Applied harmonised standards: LST EN 1434:2007: part 1, 2, 4 and 5.

The measuring instrument must correspond with the following specifications:

1 Design of the instrument

1.1 Construction

Ultrasonic flow sensor SDU-1M is designed for measuring heat-conveying liquid flow-rate in heating systems and conversion it into electrical pulse signal. SDU-1M is used in conjunction with the heat energy calculator.

SDU-1M is microprocessor-based device that consists of the flow measuring section with the mounted ultrasonic transducers and of the electronic unit. The device is powered from 3.6 V lithium batteries or an external 3.6 V ± 0.2 V DC voltage source. Bodies of the flow sensors q_p =3,5/6/10/15 m³/h are made of brass, whereas ones of the flow sensors q_p = 25/40/60 m³/h are made of steel.

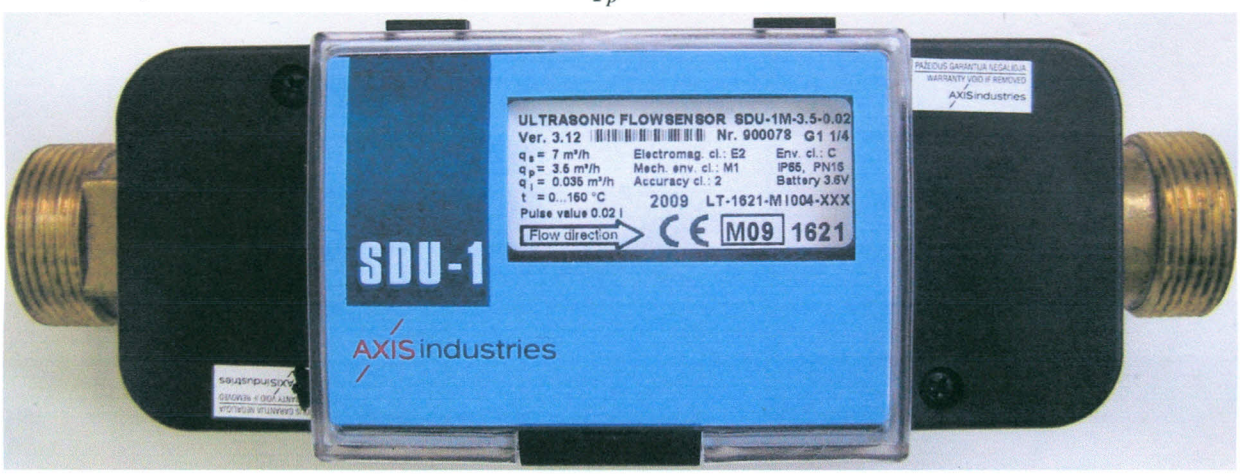


Fig.1. Flow sensor SDU-1M, q_p = 3,5/6 m³/h

Fig.2. Flow sensor SDU-1M, q_p = 10 m³/h

Fig.3. Flow sensor SDU-1M, q_p = 15 m³/h

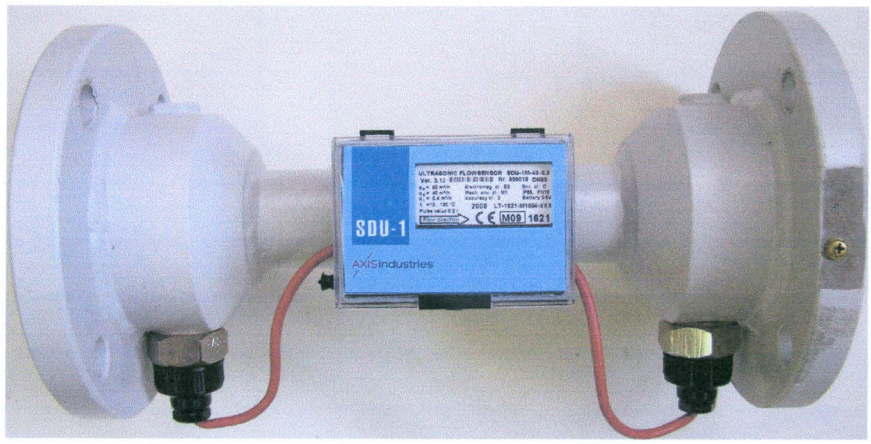


Fig. 4. Flow sensor SDU-1M, q_p = 25/40/60 m³/h

Type number combination of the flow sensor SDU-1M

Flow sensor SDU-1-M - □□ - □,□□ - □* - □□*

Type

Permanent flow-rate q_p, m³/h

Pulse value, l/pulse

Battery:
0- without built-in battery;1- with an internal battery

Pulse cable length:
01 - 3 m; 02 – 5 m; 03 – 10 m; 04 – 15 m; 05 – 20 m;
06 – 40 m; 07 – 60 m; 08 – 80 m; 09 – 100 m; 10 – 125 m;
11 – 150 m; 12 – 175 m; 13 – 200 m; 00 –without cable

Remark: * - marked numbers are used only for order coding (It is not used for sensor marking).

1.2 Sensor

The operating of the flow sensor is based on the ultrasonic flow measurement method.

1.3 Measurand processing

1.3.1 Hardware (technical equipment)

The hardware consists of the electronic unit and primary flow sensor. Volume measurement is made by means of bi directional ultrasonic technique according to the transit time method. Fluid volume is calculated according the formula:

$$V = K_H \times K_M \times (\frac{1}{t_+} - \frac{1}{t_-}) \times T;$$

where: V - measured fluid volume, m^3;
T – integration time, s;
t_+ - downstream ultrasonic pulse transition time, s;
t_- - upstream ultrasonic pulse transition time, s;
K_H – hydrodynamic coefficient;
K_M – geometrical coefficient.

Measured volume of heat-conveying liquid is converted into the pulses quantity that is transferred in output pulse terminal.

1.3.2 Software

Integrated software of flow sensor is identified by a unique version number **3.12**.
The number of software version is indicated on a device label.

1.4 Indication of the measurement results

Pulse output signal (l / pulse) is transferred to the heat meter calculator.

1.5 Optional equipment and functions subject to MID requirements

Not applicable.

1.6 Technical documentation

- Ultrasonic flow sensor SDU-1M. Technical description, operating instruction, passport PLSDU1M04MID, 2010 05 12;
- Ultrasonic flow sensor SDU-1M. Integrated software structure description PIASDU1MID, 2008 05 15.

Other reference documents on which basis this certificate is issued, are stored in a file LEI-12-MP-008-10.

1.7 Integrated equipment and functions not subject to MID

Not applicable.

2 Technical data

2.1 Rated operating condition

2.1.1 Measurand

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

2.1.2 Measurement range

The possible dimensions of flow sensor SDU-1M (depending on permanent flow and connection type of sensor) and to it corresponding minimum (q_i), permanent (q_p) and maximum (q_s) flow rates and pressure losses Δq_p at q =q_p are presented in Table 1:

Table 1

Permanent flow q_p, m³/h	Overall length, mm	Connection type	Flow-rate, m³/h			Pressure losses Δq_p, at q =q_p, MPa, not more, than
			q_i	q_p	q_s	
3,5	260	G 1¼	0,035	3,5	7,0	0,004
6,0	260	G 1¼	0,06	6,0	12,0	0,01
10,0	300	G 2	0,1	10,0	20,0	0,01
15,0	270	DN50	0,15	15,0	30,0	0,012
25,0	300	DN65	0,25	25,0	50,0	0,02
40,0	350	DN80	0,4	40,0	80,0	0,018
60,0	350	DN100	0,6	60,0	120,0	0,018

- Temperature limits of heat-conveying liquid: Θ_{min} .... Θ_{max} : 10....130 °C.

2.1.3 Accuracy class (maximum permissible error)

Accuracy class - 2.

Maximum permissible error:

$$E_f = \pm(2 + 0{,}02 q_p / q), \%;$$

where: q_p - permanent flow-rate, m³/h;
q - measured flow-rate, m³/h.

2.1.4 Environmental conditions/ Influence quantities

- Climatic environment : class C (ambient temperature +5°C .... +55°C);
- Mechanical environment : class M1;
- Electromagnetic environment : class E2.

2.2 Other operating conditions

2.2.1 Maximum admissible working pressure (class PN)

The maximum admissible working pressure of flow sensor is 1,6 MPa (PN16).

2.2.2 Mounting position of flow sensor

Flow sensor can be mounted in pipelines both vertically and horizontally.

2.2.3 Pulse values of volume on pulse output device

The pulse values of volume on pulse output device are specified in table 2:

Table 2

Permanent flow-rate q_p, m³/h	3,5	6	10	15	25	40	60
Pulse value, l/pulse	0,02	0,02	0,05	0,05	0,2	0,2	0,5

Other pulse value settings could be selected according user needs by ordering the flow sensor.

3 Interfaces and compatibility conditions

3.1 Compatibility conditions

The pulse output device of flow sensor is connected to terminals of the volume input device of the heat meter calculator. The volume pulse value of input pulse device of the calculator should correspond to value of output pulse of the flow sensor.

The two modes of output pulse transmission are possible. The output pulses can be selected by choosing the location of the jumper on corresponding contacts on the mounting plate:

- passive (open collector), pulse output device class OD. Pulse signal parameters:
  the drain supply voltage ranges U: + (3….24) V;
  the maximum drain current: 30 mA.
- active, pulse output device class OD. Pulse signal parameters:
  the voltage ranges during the pauses between pulse transmissions: +(3,0...3,6) V;
  the voltage ranges during the pulse transmission: +(0.....0,6) V.

4 Requirements on production, putting into use and utilization

4.1 Requirements on production

No special requirements identified.

4.2 Requirements on putting into use

The flow sensor must be installed and placed in use according to requirements of the document "Flow sensor SDU-1M. Technical description, operating instruction, passport PLSDU1M04MID".

Requirements for flow sensor installation in pipeline:

- For flow sensors with permanent flow rate q_p = 3,5 m³/h and q_p = 6 m³/h:
  - no requirements for straight pipeline length in upstream and downstream directions;
- For flow sensors with permanent flow rate q_p > 6 m³/h:
  - upstream straight pipeline length must be not less 5DN and downstream straight pipeline length must be not less 3DN when flow disturbance is elbow type (1 or 2 elbows);
  - upstream straight pipeline length must be not less 10DN and downstream straight pipeline length must be not less 3DN when flow disturbance is valve, pump or other.

Initial verification tests of flow sensors can be carried out with cold water (25 ± 5) °C

4.3 Requirements for utilization
No special requirements identified.

5 Control of the measuring tasks of the instrument in use

5.1 Documentation of the procedure
Not applicable.

5.2 Special equipment or software
Not applicable.

5.3 Identification of hardware and software
Not applicable.

5.4 Calibration-adjustment procedure
The adjustment of flow sensor according to the description of integrated software PIASDU1MID.

6 Security measures

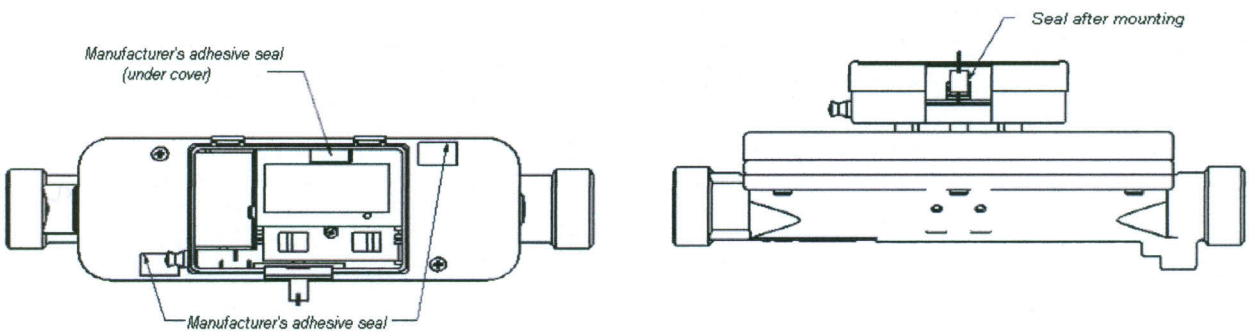
6.1 Sealing

The following flow sensor sealing is provided:
Manufacturer's seals:

- the adhesive seal -sticker on the bolts of cover protecting ultrasonic transducers (see Fig.5[a], Fig.6[a], Fig.7[a], Fig.9. [a]);
- the hanged seal on ultrasonic transducers (see Fig.8 and Fig.9[b]);.
- the adhesive seal –sticker on the inner cover inside electronic box (see Figures 5;6;7;8 [a] and Fig.9 [c]);

Mounting seal:

- Seal on the bolt on top cover of the electronic box (see Figures 5;6;7;8[b]);



a) b)

Fig.5. Sealing of flow sensor SDU-1M, q_p = 3,5/6 m³/h

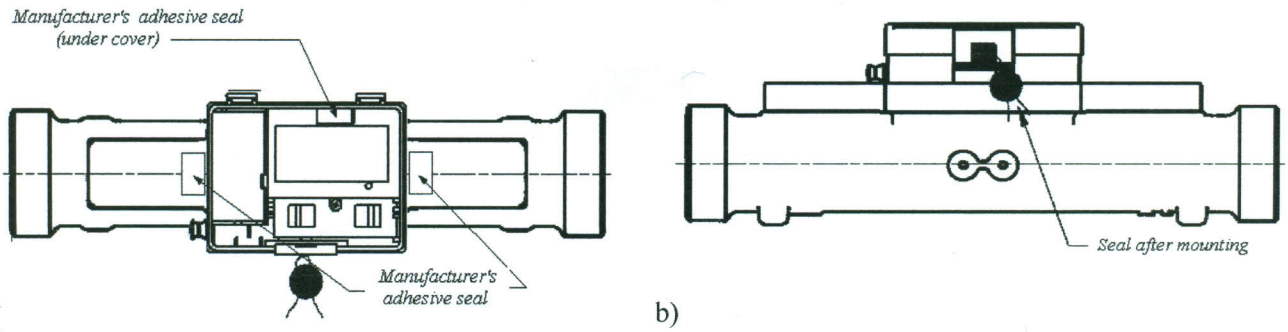


Fig.6. Sealing of flow sensor SDU-1M, q_p = 10 m³/h

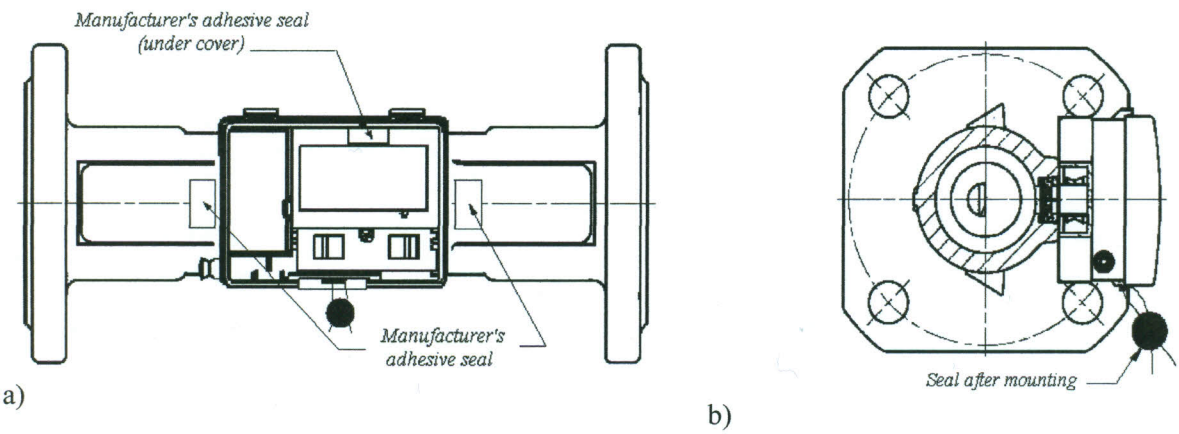


Fig.7. Sealing of flow sensor SDU-1M, q_p =15 m³/h

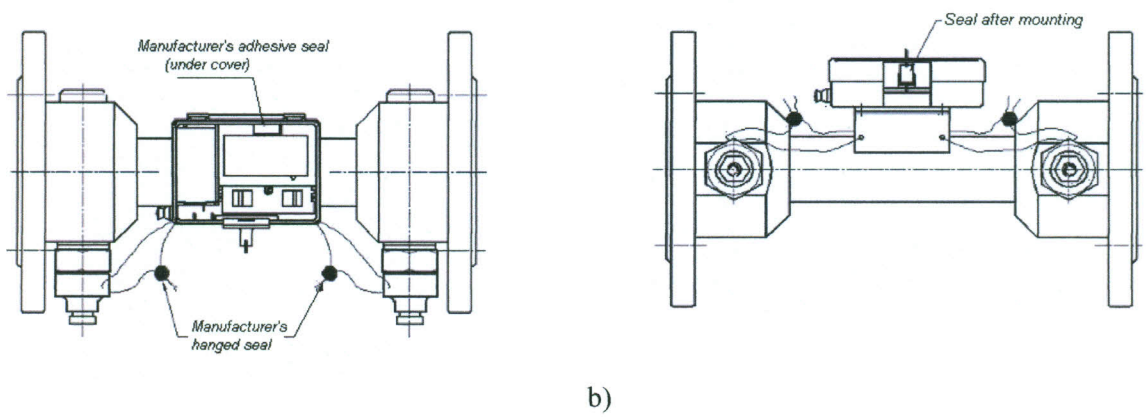
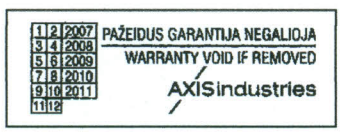


Fig.8. Sealing of flow sensor SDU-1M, q_p =25/40/60 m³/h



a) Manufacturer's warranty seal – adhesive sticker

b) Manufacturer's hanged seal

c) Manufacturer's seal – adhesive sticker

Fig.9. Examples of security seals

6.2 Data loggers
Not applicable.

7 Labelling and inscriptions

7.1 Information to be borne by and to accompany the measuring instrument
On the flow sensor housing and / or the type label shall contain at least the following information:
- number of EC-type examination certificate;
- manufacturer's name or logo;
- identity marking (type designation and type number);
- year of manufacture, serial number;
- meter factor (pulse value of volume);
- limits of temperature (Θ_{min} and Θ_{max});
- limits of flow-rate: maximum q_s, permanent q_p and minimum q_i;
- arrow to indicate the direction of the flow;
- the maximum admissible working pressure (PN class);
- the accuracy class;
- climatic environment;
- electromagnetic environment;
- mechanical environment;
- voltage level for external power supply.

7.2 Conformity marking
In addition, the label of flow sensor should contain the following marking:
- symbol "CE";
- metrology mark "M" and the last two digits of 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 No.	Date	Description
LT-1621-MI004-003	17th July 2009	Type examination certificate first issued
LT-1621-MI004-003 Revision 1	18th October 2010	- section 1.1 of the Appendix is extended; - fig.2 and fig.3 of the Appendix are replaced; - text of section 1.6 of the Appendix is replaced; - text of section 4.2 of the Appendix is replaced; - text of section 6.1 of the Appendix is replaced; - fig.6 and fig.7 of the Appendix are replaced.