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LST EN ISO 4064-1:2017;
LST EN ISO 4064-2:2017;
LST EN ISO 4064-4:2014;
LST EN ISO 4064-5:2017;
OIML R 49-1:2013;
OIML R 49-2:2013;
WELMEC 7.2:2015.

The measuring instrument shall meet the following specifications:

1 Design of the instrument

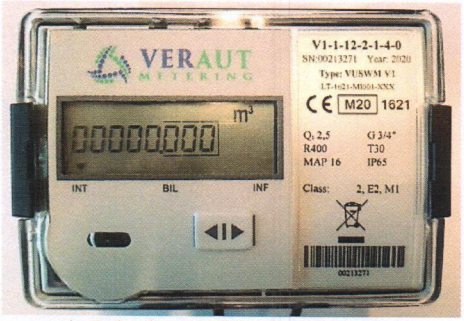
1.1 Construction

Ultrasonic water meter VUSWM V1 consists of the primary flow sensor and calculator.
The meter is available in two modifications: meter with protection class IP65 and meter with protection class IP68. Calculator of the meter with protection class IP65 can be mounted directly on the flow sensor or separately. Calculator of the meter with protection class IP68 is inseparably mounted to the flow sensor (integral construction).
The flow sensor consists of brass body with built-in ultrasonic transducers. The flow sensor, which nominal diameter is from DN65 up to DN100, body may be made either from brass (cast) or steel (welded construction).
The flow sensor of the meter with protection class IP65 is inseparably connected with the calculator via 1,2 m length screened cable (2,5 m or 5 m – optional). For welded construction flow sensors two cables are used.
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.

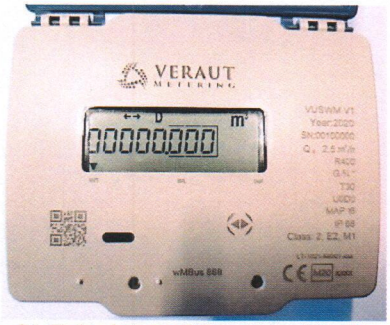
a) Water meter (IP65)

b) Water meter (IP68)

Fig.1. Water meter VUSWM V1



a) Calculator of the meter (IP65)



b) Calculator of the meter (IP68)

Fig.2. Calculator of the water meter VUSWM V1

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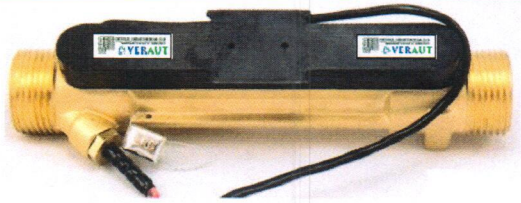
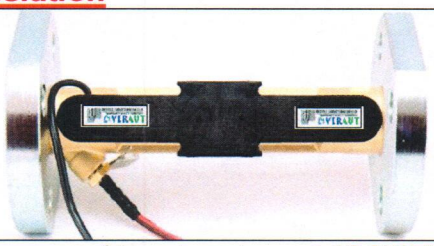
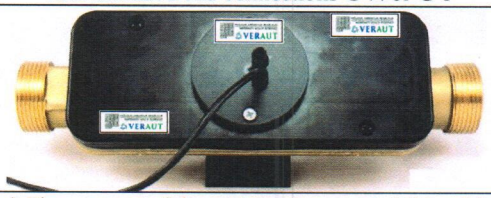


a) Flow sensor of the water meter q_p = 1,6/2,5/4/6,3 m³/h with threaded end connections G ¾ or G 1

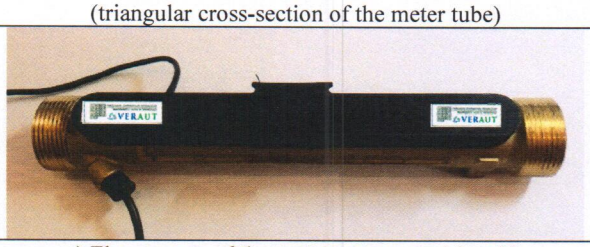


b) Flow sensor of the water meter q_p = 1,6/2,5/4/6,3 m³/h with flanged end connections DN20

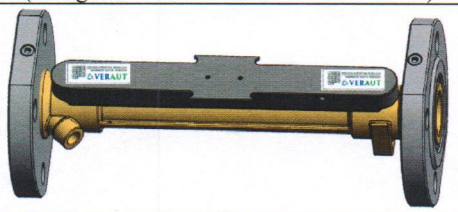


c) Flow sensor of the water meter q_p = 6,3/10 m³/h with threaded end connections G 1¼ or G 1½ (triangular cross-section of the meter tube)

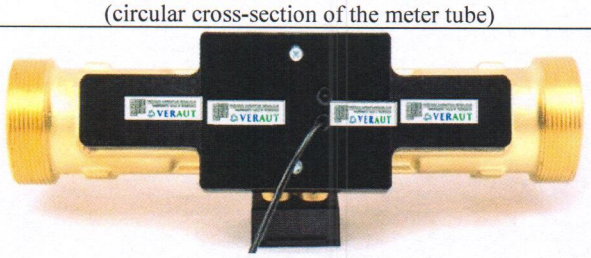
d) Flow sensor of the water meter q_p = 6,3/10 m³/h with flanged end connections DN25 or DN32 (triangular cross-section of the meter tube)



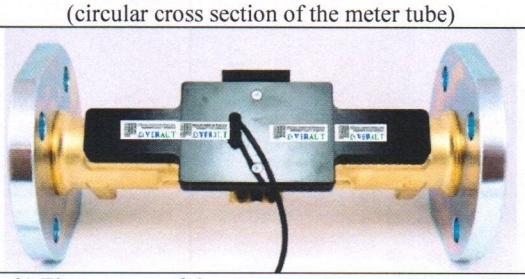
e) Flow sensor of the water meter q_p = 6,3 m³/h with threaded end connections G 1¼ or G 1½ (circular cross-section of the meter tube)



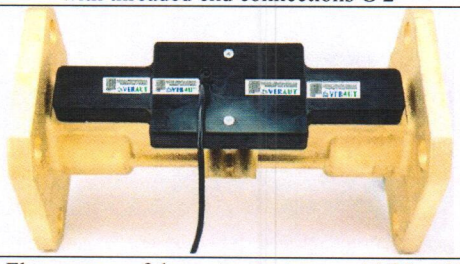
f) Flow sensor of the water meter q_p = 6,3 m³/h with flanged end connections DN25 or DN32 (circular cross section of the meter tube)



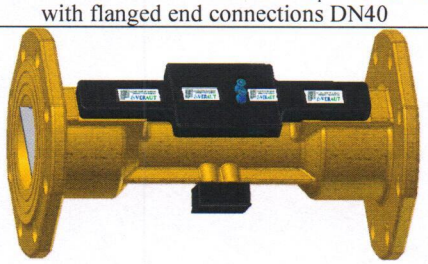
g) Flow sensor of the water meter q_p = 10/16 m³/h with threaded end connections G 2



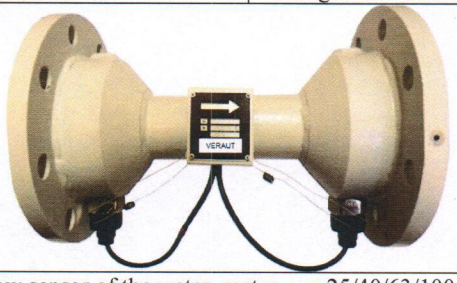
h) Flow sensor of the water meter q_p = 10/16 m³/h with flanged end connections DN40



i) Flow sensor of the water meter q_p = 16/25 m³/h with flanged end connections DN50



j) Flow sensor of the water meter q_p = 25/40/63/100 m³/h with flanged end connections (DN65/DN80/DN100), brass body



k) Flow sensor of the water meter q_p = 25/40/63/100 m³/h with flanged end connections (DN65/DN80/DN100), steel body

Fig.3. Flow sensor of the water meter VUSWM V1

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Structure of type number of the meter VUSWM V1 (protection class IP65)*

Type: **V1** □ – □□ - □ - □ - □ - □

Meter temperature class	Code
T30	1
T30/90	2
T90	3

End connections and overall length (L):	Code	End connections and overall length (L):	Code
G ¾ L = 105 mm	11	DN25 L = 260 mm	52
G ¾ L = 110 mm	01	DN32 L = 260 mm**	53
G ¾ L = 165 mm	02	DN32 L = 260 mm	54
G 1 L = 105 mm	12	DN40 L = 300 mm	6F
G 1 L = 110 mm	13	DN50 L = 270 mm	07
G 1 L = 130 mm	03	DN65 L = 300 mm (brass body)	08
G 1 L = 190 mm	04	DN65 L = 300 mm (steel body)	8S
G 1¼ L = 260 mm**	05	DN80 L = 350 mm (brass body)	09
G 1¼ L = 260 mm	51	DN80 L = 350 mm (steel body)	9S
G 1½ L = 260 mm**	55	DN80 L = 300 mm (brass body)	19
G 2 L = 300 mm	06	DN100 L = 350 mm (brass body)	10
DN20 L = 190 mm	4F	DN100 L = 350 mm (steel body)	1S
DN25 L = 260 mm**	5F	DN100 L = 360 mm (brass body)	20

Permanent flow rate Q_3, m³/h	Code
1,6	1
2,5	2
4	3
6,3	4
10	5
16	6
25	7
40	8
63	9
100	0

The ratio Q_3/Q_1:	Code
R 250	1
R 400	2

Communication module:	Code
None	0
M-Bus	1
CL	2
868 MHz RF	4
MODBUS RS485	5
LON	6
MiniBus	7
BacNet	8

Temperature measurement function:	Code
No	0
Yes	1

Notes:

1. * – type number code on the label is marked only for meter with protection class IP65. For meter with protection class IP68 code is used only for order coding (order code combination is presented in technical description VUSWM/V1/IP68).
2. ** – flow sensor of the meter with pressure-loss class Δp 40.

1.2 Sensor
Ultrasonic flow sensor.

1.3 Measurement value processing
The calculator calculates the volume of water passing through the flow sensor by integrating the measured flowrate over time.

1.4 Indication of the measurement results
Measured volume of water is indicated on the 8-line LCD indicator.
Indication in operating mode : m^3, three digits after decimal point.
Indication in TEST mode : m^3, six digits after decimal point.

1.5 Optional equipment and functions subject to MID requirements
None.

1.6 Technical documentation
Ultrasonic water meter VUSWM IP65 V1 (IP65) – Technical description & user manual: VUSWM/V1/IP65, 01-09-2019.
Ultrasonic water meter VUSWM V1 (IP68) – Technical description & user manual: VUSWM/V1/IP68, 01-09-2019.

Other reference documents on which basis this certificate is issued, are stored in a file Nr.LEI-12-MP-109.20.

1.7 Integrated equipment and functions not subject to MID
Optical interface according to requirements of EN 62056-21 integrated in the meter. For meter with protection class IP65 the optical interface is intended for data reading via M-Bus protocol and for meter parameters setting. For meter with protection class IP68 the optical interface is additionally intended for verification mode (TEST) control, and viewing the parameters on the meter LCD indicator is controlled by magnet (magnetically operated switch).
Two pulse inputs with programmable pulse value intended for connecting additional water meters: maximum pulse frequency - 3 Hz, maximum voltage level – 3,6 V.
Two open collector type pulse outputs: maximum current level – 20 mA, maximum voltage level – 50 V.

The meter can be 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.

Resistance temperature sensor Pt 500 can be connected to the water meter calculator for temperature measurement. Cable length of the sensor – up to 5 m, wiring of sensor – 2-wire. In this case the meter must have an additional temperature measurement function (optional).
The flow sensor body with end connections from G ¾ to G 1¼ and from DN20 to DN25 has intended place for temperature sensor installation.

2 Technical data

2.1 Rated operating conditions

2.1.1 Measurand

The volume of water passing through the meter, indicated on the LCD indicator.

2.1.2 Measurement range

The measuring range of the water meter VUSWM V1 and other technical characteristics are presented in table 1:

Table 1

Flowrate, m³/h				The ratio R, Q_3/Q_1	End connections	Overall length L, mm	Pressure loss class
Permanent Q_3	Overload Q_4	Minimum Q_1	Transitional Q_2				
1,6	2,0	0,0064	0,010	250	G ¾	105	Δp 63/Δp 25*
					G ¾	110	Δp 63/Δp 25*
					G ¾	165	Δp 63/Δp 25*
					G 1	105	Δp 63/Δp 25*
					G 1	110	Δp 63/Δp 25*
					G 1	190	Δp 25
					DN20	190	Δp 25
2,5	3,125	0,010	0,016	250	G ¾	105	Δp 63
					G ¾	110	Δp 63
					G ¾	165	Δp 63
					G 1	105	Δp 63
					G 1	110	Δp 63
					G 1	190	Δp 25
					DN20	190	Δp 25
					G 1	130	Δp 25
2,5	3,125	0,0063	0,010	400	G ¾	105	Δp 63
					G ¾	110	Δp 63
					G ¾	165	Δp 63
					G 1	105	Δp 63
					G 1	110	Δp 63
					G 1	190	Δp 25
					DN20	190	Δp 25
4,0	5,0	0,016	0,026	250	G 1	190	Δp 63/Δp 25*
					DN20	190	Δp 63/Δp 25*
					G 1	130	Δp 63
4,0	5,0	0,010	0,016	400	G 1	130	Δp 63
					G 1	190	Δp 63/Δp 25*
					DN20	190	Δp 63/Δp 25*
6,3	7,875	0,0252	0,040	250	G 1	190	Δp 63
					DN20	190	Δp 63
					G 1¼	260	Δp 25/Δp 40**
					DN25	260	Δp 25/Δp 40**
					G 1½	260	Δp 25/Δp 40**
					DN32	260	Δp 25/Δp 40**

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Flowrate, m³/h				The ratio R, Q_3/Q_1	End connections	Overall length L, mm	Pressure loss class
Permanent Q_3	Overload Q_4	Minimum Q_1	Transitional Q_2				
6,3	7,875	0,016	0,026	400	G 1	190	Δp 63
					DN20	190	Δp 63
					G 1¼	260	Δp 25/Δp 40**
					DN25	260	Δp 25/Δp 40**
					G 1½	260	Δp25/Δp 40**
					DN32	260	Δp 25/Δp 40**
10,0	12,5	0,04	0,064	250	G 1¼	260	Δp 63
					DN25	260	Δp 63
					G 2	300	Δp 25
					DN40	300	Δp 25
10,0	12,5	0,025	0,040	400	G 1¼	260	Δp 63
					DN25	260	Δp 63
16,0	20,0	0,064	0,100	250	G2	300	Δp 63
					DN40	300	Δp 63
					DN50	270	Δp 25
16,0	20,0	0,040	0,064	400	G 2	300	Δp 63
					DN40	300	Δp 63
25,0	31,25	0,100	0,160	250	DN50	270	Δp 63
					DN65	300	Δp 25
25,0	31,25	0,063	0,100	400	DN50	270	Δp 63
40,0	50,0	0,160	0,260	250	DN65	300	Δp 63
					DN80	300	Δp 25
					DN80	350	Δp 25
40,0	50,0	0,100	0,160	400	DN65	300	Δp 63
63,0	78,75	0,252	0,400	250	DN80	300	Δp 63
					DN80	350	Δp 63
					DN100	350	Δp 25
					DN100	360	Δp 25
63,0	78,75	0,160	0,260	400	DN80	300	Δp 63
					DN80	350	Δp 63
100,0	125,0	0,400	0,640	250	DN100	350	Δp 63
					DN100	360	Δp 63
100,0	125,0	0,250	0,400	400	DN100	350	Δp 63
					DN100	360	Δp 63

Notes:

1. * – depending on the meter tube diameter pressure loss class can be Δp 63 or Δp 25.
2. ** – depending on the meter tube, the pressure loss class can be Δp 25 (triangular cross-section of the meter tube) or Δp 40 (circular cross-section of the meter tube).

2.1.3 Meter temperature classes and maximum permissible error

Meter temperature classes and maximum permissible error are presented in table 2:

Table 2

Meter temperature class	Water temperature ranges	Maximum permissible error
T30	between 0,1 °C and 30 °C	± 5 % in flow range $Q_1 \leq Q < Q_2$ ± 2 % in flow range $Q_2 \leq Q \leq Q_4$
T30/90	between 30 °C and 90°C	± 5 % in flow range $Q_1 \leq Q < Q_2$ ± 3 % in flow range $Q_2 \leq Q \leq Q_4$
T90	between 0,1 °C and 90 °C	± 5 % in flow range $Q_1 \leq Q < Q_2$ ± 2 % in flow range $Q_2 \leq Q \leq Q_4$ (for water temperature between 0,1 °C and 30 °C) ± 3 % in flow range $Q_2 \leq Q \leq Q_4$ (for water temperature between 30 °C and 90 °C)

2.1.4 Environmental conditions / Influence quantities

Climatic class : B according to EN ISO 4064-1;
Ambient temperature : 5 °C to 70 °C;
Humidity level : condensing;
Installations : indoor;
Mechanical environment : class M1;
Electromagnetic environment : class E2;
Protection class : IP65 or IP68.

2.2 Other operating conditions

2.2.1 Maximum admissible working pressure

The maximum admissible working pressure of water meter is 1,6 MPa (MAP 16) or 2,5 MPa (MAP 25).

2.2.2 Mounting position of the flow sensor of the heat meter

Water meter can be mounted either horizontally, vertically or inclined.

3 Interfaces and compatibility conditions

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 water meters shall be tested according to the requirements of the EN ISO 4064-2, section 10.1. Errors of water meters shall not exceed the maximum permissible errors, described in Annex III (MI-001) of the Directive 2014/32/EU.
The meters shall be tested within each of the following flowrates:

between Q_1 and $1{,}1Q_1$;
between Q_2 and $1{,}1Q_2$;
between $0{,}9Q_3$ and Q_3.

For meters class T30: water temperature of tests 20 °C ± 10 °C.
For meters class T30/90: water temperature of tests is 50 °C ± 10 °C.
For meters class T90: water temperature of tests 20 °C ± 10 °C and 50 °C ± 10 °C.

4.2 Requirements on putting into use

The water meter VUSWM V1 must be installed in accordance with the requirements of technical descriptions listed in section 1.6.

For water meters with nominal diameter DN65 to DN100 necessary straight pipelines lengths are: upstream $\geq 5 \times$ DN, downstream $\geq 3 \times$ DN (flow profile sensitivity class U5 D3).

For water meters of other sizes the straight pipelines installation in upstream and downstream the meter are not necessary (flow profile sensitivity class U0 D0).

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

For meter with protection class IP65 no special requirements identified.

For meter with protection class IP68 the following equipment is required:

- optical reading head according to standard EN 62056-21;
- service software **QALCOSONIC HEAT 1 v01r150**.

5.3 Identification of hardware and software

Identification of hardware:

- see Fig. 1, Fig. 2, 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 **0.08**. This number on demand can be shown on the display.

5.4 Calibration-adjustment procedure

5.4.1 Test instruction for meter with protection class IP65

Water meter errors determination test shall be carried out when verification mode (TEST) is activated as described in section 6.4 of the technical description VUSWM/V1/IP65. Two middle contacts in the terminal block under calculator cover have to be closed using the jumper (Fig. 4).

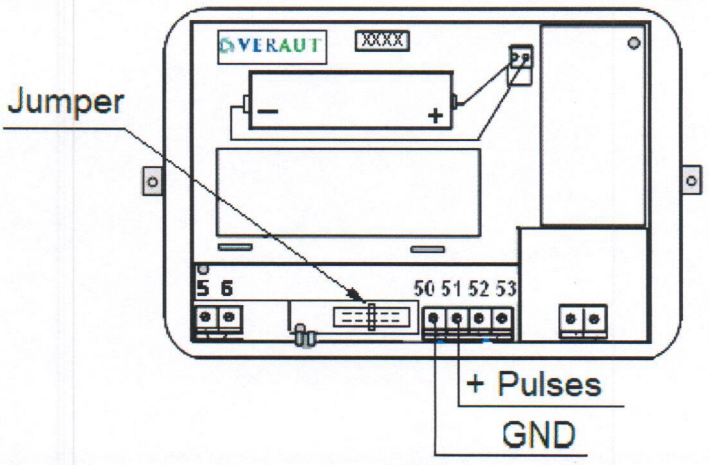

Fig. 4. Activation of the verification mode

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The measuring errors of the water meter are determined at three flowrates appointed in section 4.1 of the present appendix. Pulse output of the meter is used (terminals 50 and 51), or the meter volume indication can be read directly from meter's LCD (verification scale interval in verification mode (TEST) – 1 ml).
The volume pulse value in verification mode (TEST) is presented in table 3.

Table 3

Permanent flowrate Q_3 of the meter, m³/h	Volume pulse value in verification mode (TEST), litre/pulse
1,6	0,002
2,5	0,004
4	0,005
6,3; 10	0,02
16; 25; 40	0,05
63; 100	0,2

5.4.2 Test instruction for meter with protection class IP68

5.4.2.1 Activation of the verification (TEST) mode

Using an optical head and **QALCOSONIC HEAT 1 v01r150** software the meters verification mode (TEST) is activated. Optical head should be connected to the computer COM interface.
After opening the program startup window („**Actual**") computer port number (to which optical head is connected) is entered in the field „**Port**". Click button **„Open Port"**. Briefly place the magnet on the meter calculator (on the area marced with symbol). The optical head is placed on the meter.
Select menu item „**Testing**" and click button **„USER Test On/Off"** in the new window. If the operation succeeded, the additional window on the computer display appears with note „**Operation done**" and inscription **"TEST"** appears on the meter display.

5.4.2.2 Meter errors determination test

The measuring errors of the meter are determined at three flowrates appointed in section 4.1 of the present appendix. Optical pulse output of the meter is used (Fig. 5), or the meter volume indication can be read directly from meter's LCD (verification scale interval in verification mode – 1 ml).
The volume pulse value in verification mode (TEST) is presented in table 3.

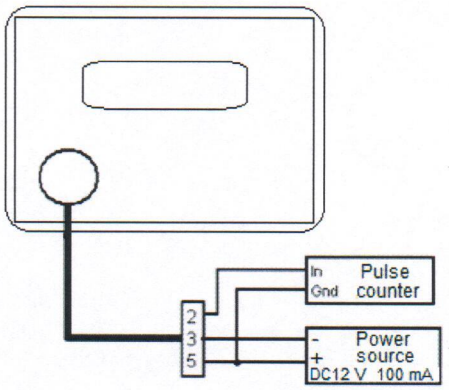


Fig. 5. Connection diagram for the meter errors determination test

6 Security measures

6.1 Sealing

The following water meter calculator sealing is provided:

- manufacturer's adhesive seal - sticker on the access to the adjustment activation jumper (Fig.6, pos.1) and on the fixer of the cover protecting electronics wiring plate (Fig.6, pos.2);
- after installation the case and cover of the calculator (Fig.6, pos.3) are sealed with two hanged seals of water supplier.

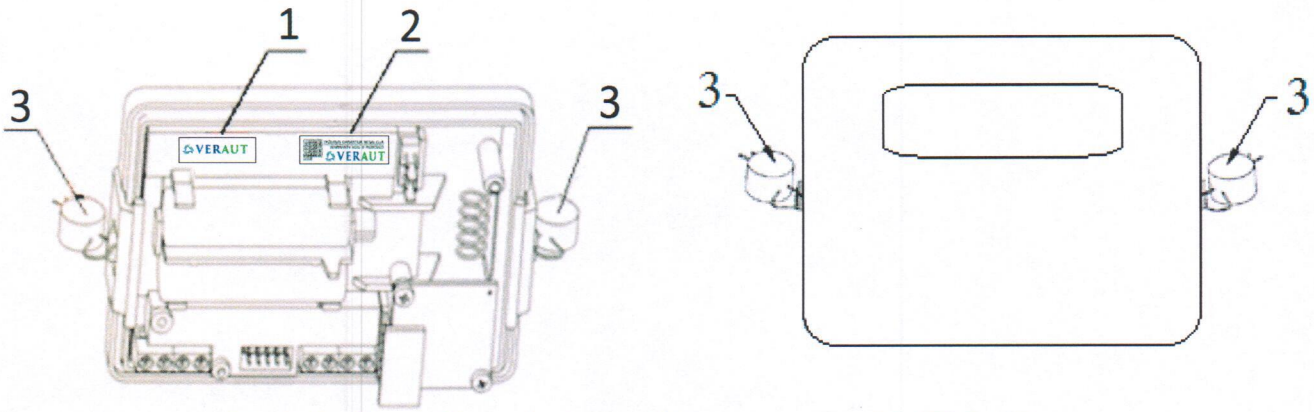
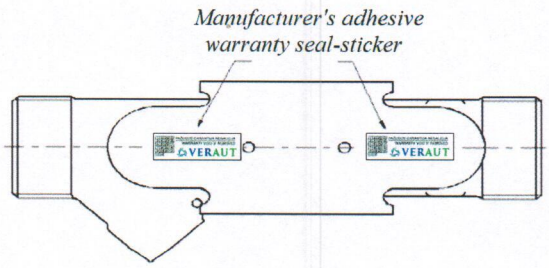


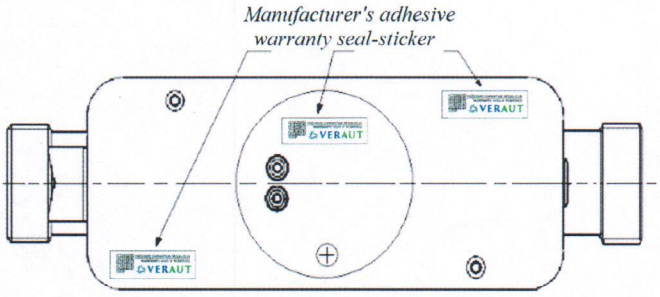
Fig.6. Sealing of the calculator of the water meter VUSWM V1

The following flow sensor sealing is provided:

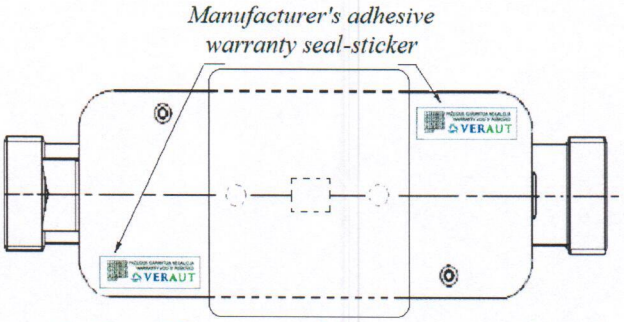
- manufacturer's adhesive seal - sticker on the bolts of the cover (Fig.7 a, b, c, d, e, f);
- manufacturer's hanged seals on ultrasonic transducers by steel body (Fig.7 g);



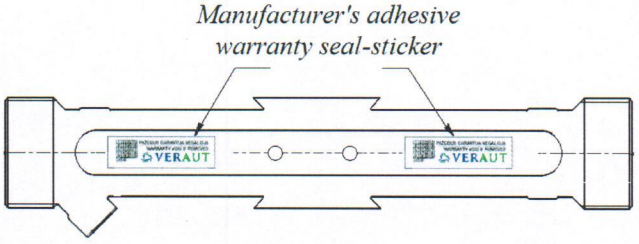
a) Sealing of flow sensor of the water meter with end connections G¾, G1, DN20 (IP65 and IP68)



b) Sealing of flow sensor of the water meter with end connections G1¼, G1½, DN25, DN32 (IP65, triangular cross-section of the meter tube)



c) Sealing of flow sensor of the water meter with end connections G1¼, G1½, DN25, DN32 (IP68, triangular cross-section of the meter tube)



d) Sealing of flow sensor of the water meter with end connections G1¼, G1½, DN25, DN32 (IP65 and IP68, circular cross-section of the meter tube)

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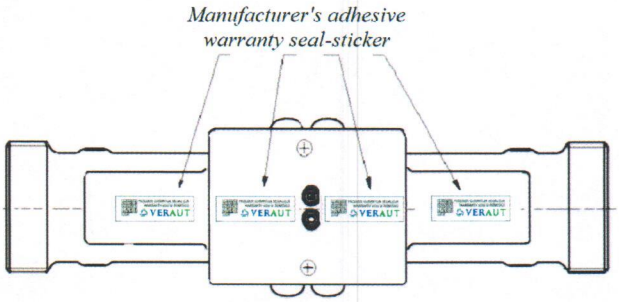
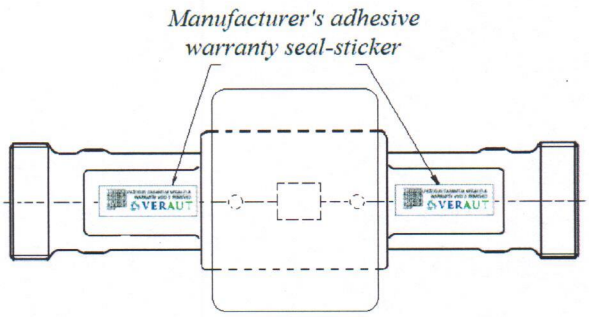
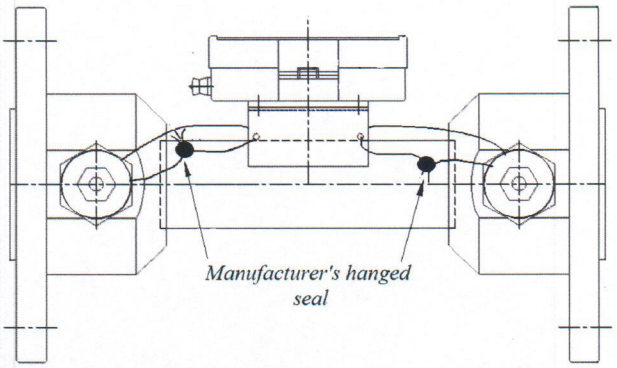


e) Sealing of flow sensor of the water meter with end connections G2; DN40; DN50; DN65; DN80; DN100 (IP65)

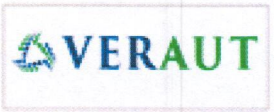


f) Sealing of flow sensor of the water meter with end connections G2; DN40; DN50; DN65; DN80; DN100 (IP68)



g) Sealing of flow sensor of the water meter with end connections DN65; DN80; DN100(steel body, IP65 and IP68)

Fig. 7. Sealing of flow sensor of the water meter



a) Manufacturer's adhesive seal-sticker

b) Manufacturer's adhesive warranty seal-sticker

Fig.8. Manufacturer's protective seals

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 water meter calculator casing and his label:

- EU-type examination certificate number;
- manufacturer's mark or name;
- distributor's logo (if applicable);
- type and type number (type number is used only for meter with protection class IP65);
- year of manufacture and serial number;
- unit of measurement: m³ (on LCD display);
- permanent flowrate Q_3;
- the ratio Q_3/Q_1, preceded by „R";

- the temperature class, where it differs from T30;
- the maximum admissible working pressure;
- pressure loss class, where it differs from Δp 63;
- end connections of the flow sensor;
- electromagnetic class;
- mechanical class;
- voltage level for external power supply;
- IP code.

Additional metal label is attached to the steel body of the meter DN65/DN80/DN100 flow sensor. On the label is the following information:

- nominal diameter DN of the meter;
- 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 water 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 No.	Description
LT-1621-MI001-045	29-10-2020, Nr. LEI-12-MP-109.20	Type examination certificate first issued