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Process Gas Analyser
AnOx, Model КС 50.260-000

OPERATOR'S MANUAL

КС 50.260-000 РЭ

Samara

2013

Content

This operator's manual applies to Process Gas analysers, model AnOx КС 50.260-000 (hereinafter referred to as the analyser), intended for measuring the volume fraction of oxygen in gases, including natural gas.

1 Description and Operation

1.1 Purpose

1.1.1. Oxygen analysers AnOx are intended to measure the volume percentage of oxygen in gases, including natural gas, and to transmit the data to external devices. The principle of operation of the analyser is electrochemical. Depending on the type of installed oxygen sensor the ranges may vary from 0-200 ppm to 0-100% . The analyser can be used to monitor gas quality, control processes in the gas and oil industry, and ensure safety. Analysed gas shall not contain strong oxidizing agents, such as halogens, ozone, nitrogen oxides, as well as H_2S and SO_2 in concentrations over 10 ppm. If these compounds may be present in the analysed gas, the chemical filters shall be installed to remove these compounds.

1.1.2 The analyser can be used in the system of commercial accounting and quality control of gas according to the requirements of GOST 5542-87 and 089 of Gazprom Company Standard at gas distribution stations, as well as gas distribution points.

1.1.3. The analyser is designed for continuous automatic operation.

1.1.4. The analyser is explosion-proof with 1ExdIICT4 Gb marking, is in compliance with technical regulations of the Customs Union 012/2011 "On Equipment Safety for Work in Explosive Environments", GOST R IEC 60079.0-2011, GOST R 52350.1-2005, and can be installed in explosion-proof areas (Electrical Installation Standard, ed.6 chapter 7.3 2001, GOST R 52350.10-2005) according to the marking of explosion protection.

The area - 1.

Types of protection - flameproof enclosure d.

Subgroup of the electrical equipment – IIC.

Temperature class – T4.

Degree of protection against environmental exposure of the analyser – IP66 on GOST 14254.

Type of climatic performance – moderately cold climate 3.1 on GOST 15150

1.2 Technical Specifications

1.2.1 Indicators of energy consumption in operation:

- the analyser is powered by alternating current voltage 220^{+22}_{-33} В and frequency (50±1) Hz;
- power consumption: no more than 90 W when warming;
  no more than 30 W in the steady mode.

1.2.2 Parameters of the analysed gas mixture:

– analysed product is gas, including natural gas, according to the Company Standard 089;

– temperature of the analysed mixture in input of the analyser is from -40 to +50 °C;

– pressure of the analysed mixture is 0.1 + / -0.05 MPa;

– mechanical impurity concentration in the the analysed mixture shall not exceed 10 mg/m^3 at particle sizes less than 5 microns.

– hydrogen sulphide content of the analysed gas is not more than 10 ppm. At higher content you shall install a filter;

– gas lines of the analyser are tight at pressures up to 0.2 MPa.

Note: When checking the tightness of the lines it is recommended to remove the electrochemical oxygen sensor (hereinafter referred to as ECD or oxygen sensor) and place it in a container with oxygen-free gas.

1.2.3 Reliability Indicators:

– average time between failures is 20000 hrs;

– average total lifetime is 10 years.

1.2.4 The Main Technical Specifications are shown in Table 1

Table 1. The Main Technical Specifications

Name of an indicator	Meaning and characteristic of an indicator
Environmental conditions at the installation site	-20 to +50 °C at atmospheric pressure of 84,0-106,7 kPa, at a relative humidity of 98% without condensation
Dimensions: LxWxH, mm×mm×mm	435x275x425
Weight not more than, kg	39
Cable glands	FAL (FAL S) or PAP type
Communication interfaces	RS 232/485, Ethernet
Ventilation device	ECDS110 or ECD
Gas service pipes	Under a tube 1/8"
Mode of operation of the thermostat	Isothermal, T=39 °C
Analysed gas pressure regulator	External mechanical
Type of detector	Electrochemical
Analysed gas flow rate, ml/min	200-2000
Number of analysed streams	Up to 2
Materials in contact with the analysed gas	12x18xH10T steel, brass, fluoroelastomer
Analysis cycle	Continuous
Defined components	Oxygen

1.2.5 The Metrological Characteristics are shown in Table 2.

Table 2. Metrological Characteristics

Measuring range * of the volume fraction of the analyte	Limits of permissible absolute error	Limit of acceptable setting time $T_{0,9}$, c
0 ppm to 200 ppm	± (1.5 + 0.05·C_{in}) ppm	120
0 ppm to 2000 ppm	± (5 + 0.08·C_{in}) ppm	60
0 ppm to 10000 ppm	± (100 + 0.06·C_{in}) ppm	60
0 % to 100 %	± (0.5 + 0.03·C_{in}) %	60
Notes 1) - * - measuring range is selected when ordering the analyser, is factory set and can not be changed by the user during operation. 2) Svh – volume fraction of the analyte at the inlet of the analyser, ppm or %.		

1.2.6 Retention Time of the Analyser to Operation Mode is not more than 1 hour.

Note: Process stabilization after replacing oxygen ECD can take up to 24 hours

1.3 Completeness of Oxygen Analyser

Table 3. Scope of Supply of the Oxygen Analyser AnOx

Designation	Name	Q-ty
КС 50.260-000	Process Gas analyser	1
	Package	1
	Spare parts, tools and equipment (in completion according to the form)	1
КС 50.260-000 Operator's Manual	Operator's manual	1
КС 50.260-000 ПС	Data sheet	1
КС 50.260-000 34 01-1	Operator's manual. software "X-metr"	1
	CD with software installation media "X-metr"	1
МП-242-1659-2013	Methods of verification	1
	Copy of the Certificate of Measuring Equipment Type Approval	1
	Copy of the Certificate of Conformity of the Customs Union	1

1.4 Oxygen Analyser Device

1.4.1 Appearance of the Oxygen Analyser.

Appearance of the oxygen analyser AnOx is shown in Fig. 1

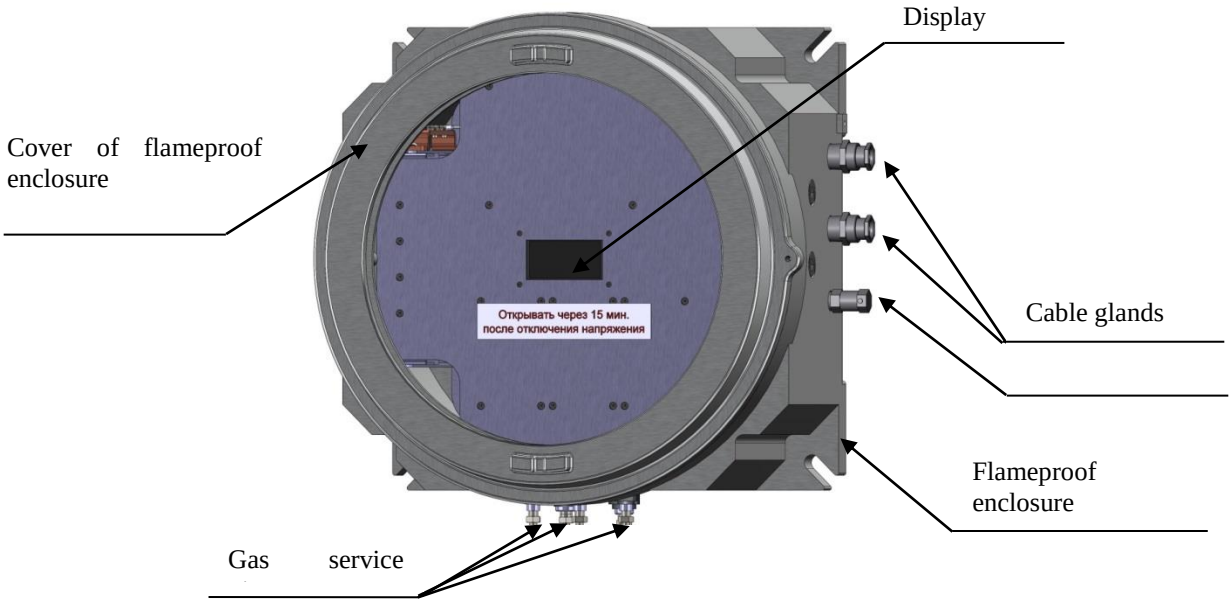


Fig. 1. Appearance of the Analyser AnOx

1.4.2 Inner Assembly of the Oxygen Analyser.

The electronic and analytical units (Fig. 2) are located inside the flameproof enclosure.

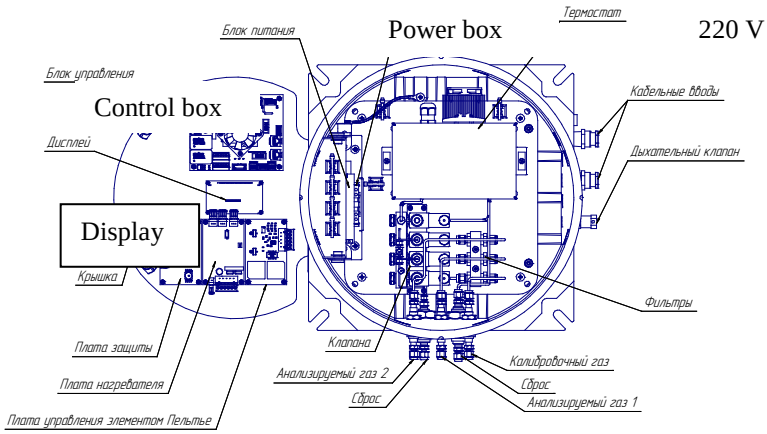
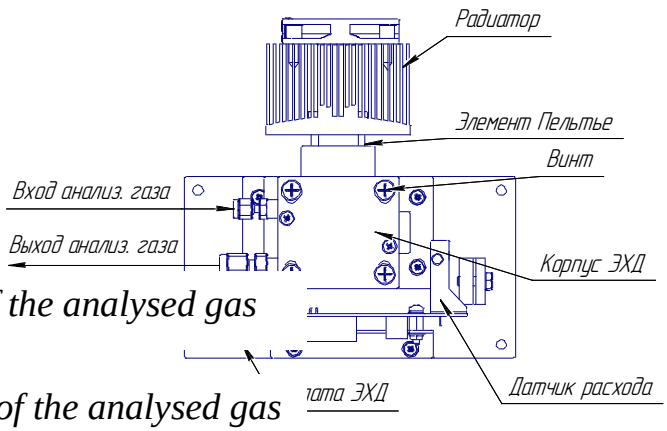


Fig. 2 Inner Assembly of the Analyser. General Arrangement

1.4.3 Description of the Analytical Unit (Thermostat) of the Oxygen Analyser

The analytical unit is shown in Fig. 3



Radiator

Peltier element

Screw

Input of the analysed gas

Output of the analysed gas

ECD case

ECD plate

Flow sensor

Fig. 3. Inner Assembly of the Analytical Unit.

1.5 Operational Principle of the Oxygen Analyser

1.5.1 Electrochemical Oxygen Sensor

1.5.1.1 Operational Principle

Oxygen sensor used in the analyser is a 2-electrode electrochemical sensor. Depending on the range the different types of ECD can be used. The sensor is a cylinder made of an inert plastic, on the one hand there is an oxygen-permeable membrane below the grid and on the other side - two concentric electrode made of copper foil.

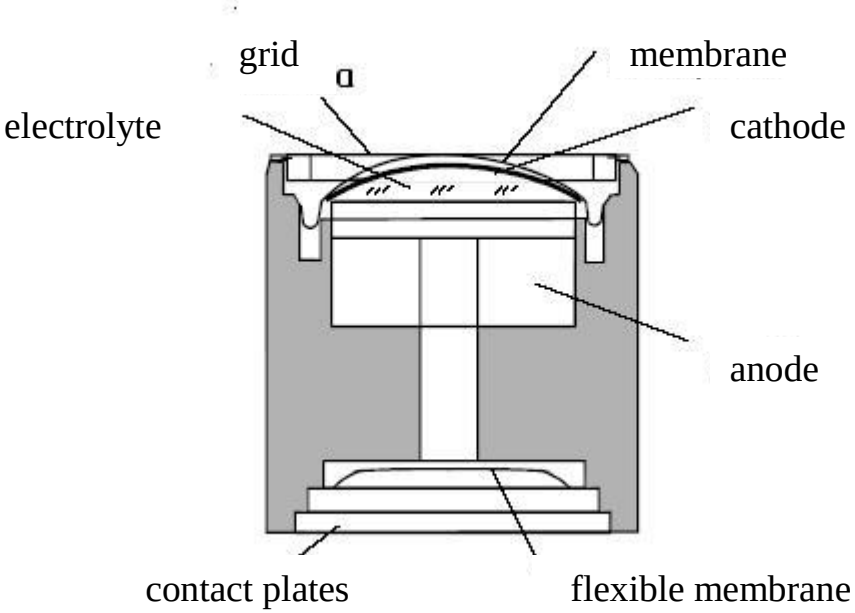


Fig.4 Inner Assembly of Oxygen ECD

At the top of ECD there is Teflon diffusion membrane (Fig. 4). Underneath there is the perforated cathode coated with a layer of electrolyte. The electrolyte may be solutions KOH, K_2CO_3, CH_3COOK or CH_3COOH. The anode is made of lead. At the bottom of ECD, below the anode, there is a membrane designed to compensate the fluctuations in atmospheric pressure. Below there are located the contact electrodes connected to the cathode and anode.

Gas sample diffuses through the Teflon membrane. There are following reactions on the electrodes:

$O_2 + 2H_2O + 4e^- = 4OH^-$ (cathode)

$Pb + 2OH^- = PbO + H_2O + 2e^-$ (anode)

The signal of the sensor is a current which is proportional to the amount of oxygen diffusing into the sensor. The current is not generated if there is no oxygen. Current of the sensor in the operating range of concentrations depends linearly of an oxygen concentration. Usually only one point with the known gas concentration is enough for calibration. For more accurate work it is better if the control gas mixture for calibration is prepared in the matrix of the analysed gas.

1.5.1.2 Factors Affecting ECD Performance

1) Effect of oxidants.

Besides oxygen some strong oxidants such as chlorine or ozone can cause ECD response. H_2S and SO_2 in concentrations of more than 10 ppm can distort readings or damage ECD.

2) Effect of pressure.

Oxygen ECD should be under constant pressure. Oxygen ECD signal is proportional to the partial pressure of oxygen. Sharp fluctuations in pressure more than 0.1 atm can damage the membrane of ECD.

3) Effect of temperature.

Since the gas diffusion rate depends on temperature, it is necessary to maintain constant temperature of the sensor. For this a heater, temperature sensors and a Peltier element are mounted in the case where the sensor is located, if ECD cooling is required.

Avoid freezing of ECD electrolyte, which can damage ECD. You shall follow the recommendations of the manufacturer of oxygen ECD.

1.5.2 Gas circuit

Gas circuit is shown in Fig. 5. All gases (analysed, calibrated and zero, if used) are fed into the shell through the flame arrestors П1-П3 to the filters Ф1-Ф3 and the solenoid valves К1, К3, К4, mounted on a manifold. After manifold, the gas enters on the capillary to limit the flow. After the capillary, the gas enters the electrochemical oxygen sensor ECD placed in a thermostatic body, and further goes via valve К2 to flowmeter ИР. After the flowmeter, the gas flows out of the shell through the flame arrester П4.

Gas is selected by turning one of the solenoid valves. Gas flow is adjusted by means of a pressure regulator which must be installed at the input of the analyser. The capillary at the manifold output (port 5) serves to maintain the flow rate of 50-100 ml/min in the lines of the analysed gases.

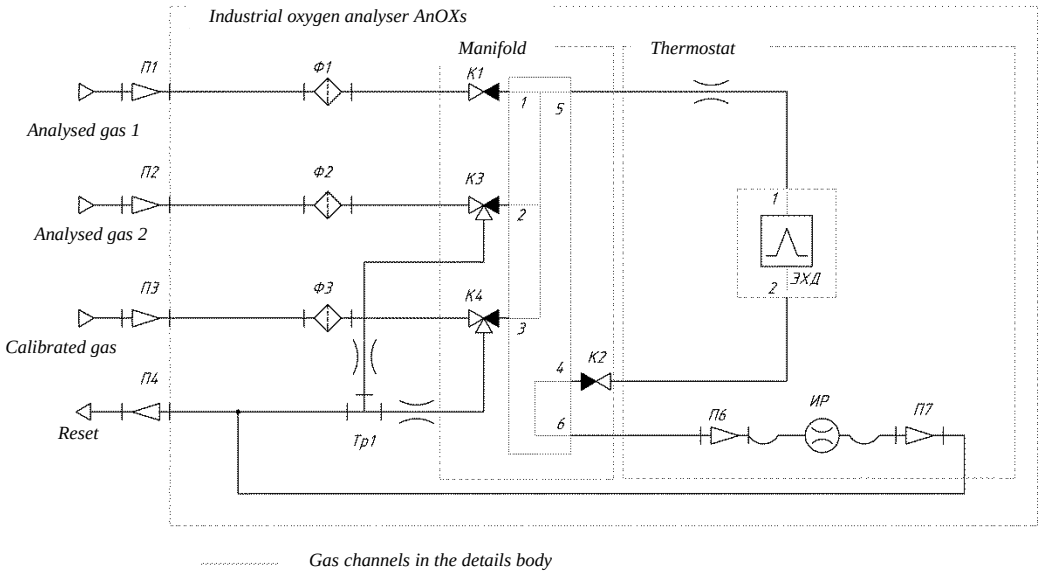


Fig. 5 Gas Circuit of the Oxygen Analyser

1.6 Ensuring the Explosion Protection Requirements

1.6.1 Industrial oxygen analyser is explosion-proof equipment.

1.6.2 The analyser can be installed in a zone 1 (GOST R 52350.10-2005).

1.6.3 Subgroup of electrical equipment: IIC.

1.6.4 Temperature class: T4.

1.6.5 The following types of explosion protection are used:

flameproof enclosure d (ГОСТ Р 52350.1-2005).

1.6.6 Marking of Explosion Protection: 1Exd IIC T4 Gb.

1.6.7 The structural and organizational measures are used to meet the requirements of explosion protection.

1.6.8 Constructive Measures.

1.6.8. All blocks of the analyser are wrapped in the enclosure with a high degree of mechanical strength CCA-04EV ("Cortem SpA") or GUBW-04 ("FEAM Srl"), capable of withstanding the pressure of an internal explosion without damage and transmission of inflammation in the surrounding explosive atmosphere in accordance with GOST R 52350.1-2005. The enclosure volume is 0.02 m^3.

1.6.8.2 Pressure inside the flameproof enclosure shall not exceed the atmospheric pressure. The ventilation device ECDS-110 or ESD is installed to equalize the pressure, dropping overpressure in case of depressurization of the gas paths. Also the absolute pressure sensor is mounted inside the enclosure that measures the pressure inside the flameproof enclosure. In case of excess pressure inside the box of 1.2 atmospheric level, the electrical power of the oxygen analyser is turned off.

1.6.8.3 Cable entry in box is made using certified explosion-proof cable glands of FAL (FAL S). FAL(FAL S) or PAP type. Use of the cable glands of this type does not require potting, due to their long elastomer O-rings. Cable glands for power circuits and for the transmission of data are located on the side wall of the device.

1.6.8.4 Flameproof enclosure, cable glands, ventilation device are products of Cortem SpA. or FEAM Srl (Italy), are certified by NANIO "Certification Centre of Explosion-Proof and Mine Electrical Equipment" and have permit for use of the Federal Service for Ecological, Technological and Nuclear Supervision.

1.6.8.5 Gas glands are made through the slit-type flame arrestors with the maximum possible clearance according to GOST R 52350.1-2005. Their structure is shown on the assembly drawing КС 50.260-000 СБ.

1.6.8.6 The basic blocks of the oxygen analyser are powered under 24 V. To have this voltage from the network, a certified power supply TSP 090-124 (Traco Power) is used, certificate No. LCIE 07 ATEX 0004 U.

1.6.9 Organizational measures.

1.6.9.1 On the body of the oxygen analyser there is a plate with information about the type and parameters of explosion protection, and contact information of the manufacturer.

1.6.9.2 There is a plate on the body of the device with warning sign "Open in 15 min. after a power shut-off".

1.6.9.3 The device is provided with a grounding terminal in accordance with GOST 21130-75.

1.7 Marking

1.7.1 The plate mounted on the oxygen analyser (Fig. 6), shall include:

- trademark of the manufacturer;
- the product name;
- serial number and year of manufacture;
- approval mark of the type of the measuring device on ПР 50.2.009;
- electrical parameters of the oxygen analyser;
- maximum gas pressure in the gas lines;
- permissible ambient temperature range at the installation site of the product;
- measurement range
- marking of explosion protection and degree of protection from external influences;
- OS abbreviation and certificate number: Certification Centre STV No. ТС RU С-.ГБ04.В.00006;
- mark of conformity on GOST R 50460-92;
- name and address of the manufacturer.

Fig. 6. Plate Mounted on the cover of the Oxygen Analyser

1.7.2 The warning label is mounted on the cover of the oxygen analyser:

Open in 15 min. after power shut-off

1.8 Packing

Packing of oxygen analysers AnOx is performed in accordance with their operational documents. Oxygen analyser shall be packed in wooden or plywood box. Before being placed in the box the oxygen analyser shall be placed in a plastic bag to prevent moisture on it (or any other material, not leaky).

The oxygen analyser is placed in shipping containers and secured to avoid displacement.

The operator's manual, data sheet, verification procedure and certificates put in a separate plastic bag are also placed in shipping containers (packaging).

In each box of the shipping container there shall be a packing list containing the following information:

- name and designation of the oxygen analyser, completeness;
- packing date;
- signature or stamp of the responsible for the packaging and QC stamp.

Packing list must be enclosed in a plastic bag and stowed under the cover of the box on the top layer of the packaging material so as to ensure its safety.

The oxygen sensors shall be packed in a separate container and transported in accordance with the conditions specified in the Data Sheet for the device КС 50.260-000 ПС.

Shipping containers shall be sealed with QC stamp of the manufacturer.

2 Intended Use

2.1 General Operation

2.1.1 The oxygen analyser is a complex device that combines the elements of electric engineering, gas flow management system, and pneumatic automation. Before mounting the analyser on the site, you shall check it in the laboratory in automatic mode.

2.1.2 In operation, it is necessary to observe the work of the analyser. If there are any changes in the work it is necessary to check the pressure of the analysed gas, tightness of the gas lines and view the event log of the analyser.

2.2 Safety Precautions

2.2.1 There are pipelines in the oxygen analyser which are working under pressure of compressed gases. When the analyser is on duty it is necessary to follow the safety rules provided when working with devices that are under excessive pressure.

2.2.2 There are electrical circuits in the oxygen analyser under pressure 220 V. Therefore, when installing the analyser on the explosive facility you shall strictly follow the "Instructions for Installation of Equipment of Power and Lighting Networks in the Explosive Areas ВСН-332-74", "Electrical Installation Standard", "Safety Rules" and" Rules of Technical Operation of the Electrical Installations", including Ch. ЭШ-13 "Electrical Equipment of the Explosive Productions".

2.3 Location and Installation

2.3.1 The oxygen analyser is located on technological facility in accordance with the instructions of this operator's manual.

2.3.2 When installing the device the following shall be connected:

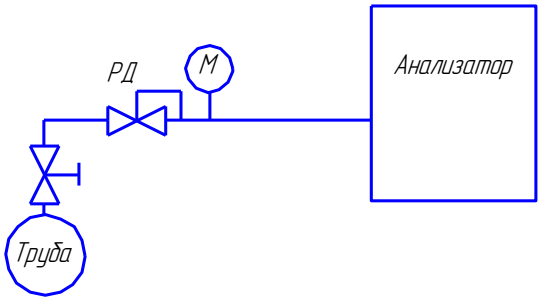
lines of the analysed gas and parametric light oscillator;

reset line of analysis products;

electrical communications connecting the device with external devices;

electrical supply of 220 V.

2.3.3 The gas lines shall be connected with a stainless steel tube of 1/8" with an inner diameter of 2 mm (Fig. 7).



Analyser

Tube

Fig. 7 Connecting the Analyser on Site

2.3.4 For fixing the oxygen analyser to the wall or frame on the technological object you shall be guided by a dimensional drawing (Appendix A).

2.3.5 The analyser is installed permanently indoors or in a heated cabinet.

2.3.6. To the analyser shall be easily accessible from three sides.

2.3.7 The device shall be placed away from high heat sources. Minimum distance between the device and the heat source is 0.5 m

2.4 Order of Installation, Preparation for Work, Start-up

2.4.1 Installation of the analyser on the technological object. The installation on technological facility shall be made subject to guidelines set forth in Section 1 of this operator's manual.

2.4.2 The analyser shall be positioned as close as possible to the sampling point, as it reduces the time of transportation delay.

2.4.3 Verification of means of protection. Verification is carried out by an external examination. On the surfaces of parts providing explosion there shall not be rock faces, scratches, dents, perishing, and damage of threads. Details with defects shall be rejected and replaced by new, supplied by the manufacturer. Check the plates and inscriptions clarity, content and quality of marking of explosion protection and compliance with the applicable certification.

2.4.4 Preparation for operation and turning on of the oxygen analyser include the following:

2.4.4.1 Connection of the gas lines of the analysed gas and reset. Legend of the gas inputs is shown in Fig. 8:

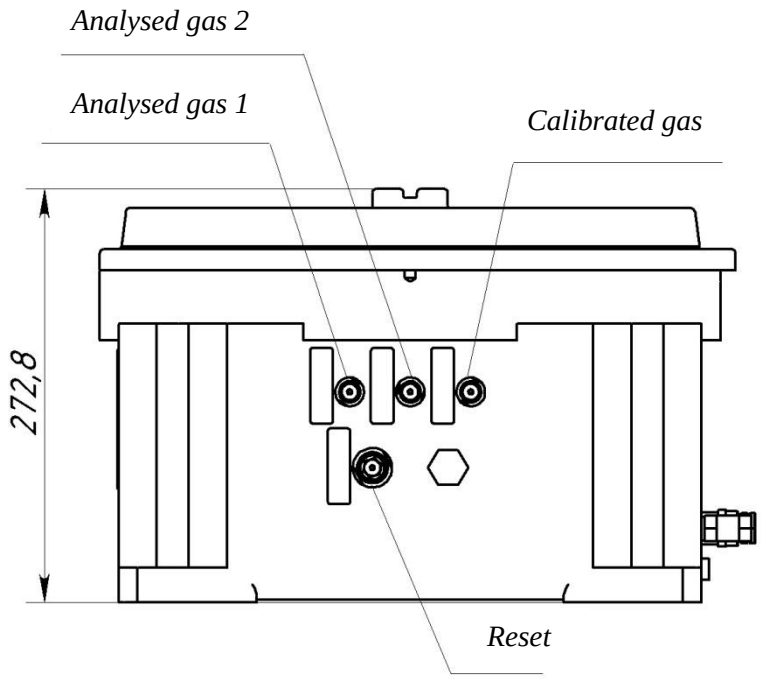


Fig. 8. Purpose of the Gas Service Pipes

The gas lines are connected to the appropriate terminals of the analyser with stainless steel pipes (AISI 316) 1/8" using adapters with supplied compression fitting.

Reset line from the analyser shall be connected to the reset lines of the company where there are no sharp changes in pressure (more than 1 kPa).

2.4.4.2 Electrical connection to the analyser. The electrical lines shall be connected in accordance with the wiring diagram (Appendix B).

Electrical power is supplied to the analyser through armoured cable with copper conductor with cross-section of at least 1.5 mm^2. There are three wires in the cable. Cable for data transmission is connected through armoured cable of "twisted pair" type and the conductor cross-section of 0.5-0.75 mm^2. There are three twisted pairs in the cable. Cable brands and requirements for wiring and installation are in accordance with the Electrical Installation Standard (ed. 6).

The analyser shall be grounded via separate ground terminals to specifically designed bus external grounding.

Cables are entered into flameproof enclosure via the cable glands, located on the right side wall of the flameproof enclosure of the analyser (Fig. 1). For cable connection it is necessary:

– to open the flameproof enclosure;

– to connect the power cord to the terminal XS3 (Appendix B);

– to connect the analyser to a remote workstation using the standard interface RS 232/485 or Ethernet (on-board connectors X14, X16, respectively, Appendix B);

2.4.4.3 After connecting the analyser to the gas and electrical supply a display of the analyser (Fig. 1) shall show the current concentration status of the oxygen and status signals (error signals, output of oxygen above the concentration limits, the current mode of operation, etc.).

2.5 Using the Oxygen Analyser

2.5.1 Establishing a connection.

The software "X-meter" is used to display the information, monitor performance and settings of the oxygen analyser. Connection with the network is carried out in accordance with the instructions on working with the software "X-meter" installed on an external computer. This program is supplied.

2.5.2 Setting the device.

To check the operation of the oxygen analyser you need a cylinder with gas mixture. The first few tests are performed manually. According to the results you can correct measurement technique and software for automatic operation control of the oxygen analyser, i.e. the following parameters of the device shall be set:

– duration and frequency of the analysis;

– duration and frequency of the calibration mode;

– lower and upper threshold of oxygen content in the analysed gas;

Adjustment is carried out using the program "X-meter". After adjusting the device can be put into automatic mode of operation in which the main parameters of the device are tested in accordance with the verification procedure (supplied in the operational documentation).

2.5.3 Performing measurements.

The main purpose of the device AnOx is to determine the oxygen content of the gases in the automatic mode. When you turn it on the oxygen analyser switches to the automatic mode per default with the settings of the manufacturer. To change to the manual mode, you shall reset the device using the program "X-meter" according to the manual.

Before making measurements you shall drain the gas lines of the oxygen analyser.

2.5.4 Correction of the zero signal of the detector.

Correction of the zero signal of the oxygen sensor is recommended prior to the calibration of the analyser or after replacing oxygen ECD (but not earlier than 24 hours after installation). The gas is supplied in the analyser from the oxygen generator ГК-500 with zero oxygen concentration. Nitrogen can be used for models with measuring ranges of 0-10,000 ppm and 0-100% as the zero gas. Zero gas purges shall be made prior to stabilization of the analyser, but not less than 24 hours. The resulting signal is taken for zero, and its value is used in calculating the values of the signal of calibration and analysed gases.

During zero correction it is necessary:

- to connect the oxygen generator ГК-500 to one of the inputs
- set zero oxygen concentration and flow rate of 500 ml/min
- to set a rough measurement range 1
- to observe the change in the sensor readings using the software "X-meter". To do this, go to Tools/Zero Adjustment.
- after stabilization of the signal (may take several hours to days), using the software "X-meter", run mode Service/Zero Adjustment/Calculate new 0.
- in a few minutes click "Save new 0".
- set the measurement range 2 and try again zero correction in this range.

2.5.5 Calibration of the device.

It is recommended to make calibration once a week when running in automatic mode, before the analyser calibration and after replacing oxygen ECD. Calibration of the oxygen analyser can be made in manual or automatic mode on control gas mixture on schedule. Calibration is carried out by a single point. To minimize the influence of the ambient air it is recommended to use for calibration the oxygen concentration in the control gas mixture of at least 100 ppm. Outside the danger zone it can be calibrated on the oxygen generator ГК-500. It is recommended to install the drip tray at the output of the generator and provide constant pressure at the input of the analyser as described in the Methods of Verification.

When calibrating in the manual mode, you shall:

- using the software "X-meter" go to Tools/Data Sheet of the control gas mixture and enter the concentration of oxygen, which will be used for calibration.

- purge the calibration gas line to remove oxygen and connect it to the corresponding input of the analyser (Fig. 8). The valve K4 controls the calibration gas (Fig. 5). Monitor changes in the sensor readings, using the software "X-meter" go to Tools/Zero Adjustment.

- after the signal stabilization run calibration mode.

2.6 Software

2.6.1 Process Gas analysers of AnOx model have the following types of software:

- embedded;

- fixed.

Embedded software is specially designed for the measurement of the test components and provides the following main functions:

- processing of measurement data from ECD,

- generation of output signals (digital, analogue),

- diagnostics of analyser hardware and integrity of the fixed firmware.

- recording interferences of the device (mode change, time synchronization, specification of new value criteria standards and calibration parameters) in the archive of events.

Analyser firmware implements the following algorithms:

1) Manual operation - execution of the commands of the operator;

2) Automatic operation - according to a predetermined algorithm.

2.6.2 In the process of testing the embedded software performs sequencing specified within the chosen method:

- exit to the desired mode of operation when the analyser is on;
- launches scheduled sets of commands for ad hoc analyses;
- oversees the progress of the analysis;
- after collection, calculates the analysis according to specified algorithms;
- produces the required parameter calculation in a predetermined sequence and by specified expressions;
- stores the results of calculations in separate analyses;
- displays the analysis results on the integrated display;
- in the analysis of control gas mixtures provides an automatic calibration of the analyser according to specified algorithms, preserving the grading results in the archive.

In addition, the process of its operation the software:

- provides protection and control of metrologically significant parts of the program and stored data;
- fixes changes in the Intervention Log made to the software configuration and user interactions in its modes of operation;
- identifies the software and its design module;
- views results of the last analysis;
- By open communication protocol Modbus RTU transmits in the automated process control system the top level of service and status information about the status of the individual measurements of current or archival analysis, entries of the Intervention Log and Accidents Log for arbitrary time interval, controls the start and stop of the analysis, selection of the mode of analysis or calibration.

2.6.3 Description of calculation modules of the analyser

The firmware includes the following programs for data processing:

"Calibration" is the determination of the signal level of the calibration and calculation of the calibration factor.

"Analysis of the measurement result" is the determination of the signal level of the analysis and oxygen concentrations.

"Selection of the next mode" is a helper program to select the next mode of operation.

2.6.4 Identification of the firmware

2.6.4.1 Identification of the firmware is made by verification of:

- firmware version;
- compliance of CRC-codes of controlled programs with the values that are specified in the data sheet of the corresponding analyser model.

2.6.4.2 Fixed firmware for personal computers running under OS of Microsoft Windows XP/Vista/7/8, operator program «X-meter" is used to configure and control the analyser.

Fixed firmware performs the following functions:

1) At the user level:

- display of the results of measurements on a PC;
- identification of the analyser firmware and its calculation module;
- view the results of recent analyses;
- view the results of archival analyses;
- view the events of Intervention Log;
- view the events of Accidents Log;

2) At the administrator level:

- setting modes of the analyser;
- setting criteria for standards of the monitored parameters;

- setting parameters of the communication ports;
- management of user rights;
- time synchronization on computer time;
- firmware upgrade of the microcontroller of the analyser.

Identification of software is carried out with the on-screen form "About.." software "X-metr". This screen form is opened from the main working window of the software by clicking the menu item "Help\About" (Fig. 9). At the top of the dialog box "About" it is displayed the version of the software, as well as information about the manufacturer.

The bottom table shows the description of the connected device: Device model, serial number, firmware version, the list of CRC-codes of controlled programs of the firmware and integral sum of the device.

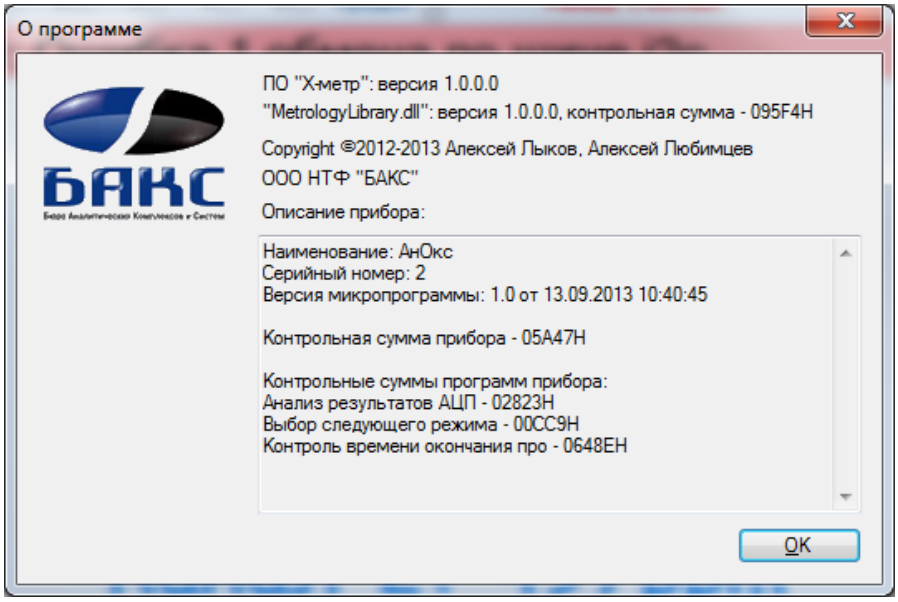


Fig. 9. Software "X-metr"

Detailed description of the software "X-meter" is given in the "Operator's Manual, Software "X-meter".

3 Maintenance

3.1 ***Caution! The cover of the analyser, in accordance with the plate, can be opened no earlier than 15 minutes after power switch off clause 1.7.2.***

3.2 Maintenance of the oxygen analyser shall be made by technical staff in accordance with the "Rules for the Design and Operation of Electrical Installations", "Safety Regulations of Electrical Installations", "Electric Installation Standard" (chapter 7.3, etc.), this operator's manual and software "Analyser".

3.3 Operated oxygen analyser does not need maintenance, except for periodic monitoring, which means:

- following of the operation conditions;
- safety of stickers and seals on the analyser;
- clean exterior surfaces of the device;
- tightness of the analyser connections to the pipeline;
- no external damage.

Frequency of inspection is determined by the operator, along with the company, performing facility maintenance, where the oxygen analyser is installed.

3.4 Replacing electrochemical detector (ECD)

ECD life cycle is 12 months, which corresponds to the calibration interval of the analyser. After 12 months of operation, during the preparation of the analyser for periodic calibration procedure is recommended to replace ECD.

To replace ECD you shall:

a) open the cover of the flameproof box of the analyser (Fig. 1);

b) unscrew four screws from the lid of the thermostat, remove the cover (Fig. 2);

c) remove 4 screws of the cover of ECD case, remove the cover (Fig. 3);

d) replace ECD;

e) reassemble in reverse order;

f) remove atmospheric oxygen from the gas channel of the analyser respectively.

WARNING!

Failure to comply with the operating conditions can lead to a failure of the oxygen analyser or exceeding the maximum permissible error of measurement values of the oxygen analyser.

4 Transportation, Storage and Disposal

4.1 Transportation

Packed analyser can be transported at any distance by any mode of transport except for non-pressurized aircraft compartments and open decks provided the storage conditions 5 on GOST 15150 are observed. The shipping containers shall be protected from rain during transportation.

Transportation conditions:

- ambient temperature -40 to +50 °C;
- relative humidity up to 98% at 25 °C;
- dust and vapour aggressive impurities are unacceptable in the air.

Method of stacking boxes in the transport means shall eliminate their movement. During loading and unloading the transport boxes shall not be exposed to excessive shocks and the impact of rainfall.

WARNING!

At temperature below -20°C the electrochemical sensors that are part of the analysers shall be transported separately at temperature -20 to +50°C in the package, protected from atmospheric oxygen. The sensor that is a part of the analyser may be transported, subject above temperature range.

The analyser shall be unpacked in a dry heated area after night stay in them, in case when transporting or storing the ambient temperature is below 5°C.

4.2 Storage

Packed analyser shall be stored indoors under conditions 2 on GOST 15150:

- air temperature - 40 to +50 °C;
- relative humidity less than 98% at 25 °C;
- vapours of acids, alkalis and other aggressive substances in the air are prohibited;
- prohibited to store near heaters

WARNING!

The electrochemical sensors that are part of the analysers shall be stored separately at temperature 0 to +40 °C. The sensors shall be stored in the package, protected from atmospheric oxygen. For long-term storage it is recommended to leave the sensor in the analyser, subject to the storage temperature range of the sensor.

4.3 Disposal

The oxygen analysers do not contain harmful substances and components that pose a threat to human health and the environment during and after the end of life and during recycling.

The oxygen analyser is recycled separately by groups of materials: plastic elements, metallic elements of the housing and fixing elements.

4.4 Warranty

The manufacturer guarantees compliance of the oxygen analyser with the requirements TECH SPEC 4215-022-21189467-2012 if the consumer complies with the installation, operation, transportation and storage conditions.

Warranty period of the oxygen analysers AnOx is 12 months from the date of commissioning, but not more than 18 months from the date of manufacture.

The manufacturer is entitled to refuse the warranty repair, in case of failure of the device if:

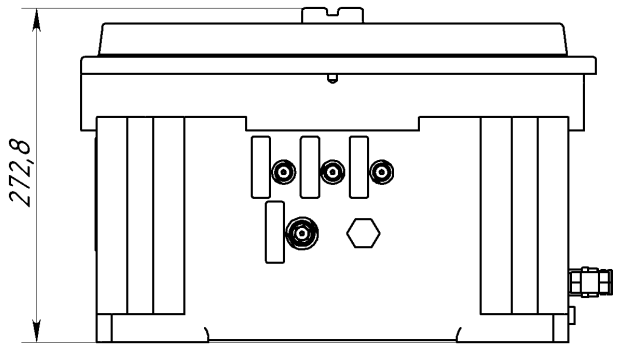
- the oxygen analyser has mechanical damage;
- failure of the oxygen analyser occurred as a result of violations of the operation requirements by the consumer;
- the oxygen analyser is dismantled or any other interventions were made in product design;
- no data sheet;
- no mark on commissioning of the oxygen analyser in its date sheet.

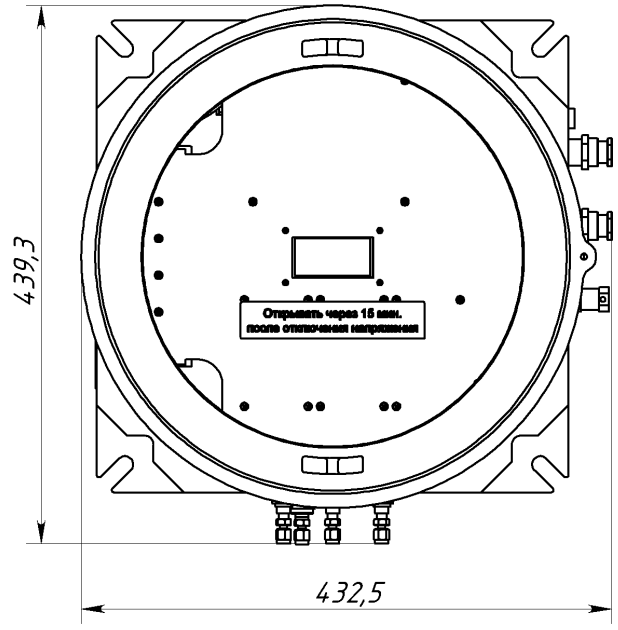
Warranty repair of the oxygen analyser shall be made by the manufacturer, unless otherwise provided by the additional agreement between the operating organization and the manufacturer.

Manufacturer
BACS STF LLC, Samara
Address: 10, Kirova av., Samara, 443022.

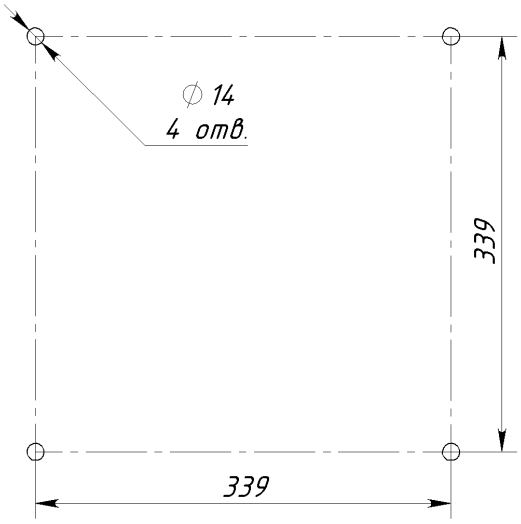
APPENDICES

Appendix A. Dimensional Drawing.

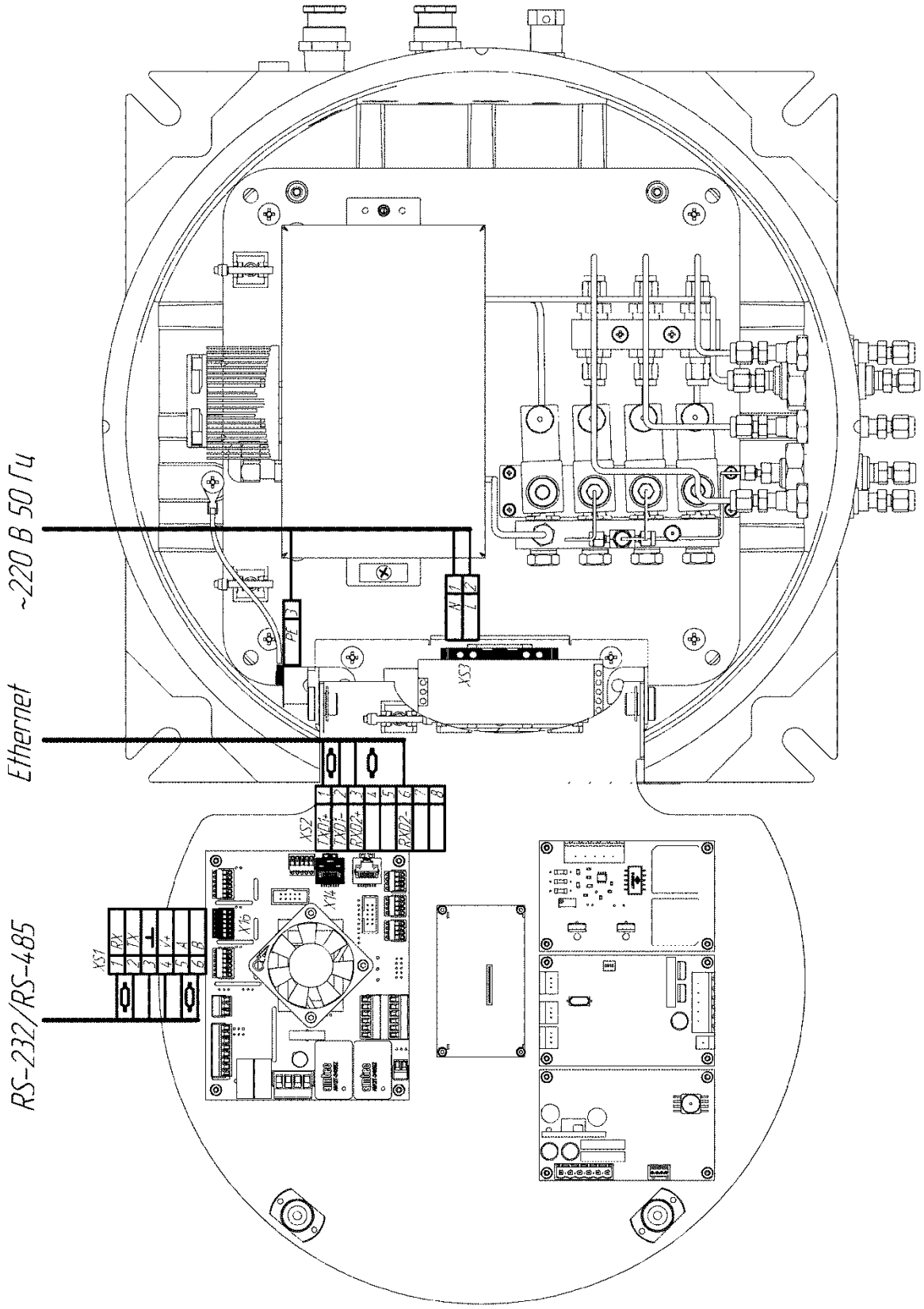




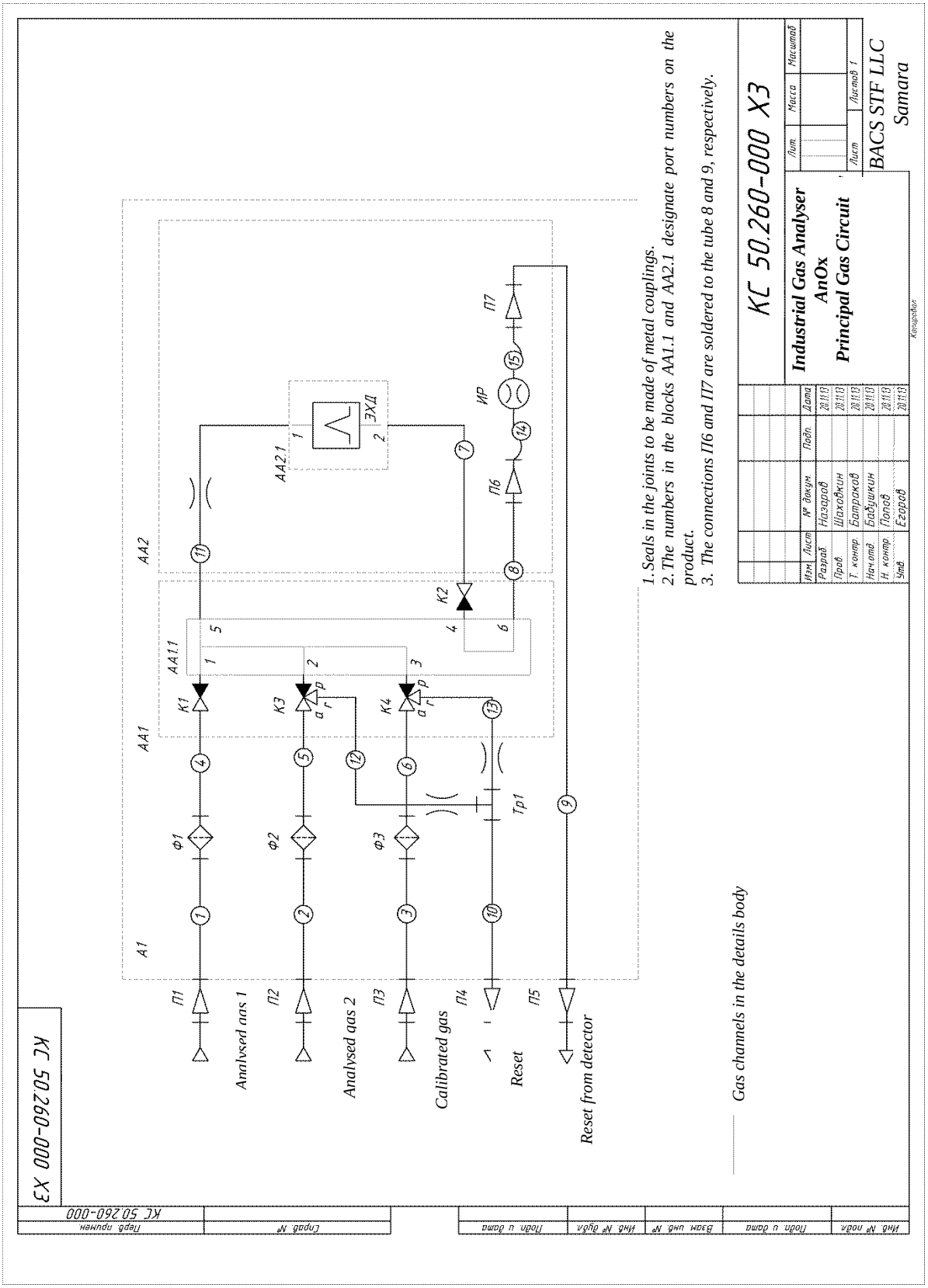
Marking of the mountings



Appendix B. Wiring Diagram.



Appendix C. Principle Gas Circuit



Appendix D. Methods of Verification