



Calculator

DE-08-MI004-PTB014 / 22.75/08.03

Installation and Operating Instructions

1 Application and Function

The *SENSOSTAR*[®]2C Calculator is designed for heating and cooling applications. The connected flow meter must be installed in the return flow. Optionally, the calculator can be set in the factory to accommodate flow meters installed in the forward flow (state when ordering – not for cooling meters!).

The calculator has an optical interface for read-out and parameterization. Optionally, the calculator can be equipped at the factory with an M-bus interface, up to two pulse outputs (for energy and volume) or alternatively with two pulse inputs. It is also possible to power the instrument using a power pack (not available in combination with M-bus power supply).

2 Scope of Delivery

- Calculator *SENSOSTAR*[®]2C
- Installation kit: 1 O-ring; 5 selflock seals + 5 sealing wires; 2 screws + 2 dowels for direct screw mounting (if this technique is used - see section 4.3)
- Installation and Operating Instructions

3 General Information

All details and specifications listed in the calculator data sheet or in these installation and operating instructions must be adhered to:

- The valid statutory provisions and standards for the application of calculators for the measurement of heat energy are: EN1434 parts 1+6 and the Directive 2004/22/EC with annexes I and MI-004.
- The applicable verification regulations and periods for the country in which the calculator is to be installed must be observed.
- The calculator may only be installed or exchanged by qualified and authorized technical personnel.
- The regulations for electrical installations must be adhered to.
- The calculator left the factory in conformance with all applicable safety regulations.
- The instrument must be stored and transported frost-free. The temperature during storage or transport may not fall below 1°C. The relative humidity during storage and transport may not be more than 80%.

• Important: Instruments with activated radio function are not allowed on air freight!

- The instrument identification and the seals required for verification of the calculator must not be damaged or removed – otherwise the guarantee and verification of the instrument no longer apply!
- To protect against damage and dirt the calculator should only be removed from the packaging directly before installation.
- The flow meter and the calculator must have the **same pulse value!** In the case of the TX version the correct pulse value must be set on the calculator before the flow meter is connected.

- To clean the calculator (only if necessary) use a slightly moist (not dripping wet!) cloth.
- All electrical connections of the instrument must be laid at a **minimum distance of 50 cm** to sources of electromagnetic interference (switches, controllers, pumps, etc.)
- All instrument connections must be laid at a **minimum distance of 10 cm** to other current-carrying wires.

4 Wall Mounting of Calculator

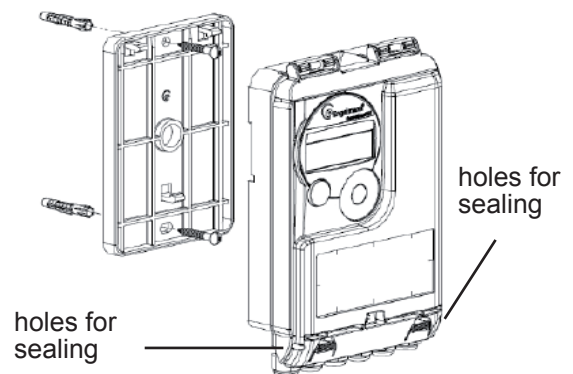
The housing cover can be opened by pulling the two snap-fit hooks at the base of the calculator (between the cable glands) towards you.

After mounting, all calculators must be sealed against manipulation at the holes provided on the housing cover (see section 4.1) using the seals and wires included in the delivery (see 2 'Scope of Delivery').

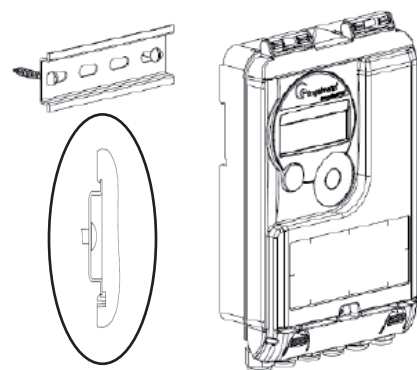
Before mounting, check to make sure that the cable lengths of the instruments to be connected are correct for the individual installation situation.

For existing mounting positions an optional adapter panel - meeting EN1434-2:2007 (D) specifications – is available which makes it possible for the wall-mounting support to be mounted using standardized drill holes. The center to center drill hole separation for the wall-mounting unit (see 4.1) and direct screw mounting (see 4.3) is 119 mm.

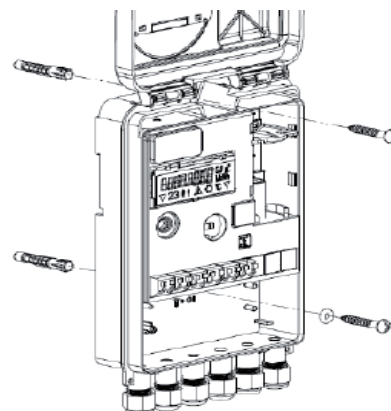
4.1 With wall-mounting support



4.2 With commonly available mounting rail



4.3 Direct screw mounting



5 Connection of 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 'ERR 03' until temperature sensors have been attached. This message disappears as soon as temperature sensors have been connected and the first measurement is carried out (every 30 seconds for standard)

Recognition of switched temperature sensors is only activated for meters which are purely heat meters or cooling meters. Recognition of switched sensors is not possible for dual-purpose heat / cooling meters.

The *SENSOSTAR*[®]2C 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.

5.1 Temperature sensor connection

Before connecting the temperature sensors to the calculator please check the following points:

- The temperature sensors (up to DN 100) must be installed against the flow direction.
- The temperature sensor with the **red** identification must always be installed in the forward flow.
- The temperature sensor with the **blue** identification must always be installed in the return flow.
- The temperature sensors are not to be installed within the influence of other sources of heat.
- Do not kink, lengthen or shorten the cables.
- Cables that are too long should not be rolled up tightly into an 'air-core coil'. The cables should either be laid out unordered, or rolled up loosely into a wide coil which can be turned and tied into an '8'.

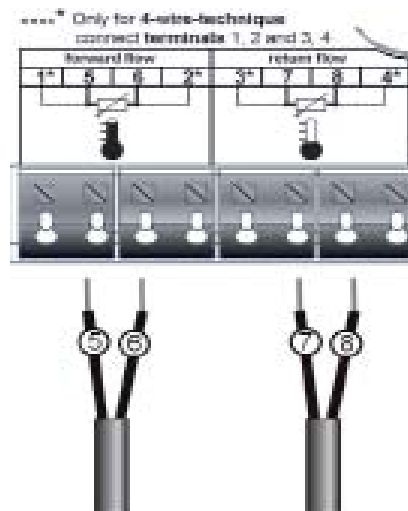
Mounting

- Loosen two cable glands and glide them over the sensor cables. Remove the two blind plugs from the cable gland openings.
- Feed the temperature sensor cables through the appropriate openings of the cable glands into the terminal box.
- Clamp the wires as shown in the illustrations. Make sure the temperature sensor connection is correct:

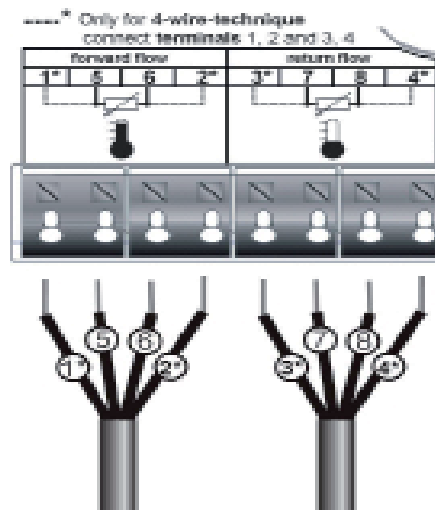
Sensor with red identification → forward flow

Sensor with blue identification → return flow

Connection for 2-wire technique



Connection for 4-wire technique



- Check that the connections are tight.
- Screw the cable glands tight by hand.

5.2 Flow meter connection

The pulse output of the flow meter (VMT) 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.

Important note for TX versions:

The pulse value is set permanently by input pulses and cannot be changed afterwards. Pay special attention that the flow meter does not register a flow before the correct pulse value has been set.

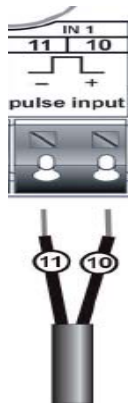
See section: 8.1 'Pulse value (TX version)'.

Mounting:

- Loosen a cable gland and glide it over the 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 on the wires as shown in the illustration.

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

Connection of flow meter



- Check that the connections are tight.
- Screw the cable glands tight by hand.

5.3 Connection of optional interfaces

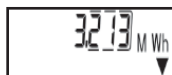
- The following are options that the calculator can be equipped with at the factory (state when ordering) and will vary depending on the individual calculator.
- Feed the cable to be connected (cable diameter 3.5 to 6.5 mm) through an opening on the bottom edge of the calculator housing into the space containing the terminal strips.
- The terminal clamps are designed to fit strands with ends with a cross-section of 0.5 – 1.5 mm².
- Clamp on the cable according to the following illustrations that apply depending on the interface.

Connection of M-bus

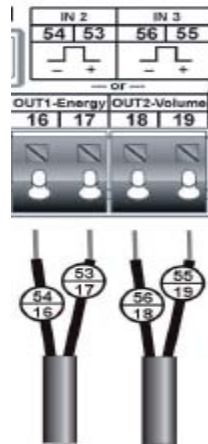


Polarity is not important for these connections so the wires can be clamped arbitrarily.

When the M-bus network is in operation a triangle will appear in the lower right corner of the display. (Power supply from the M-bus network is functioning.)



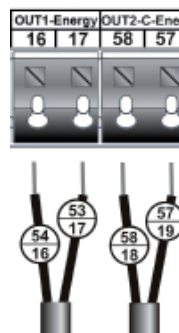
Connection of pulse outputs or inputs



Depending on the option, here there are located two additional pulse inputs (IN) for further meters or two pulse outputs (OUT) for connection to an additional system.

For connection of meters with open collectors attention must be paid to the polarity.

Optional:



For the dual-purpose heat/cooling meter version, separate pulse outputs for heating energy and cooling energy are available.

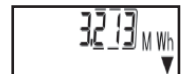
Connection of power pack



It is strongly recommended to use only the Engelmann Sensor power pack.

It is imperative to pay attention to the polarity.

- Check that the connections are tight.
- The power pack should only be connected to 230V and checked by authorized technical personnel.
- Check on the display whether a triangle appears in the lower right corner, as shown in the illustration.
- Screw the cable gland tight by hand.
- Close the cover of the calculator housing and protect against unauthorized opening using the delivered



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

6 Calculator Operation

The **SENSOSTAR® 2C** calculator has a liquid crystal display with 8 digits and special characters. The values that can be shown are divided into three display loops.

All data is retrieved using the Engelmann pushbutton next to the display.

To scan all the information in a loop, simply press the pushbutton briefly. To change to the next loop press the pushbutton longer. Keep the pushbutton pressed until you reach the desired information loop. As soon as the desired loop appears, let go of the pushbutton. After one minute of non-use of the pushbutton, the display automatically returns to the main loop.

1. Level / Main Loop

- 1) Total heat energy / total cooling energy –standard display- (alternating display without pressing the button heat/cooling meters)

- 2) Segment test, all segments triggered simul-taneously.

- 3) Total heat energy / cooling energy at last billing date alternating with that date. ¹⁾ Flow volume, tariff values, or the values of the individual pulse counters can be shown if this has been set.

- 4) Total volume in m³

- 5) Current power in kW

- 6) Current flow in m³/h

- 7) Current date

- 8) Error message (alternating binary and hexadecimal display)

- 9) Selectable customer-set calculator no. (secondary address); factory setting is the serial no.

- 10) Tariff register 1: Values alternating with tariff register and criteria. ^{2) 3)}

- 11) Tariff register 2: Values alternating with tariff register and criteria. ^{2) 3)}

- 12) Momentary reading of the pulse counter 1 alternating with the pulse value. ^{2) 3)}

- 13) Momentary reading of the pulse counter 2 alternating with the pulse value. ^{2) 3)}

2. Level / Technician's Loop

- 1) Current forward flow temperature in C°

- 2) Current return flow temperature in C°

- 3) Temperature difference

- 4) Days since first verification of calculator

- 5) Pulse value of calculator

- 6) M-bus address (primary address)

- 7) Serial number

- 8) Software / firmware version

- 9) return flow or forward flow Temperature sensor type and mounting position

- 10) Set billing date

- 11), 13), 15) Maximum power value alternating with date and time of occurrence.

- 12), 14), 16) Maximum flow value alternating with date and time of occurrence.

3. Level / Statistics Loop

Previous billing date alternating with its values. Alternatively, the total volume, tariff values, or values of individual instruments connected to the optional pulse inputs can be displayed, if so set. ¹⁾

2-16) 15 Monthly values: Dates alternating with their values. Alternatively, the total volume, tariff values, or the values of individual pulse counters can be displayed, if so set. ¹⁾

¹⁾ Up to the end of the month the consumption and billing date for that month will be shown as 0.

²⁾ Can be set using the software "Engelmann® Monitor". A dedicated meter password is necessary. Password available from manufacturer.

³⁾ Note: For invoicing, the total heat energy must be used.

7 Calculator Settings

7.1 Optical (infrared) interface

In order to be able to communicate with a *SENSOSTAR®2C* instrument, an optocoupler must be connected to the USB-interface or to the serial interface of the PC. The optocoupler and the Engelmann®Monitor software are available as options.

The optical (infrared) interface is activated by pressing the Engelmann pushbutton.

If within 60 seconds neither a valid telegram is received nor the pushbutton pressed again, then the interface is deactivated.

7.2 M-bus interface

An M-bus interface is also available as a built-in option for the *SENSOSTAR®2C* (must be stated when ordering).

A calculator with an M-bus interface is supplied with power via the M-bus network (no galvanic separation). The number of read-outs via the M-bus interface per instrument per day is unlimited.

The valid standards for the M-bus protocol are EN13757-2 and 13757-3.

Notes on installation:

- Each end instrument is only protected against high voltage up to the maximal allowed bus voltage ($\pm 50V$). Additional protective measures must be provided by the level converter.
- The installation of an instrument in an M-bus network may only be carried out by authorized, qualified technical personnel.
- Attention must be paid to ensure that the cable lengths and cable cross-sections in the bus network are appropriate for the baud rate of the end instrument (2400 baud).
- Recommended cable type:
Telephone cable J-Y(ST) Y2 x 2 x 0.8 mm²

SENSOSTAR®2C calculators with the M-bus option can be addressed primarily or secondarily.

Both addresses can be set via the optical interface using the Engelmann®Monitor software. They can also be set using the display.

The primary address is the M-bus address displayed in the 2nd level (technician's loop) in menu item 6) 'M-bus address (primary address)'.

The secondary address is the customer identification no. and can be selected under menu item 9) 'Selectable customer-set calculator no.', in the first level (the main loop).

If a customer no. has not been identified, the serial no. is displayed. This is the factory setting.

8 Calculator Settings

8.1 Pulse value (TX version)

For version TX instruments the pulse value can be set at the beginning of operation.

TX version instruments can be recognized by a special display.



If the pulse value has not yet been set, follow these steps:

- Choose the desired pulse value by pressing the Engelmann pushbutton briefly.
- Confirm the selected value by pressing the pushbutton longer than 4 seconds.

Important:

As soon as the first input pulses are registered by the calculator, the calculator fixes the pulse value at the value it has at that moment (factory setting 1 liter/pulse). This value is then permanent and cannot be changed.

Make sure that the pulse value is properly set before the equipment is put into operation.

The display format is automatically determined by the pulse value that has been set:

Pulse [l/Imp.]	Energy [MWh]	Volume [m ³]	Flow [m ³ /h]	Power [kW]
1	0,000	0,000	0,000	0,000
2,5	0,00	0,00	0,00	0,00
10	0,00	0,00	0,00	0,00
25	0,0	0,0	0,0	0,0
100	0,0	0,0	0,0	0,0
250	0	0	0	0
1000	0	0	0	0

8.2 Pulse inputs 1+2

The optional pulse inputs 1+2 for external meters can be set using the configuration software

Engelmann®Monitor. The settings are the input pulse value and the units in which the external meter counts.

For invoicing, the meter readings of the instruments connected to the pulse inputs must be included in the calculation.

8.3 Pulse outputs (potential-free)

The potential-free pulse outputs available as a built-in option (state when ordering) of the meter is an electronic switch for flexible use (class OA according to EN1434), which outputs the counting pulses of the heat meter.

The pulse outputs closes corresponding to the pulse value (see the identification plate on the instrument). As long as the nominal and boundary values of the contact are taken into consideration, the user is free to define his contact data within a wide range. A wide variety of data acquisition instruments can be connected to the contact outputs.

The pulse value is indicated on the instrument.

Technical data of the pulse outputs:

Max. switching current (peak)	300 mA ~/-
Max. switching voltage	35 V ~/-
Max. switching power	300 mW
Insulation resistance	> 10 ⁰⁹ Ohm
Contact resistance	max. 25 Ohm
Contact capacity	1.5 pF
Maximum current	120 mA
Dielectric strength (open contact)	350 V ~/-
Pulse length	125 ms
Min. pulse interval	125 ms

Pulse output for energy (OUT1-Energy)

A pulse is sent via the pulse output for energy when the last digit of the energy display is increased. The pulse value is automatically determined by the last place of the energy display.

The pulse units are identical to the units of the energy display:

Example 1: Display 12345678 kWh => pulse value for energy pulse output = 1 kWh / pulse

Example 2: Display 12345,678 MWh => pulse value for energy pulse output = 0.001 MWh / pulse

Example 3: Display 1234567,8 GJ => pulse value for energy pulse output = 0.1 GJ / pulse

Pulse output for volume (OUT2-Volume)

A pulse is sent via the pulse output for volume, when the **second-to-last** digit of the volume display is increased.

The pulse value is automatically determined by the **second-to-last** place of the volume display. The pulse units are identical to the units of the volume display.

Example 1: Display 12345,678 m³ => pulse value for volume pulse output = 0.01 m³ / pulse

Example 2: Display 12345678 l => pulse value for volume pulse output = 10 l / pulse

The following parameters can be individually set for recording, singly or jointly, using the software "Engelmann Datalogger":

- time (is always stored)
- heat energy
- cooling energy
- volume
- power
- flow
- forward flow temperature
- return flow temperature
- temperature difference

The meters values can be measured at the following freely selectable time intervals:

- 1 minute
- 10 minutes
- 15 minutes
- 30 minutes
- 60 minutes
- 3 hours
- 6 hours
- 12 hours
- 24 hours

Depending on the configuration, the datalogger can store between 2117 and 10,589 sets of data.

Note:

All previous stored values are lost (deleted) upon reparameterization!

8.4 Settings of the Datalogger

The datalogger is an optional additional function for meters and calculators which must be specified in the original order (instruments cannot be retrofitted).

The Engelmann datalogger makes it possible to record consumption data and the individual meter values in the internal storage module in freely selectable time intervals. The recorded data can be stored in various data formats, for example for analysis of peak values in order to optimize cost-effective supply of heat.

The datalogger can be read out either via the optical interface or via M-bus, so that the data can be used for individual analysis. The Engelmann datalogger is a ring buffer. The current values are always stored; this means that when the memory is full, the oldest values are written over by each new piece of data.

The storage capacity is up to 10,589 values.

The software "Engelmann Datalogger" reads out only one meter at a time, which is addressed using the set primary address. If only one meter is at hand, the address 254 can be used.

8.5 Tariff registers

There are 2 tariff registers, which add up the energy or time, depending on certain criteria. The registers can be individually set using the Engelmann®Monitor software and can be read via the display or using the read-out software.

	Display examples			Description of example in tariff register 1 (either the energy or the time can be measured)	
0	'E1 0			Not defined (at delivery).	
1	' 0683 MWh	'E1 1	' 1800	' 0600	The energy (0.683 MWh) in the time period from 18.00 (6 pm) to 6.00 am (the time can be set in 10-min. steps) is being measured.
2	' 0683 MWh	'E1 2	' 2000 kW		The energy (0.683 MWh) above a power of ≥ 2.000 kW
3	' 0683 MWh	'E1 3	' 2000 kW		The energy (0.683 MWh) up to a power ≤ 2.000 kW
4	' 0683 MWh	'E1 4	' 0600 m ³ /h		The energy (0.683 MWh) above a flow of ≥ 0.600 m ³ /h
5	' 0683 MWh	'E1 5	' 0600 m ³ /h		The energy (0.683 MWh) up to a flow ≤ 0.600 m ³ /h
6	' 11 h	'E1 6	' 6500 °C		The time (11 h) above a temperature in the forward flow of ≥ 65.00 °C (in steps of 0.01 °C)
7	' 11 h	'E1 7	' 6500 °C		The time (11 h) up to a temperature in the forward flow ≤ 65.00 °C (in steps of 0.01 °C)
8	' 11 h	'E1 8	' 3600 °C		The time (11 h) above a temperature in the return flow ≥ 36.00 °C (in steps of 0.01 °C)
9	' 11 h	'E1 9	' 3600 °C		The time (11 h) up to a temperature in the return flow ≤ 36.00 °C (in steps of 0.01 °C)
10	' 0683 MWh	'E1 10	' 1000 °C		The energy (0.683 MWh) above a temperature difference of ≥ 10.00 °C (in steps of 0.01 K)
11	' 11 h	'E1 11	' 1000 °C		The time (11 h) up to a temperature difference of ≤ 10,00 °C (in steps of 0,01 K)

8.6 Radio Transmission

As a customer option, *SENSOSTAR®2C* meters can be equipped at the factory with a radio interface based on the European standard EN 13757-4 for wireless M-bus.

This option must be stated when ordering.

Operating frequency: 868 MHz

Transmission power: up to 25 mW (ca. 14 dbm)

Protocol: wireless M-bus based on EN 13757-4, optional mode of operation T1, S1, T2, S2

Short telegram for stationary read-out

Long telegram for walk-by read-out

The time setting in the meter at the factory is standard time (GMT + 1). Please note the following points:

Reference switch on time: 7 a.m.

Reference switch off time: 7 p.m.

Setting during standard time:

Switch on time: 7 a.m.

Switch out time: 7 p.m.

Setting during daylight-saving time / summer time:

Switch on time: 8 a.m.

Switch out time: 8 p.m.

8.6.1 Radio configuration

Radio is always deactivated upon delivery (factory setting) (see 8.6.2 Activation of the radio interface)

Parameter	Possible setting	Standard setting
Mode	S1 / T1: unidirectional	T1 (unidirectional)
	S2 / T2: bidirectional	
Transmission period	0:00 - 24:00	7 a.m - 7 p.m.
Transmission interval	120 minutes - 240 minutes; special setting: once per month	120 minutes
Weekdays	Monday - Sunday	Monday - Friday
Calendar weeks	1 - 4	1 - 4
Months	1 - 12	1 - 12
Switch-on date	01. Jan. - 31. Dec.	not set
AES-Encoding	activated / not activated; same key per customer or order / random key per meter	activated; random key per meter
Telegram type	short telegram / long telegram (monthly values)	long telegram (monthly values)

8.6.2 Activation of the radio interface

When leaving the factory the radio interface is **deactivated**. It can be activated as follows:

- a) Without using additional software the radio function can be activated by pressing the Engelmann pushbutton longer than 3 seconds in the menu item "M-bus address" in level 2 (Technician's loop). See section 6: "Display Information". The factory settings will be loaded:



- b) Using separate software Engelmann®Monitor. The software are available as options.

The exact procedure for activating the radio function via the separate software is described in the operating instructions.

8.6.3 Checking whether radio is activated

After the radio function has been successfully activated a triangle will appear permanently in the lower left corner of the display.



Note:

Radio-activated heat meters should not be installed between or behind heating system pipes. This can negatively affect the range of the radio signal.

In addition, the range of the *SENSOSTAR®2C* with radio function (as well as any heat meter with radio) can possibly be affected by other instruments nearby with radio interfaces, such as WLAN routers, baby phones, remote controls, etc.

A third important aspect which can influence the radio range is the type of construction of the building in which the meter is installed.

9 Technical Data

Calculator		
Ambient temperature	°C	5 ... 55
Temperature range	°C	1 ... 150 °C (optional 1 ... 180 °C)
Temperature difference heat	K	3 K... 100 K
		(3 ... 130 for temperature measurement range 1 °C - 180 °C)
Temperature difference cooling	K	-3 K... -50 K
Calculation of heat from	K	$\Delta\Theta > 0.05$
Calculation of cooling from	K	$\Delta\Theta < -0.05$
Dual-purpose heat/cooling meter	K	$\Delta\Theta_{HC} < -0.5$
Resolution temperature	°C	0,01
Measurement cycle		30 seconds (with external power supply 4 sec.)
Power supply	standard	3V lithium (6+1 years)
	optional	3.6V lithium (6+1 years)
		3V power pack supply via M-bus
Pulse values	standard	see type identification
	TX versions	possible values: 1 / 2.5 / 10 / 25 / 100 / 250 / 1000 recognizable on display
Pulse length (volume input)		min. pulse length 25 ms
		min. pulse interval 25 ms
Display		LCD 8 digits + special characters
Units	standard	MWh
	optional	kWh, GJ
	For TX versions: MWh; decimal places dependent on the pulse value (see table 8.1)	
Interfaces	standard	infrared
	optional	M-bus with supply
		M-bus
		2 potential-free contact outputs for volume and energy or 2 additional pulse inputs (max. length of cable 10 m)
		2 potential-free contact outputs for heat- and cooling energy (dual-purpose meters) or 2 additional pulse inputs
	radio 868 MHz	
Data storage		E ² PROM / daily
Maximal value storage		3 each for flow and power
Billing dates		annual billing date selectable (from dd.mm. to dd.mm.)
Monthly values		24 monthly values readable
Protection class housing		IP65
EMC		class E1
Mechanical environment		class M1
Pulse input device		microcontroller CMOS input class IB as per EN1434-2:2007
Dimensions		length x width x height 198 mm x 123.7 mm x 45.8 mm
Weight		approx. 250 g

Requirements for the flow meter

Pulse output device	electromechanical switch (reed contact) class OA as per EN1434-2:2007	
	passive electronic current sink (open collector) class OC as per EN1434-2:2007	
Installation point	standard	in return flow
	optional	in forward flow; calculator must be so set in factory
Pulse length		min. pulse length 25 ms min. pulse interval 25 ms

Requirements for the temperature sensor pair

Platinum precision resistor	Pt500; separately approved type as per EN 60751
Length of connecting cables (unshielded)	3 m in 2-wire technique 10 m in 4-wire technique
Installation	direct
	in temperature pocket as per EN1434

In the case of non-permanently attached temperature sensors the temperature sensors that are later connected must meet the following requirements:

Application	Requirements for the temperature sensors
Heat meter	EU (MID) identification on the temperature sensors
Cooling meter	National approval as a temperature sensor for cooling meters *)
Dual-purpose heat and cooling meter	EU (MID) identification and separate national approval as a temperature sensor for cooling meters *)

*) Requirements in countries other than Germany may be different.

All classes refer to the currently valid legal requirements for heat meters (see Declaration of Conformity).

10 Application of Configuration Engelmann® Monitor

Available separately (including instructions).

11 Error Codes



When the instrument detects an error, the error symbol and number are displayed.

The error can also be displayed in binary form by selecting the menu item 8) 'error display' in the first level / main loop.

There are seven possible causes of error, and they can appear in combination with each other, depending on the situation.

At delivery, the display shows 'ERR 03' until temperature sensors have been attached. This message disappears as soon as temperature sensors have been connected and the first measurement is carried out (every 30 seconds for standard instruments).

Using the binary display, it is easy to identify an error:

- 1 at 1st position: check sum fault
- 1 at 2nd position: E2PROM fault
- 1 at 3rd position: instrument has been reset
- 1 at 4th position: sensors switched
- 1 at 5th position: reference temp. sensor fault
- 1 at 6th position: return flow temp. sensor fault/not connected
- 1 at last position: forward flow temp. sensor fault/not connected

Example: sensors switched

Error	Check sum fault	E2PROM fault	Reset	Sensors switched	Reference sensor fault	Return flow senso fault	Forward flow sen. fault	Error display hexadecimal (LCD)
Error code								
Binary display LCD	E	000	1	000	0	0	0	08

When an error occurs, with the exception of the 'reset' and 'sensors switched' error, the instrument must be exchanged and sent to the manufacturer for examination.

Recognition of switched temperature sensors is only activated for meters which are purely heat meters or cooling meters. Recognition of switched sensors is not possible for dual-purpose heat / cooling meters.

12 Temperature Sensor Installation

See manufacturer installation instructions of the temperature sensor pair.

13 Flow Meter Installation

See manufacturer installation instructions of the flow meter.

14 Disposal

This instrument contains a lithium battery. This battery may not be opened by force, come into contact with water, short-circuited, or subjected to temperatures over 80°C. Dead batteries, and electronic instruments or components which are no longer needed are hazardous waste and must be disposed of at designated collection points. Return shipment of the lithium batteries must be carried out appropriately.

15 MID Declaration of Conformity

For the product described in this document we confirm, as the manufacturer, that it meets the fundamental requirements according to the

- Council Directive 2004/22/EC of 31 March 2004 on the approximation of the laws of the member states relating to measurement instruments, in particular those in annex MI-004, as well as
- the requirements relating to emissions in the European Council Directive on EMC 2004/108/EC, and the requirements according to the Council Low Voltage Directive 2006/95/EC, as well as
- R&TTE Directive (1999/5/EC).

The complete signed declaration can be found at www.engelmann.de.

16 Contact

Engelmann Sensor GmbH
 Rudolf-Diesel-Str. 24-28,
 69168 Wiesloch-Baiertal
 Germany
 Phone: +49 (0)6222-9800-217
 Fax: +49 (0)6222-9800-50
www.engelmann.de
 E-Mail: info@engelmann.de

Subject to technical change!