

ОКП 43 7114



## **Flame Detector**

**«Vega»**

**IP-330-1-4**

**Datasheet**

**Saint Petersburg  
2018**

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## Introduction

This document (here and after DATASHEET) combined with a user manual intended for studying the device design and principle of operation of the Fire Flame Detector IP-330-1-4 (hereafter referred to as the “detector”). The DATASHEET contains basic technical data, maintenance recommendations, and other information necessary for the proper operation, repair, and storage of the detector.

Scope – explosive zones of class 1 and 2, categories IIA, IIB and IIC, groups T1...T5 (classification – according to GOST 30852.9-2002, GOST 30852.11-2002) in accordance with the assigned marking of explosion protection, GOST 30852.13-2002 and the manufacturer's manual.

According to GOST R 53325 IPP-330-1-4 applies:

- a) by referring to the monitored characteristic of fire - to flame detection;
- b) in the spectral region of electromagnetic radiation – to infrared spectrum;
- c) according to the method of power supply - to powered from a separate wire;
- d) if possible, address setting - to addressed device.

IPP-330-1-4 transmits output signals by relay, LED indication and outputs data for interfaces:

- digital serial RS-485 MODBUS;
- current loop 4-20mA.
- HART

The detector has the function of self-testing, which provides continuous automatic monitoring of the detector performance at a specified time interval in order to increase the reliability of the detection of the fire and reduce operating costs associated with periodic testing of performance by the staff.

The detector is not a source of danger to people and property.

The detector does not contain radioactive sources and chemically harmful substances in its composition.

## **1. Product's Purpose**

The detector is designed to issue an alarm signal to the devices of reception and fire control and fire security in the event of a fire in the field of view of the detectors. The detector is placed in the places of installation of technological equipment of pumping stations of oil trunk pipelines, tank farms, loading racks etc.

The detector has an output unified current signal (4...20) mA ("active" current loop) according to ГОСТ 26.011 with the following characteristics:

- galvanic isolation from the power supply circuit;
- load resistance in the current output circuit is no more than 500 Ohms;
- the range of changes in the value of the output current signal is from 0,5 to  $(22\pm 1)$  mA.

Table 1.1 output signals of the detector

External influence	Status/mode	Output				Description
		LED glow	Relay «Failure»	Relay «Fire»	Current loop signal	
Any	Off, no power	N/A	Normal opened (N.O.)	N.O.	0 mA	- at shutdown - in case of failure of protective fuses
Non	«Self-testing»	Flashing green light 1Hz	Normal closed (N.C.)	N.O.	2 mA	when turned on and periodic self-test *
Self-testing	«Failure.»	Switches the display green on red 1 Hz	N.O.	N.O.	4,2 mA	- in case of malfunction of sensitive elements of the photodetector or input stages of preamplifiers; - if the optical window is dirty or there is an object at a distance of 5-10 cm from the optical window; - if the maximum sensitivity of the photodetector is exceeded;
Non	«Normal»	Continuous illumination of only the green color	N.C.	NO	4 mA	- standby mode
Impact of a controlled sign of fire	«Fire»	Continuous glow only in red	N.C.	N.C.	18 mA	- the signal was recorded within the specified wavelength ranges and radiation levels corresponding to the flame source;
The effect of the fire signal is eliminated	«Fire»	Continuous glow in red	N.C.	N.C.	18 mA	- the signals do not correspond to the specified limits of the wavelength ranges and radiation levels of the flame source;

\*- the relays are locked in the starting position until the test is passed. During periodic testing, the IED and the current output retain the state and value as before the start of the mode. Test time – no more than 10 seconds;

The parameters of the output signals transmitted via the interface RS-485 and HART correspond to those specified in supplement G.

1.1. Operating conditions:

- ambient temperature from -60 to 85<sup>0</sup>C
- relative humidity 20 to 98 % without condensation;
- atmospheric pressure from 80 to 120 kPa;
- the content of mechanical and aggressive impurities in the controlled environment must not exceed the threshold limit value level according to GOST 12.1.005.

1.2. Climatic version of the detector – B5, atmosphere type I GOST 15150.

**2. Technical characteristics**

1.3.1 Basic parameters and characteristics of the detector meet the requirements of GOST R 53325—2012.

1.3.2 According to the sensitivity the flame detector corresponds to the 4th class GOST R 53325—2012. «Fire equipment. Technical means of fire automatics. General technical requirements and test methods», at the same time the range of detection of fire, not less than:

- For the fire TF-5\* – 60m;
- For the fire TF-6\*— 30m.

\* - From GOST R 53325: Test Fire 5 (TF-5) is burning of 97%N-Heptane+3%Toluene, 650g, test plate 330x330x50 mm. Test Fire 6 (TF-6) is burning of ethyl alcohol, 1.5kg, test plate 435x435x50 mm.

1.3.3 The response Time of the detector to test the flames of TF-5 and TF-6, not more than 10 s.

1.3.4 The angle of view of the detector no less than 90°± 2 degrees.

1.3.5 Maximum value of background illumination, in which the detector keeps working without not issuing false notices, lux, is no less than:

a) from artificial lighting sources:

from electroluminescent sources - 2500;

from incandescent lamps - 250.

б) from natural light sources - 25 000\*.

\* - direct illumination and reflected rays.

1.3.6 1.3.6 The detector remains operational in the supply voltage range from 9 to 32 V. The magnitude of the voltage ripple is not more than 0.1 V.

Power consumed by the detector in standby mode, VA, no more:

- in standby mode 2.
- in alarm mode 3;
- in heating mode 6.

1.3.7 The parameters of the output signals, in addition to the RS-485 and HART interface, the state of the relay contacts and indicator LEDs for different States shall correspond to those in Table 1.

1.3.8 The detector is resistant to ambient temperature and humidity in the range corresponding to the performance group D3 in accordance with GOST R 52931-2008 with the specification of temperature limits in accordance with paragraph 1.2 current DATASHEET.

1.3.9 The detector needs to work steadily at ambient temperature from -60 C to + 75°C.

The detector is resistant to ambient temperature + 85 °C for no more than 2 hours per day.

1.3.10 The detector remains operational after exposure to sinusoidal vibration with an acceleration of 9.81 m/s<sup>2</sup> (1g) in the frequency range from 10 to 150 Hz.

1.3.11 The detector remains operational after impact of semi-sinusoidal shock pulses of 2 ms duration and acceleration amplitude 100 m/s<sup>2</sup>.

1.3.12 Level of protection of the detector against water, dust or foreign solid particles – IP68 acc. to IEC 60529.

1.3.13 The detector remains operational when exposed to nanosecond electrical pulses, the parameters of which must correspond to the second degree of rigidity of the detector according to GOST R 50009 (IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-11).

1.3.14 The detector remains operational when exposed to electrostatic discharges, the parameters of which must comply with the second degree of rigidity according to GOST R 50009 (IEC 61000-4).

1.3.15 The detector remains operational when exposed to an electromagnetic field, the parameters of which must comply with the second degree of rigidity according to GOST R 50009 (IEC 61000-4).

1.3.16 The value of the field strength of radio interference generated by the detector during operation corresponds with GOST R 50009 (IEC 61000-4).

1.3.17 Marking of the detector explosion protection: 1ExdIICT5 X.

1.3.18 The detector in the transport container withstands without damage the impact of external factors within the limits of:

- ambient temperature from -60 to 75 °C;
- relative humidity of ambient air from 20 to 98% without condensation;
- atmospheric pressure from 80 to 120 kPa.

1.3.19 The detector in the transport container is resistant to shocks with a free fall from a height of 1000 mm according to GOST R 52931-2008.

2.1 Mean time between failures of the detector is no less than 100,000 hours. The criterion of failure – the non-fulfilment of functional purpose.

2.2 Full average service life of the detector – 10 years.

### 3. Scope of delivery

3.1 The typical delivery set of the detector is given in table 2.

Table 2

Name and designation	Units.	Notes
Flame detector «Vega» IP 330-1-4	1	
Mounting bracket	1	
Sun shield	1	
DATASHEET	1	
Cable gland FEC 1IB (M20x1,5)	2	
Plug CPP 1IB M20x1,5	1	
Packaging	1	

### 4. Structure and operation

#### 4.1 Principle of operation

The presence of fire is detected by the ratio of the intensity of the infrared electromagnetic radiation accompanying the fire in the three wavelength ranges in the range of 3 – 5 microns.

#### 4.2 Design and construction

The dimensional drawing of the detector is shown in figure V. 1 in Appendix B of this DATASHEET.

Structurally, the detector is made in an aluminum housing with an observation window for receiving IR radiation and status indication. The detector housing is an explosion-proof enclosure, see Appendix B of this DATASHEET, inside which all the detector devices are located. The housing contains two compartments, one of which is the Assembly of the optoelectronic module, the other switching Board.

The compartment with the optoelectronic module is hermetically separated from the compartment with the switching Board. Access to the compartment with the optoelectronic module during installation is prohibited, a seal is installed on the detector body – “Insured, do not open!”

On the switching Board there are terminals for connecting external signal and supply circuits.

The optoelectronic module contains three boards: a signal board, an interface board and a power board. The boards of the optoelectronic module are connected to each other by inter-board connectors. The power board and the switching board in the other compartment are connected by a loop.

On the signal board is the FPU, two LEDs display red and green, optocoupler to check the degree of contamination of the viewing window, the preamplifiers of the photo-receiver (FPU) and the microcontroller (MC).

On the interface Board there are 4-20 mA, RS-485 and relay control signal conditioners. as well as switching relay “Fire”, “Fault”.

On the power board there are elements of the formation of internal supply voltages.

Additionally, there is a heating element on the interface board. The heater is used for heating of radioelements boards of interest and signal boards.

When you connect the power supply from the switching board, voltage is supplied to the power board, where internal voltages are formed, which, through the inter-Board connectors come to the signal board. On this board, signals from the FPU and optocoupler check the contamination of the window, through pre-amplifiers in ADC of microcontroller unit (MCU), in software of MCU mathematical processing of the obtained data is performed.

Depending on the data obtained and the results of algorithmic processing, the MCU generates control output signals for the interface Board and indicator LEDs. After converting these signals, the output signals from the interface Board are fed to the switching Board via a loop.

The detector is switched on and off automatically when an external power supply is supplied. In case of switching on the detector at temperatures below minus 40°C, the detector device initially initiates switching on the heater of the internal units of the device without supplying power to the main circuits. When the internal temperature of the detector reaches minus 40°C, the heater is switched off and the main circuits of the detector are automatically supplied with power.

Wiring diagrams – according to figure A. 1 and A. 2 of Appendix A and the instructions of section 9 of this DATASHEET.

## **5. Ensuring explosion protection**

Explosion protection is provided by compliance of the equipment with the requirements of GOST R IEC 60079-0, GOST R IEC 60079-1. The drawing of means of explosion protection is presented in Appendix B.

5.1 Explosion protection of the detector is achieved due to:

- conclusion of the current-carrying parts of the detector in an explosion-proof shell with a slit explosion protection in the places of coupling of parts and assemblies of the explosion-proof shell capable of withstanding the explosion pressure and eliminating the transfer of the explosion into the surrounding explosive environment. Pairing parts in the drawing are marked with the word "Explosion" indicating acceptable parameters for explosion protection flameproof ezybuy connections: the number of complete intact of turns of the screw thread, the axial length and the thread pitch, in accordance with the requirements of GOST R IEC 60079-1;
- use of external circuits for supply of explosion-proof cable entry;
- protection against self-unscrewing of all elements, fastening parts, providing explosion protection of the detector;
- mechanical strength of the detector shell corresponding to GOST R IEC 60079-0;
- corrosion protection with grease on all surfaces marked with the word “Explosion”;
- the presence of a warning label on the cover of the detector body "Do not open in hazardous areas!"

The X mark after the explosion protection marking means that special conditions must be observed during the operation of the detector. Special conditions – according to paragraph 9.1 of this DATASHEET.

## 6. Marking and sealing

Marking of the detector includes:

- name and trademark of the manufacturer;
- name and designation of the detector;
- month and year of manufacture;
- unit number of the detector according to the numbering system of the manufacturer;
- explosion protection marking: 1ExdIICT5 X;
- a warning that says "KEEP COVER TIGHT WHEN CIRCUITS ALIVE";
- IP code;
- operating temperature range;
- voltage supply parameters;
- name of certification body and certificate number;
- grounding sign.

The detector is sealed at the manufacturer.

## 7. Packaging

7.1 The detector and operational documentation are Packed in a cardboard box. The cardboard box from the detector is covered with a polyethylene tape with a sticky layer.

7.2 Term of protection without re-preservation – 1 year.

## 8. Safety precautions

8.1 persons who have been instructed on safety in accordance with the established procedure and have studied this DATASHEET are allowed to work with the detector.

8.2 "Rules of technical operation of electrical installations of consumers" approved by the State Power Supervision Agency shall be observed.

8.3 The detector must be repaired only by the personnel of the manufacturer.

8.4 Before switching on the detector, check for external damage to the detector, seals, and all mounting elements.

8.5 It is forbidden to operate the detector while having mechanical damages to the case or violations of a seal.

8.6 The detector housing must be grounded. A ground bolt is provided to ground the detector.

### 9.1 Special conditions of use:

- operation and installation of detectors should be carried out by persons who know the rules of operation of electrical installations in hazardous areas, have studied this Datasheet, certified and approved by the order of the administration to work with these products;
- laying of cables in the hazardous area in accordance with regional standards;
- during operation, the detector should be protected from shocks and falls;
- do not use detectors that have damaged housing;
- installation and connection of the detectors must be carried out with the power supply disconnected;
- the connection of the power supply circuits and the detector interface circuits shall be made in accordance with figure A. 1 of Appendix A, and the voltages in the circuits shall not exceed the  $U_m$  values:
  - for power circuits  $U_m= 32V$

## 9 Intended use

### 10.1 General requirements

10.1.1. To work with the detector are allowed persons who know the rules of operation of electrical installations in hazardous areas, have studied this Datasheet, certified and approved by the order of the administration to work with these products.

### 10.2 Preparation for work

10.2.1. If the detector was in the transport package at a negative temperature, keep it at a temperature of (10-35) °C for at least an hour.

10.2.2. Remove the package. Check the completeness, the presence of seals, explosion protection markings, make sure there is no mechanical damage.

10.2.3. Assemble and install the detector according to the installation drawing Fig. B. 1 Appendix b and by the delivery set.

### 10.3 Ensuring explosion protection during installation

10.3.1. Installation of the detector at the facility must be carried out in accordance with the approved project in accordance with the established procedure for the placement of the control system, in which the detector is used.

10.3.2. The installation should be guided by:

- Chapter 7.3. "Rules of the device of electroinstallations"
- Chapter 3.4. "Rules of operation of electrical installations of consumers"
- "Safety rules at operation of electrical installations of consumers"

Or other regional standards.

10.3.3. Installation of the detector must be carried out in accordance with the documentation of the manufacturer.

### 10.4 Operating procedure

10.4.1. Ensuring explosion protection during operation.

10.4.2.1. When operating it is necessary to be guided by:

- Chapter 3.4. "Rules of operation of electrical installations of consumers"
- "Safety rules for the operation of electrical installations of consumers"

Or other regional standards.

10.4.1.2. The detector must have an external grounding device.

10.4.2. Initial operability check of the detector.

10.4.2.1. Connecting the detector.

Connect the power supply and interface circuits according to Fig. A. 1. and A. 2 of Appendix A

Note:

*The detector comes with the technological harness intended for preliminary checks before the installation of the facility. The purpose of the wiring harness is marked with tags.*

10.4.2.2. After switching on the detector in a room without fire sources, the alarm and indication shall be carried out in accordance with table 1.

10.4.2.3. After supplying external power to the detector for no more than two minutes, the current output of the current loop has a current of 4.2 mA (when using the analog output of the detector) or a "Warm-up" value in register 4 when using the digital interface. After 2 minutes, the detector starts to work in the normal mode and provides indication and alarm in accordance with table 1.

During the warm-up, as well as during the operation of the detector, every 2 hours the level of contamination of the observation window is checked, and when contamination is detected, signals are processed in accordance with Table 1.

When mounting on the object to check the performance of the detector after it is turned on, you can use the magnetic sensor, bringing the magnet to the specified location on the body, on the side surface of the cover with the viewing window.

## **10.5 Maintenance**

10.5.1. Maintenance is performed to ensure the normal operation of the detector during its service life. Maintenance should be prepared by persons knowledgeable about the safety rules when working with electrical installations in hazardous areas, studied present DATASHEET, and certified and approved by order of the administration to work with these products.

10.5.2. Recommended types and terms of maintenance:

- external inspection of the detector – annually;
- periodic health check – annually;
- cleaning of the case and the viewing window—once every three months.

10.5.3. Operability of the detector.

The detector is automatically checked for operability and the main faults are indicated in accordance with table 1.

## **10.6 Транспортирование и хранение**

10.5.1 transport Conditions – storage conditions 5 according to GOST 15150.

10.5.2 Transportation of detectors should be carried out by all means of transport in closed vehicles, as well as in heated sealed compartments of aircraft in accordance with the rules for the carriage of goods in force on the respective mode of transport.

10.5.3 Detectors in the packaging of the manufacturer must be stored in the warehouses of the supplier and the consumer in storage conditions 1 according to GOST 15150.

10.5.4 The atmosphere of the storage room should not contain harmful impurities that cause corrosion.

10.5.5 Detectors in the manufacturer's packaging should be stored on racks.

10.5.6 The distance between the storage heating devices and the detectors must be at least 0.5 m.

### 10 Manufacturer information

Russia, 194156, Saint Petersburg, Engels Avenue, 27, building 5, Letter A.

**Telephone:** +7(812) 923-02-69, +7(812)601-06-94

**Fax:** +7 (812) 601-06-94

**E-mail:** [igm@igm-pribor.ru](mailto:igm@igm-pribor.ru)

### 11 Certification of receipt

Flame Detector IPP-330-1-4 “Vega” serial number \_\_\_\_\_ complies with the specifications, fit for service.

Date of issue \_\_\_\_\_

Signature, responsible for the acceptance \_\_\_\_\_ Stamp  
(signature)

### 12 Certification of packaging

Flame Detector IPP-330-1-4 “Vega ” serial number \_\_\_\_\_ packaged on "IGM detector" 194156, St. Petersburg, 27 Engels Ave., korp 5, Letter A. according to the requirements of the technical conditions of МРБП.425241.001ТУ.

Date of packaging \_\_\_\_\_

Packaging produced \_\_\_\_\_ Stamp  
(Signature)

The product after packaging was accepted \_\_\_\_\_

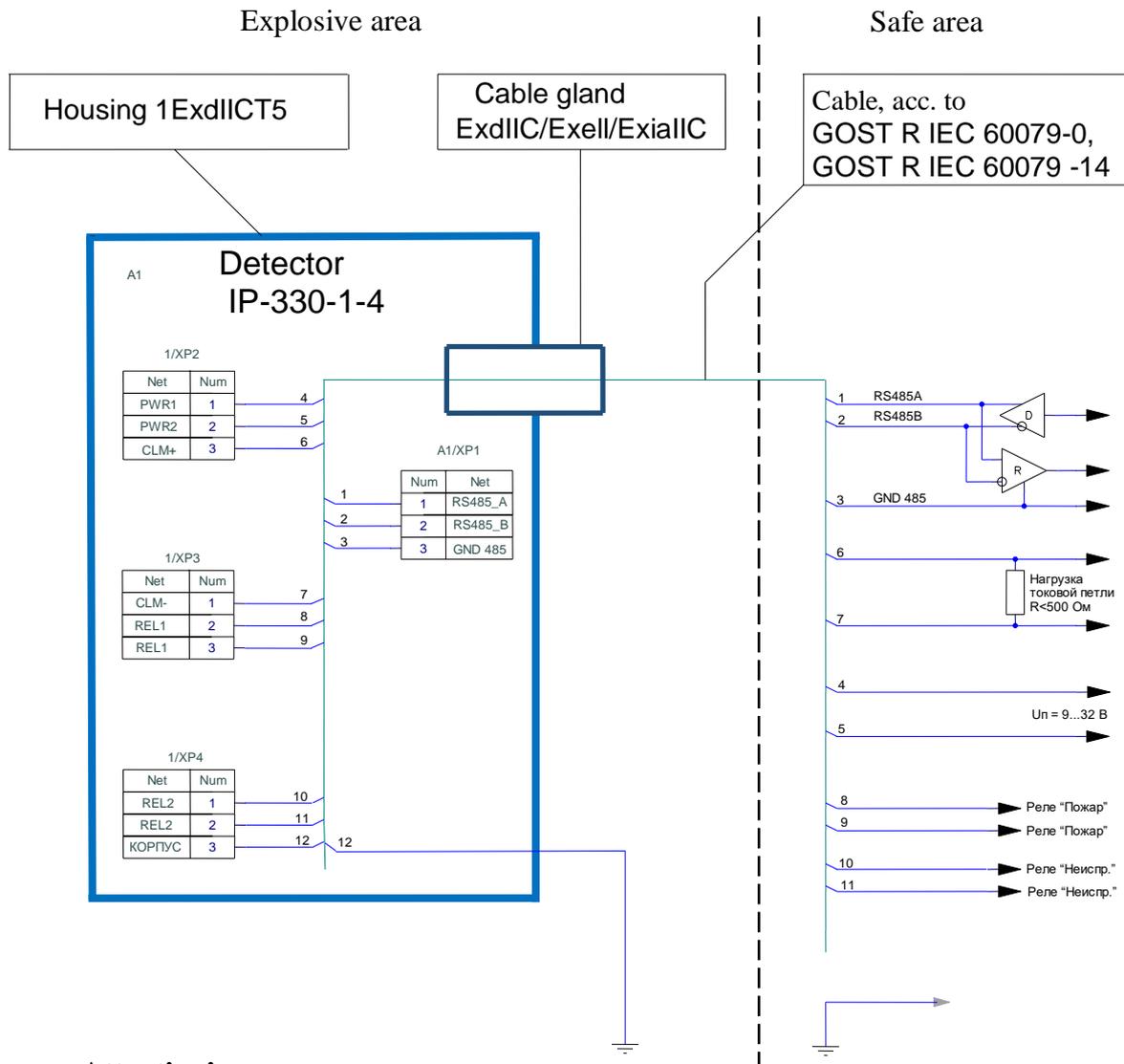
### 13 Manufacturer's guarantee

The warranty period is set 24 months from the date of commissioning of IP-330-1-4 “VEGA” in operation, but no more than 36 months from the date of its production.

The manufacturer undertakes to eliminate the detected defects or replace the failed parts of the gas analyzer in the presence of intact seals free of charge during the warranty period.

**Appendix A**  
(obligatory)

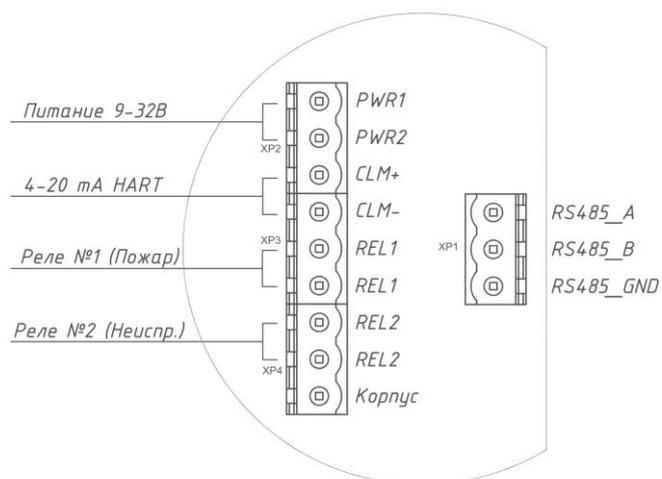
Figure A. 1 – Connection diagram of the detector to the power supply, relay terminals, current loop interfaces and RS-485 MODBUS.



**Attention!**

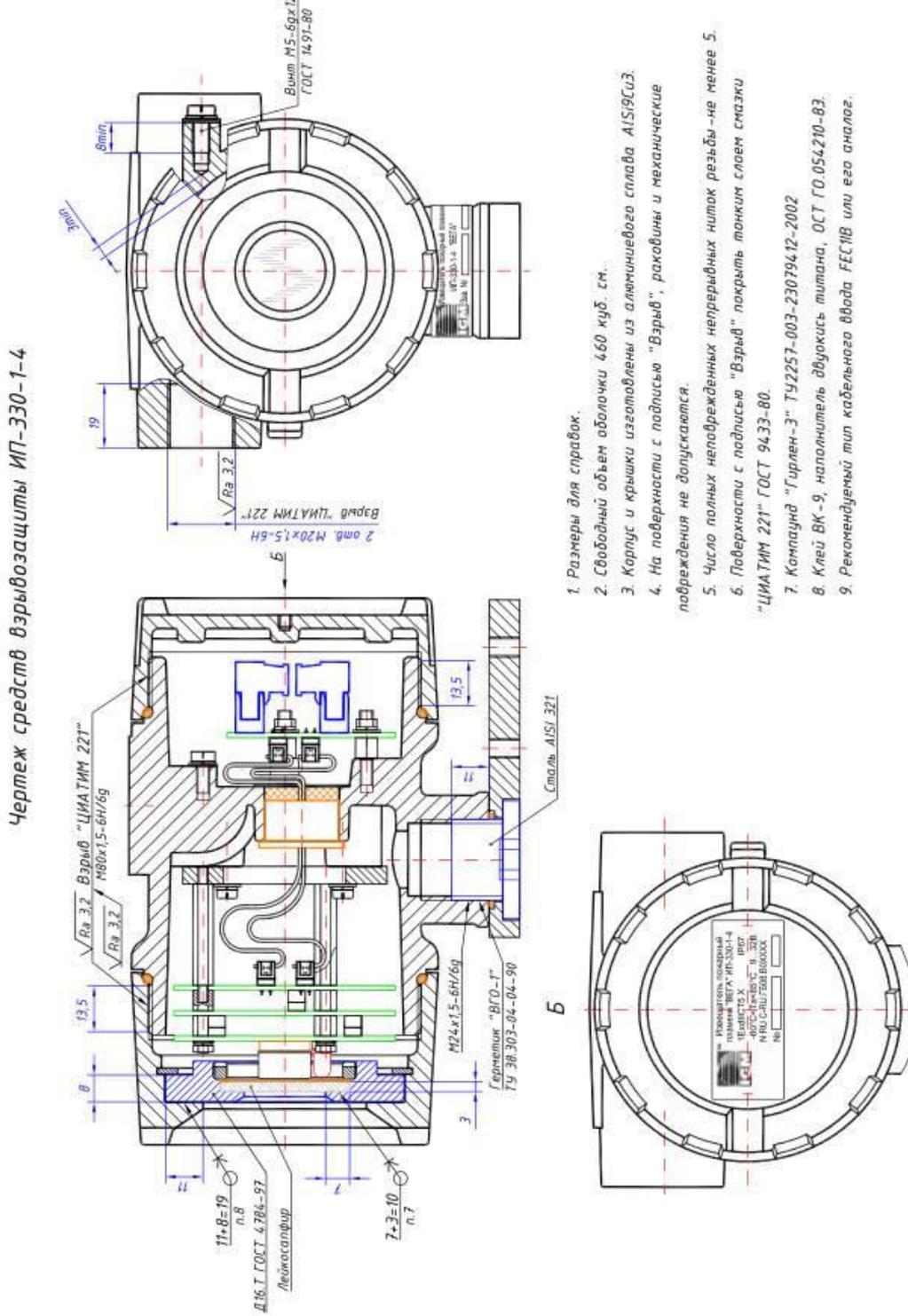
When connecting the IP-330-1-4 the HART load resistance current loop between the terminals 6,7 should be avoided.

Figure A. 2 – Switching board with connection circuits.



**Appendix B**  
(obligatory)

Figure B. 1 – Drawing of the detector's explosion protection means





## Appendix G

### Exchange protocols ИИИИ-330-1-4 “Vega”

**Interface:** RS-485 (19200, 8-E-1)

**Protocol:** MODBUS RTU with support for the following commands:

- Read Holding Registers,
- Write Single Register.

**Device registers** (all 16-bit):

№ register	Description	Access
<b>1</b>	Device address / Exchange speed	Read/Write
<b>2</b>	Serial number of device (Junior part)	Read
<b>3</b>	Serial number of device (Senior part)	Read
<b>4</b>	The sign of the activation of the Hart Protocol	Read
<b>5</b>	Device status	Read
<b>6</b>	Command to execute	Write

Register

1:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Address (1 - 247)								Exchange rate (1 - 5)							

Скорость: 1 - 1200  
bauds  
2 - 2400  
bauds  
3 - 4800  
bauds  
4 - 9600  
bauds  
5 - 19200  
bauds

Register

2:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Device № (Junior part)															

Регистр

3:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Device № (Senior part)															

Register

4:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
----	----	----	----	----	----	---	---	---	---	---	---	---	---	---	---

The sign of the activation of the Hart Protocol

Comands:

20302 - Hart included  
 20294 - Hart excluded

Register 5:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
X	X	X	X	X	X	X	DE	X	SE.	X	ST	X	FR	X	FL

Status flags:

- FL** - FAILURE: 0-normal / 1-failure. Set to 1 when either the flag is set: FR, ST, SE, DE.
- FR** - FIRE: 0-normal / 1-fire
- ST** - STATE: 0-normal / 1- contamination of optics
- SE** - SENSITIVITY: 0-normal / 1- the sensitivity of the sensor increased
- DE** - DETECTOR: 0-normal / 1-sensor defective
- X** - This BIT is not used

Register 6:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Command code for execution by the device															

commands:

- 2 - set fire alarm
- 4 - fire alarm reset, glass is dirty and sensor is faulty
- 8 - not used.
- 16 - not used.
- 32 - not used.
- 64 - to set the sensor sensitivity of the "normal"
- 65- to increase the sensitivity of the sensor
- 128 to read the archive of events

Exchange HART

The detector uses an analog output of 4-20 mA and a built-in modem of Bell 202 signals to output information via the HART Protocol.

Interface: Bell 202 Current (1200, 8-Odd-1).  
 Protocol: HART 6.

Detailed description is given in the specification:

[http://ru.hartcomm.org/hcf/org\\_mbr/documents/documents\\_spec\\_list.html](http://ru.hartcomm.org/hcf/org_mbr/documents/documents_spec_list.html).

The implemented commands are given in Table G. 1.

Command	Appointment	Data byte	Sample package
128	The read status register the device	0	0xFF 0xFF 0xFF 0xFF 0xFF 0x02 0x81 0x80 0x00 0x03
129	Resets all the event flags status registered to the device	0	0xFF 0xFF 0xFF 0xFF 0xFF 0x02 0x81 0x81 0x00 0x02
130	The entry flag of the sensitivity of the sensor	1	0xFF 0xFF 0xFF 0xFF 0xFF 0x02 0x81 0x82 0x01 0x01 0x01
131	Reading the archive of alarm events	0	0xFF 0xFF 0xFF 0xFF 0xFF 0x02 0x81 0x83 0x00 0x00

Ответные посылки от прибора

Command	Appointment	Data byte	Sample package
128	The read status register of the device	2	0xFF 0xFF 0xFF 0xFF 0xFF 0x06 0x81 0x80 0x04 0x00 0x00 0x00 0x00 0x03
129	Resets all the event flags status register the device	2	0xFF 0xFF 0xFF 0xFF 0xFF 0x06 0x81 0x81 0x04 0x00 0x00 0x00 0x00 0x02
130	The entry flag of the sensitivity of the sensor	1	0xFF 0xFF 0xFF 0xFF 0xFF 0x06 0x81 0x82 0x03 0x00 0x00 0x01 0x07
131	Reading the archive of alarm events	?	0xFF 0xFF 0xFF 0xFF 0xFF 0x06 0x81 0x83 0x? 0x00 0x00 0x? 0x03