

These instructions are intended for trained and qualified personnel. The device may only be installed by this specialist personnel in compliance with the recognised rules of technology.

i

Use / Function

The sensonic 3 is a turbine meter for thermal energy in accordance with EN 1434 for heat, cold or combined heat/cold metering. It is available in the sizes q_p 0.6, q_p 1.5 and q_p 2.5. It is approved for the metering of circulating water in accordance with AGFW (FW 510) in heating systems. It is not authorised for use for billing purposes in systems with glycol admixtures.



Extent of delivery

- 1 x sensonic 3 compact device
- 1 x "IST" seal including sealing wire
- 1 x manual
- 1 x instructions for thermowell identification
- 1 x sticker for thermowell labelling
- 1 x EU declaration of conformity (for heat and combined heat/cold meters only)
- 1 x national declaration of conformity, cold (for cold and combined heat/cold meters only)



Warnings



WARNING!

Risk of severe burns

Leakage of hot, pressurised water due to malfunctioning shut-off devices or leaking measuring point components can cause severe burns.

- ▶ Before starting installation, check that the shut-off devices upstream and downstream of the installation point are closed, that all sealing points are tight and that the installation point is depressurised.
- ▶ Once the work has been completed, open the shut-off devices slowly and check that all sealing points at the measuring point are tight.



WARNING!

Explosion hazard

Improper handling of the lithium metal battery installed in the appliance can cause the battery to explode, resulting in fire or injury.

The device and the LITHIUM METAL BATTERY

- ▶ Do not heat the appliance above the temperatures specified in this document for storage and operation.
- ▶ do not throw into the fire.
- ▶ Do not expose to water.
- ▶ do not short-circuit.
- ▶ do not open or damage.
- ▶ do not charge.
- ▶ Do not weld or solder.



WARNING!

Danger of injury due to electric shock and explosion

Drilling into electricity cables or gas pipes can cause an electric shock or explosion.

- ▶ Always inspect or test the assembly area for concealed electrical cables, as well as gas pipes laid in the wall, before assembling electronics on a wall.



CAUTION!

Risk of injury

Escaping pressurised water and components accelerated by water pressure can cause injuries.

- ▶ Always inspect the shut-off devices upstream and downstream of the installation location to ensure that they are closed and the installation location is depressurised before commencing installation work.



NOTICE

Danger of water damage

Drilling into water pipes can cause water damage.

- ▶ Inspect the assembly location for any concealed pipes which are laid in the wall before assembling the electronics.



NOTICE

Protective equipment

Wear the following protective equipment when installing the product with glycol and glycol/water mixtures:

- ▶ Protective gloves according to EN 374, breakthrough time > 480 minutes, penetration level 6
- ▶ Safety goggles according to EN 166

i Notes

Transport and Shipping

- You may only transport the sensonic 3 in its original packaging.

UN3091 LITHIUM METAL BATTERIES IN EQUIPMENT

The certificates required for transport can be requested from ista SE, stating the article number.

Storage / Disposal

- Store the device in a dry, frost-free place.
- This product falls under Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) and may not be disposed of as domestic waste. Dispose of the used products via the channels provided for this purpose, or return it to your local ista branch.
- Disposal of the product with glycol and glycol-water mixtures is carried out by an external service provider after consultation with your responsible branch.

Notes on use and handling the meter

- Only remove user seals if you are authorised to do so. The seals must be replaced after the work is completed.
- Do not install in a dry system, as otherwise functional and leak testing will not be possible.
- Do not weld pipes if a meter is already installed.
- The requirements on circulating water of the German Heat and Power Association (AGFW) must be followed.
- Protect the meter from knocks and vibrations.
- To properly adhere to calibration error limits, the current state-of-the-art as well as notes and facts in this manual must be observed.
- Cavitation caused by overpressure must be avoided within the whole measurement range, i.e. at least 1 bar at q_p and approx. 3 bar for overload q_s (applies to approx. 80 °C).
- Use the sealing material provided only to seal the device. Use of hemp and sealing compound is not permitted.

Notes on installation location and position

- The hydraulics may only be installed in SPC to EN ISO 4064-4:2014 Type "IST". This can be recognised by one of the following forms of lettering:
 - "IST"
 - "ista"
 - "viterra"
 - RaabKarcher logoThe SPCs marked with the "ista", "viterra" or RaabKarcher logo are to be labelled with the enclosed "IST" seal. Use of adapters and extensions is prohibited.
- The flow sensor and temperature sensor of the energy meter must be located in the same partial circuit of the system (same circuit rule).
- Upstream and downstream of the sensonic 3, shut-off valves must be installed for use during device replacement.
- The installation site must always ensure complete filling of the measuring insert with water.
- If there is a risk of contamination, install a filter upstream of the device.
- Install the device either vertically or horizontally. No other installed positions are allowed. If installed in a horizontal position, the indicating device must not face downwards (turn through 90° max.).
- If using the device as a cold meter or a combined heat/cold meter, disconnect the calculator from the flow sensor and use the wall adapter (art. 45221) and the enclosed screw and wall plug to mount it on the

wall so that condensation cannot flow along the cable and penetrate the calculator (see Fig. .

- If possible, when installing the calculator and cables, as recommended in EN 1434-6, Clause 4.2, maintain a minimum distance of 60 cm from strong electromagnetic fields (e.g. from frequency-controlled pumps and power cables) or their wiring.

Notes on installing the temperature sensor

- *Approved temperature sensor combinations:* asymmetrical: One sensor sealed in the meter / one sensor in the thermowell or ball valve, symmetrical: both sensors in the ball valve or both sensors in the thermowell
- If the sensors are installed asymmetrically, the nominal operating conditions as per the rating plate will be limited.
- Do not coil, extend or shorten the sensor cables.
- If used as a cold meter or combined heat / cold meter, only symmetrical, direct installation (e.g. ball valve) of the temperature sensors is allowed.

 Installation

a) Mounting meter

1. Observe the directional flow comparing it with the arrow on the SPC.
2. Close the shut-off devices.
3. Unscrew the overflow cap (SW 22).
4. Remove profile seal.
5. Clean sealing surfaces.
6. Insert the profile seal with the flat part on top.

**NOTICE**

► Only insert one profile seal!

7. Thinly grease the external thread of the meter with food-grade silicone grease.

**NOTICE**

► The O ring of the meter must sit in the groove.

8. Screw in the meter.

9. Tighten meter with wrench.

10. Screw in meter up to the metallic stop and turn it into the correct reading position.

Variant	hot line / red sensor marking	cold line / blue sensor marking
Heat meter	Flow	Return
combined heat/cold meter	Flow	Return
Cold meter	Return	Flow

b) Installation of the temperature sensor in the ball valve

1. Slide seal screw to stop unit over the temperature sensor.
2. Tighten locking screw in second groove (as seen from the sensor tip).
3. Remove screw plug and seal from the ball valve, including any residue.
4. Insert O-ring into the temperature sensor port of the ball valve.
5. Install the temperature sensor into the ball valve.
6. Tighten seal screw.

c) Installation of the temperature sensor in the immersion sleeve 1/4“ (Ø 5 mm)

- 1. Insert O-ring (1) into the first groove (as seen from the sensor tip).
- 2. Insert temperature sensor in immersion sleeve - surface low
- 3. Tighten seal screw.
- 4. Tighten the locking screw.

d) Installation of the temperature sensor in the immersion sleeve 3/8“ (refitted to 5 mm diam.)

- 1. Slide sealing screw upwards from sensor and remove the O-ring.
- 2. Insert temperature sensor in immersion sleeve - surface low
- 3. Tighten seal screw.
- 4. Tighten the locking screw.

e) Final steps

- 1. Seal temperature sensor.

NOTICE

If the sensor is installed asymmetrically it is sealed in the meter and may not be removed. Equally, if installed symmetrically the sensor installation location in the meter must not be used.

2. Seal meter.

i User interface

Button functions

The following activities can be carried out using the button:

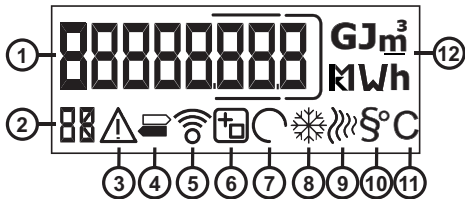
Button function	Length / interval	Function in display loops
Short press of button	< 2 seconds	Change to next display within same loop (from last to first menu item)
Longer press of button	> 2 seconds	Continuous change to next display loop, as long as button is pressed (< 1 minute)
Double-click	2-times for 0.5 seconds	Activating certain functions (e. g. editor)

Display

In measuring mode, the display is generally deactivated as long as

- no button has been pressed within the past 60 s and
- no error exists in the device.

The display is activated by pressing a button. First, a display test is shown, where all display elements are shown. The display changes to display 1A automatically.



- 1.Measured values with optional three, one or without a full stop (visualised by full stop and frame)
- 2.Number of the currently shown display
- 3.Error recognised
- 4.Incorrect flow direction
- 5.Wireless status

- Off: Device not accessible with ista service tools
 - On: Device accessible with ista service tools
 - Flashing: Device is accessible with ista service tools, installation or service mode
- 6.Module recognised
 - 7.Flow recognised
 - 8.Cold value
 - 9.Heat value
 - 10.Device metrologically sealed
 - 11.in °C:
 - Temperature
 - Temperature difference
 - 12.Units for
 - energy in kWh, MWh, GJ
 - Volume in m³
 - Power in kW
 - Time in h

If the figure currently shown on the display changes, then it is updated automatically. This mainly affects current consumption values, but also device parameters such as wireless status, M-bus primary addresses etc., which can be written via external interfaces (wireless, M-bus).

Display loops

The following table shows symbols which signify display conduct or actions required from the user within the display loop description.

Symbol	Description
	Displays automatically change every 2 sec
	Alternative displays, depending on the status of the device
	Displays can be retrieved with just a short click
	Display/loop can be retrieved with a long click
	Display can be retrieved by double clicking

Loop 1: Measuring loop

In the measuring loop you can read out the current measured values, the last and second-to-last reference date values for energy and volumes and the next reference date.

1A: Current meter reading for thermal energy¹ / Current meter reading for cold energy²

1B: | Last reference date value for thermal energy¹ / Last reference date value for cold energy² / Last reference date value for total volume³ / Last reference date value for cold volume^{3.4} / Date of last reference date

1C: | Second-to-last reference date value for thermal energy¹ / Second-to-last reference date value for cold energy² / Second-to-last reference date value for total volume³ / Second to last reference date value for cold volume^{3.4} / Date of second-to-last reference date

1D: | Date of next reference date

1E: | Current meter reading for total volume / Current meter reading for cold volume^{3.4} / Current meter reading for error volume^{5.6}

- 1.For heat meters and combined heat/cold meters only
- 2.For cold meters and combined heat/cold meters only
- 3.For combined heat/cold meters, if necessary, calculate the “heat volume” as the difference between the “total volume” and the sum of the “cold volume” and “error volume”.
- 4.For combined heat/cold meters only
- 5.The “error volume” is volume for which, for various reasons, no energy could be calculated.
- 6.If necessary, calculate the “heat volume” for heat meters or “cold volume” for cold meters as the difference between the “total volume” and the “error volume”.

Loop 2: Wireless service loop

NOTICE

Wireless M-bus telegrams can only be activated via ista radio after the activation of the bidirectional ista radio system via display 2A or 2B.

NOTICE

After activation of the radio, manual parameterisation via the parameterising loop is no longer possible.

- 2A: — Activation of installation beacons by double-clicking (maximum 14 times); if no parametrisation takes place via ista service tools, then the radio is deactivated ('SETUP') # Activation of 30 fast service beacons by double-clicking (maximum 20 times a day)('rEAd') # No further activation of installation beacons (at all) or service beacons (until daily change) possible ('no rEAd')
- 2B: | One-off activation of installation beacons by double-clicking; if no parameterisation takes place via ista service tools, the radio is activated with default parameters ('A SETUP')
- 2C: | Activation of wireless M-bus telegrams by double-clicking ('C1 SETUP')¹

- 1.Protected by password 2

Loop 5: Statistics loop

- In the statistics loop, you can read the values at the end of the month for energy and volumes, and the respective reference date of the last 14 months.
- 5A: — Reference date of last month / End of month value for thermal energy for last month¹ / End of month value for cold energy for last month² / End of month value for total volume for last month³ / Cold volume for last month^{3,4}
- 5B – 5N: | As 5A for the previous 13 months

- 1.For heat meters and combined heat/cold meters only
- 2.For cold meters and combined heat/cold meters only
- 3.For combined heat/cold meters, if necessary, calculate the “heat volume” as the difference between the “total volume” and the “cold volume”.
- 4.For combined heat/cold meters only

Loop P: Parametrising loop

If the device has not already been commissioned by radio, you can manually programme different parameters into the device using the parameterising loop.

- Double-click to access the individual parameters in the Editor to edit them. On exiting the Editor, the values entered are saved.
- If you are in the parametrising loop or the Editor, and do not press any buttons for 60 seconds, the display deactivates and you exit the parametrising loop automatically with the last saved values.
- PA: — Parametrising the reference day date in the DD-MM format^{1,2}
- PD: | Parametrising the M-bus primary address ("BUS XXX")^{1,2,3}
- PE: | Parametrising the pulse output module, pulse type ("PULSETYPE")^{1,2}
- PF: | Parametrising the pulse output module, pulse value ("PULSESrAtE")^{1,2}

- 1.Parameterising only possible if the device has not already been commissioned via ista service tools
- 2.Protected by password 1
- 3.Parametrising only possible if the M-bus primary address has not yet been set via the M-bus

Editor

The following activities can be carried out in the editor, using the button:

Button function	Length / interval	Function in editor
Short press of button	< 2 seconds	- Jump to next point to be entered (or from last to first) - Change to next entry with selection list
Longer press of button	> 2 seconds	Change to current point to be entered
Double-click	2-times for 0.5 seconds	Exiting editor and saving changed values

The current points to be worked on are indicated by flashing.

Password entry

- To avoid undesired changes to the parameterisation of the device, the parameterisation loop is protected by password 1 and the activation of wireless M-bus telegrams is protected by password 2.
- Password 1 has four digits and consists of the current month and year in the format 'MMYY' (example: January 2019 equals "0119"). You must enter the password once during the first parameterisation process. It is then valid until the next deactivation of the display.
 - Password 2 has three digits and consists of the first three digits in the serial number (Example: Serial number of the device '914000069' -> password 2 = '914').

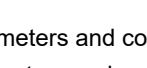
You reach the screen for entering the password from the parameterisation loop or display 2C by double-clicking.

Number	Display	Meaning
PA -PI		Entry of password 1
		Password is correct
		Password incorrect

Parameter input

You access the entry to be edited automatically from the corresponding entry in the parametrising loop and after successfully entering the pass-

word if required. After entering the required value, double-click to exit the Editor.

Number	Display	Meaning
PA		Reference date
PD		M-bus primary address
PE		Pulse output type
●●		Thermal energy ¹
●		Cold energy ²
●		Volume
PF		Pulse output value
●●		1 pulse per increase of last place in the display
●		1 pulse per 0.1 kWh or 0.001 GJ ³
●		1 pulse per 1.0 kWh or 0.010 GJ ³
●		1 pulse per 10.0 kWh or 0.100 GJ ³
●		1 pulse per 100.0 kWh or 1.000 GJ ³
●		1 pulse per 1000.0 kWh or 10.000 GJ ³
●		1 pulse per 0.001 m ³ ⁴
●		1 pulse per 0.010 m ³ ⁴
●		1 pulse per 0.100 m ³ ⁴
●		1 pulse per 1.000 m ³ ⁴

- 1.For heat meters and combined heat/cold meters only
- 2.For cold meters and combined heat/cold meters only
- 3.For heat energy or cold energy pulse output types only (unit dependent on device variant kWh or GJ)
- 4.For volume pulse output type only

Parameter entry

You access the entry to be edited automatically from the corresponding entry in the parametrising loop after successfully entering the password if required. After entering the required value, exit the editor with a double-click.

- PA: || Reference date
- PD: || M-bus primary address (“BUS XXX”)
- PE: Pulse output type || Thermal energy (“En hot”)¹ | Cold thermal energy (“En cold”)² | Volume (“Fluid”)
- PF: Pulse output value || 1 pulse per increase of last digit in display (“Auto”)
 - 1 pulse per | 0.1 | 1.0 | 10.0 | 100.0 | 1000.0 kWh³
 - 1 pulse per | 0.001 | 0.010 | 0.100 | 1.000 m³⁴

- 1.Only for heat and combined heat/cold meters
- 2.Only for cold and combined heat/cold meters
- 3.Only for thermal or cold energy pulse types
- 4.Only for volume pulse output type

Error status

Number	Display	Meaning
3A		Calculation unit error – check temperature sensor and replace temperature sensor and / or device if necessary ¹
		Temperature measurement error – check temperature sensor and replace temperature sensor and / or device if necessary ¹
		Flow measurement error - replace device ¹
		Internal error – replace device ¹
		End of life – replace device ¹
		System error – replace device ²

- 1.Combinations of the stated errors are possible.
- 2.Permanent display. Access to display loops no longer possible.
 - 3A “ERR C”: Computing unit error – check temperature sensor; replace temperature sensor and / or device if necessary¹
 - 3A “Err t”: Temperature measurement error - check temperature sensor; replace temperature sensor and / or device if necessary¹
 - 3A “Err F”: Flow measurement error - replace device¹
 - 3A “Err U”: Internal error – replace device¹
 - 3A “Err L”: End of life – replace device¹
 - “SysError”: System error – replace device²

- 1.Combinations of the stated errors are possible.
- 2.Permanent display. Access to display loops no longer possible.



Startup



NOTICE

- When commissioning a heat meter, a commissioning record must be prepared in accordance with PTB K6.

1. Parametrise the device manually or via wireless connection, using the above parametrising loop.
2. Slowly open shut-off valves, the supply line first.
3. Check for function and leakage.
4. Clean the device exterior with a soft damp cloth. Do not use cleaning products.



Replacement

1. Note meter reading of meter.
2. Close the shut-off devices.
3. Use wrench to unscrew meter.
4. Remove temperature sensor.
5. Continue with installation step a.4



Technical data

- **Environmental classes:** A + C to EN 1434, E1 / M2 to 2014/32/EU
- **Ambient temperature:** Storage: -25 °C to +55 °C, Operation: +5 °C to +55 °C
- **Relative humidity:** 5 % to 95 %, non-condensing
- **Protection class:** Calculator: IP54 to EN 60529, Flow sensor: IP 65 to EN 60529
- **Installation site (see nameplate):**

	Flow	Return
Heat meters	hot line	Cold line
Combined heat/cold meter	hot line	Cold line
Cold meters	Cold line	hot line

- **Approved fluid:** Water
- **Nominal flow:** q_p 0,6 / 1,5 / 2,5 (acc. rating plate)
- q_p / q_i : asymmetric: 25, symmetric: 50
- **Combined heat / cold meter changeover criteria:** $\Delta\Theta_{\text{grenz}} = 0.19 \text{ K}$, $\Theta_{\text{in_umsch}} = 20 \text{ °C}$
- **Nominal pressure:** PN 16
- **Pressure loss at q_p (depending on the EAS):** $\Delta p < 0.25 \text{ bar}$
- **Inlet section:** 10 x DN in case of lack of thermal mixing or thermal stratification (e.g. after several heating circuits merge), otherwise not required
- **Outlet section:** not required
- **Flow sensor temperature range limits (Θ):**

	Θ_{min}	Θ_{max}
Heat meter	15 °C	90 °C
Combined heat/cold meter	5 °C	90 °C
Cold meter	5 °C	25 °C

- **Temperature measurement range limits (Θ) / Temperature difference limits ($\Delta\Theta$):**

	Θ_{min}	Θ_{max}	$\Delta\Theta_{\text{min}}$	$\Delta\Theta_{\text{max}}$
Heat meter (flow)	5 °C	90 °C	3 K	85 K
Heat meter (return)	5 °C	150 °C	3 K	100 K
Combined heat/cold meter (flow)	1 °C	90 °C	3 K	85 K
Combined heat/cold meter (return)	1 °C	150 °C	3 K	100 K
Cold meter	1 °C	25 °C	3 K	20 K

- **Temperature sensors:** Typ Pt500 acc. EN 60751
- **Length sensor cable:** depending on the order variant: symmetrical: 1.5 m/1 m or 3 m/1 m, asymmetrical:
 Temperature sensor in the hydraulics: 0.4 m, External temperature sensor: 1.5 m or 3 m

- **Power supply:** 3.6 V AA lithium-metal battery
- **Service life:** 10 years of operation + 1 year operating reserve + 1 year storage
- **Measurement interval:** 8 s
- **Main dimensions:** Length: 86 mm, Width: 92 mm, Height: 66 mm, Connection: G 2"
- **Wireless interfaces:** Frequency range: 868 MHz, Maximum transmission power: < 10 mW, Wireless M-Bus: Operating mode C1 as per EN 13757-4; transmission interval: 4 minutes



Approval

- Heat (MID): DE-19-MI004-PTB030
- Cold (national approval for Germany): DE-21-M-PTB-0078
- Cold (national approval for Switzerland): CH-T2-21781-00

The following thermowells conform to the named EC type examination certificate/PTB toleration:

Article number	Set	Thread	Inner diameter / Length (mm)	Spanner size (width AF)	Hexagon height (mm)
18391	Yes	G 1/4"	5 / 50	17	8
18386	Yes	G 1/4"	5 / 50	17	8
18387	Yes	G 1/4"	5 / 50	17	8
18394	Yes	G 1/4"	5 / 50	17	8
18395	Yes	G 1/4"	5 / 50	17	8
18396	Yes	G 1/4"	5 / 50	17	8
18380	No	G 1/4"	5 / 50	17	8
18383	No	G 1/4"	5 / 50	17	8
18392	Yes	G 1/4"	5 / 80	17	8
18381	No	G 1/4"	5 / 80	17	8
18393	Yes	G 1/4"	5 / 150	17	8
18382	No	G 1/4"	5 / 150	17	8
18385	No	G 1/4"	5 / 150	17	8
18515	No	G 3/8"	5 / 50	22	8
18520	No	G 3/8"	5 / 80	22	8
18523	No	G 3/8"	5 / 150	22	8
18379	No	G 1/2"	5 / 60	22	18
18518	No	G 1/2"	5 / 50	22	8

Copyright

The firmware of this device contains sections which are under BSD licence. You can find the relevant copyright note at the end of this manual.

Original BSD-style license

Copyright (c) 2004-2005, Swedish Institute of Computer Science.

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- 1.Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- 3.Neither the name of the Institute nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

This software is provided by the Institute and contributors "as is" and any express or implied warranties, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose are disclaimed. In no event shall the Institute or contributors be liable for any direct, indirect, incidental, special, exemplary, or consequential damages (including, but not limited to, procurement of substitute goods or services; loss of use, data, or profits; or business interruption) however caused and on any theory of liability, whether in contract, strict liability, or tort (including negligence or otherwise) arising in any way out of the use of this software, even if advised of the possibility of such damage.



Installation diagrams

