ВЫМПЕЛ
Научно-производственное объединение

All-Russian Product Classifier 2 26.51.53.140

MOISTURE ANALYZER

FAS-W

Operating Manual
VMPL2.848.008 RE

Dedovsk 2017

Introduction

Thank you for your interest in Vympel products.

We hope that the device you have purchased will prove to be long-lasting and reliable. Certain usage and maintenance rules should be observed, which is why we recommend that you read these instructions carefully.

If you have any queries or problems related to our products, please contact:

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The manufacturer reserves the right to make changes to the device's design that do not impair its consumer properties.

Contents

1 Description and operation

1.1 Application

Moisture analyzer FAS-W VMPL2.848.008 (hereinafter referred to as the analyzer, the device) is an automatic condensation hygrometer operating on the chilled mirror principle. The device is intended to automatically measure gas humidity at gas metering stations and in technological processes that require monitoring of gas quality parameters.

1.2 Technical specifications

The device's key technical specifications are shown in Table 1.

Table 1

Parameter		Parameter value		
		Design A	**Design B**	**Design C**
Dew point temperature measurement range (metrological), °C	Range I	-30...+60	—	-30...+60
	Range II	-80[1)]...+20	—	-80[1)]...+20
	Range III	-65...+30	—	-65...+30
Volumetric moisture fraction measurement range (metrological), mln^{-1}	Range I	—	$0.5…200·10^3$	$0.5…200·10^3$
	Range II	—	$0.5…20·10^3$	$0.5…20·10^3$
	Range III	—	$0.5…450·10^3$	—
Limits of dew point temperature absolute measurement error, °C, max.	In the range of +60...-30 °C	±1.5		
	In the range of -30...-65 °C	±2.0		
	In the range of -65...-80[1)] °C	±3.0		
The thresholds of relative error within the range of 0.5…100 mln^{-1}, %, max.		±10		
The thresholds of relative error within the range of 100…$450·10^3$ mln^{-1}, %, max.		±5		

Table continued 1

Specified error of the measured value transformation into the output signal 4 - 20 mA, %, max.		0.3
Duration of measurement cycle, min.		From 5 to 15
Characteristics of gas samples		
Maximum pressure of the measured medium, MPa, max.		10
Gas temperature, °C		-20...+80
Device specifications		
Electrical connection		Cable 4x1.5 mm^2 with outer diameter from 5 to 10 mm
Emergency switch load-carrying capacity (alarm, 2 pcs.)		0.6 A at 125 VAC, 2 A at 30 VDC
Materials in contact with the measured gas		Stainless steel, fluoroplastics, glass, silicon
Gas flow rate, dm^3/min		From 0.2 to 2
Explosion protection marking		1 Ex d IIC T5 X
Enclosure protection rating		IP67
Installation		In a heated box/room (explosion-hazard area)
Output signals	Alarm	2 "open collector" type outputs [2]
	Digital	RS485 /Modbus protocol/ RTU, insulation breakdown 500 V
	Analog (active)	Output (4–20) mA, load 400 Ohm (max), insulation breakdown 500 V
Power supply voltage, V		20 - 27
Power consumption, W, max.		15
Weight and dimensions:		
Device weight, kg, max.		4
Weight of the power supply DR-60-24, kg, max.		0.69
Analyzer overall dimensions, mm, max.		185x120x135
Overall dimensions of the power supply DR-60-24, kg, max.		80x90x60
Operating conditions		
Ambient temperature for normal operation of the device, °C		- 40...+70 [3)]
Device storage temperature, °C		Min. -60

Table continued 1

Relative air humidity at a temperature of +35 °C or lower without condensation (away from direct contact with precipitation), %, max.	98
Atmospheric pressure, kPa	From 84 to 106.7 (from 630 to 800 mm Hg)
Distance from the device to the power supply unit, m, max.	1000 [4)]
Average service life, years	10 [5)]

[1)] When using the additional cooling for the device body.
[2)] Factory setting according to the customer's requirements specified in the datasheet.
[3)] The temperature of the device and of a sampling line should be at least 5°C above the temperature of possible condensation. In the explosive area, the ambient temperature should not exceed +60°C.
[4)] Total resistance of the cable cores designed for the device power supply is max. 2.5 Ohm.
[5)] Service life of the primary transducer (in the device) is min. 3 years.

Note — Constant magnetic fields or alternating fields of industrial frequency with the voltage of more than 40 A/m should be absent.

1.3 Analyzer composition

Analyzer composition is provided in Table 2.

Table 2

Designation	Description	Qty	Note
	Basic set:		
VMPL2.848.008	The moisture analyzer FAS-W is included with the following additional equipment and accessories:	1	
KRAU8.046.155	Cover	1	For analyzer transportation
VMPL8.054.011	Cover	1	For the gas supply line
KRAU8.331.003	Wrench for covers	1	
	Cotton swabs for mirror cleaning	1	(pack of 50 pcs.)
	DR-60-24 power supply	1	
1.622.1600.50	Cable entry	2	Additional cable entries
1.325.1600.50	O-ring	2	For installation of additional cable entries

Table continued 2

Operational documentation			
VMPL2.848.008 RE	Moisture analyzer FAS-W. Operating Manual	1	
VMPL2.848.008 MP	Moisture analyzer FAS-W. Calibration method	1	
VMPL2.848.008 FO	Moisture analyzer FAS-W. Record sheet	1	
	Calibration certificate	1	
Special-order equipment			
	Interface converter RS485/RS232/USB to connect the analyzer to the process computer.		
	Thermal cover for installation of the analyzer directly on the pipeline		
	External dew point indication unit for the volumetric moisture fraction		
	Absolute pressure detector in explosion proof enclosure.		
	Submerged gas supply line for installation of the analyzer directly on the gas pipeline		

Note — When ordering the moisture analyzer FAS-W together with the gas preparation system, the analyzer is delivered already mounted on the system.

1.4 Arrangement and function

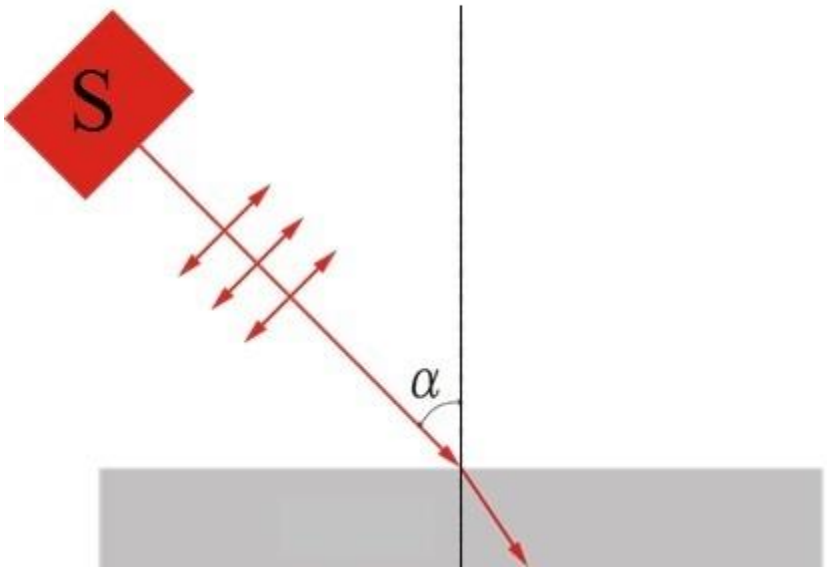
1.4.1 Operation principle

The device uses the optical condensation method for measuring the dew point temperature based on the total refraction effect. The dew point temperature is recalculated into volumetric moisture fraction, mln^{-1} (metrologically significant value), and into mass fraction, mg/m^3.

To implement the total refraction effect, a laser with vertically polarized waves S (Figure 2) is used as the radiation source.

As a result, when the mirror surface is dry (Figure 1), the laser beam falling on the mirror surface at Brewster's angle α (Figure 2) is completely refracted into the mirror.

Figure 1 — Dry mirror surface



α — Brewster's angle
S — Laser diode

Figure 2. Full refraction of light into a dielectric

When the mirror surface is cooled and water drops appear (Figure 3), the beam is not refracted into the mirror body, but is scattered on the condensed drops. A photoelectron registration system reacts to the light reflection from water drops by an increase in the level of the photo signal arriving from photosensor F1 (Figure 4). The signal level of photosensor F1 depends on the amount of water drops condensed on the chilled mirror's surface.

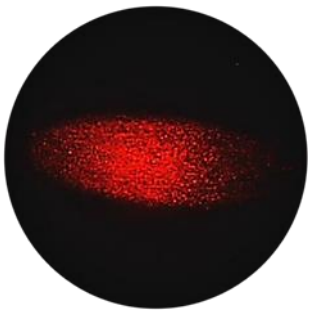
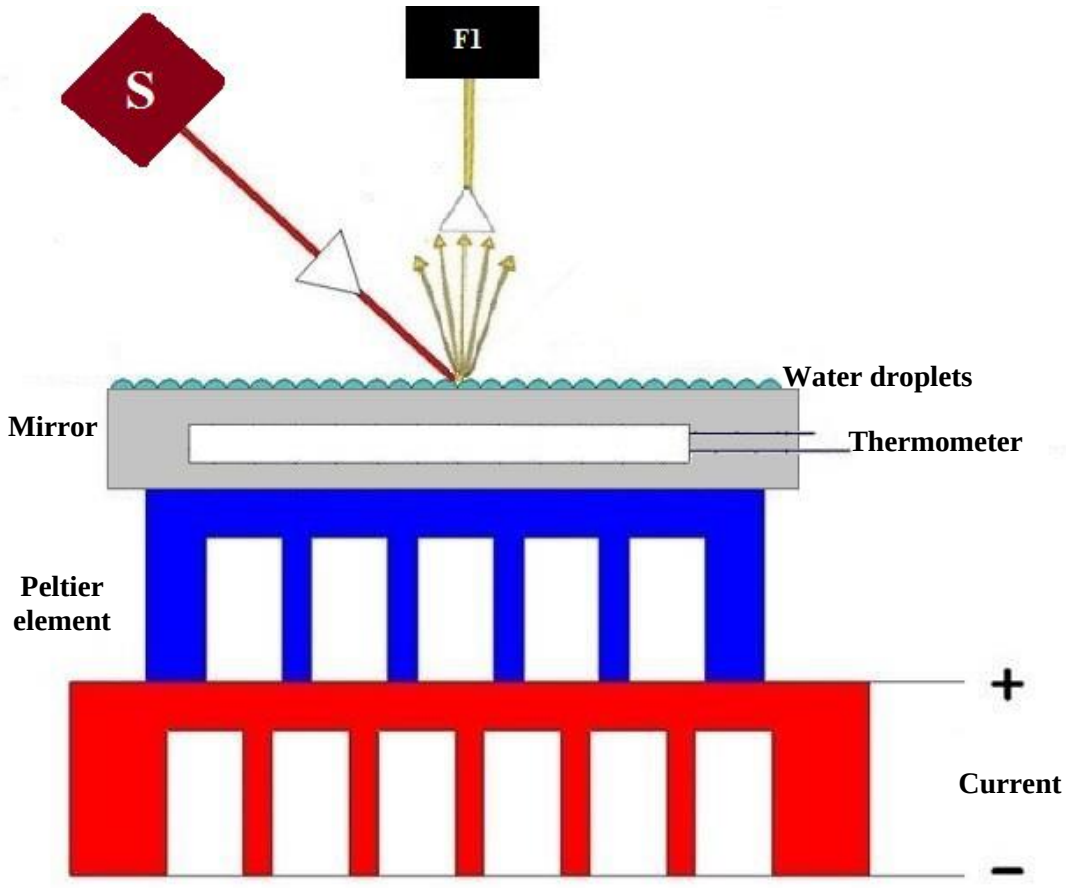


Figure 3. Water drops on the mirror surface



α — Brewster's angle
S — Laser diode

Figure 4. Scattering of light during condensation of water drops on the chilled mirror surface.

1.4.2 Product design

An image of the analyzer is shown in Figure 5. The analyzer is designed for measurements in laboratory and industrial conditions on gases with a high degree of purification. The analyzer is a measuring module with gas supply line VMPL8.046.023 implemented by a flow-through circuit with no system of gas filtration, supply and discharge. For measurements in non-purified gases the device can be supplied by special order together with the gas purification system (cl. 1.5.1). To mount the analyzer directly on the pipeline, one of three options of submerged gas supply lines can be included in the supply set by special order:

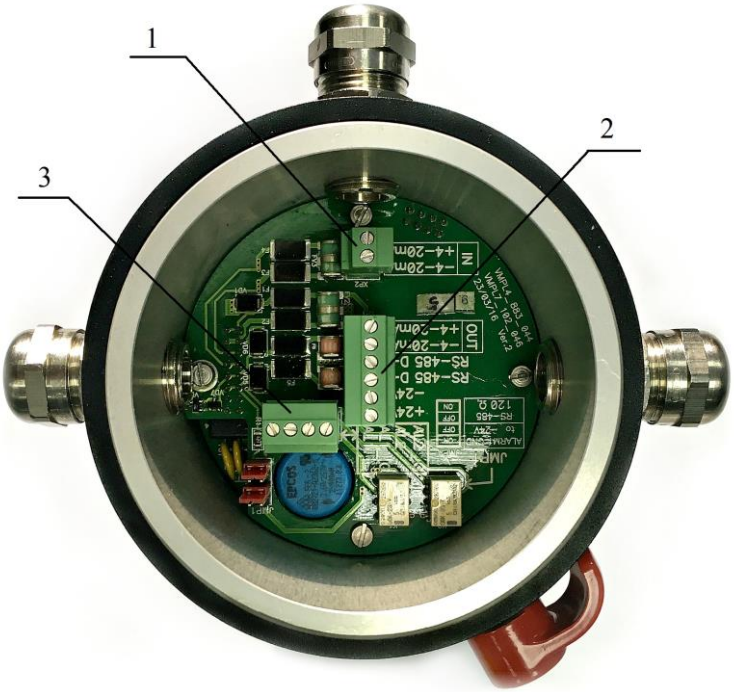
- ♦ gas supply line VMPL6.457.022 with integrated filter — for operation in purified gases. It operates if there is a gas flow through the device measuring chamber (cl. 1.5.2);
- ♦ gas supply line VMPL6.457.024 with gas filtration at the end of a sampling probe and the option to change the probe immersion depth under operating pressure (cl. 1.5.3);
- ♦ gas supply line VMPL6.457.107 without filtration - for operation in purified impulsed gases only. It operates if there is no gas flow through the device measuring chamber (cl. 1.5.4).

Figure 5. Moisture analyzer FAS-W

Structurally, the device consists of the primary transducer 1 (Appendix A) (hereinafter referred to as PT), the body 2, the cover 3, and the electronics unit located inside the body 2. The primary transducer is a measuring cell consisting of a dielectric chilled mirror with an embedded temperature detector and Peltier elements, a laser diode, a photosensor and a high pressure chamber, which the monitored gas passes through. The high pressure chamber is designed for pressure up to 10 MPa.

The device has no measured value indication. Measured values can be obtained by connecting external telecom systems via analog and/or digital channels. Electrical power supply and communication with external telecommunication systems is provided by connecting the cables through three cable entries (one main 6 and two additional 11) to the terminal block (see Figure 6) located under the cover 3 of the device. The numbering and purpose of the terminals are given in Appendix B. Additional cable entries are supplied separately from the device and are mounted as required.

The analyzer has two "Alarm" emergency outputs of "open collector" type, whose load capacity is 0.6 A at 125 VAC and 2 A at 30 VDC. The contacts of these outputs are normally open, and the closing level is configured through the terminal program.



1 — current input (XP2);
2 — outputs: digital — RS485,analog — (4-20) mA, supply (XP1);
3 — 2 "Alarm" emergency outputs of "open collector" type (XP3);

Figure 6. Terminal compartment

Detector connection with the gas supply line 4a (Appendix A) is performed by means of eight fixing bolts 10. This connection ensures the structure tightness at a pressure of up to 10 MPa.

To ensure the metrological range of the analyzer (see cl. 1.2), forced additional cooling of the device body may be required. The body design has a special through passage 8 (coolant passage) (Appendix A) to ensure a free flow of liquid and gaseous refrigerants. Various refrigerants can be used to cool the analyzer body: water, alcohol, carbon dioxide, propane, natural gas after throttling, etc. The maximum pressure of the refrigerant supplied to the coolant passage should not exceed 1 MPa. The inlet and outlet of the coolant passage have a cylindrical thread G1/8-A for connecting external fittings for refrigerant supply.

The device is connected to external gas systems using Swagelok / DK-Lok connection for a pipe with an outer diameter of 3 mm.

The device is powered by an external power source with a voltage of 20 - 27 V, power 15 W. The power supply is included in the basic supply set. Any other power source with similar technical characteristics can be used

1.4.3 Analog and digital communication

The device can be connected to an information and measurement system using two types of interface:

- digital interface RS-485;
- analog interface 4–20 mA.
- 2 "Alarm" emergency outputs of "open collector" type.

Serial interface RS-485

This interface is used to transfer measurement information to external telecommunication systems via the protocol Modbus/RTU (Appendix C). Description of Modbus registers is presented in Appendix C.

The interface is galvanically isolated, the breakdown voltage is 500 VDC.

Analog interface 4–20 mA.

This interface displays one of the measured values of gas humidity. This parameter is determined by the device's factory settings and is not available for later changes.

The maximum load resistance should not exceed 400 Ohms. The output is active. Galvanic isolation is 500 VDC. The ratio of the dew point (DP) temperature and the current (I) value at the analog outputs:

$$I_{вых} = \frac{(I_{max} - I_{min}) \times (T_р - T_н)}{(T_в - T_н)} + I_{min}$$

$$T_р = \frac{(I_в - I_{min}) \times (T_в - T_н)}{(I_{max} - I_{min})} + T_н,$$

$$T_р = \frac{(I_в - 4) \times (T_в - T_н)}{16} + T_н, \text{ where}$$

$I_{вых}$ – the current value at the analog output;

$T_р$ – the dew point temperature value;

$T_н$ – the device measuring range lower limit temperature;

$T_в$ – the device measuring range upper limit temperature;

The current value of 4 mA corresponds to the measuring range lower limit temperature; the current value of 20 mA corresponds to the measuring range upper limit temperature.

Device connection depending on the used interface (analog and/or digital) is performed in accordance with Appendix B.

Input channel 4 - 20 mA

The active current input is designed for connecting an absolute pressure detector in an explosion-proof enclosure with analog current output (4 - 20 mA).

Pressure detector characteristics are shown in cl. 1.5.6.

1.4.4 Explosion protection

The device is certified for compliance with the requirements of the standard and GOST 30852.1-2002 (1 Ex d IIC T5 X).

The device's explosion protection is provided by "explosion-proof enclosure" according to GOST 30852.1-2002.

Explosion protection for photosensors, the temperature sensor and dielectric chilled mirror that are included in the PT is ensured by placing them into an explosion-proof zone in accordance with subsection 2.1.

The explosion protection "explosion-proof enclosure" is provided by enclosing electrical elements of the electronic unit into the enclosure, which has a high degree of mechanical strength according to GOST 30852.0-2002, withstands explosion pressure and prevents the transmission of the explosion into the surrounding explosive atmosphere.

The "X" sign following the electronic unit explosion protection marking means that when operating the analyzer special requirements should be observed in accordance with cl. 2 hereof.

Device shell explosion resistance is provided by use of threaded and cylindrical, flameproof connections. On the explosion protection equipment drawing (Appendix G), these connections are designated by the word "Explosion" with an indication of permissible explosion protection parameters according to GOST 30852.1-2002.

The warning inscription "DO NOT OPEN WHEN ENERGIZED" is provided on the enclosure's removable cover.

The device's power supply is installed in an explosion-proof zone in rooms with a temperature from 0 to plus 60 °C. Equipment installation is provided with a cable with an outer diameter of 8 - 11.5 mm, with at least six cores a core section of at least 0.75 mm^2. The outer diameter of the cable determines the tightness of the explosion-proof inlet of the device.

1.5 Description and operation of product component parts with additional parts

The analyzer supply may include a set of additional accessories delivered in accordance with the customer's orders (by special order), which makes it possible to expand the device capabilities.

The additional supply set (by special order) includes the following systems and devices in accordance with Table 2:

- interface converter RS485/RS232/USB — to connect the analyzer using the digital interface RS-485;
- external dew point indication unit for the volumetric moisture fraction DS400 (cl. 1.5.6);
- external dew point indication unit for the volumetric moisture fraction IRT 1730 (cl. 1.5.7);
- gas purification system (hereinafter referred to as GPS) (cl. 1.5.1);
- gas supply line VMPL6.457.022 with integrated filter — for operation in purified gases. It operates if there is a gas flow through the device measuring chamber (cl. 1.5.2);
- gas supply line VMPL6.457.024 with gas filtration at the end of a sampling probe and the option to change the probe immersion depth under operating pressure (cl. 1.5.3);
- gas supply line VMPL6.457.107 without filtration - for operation in purified impulsed gases only. It operates if there is no gas flow through the device measuring chamber (cl. 1.5.4).
- flow rate control unit Model-001 (cl. 1.5.5);
- pressure detector in an explosion proof enclosure (cl. 1.5.8).

1.5.1 Gas purification system.

The gas purification system (Figure 7) (hereinafter referred to as GPS) is designed for the purification of gas to remove mechanical and aerosol impurities, and to supply a representative sample to gas analyzers at operational pressure (max. 16.0 MPa) or reduced pressure within the range from 8.0 to 0.1 MPa.

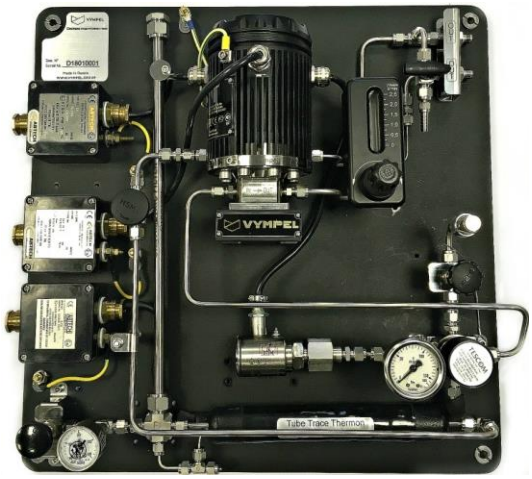


Figure 7. GPS design with FAS-W

Patented inertial gravity filter is used to purify gas from mechanical and aerosol impurities, which provides a high degree of purification without distortion of the gas sample, due to the absence of filter sintered cartridges and membranes in the gas flow path and requires no maintenance. The GPS is equipped with a pressure detector and an intrinsically safe pressure sensor to monitor pressure in the system. The GPS has a gas outlet for connecting control hygrometers, as well as a folding console for convenient installation of Hygrovision series hygrometers from NPO Vympel LLC. Gas heating during reduction to prevent hydrate formation and subsequent freezing of the regulator while reducing the gas is provided in GPS.

A more detailed description of the GPS is provided in Operational Manuals VMPL2.848.002 RE and VMPL2.848.003 RE.

1.5.2 Submerged gas supply line with integrated filter VMPL6.457.022

The submerged gas supply line with an integrated filter (Figure 8) is designed for installation of the analyzer directly on the pipeline using welded mounting sleeve 16a (Appendix D). This gas supply line has a built-in filter element for mechanical and aerosol impurities.

Note — Sampling probe length is 200 mm (from the inner edge of the pipeline). The probe length is reduced by the consumer. If necessary, it is possible to order a longer sampling probe.

Measurements using this gas supply line are performed with a gas flow through the measuring chamber of the device. The flow rate is set using the flow rate control unit Model-001 (subsection 1.5.5) or another rotameter. After arranging the flow, the flow rate control unit Model-001 can be disconnected.

Figure 8. Analyzer FAS-W with submerged gas supply line without filtration

1.5.3 The submerged gas supply line with gas filtration at the end of the sampling probe and the option to change the probe immersion depth under operating pressure VMPL6.457.024

The submerged gas supply line with filtration (Figure 9) is designed for mounting the analyzer directly onto a pipeline with a diameter of 200 mm or more. This gas supply line has a mechanical impurities filter 20 (Appendix E) at the end of the sampling probe, and therefore can be used in gas containing mechanical and aerosol impurities. There is a system for replacing the mechanical impurities filter without pipeline shutdown.

The sampling probe length in the standard supply is 200 mm (from the inner edge of the pipeline, the sampling probe is 12 inches), which can be reduced/increased by 40 mm during operation by adjusting the immersion length with a special valve. If necessary, it is possible to order a longer sampling probe.

Measurements using this gas supply line are performed with a gas flow through the measuring chamber of the device. The flow rate is set using the flow rate control unit Model-001 (subsection 1.5.5) or another rotameter. After arranging the flow, the flow rate control unit Model-001 can be disconnected.

Figure 9. Analyzer FAS-W with a submerged gas supply line with filtration

1.5.4 Submerged gas supply line without filtration VMPL6.457.107

The submerged gas supply line is designed for installation of the analyzer directly on the pipeline using mounting sleeve 16b (Appendix F). This gas supply line (Figure 10) does not have filter elements, and is designed for measurement without gas flow through the device measuring chamber; therefore only purified impulsed gases can be used.

Figure 10. Analyzer FAS-W with a submerged gas supply line without filtration

Sampling probe length is 150 mm (from the inner edge of the pipeline). The probe length is reduced by the consumer. If necessary, it is possible to order a longer sampling probe.

Measurements using this gas supply line should be performed without a gas flow through the measuring chamber of the device. To purge the measuring chamber of the device before measurement, as well as the gas outlet from the system, relief valve 11 (Appendix F) is provided.

1.5.5 Flow rate control unit Model-001

Flow rate control unit Model-001 is designed to set the gas flow rate up to 1 dm^3/min, when operating the analyzer with submerged gas supply line VMPL6.457.022 or VMPL6.457.024. In this case, the flow rate only needs to be set during the first start-up, after that the rotameter can be dismantled (cl. 2.2.5).

1.5.6 Pressure detector in an explosion proof enclosure.

The analyzer FAS-W with a pressure detector is available by special order. A mandatory requirement for the pressure detector is the availability of explosion protection class not lower than Exd class.

The pressure detector should meet the following requirements:

- Accuracy class of at least 0.4%;
- Measurement range of no more than 0.16 MPa.

The detector connection diagram is provided in Appendix B.

1.6 Labeling

Each analyzer has a label with the following information in Russian and English:

- trade mark and the manufacturer's name;
- analyzer name;
- name of the certification body, the registration numbers of the accreditation certificate and the certificate of conformity;
- explosion protection classification, CE - conformity marking;
- special explosion protection sign in accordance with TR CU 012/2011;
- Customs Union Conformity Mark;
- solid bodies and water impact protection grade marking in accordance with GOST 14254-2015 (IP67);
- output signal;
- the value of the maximum permissible operating excess pressure;
- the range of permissible supply voltage and power consumption;
- operating device temperature;
- the serial number of the analyzer, including the manufacturing date, as well as the current output configuration;
- country of origin and the manufacturer's website.

On the case, next to the grounding bolt, the grounding sign is marked in accordance with GOST 21130-75.

1.7 Package

The transducer packaging meets the requirements of GOST 23170-78 with annexes provided in this subsection.

The transducer is packed in closed ventilated rooms at ambient air temperature from plus 17 to plus 40 °C, and relative humidity up to 80% without aggressive impurities in the environment.

Before packing, the transducer is conserved in accordance with GOST 9.014-78 requirements (B3-10 protection variant) and detailed design documentation of the packaging. Before packing, openings and flanges are covered with caps or stops, protecting the inside from dirt and the flanges from mechanical damage.

For consumer packaging, cardboard boxes as per GOST 12301-2006 and GOST 9142-2014 or crates can be used. The transducer is packed in the container in accordance with the requirements of the detailed design documentation.

A packing list is placed inside each consumer packaging (boxes, crates) of each container.

2 Intended use

2.1 Provision of explosion protection during installation

During the assembly/disassembly of the device, the pressure in the gas supply line should be reduced to the atmospheric pressure.

To ensure the explosion protection of PT elements, before switching on the device, it is necessary to purge the device's measuring chamber with measured gas with a gas flow rate of 0.4 - 0.7 dm ^{3}/min for at least five minutes to remove the explosive mixture and ensure the explosion-proof of electrical PT elements in accordance with subsection 1.4.3

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to switch on the analyzer without preliminary purging of the measuring chamber.

2.1.1 Requirements for the gas sampling location.

The sampling location should be located on the straight section of the pipeline, which should be free of narrows and obstacles for the length of five diameters before and three pipeline diameters after the sampling location.

2.1.2 Installation note

The device is attached to the gas supply line using eight bolts, with a tensile strength of 830 MPa;

Electrical installation of the device should be performed in accordance with Appendix B;

Tools and accessories used for installation are listed in Table 3.

Table 3

Description standard size	Tool standard size	Note
Hex wrench	6 mm	To connect the device to the gas supply line
Hex wrench	5 mm	For locking bushings preventing the tool cover self-unscrewing
Screwdriver for slots	Width is 2.5 mm	To connect the electrical cable to the device terminal block

2.2 Installation

2.2.1 Installation of the device with flow-through gas supply line VMPL8.046.023

Installation instructions are provided below for a device with flow-through gas supply line VMPL8.046.023 (included in the basic supply set) for measurement under excessive pressure according to the flow-through circuit. Installation is performed in accordance with Appendix A:

- remove analyzer cover 3, loosening latch 5;
- insert power cable 7 through cable entry 6 into device body 2 and connect it to the terminal block in accordance with the electrical connection diagram (Appendix B);
- put the cover on the analyzer and tighten (lock) latch 5;
- fix the gas supply line of the device 4a with four M8 bolts (not included in the supply set) vertically on the horizontal surface;
- ground the device. For this purpose, use an insulated copper conductor with a minimum cross-section 1.5 mm^2 to connect grounding clamp 9 of the device to the grounding bus;
- connect the device to external gas systems using Swagelok/DK-Lok connection for the pipe with an outer diameter of 3 mm;
- apply the studied gas to the gas supply line; the analyzed gas flow is performed through the input In. and output Out of the gas supply line;
- purge the analyzer measuring chamber for at least five minutes setting the gas flow through the gas supply line 0.4 - 0.7 dm^3/min to remove the explosive mixture (more in subsection 2.1);
- set the gas flow through the gas supply line 0.2 - 2.0 dm^3/min;
- check the threaded connection tightness by using a soap solution. When bubbles appear, the appropriate connections should be sealed;

- apply power to the device.

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to tighten connections under pressure in the pipeline.

2.2.2 Installation of the device with a submerged gas supply line with integrated filter VMPL6.457.022

Installation of the device with submerged gas supply line VMPL6.457.022 (not included in the basic supply set) is performed in two stages: first, the gas supply line is installed on the pipeline, and then the tool is installed on the gas supply line.

Gas supply line installation

Gas supply line installation is performed in the following sequence in accordance with Appendix D:

- weld mounting sleeve 16a with internal thread M33x2 (included in the supply set) into the pipeline vertically (permissible deviation ±10°);
- check presence of O-ring 15a on gas supply line 4b;
- screw the gas supply line into mounting sleeve 16a, until it stops;
- orient the gas supply line along the gas flow in accordance with the direction of the arrow on the gas supply line by turning it counterclockwise, but not more than one turn;
- tighten lock nut 13;
- make sure that the gas supply line ball valve handle is in position B — "closed";
- fill the pipeline with gas and check for leaks at operating pressure. To do this, apply the soap solution in the gap between locking nut 13 and mounting sleeve 16a. When bubbles appear, tighten the nut.

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to tighten connections under pressure in the pipeline.

Installation of the device on a gas supply line

Installation of the analyzer on a gas supply line is performed in the following sequence in accordance with Appendix D:

- disconnect the base flow-through gas supply line VMPL8.046.023 unscrewing 8 bolts M8 (pos. 10);
- install the device on the gas supply line according to Appendix D and secure it with eight M8 bolts (pos. 10) from the supply set;
- remove analyzer cover 3, loosening latch 5;
- insert power cable 7 through cable entry 6 into device body 2 and connect it to the terminal block in accordance with the electrical connection diagram (Appendix B);
- connect the device to external telecommunication systems;
- put the cover on the analyzer and tighten (lock) latch 5;
- ground the device. For this purpose, use an insulated copper conductor with a minimum cross-section 1.5 mm^2 to connect grounding clamp 9 of the device to the grounding bus;
- connect the rotameter to the output of fine adjustment valve 1 (flow rate control unit Model-001, which is delivered by special order, can be used or any other rotameter with a flow rate up to 1 dm^3/min);

- close fine adjustment valve 11;
- move the ball valve handle of the gas supply line into position A — "open";
- purge the analyzer measuring chamber for at least five minutes setting the gas flow through the gas supply line 0.4 - 0.7 dm^3/min to remove the explosive mixture (more in subsection 2.1). The arrangement of the gas flow rate is described in subsection 2.2.5;
- set the gas flow rate at 0.2 - 2.0 dm^3/min;
- apply power to the device.

2.2.3 Installation of a device with a submerged gas supply line with gas filtration at the end of the sampling probe and the option to change the probe immersion depth under operating pressure VMPL6.457.024

Installation of a device with submerged gas supply line VMPL6.457.024 (not included in the basic supply set) is performed in two stages: first, the gas supply line is installed on the pipeline, and then the device is installed on the gas supply line. Installation is in accordance with Appendix E.

Gas supply line installation

Gas supply line installation is performed in the following sequence in accordance with Appendix E:

- weld mounting sleeve 16a with internal thread M33x2 (included in the supply set) into the pipeline vertically (permissible deviation ±10°);
- check the presence of O-ring 15a on gas supply line 4c;
- screw out pin 18 counterclockwise until it stops. Distance from filter 155 to the welding plane of mounting sleeve 16a in this state is 155 mm, with the standard length of the submerged probe;
- screw the gas supply line into mounting sleeve 16a, up to the position specified in view A;
- tighten lock nut 13;
- make sure that ball valve 12 handle is in position B — "closed";
- fill the pipeline with gas and check for leaks at operating pressure. To do this, apply the soap solution in the gap between locking nut 13 and mounting sleeve 16a). When bubbles appear, tighten the nut;

IT IS PROHIBITED
to tighten connections under pressure in the pipeline!

Installation of the device on a gas supply line

Installation of the analyzer on the gas supply line is performed in the following sequence in accordance with Appendix E:

- disconnect the base flow-through gas supply line VMPL8.046.023 unscrewing 8 bolts M8 (pos. 10);
- install the device on the gas supply line according to Appendix E and secure it with eight M8 bolts (pos. 10) from the supply set;
- remove analyzer cover 3, loosening latch 5;

- insert power cable 7 through cable entry 6 into device body 2 and connect it to the terminal block in accordance with the electrical connection diagram (Appendix B);
- connect the device to external telecommunication systems;
- put the cover on the analyzer and tighten (lock) latch 5;
- ground the device. For this purpose, use an insulated copper conductor with a minimum cross-section 1.5 mm^2 to connect device grounding clamp 9 to the grounding bus;
- close the fine adjustment valve, pos. 11;
- move the ball valve handle of the gas supply line into position A — "open";
- screw pin 18 to the required length into the pipeline. Filter 20 should be located in the center of the pipeline. Lock the position of gas supply line pin 18 with locking nut 13;
- purge the analyzer measuring chamber for at least five minutes setting the gas flow through the gas supply line 0.4 - 0.7 dm^3/min to remove the explosive mixture (more in subsection 2.1). The arrangement of the gas flow rate is described in subsection 2.2.5;
- set the gas flow rate at 0.2 - 2.0 dm^3/min. Arrangement of the gas flow rate using the flow rate control unit Model-001 is described in subsection 2.2.5;
- apply power to the device.

2.2.4 Installation of a device with submerged gas supply line without filtration VMPL6.457.107

Installation of a device with submerged gas supply line VMPL6.457.107 (not included in the basic supply set) is performed in two stages: first, the gas supply line is installed on the pipeline, and then the device is installed on the gas supply line. Installation is in accordance with Appendix F.

Gas supply line installation

Gas supply line installation is performed in the following sequence in accordance with Appendix F:

- weld mounting sleeve 16b with internal thread M20x1.5 (included in the supply set) into the pipeline vertically (permissible deviation ±10°);
- check the presence of O-ring 15b on gas supply line 4g;
- screw the gas supply line into mounting sleeve 16b, until it stops;
- make sure that the gas supply line ball valve handle is in position b — "closed";
- fill the pipeline with gas and check for leaks at operating pressure. To do this, apply the soap solution in the gap between locking nut 13 and mounting sleeve 16b — when bubbles appear, tighten the nut.

IT IS PROHIBITED
to tighten connections under pressure in the pipeline.

Installation of the device on a gas supply line

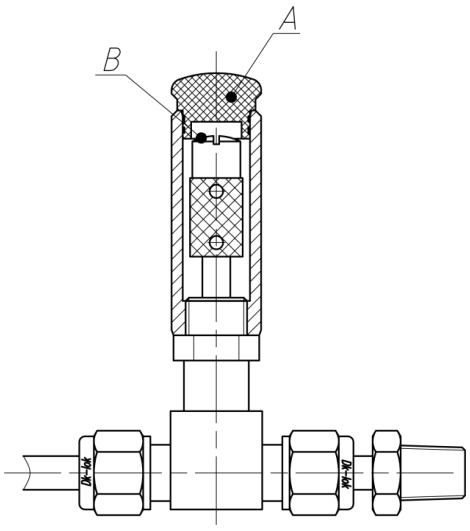
Installation of an analyzer on a gas supply line is performed in the following sequence in accordance with Appendix F:

- ♦ disconnect the base flow-through gas supply line VMPL8.046.023 unscrewing 8 bolts M8 (pos. 10);
- ♦ install the device on the gas supply line according to Appendix F and secure it with eight M8 bolts (pos. 10) from the supply set;
- ♦ remove analyzer cover 3, loosening latch 5;
- ♦ insert power cable 7 through cable entry 6 into device body 2 and connect it to the terminal block in accordance with the electrical connection diagram (Appendix B);
- ♦ connect the device to external telecommunication systems;
- ♦ put the cover on the analyzer and tighten (lock) latch 5;
- ♦ ground the device. For this purpose, use an insulated copper conductor with a minimum cross-section 1.5 mm^2 to connect device grounding clamp 9 to the grounding bus;
- ♦ move the ball valve handle of the gas supply line into position a — "open";
- ♦ slightly unscrew the screw of discharge valve 11 for purging the measuring chamber of the device for at least five minutes to ensure the device explosion-proof (more details in subsection 2.1);
- ♦ screw in the screw of discharge valve 11;
- ♦ apply power to the device.

2.2.5 Arrangement of the gas flow rate via the gas supply line

Using a rotameter, which is not included in the supply set:

- ♦ connect the rotameter with a flow measuring range of max. 1 dm^3/min to the output of fine adjustment valve 1 (Appendices D and E). Information for connection: male thread of fine adjustment valve 7/16–20 (UNF);
- ♦ set gas flow rate 0.2 - 0.5 dm^3/min with fine adjustment valve 11 with the rotameter; disconnect the rotameter and connect the impulse tube to vent gas into the atmosphere at the outlet of valve 11.



A — plug; *B — groove for the screwdriver*

Figure 11. Fine adjustment valve assembly

Using the set of the flow rate control unit supplied by special order to the gas supply line VMPL6.457.022 and VMPL6.457.024:

- connect flow rate control unit 16 Model-001 to the output of fine adjustment valve 11 (Appendices D and E; Figure D.1 and Figure E.1, pos. 11);
- when adjusting the gas flow rate control unit in the rooms, connect the impulse tube for gas removal to the flare to outlet valve 2 (Figure 11) of the set of gas flow. Information for connection: male thread 7/16-20 (UNF);
- set 3 flow rate control units Model-001, gas flow of 0.2 - 0.5 dm^3/min, with valve 1 (Figure 12) with the rotameter; disconnect the rotameter and connect the impulse tube to vent gas into the atmosphere at the outlet of valve 1.

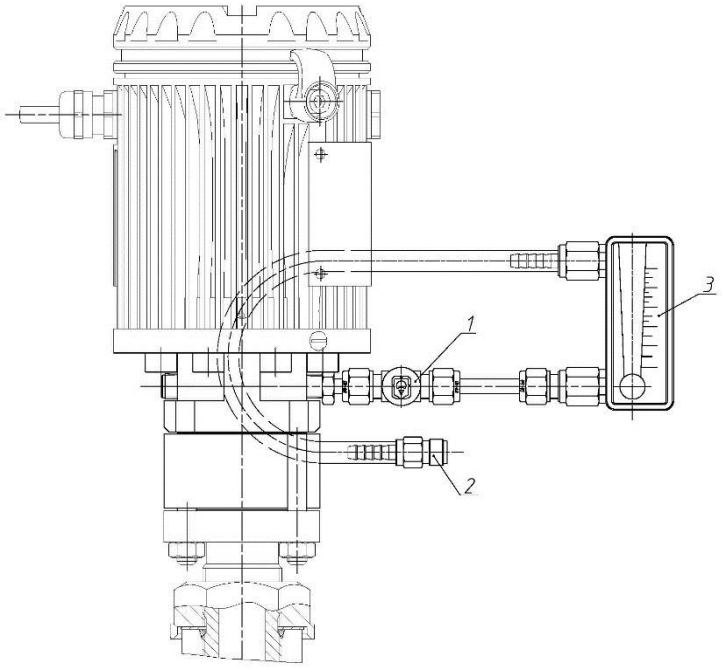


Figure 12. Connection of the gas flow rate control unit

Important!

The procedure for controlling the gas flow rate should be performed at an ambient temperature of no less than minus 10°C.

2.2.6 Installation of the device together with GPS.

When purchasing the moisture analyzer FAS-W together with the gas preparation system, the analyzer is delivered already mounted on the system.

2.3 Performance of measurements

To switch on the device, supply 24 V from the power supply to the device (Appendix B). Immediately after switching on, the device switches to measuring mode. Measurements are performed automatically. To view the measured values, the device should be connected to external telecommunication systems. Connection is performed in accordance with Appendix B.

2.4 Dismantling

2.4.1 Dismantling the device with flow-through gas supply line VMPL8.046.023

Dismantling the device is performed in the following sequence as outlined in Appendix A:

- switch off the analyzer's power supply;
- close the gas sampling line;
- release gas from the measuring chamber;
- disconnect gas communications;
- remove analyzer cover 3, loosening latch 5;
- remove power cable 7 through cable entry 6 from device body 2, having previously loosened the terminal block terminals;
- put cover 3 on the analyzer and tighten (lock) latch 5;
- disconnect the gas supply line of device 4 from the horizontal surface by unscrewing four bolts M8 (pos. 10).

2.4.2 Dismantling a device with a submerged gas supply line

Dismantling a device with a submerged gas supply line is performed in accordance with Appendix D for VMPL6.457.022, Appendix E for VMPL6.457.024 and Appendix F for VMPL6.457.107 in the following sequence:

- switch off the analyzer's power supply;
- move the ball valve handle of the gas supply line into position b — "closed";
- release gas from the gas supply line using fine control valve 11 for gas supply line VMPL6.457.022 and VMPL6.457.024 or discharge valve 11 of gas supply line VMPL6.457.107;
- remove analyzer cover 3, loosening latch 5;
- remove power cable 7 through cable entry 6 from device body 2, having previously loosened the terminal block terminals;
- put cover 3 on the analyzer and tighten (lock) latch 5;
- disconnect the device from the gas supply line unscrewing eight bolts M8, pos. 10;
- put the cover for transportation of the analyzer KRAU8.046.155 on the device and fix it with bolts M8 to prevent contamination of the measuring chamber of the device;

put the cover for the gas supply line VMPL8.054.011 on the gas supply line and fix it with bolts M8 to prevent contamination.

3 Maintenance

3.1 General instructions

Commissioning and maintenance of the device can be carried out by the manufacturer according to a separate contract or independently.

Maintenance related to opening seals is carried out by the manufacturer only.

3.2 The maintenance procedure

Maintenance operations include:

- ♦ detector cleaning;
- ♦ analyzer calibration;
- ♦ troubleshooting.

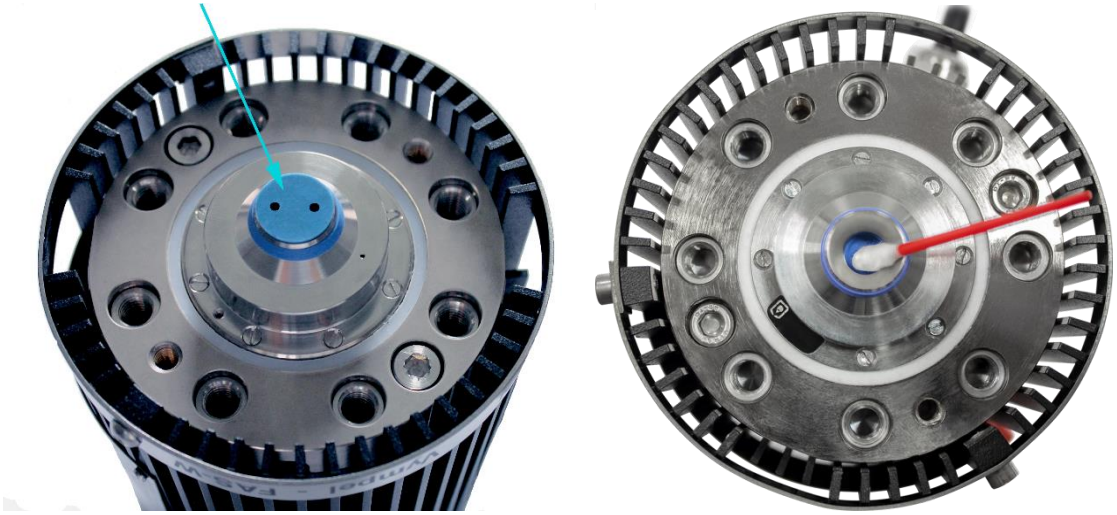
3.2.1 Detector cleaning

Important!

Detector cleaning should be performed outside hazardous areas!

Detector cleaning should be performed in the following sequence:

- ♦ dismantle the device in accordance with subsection 2.4;
- ♦ if available, dismantle the gas supply line removing eight bolts M8 (pos.10);
- ♦ put the cover for transportation of KRAU8.046.155 (included in the supply set) on and transfer the device to an explosion-proof room;
- ♦ dismantle the insert (Figure 13a), if available;
- ♦ with a cotton swab dipped in isopropyl alcohol (not included in the analyzer supply set), carefully, without applying any effort, rinse the surface of the mirror (Figure 13b, c)
- ♦ using eight bolts M8 (pos. 10, included in the supply set) fix the device on the gas supply line, when using flow-through gas supply line, in such a way that the holes of the gas supply line and insert (if available) match;
- ♦ install the device in accordance with subsection 2.2 hereof.



a) b)

c)

Figure 13. Detector cleaning.

Important!

Special care should be taken when cleaning the mirror. The appearance of scratches and chips on the mirror significantly worsens the analyzer's performance. Warranty repair in the event of mechanical mirror damage will not be performed.

3.2.2 Analyzer calibration

Analyzer calibration is performed in accordance with the Calibration procedure VMPL2.848.008 MP.

Analyzer calibration should be performed once a year.

3.2.3 List of possible failures

During the device operation, the device produces corresponding error messages when failures appear. Since the analyzer does not have an indicator, the error code is output from the digital output RS485. The list of possible messages, the reasons for their occurrence, the recommended actions for their elimination and the current values on the analog interface corresponding to the errors are presented in Table 4.

Table 4

Error code	Error description	Current value	Description of the problem	Recommended actions
Error 01	Photoelectric signal level by direct channel is below the permissible value	20.5 mA	1) laser operation error 2) photo-diode failure	1) Visually inspect the laser emission removing the device from the gas supply line. 2) If there is no emission, the device should be repaired at the factory.
Error 04	Error in the channel for measuring the device body temperature.	21 mA	Device body tempe-rature detector failure	Repair the device at the factory
Error 05	Error in the channel for measuring the device mirror temperature.	21.5 mA	Chilled mirror temperature sensor failure	Repair the device at the factory
Error 06	Operation error or failure of the thermionic battery	22 mA	Absence of the mirror cooling/heating dynamic	Repair the device at the factory
Error 07	Detector is contaminated	The current value is equal to the last measured value	Exceeding the allowable level of signals from photo-diodes	Clean the device mirror

Error 08	Failure of laser emitter	22.5 mA	The laser diode temperature is lower than permissible value at the device body temperature above −20°C	Repair at the factory.
Error 09	Evaporation measuring error	The current value is equal to the last measured value	The device failed to measure the evaporation temperature in three consecutive cycles	If the error does not disappear within an hour, clean the measuring chamber

If these messages appear, the cause of inconsistencies in the device operation should be eliminated. If it is impossible to restore the device operation capacity, ask for advice from the manufacturer.

3.2.4 Replacement of the gas supply line VMPL6.457.022 filter

The gas supply line filter is replaced in accordance with Appendix F in the following sequence:

- dismantle the transducer in accordance with cl. 2.4. hereof;
- screw out the pin (pos. 10) of the gas supply line counterclockwise until it stops;
- smoothly switch the shutoff valve handle at the gas supply line (pos. 13) into the "closed" position;
- release gas from the gas supply line opening the valve (pos. 9);
- unscrew the sleeve (pos. 12) from the valve (pos. 4);
- remove the retaining ring (with raised portions), pos. 1 (Figure 14b), located inside the protection enclosure on the probe bottom tip;

a) Gas supply line probe lower probe *b) Protection enclosure section*

Figure 14

- remove the star-shaped ring, pos. 2 (Figure 14b), located inside the protection enclosure on the probe bottom tip. There is no necessity to remove the ring, pos. 3, from the protection enclosure;
- to remove the membrane, unscrew the protection enclosure (Figure 15a) manually until the membrane (Figure 15b) appears;

a) *b)*

Figure 15

- remove the membrane using a 3/16” Allen key (included in the membrane replacement set);

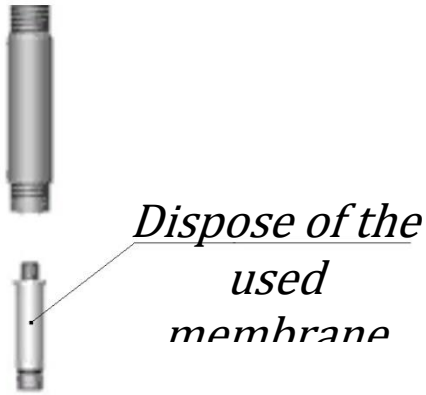


Figure 16

- remove the membrane component for replacement from the protective packaging. Remove the butterfly nut from the membrane component (Figure 17);

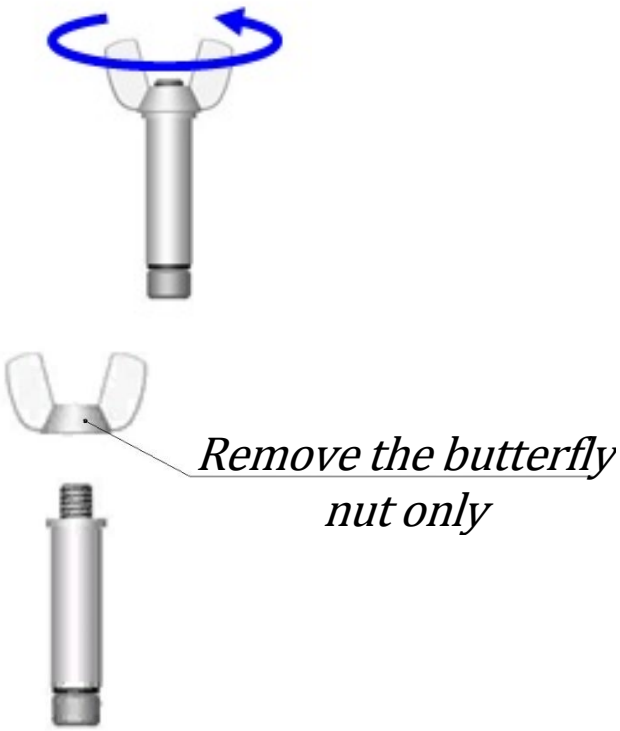


Figure 17

- using a 3/16” Allen key, install the new membrane component into the gas supply line filter (Figure 18), having tightened it up to a torque of 10 in-lb (1.13 N/m);

Figure 18

- screw the protection enclosure down manually until it stops mechanically (Figure 19);

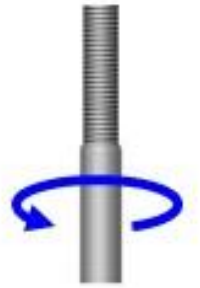


Figure 19

- install (from the membrane replacement set) a new ring in star form (from the membrane replacement set), pos. 2 (Figure 14b), into the protection enclosure;
- install (from the membrane replacement set) a new retaining ring (with raised portions), pos. 1 (Figure 14b), into the protection enclosure;
- screw the sleeve (pos. 12) into the valve (pos. 4);
- close the gas supply line valve (pos. 9);
- smoothly switch the shutoff valve handle at the gas supply line (pos. 13) into the "open" position;
- check the sleeve (pos. 12) and the valve (pos. 4) connection for leaks;

Important!
Tighten connections without pressure in the gas supply line. To do this, release the pressure by closing the valve (pos. 13) and opening the valve (pos. 9).

- screw the pin (pos. 10) into the pipeline for the required length;
- install the device on the gas supply line according to cl. 2.4.2 hereof.

4 Current repairs

Repairs of the analyzer can only be carried out by the manufacturer or an authorized organization.

5 Storage

Packed analyzers should be stored in the consignor's and consignee's warehouses, ensuring their protection from mechanical damage, dirt and the impact of harsh environments, in storage conditions 3 in accordance with GOST 15150-69.

The analyzers may be stored in a transportation container for up to 6 months. If stored over 6 months, the devices shall be unpacked and stored in storage conditions 1 according to GOST 15150-69.

The storage conditions for the analyzers should comply with the general requirements for storage in heated storage facilities according to GOST R 52931-2008.

6 Transportation

6.1 General requirements for transportation

The transportation conditions for the analyzers should meet the requirements of GOST R 52931-2008.

6.2 Conditions of transportation

The packed devices shall be transported in closed transportation by any means of transport, including by air, in a heated pressurized compartment in accordance with shipping rules applicable for each means of transport.

In terms of the impact of climate factors, the transport conditions must comply with Group 5 (OJ4) conditions as per GOST 15150-69 for covered vehicles.

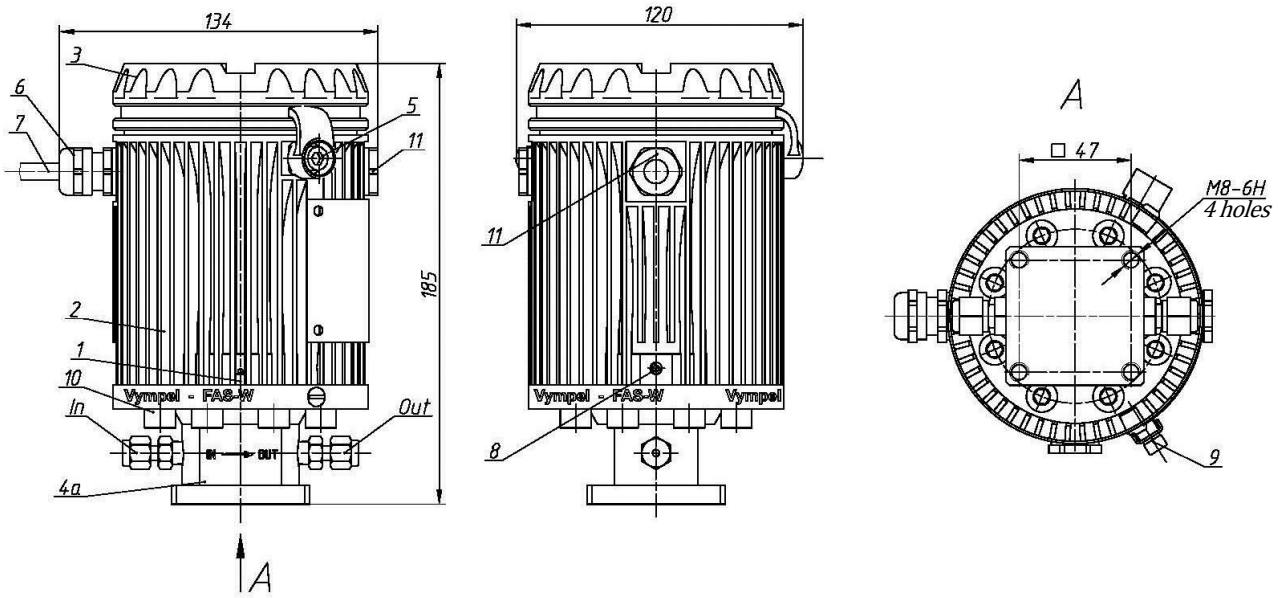
In terms of mechanical impact, transport conditions must comply with Group F3 as per GOST R 52931-2008.

7 Disposal

Materials and components used for the device's manufacture are not harmful for human health, industrial and warehouse premises and the environment during its service life and upon its expiry.

Out of service devices can be disposed of by any means available to the customer.

Appendix A
(obligatory)
Main view, overall and connecting dimensions of the Analyzer FAS-W. VMPL2.848.008



In — studied gas input; *Out — studied gas output.*

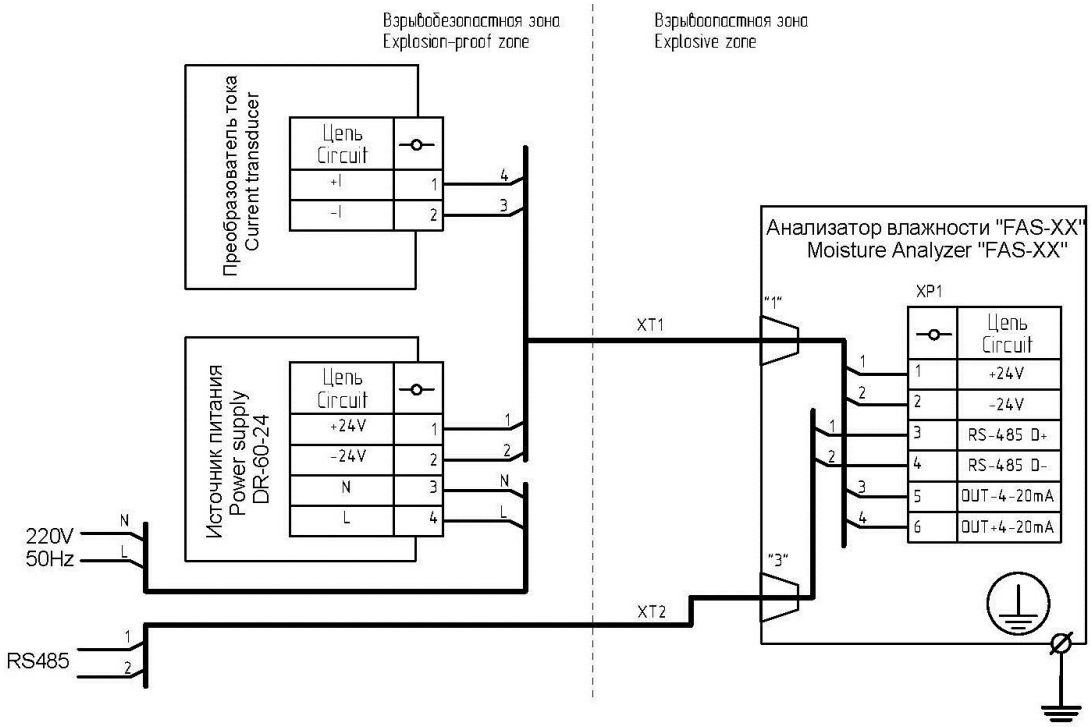
Figure A.1

Table A.1

Pos.	Designation	Description	Qnty
1	VMPL5.910.002	PT	1
2	VMPL8.034.051	Body	1
3	VMPL8.040.010	Cover	1
4a	VMPL8.046.023	Gas supply line (flow-through)	1
5	VMPL8.227.020	Sleeve (latch)	1
6	1.622.1600.50	Cable entry	1
7		Power cable	1
8		Coolant passage	1
9	VMPL6.625.001	Terminal	1
10		Screw M8x25.A4-80 DIN912	8
11	1.877.1600.50	Plug (or cable entry 1.622.1600.50 from the accessories kit VMPL4.078.151)	2

Appendix B
(obligatory)
FAS-W. Electrical connection diagrams

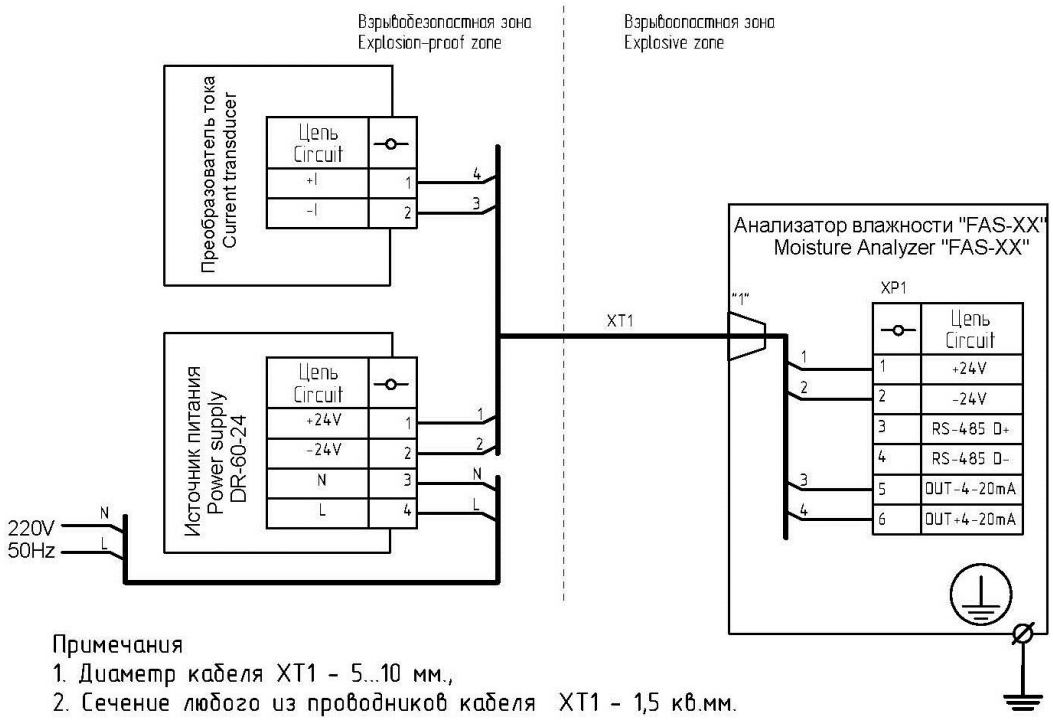
Moisture analyzer FAS. Connections by digital output signals:



Примечания
1. Диаметр кабелей XT1, XT2 - 5...10 мм.
2. Сечение любого из проводников кабелей XT1, XT2 - 1,5 кв.мм.
3. Для подключения согласующего резистора 120 Ом (для оконечного устройства шины RS-485) выставить перемычку на цепи "RS-485 120" разъема JP1 в положение "ON".

Note
1. Diameter cables XT1, XT2 - 5 ... 10 mm.,
2. Any cross-section of the cables XT1, XT2 conductors - 1,5 sq.mm.
3. For connection termination resistor 120 Ohm (for the RS-485 bus terminal device) to set jumper on the circuit "RS-485 120" JP1 connector to position "ON".

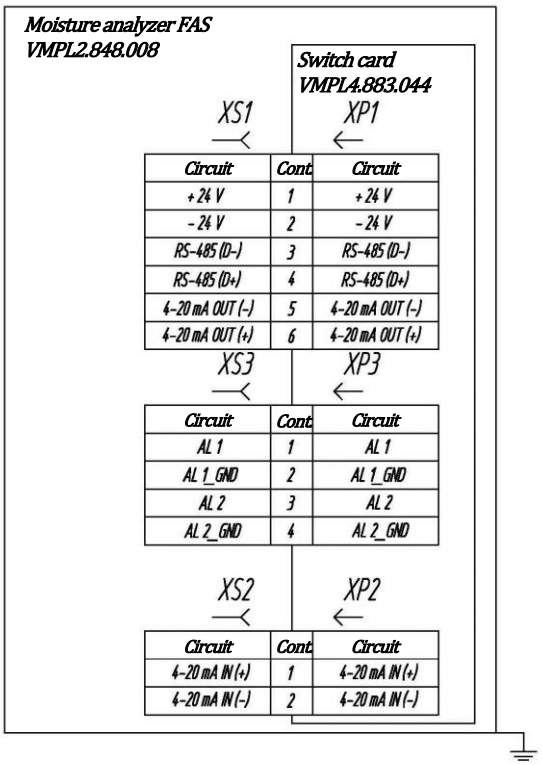
Moisture analyzer FAS. Connections by analog output signals:
(active output 4 - 20 mA):



Примечания
1. Диаметр кабеля XT1 - 5...10 мм.,
2. Сечение любого из проводников кабеля XT1 - 1,5 кв.мм.

Note
1. Diameter cable XT1 - 5 ... 10 mm.,
2. Any cross-section of the cable XT1 conductors - 1,5 sq.mm.

Connection diagram for absolute pressure detector (XP2) and 2 "Alarm" emergency outputs of "open collector" type (XP3):



Appendix C
(reference)
Analyzer FAS-W. Modbus register description

Registers containing information on measured values are specified in Table C.1.

Table C.1

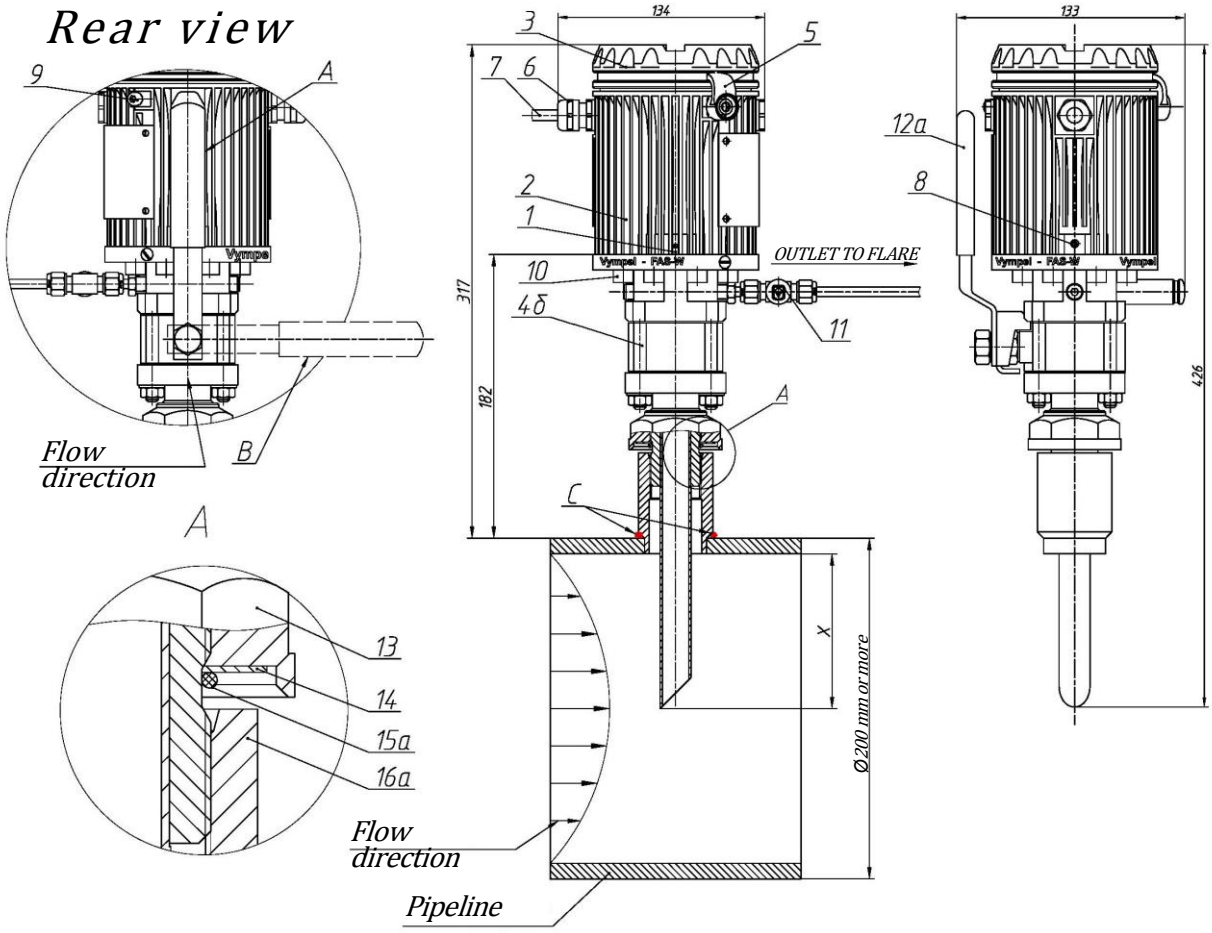
Register address	Value type	Parameter description
0–1		Device identifier
20-21	float	Body temperature, °C
60-61	uint32_t	Operation time after start, sec
Measured dew point temperature		
6-7	float	Dew point temperature (in set units)
8-9	float	Measured pressure (in set units)
10-11	float	Dew point temperature (recalculated in set units)
12-13	float	Volumetric moisture fraction (in set units)
14-15	float	Contractual pressure (in set units)
16-17	uint32_t	Temperature scale: 0-ºC 1-ºF 2-ºK
18-19	uint32_t	Pressure units: 0 MPa 1 bar
20-21	uint32_t	Volumetric moisture fraction: 0-g/m3, 1-ppm, 2-mg/m3
22-23	uint32_t	Recalculation method: 0-GOST-2006 1-Ukrainian tables 2-GOST-2009 3-W68 (water) 4-W68 (ice) 5-W90 (water) 6-W90 (ice) 7-GOST-2012 (water) 8-GOST-2012 (ice)
24-25	uint32_t	Device error code
26-27	uint32_t	Dew point temperature, °C
28-29	float	Volumetric moisture fraction, ppm
30-31	float	Volumetric moisture fraction, mg/m3

Flags containing information on measured values are specified in Table C.2.

Table C.2

Bit number	Feature value
0x0001	Dew point temperature is not defined
0x0004	Dew point temperature below the measuring range minimum
0x0008	Dew point temperature above the measuring range minimum
0x0020	Dew point temperature below the displayed value
0x0080	More than 4 hours passed after measurement
0x0100	Measurement cycle 1 — by water
0x8000	Measurement mode: 1 — automatic

Appendix D
(reference)
Main view, overall and connecting dimensions of the Analyzer FAS-W. VMPL2.848.008 with the gas supply line VMPL6.457.022



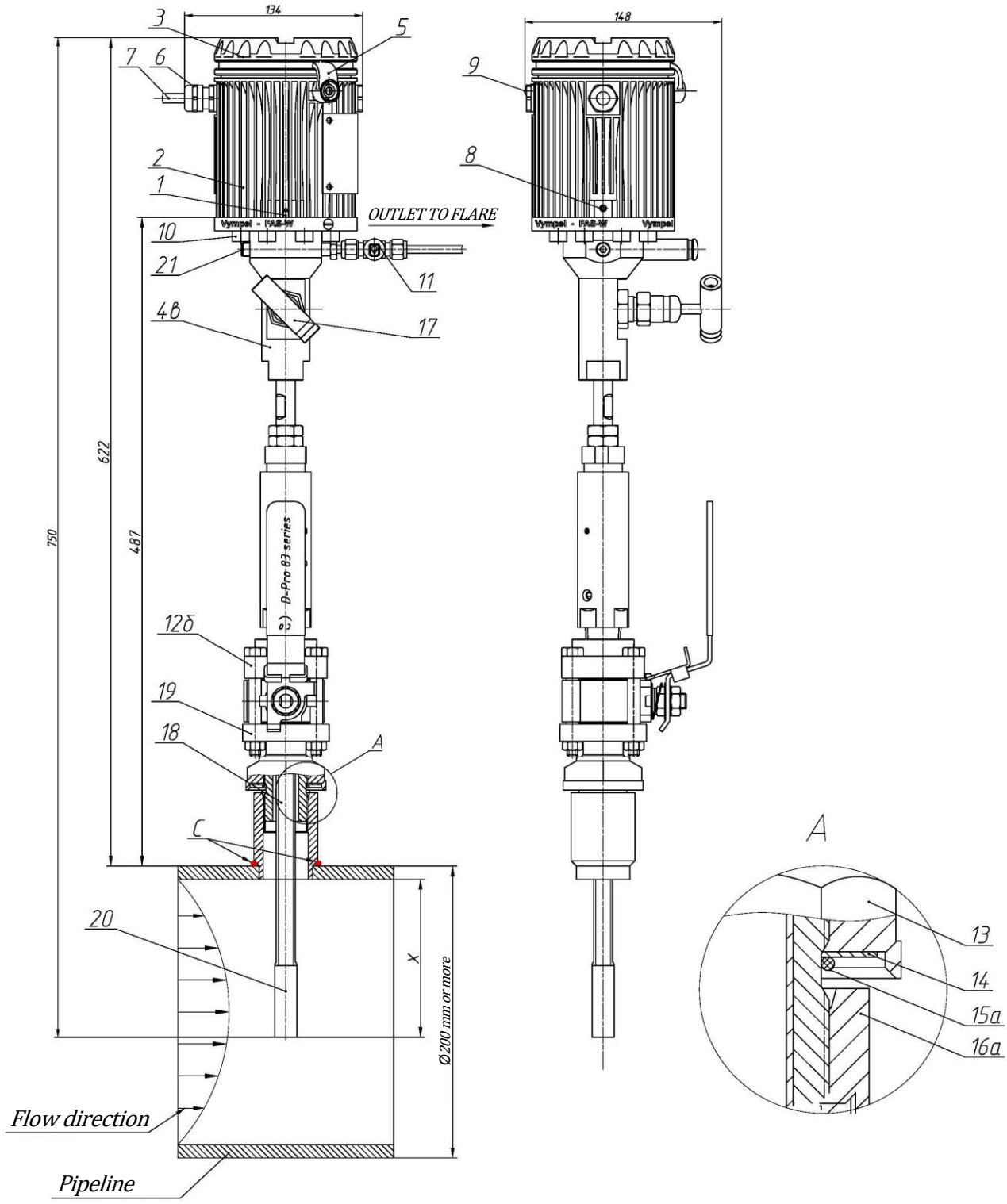
FAS-W height is specified for the submerged gas supply line VMPL6.457.022 with the standard length of the submerged probe (X=200 mm).

Figure D.1.

Table A.1

Pos.	Designation	Description	Qnty
1	VMPL5.910.002	PT	1
2	VMPL8.034.051	Body	1
3	VMPL8.040.010	Cover	1
4b	VMPL6.457.022	Gas supply line	1
5	VMPL8.227.020	Sleeve (latch)	1
6	1.622.1600.50	Cable entry	1
7		Power cable	1
8		Coolant passage	1
9	VMPL6.625.001	Terminal (grounding clamp)	1
10		Bolt M8x25	8
11	VMPL6.451.001	Fine adjustment valve	1
12a	SS-L65TF12 or SS-L65TSW12P	Ball valve	1
13	KRAU 8.930.006	Lock nut	1
14	KRAU 8.942.009	Washer	1
15a	030-035-30-2-2 GOST 18829-73 16ST V19-OR-0916	Ring or O-ring	1
16a	VMPL8.223.019	Mounting sleeve	1
A		Valve is open	
B		Valve is closed	
C		Welding points	

Appendix E
(reference)
Main view, overall and connecting dimensions of the Analyzer FAS-W. VMPL2.848.008 with the gas supply line VMPL6.457.024



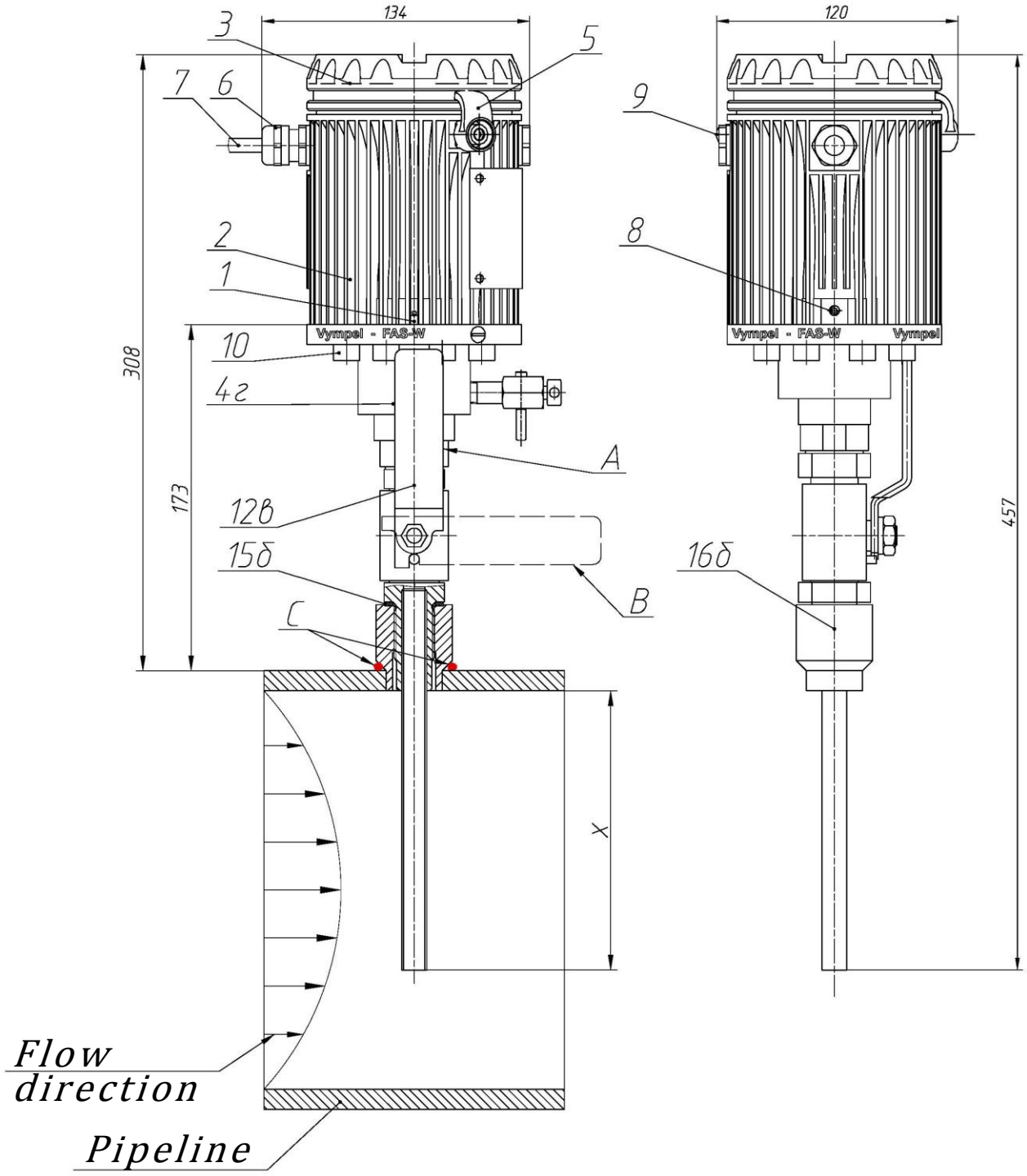
FAS-W height is specified for the submerged gas supply line VMPL6.457.024 with the standard length of the submerged probe (X=200 mm).

Figure E.1

Table E.1

Pos.	Designation	Description	Qnty
1	VMPL5.910.002	PT	1
2	VMPL8.034.051	Body	1
3	VMPL8.040.010	Cover	1
4c	VMPL6.457.024	Gas supply line	1
5	VMPL8.227.020	Sleeve (latch)	1
6	1.622.1600.50	Cable entry	1
7		Power cable	1
8		Coolant passage	1
9	VMPL6.625.001	Terminal (grounding clamp)	1
10		Bolt M8x25	8
11	VMPL6.451.001	Fine adjustment valve	1
12b	V83C-F12N-S	Ball valve	1
13	KRAU 8.930.006	Lock nut	1
14	KRAU 8.942.009	Washer	1
15a	030-035-30-2-2 GOST 18829-73 16ST V19-OR-0916	Ring or O-ring	1
16a	VMPL8.223.019	Mounting sleeve	1
17		Valve	1
18		Pin	1
19		Sleeve	1
20		Filter	1
21		Process output	1
C		Welding points	

Appendix F
(reference)
Main view, overall and connecting dimensions of the Analyzer FAS-W. VMPL2.848.008 with the gas supply line VMPL6.457.107



FAS-W height is specified for the submerged gas supply line VMPL6.457.107 with the standard length of the submerged probe (X=150 mm).

Figure F.1

Table A.1

Pos.	Designation	Description	Qnty
1	VMPL5.910.002	PT	1
2	VMPL8.034.051	Body	1
3	VMPL8.040.010	Cover	1
4c	VMPL6.457.107	Gas supply line	1
5	VMPL8.227.020	Sleeve (latch)	1
6	1.622.1600.50	Cable entry	1
7		Power cable	1
8		Coolant passage	1
9	VMPL6.625.001	Terminal (grounding clamp)	1
10		Bolt M8x25	8
11	VBV-M2N-L52-S	Discharge valve	1
12c	V86A-M-20M15-OH-NTA-S	Ball valve	1
15b	VMPL8.248.004	Ring or O-ring	1
16b	VMPL8.223.012	Mounting sleeve	1
A		Valve is open	
B		Valve is closed	
C		Welding points	

Appendix G
(obligatory)
FAS-W. Means of explosion protection

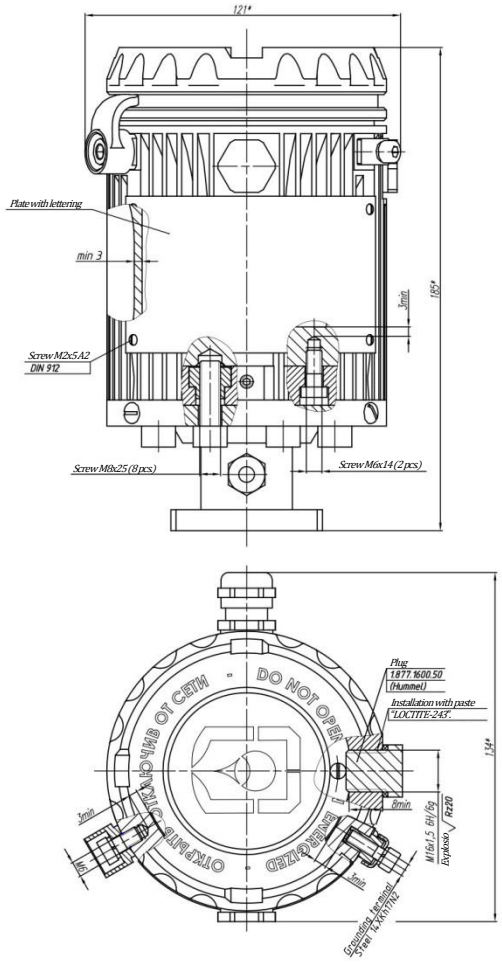


Figure 1

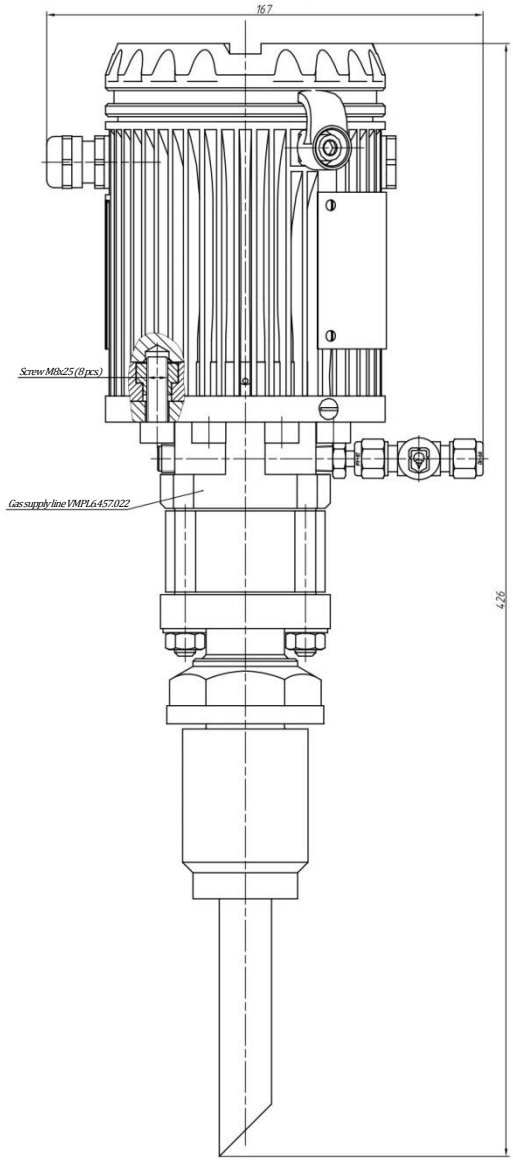
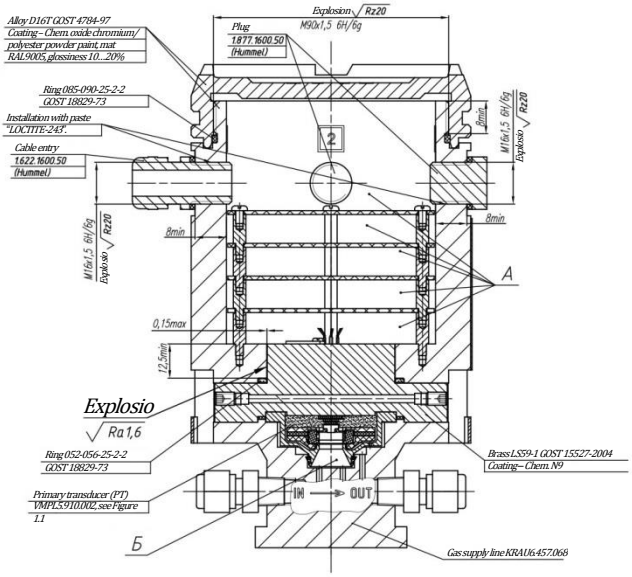


Figure 2
For the rest, see Figure 1



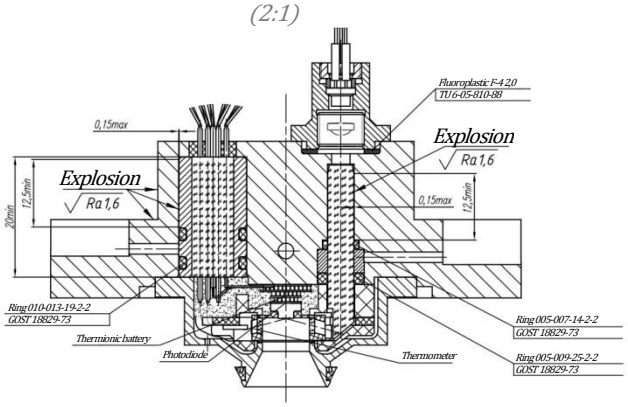


Figure 1.1
(2:1)

Figure G.1 (sheet 1 of 2)

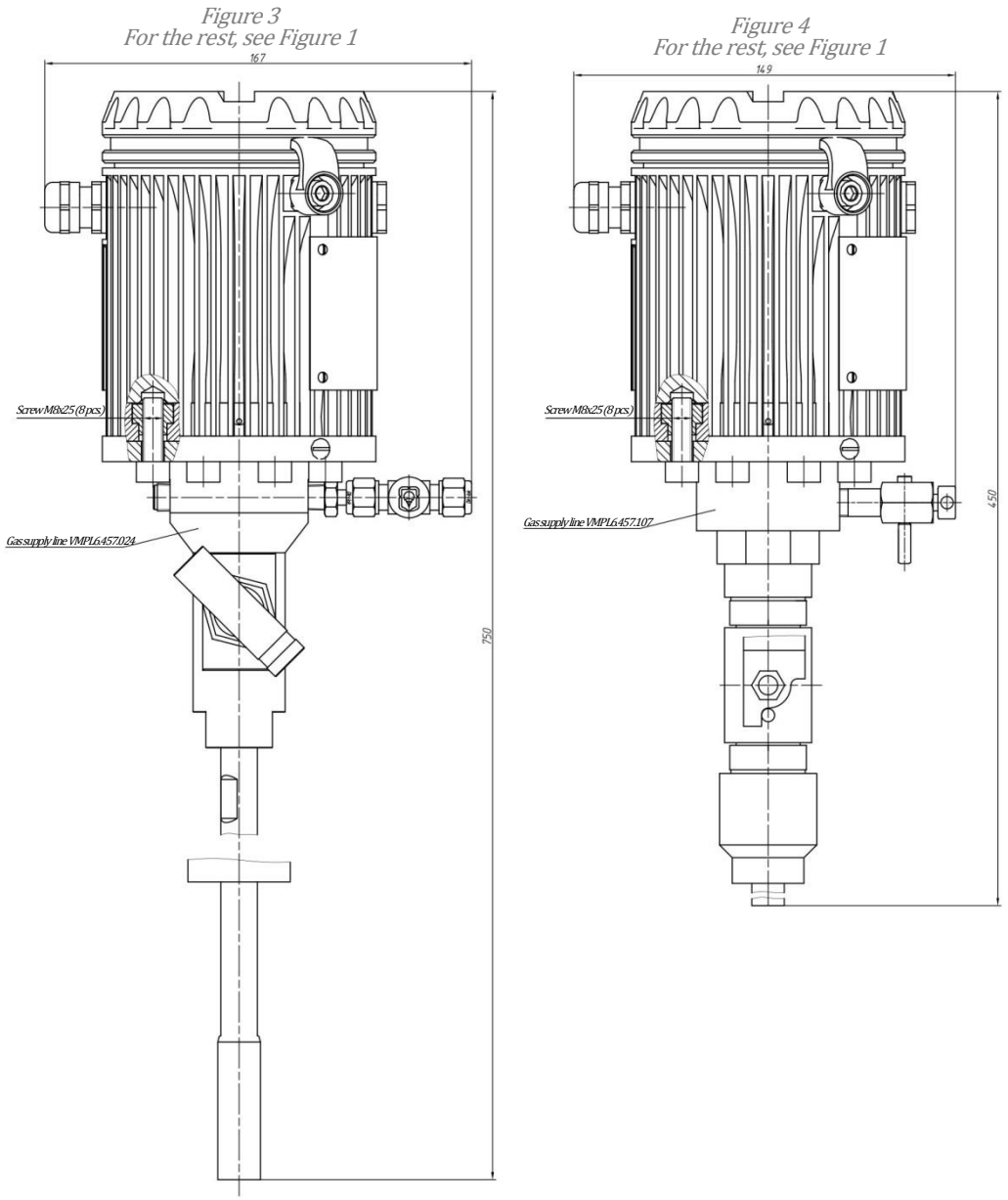


Figure G.1 (sheet 2 of 2)

Appendix H
(obligatory)
Description of work in the terminal program.

1. Run the Hygrovision.exe application from a folder with the terminal program.
2. Select the tab *Подключение (Connection)* → *Настройки (Settings)*.
3. In the pop-up window *Подключение (Connection),* select the *COM port* and *Модбас (Modbus address)* (see Figure 1).

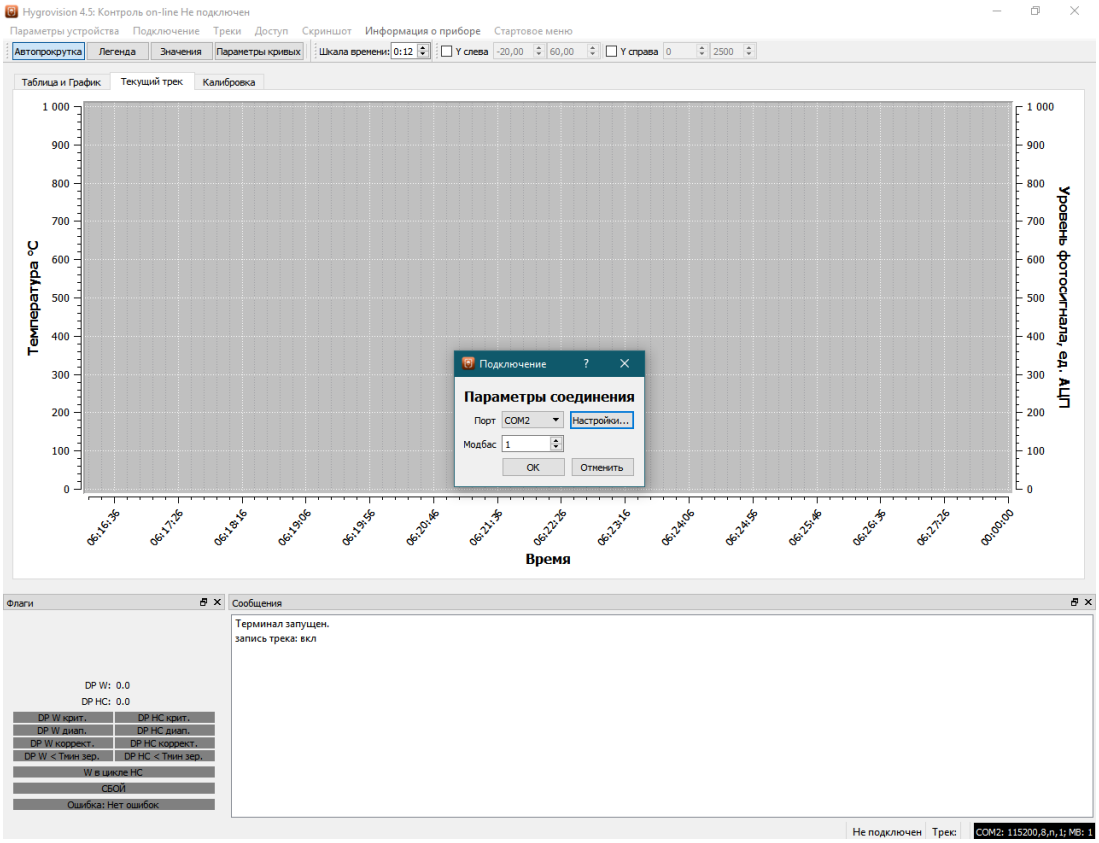


Figure 1: Connection parameters.

4. In the pop-up window, press the button *Настройки (Settings)*.
5. In the pop-up window *Свойства (Properties): COM*, set the necessary values: bit rate, data bits, parity, stop bits and flow control (see Figure 2).
6. Then select the tab *Подключение (Connection)* → *Подключиться (Connect)*.
7. For information about the instrument, select the tab *Информация о приборе (Information about the instrument).*

8. All information will be indicated in a pop-up window (see Figure 3).

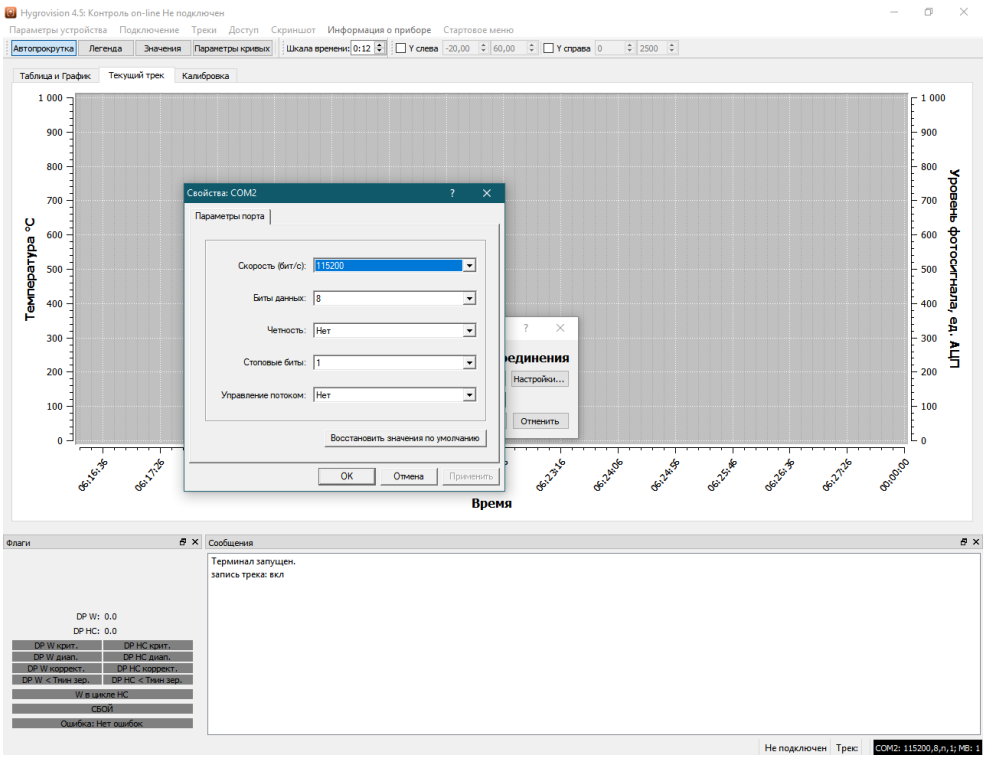


Figure 2: Properties: COM2

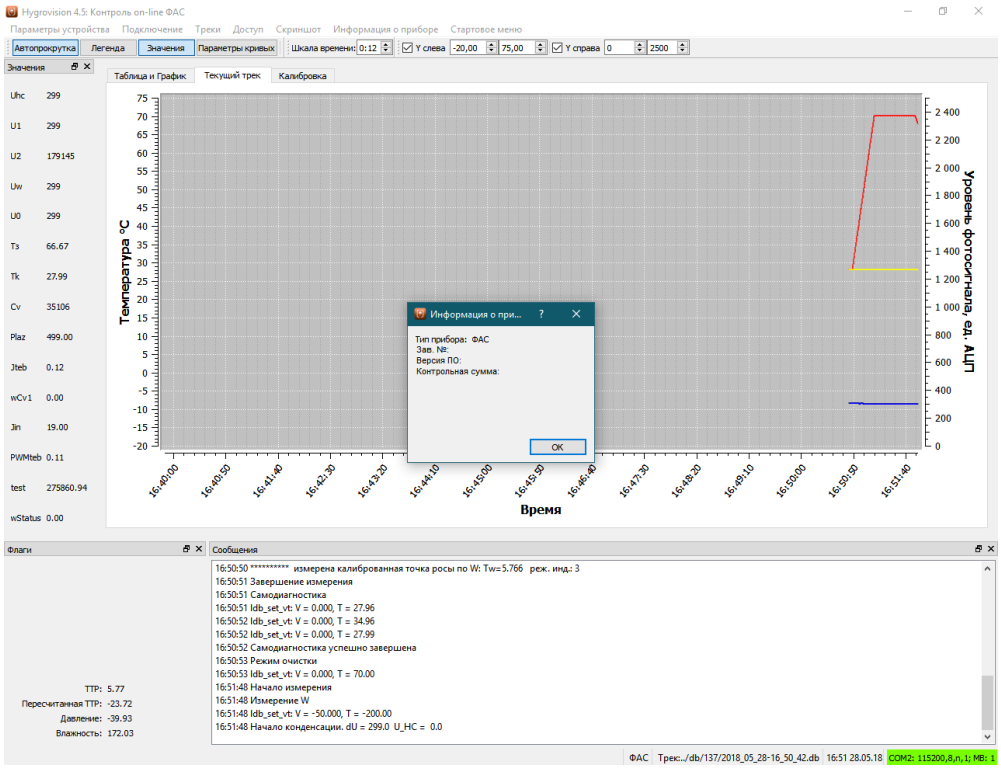


Figure 3: Information about the device.

Revision Record Sheet

Rev.	Page No.				Total number of pages in the document	Document No.	Ref. No. of accompanying document, date	Signature	Date
	changed	replaced	new	deleted					