Harmonized standards applied: EN 1434-1:2015, EN 1434-2:2015, EN 1434-4:2015, EN 1434-5:2015.

Additionally documents applied:
WELMEC 7.2 – Software guide (Issue 6).

The measuring instrument must correspond with the following specifications:

1 Design of the instrument

1.1 Construction

Heat meter INVONIC H consists of the primary flow sensor and the calculator with type approved pair of temperature sensors with Pt 500 elements.
Flow sensor consists of brass body with built-in ultrasound transducers. The flow sensor inseparably connected with the calculator via 1,2 m length screened cable (2,5 m and 5 m – optional). The flow sensors q_p = (0,6 – 6,0) m³/h has intended place for temperature sensor installation.
The calculator can be mounted directly on the flow sensor or separately.
The heat meter is powered by 3,6 V DC lithium battery either remote 12 V to 42 V DC or 12 V to 36 V AC power source.

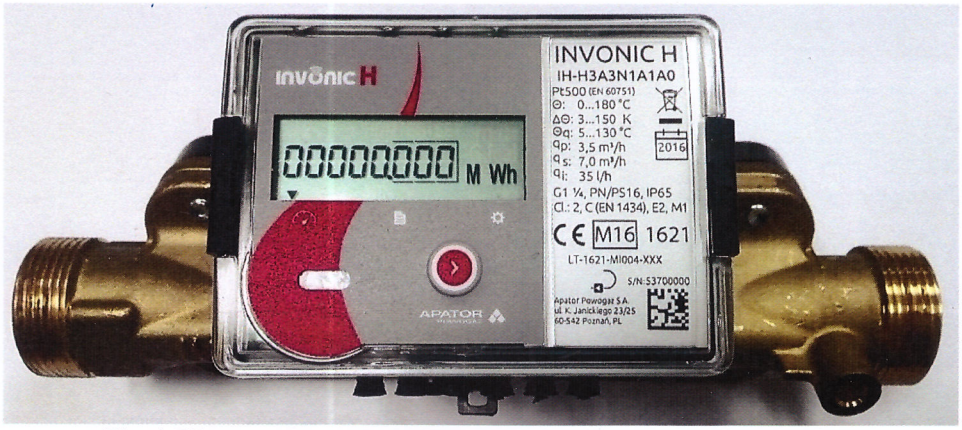

Fig.1.Heat meter INVONIC H (calculator and flow sensor)

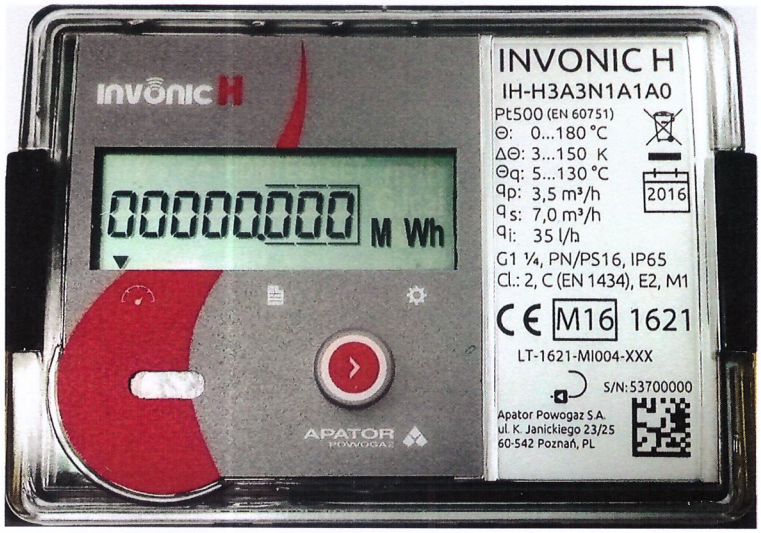

Fig.2. Calculator of the heat meter INVONIC H

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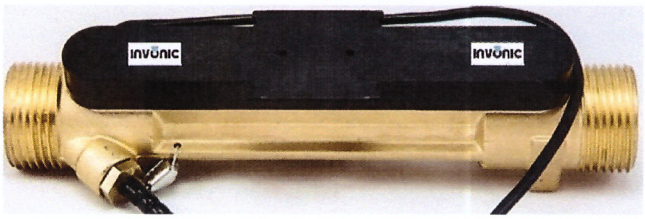
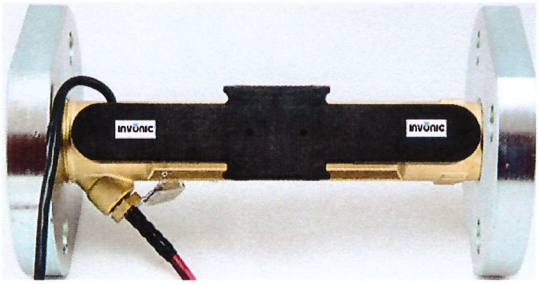
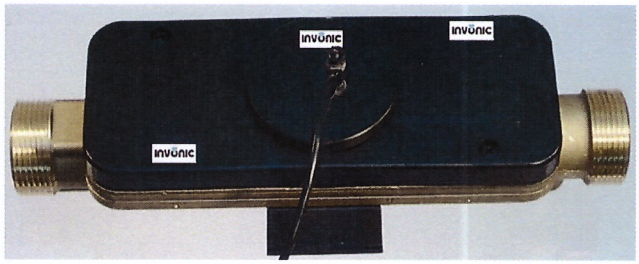


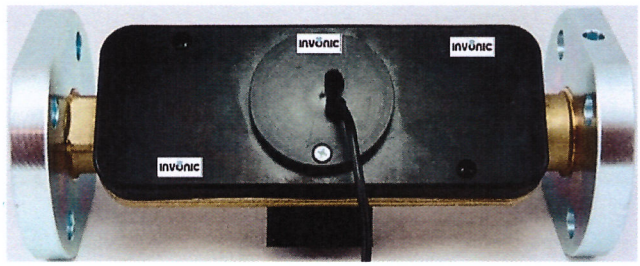
a) Flow sensor of the heat meter
q_p = 0,6/1,0/1,5/2,5 m³/h with threaded end connections
G ¾ B or G 1 B



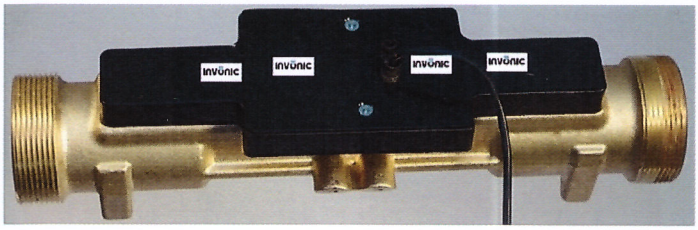
b) Flow sensor of the heat meter
q_p = 0,6/1,0/1,5/2,5 m³/h with flanged end connections DN20



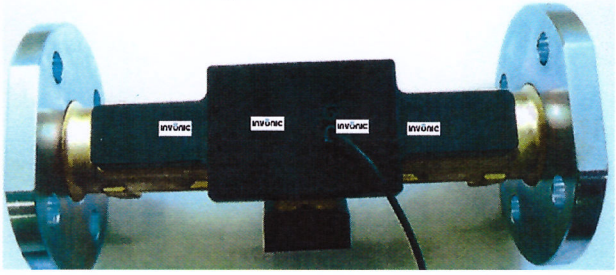
c) Flow sensor of the heat meter q_p = 3,5/6 m³/h
with threaded end connections G 1¼ B



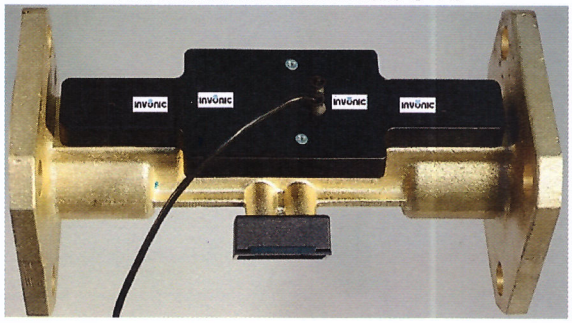
d) Flow sensor of the heat meter q_p = 3,5/6 m³/h
with flanged end connections DN25



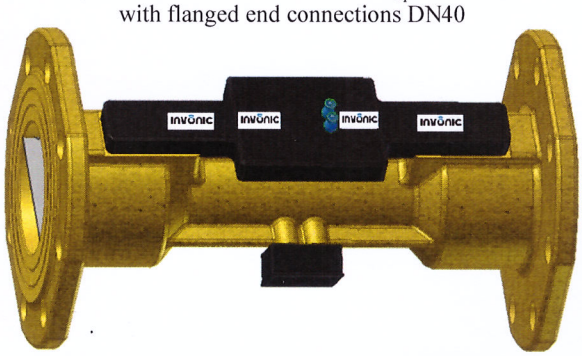
e) Flow sensor of the heat meter q_p = 10 m³/h
with threaded end connections G 2 B



f) Flow sensor of the heat meter q_p = 10 m³/h
with flanged end connections DN40



g) Flow sensor of the heat meter q_p = 15 m³/h
with flanged end connections DN50



h) Flow sensor of the heat meter q_p = 25/40/60 m³/h
with flanged end connections (DN65/DN80/DN100)

Fig.3. Flow sensor of the heat meter INVONIC H

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Structure of type number of the heat meter INVONIC H

INVONIC H **IH -** □ □ □ □ □ □ □ □ □ □ □ □

Type

Ratio of the flow rates q_v/q_i :	Code
100	H
250*	I

Mounting place of the flow sensor; nominal pressure PN:	Code
In flow pipe; PN16	1
In flow pipe; PN25	2
In return pipe; PN16	3
In return pipe; PN25	4

Destination of the meter; protection class of calculator; protection class of flow sensor; heat-conveying liquid	Code
Heat meter; IP65; IP65; water	A
Heat meter; IP65; IP67; water	B
Meter for heating and cooling; IP65; IP67; water	C

Energy measurement units:	Code
GJ	1
kWh	2
MWh	3
Gcal	4

Flow sensor (nominal flow-rate q_p, overall length, connection type and size)	Code	Flow sensor (nominal flow-rate q_p, overall length, connection type and size)	Code
0,6 m³/h, 110 mm, thread, DN15/G ¾	A	2,5 m³/h, 190 mm, flange, DN20	M
0,6 m³/h, 190 mm, thread, DN20/G 1	B	3,5 m³/h, 260 mm, thread, DN25/G 1¼	N
0,6 m³/h, 190 mm, flange, DN20	C	3,5 m³/h, 260 mm, flange, DN25	O
1 m³/h, 110 mm, thread, DN15/G ¾	D	6 m³/h, 260 mm, thread, DN25/G 1¼	P
1 m³/h, 190 mm, thread, DN20/G 1	E	6 m³/h, 260 mm, flange, DN25	Q
1 m³/h, 190 mm, flange, DN20	F	10 m³/h, 300 mm, thread, DN40/G2	R
1,5 m³/h, 110 mm, thread, DN15/G ¾	G	10 m³/h, 300 mm, flange, DN40	S
1,5 m³/h, 130 mm, thread, DN20/G 1	H	15 m³/h, 270 mm, flange, DN50	T
1,5 m³/h, 190 mm, thread, DN20/G 1	I	25 m³/h, 300 mm, flange, DN65	U
1,5 m³/h, 190 mm, flange s, DN20	J	40 m³/h, 300 mm, flange, DN80	V
2,5 m³/h, 130 mm, thread DN20/G 1	K	60 m³/h, 360 mm, flange, DN100	W
2,5 m³/h, 190 mm, thread, DN20/G 1	L		

Power supply:	Code
Battery (battery not included)	0
Battery (1 × AA Li-SOCl2 battery, 3,6 V 2,7 Ah)	1
Battery (2 × AA Li-SOCl2 battery, 3,6 V 2,7 Ah)	2
External 24 V AC/DC power supply + battery (3,6 V 2,7 Ah)	3

Communication module:	Code
none	A
M-Bus module	B
CL module (current loop)	C
868 MHz RF radio module S1 (standard)	D
MODBUS RS485 module	E
868 MHz RF radio module T1 OMS, individual password per module	F
868 MHz RF radio module T1 OMS, common password for all modules	G
BACnet module	H

Cable length between flow sensor and calculator:	Code
1,2 m	1
2,5 m	2
5,0 m	5

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Structure of type number of the heat meter INVONIC H (continue)

Configuration profile:	Code
Standard profile	A

Temperature sensors pair:	Code
None (without bolt protection sleeve for temperature sensor socket in the flow sensor body)	0
None (with bolt protection sleeve for temperature sensor socket in the flow sensor body)	1
Pair of direct mounted Pt 500 sensors / M10×1/ 1,5 m cable / 5,2 mm diameter/ (0-130) °C/ brass nut	2
Pair of direct mounted Pt 500 sensors / M10×1/ 1,5 m cable / 5,2 mm diameter/ (0-130) °C /plastic nut	3
Pair of direct mounted Pt 500 sensors / M10×1/ 2 m cable / 5,2 mm diameter/ (0-130) °C/ plastic nut	4
Pair of direct mounted Pt 500 sensors / M10×1/ 2 m cable / 5,2 mm diameter/ (0-130) °C /brass nut	5
Pair of direct mounted Pt 500 sensors / M10×1/ 3 m cable / 5,2 mm diameter/ (0-130) °C/ plastic nut	6
Pair of direct mounted Pt 500 sensors / M10×1/ 3 m cable / 5,2 mm diameter/ (0-130) °C /brass nut	7
Pair of direct mounted Pt 500 sensors / M10×1/ 5 m cable / 5,2 mm diameter/ (0-130) °C/ plastic nut	8
Pair of direct mounted Pt 500 sensors / M10×1/ 5 m cable / 5,2 mm diameter/ (0-130) °C /brass nut	9
Pair of pocket mounted Pt 500 sensors / 3 m cable/ 6 mm diameter/ (0-130) °C	A
Pair of pocket mounted Pt 500 sensors / 5 m cable/ 6 mm diameter/ (0-130) °C	B

Remark:
* - with the exception of meters $q_p = 0{,}6$ m^3/h; $q_p = 1{,}0$ m^3/h; $q_p = 1{,}5$ m^3/h (l=130 mm); $q_p = 3{,}5$ m^3/h.

1.2 Measurand sensor

The heat meter hardware consists of an ultrasonic flow sensor and heat meter calculator. The calculator measures the resistance of type approved pair of temperature sensors with Pt 500 elements and converts it to temperature according to formulas of EN 60751. The calculator also measures the volume of the heat-conveying liquid by processing signals received from the ultrasound transducers of the flow sensor.

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.

1.4 Indication of the measurement results

The accumulated quantity of thermal energy is presented on the LCD display in the MWh. Other units (kWh, Gcal, GJ) can be chosen too.

1.5 Optional equipment and functions subject to MID requirements

None.

1.6 Technical documentation

Ultrasonic meter for heating and cooling INVONIC H. Technical description, installation and user instructions, 12-01-2018.

Other reference documents on which basis this certificate is issued, are stored in a file Nr.LEI-12-MP-71.18.

1.7 Integrated equipment and functions not subject to MID

Optical interface according to requirements of EN 62056-21 integrated in the meter.
The heat meter can be either without communication module or equipped with one of the following modules:

- M-Bus module;
- CL module;
- 868 MHz RF radio module;
- MODBUS RS485 module;
- LON module;
- MiniBus module;
- BACnet module.
-

Two pulse inputs with programmable pulse value. Class of pulse input device – IB according to EN 1434-2.
Two pulse outputs. Class of pulse output device – OB in operating mode, OD in test mode according to EN 1434-2.
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

For calculator:

- limits of the temperature Θ: 0 °C to 180 °C;
- limits of temperature differences $\Delta\Theta$: 3 K to 150 K.

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

Table 1

End connections	Flow-rate, m³/h			Overall length, mm
	Permanent q_p	Maximum q_s	Minimum q_i	
G ¾	0,6	1,2	0,006	110
G 1 or DN20	0,6	1,2	0,006	190
G ¾	1,0	2,0	0,010	110
G 1 or DN20	1,0	2,0	0,010	190
G ¾	1,5	3,0	0,006	110
G 1 or DN20	1,5	3,0	0,006	190
G ¾	1,5	3,0	0,015	110
G 1 or DN20	1,5	3,0	0,015	190
G 1	1,5	3,0	0,015	130
G 1	2,5	5,0	0,010	130
G 1 or DN20	2,5	5,0	0,010	190
G 1	2,5	5,0	0,025	130
G 1 or DN20	2,5	5,0	0,025	190
G 1 ¼ or DN25	3,5	7,0	0,035	260

End connections	Flow-rate, m³/h			Overall length, mm
	Permanent q_p	Maximum q_s	Minimum q_i	
G 1 ¼ or DN25	6,0	12,0	0,024	260
G 1 ¼ or DN25	6,0	12,0	0,060	260
G 2 or DN40	10,0	20,0	0,040	300
G 2 or DN40	10,0	20,0	0,100	300
DN50	15,0	30,0	0,060	270
DN50	15,0	30,0	0,150	270
DN65	25,0	50,0	0,100	300
DN65	25,0	50,0	0,250	300
DN80	40,0	80,0	0,160	300
DN80	40,0	80,0	0,400	300
DN100	60,0	120,0	0,240	360
DN100	60,0	120,0	0,600	360

Temperature limits of heat-conveying liquid Θ_q : 5 °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 nominal pressure/maximum admissible working pressure/ (PN/PS) 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.

3 Interfaces and compatibility conditions

Two temperature measurement channels for temperature sensors Pt 500 connection. Connection of the temperature sensors is according to the two-wire scheme.
The communication interfaces of the meter, pulse inputs and outputs are described 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 indication shall not exceed the maximum permissible errors, described in Annex VI (MI-004) of Directive 2014/32/EU.
The flow sensor can be tested with cold water (25 ± 5) °C.

4.2 Requirements on putting into use

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

For flow sensors of the heat meter with nominal diameter DN65 to DN100 necessary straight pipelines lengths are: upstream $\geq 5 \times$ DN, downstream $\geq 3 \times$ 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

None.

5.2 Special equipment or software

No special requirements identified.

5.3 Identification of hardware and software

Identification of hardware:

- see Fig.1, Fig. 2 and Fig.3 of this appendix;
- identification mark on the meter electronics wiring plate is SKU3-v12R8.

Identification of software: version number of the software is **0.07**. This number can be displayed on the device's display according to the request.

5.4 Calibration-adjustment procedure

Heat meter flow sensor and calculator errors determination test shall be carried out when TEST mode is activated as indicated in section 6.4 of the document noted in section 1.6 of the present appendix.

Determination of the error of the flow sensor shall be carried out using hydrodynamic test bench within each of the flow rate ranges appointed in section 6.2 of EN 1434-5. Meter pulse output should be used.

Determination of the heat energy error shall be carried out using internal volume simulation, which is activated by a long press of calculator control button.

Value of energy measured in TEST mode can be read directly from display or by counting energy pulses from pulse output. Supply and return flow temperatures should be simulated using precise resistors. Test should be carried out in accordance with section 6.4 of EN 1434-5.

6 Security measures

6.1 Sealing

The following heat meter calculator sealing is provided:

- the manufacturer's adhesive seal - sticker on the access to the adjustment activation jumper (Fig.4, pos.1) and on the fixer of the cover protecting electronics wiring plate (Fig.4, pos.2);
- after installation the case and cover of the calculator (Fig.4, pos.3) are sealed with two hanged seals of heat supplier.

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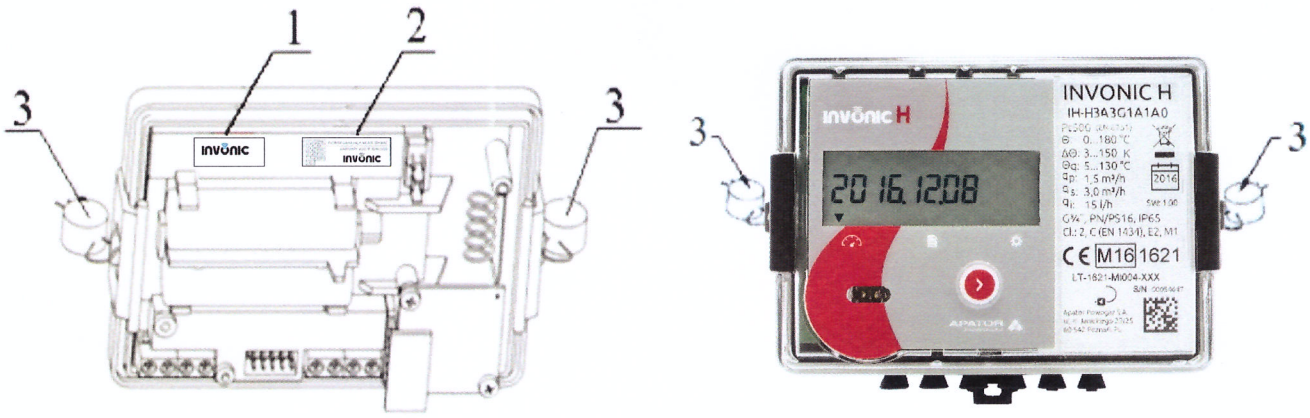


Fig.4. Sealing of the calculator of the heat meter

The following flow sensor sealing is provided:

- the manufacturer's adhesive seal - sticker on the bolts of the cover (Fig.5, Fig.6, Fig.7, Fig.8);

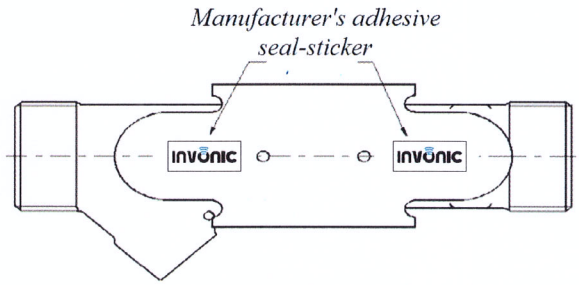


Fig. 5. Sealing of flow sensor $q_p = 0{,}6/1{,}0/1{,}5/2{,}5$ m³/h

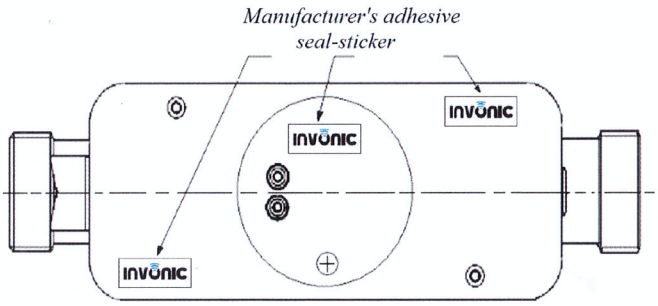


Fig. 6. Sealing of flow sensor $q_p = 3{,}5/6{,}0$ m³/h

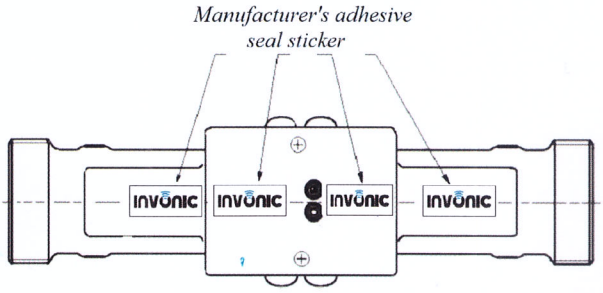


Fig. 7. Sealing of flow sensor $q_p = 10$ m³/h

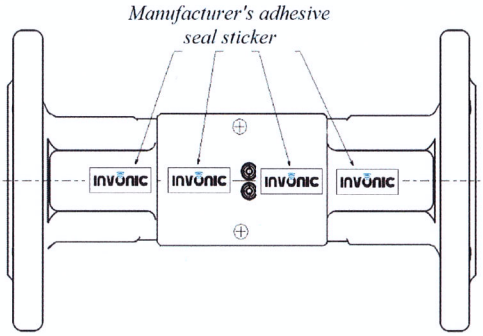
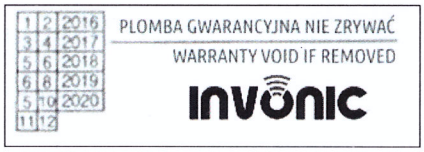


Fig. 8. Sealing of flow sensor $q_p = 15/25/40/60$ m³/h

a) Manufacturer's adhesive seal-sticker



b) Manufacturer's adhesive warranty seal sticker

Fig.9. Manufacturer's protective seals

6.2 Data logger

Archive data retention time is at least 12 years.

7 Marking and inscriptions

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

The following information shall appear in legible and indelible characters on the heat meter calculator casing and his label:

- EU-type examination certificate number (LT-1621-MI004-029 rev. 1);
- manufacturer's mark or name;
- type designation and type number;
- year of manufacture and serial number;
- limits of the temperature;
- limits of temperature differences;
- limits of heat conveying liquid temperature;
- type of temperature sensors (Pt 500);
- limits of flow-rate: maximum q_s, permanent q_p and minimum q_i;
- the nominal pressure/ maximum admissible working pressure (PN/PS);
- flow sensor to be installed in the flow (supply) or return;
- accuracy class;
- voltage level by external power supply;
- climatic class;
- electromagnetic class;
- mechanical class.

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

7.2 Conformity marking

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

- „CE" marking;
- 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
1	2	3
LT-1621-MI004-029	07-02-2017, No. LEI-12-MP-054.17	Type examination certificate first issued

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<table>
<tr><th>1</th><th>2</th><th>3</th></tr>
<tr><td>LT-1621-MI004-029
Revision 1</td><td>03-04-2018,
No. LEI-12-MP-071.18</td><td>1. Type number of the meter has been supplemented.

2. The heat meter has been supplemented with the following flow sensor modifications:

<table>
<tr><th rowspan="2">End connections</th><th colspan="3">Fow-rate, m³/h</th><th rowspan="2">Overal length, mm</th></tr>
<tr><th>Permanent q_p</th><th>Maximum q_s</th><th>Minimum q_i</th></tr>
<tr><td>DN65</td><td>25</td><td>50</td><td>0,100</td><td>300</td></tr>
<tr><td>DN65</td><td>25</td><td>50</td><td>0,250</td><td>300</td></tr>
<tr><td>DN80</td><td>40</td><td>80</td><td>0,160</td><td>300</td></tr>
<tr><td>DN80</td><td>40</td><td>80</td><td>0,400</td><td>300</td></tr>
<tr><td>DN100</td><td>60</td><td>120</td><td>0,240</td><td>360</td></tr>
<tr><td>DN100</td><td>60</td><td>120</td><td>0,600</td><td>360</td></tr>
</table>

3. Additional communication interface module BACnet appeared.

4. The technical description , issued 10-2016, has been replaced by the technical description, issued 12-01-2018.</td></tr>
</table>