sensonic 3 calculator



G.83.0217 – Release 9.1.0 – 2025 online ista SE – Luxemburger Str. 1 – 45131 Essen Germany https://www.ista.com – info@ista.com





Installation and Operating Instructions



Use / Function

The battery-operated sensonic 3 calculator is a component of a combination thermal energy meter in accordance with EN 1434. It receives signals from connected flow sensors and temperature sensors, and calculates the energy transferred from these.

It is authorised for measuring circuit water in accordance AGFW (FW 510) in heating systems. It is not authorised for use for billing purposes in systems with glycol admixtures.

Variants:

- T1: 1 pulse = 1 l
- T25: 1 pulse = 25 l
- T250: 1 pulse = 250 l
- TX: Pulse value of on-site flow sensor can only be selected once



Extent of delivery

- 1 x sensonic 3 calculator
- 1 x mounting plate
- 1 x mounting set (2 screws / 2 dowels)
- 3 x cable grommet (pre-assembled)
- 1 x manual including declarations of conformity



Warnings



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 MET-AL 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.

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WARNING!

Danger of injury due to electric shock, fire or explosion

Connecting to an external voltage (230 V) can cause injuries due to electric shock as well as explosion of the battery and subsequent fire.

 Do not connect any external power sources to the device.



Notes

Transport and Shipping

You may only transport the sensonic 3 calculator 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.

Notes on use and handling the meter

- The device may only be installed by trained skilled personnel!
- Only remove user seals if you are authorised to do so. The seals must be replaced after the work is completed.
- 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.
- Always utilise the device in an environment that fulfils the indicated operating conditions.

Installation notes

- Check to see whether the installation site (flow/return) and the flow sensor pulse value is appropriate for the type sensonic 3 calculator (see type plate and type plate loop).
- The flow sensor and temperature sensor of the energy meter must be located in the same partial circuit of the system (same circuit rule).
- Observe the cable lengths when selecting the installation site.
- The length of the connecting bend for the flow sensor may only be 10 m.
- 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.

- If used as a cold meter or combined heat/cold meter, the calculator must be attached so that condensation cannot penetrate the calculator via the connected cables.
- The clamping screws of the calculator connections must be fitted on the cable, as otherwise there will be no contact.
- Only connect temperature sensor pairs and flow sensors with their own EU marking.
- Temperature sensor pairs with a maximum length of 3 m (2 wire technology) or max. 30 m (4 wire technology) are approved.
- The temperature sensors may only be installed symmetrically in the warm and cold lines.
- The lithium metal battery is fixed in this device and may not be replaced.



Installation



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.



NOTICE

Danger of water damage

Drilling into water pipes can cause water damage.

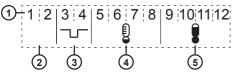
- ► Inspect the assembly location for any concealed pipes which are laid in the wall before assembling the electronics.
- 1. Attach the mounting plate to the wall.
- 2. Engage calculator in mounting plate.
- 3. Open clamping cover.
- 4. Undo/remove strain relief.
- 5. Thread cables through sleeves.
 - Left sleeve: Pulse cable of flow sensor
 - Central sleeve: Cold line temperature sensor cable
 - Right sleeve: Hot line temperature sensor cable



- 6. Connect the lines (see connection).
- 7. Attach strain relief.
- 8. Close clamping cover
- Installation of the temperature sensor as per its installation instructions.



Terminal labelling



- 1. Numbering of the terminals
- 2. Terminals 1 + 2: Not used.
- Terminal 3: Connection of flow sensor pulse cable earth Terminal 4: Connection of flow sensor pulse cable pulse
- 4. Terminals 5 8: Cold line temperature sensor cable connection
- 5. Terminals 9 12: Hot line temperature sensor cable connection

Connection, flow rate sensors

	Cab no.	e to	termin	al	
	whi te	gre en	brow n	blu e	red
sensonic II flow sensor	-	4	-	-	3
US flow sensor (Diehl variant)	4	-	-	3	-
US flow sensor (Zenner vari- ant)	-	4	-	3	-
US flow sensor	reve	rse no	olarity r	oro-	

US flow sensor reverse polarity pro-(variant L&G) tected

KTZ* / ultego reverse polarity pro-III flow sensor tected

* Do not connect cable shielding



NOTICE

 Calculator and flow sensors must have the same pulse value: T1 = 1 l/pulse, T25 = 25 l/ pulse, T250 = 250 l/pulse.

Connection ista temperature sensor



= cold line = blue sensor marking



= hot line = red sensor marking

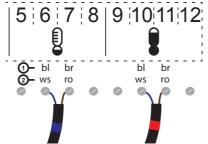
Variant	hot line / red sensor marking	cold line / blue sensor marking
Heat meter	Flow	Return
combined heat/cold meter	Flow	Return
Cold meter	Return	Flow

Abbreviations used on the terminals:

bl = blue gn = green ws = white br = brown ge = yellow ro = red

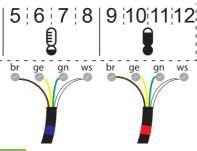
In case of calculators without permanently connected temperature sensors, connector sensor cables as follows:

2 wire technology



- 1. ista temperature sensor, Ø 5.0 mm
- 2. ista / Jumo temperature sensor, \varnothing 5.2 and 6.0 mm

4 wire technology



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User interface

Button functions

The following activities can be carried out using the button:

Length / interval	Function in dis- play loops
<	Change to next dis-
2 seconds	play within same
	loop (from last to
	first menu item)
>	Continuous change
2 seconds	to next display loop,
	as long as button is
	pressed (< 1 min-
	ute)
	interval < 2 seconds >

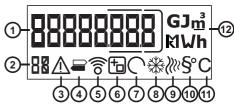
Button function	Length / interval	Function in dis- play loops
Double-	2-times	Activating certain
click	for 0.5	functions (e. g. edi-
	seconds	tor)

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 switches over to display 1A automatically.



- 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 detected
- 4. Wrong flow direction (not relevant for sensonic 3 calculator)
- 5.Radio 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 detected
- 7.Flow detected
- 8.Cold value
- 9.Heat value
- 10.calibrated value
- 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 value currently shown on the display changes, it is updated automatically. This mainly affects current consumption values, but also device parameters such as radio status, M-bus primary addresses etc., which can be written via external interfaces (radio, M-bus).

Display loops



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

Sym- bol	Description
ς	Displays automatically change every 2 sec
V	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.

Num	iber	Display	Meaning
1A		12345 <u>678</u> k wh	Current meter reading for thermal energy ¹
	^	naanceaa) et d	Current meter
		12345678 k Wh	reading for cold
			energy ²
1B	•	12342678 k Wh	Last reference date value for
			thermal energy ¹
	S	12345678) k Wh	Last reference date value for
			cold energy ²
	5	12345578 S.M.	Last reference date value for
			total volume ³
	S	12845678 mi	Last reference date value, cold
			volume ^{3.4}
	ς	38-86-98 Sun 36-860****So	Date of last ref- erence date
1C		12342030 GJ	Second-to-last
			reference date
			value for ther-
			mal energy ¹ Second-to-last
	5	12345678)kWh	reference date
	О,		value for cold
			energy ²
	5	יים (עֿנעטטרניי	Second-to-last
	\ <u>`</u>	RAP®田〇衆※S°C	reference date
			value for total
			volume ³

Num	ber	Display	Meaning
	S	1234567B) "" 16 A = 10 O #	Second-to-last reference date value, cold energy ^{3.4}
	S		Date of second- to-last refer- ence date
1D	•	80-05-09 6Jri	Date of next ref- erence date
1E	•	12342818 CM	Current meter reading for total volume
	\mathcal{C}	1234567B) Sam 18A=760 & MS 0	Current meter reading for cold volume ^{3.4}
	S	12345678 mi	Current meter reading, 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

You can initiate wireless commissioning and activate fast service beacons via the wireless service loop.

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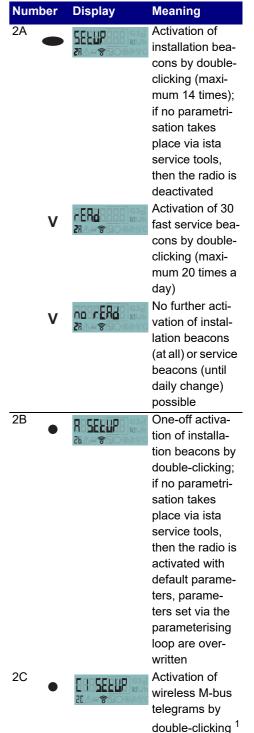
NOTICE

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.



1.Protected by password 2

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 3: Diagnostics loop

In the diagnostics loop, you will find extensive information on the device's current status.

Nun	nber	Display	Meaning
3A	•		No existing device errors
	٧		Existing device error ¹
	\mathcal{C}		Number of days in operation
	ς	4E-11(234) Mulh 3R A=@BO#//850	since production Number of error days since pro- duction
3B	•	15 45 10 m h	Current flow
3C	•	12345 <u>678</u> kw	Current heat output ²
	٧	12345 <u>678</u> kw	Current cold output ²
3D	•		Current flow temperature
3E	•	#V=&@O****.c	Current return temperature
3F	•	4- (45 <u>678)</u> kun #A=%%0****°C	Current tem- perature differ- ence Δt ³
3G	•	2342 <u>578</u>	Maximum flow since production
	ς	35A=@BO*///°C	Maximum tem- perature of the current billing period

Number	Display	Meaning
2		Maximum tem-
<i>'</i> \		perature differ-
		ence Δt of the
		current billing
		period ³

- Description of the device errors in the 'error status' section
- 2.Depending on current count mode (heat/cold)
- 3.Becomes negative, if T_{flow} < T_{return} (cold measurement or sensor mixed up)

Loop 4: Type plate loop

You can find information on the current configuration of the device in the type plate loop.

4A: — M-bus ID number (part of secondary address)

4B: | Flow sensor pulse value (litres per pulse) ("LP X.X") / (Flow sensor installation site for hot line ("LoC hot") # Flow sensor installation site for cold line ("LoC cold") 1)

4C: | Device can no longer be read out via the module until the day changes ("no CrEdt")² # Mbus module detected with bus address (primary) ("Bus XXX") ² # Pulse output module detected ("PULSEOUt")²

4D: | Glycol type³ / Glycol concentration (*"ConC XX"*)³

4E: | Radio off ("rF OFF") # WalkBy ("rF PdA") # ista radio ("rF nEt") # OMS C1 + WalkBy ("rF C1")

4F: | Radio network number (first 8 digits) # Radio network number (last 8 digits)

4G: | Measuring interval in seconds ("SEC X")

4H: | Sensor type Pt500 ("Pt 500")/ Detected sensor connection technology: 2-wire ("PtLInE 2") # Detected sensor connection technology: 4-wire ("PtLInE 4") # Sensor connection technology not detected ("PtLInE 0")

4I: | Software version

4J: | Hash code

- 1.Display shows the planned (programmed) installation site of the flow sensor, not the actual site
- 2.Display only if a module was detected
- 3. Display only for glycol meters

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.

Num	ber	Display	Meaning
5A	•	BB-DU-RQ GJ ii SRA=常悟〇樂//S S C	Reference date from last month
	S	12345678 kwh	Thermal energy value from end
			of last month ¹
	\mathcal{C}	(234567B) _{kWh}	Cold energy value from end
			of last month ²
	S	12345678 MM/h 58A=@60%/m80	End of month value total vol-
			ume last month ³
	5	12300000000m	Cold volume
	G	28V=\$四○參//8.0	last month ^{3.4}
5B			Same as 5A for
_			the previous 13
5N			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 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 month ¹ / 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
- 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 6: Tariff loop

In the tariff loop, you can read the values at the end of the month for the maximum performance and flow, and each reference date from the last 14 months.



Number	Display	Meaning
6A	20-00-00	Reference date
	SHA=>BO#W5°C	from last month
5	HEROTO COM	Maximum heat
C,		performance
		value from end
		of last month ¹
5		Maximum cold
\ <u>\</u>		performance
		value from end
		of last month ²
5		Maximum flow
<u>G</u>	ENV=&PO***2.C	value from end
		of last month
6B		Same as 6A for
_		the previous 13
6N		months

- 1.Only for heat meter and combined heat meter/cold meters
- Only for cold meters and combined heat/cold meters

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 selec- tion 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 (Ex-

ample: 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 ●●	Pan Ban GJm kiwh 88本字も〇米※5°C	Entry of pass- word 1
••	GIM FINE POSS KWh	Password is correct
V		Password incor- rect

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
- PC: Pulse value: || Flow sensor undefined
 ("undEF") | 1.0 | 2.5 | 10.0 | 25.0 | 100.0 |
 250.0 | 500.0 | 1000.0 | 2500.0 | 10000.0 |
 25000.0 litres per pulse (LPP)¹
- PD: | M-Bus primary address ("BUS XXX")
- PE: Pulse output type || heat energy ("En hot")² | cold energy ("En cold")³ | 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 kWh ⁴
- -1 pulse per | 0.001 | 0.010 | 0.100 | 1.000 m³
- PI: || Discard entry from PC ("dIScArd") | save entry from PC ("SEt") || entry is being saved ("SEttING") / (save successful ("SEt dOnE") # save failed ("SEt FAIL"))
- 1.Only for TX variant
- 2. Only for heat and combined heat/cold meters
- 3.Only for cold meters and combined heat/cold meters
- 4.Only for heat or cold energy pulse output types
- 5. Only for volume pulse output type

Error status

Number	Display	Meaning
3A		Calculation unit
	HULL LULL MUH RAPS TO 鉄 ※ S°C	error – check
		temperature
		sensor and
		replace tem-
		perature sensor
		and / or device if
		necessary ¹

Number	Display	Meaning
	0000000 GJ-6	Temperature
		measurement
		error – check
		temperature
		sensor and
		replace tem-
		perature sensor
		and / or device if
		necessary ¹
	G000000 MV//	Flow measure-
		ment error -
		replace device ¹
	00000000 GJm	Internal error –
		replace device ¹
		End of life –
		replace device ¹
		System error –
		replace device ²

- 1.Combinations of the stated errors are possi-
- 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 errorcheck temperature sensor; replace temperature sensor and / or device if necessary¹
- 3A "Err U": Internal error replace device¹
- 3A "Err L": End of life replace device¹
- "SysError": System error replace device²
- 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.
- Parametrise the device manually or via wireless connection, using the above parametrising loop.
- 2. Check function.
- 3. Clean the device exterior with a soft damp cloth. Do not use cleaning products.
- 4. Seal meter.





Replacement

- 1. Make a note of meter reading.
- 2. Open clamping cover.
- 3. Undo/remove strain relief.
- 4. Disconnect the cables.
- 5. Undo/remove terminal labelling.
- Remove the ALU (fold back the clamp using a screwdriver).
- 7. For more see installation from point 2 onward



Technical data

- Ambient conditions to EN 1434: Classes M1 / E1
- Ambient temperature: Storage: -25 °C to +55 °C, Operation: +5 °C to +55 °C
- Relative humidity: 5 % to 95 %, non-condensing
- Protection class: IP 65 as per EN 60529
- Temperature sensors: Typ Pt500 acc. EN 60751
- Temperature measurement range limits (Θ) / Temperature difference limits ($\Delta\Theta$):

Tomporatare ameronee minte (20).						
	Θ_{min}	Θ_{max}	$\Delta\Theta_{\text{min}}$	$\Delta\Theta_{ extsf{max}}$		
Heat meter	5°C	150 °C	3 K	100 K		
Com- bined heat/ cold meter	1°C	150 °C	3 K	100 K		
Cold meter	1°C	25 °C	3 K	20 K		

- Combined heat / cold meter changeover criteria: $\Delta\Theta_{\rm grenz}$ = 0.19 K, $\Theta_{\rm in~umsch}$ = 20 °C
- Pulse value: 1 / 25 / 250 l/pulse set by the factory in accordance with type plate (T1, T25, T250 versions), 1 / 2.5 / 10 / 25 / 100 / 250 / 500 / 1000 / 2500 / 10000 / 25000 l/impulse can be adjusted oncer (TX version)
- Impulse input: Class IB as per EN 1434
- Main dimensions: Width: 93 mm, Height (without cable sockets): 134,5 mm, Height (with cable sockets): 149 mm, Depth: 35 mm
- Power supply: 1 x 3.6 V AA lithium metal battery
- Service life: 10 years of operation + 1 year operating reserve + 1 year storage
- 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

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Approval

- Heat (MID): DE-19-MI004-PTB029
- Cold (national approval for Germany): DE-21-M-PTB-0025
- Cold (national approval for Switzerland): CH-T2-21779-00

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