

Engelmann Heat Meter

# SensoStar C



Various application options due to a large selection of variants and setting options

User-friendly mounting system for easy connection of flow and temperature sensors

Flexible communication based on a modular system

Connection of an external power pack enables direct monitoring of your system

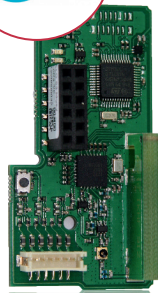
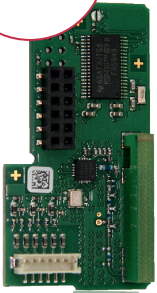
## Precise heat/cooling measurement

The SensoStar C is a flexible calculator for recording heat or cooling energy that offers a suitable solution for every installation situation. Specially designed for the measurement of large volume flows, the calculator can be easily combined with all standard flow sensors. The range is rounded off by a wide selection of retrofittable communication modules as well as the option of an external power pack for direct system monitoring.

### We speak your language

The continuously growing portfolio of communication modules offers you a wide range of remote readout options.

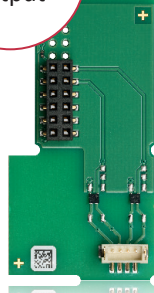
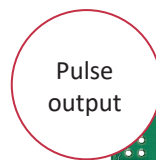
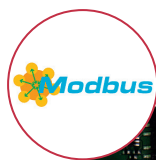
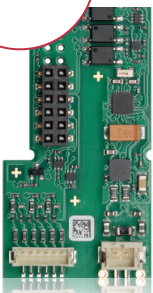
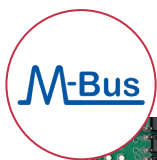
#### RADIO MODULES



#### Features

- Available for heating and cooling applications
- Wide range of variants for different requirements
- Installation point and display unit adjustable on site
- Battery life of up to 20 years
- Automatic adjustment of the temperature measurement cycle by using external power supply

#### WIRED MODULES



wM-Bus, LoRaWAN and M-Bus can also be equipped with 3 pulse inputs to connect other devices.

Calculator		
Temperature range medium	°C	0 – 150 heat / 0 – 50 cooling
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
Temperature difference range $\Delta\theta$ heat	K	3 – 100
Temperature difference range $\Delta\theta$ cooling	K	-3 – -50
Minimum temperature difference $\Delta\theta$ heat	K	> 0.05
Minimum temperature difference $\Delta\theta$ cooling	K	< -0.05
Minimum temperature difference $\Delta\theta$ heat / cooling	K	> 0.5 / < -0.5
Resolution temperature	°C	0.01
Temperature measurement cycle in normal operation	s	60 2 by using a power pack
Pulse values, optional	l/Imp	25; 100; 250; 1000; 2500
Display		LCD – 8 digits + special characters
Displayed thermal energy		up to 3 decimal places
Units		MWh, kW, m <sup>3</sup> , m <sup>3</sup> /h (kWh, GJ) unit of energy can be set when the amount of energy is still $\leq 10$ kWh
Communication interfaces		optical interface (M-Bus protocol) wired: M-Bus,* Modbus, 2 pulse outputs radio: wireless M-Bus,* LoRaWAN*
Power supply		easily replaceable 3 V lithium battery preparation for 3 V power pack available (input voltage 230 V / 24 V AC)
Estimated lifetime	years	20 without communication module 12 with M-bus hourly readout 10 with others e.g. wM-bus, Modbus, LoRaWAN
Data storage		24 monthly and semi-monthly values
Billing dates		freely selectable annual billing date
2 tariff registers		individually adjustable (store energy or time)
Storage of the maximum values		flow, power and temperatures (inlet, outlet, $\Delta\theta$ ) as well as the respective maximum values of the last 15 months
Mechanical / electromagnetic class (MID)		M2 / E2
Protection class		IP54
Medium		water; optional, without approval: water with a propylene glycol or ethylene glycol percentage rate of 20 %, 30 %, 40 % or 50 % (type and concentration of glycol can be set at any time)
Pulse input device		microcontroller CMOS input of class IB according to EN 1434-2:2015 (D)
Approvals		DE-18-MI004-PTB037 (MID heat) DE-18-M-PTB-0049 (national German cooling) CH-T2-18769-00 (national Swiss cooling) CE
Weight	kg	0.350
W x H x D	mm	150 x 130 x 35

\* Optional with 3 pulse inputs.

### Flow sensor requirements

Encoder type class (according to EN 1434-2:2015)	OA (reed contact); OC (open collector)	
Maximum input frequency	Hz	10
Pulse length	ms	at least 25
Pulse pause	ms	at least 50

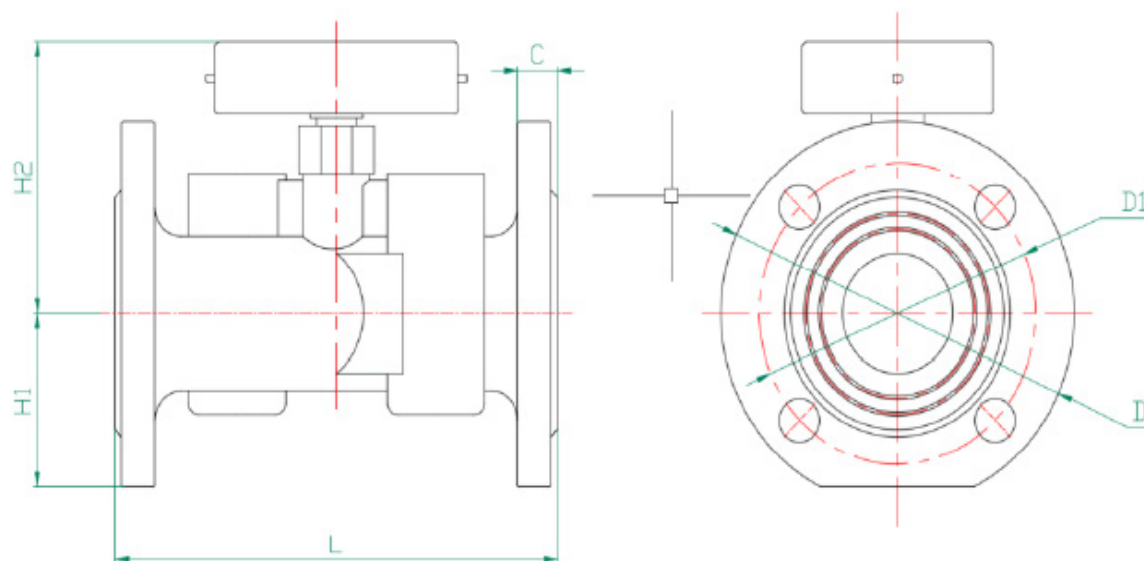
### Temperature sensor requirements

Platinum precision resistor	Pt 500	
Connecting cable length (unshielded)	m	up to 10 in 2-wire technology (3 and 10 available)
Installation type	direct immersion; in thermowells	

### Main technical data of the flow sensor

Diameter (mm)	Qn (m <sup>3</sup> /h)	Qmin (m <sup>3</sup> /h)	Qmax (m <sup>3</sup> /h)	Length (mm)
DN 50	15	0.6	30	200
DN 65	25	1	50	200
DN 80	40	1.6	80	225
DN 100	60	2.4	120	250
DN 125	100	4	200	250
DN 150	150	6	300	300
DN 200	250	10	500	350
DN 250	400	16	800	450
DN 300	600	24	1200	500
Range ratio	R25			
Accuracy class (MID)	EN 1434, class 2			
Connection	flange			
Pressure drop	≤ 20 kPa (≤ 0.2 bar) at Qn			
Pressure rating	≤ 1.6 MPa (≤ 16 bar)			
Power supply	3.6 V lithium battery			
Battery life	10 years			
Environmental class (MID)	class B			
IP rating	IP68 – indoor installation			
Static pressure	min. 1.5 bar			

**Static pressure requirement: To minimize the risk of measuring errors due to cavitation or air in the water it is recommended to keep a sufficient static pressure at the flow sensor outlet of min. 1.5 bar.**



Dimensions									
Diameter (mm)	L (mm)	H1 (mm)	H2 (mm)	C (mm)	D (mm)	D1 (mm)	Bolt hole	Weight (kg)	Pressure (MPa)
DN 50	200	72	115	18	165	125	4 – Ø18	7.2	1.6
DN 65	200	78	125	18	182	145	4 – Ø18	7.8	1.6
DN 80	225	88	132	20	197	160	8 – Ø18	9.2	1.6
DN 100	250	98	142	22	218	180	8 – Ø18	12.2	1.6
DN 125	250	116	155	22	245	210	8 – Ø18	16.5	1.6
DN 150	300	135	165	24	283	240	8 – Ø22	22.5	1.6
DN 200	350	162	193	24	335	295	12 – Ø22	30.0	1.6
DN 250	450	195	225	26	405	355	12 – Ø26	56.0	1.6
DN 300	500	223	250	28	460	410	12 – Ø22	85.0	1.6

# SensoStar C

DE-18-MI004-PTB037 (MID heat)

DE-18-M-PTB-0049 (national German cooling)

CH-T2-18769-00 (national Swiss cooling)

## 1. Application and Function



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

## 2. General Information



- Valid standards for the application of calculators for heat metering: EN 1434, parts 1 – 6; the Measuring Instruments Directive 2014/32/EU, Annexes I and MI-004; and the relevant national verification regulations.
- This product fulfils the requirements of the European Council Directive on Electromagnetic Compatibility (EMC Directive) 2014/30/EU.
- The identification plate of the instrument and the seals must not be removed or damaged – otherwise the guarantee and the approved application of the instrument are no longer valid!
- The calculator 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.
- The correct installation point in the system must be chosen: inlet or outlet flow (see item 3.1 „Pictograms installation point“).
- The heat meter has a lithium-metal-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.
- Instruments which have been replaced or exchanged must be disposed of according to relevant environmental regulations.
- The display is deactivated and can be activated for two minutes by pushing the button.
- **Unit of energy and installation point (outlet flow / inlet flow) can be set on location, only once, before start of operation by pushing the button or alternatively using the Device Monitor software.**
- **Type and concentration of glycol in the medium of those calculator types designed to be used with glycol can be set on location at any time using the Device Monitor software.**

### 2.1 Pictograms installation point of calculator (in the information loops)

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

	Installation in outlet flow
	Installation in inlet flow

### 2.2 Pictograms type of calculator (on type identification label)

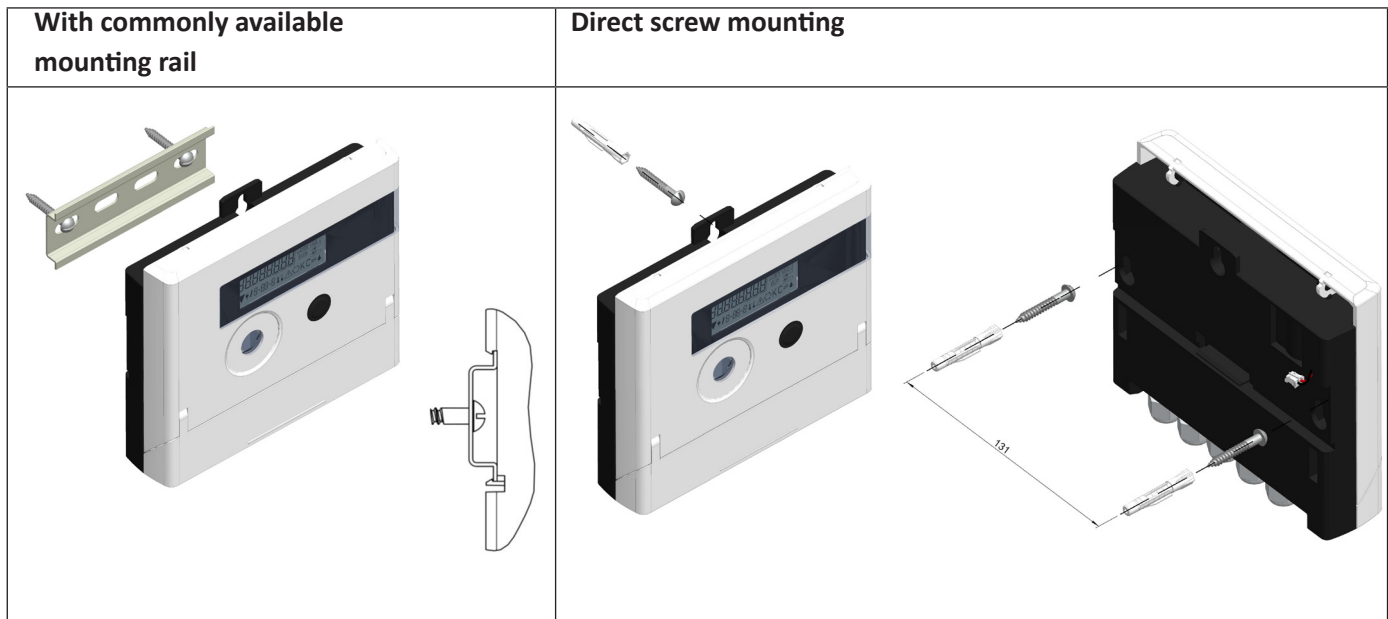
	Heat meter calculator
	Cooling meter calculator

## 3. Wall Mounting the Calculator

You can open the calculator by pulling the clamping bracket at the upper housing's leading edge up.

Before mounting, check to make sure that the cable lengths of the instruments to be connected are correct for the individual installation situation.

The center-to-center drill hole separation for the direct screw mounting is in the following picture 131 mm.



#### 4. Connecting the Components

**Important:** First mount the temperature sensors and then connect the flow meter to the calculator. This way unnecessary error messages can be avoided.

**At delivery, the display shows „H 05” until temperature sensors have been attached.** This message disappears as soon as temperature sensors have been connected and the first temperature measurement is carried out (every 15 minutes without flow).

The calculator connections have been designed to meet the valid standard EN1434-2. All terminal strips have been labelled according to this standard.

The terminal strips are located under the cover of the calculator housing.

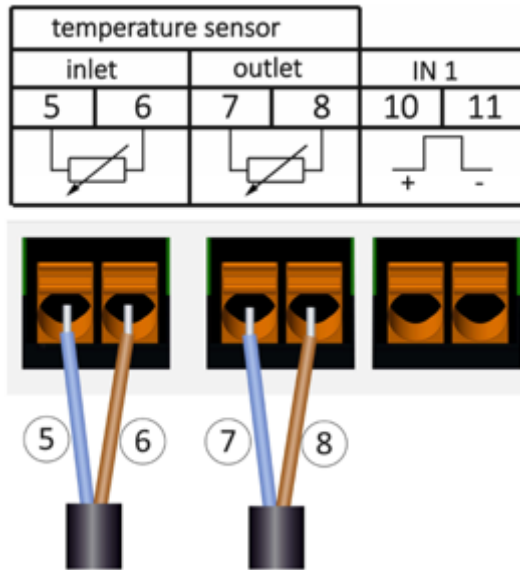
##### 4.1 Mounting the temperature sensors

Please note the following points:

- The temperature sensors must have the type of Pt suitable for the calculator (Pt 500).  
The calculator identifies the temperature sensors automatically and shows the type of Pt in loop 2.
- The temperature sensors (up to DN 100) must be installed against the flow direction.
- The temperature sensors are not to be installed within the influence of other sources of heat.
- The temperature sensor cables must not be kinked, lengthened or shortened.
- Sensor cables that are too long should not be rolled up tightly into an „air-core coil”.  
The cables should either be laid out disordered, or rolled up loosely into a wide coil which can be turned and tied into an „8”.

##### Mounting

- Loosen the two cable glands without blind plugs and glide them over the sensor cables.
- Feed the temperature sensors through the appropriate openings of the cable glands into the terminal box.
- Clamp the wires (see identification label temperature sensors) as shown in the illustration: The inlet flow temperature sensor must always be connected to clamp 5 and 6 (inlet).
- The outlet flow temperature sensor must always be connected to clamp 7 and 8 (outlet).
- The color of the wires does not matter.
- Check that the connections are tight.
- Screw the cable glands tight by hand.



#### 4.2 Mounting the flow meter

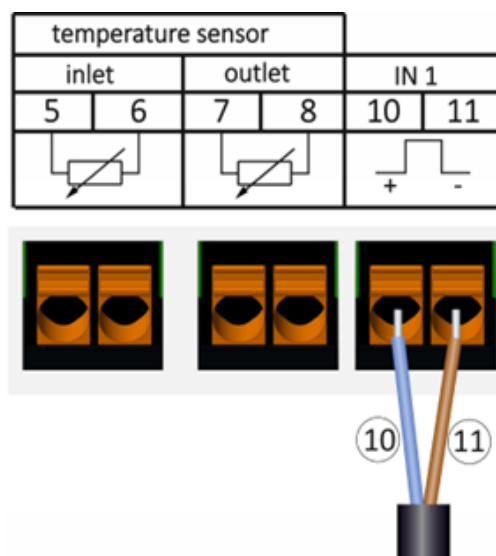
The pulse output of the flow meter to be connected to the calculator must be identical to the calculator input pulse value. Check the technical data of the flow meter and compare it to the specifications on the calculator.

##### Mounting

- Loosen the middle cable gland and glide it over the flow meter cable.
- Remove the blind plug in the cable gland opening. Feed the pulse cable of the flow meter through the opening into the terminal box.
- Clamp 10 and 11 are used for the connection to the flow meter.
- Clamp on the wires as shown in the illustration.
- Check that the connections are tight.
- Screw the cable gland tight by hand.


Note: For flow meters with open collector connections (electronic outputs) make sure the polarity is correct.

Please check the unused cable glands to make sure that the necessary blind plugs are inserted and then tighten the cable glands by hand.





## 5 Information Messages

When the instrument has detected an information message, the message symbol is displayed: .  
The specific message can be found at menu item 6 „Information message“ in level 1 / main loop (see section 8, „Display“). The message code is displayed alternately in binary and hexadecimal form.  
The instrument recognizes seven message 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 08	Temperature sensor outlet flow short circuit	1 at fifth place
H 04	Temperature sensor outlet flow cable break	1 at sixth place
H 02	Temperature sensor inlet flow short circuit	1 at seventh place
H 01	Temperature sensor inlet flow cable break	1 at eighth place

When a message  appears in the standard display (total heat energy), with the exception of the messages

- Low battery (H 80)
- Reset (H 40),

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

### 5.1 Message description

Display	Message	Effect	Possible cause
H 80	Low battery	No influence on the calculation	Adverse environmental conditions; long operating time
H 40	Reset	No influence on the calculation	EMC, electromagnetic interference
H 20	Electronics defective	No energy calculations are carried out. The register for energy is not being updated.	Defective component, defect on the calculator PC board
H 08 / H 04 / H 02 / H 01	Temperature sensor outlet or inlet flow: short circuit / cable break	As for message „Electronics defective“	Sensor cable damaged

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