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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

Heat meter NE1 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 NE1 (calculator and flow sensor)

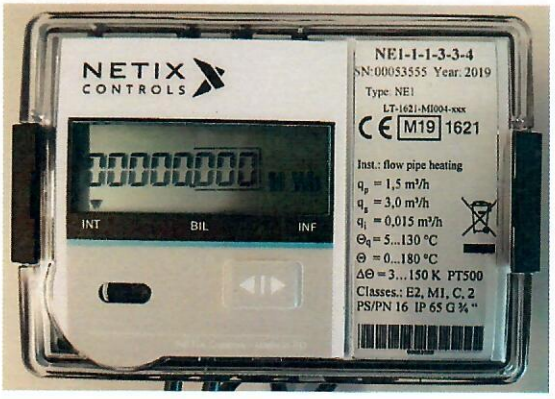

Fig.2. Calculator of the heat meter NE1

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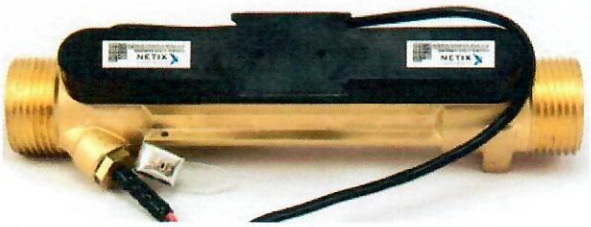
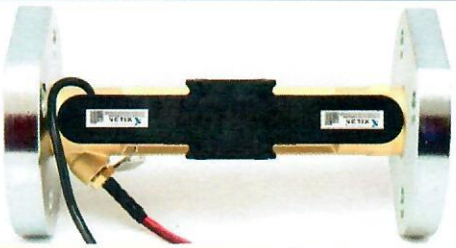
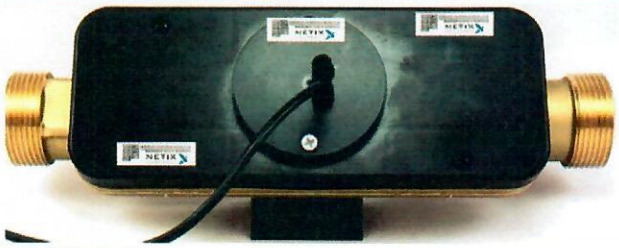
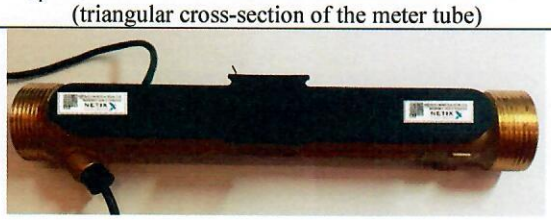
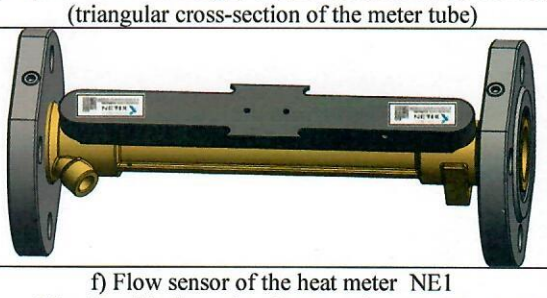
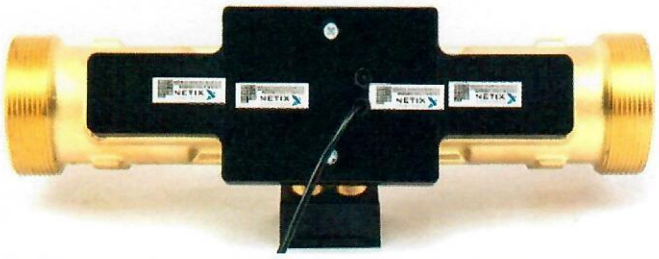
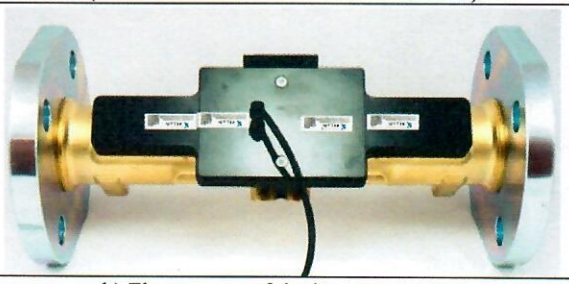
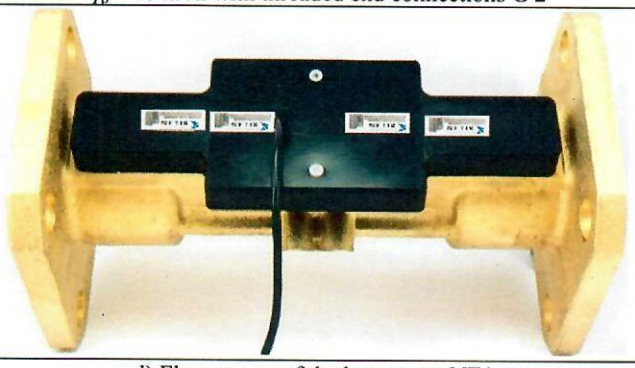
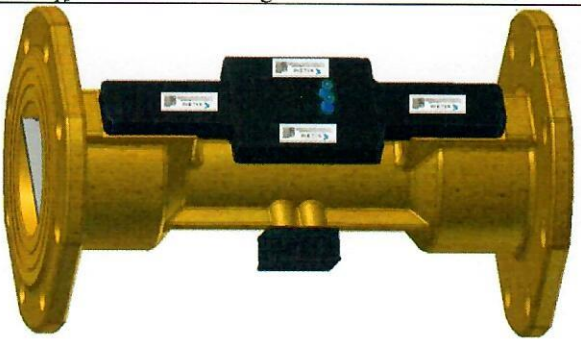
	
a) Flow sensor of the heat meter NE1 q_p = 0,6/1,0/1,5/2,5 m³/h with threaded end connections G ¾ or G 1	b) Flow sensor of the heat meter NE1 q_p = 0,6/1,0/1,5/2,5 m³/h with flanged end connections DN20
	
c) Flow sensor of the heat meter NE1 q_p = 3,5/6 m³/h with threaded end connections G 1¼ (triangular cross-section of the meter tube)	d) Flow sensor of the heat meter NE1 q_p = 3,5/6 m³/h with flanged end connections DN25 or DN32 (triangular cross-section of the meter tube)
	
e) Flow sensor of the heat meter NE1 q_p = 3,5 m³/h with threaded end connections G 1¼ (circular cross-section of the meter tube)	f) Flow sensor of the heat meter NE1 q_p = 3,5 m³/h with flanged end connections DN25 or DN32 (circular cross-section of the meter tube)
	
g) Flow sensor of the heat meter NE1 q_p = 10 m³/h with threaded end connections G 2	h) Flow sensor of the heat meter NE1 q_p = 10 m³/h with flanged end connections DN40
	
i) Flow sensor of the heat meter NE1 q_p = 15 m³/h with flanged end connections DN50	j) Flow sensor of the heat meter NE1 q_p = 25/40/60 m³/h with flanged end connections (DN65/DN80/DN100)

Fig.3. Flow sensor of the heat meter NE1

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Structure of type number of the heat meter NE1

Type	NE1	□ - □ - □ - □ - □ - □*- □*- □*- □*-15*

Installation of the flow sensor:	Code
In supply pipe	1
In return pipe	2

Destination of the meter:	Code
Meter for heating (for measuring heating energy only)	1
Meter for heating and cooling	2

Ratio of the flow rates q_p/q_i:	Limits of temperature differences:	Code
100	2 K to 150 K	1
250**	2 K to 150 K	2
100	3 K to 150 K	3
250**	3 K to 150 K	4

Flow sensor:

Permanent flow rate q_p, m^3/h	Overall length, mm	End connections	Code	Permanent flow rate q_p, m^3/h	Overall length, mm	End connections	Code
0,6	110	G ¾	1	1,0	190	DN20	H
1,0	110	G ¾	2	1,5	190	DN20	K
1,5	110	G ¾	3	2,5	190	DN20	L
1,5	130	G1	M	3,5	260	DN25	A
2,5	130	G1	4	3,5***	260	DN25	Z
3,5	260	G1 ¼	5	3,5	260	DN32	O
3,5***	260	G1 ¼	Y	3,5***	260	DN32	X
6,0	260	G1 ¼	6	6,0	260	DN25	B
0,6	190	G1	C	6,0	260	DN32	P
1,0	190	G1	D	10,0	300	DN40	8
1,5	190	G1	E	15,0	270	DN50	9
2,5	190	G1	F	25	300	DN65	R
10,0	300	G2	7	40	300	DN80	S
0,6	190	DN20	G	60	360	DN100	T

The external communication interface:		Type	Code
Type	Code	MODBUS RS485	5
None	0	LON	6
M-Bus	1	MiniBus	7
CL	2	BACnet	8
868 MHz RF module	4		

The maximum admissible working pressure (nominal pressure PN):	Code
PN16	1
PN25	2

Power supply:	Code
3,6 V internal battery	1
24 V AC/DC main power supply	2

The length of the flow sensor signal lead:	Code
1,2 m	1
2,5 m	2
5,0 m	5

Temperature sensor pair:	Code
None	0
DS, Pt 500	1
PL, Pt 500	2

Temperature sensor signal cable length, in metres (up to 5 m), example 1,5 m

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Notes:

1. * - marked numbers are used only for order numbering (it is not used for type number);
2. ** - with the exceptions of flow sensor q_p = 3,5 m^3/h (with triangular cross-section of the meter tube), q_p = 0,6 m^3/h and q_p = 1,0 m^3/h.
3. *** - flow sensor with triangular cross-section of the meter tube.

1.2 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 thermal energy meter NE1. User guide NCUTEMUSERGUIDE092019V02, 09-01-2020.

Other reference documents on which basis this certificate is issued, are stored in a file Nr.LEI-12-MP-097.20.

1.7 Integrated equipment and functions not subject to MID

Optical interface according to requirements of EN 62056-21 integrated in the meter.
Two pulse outputs. Class of pulse output device - OB in operating mode, OD in test mode according to EN 1434-2.
Two pulse inputs with programmable pulse value. Class of pulse input device – IB according to EN 1434-2.
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.

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 * — $\Delta\Theta$: 2 K** to 150 K or 3 K to 150 K.

Notes:

1. * - the lower limit of the temperature difference of the meter and connected temperature sensor pair must be the same.
2. ** - 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:

Table 1

End connections	Flow-rate, m³/h			Pressure loss at q_p, kPa	Overall length, mm
	Permanent q_p	Maximum q_s	Minimum q_i		
G¾	0,6	1,2	0,006	7	110
G1 or DN20	0,6	1,2	0,006	0,9	190
G¾	1,0	2,0	0,010	11,3	110
G1 or DN20	1,0	2,0	0,010	2,5	190
G¾	1,5	3,0	0,006	17,1	110
G1 or DN20	1,5	3,0	0,006	5,8	190
G¾	1,5	3,0	0,015	17,1	110
G1 or DN20	1,5	3,0	0,015	5,8	190
G1	1,5	3,0	0,015	7,2	130
G1	2,5	5,0	0,010	19,8	130
G1 or DN20	2,5	5,0	0,010	9,4	190
G1	2,5	5,0	0,025	19,8	130
G1 or DN20	2,5	5,0	0,025	9,4	190
G1 ¼ or DN25 or DN32	3,5	7,0	0,035	4***	260
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
G1 ¼ or DN25 or DN32	6,0	12,0	0,024	10	260
G1 ¼ or DN25 or DN32	6,0	12,0	0,060	10	260
G2 or DN40	10,0	20,0	0,040	18	300
G2 or DN40	10,0	20,0	0,100	18	300

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End connections	Flow-rate, m³/h			Pressure loss at q_p, kPa	Overall length, mm
	Permanent q_p	Maximum q_s	Minimum q_i		
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.

Temperature limits of heat-conveying liquid Θ_q: 5 °C to 130 °C.

3.1.3 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.

2.2 Other operating conditions

2.2.1 Maximum admissible working pressure

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

2.2.2 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 of the heat meter can be tested with cold water (25 ± 5) °C.

4.2 Requirements on putting into use

The heat meter NE1 must be installed in accordance with the requirements of technical description 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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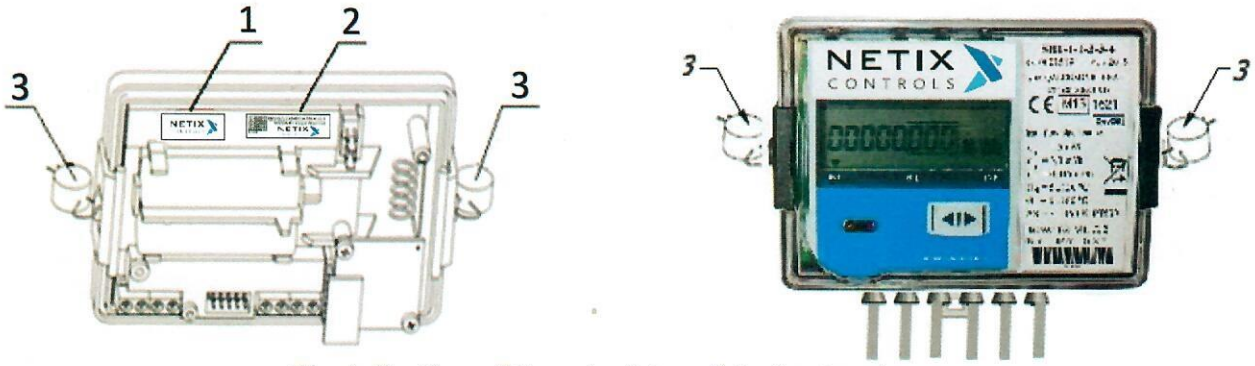
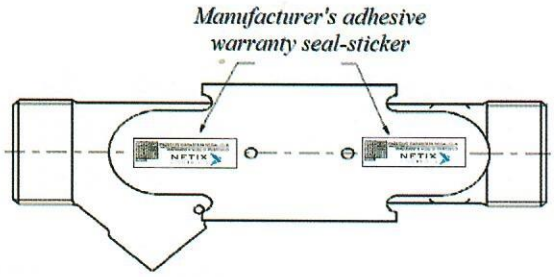


Fig.4. Sealing of the calculator of the heat meter

The following flow sensor sealing is provided:

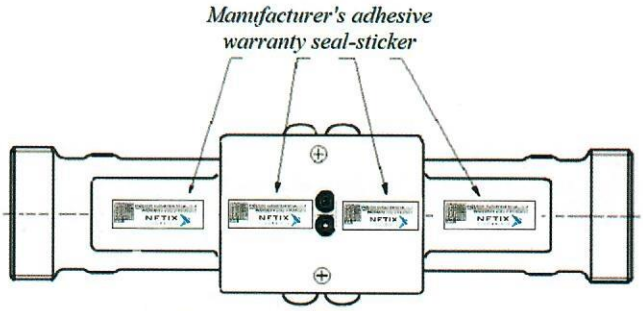
- the manufacturer's adhesive seal - sticker on the bolts of the cover (Fig.5).



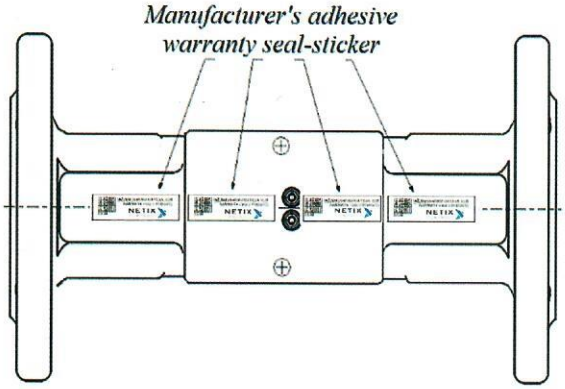
a) sealing of flow sensor q_p = 0,6/1,0/1,5/2,5 m³/h

b) sealing of flow sensor q_p = 3,5/6 m³/h (triangular cross-section of the meter tube)

c) sealing of flow sensor q_p = 3,5 m³/h (circular cross-section of the meter tube)



d) sealing of flow sensor q_p = 10 m³/h



e) sealing of flow sensor q_p = 15/25/40/60 m³/h

Fig.5. Sealing of flow sensor of the heat meter

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a) Manufacturer's adhesive seal-sticker

b) Manufacturer's adhesive warranty seal-sticker

Fig.6. Manufacturer's protective seals

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;
- 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

<table>
<tr><th>Issue</th><th>Date and reference №</th><th>Description</th></tr>
<tr><td>LT-1621-MI004-040</td><td>28-10-2019, No. LEI-12-MP-093.19</td><td>Type examination certificate first issued</td></tr>
<tr><td>LT-1621-MI004-040 Revision 1</td><td>28-02-2020, Nr. LEI-12-MP-097.20</td><td>1. The heat meter has been supplemented with the following modifications of the flow sensor with a triangular cross-section meter tube:
<table>
<tr><th rowspan="2">End connections</th><th colspan="3">Fow-rate, m³/h</th><th rowspan="2">Pressure loss at q_p, kPa</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>DN32</td><td>3,5</td><td>7,0</td><td>0,035</td><td>4</td><td>260</td></tr>
<tr><td>DN32</td><td>6,0</td><td>12,0</td><td>0,024</td><td>10</td><td>260</td></tr>
<tr><td>DN32</td><td>6,0</td><td>12,0</td><td>0,060</td><td>10</td><td>260</td></tr>
</table>
2. The heat meter has been supplemented with the following modifications of the flow sensor with a circular cross-section meter tube:
<table>
<tr><th rowspan="2">End connections</th><th colspan="3">Fow-rate, m³/h</th><th rowspan="2">Pressure loss at q_p, kPa</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>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>
3. The meter type number code has been changed.

4. The document NCUTEMUSERGUIDE092019V01, issued 10-2019, has been replaced by the document NCUTEMUSERGUIDE092019V02, issued 09-01-2020.</td></tr>
</table>