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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

Ultrasonic flow sensor for heat meter IFX-M4-01 designed for measuring of volume of the heat-conveying liquid in heating system and conversion it into electrical pulse signal. It is used in conjunction with the type approved heating energy calculator.

The flow sensor consists of the brass measuring section with built-in ultrasonic transducers and electronics unit, which can be mounted either directly on the measuring section or separately. For flow sensors having relative diameters from DN65 to DN100 measuring section can be made from either brass (cast) or steel (welded construction). The measuring section is inseparably connected with the electronic unit via 1,2 m length screened cable (2,5 m or 5 m – optional). For welded construction measuring sections two cables are used.

The flow sensor 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. Flow sensor IFX-M4-01 (measuring section and electronics unit)

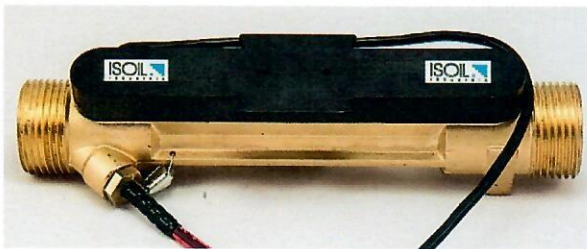


Fig.2. Electronics unit of the flow sensor

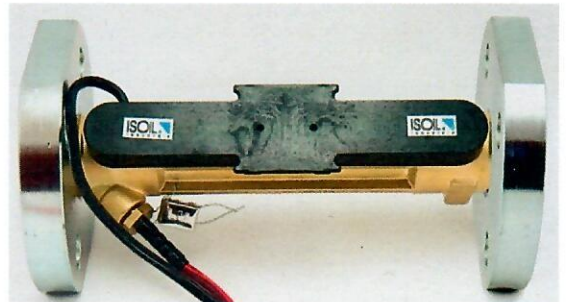
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a) Measuring section of the flow sensor $q_p = 0,6/1,0/1,5/2,5 \text{ m}^3/\text{h}$ with threaded end connections G $\frac{3}{4}$ B or G 1 B



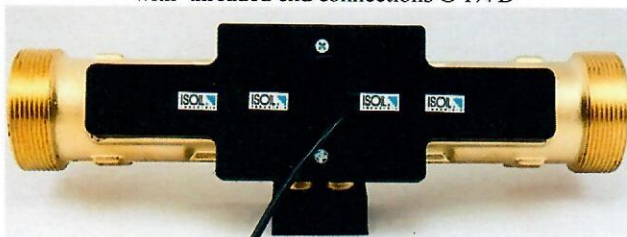
b) Measuring section of the flow sensor $q_p = 0,6/1,0/1,5/2,5 \text{ m}^3/\text{h}$ with flanged end connections DN20



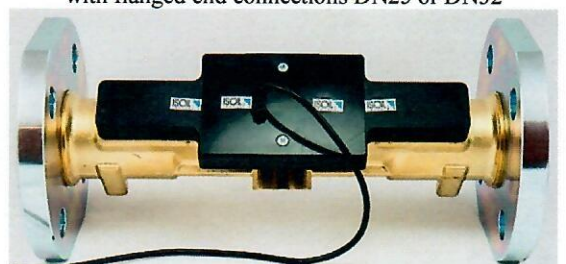
c) Measuring section of the flow sensor $q_p = 3,5/6 \text{ m}^3/\text{h}$ with threaded end connections G $1\frac{1}{4}$ B



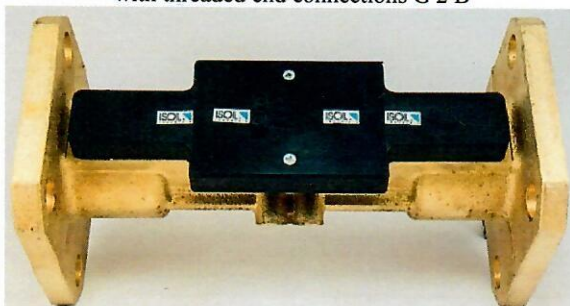
d) Measuring section of the flow sensor $q_p = 3,5/6 \text{ m}^3/\text{h}$ with flanged end connections DN25 or DN32



e) Measuring section of the flow sensor $q_p = 10 \text{ m}^3/\text{h}$ with threaded end connections G 2 B



f) Measuring section of the flow sensor $q_p = 10 \text{ m}^3/\text{h}$ with flanged end connections DN40



g) Measuring section of the flow sensor $q_p = 15 \text{ m}^3/\text{h}$ with flanged end connections DN50



h) Measuring section of the flow sensor $q_p = 25/40/60 \text{ m}^3/\text{h}$ with flanged end connections (DN65/DN80/DN100), brass body



i) Measuring section of the flow sensor $q_p = 25/40/60 \text{ m}^3/\text{h}$ with flanged end connections (DN65/DN80/DN100), steel body

Fig.3. Measuring section of the flow sensor IFX-M4-01

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Structure of type number combination of the flow sensor IFX-M4-01

IFX-M4-01 - □ - □□ - □ - □ - □ - □*

Type

Ratio of the flow rates (q_r/q_i):	Code
100	1
250 (with the exeptions of sensors $q_p = 0,6 \text{ m}^3/\text{h}; 1,0 \text{ m}^3/\text{h}; 3,5 \text{ m}^3/\text{h}$)	2

Technical data of the flow sensor:

Permanent flow-rate q_p , m ³ /h	Overall length, mm	End connections	Code
0,6	110	G ¾	10
1,0	110	G ¾	11
1,5	110	G ¾	12
1,5	165	G ¾	09
1,5	130	G 1	14
2,5	130	G 1	20
3,5	260	G 1¼	25
6,0	260	G 1¼	32
10,0	300	G2	40
10,0	300	DN40	41
15,0	270	DN50	50
3,5	260	DN25	26
6,0	260	DN25	33
0,6	190	G 1	06
1,0	190	G 1	13
1,5	190	G 1	17
2,5	190	G 1	22
0,6	190	DN20	19
1,0	190	DN20	23
1,5	190	DN20	24
2,5	190	DN20	21
3,5	260	DN32	35
6,0	260	DN32	34
25	300	DN65	65
25	300	DN65 Brass	66
40	350	DN80	80
40	300	DN80 Brass	81
60	350	DN100	100
60	360	DN100 Brass	101

Length of connection cable between measuring section and electronics unit:

Cable length	Code
1,2 m	1
2,5 m	2
5 m	3

Pulse value of the flow sensor, litre/pulse:

Pulse value	Code
0,1 litre/pulse – standard value for $DN \leq 50$	0.1
1 litre/pulse – standard value for $DN \geq 65$	1
Special pulse value	2

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Structure of type number combination of the flow sensor IFX-M4-01(continue)

Power supply/nominal pressure PN:	Code
Internal battery/ nominal pressure PN16	1
External power supply 24 V AC/DC / PN16	2
Internal battery/ nominal pressure PN25	3
External power supply 24 V AC/DC / PN16	4

Length of the pulse output device connection cable, m:
3; 5; 10; 15... 200, 0 (or omitted) - none

Note : * - marked code number is used only for order coding.

1.2 Sensor

Ultrasonic flow sensor.

1.3 Measurement value processing

Volume measurement is made by means of bi-directional ultrasonic technique according to the transit time method. Measured volume of heat-conveying liquid is converted into the pulses quantity that is transferred in output pulse terminal.

1.4 Indication of the measurement results

None.

Output signal (litre/pulse) is transferred to the connected heat meter calculator.

1.5 Optional equipment and functions subject to MID requirements

None.

1.6 Technical documentation

Ultrasonic flow sensor IFX-M4-01. Technical description, user manual: IFX-M4-01_M_E_2019_18_REV.1, 06-2019.

Other reference documents on which basis this certificate is issued, are stored in a file Nr.LEI-12-MP-091.19.

1.7 Integrated equipment and functions not subject to MID

None.

2 Technical data

2.1 Rated operating conditions

2.1.1 Measurand

Quantity of a heat-conveying liquid passed through the flow sensor, is transferred in the form of volume pulses (litre/pulse).

2.1.2 Measurement range

The technical data of the flow sensor are presented in table 1.

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Table 1

End connections	Flow-rate, m ³ /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	0,01	190
G ¾	1,5	3,0	0,006	110; 165
G 1 or DN20	1,5	3,0	0,006	190
G ¾	1,5	3,0	0,015	110; 165
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	0,01	130
G 1 or DN20	2,5	5,0	0,01	190
G 1	2,5	5,0	0,025	130
G 1 or DN20	2,5	5,0	0,025	190
G 1¼ either DN25 or DN32	3,5	7,0	0,035	260
G 1¼ either DN25 or DN32	6,0	12,0	0,024	260
G 1¼ either DN25 or DN32	6,0	12,0	0,06	260
G 2 or DN40	10,0	20,0	0,04	300
G 2 or DN40	10,0	20,0	0,10	300
DN50	15,0	30,0	0,06	270
DN50	15,0	30,0	0,15	270
DN65	25,0	50,0	0,10	300
DN65	25,0	50,0	0,25	300
DN80	40,0	80,0	0,16	300; 350
DN80	40,0	80,0	0,40	300; 350
DN100	60,0	120,0	0,24	350; 360
DN100	60,0	120,0	0,60	350; 360

Temperature limits of heat conveying liquid :

- when electronics unit is mounted directly on the measuring section : Θ_q : 5 °C to 90 °C;
- when electronics unit is mounted separately : 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.

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2.1.5 Maximum admissible working pressure

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

2.1.6 Mounting position of the flow sensor of the heat meter

Flow sensor can be mounted either horizontally or vertically.

3 Interfaces and compatibility conditions

Pulse output. Class of pulse output device - OD according to EN 1434-2.

The minimum admissible pulse values are specified in table 2:

Table 2

Permanent flow-rate q_p , m ³ /h	0,6/1,0/1,5	2,5	3,5	6/10/15	25	40	60
Pulse value, litre/pulse	0,01	0,02	0,05	0,1	0,2	0,5	1

4 Requirements on production, putting into use and utilization

4.1 Requirements on production

At the end of the manufacturing and adjustment process the flow sensors 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 flow sensor must be installed in accordance with the requirements of document listed in section 1.6.

For flow sensors 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, Fig.3 and Fig. 4 of this appendix.

Identification of software: version number of the software is **1.00**. This number (SW:1.00).shall be marked on the label of flow sensor.

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5.4 Calibration-adjustment procedure

Flow sensor errors determination test shall be carried out when TEST mode is activated: two middle contacts in the terminal block under cover of the electronics unit have to be closed using the jumper (Fig. 4).

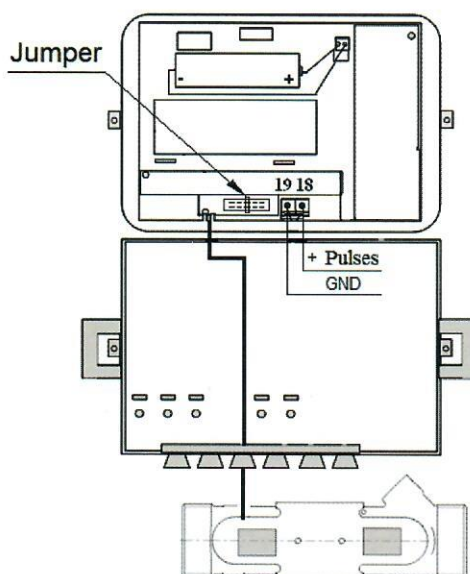


Fig. 4. Activation of the TEST mode

The flow sensor measurement error should be evaluated at the control flow rates specified in the section 5.2 of the EN 1434-5. Pulse output of the flow sensor is used (terminals 18 and 19). The volume pulse value in TEST mode is presented in table 3.

Table 3

Permanent flow-rate q_p , of the flow sensor, m ³ /h	Volume pulse value in TEST mode, litre/pulse
0,6/1,0	0,002
1,5	0,004
2,5	0,005
3,5/6	0,02
10/15/25	0,05
40/60	0,2

6 Security measures

6.1 Sealing

The following sealing of the electronics unit is provided:

- manufacturer adhesive seal - sticker on the access to the adjustment activation jumper (Fig.5, pos.1) and on the fixer of the cover protecting electronics wiring plate (Fig.5, pos.2);
- after installation the case and cover of the electronics unit (Fig.5, pos.3) are sealed with two hanged seals of heat supplier.

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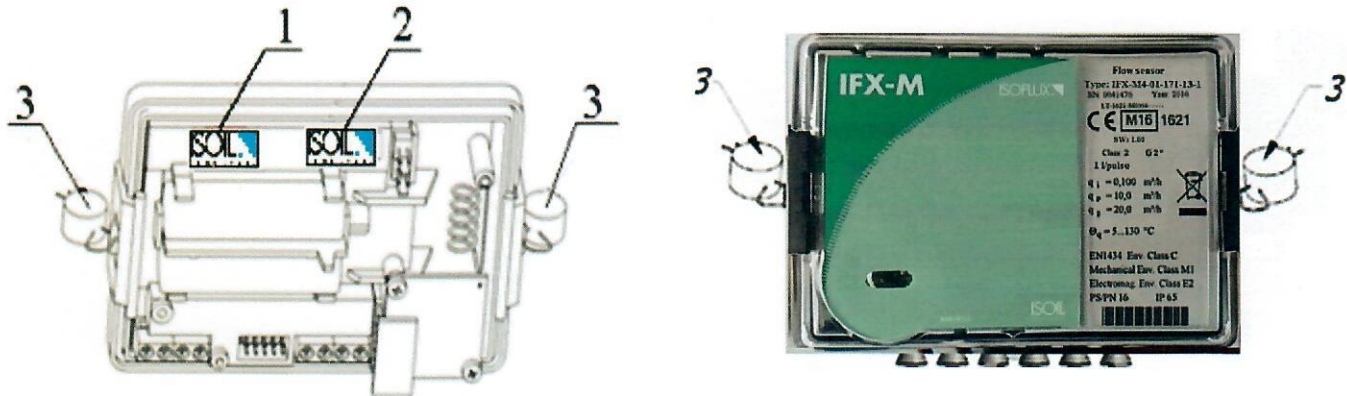


Fig. 5. Sealing of the electronics unit of the flow sensor

The following measuring section sealing is provided:

- manufacturer's adhesive seal - sticker on the bolts of the cover (Fig. 6, Fig. 7, Fig. 8);
- manufacturer's hanged seals on ultrasonic transducers for flow sensors with steel body (Fig. 9).

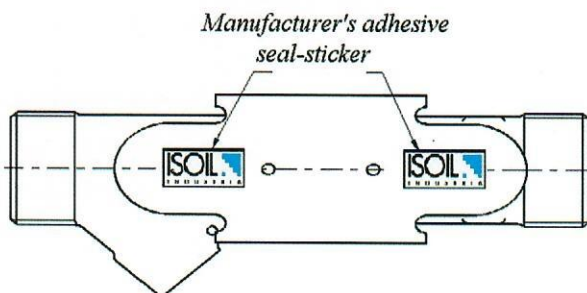


Fig. 6. Sealing of measuring section of the flow sensor $q_p = 0,6/1,0/1,5/2,5 \text{ m}^3/\text{h}$



Fig. 7. Sealing of measuring section of the flow sensor $q_p = 3,5/6,0 \text{ m}^3/\text{h}$

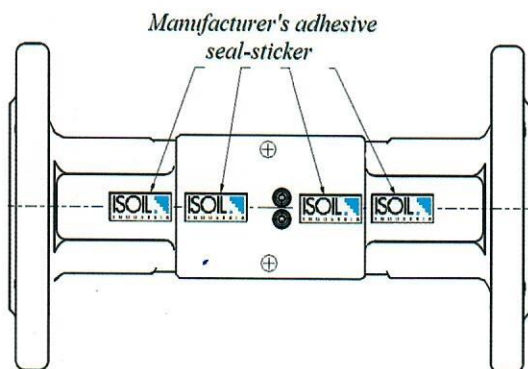


Fig. 8. Sealing of measuring section of the flow sensor $q_p = 10/15/25/40/60 \text{ m}^3/\text{h}$ (brass body)

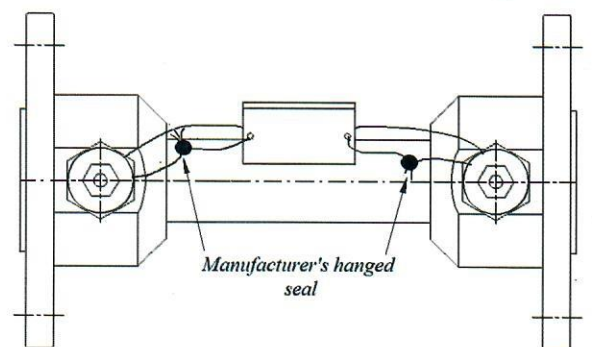


Fig. 9. Sealing of measuring section of the flow sensor $q_p = 25/40/60 \text{ m}^3/\text{h}$ (steel body)

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a) Manufacturer's adhesive
seal-sticker



b) Manufacturer's hanged seal

Fig.10. Manufacturer's protective seals

6.2 Data logger

Not applicable.

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 casing of the electronics unit and his label:

- EC-type examination number (LT-1621-MI004-009 rev.2);
- manufacturer's mark or name;
- type designation and type number;
- year of manufacture and serial number;
- limits of heat conveying liquid temperature;
- meter factor (pulse value of volume);
- 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;
- voltage level for external power supply;
- climatic class;
- electromagnetic class;
- mechanical class;
- software version number.

Additional metal label is attached to the flow sensor DN65/DN80/DN10 steel measuring section.

On the label is the following information:

- nominal diameter DN of the measuring section;
- serial number;
- year of manufacture;
- manufacturer's mark or name;
- arrow to indicate the direction of the flow

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

7.2 Conformity marking

In addition, the label of electronic unit of the flow sensor 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.

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8 List of the drawings attached to the certificate.

Drawings are not added.

9 Certificate history

Issue	Date and reference №	Description																																																																																																								
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LT-1621-MI004-009	15-10-2012, No. LEI-12-MP-013.12	Type examination certificate first issued																																																																																																								
LT-1621-MI004-009 Revision 1	29-11-2016, No. LEI-12-MP-044.16	<p>1. Device power supply 3,6 V DC lithium battery either remote 3,6 V ± 0,2 V DC power source is changed to: 3,6 V DC lithium battery either remote 12 V to 42 V DC or 12 V to 36 V AC power source.</p> <p>2. Flow sensor is supplemented with following modifications of the measuring section:</p> <table><tr><th>End connections</th><th>Permanent flow-rate q_p, m³/h</th><th>Minimum flow-rate q_i, m³/h</th><th>Overall length, mm</th></tr><tr><td>G ¾</td><td>0,6</td><td>0,006</td><td>110</td></tr><tr><td>G 1 or DN20</td><td>0,6</td><td>0,006</td><td>190</td></tr><tr><td>G ¾</td><td>1,0</td><td>0,01</td><td>110</td></tr><tr><td>G 1 or DN20</td><td>1,0</td><td>0,01</td><td>190</td></tr><tr><td>G ¾</td><td>1,5</td><td>0,006</td><td>110; 165</td></tr><tr><td>G 1 or DN20</td><td>1,5</td><td>0,006</td><td>190</td></tr><tr><td>G ¾</td><td>1,5</td><td>0,015</td><td>110; 165</td></tr><tr><td>G 1 or DN20</td><td>1,5</td><td>0,015</td><td>190</td></tr><tr><td>G 1</td><td>1,5</td><td>0,015</td><td>130</td></tr><tr><td>G 1</td><td>2,5</td><td>0,01</td><td>130</td></tr><tr><td>G 1 or DN20</td><td>2,5</td><td>0,01</td><td>190</td></tr><tr><td>G1</td><td>2,5</td><td>0,025</td><td>130</td></tr><tr><td>G 1 or DN20</td><td>2,5</td><td>0,025</td><td>190</td></tr><tr><td>DN25 or DN32</td><td>3,5</td><td>0,035</td><td>260</td></tr><tr><td>G 1¼ either DN25 or DN32</td><td>6,0</td><td>0,024</td><td>260</td></tr><tr><td>DN25 or DN32</td><td>6,0</td><td>0,06</td><td>260</td></tr><tr><td>G 2 or DN40</td><td>10,0</td><td>0,04</td><td>300</td></tr><tr><td>DN40</td><td>10,0</td><td>0,10</td><td>300</td></tr><tr><td>DN50</td><td>15,0</td><td>0,06</td><td>270</td></tr><tr><td>DN65</td><td>25,0</td><td>0,10</td><td>300</td></tr><tr><td>DN65*</td><td>25,0</td><td>0,25</td><td>300</td></tr><tr><td>DN80</td><td>40,0</td><td>0,16</td><td>350</td></tr><tr><td>DN80*</td><td>40,0</td><td>0,40</td><td>350</td></tr><tr><td>DN100</td><td>60,0</td><td>0,24</td><td>350</td></tr><tr><td>DN100*</td><td>60,0</td><td>0,60</td><td>350</td></tr></table> <p>Remark: * - additional modifications of the measuring section with brass body are added.</p>	End connections	Permanent flow-rate q_p , m³/h	Minimum flow-rate q_i , m³/h	Overall length, mm	G ¾	0,6	0,006	110	G 1 or DN20	0,6	0,006	190	G ¾	1,0	0,01	110	G 1 or DN20	1,0	0,01	190	G ¾	1,5	0,006	110; 165	G 1 or DN20	1,5	0,006	190	G ¾	1,5	0,015	110; 165	G 1 or DN20	1,5	0,015	190	G 1	1,5	0,015	130	G 1	2,5	0,01	130	G 1 or DN20	2,5	0,01	190	G1	2,5	0,025	130	G 1 or DN20	2,5	0,025	190	DN25 or DN32	3,5	0,035	260	G 1¼ either DN25 or DN32	6,0	0,024	260	DN25 or DN32	6,0	0,06	260	G 2 or DN40	10,0	0,04	300	DN40	10,0	0,10	300	DN50	15,0	0,06	270	DN65	25,0	0,10	300	DN65*	25,0	0,25	300	DN80	40,0	0,16	350	DN80*	40,0	0,40	350	DN100	60,0	0,24	350	DN100*	60,0	0,60	350
End connections	Permanent flow-rate q_p , m³/h	Minimum flow-rate q_i , m³/h	Overall length, mm																																																																																																							
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DN65*	25,0	0,25	300																																																																																																							
DN80	40,0	0,16	350																																																																																																							
DN80*	40,0	0,40	350																																																																																																							
DN100	60,0	0,24	350																																																																																																							
DN100*	60,0	0,60	350																																																																																																							

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		<p>3. Exterior and interior design of the electronics unit is changed.</p> <p>4. Marking label is changed.</p> <p>5. The maximum admissible working pressure/nominal pressure 16 bar (PS/PN 16) is changed into 16 bar (PS/PN 16) or 25 bar (PS/PN 25).</p> <p>6. Requirements for the straight pipelines installation of the flow sensors with nominal diameter less than DN65 are eliminate.</p> <p>7. Document IFX-M4-01V01, issued 10-09-2012, has been replaced by the document IFX-M4-01V02, issued 27-10-2016.</p> <p>8. Error determination test procedure, described in section 5.4 of this appendix, is changed.</p> <p>9. New flow sensor software version 1.00.</p> <p>10. Climatic environment of the meter „non-condensing humidity“ is changed to „condensing humidity“.</p>																				
LT-1621-MI004-009 Revision 2	12-09-2019, No. LEI-12-MP-091.19	<p>1. Flow sensor is supplemented with following modifications of the measuring section:</p> <table><tr><th>End connections</th><th>Permanent flow-rate q_p, m³/h</th><th>Minimum flow-rate q_i, m³/h</th><th>Overall length, mm</th></tr><tr><td>DN80</td><td>40</td><td>0,16</td><td>300</td></tr><tr><td>DN80</td><td>40</td><td>0,40</td><td>300</td></tr><tr><td>DN100</td><td>60</td><td>0,24</td><td>360</td></tr><tr><td>DN100</td><td>60</td><td>0,60</td><td>360</td></tr></table> <p>2. Flow sensor type number code has been changed.</p> <p>3. Document IFX-M4-01V02, issued 27-10-2016, has been replaced by the document IFX-M4-01_M_E_2019_18_REV.1, issued 06-2019.</p>	End connections	Permanent flow-rate q_p , m ³ /h	Minimum flow-rate q_i , m ³ /h	Overall length, mm	DN80	40	0,16	300	DN80	40	0,40	300	DN100	60	0,24	360	DN100	60	0,60	360
End connections	Permanent flow-rate q_p , m ³ /h	Minimum flow-rate q_i , m ³ /h	Overall length, mm																			
DN80	40	0,16	300																			
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