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**Standards and documents applied:**

EN 1434-1:2015+A1:2018;  
EN 1434-2:2015+A1:2018;  
EN 1434-4:2015+A1:2018;  
EN 1434-5:2015+A1:2019;  
WELMEC 7.2:2015.

The measuring instrument must correspond with the following specifications:

**1 Design of the instrument**

**1.1 Construction**

The heat meter IFX-M4-E3 can be produced in two design options:

- complete heat meter, consisting of a flow sensor and calculator with inseparably connected temperature sensors Pt 500;
- combined heat meter, consisting of a flow sensor and calculator with connected type approved temperature sensor Pt 500 pair.

In both cases, the flow sensor is inseparably connected to the calculator by 1,2 m length cable (optional - 2,5 m ; 5,0 m or 10 m). Flow sensor  $q_p = (0,6 - 6,0) \text{ m}^3/\text{h}$  has intended space for temperature probe installation.

The heat meter calculator can be mounted directly on the flow sensor housing or separately on the wall or on a standard DIN rail.

The meter can be powered by:

- 3,6 V DC lithium battery;
- remote 12 V to 42 V DC or 12 V to 36 V AC power source;
- 230 V AC mains.



Fig.1.Heat meter IFX-M4-E3

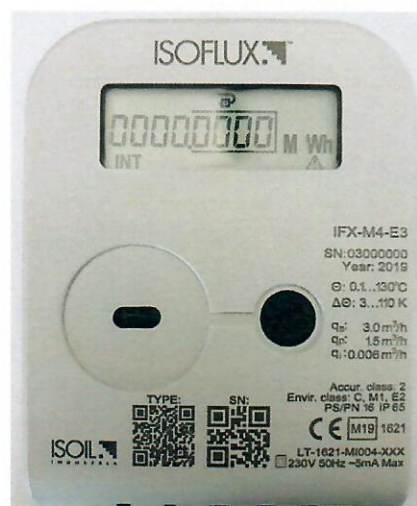


Fig.2. Calculator of the heat meter IFX-M4-E3

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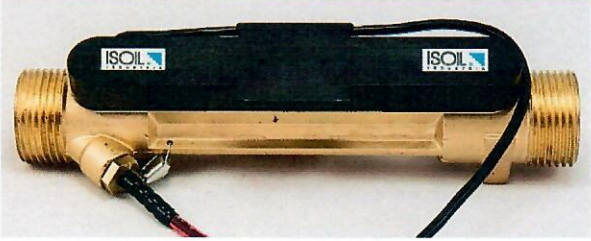
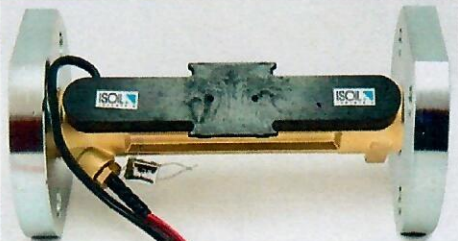



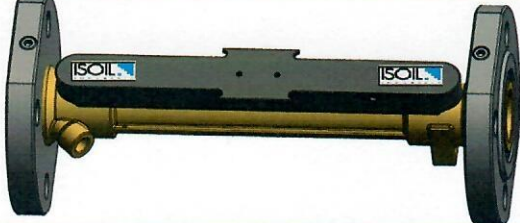

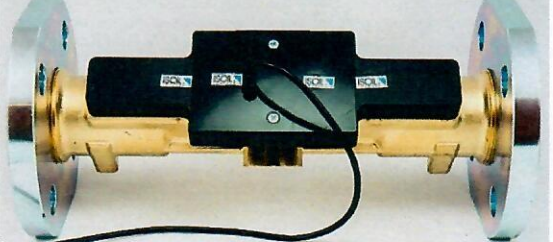
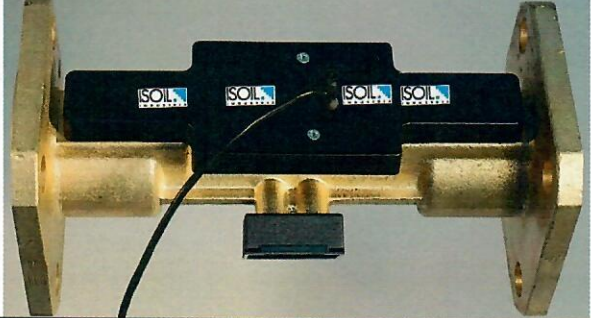

	
<p>a) Flow sensor of the heat meter <math>q_p = 0,6/1,0/1,5/2,5 \text{ m}^3/\text{h}</math> with threaded end connections G <math>\frac{3}{4}</math> or G 1</p>	<p>b) Flow sensor of the heat meter <math>q_p = 0,6/1,0/1,5/2,5 \text{ m}^3/\text{h}</math> with flanged end connections DN20</p>
	
<p>c) Flow sensor of the heat meter <math>q_p = 3,5/6 \text{ m}^3/\text{h}</math> with threaded end connections G <math>1\frac{1}{4}</math> or G <math>1\frac{1}{2}</math> (triangular cross-section of the meter tube)</p>	<p>d) Flow sensor of the heat meter <math>q_p = 3,5/6 \text{ m}^3/\text{h}</math> with flanged end connections DN25 or DN32 (triangular cross-section of the meter tube)</p>
	
<p>e) Flow sensor of the heat meter <math>q_p = 3,5/ \text{ m}^3/\text{h}</math> with threaded end connections G <math>1\frac{1}{4}</math> (circular cross section of the meter tube)</p>	<p>f) Flow sensor of the heat meter <math>q_p = 3,5 \text{ m}^3/\text{h}</math> with flanged end connections DN25 or DN32 (circular cross section of the meter tube)</p>
	
<p>g) Flow sensor of the heat meter <math>q_p = 10 \text{ m}^3/\text{h}</math> with threaded end connections G 2</p>	<p>h) Flow sensor of the heat meter <math>q_p = 10 \text{ m}^3/\text{h}</math> with flanged end connections DN40</p>
	
<p>i) Flow sensor of the heat meter <math>q_p = 15 \text{ m}^3/\text{h}</math> with flanged end connections DN50</p>	<p>j) Flow sensor of the heat meter <math>q_p = 25/40/60 \text{ m}^3/\text{h}</math> with flanged end connections (DN65/DN80/DN100)</p>

Fig.3. Flow sensor of the heat meter IFX-M4-E3



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## 1.2 Sensor

Heat meter hardware consist of an ultrasonic flow sensor and calculator with inseparably connected resistance temperature sensors Pt 500 or with connected type approved temperature sensor Pt 500 pair.

For the meters  $q_p = (0,6 - 6,0)$ , direct mounted DS design type temperature probes according to LST EN 1434-2 are used. In case of large size meters, pocket mounted PL design type temperature probes according to LST EN 1434-2 are used. The pocket installation length can be 85; 120 or 210 mm.

The design and main dimensions of the temperature probes are shown in Fig. 4.

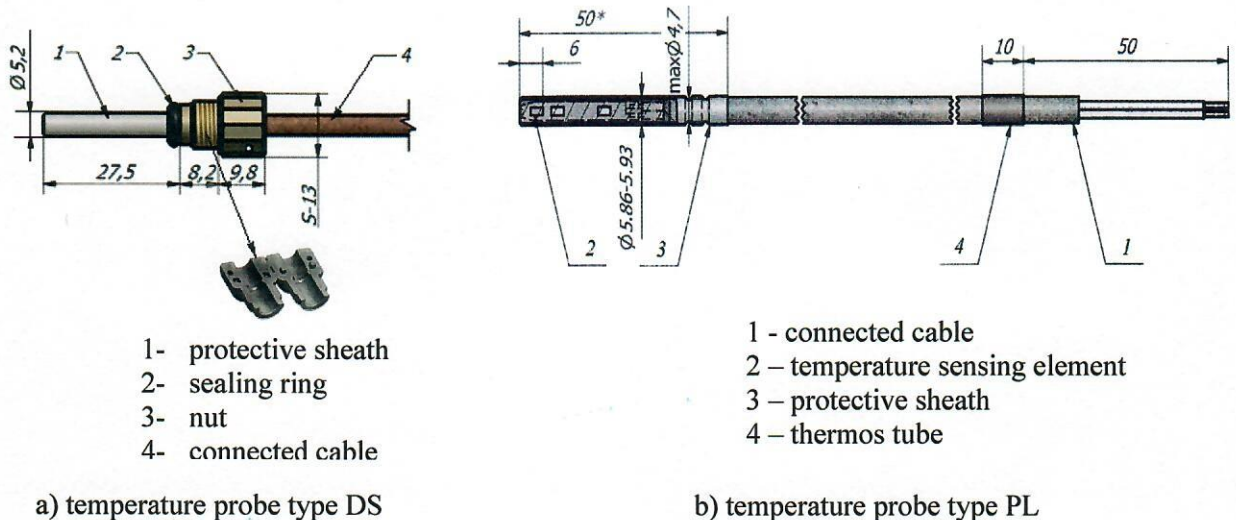


Fig.4. Design and main dimensions of the temperature probes

## 1.3 Measurement value processing

The energy, consumed for heating, is calculated by integrating the temperature difference and the volume of the heat-conveying liquid over time. The temperature difference is calculated from the resistance of the temperature sensors pair connected to the calculator and converts it to temperature according to formulas of EN 60751.

## 1.4 Indication of the measurement results

The accumulated quantity of thermal energy is presented on the LCD display optionally in MWh, kWh, Gcal or GJ.

## 1.5 Optional equipment and functions subject to MID requirements

None.

## 1.6 Technical documentation

Ultrasonic heating and cooling energy meter IFX-M4-E3. Technical description, user manual IFX-M4-E3\_M\_E\_2019\_020\_REV.1, 06-2020.

Test instruction of the heat meter IFX-M4-E3, 06-2020.

Other reference documents on which basis this certificate is issued, are stored in a file Nr. LEI-12-MP-104.20.





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**1.7 Integrated equipment and functions not subject to MID**

The optical interface according to requirements of EN 62056-21 is integrated in the meter, intended for data reading, meter parameters setting and optical pulse output in test mode.

Two pulse outputs for energy and volume pulses (optional). Class of pulse output device according to EN 1434-2: OB in operating mode, OD in test mode.

Two programmable pulse inputs for volume pulses (optional). Class of pulse input device – IB according to EN 1434-2.

When the complete meter has a pulse input/output function, it is supplied with inseparably connected 1,5 m input/output cable.

Normally, the meter can be without a communication interface or equipped with one or both of the following communication interfaces:

- M-Bus;
- 868 MHz RF (wM-Bus S1, T1 or LoRa).

The meters can be produced with one of the following additional communication interfaces (optional):

- M-Bus;
- CL (current loop);
- RS485 (MODBUS or BacNet);
- MiniBus.

The meter can be used also for cooling energy measurement under rated operating conditions, listed in section 2.1.

**2 Technical data**

**2.1 Rated operating conditions**

**2.1.1 Measurand**

Heating energy, calculated from the measured volume of water and the measured difference of water temperature in flow and return pipes.

**2.1.2 Measurement range**

Limits of the temperature  $\Theta$  : 0,1 °C to 90 °C or  
0,1 °C to 130 °C (optional).

Limits of temperature differences  $\Delta\Theta$  : 2K\* to 70 K, or 3 K to 70 K;  
2 K\* to 110 K or 3 K to 110 K  
(optional).

Note: \* - for meters with the lower limit of the temperature difference 2 K, the requirements of the Directive 2014/32/EU are not applied.

Technical data of heat meter flow sensor are presented in Table 1:



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Table 1

End connections	Flow-rate, m <sup>3</sup> /h			Pressure loss at $q_p$ , kPa	Overall length, mm
	Permanent $q_p$	Maximum $q_s$	Minimum $q_i$		
G 3/4	0,6	1,2	0,006	7	110
G 1 or DN20	0,6	1,2	0,006	0,9	190
G 3/4	1,0	2,0	0,010	11,3	110
G 1 or DN20	1,0	2,0	0,010	2,5	190
G 3/4	1,5	3,0	0,006	17,1	110
G 3/4	1,5	3,0	0,006	17,1	165
G 1 or DN20	1,5	3,0	0,006	5,8	190
G 3/4	1,5	3,0	0,015	17,1	110
G 3/4	1,5	3,0	0,015	17,1	165
G 1 or DN20	1,5	3,0	0,015	5,8	190
G 1	1,5	3,0	0,015	7,2	130
G 1	2,5	5,0	0,010	19,8	130
G 1 or DN20	2,5	5,0	0,010	9,4	190
G1	2,5	5,0	0,025	19,8	130
G 1 or DN20	2,5	5,0	0,025	9,4	190
G 1 1/4, or G 1 1/2, or DN25, or DN32	3,5	7,0	0,035	4*	260
G 1 1/4, or DN25, or DN32	3,5	7,0	0,014	9**	260
G 1 1/4, or DN25, or DN32	3,5	7,0	0,035	9**	260
G 1 1/4, or G 1 1/2, or DN25, or DN32	6,0	12,0	0,024	10	260
G 1 1/4, or G 1 1/2, or DN25, or DN32	6,0	12,0	0,060	10	260
G 2 or DN40	10,0	20,0	0,040	18	300
G 2 or DN40	10,0	20,0	0,100	18	300
DN50	15,0	30,0	0,060	12	270
DN50	15,0	30,0	0,150	12	270
DN65	25,0	50,0	0,100	20	300
DN65	25,0	50,0	0,250	20	300
DN80	40,0	80,0	0,160	18	300
DN80	40,0	80,0	0,400	18	300
DN100	60,0	120,0	0,240	18	360
DN100	60,0	120,0	0,600	18	360

Notes:

1. \* - flow sensor with triangular cross-section of the meter tube.
2. \*\* - flow sensor with circular cross section of the meter tube.

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Temperature limits of heat-conveying liquid  $\theta_q$ :

- when the calculator is mounted on the flow sensor : 0,1 °C to 90 °C;
- when the calculator is mounted separately, and specially ordered : 0,1 °C to 130 °C.

**2.1.3 Accuracy class**

Accuracy class : 2 according to EN 1434-1.

**2.1.4 Environmental conditions / Influence quantities**

Ambient temperature : 5 °C to 55 °C;  
Humidity level : condensing;  
Installations : indoor;  
Mechanical environment : class M1;  
Electromagnetic environment : class E2.

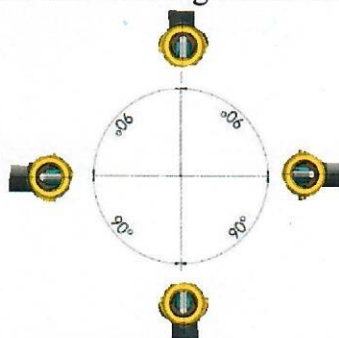
**2.1.5 Maximum admissible working pressure**

The maximum admissible working pressure/nominal pressure (PS/PN) of heat meter is 16 bar or 25 bar.

**2.1.6 Mounting position of the flow sensor of the heat meter**

Flow sensor of the heat meter can be mounted either horizontally, vertically or inclined.

In case of installation horizontally or inclined, flow sensors with end connections G 3/4, G 1 or DN20 can be rotated about the mounting axis at any angle (Fig. 5a)). Larger size flow sensors must be rotated about the mounting axis as shown in Fig. 5 b).



a) for flow sensors with end connections G 3/4, G 1 or DN20



b) for flow sensors other sizes

Fig.5. Mounting positions of the flow sensor to the longitudinal axis

**3 Interfaces and compatibility conditions**

The combined heat meter has two temperature measurement channels for connecting Pt 500 temperature sensors. Connection of the temperature sensors is according to the two-wire scheme.

Communication interfaces of the meter are presented in section 1.7 of this appendix.

**4 Requirements on production, putting into use and utilization**

**4.1 Requirements on production**

At the end of the manufacturing and adjustment process the heat meters shall be tested according to the requirements of the EN 1434-5. Errors of heat meters shall not exceed the maximum permissible errors, described in Annex VI (MI-004) of Directive 2014/32/EU.

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The flow sensors can be tested with cold water ( $25 \pm 5$ ) °C.

NOTE: the energy measuring error determination test shall be carried out when the flow sensor is installed in inlet and when the flow sensor is installed in outlet (in both cases).

#### **4.2 Requirements on putting into use**

The heat meter must be installed in accordance with the requirements of technical description listed in section 1.6.

Before the putting into use, the meter can be supplied in transport mode (this is indicated by the „<->“ symbol on LCD display). In this mode, the configuring of the meter parameters (referred to the user manual, section “Check of the configuration of the meter”) by means of a button or via the optical interface using the E3-CONFIGURATOR software is possible without affecting the seals on the meter (see section 6.1.1 of this appendix). Transport mode switches off itself after 0,001 m<sup>3</sup> of water volume passed through the meter, or it can be switched off by means via the optical interface using the E3-CONFIGURATOR software.

For flow sensors of the heat meter with nominal diameter DN65 to DN100 necessary straight pipelines lengths are: upstream  $\geq 5 \times \text{DN}$ , downstream  $\geq 3 \times \text{DN}$ . For flow sensors of other sizes the straight pipelines installation in upstream and downstream the sensor are not necessary.

#### **4.3 Requirements for consistent utilization**

No special requirements identified.

### **5 Control of the measuring process after tasks of the instrument in use**

#### **5.1 Documentation of the procedure**

Test instruction of the heat meter IFX-M4-E3, 06-2020.

#### **5.2 Special equipment or software**

- optical reading head according to standard EN 62056-21;
- service software **E3-CONFIGURATOR**.

#### **5.3 Identification of hardware and software**

Identification of hardware:

- see Fig. 1, Fig. 2, Fig. 3 and Fig. 4 of this appendix.

Identification of software: version number of the software is **0.01**. This number can be displayed on the device's display according to the request.

#### **5.4 Calibration-adjustment procedure**

The tests are carried out according to the test instruction of the heat meter IFX-M4-E3 given on pages 12 to 14 of this appendix, in accordance with the requirements of the EN 1434-5.

### **6 Security measures**

#### **6.1 Sealing**

##### **6.1.1 Sealing of the heat meter calculator**

The newly manufactured complete meter calculator shall not be subject to additional sealing. Access to the calculator cover release latch (Fig. 6, pos. 1), the parameter change and test mode activation contacts (Fig. 6, pos. 2) and adjustment data activation contacts (Fig. 6, pos. 3) is protected by easy break-out screens.





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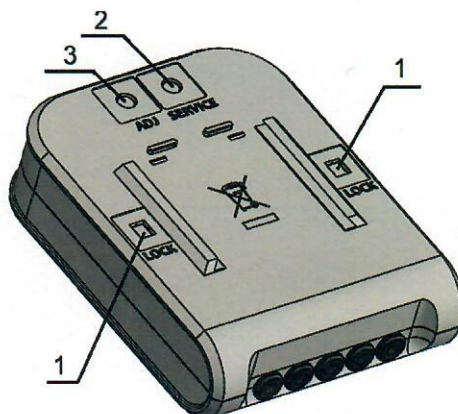


Fig.6. Sealing of the calculator of the heat meter

When the abovementioned casing screens are break-out (after opening the calculator casing, changing the meter\* parameters, adjusting the meter or activation the test mode), open slots are sealed with metrological seal-stickers (pos. 1 and pos. 3) and with the protective seal-sticker of heat supplier (Fig 6, pos. 2).

For the combined device, additional metrological seals shall be used to seal access to the protective cap mounting screw (Fig. 7, pos. 1) and the activation contacts for the adjustment data if the protective screen (Fig. 7, pos. 2) has been broken.

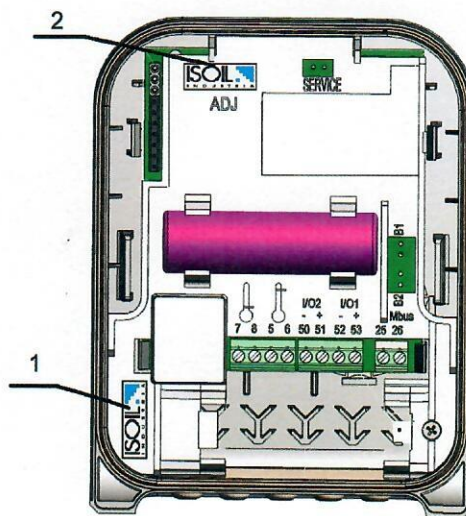


Fig.7. Additional sealing of the combined device calculator

### 6.1.2 Sealing of the flow sensor

The following flow sensor sealing is provided:

- the manufacturer's adhesive seal - sticker on the bolts of the cover (Fig. 8).

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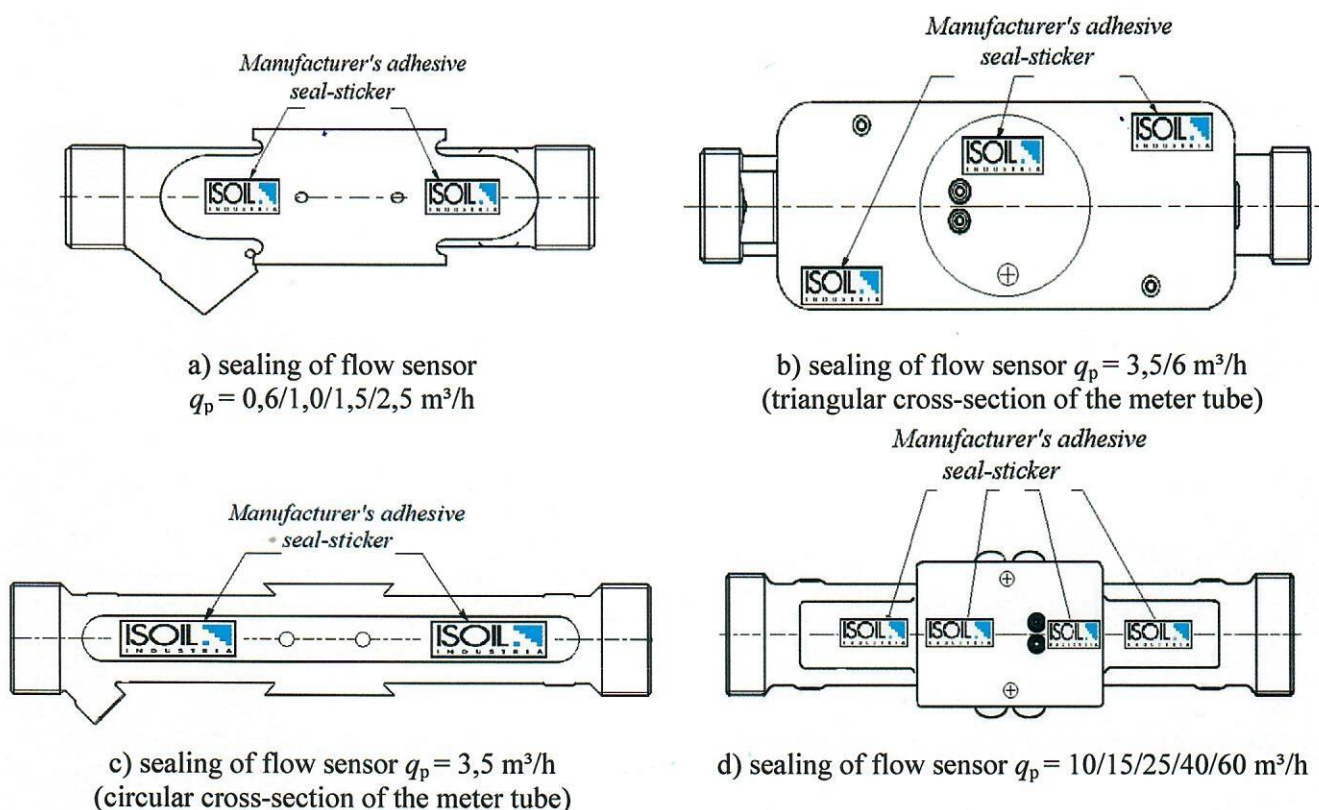


Fig.8. Sealing of flow sensor of the heat meter



Fig. 9. Manufacturer's adhesive seal-sticker

### 6.1.3 Sealing of the temperature sensor pair

The temperature sensors must be sealed with hanged seal of heat supplier to ensure that after the temperature sensors have been installed, it is not possibility of dismantle, remove or altering the sensors without evident damage on the sensors or the seal (Fig. 10 and Fig. 11).

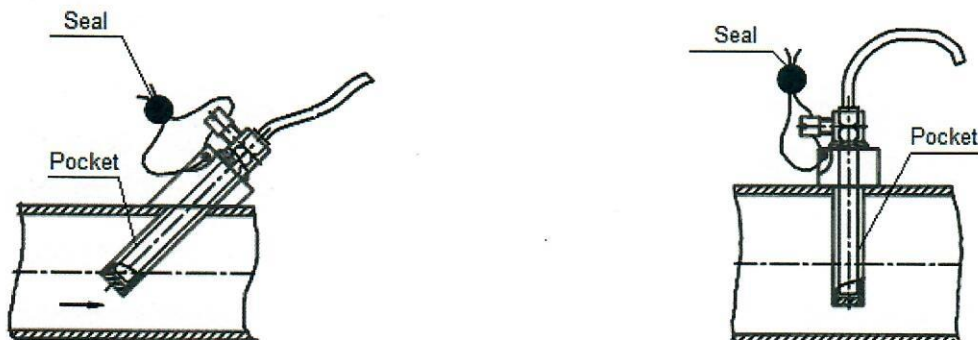


Fig. 10. Sealing of the PL type temperature probes

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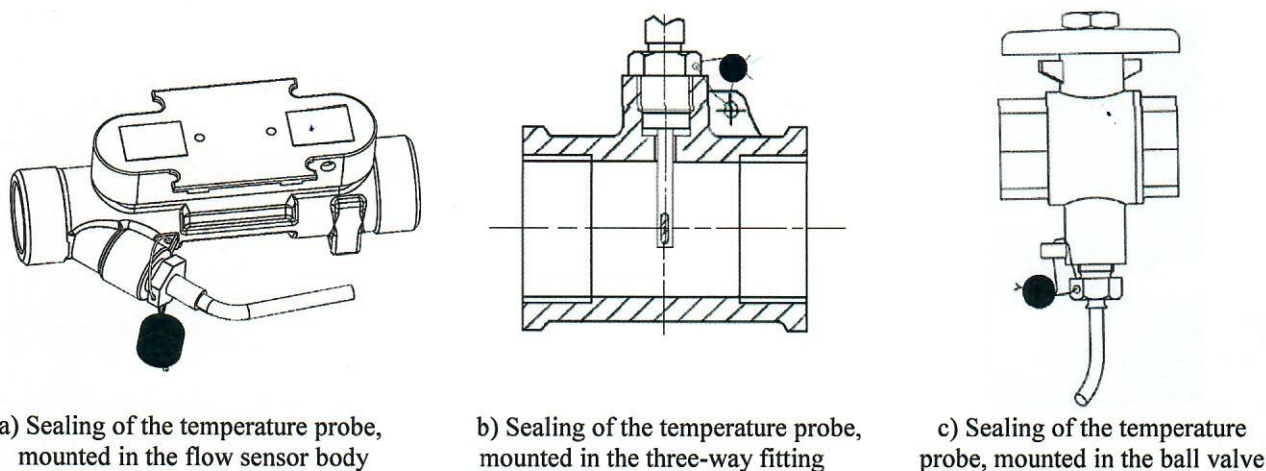




Fig. 11. Sealing of the DS type temperature probes

## 7 Marking and inscriptions

### 7.1 Information to be borne by and to accompany the measuring instrument

At least the following information shall appear on the heat meter calculator label:

- EU-type examination certificate number;
- manufacturer's name and trade mark;
- type designation;
- year of manufacture and serial number;
- limits of the temperature;
- limits of temperature differences;
- limits of flow-rate: maximum  $q_s$ , permanent  $q_p$  and minimum  $q_i$ ;
- the maximum admissible working pressure/nominal pressure (PS/PN);
- accuracy class;
- climatic class;
- electromagnetic class;
- mechanical class;
- IP code;
- voltage level for external power supply.

Information about the location of the meter's flow sensor is shown on the device's LCD indicator: when the flow sensor is installed in inlet – the  sign, when the flow sensor is installed in outlet – the  sign.

Arrow to indicate the direction of the flow shall appear on flow sensor body.

For the complete heat meter, the supply line temperature probe cable is marked with a red plastic tube and the outlet temperature sensor cable must be marked with a blue color plastic tube.

Pockets, in which the PL type temperature probes are fitted, must be marked with the mark "EN 1434".



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**7.2 Conformity marking**

In addition, the label of heat meter calculator should contain the following marking:

- „CE” marking;
- supplementary metrology marking, consisting of the capital letter „M” and the last two digits of the year of its affixing, surrounded by a rectangle;
- identification number of the notified body, which carried out the conformity assessment.

**8 List of the drawings attached to the certificate.**

Drawings are not added.

**9 Certificate history**

Issue	Date and reference №	Description																					
LT-1621-MI004-039	20-06-2019, No. LEI-12-MP-087.19	Type examination certificate first issued																					
LT-1621-MI004-039 Revision 1	13-07-2020, Nr. LEI-12-MP-104.20	<div>1. The heat meter has been supplemented with the following modifications of the flow sensor with a circular cross-section meter tube:</div> <table><tr><th rowspan="2">End connections</th><th colspan="3">Fow-rate, m³/h</th><th rowspan="2">Pressure loss at <math>q_p</math>, kPa</th><th rowspan="2">Overall length, mm</th></tr><tr><th>Permanent <math>q_p</math></th><th>Maximum <math>q_s</math></th><th>Minimum <math>q_i</math></th></tr><tr><td>G1 ¼ or DN25 or DN32</td><td>3,5</td><td>7,0</td><td>0,014</td><td>9</td><td>260</td></tr><tr><td>G1 ¼ or DN25 or DN32</td><td>3,5</td><td>7,0</td><td>0,035</td><td>9</td><td>260</td></tr></table> <div>2. The meter has been supplemented by a design option – flow sensor and calculator with connected type approved temperature sensor Pt 500 pair.</div> <div>3. The maximum cable length between the flow sensor and the calculator has been increased to 10 m.</div> <div>4. Additional sealing of the combined device calculator.</div> <div>5. Additional meter communication interfaces:<ul style="list-style-type: none"><li>- 868 MHz RF (LoRa );</li><li>- RS485 (BacNet).</li></ul></div> <div>6. New meter test instruction, issued 06-2020.</div> <div>7. The document IFX-M4-E3_M_E_2019_020_REV.0, issued 02-2020, has been replaced by the document IFX-M4-E3 M E 2019 020 REV.1, issued 06-2020.</div>	End connections	Fow-rate, m³/h			Pressure loss at $q_p$ , kPa	Overall length, mm	Permanent $q_p$	Maximum $q_s$	Minimum $q_i$	G1 ¼ or DN25 or DN32	3,5	7,0	0,014	9	260	G1 ¼ or DN25 or DN32	3,5	7,0	0,035	9	260
End connections	Fow-rate, m³/h			Pressure loss at $q_p$ , kPa	Overall length, mm																		
	Permanent $q_p$	Maximum $q_s$	Minimum $q_i$																				
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**Test instruction of the heat meter IFX-M4-E3**

**1. Activation of the test mode**

The test mode can be activated in one of the following ways:

**1.1. Activation of the test mode with the button**

The test mode is activated by the meter's control button according to the following procedure:

- long press the button, on the meter's LCD select page „INF“;
- short press the button, select „tEST on Wh“ (when it is necessary to activate the energy pulse output via the optical interface) or „tEST On m<sup>3</sup>“ (when it is necessary to activate the volume pulse output via the optical interface);
- long press the button, open the 4- digits security password input window:

PS: 0 \_ \_ \_  
INF

- short press the button, select digit in the first position, after that long press the button and go to the next position;
- after selecting the digit in the fourth position, long press the button, the message „PASS“ appears briefly (when the password entered correctly) and the meter switches to test mode – the sign „TEST“ appears;
- if the password was entered incorrectly, the message „FAIL“ appears briefly and the meter returns to the operating mode, and the procedure for turning on the test mode must be repeated initially;
- the password value is fixed: **0001**.

NOTE: when the test mode is activated by the button, the volume and energy accumulated in the test mode are added to the meter's energy and volume readings in operating mode (after turning off the test mode).

**1.2. Activation of the test mode by short-circuiting the contacts**

Remove the screen „SERVICE“ on the back of the calculator or, if the screen has already broken down, a protective seal-sticker is removed (Fig. 6, pos. 2 of this appendix), or, for a combined device, opens the calculator box. By short-circuiting the contacts „SERVICE“, the SERVICE mode is activated, symbol „<->“ and sign „TEST“ are displayed on the LCD.

In this mode:

- volume pulses are generated via the optical interface of the meter. The button can be used to toggle the energy pulse output by selecting the menu item "tEST on Wh";
- the energy pulses are generated in the 1<sup>st</sup> pulse output and the volume pulses in the 2<sup>st</sup> pulse output (when the meter is supplied with a connected pulse input/output cable or the meter is combined);
- it is possible to simulate volume pulses for determination the energy measurement errors;
- it is possible to change the parameters of the meter configuration.

NOTE: when the test mode is activated by short-circuiting the contacts „SERVICE“, the volume and energy accumulated in the test mode are not added to the meter's operating mode volume and energy readings.

**1.3. Activation of test mode with software E3-CONFIGURATOR**

The test mode can be activated via the optical interface using the software E3-CONFIGURATOR and optical scan head in accordance with EN 62056-21 standard. In this case, optionally volume or energy pulses are generated via the optical interface of the meter.

**2. Determination of measurement errors of the meter**

**2.1. Volume measuring errors determination test**

The determination of volume measurement errors shall be carried out in the hydrodynamic test bench in the following order:

- 1) The test mode is activated in accordance with section 1.1, 1.2, or 1.3 of this instruction;



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- 2) The volume measuring errors should be evaluated at control flow rates specified in EN1434-5. The volume of water, passing through the meter can be read directly from the indicating device (with resolution 1 ml), via meter optical output, using the optical reading head according to EN 62056-21 or through wired volume pulse 2<sup>nd</sup> output (for a complete meter with a connected pulse input /output cable and for a combined meter activated in test mode according to p.1.2 of this instruction);
- 3) Volume pulse values in test mode are presented in table 1p:

Table 1p

Permanent flow-rate $q_p$ of the heat meter, m <sup>3</sup> /h	Volume pulse value in test mode, litre/pulse
0,6 and 1,0	0,002
1,5	0,004
2,5	0,005
3,5 and 6	0,02
10; 15 and 25	0,05
40 and 60	0,2

**2.2. Energy measurement errors determination test**

The energy measurement error of a calculator with temperature sensors pair shall be evaluated by immersing the temperature sensors in a temperature regulated baths. The test shall be performed in the following order:

- 1) The test mode is activated in accordance with section 1.2 of this instruction;
- 2) The meter temperature sensors are immersed in thermostatic baths, which form the supply and return line temperature and temperature difference values specified in EN 1434-5.

NOTE: for a combined meter, the energy measurement error determination may be performed separately for a calculator with a flow sensor. In this case, the temperature and temperature differences of the supply and return line specified in EN 1434-5 are simulated by connecting the reference resistors to the calculator terminals No.5;6;7;8.

- 3) Long press the button (for more than 5 seconds) activates the simulation of the volume pulses (the meter display periodically shows "SF" with the nominal flow rate of the meter, m<sup>3</sup>/h):

TEST m <sup>3</sup> /h
SF 1.500

- 4) After 2,5 min. the volume simulation is completed, the sign „SF“ turns off. To calculate the energy measurement error, the simulated volume and energy readings shall be visually read from the meter display;
- 5) The amount of volume or energy can be read through the wired pulse output (if it is equipped in the meter);
- 6) The amount of volume or energy can be read through the meter's optical interface output using an optical scan head that complies with EN 62056-21;
- 7) Energy pulse values in test mode are presented in table 2p:

Table 2p

Permanent flow-rate $q_p$ of the heat meter, m <sup>3</sup> /h	Energy pulse value based on displayed energy units:		
	„kWh“, „MWh“	„GJ“	„Gcal“
0,6 and 1,0	0,1 Wh/pulse	0,5 kJ/ pulse	0,1 kcal/ pulse
1,5	0,2 Wh/ pulse	1 kJ/ pulse	0,2 kcal/ pulse
2,5	0,5 Wh/ pulse	2 kJ/ pulse	0,5 kcal/ pulse
3,5 and 6	1 Wh/ pulse	5 kJ/ pulse	1 kcal/ pulse
10; 15 and 25	2 Wh/ pulse	10 kJ/ pulse	2 kcal/ pulse
40 and 60	5 Wh/ pulse	20 kJ/ pulse	5 kcal/ pulse
0,6 and 1,0	10 Wh/ pulse	50 kJ/ pulse	10 kcal/ pulse

*Handwritten signature*





**Not an Authorized Translation**

NOTE: the energy measurement error determination test shall be performed when the flow sensor is installed in the supply line and when the flow sensor is installed in the return line (in both cases).

**3. Turn off the test mode**

The test mode can be turned off in one of the following ways:

- long press the button select page „INF“ on the meter's LCD → short presses the button select „tEST off“ on the LCD → long press the button and the test mode is turn off, there is no sign „TEST“ on the screen (when the test mode is activated in accordance with section 1.1 of this instruction);
- by short-circuiting the contacts “SERVICE”, (when the test mode is activated in accordance with section 1.2 of this instruction);
- via the optical interface, using the software E3-CONFIGURATOR and optical head that complies with EN 62056-21 standard (when the test mode is activated in accordance with section 1.1 or 1.3 of this instruction);
- the meter switches to the operating mode by itself 12 hours after activation the test mode.