



Завод-производитель  
газоаналитического  
оборудования

Address: 27 Engels Prospect,  
building 5, litera A  
Saint-Petersburg  
194156, Russia,  
Tel: 8 (800) 234-66-90  
Website: [www.igm-pribor.com](http://www.igm-pribor.com)  
E-mail: [support@igm-pribor.ru](mailto:support@igm-pribor.ru)

---



**Flame detector  
FD 330-4-1 «Vega»**

User manual

MRBP.425241.001-01 UM

## Contents

	Page
1. Introduction.....	3
2. Intended use .....	3
3. Technical specifications.....	4
4. Contents of delivery.....	6
5. Configuration and operation .....	7
5.1 Appearance .....	7
5.2 Overall dimensions .....	8
5.3 Construction .....	8
5.4 Principle of operation .....	8
6. Safety precautions .....	10
7. Mounting.....	11
7.1 Mounting location.....	11
7.2 Preparation .....	12
7.3 Cable requirements. Cable gland.....	12
8. Detector connection .....	13
8.1 Power source requirements.....	13
8.2 Detector connection.....	13
Connecting a detector to digital channel RS-485.....	13
5.1 Connection diagrams .....	14
9. Commissioning.....	18
Output signals and LED indicators description.....	19
9.1 Functionality check.....	21
9.1.1 Manual mode.....	21
9.1.2 Automatic mode.....	22
9.1.3 Detector setup test program.....	22
9.2 Factory default.....	23
10. Maintenance service .....	24
11. Troubleshooting.....	24
12. Packaging .....	25
13. Storage and transportation .....	25
14. Storage .....	25
15. Marking and sealing.....	25
16. Warranty.....	26
Appendix A.....	27
Ex-protection drawing.....	29
Revision history sheet .....	30

## 1. Introduction

This user manual (UM) is intended to describe design, principle of operation and operating routine of flame detectors «Vega» 330-4-1 (hereinafter FD 330-4-1 «Vega»). The UM contains basic technical data, guidelines for connection, maintenance service, as well as other information, necessary for the correct operation, storage and repair of flame detectors «Vega».

According to GOST R 53325 classification FD 330-4-1 «VEGA» belongs to:

- a) by controlled fire sign type – to the flame;
- б) by region of the electromagnetic radiation spectrum – infrared;
- в) by power supply – powered by a separate wire;
- г) by address setting possibility – addressable.

In terms of the functioning quality, FD 330-4-1 "VEGA" meets criteria A in accordance with GOST R 53325 Appendix B.

Application scope:

- explosive and fire hazardous areas of premises and outdoor installations at the mounting sites of technological equipment of pumping stations of main oil pipelines, tank farms, loading racks, etc., with the possible occurrence of an explosive and flammable mixture of vapors of petroleum products, natural gas and other hydrocarbons
- explosive and fire hazardous facilities of the oil and gas as well as fuel and energy complexes, including production sites, transport systems and storage facilities in the oil and gas sector, tanks with oil, oil products, natural gas, etc.;
- offshore oil production/refining platforms, ships and vessels;
- as a part of fire protection and firefighting installations and complexes.

## 2. Intended use

FD 330-4-1 «VEGA» is a multi-range detector, responding to infrared (IR) radiation in three regions of the spectrum.

Flame detector FD 330-4-1 «VEGA» is designed to detect fires of various combustible materials indoors and outdoors and transmit a fire notification signal to fire alarm control units, security and fire units and/or automatic fire fighting systems. It can be used both as a separate device and as part of fire and security alarm systems.

FD 330-4-1 «VEGA» is placed at the process equipment mounting locations at oil and gas production, transportation and storage facilities, in pumping stations of main oil pipelines, on open areas, offshore platforms and tank farms, loading racks, etc. (electrical equipment of subgroups IIA, IIB, IIC, IIIA, IIIB, IIIC temperature classes T1 - T6 according to GOST IEC 60079-14-2013.

### 3. Technical specifications

<b>Housing material</b>	- Aluminium - Marine grade stainless
<b>EX-marking</b>	1 Ex d IIC T6...T4 Gb X; Ex tb IIIC T85°C ...135°C Db X Sign X, following the ex-marking, means that while mounting a detector you should use a cable gland and a plug, certified according to TR CU and having a marking according to certificate.
<b>Protection</b>	IP 66/IP68
<b>FD 330-4-1 «VEGA» overall dimensions (with a mounting bracket) not more than, mm</b>	Ø266×166×99
<b>FD 330-4-1 «VEGA» weight (with a mounting bracket) not more than, kg</b>	- 3,5 (aluminium), - 6,0 (stainless)
<b>Cable gland type</b>	M 20
<b>Ambient temperature range</b>	-60 ... +125 °C for temperature class T4 -60 ... +90°C for temperature class T5 -60 ... +75 °C for temperature class T6
<b>Ambient temperature range according to transportation conditions</b>	-50° C ... +50°C
<b>RH</b>	Up to 95% (short-term exposure to 100% humidity is allowed)
<b>Supply voltage</b>	Nominal: 24 VDC; Range: 18 ...32 VDC
<b>FD 330-4-1 «VEGA» power consumption</b>	Stand-by mode – not more than 2 VA, Alarm mode – not more than 3 VA. With heating on – not more than 5,8 VA
<b>FD 330-4-1 «VEGA» viewing angle, not less than</b>	120°
<b>FD 330-4-1 «VEGA» responds</b>	a) to radiation, generated by test sources TP-5 и TP-6 according to GOST R 53325 Appendix A at a distance of at least 25 m (detectors of the 1st class); б) to radiation, created by test radiation source.
<b>Output signals</b>	- analogue signal: 4..20 mA - HART-interface - digital signal in RS-485 standard with Modbus RTU interface; - actuation of relay contacts «Fire» and «Failure».
<b>FD 330-4-1 «VEGA» response time on test flames TP-5 and TP-6 at a distance of 25 meters</b>	not more than 5 s
<b>Seismic resistance</b>	FD 330-4-1 «VEGA» are earthquake-resistant till 9 points according to MSK-64 at the installation level above the zero mark up to 10 m in accordance with GOST 30546.1-98.
<b>MTBF</b>	Not less than 100000 h
<b>Specified lifetime</b>	15 years

<b>Shelf life and conservation of detectors in the manufacturer's packaging</b>	10 years
<b>Warranty storage period</b>	6 months since manufacturing
<b>Warranty life</b>	- 18 months from the day of commissioning; - not more than 24 months since manufacturing.
<b>Exposure to sinusoidal vibration</b>	group V2 GOST R 52931-2008, corresponding to operation conditions group F3 GOST R 52931-2008, corresponding to transportation conditions
<b>Resistance to atmospheric pressure according to GOST R 52931-2008.</b>	Group R1
<b>Climatic category according to GOST 15150-69.</b>	Boreal climate class 1
<b>Seismic resistance according to GOST 30546.1-98</b>	the impact of earthquakes with an intensity of 9 points according to MSK-64 at an installation level above the zero mark up to 10 m
<b>Immunity to direct mechanical impact with an energy of at least</b>	1,9 J
<b>Resistant to single shock pulses of a half-sine waveform with peak acceleration with a pulse duration within</b>	50 m/s <sup>2</sup> 10 - 20 ms
<b>Immunity to nanosecond electrical impulses propagating in the power circuit and in the output circuits</b>	Severity degree 4 according to GOST R 53325 Appendix B
<b>Resistance to exposure to electrostatic discharges of at least, kV:</b>	contact – 8; air – 15
<b>Immunity to RF electromagnetic fields with parameters</b>	root-mean-square value of electromagnetic field strength with amplitude modulation depth of 80%, frequency 1 kHz, not less than, V/m: frequency range 0,1 ... 150 MHz – 10; frequency range 150 ... 500 MHz – 5.

#### 4. Contents of delivery

Package includes:

Name	Identification	Number
Flame detector	FD 330-4-1 «VEGA»	1
User manual	MRBP.425241.001-01UM	1 in a set
Datasheet	MRBP.425241.001-01 DS	1
Approval documentation (certificates of conformity, declarations of conformity, permits etc.)	-	1 package in a set, delivered on a CD. Paper copy – on request.
Magnetic key	-	1 for 10 devices, but not less than 1 in a set
Cable gland	-	On request
End plugs	-	On request
Sunshield	-	On request

**Magnetic key** allows to perform operability check in conditions of standard mounting without disconnection from the external actuating alarm system.

**Sunshield** - protects the optical elements of the sensors from the adverse effects of the environment at their mounting location.

**The test radiation source** is designed to test the detectors' operability without dismounting the latter from their workplaces.

**Cable gland**, designed for safe cable entry while mounting. Specify the model of the cable gland when ordering. Not included in the delivery set, delivered on request.

**End plug**, is installed in a free hole for cable entry, to ensure the tightness and explosion resistance of the gas detector. Specify the model of the end plug when ordering. Not included in the delivery set, delivered on request.

## 5. Configuration and operation

### 5.1 Appearance



Figure 1 – FD 330-4-1 «VEGA» appearance

## 5.2 Overall dimensions

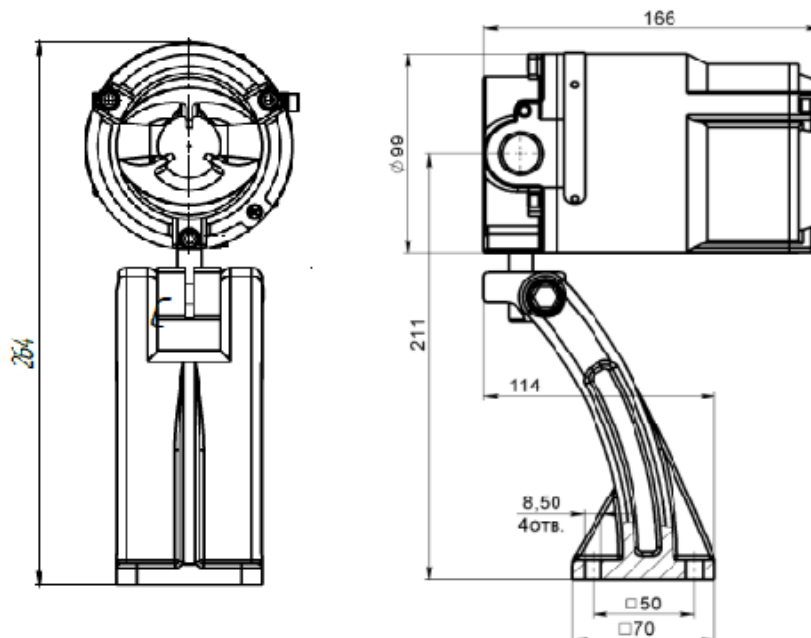


Figure 2 - Overall dimensions of the detector with a mounting bracket

## 5.3 Construction

The detector housing is a flameproof enclosure, inside which all detector devices are located, including sensitive elements that convert the electromagnetic radiation of the flame into an electrical signal, electronic amplifiers and filters, digital-to-analog converters, a microprocessor, display elements, optical elements for checking the operability of channels.

## 5.4 Principle of operation

The IR sensor, when a flame is detected, converts electromagnetic radiation into an electrical signal. Signals in digital form are processed in the microcontroller according to a given algorithm to increase the reliability of the alarm output. The program highlights the useful signal from the background. As a result of signal processing, a decision is made on the formation of output signals: analog current output 4.20 mA, digital output in RS-485 standard with Modbus RTU interface, "FIRE" relay contacts, "FAILURE" relay contacts.

FD 330-4-1 «VEGA» detector is equipped with a special self-testing function, that performs correct operation check automatically every 30 minutes. It does not require the use of an external control source of radiation (test lamp). Successful completion of the automatic check does not cause the detector to switch to the "Fire" mode.

FD 330-4-1 «VEGA» is resistant to false alarm. It doesn't respond to visual disturbance sources other than flame, such as electric welding, artificial lighting, sunlight, lightning, high voltage arc, X-rays and gamma rays, etc.



MRBP.425241.001-01 UM version 1.1 01.05.2022 FD 330-4-1 «Vega»

*Notice: It is not recommended to operate FD 330-4-1 «VEGA» in places where combined disturbance may occur (welding + radio station 5 W 100 MHz, welding + device vibration with an acceleration > 10 g).*

*It is not recommended to use radio station in a distance less than 1 m away from FD 330-4-1 «VEGA» under conditions of continuous exposure to radiation from welding.*

## 6. Safety precautions



*Any person who is familiar with the configuration, has studied this UM, has been briefed on safety precautions when working with electrical installations and have an electrical safety qualification group of at least III, including in hazardous areas, is admitted to operate the flame detector.*

*FD 330-4-1 «VEGA» must have internal and external groundings and grounding signs in accordance with GOST21130-75.*

*It is forbidden to operate the detector if the housing is damaged.*

*Equipment mounting in pumping stations should be carried out in accordance with SNiP (construction rules and regulations) 3.05.05-84 "Technological equipment and process pipelines".*

*Detectors mounting must be carried out with the power supply switched off.*

*Detector repair is allowed only to the personnel of the manufacturer's enterprise or to persons authorized by the manufacturer to carry out repair work.*

*FD 330-4-1 «VEGA» mounting at the control object must be carried out in accordance with the duly approved project for the system placement, which includes FD 330-4-1 «VEGA». Install detectors according to the project, while FD 330-4-1 «VEGA» mounting it is necessary to follow:*

- *Chapter 7.3 of the Electrical Installation Code;*
- *Chapter 3.4 of the Operational Code for Electrical Installations (OCEI);*
- *Safety Rules for Operation of Customers' Electrical Installations;*
- *This UM and maintenance documentation for co-used technical equipment.*
- *Electrical connections must be made in accordance with point 8***Ошибка! Источник ссылки не найден..**

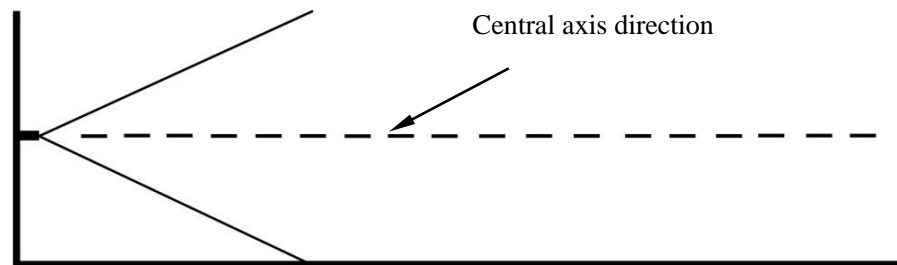
## 7. Mounting

### 7.1 Mounting location

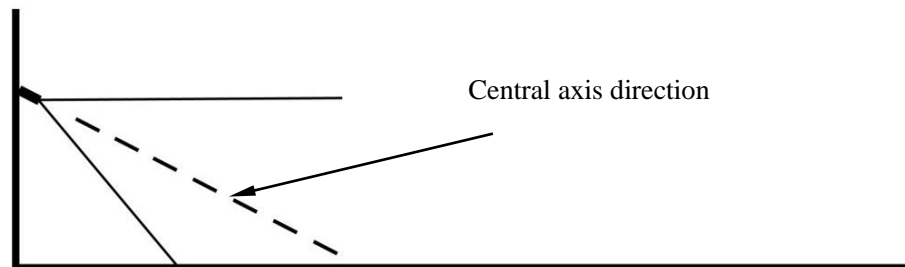
For the correct mounting of the detector, the following factors must be taken into account:

- The location of the detectors must ensure unobstructed control of the entire protected area;
- While detector's positioning and targeting take into account the distance of action and the viewing angle of the device;

**Notice:** Recognized that FD 330-4-1 «VEGA» has the highest sensitivity along the central axis, which should be oriented to the place of a possible fire (Figure 1);



*Wrong orientation of the detector*



*Correct orientation of the detector*

Figure 3 – Installation relative to the horizon.

- It is necessary to visually estimate the area (viewing angle) controlled by the detector. To do this, you can use the viewing angle indicator, which simplifies the process of orienting the sensors while mounting in the field.
- While mounting the detector should be oriented in such a way as to avoid direct illumination from radiation powerful sources (sun, projector, etc.)
- If there is a danger of mechanical damage to the detector, a protective structure must be provided that does not intervene its performance and fire detection efficiency;

- Availability of a sufficient number of detectors to protect the controlled area;
- The detector must be mounted on a rigid surface that is not subject to vibrations;
- The detector must be easily accessible for periodic maintenance service;
- While mounting take measures to prevent moisture from getting into the electrical connections or components of the detector. Ensuring moisture protection is necessary to keep the device in operation.

## 7.2 Preparation

Before FD 330-4-1 «VEGA» mounting a visual inspection is carried out. It needs to pay attention to:

- 1) FD 330-4-1 «VEGA» ex-marking and a warning label;
- 2) zero damages;
- 3) presence of all the fasteners (bolts, nuts, washers) in accordance with FD 330-4-1 «VEGA» site placement project;
- 4) presence and integrity of the connecting wires (coming out of FD 330-4-1 «VEGA» insulation;
- 5) presence and integrity of the seal on the housing of FD 330-4-1 «VEGA».
- 6) It is recommended to connect FD 330-4-1 «VEGA» analogue outputs located in the hazardous area with an external device located in the non-explosive area using a control armored cable of the КББ6ШВ4x1,5 brand according to GOST 1508-78. The КББ6ШВ cable can be used in hazardous areas of any class, including indoors, outdoors, in channels, tunnels, ground (trench) in an aggressive environment, in places exposed to stray currents.
- 7) While FD 330-4-1 «VEGA» mounting it is necessary to check the condition of the ex-proof parts subjected to disassembly for compliance with the requirements of the EX protection drawing (appendix B).
- 8) Removable parts should fit as closely to the housing as possible.
- 9) The cable sealing on the cable gland must be carried out in every manner, since the explosion-resistance of the input converter depends of this.
- 10) The external grounding conductor must be carefully stripped, and its connection to the grounding clamp must be protected from corrosion by applying grease.
- 11) Upon mounting completion, the grounding device resistance must be checked and must not exceed 4 Ohm.

## 7.3 Cable requirements. Cable gland

It is recommended to connect FD 330-4-1 «VEGA» analogue outputs located in the hazardous area with an external device located in the non-explosive area using a control armored cable of the КББ6ШВ4x1,5 brand according to GOST 1508-78. The КББ6ШВ cable can be used in hazardous areas of any class, including indoors, outdoors, in channels, tunnels, ground (trench) in an aggressive environment, in places exposed to stray currents.

Use certified cable glands M20 while mounting.

The cable sealing on the cable gland must be carried out in every manner, since the explosion-resistance of the entry compartment depends of this.

**Notice:** *If it is necessary to connect piping to a cable gland with a 3/4' NPT thread, the connection is made using a transitional threaded sleeve:*

## 8. Detector connection

### 8.1 Power source requirements



*Before connection it is necessary to:*

- Calculate the total power consumption rate of the gas detection system in watts, taking into account cold start.
- Select a power source with the appropriate power for the calculated load.
- Make sure the selected power source provides a regulated 24 VDC output voltage for the entire system, taking into account allowable ripples. It is recommended to use of a battery backup power supply to improve system reliability.

**Notice:** *If it is required to be able to turn off the power supply, then a separate method of turning it off must be provided.*

### 8.2 Detector connection

To connect the detector:

- fix the mounting bracket at the FD 330-4-1 «VEGA» workplace, install a base on it and fix it with a screw and a lock nut. The detector with a mounting bracket and its overall dimensions are shown in figure 2;
- separate the base with cable gland from the detector housing;
- install the connecting cable in the cable gland и соединить проводники с соответствующими клеммами, and connect the conductors to the corresponding terminals located on the backplane:
  - Figures 4 and 5 show examples of connecting the detector to fire alarm control panels;
  - Figures 6 and 7 show diagrams of connecting the detector to fire alarm control panels in the analogue signal using and digital output using mode;
  - Figures 8 and 9 show diagrams of connecting two detectors to fire alarm control system via RS-485 interface with and w/o terminal box;
- install the FD 330-4-1 «VEGA» housing on the base and tighten the 3 screws;
- turn the detector for correct targeting;
- after applying power to the detector, it is necessary to check whether the LED indicator on the FD 330-4-1 «VEGA» front is illuminated with constant yellow light for 3 seconds. After 3 seconds, the LED indicator lights up with a flashing yellow light for 7-8 seconds, after which the detector self-test begins (three test lamps flash three times), then at the end of the initial test – a continuous glow of green.

#### Detector connection to RS-485 digital channel

1. It is recommended to connect the detectors to the bus via a terminal box. Detectors connection to a terminal box is carried out by a cable with a recommended length of not more than 0,5m. Cable must meet the cable gland requirements on the FD 330-4-1 «VEGA» housing and terminal box. For the connection from terminal box to the bus an armored cable with pairs of shielded twisted pairs can be used.
2. For the correct power supply network organization note that the supply voltage at the terminals of the devices must be not less than 18 V and not more than 32 V, taking into account the FD 330-4-1 «VEGA» consumption.
3. The information network organization must be carried out in a way that the voltage drop on the –24 V wire between the central processor and the detector does not exceed 8 V.

4. It is recommended to connect the detectors in a branch line from the main interface line. Branches should be formed by installing repeater-splitters with galvanic isolation of the type at the nodal points of the line. Each branch must serve a separate tank. Extension of the main line beyond 1200 m must be carried out by inserting an interface repeater into the line.
5. It is advisable to power the FD 330-4-1 «VEGA» according to the beam scheme - each tank has its own cable.

**Allowable line length is determined by the formula:**

$$L(\text{km}) = 25 \Delta U(\text{V}) S (\text{mm}^2) / I_{\text{max}}(\text{mA}),$$

where  $\Delta U(\text{V})$  – allowable line voltage drop;

$I_{\text{max}}(\text{mA})$  – max current consumption;

$(I_{\text{max}}(\text{mA}) \text{FD 330-4-1 «VEGA»} = 150 \text{ mA N(pcs.)})$

Notice: FD 330-4-1 «VEGA» digital output protocol parameters are shown in Appendix A.

### 5.1 Connection diagrams

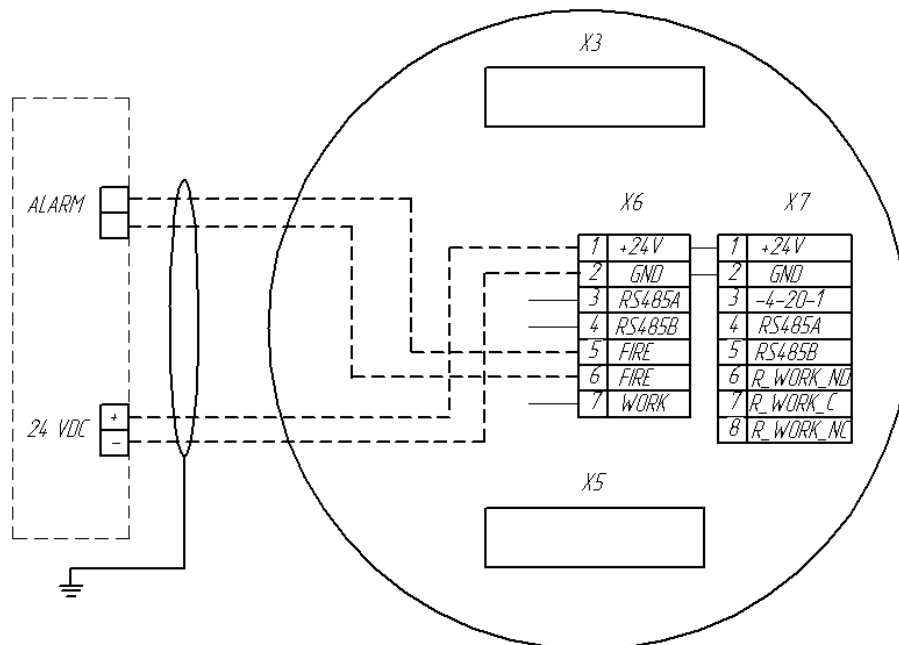


Figure 4 – Connection diagram for an explosion-proof detector EEx

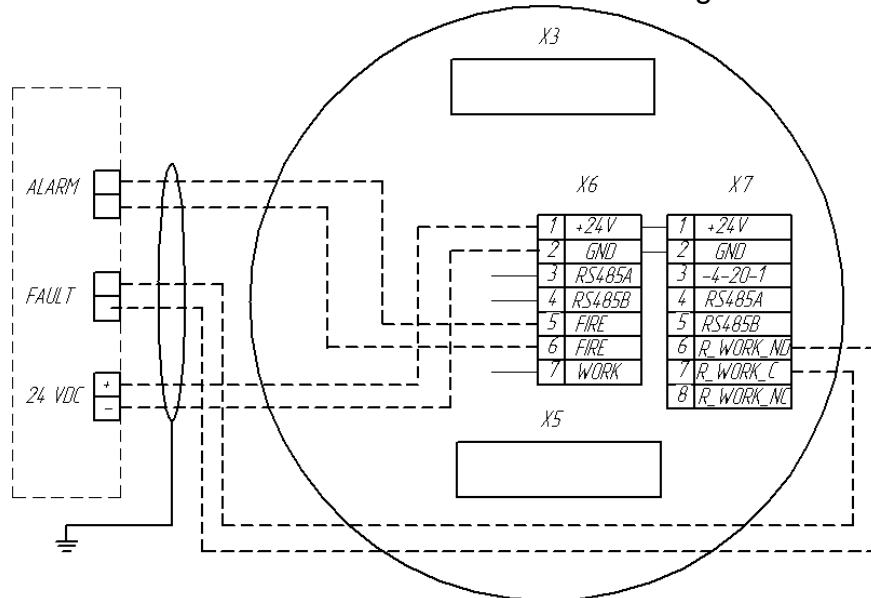


Figure 5 – Connection diagram for an ultra-explosion-proof detector EEx de.

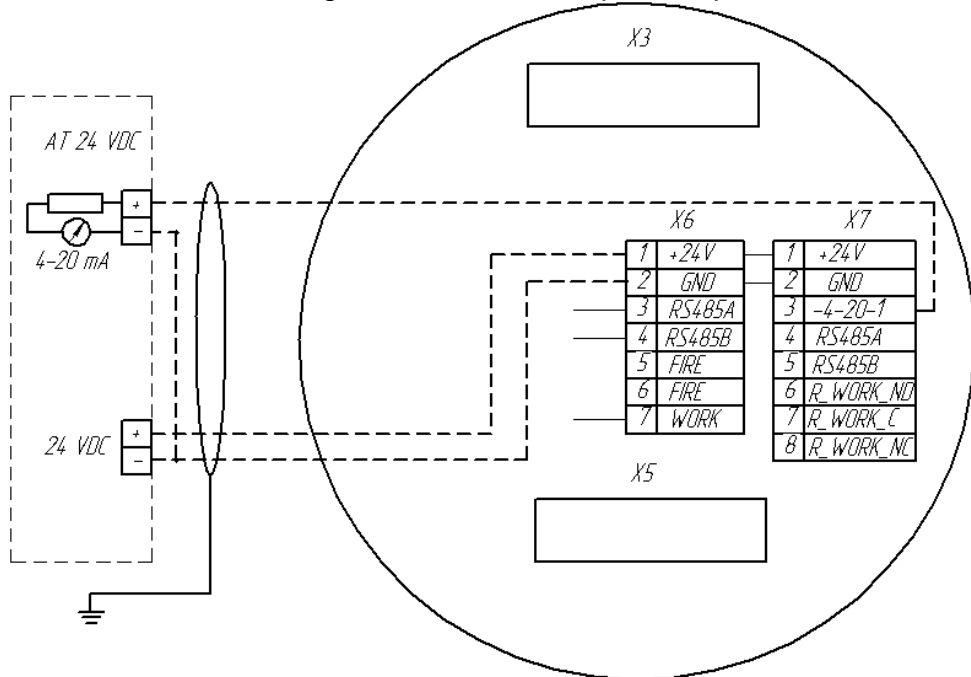


Figure 6 – Connection diagram for a detector with uninsulated output 4-20 mA

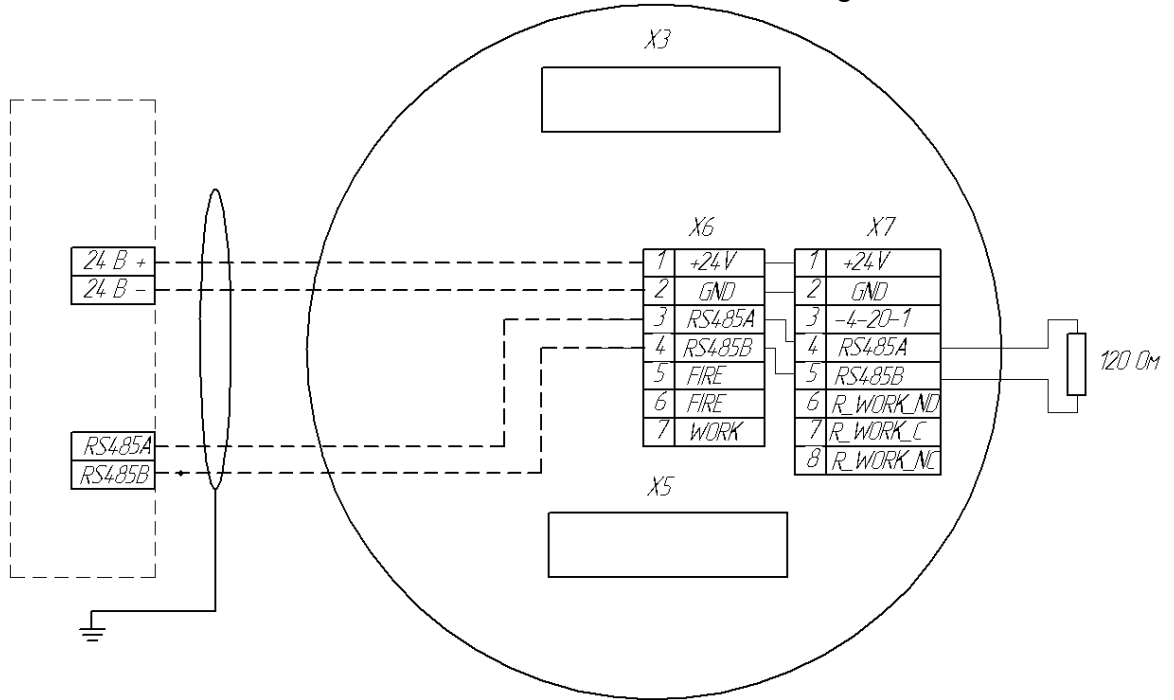


Figure 7 – Connection diagram for an explosion-proof detector EEx via RS-485 interface

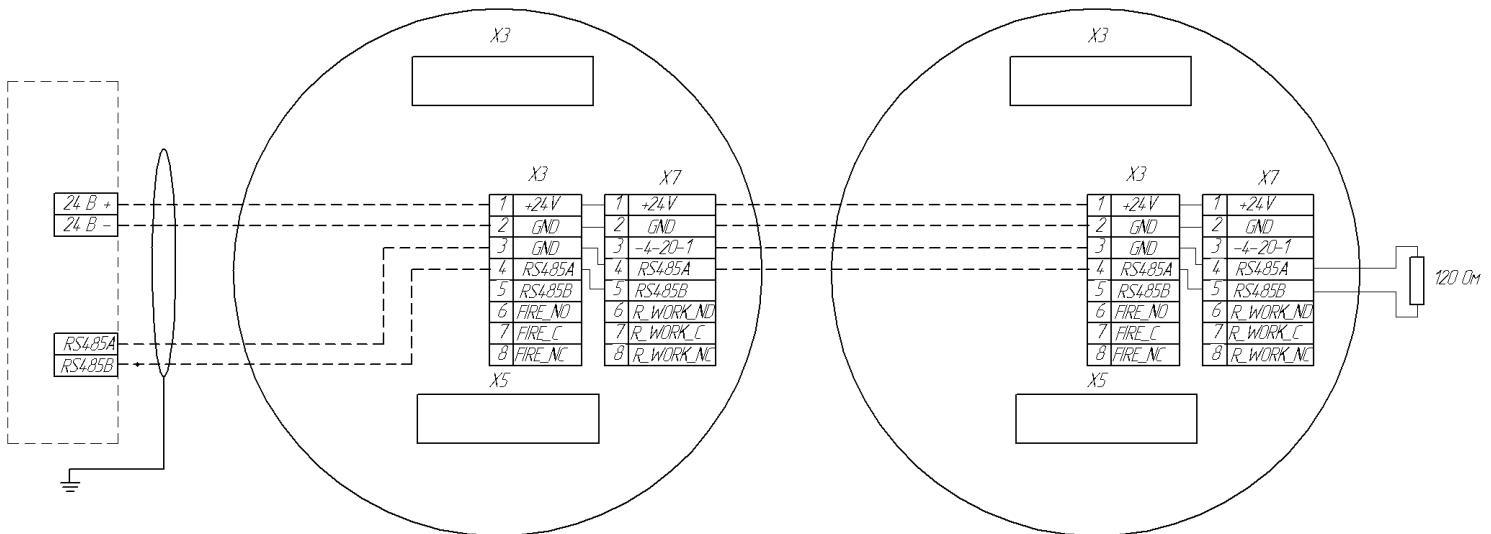


Figure 8 – Connection diagram for two explosion-proof detectors EEx via RS-485 interface



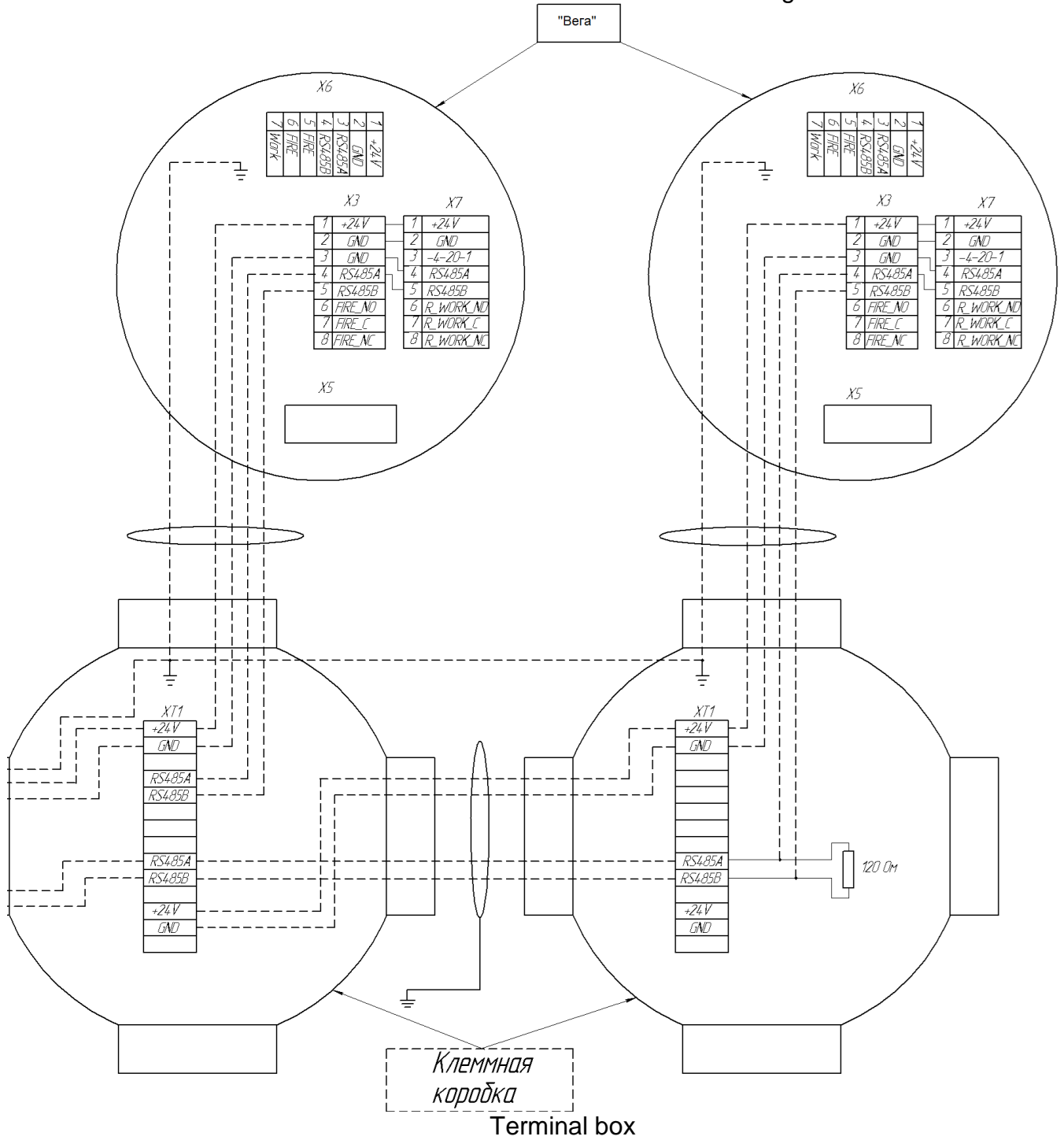
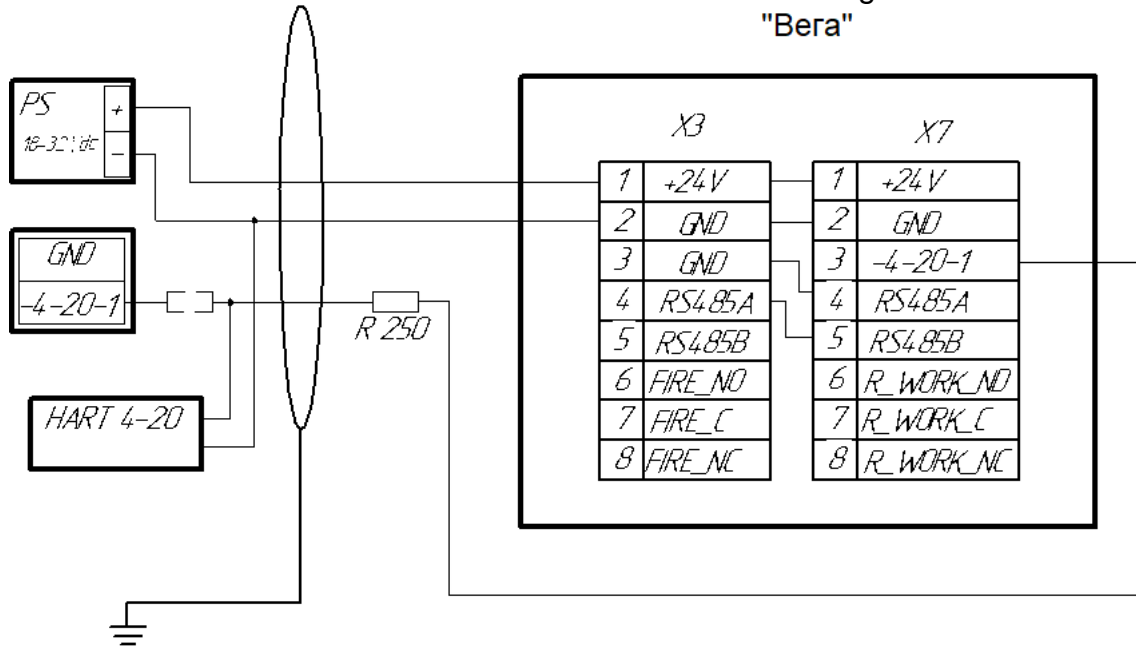
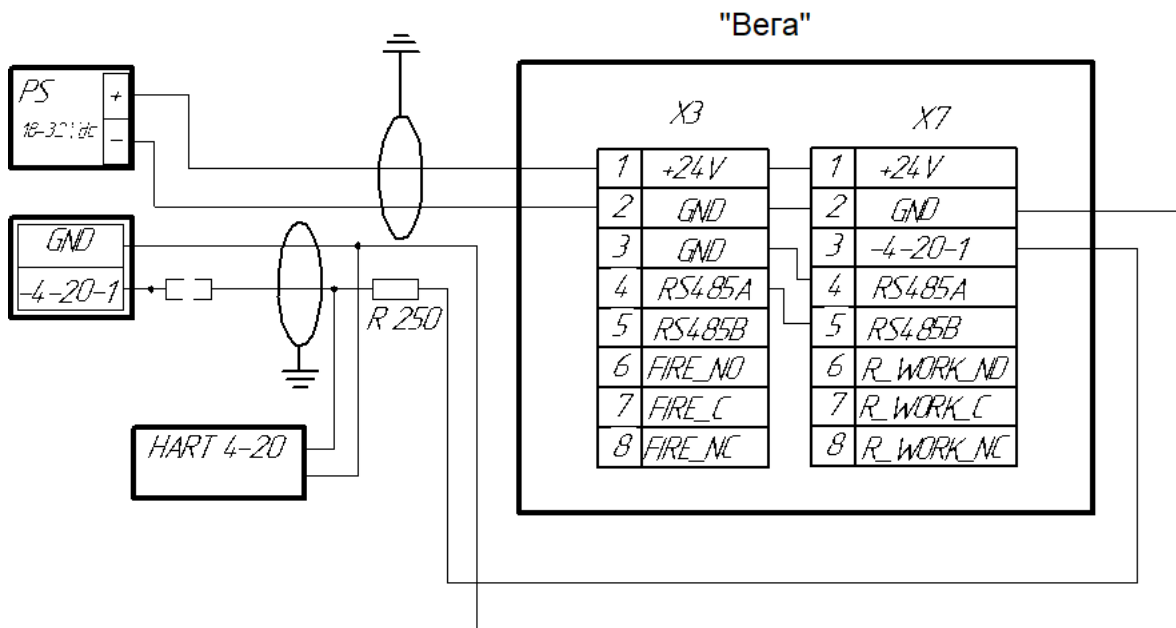


Figure 9 – Connection diagram for two detectors and a digital channel RS-485 via terminal box



**Notice:** 250 Ohm is necessary to ensure the correct operation of the HART interface, in case of 4-20 mA controller low resistance, it is not necessary to install resistance at the FD 330-4-1 «VEGA» output, it can be installed at the controller input.

Figure10 – Three-wired connection diagram FD 330-4-1 «VEGA» using 4-20mA and HART



**Notice:** 250 Ohm is necessary to ensure the correct operation of the HART interface, in case of 4-20 mA controller low resistance, it is not necessary to install resistance at the FD 330-4-1 «VEGA» output, it can be installed at the controller input.

Figure 11 – Four-wired FD 330-4-1 «VEGA» connection diagram using 4-20mA and HART

## 9. Commissioning



### PROHIBITED:

- 1 OPERATION OF THE DETECTORS IN CONDITIONS AND MODES DIFFERENT FROM THOSE, MENTIONNED IN THIS UM!
- 2 OPERATION OF THE DETECTORS WITH DAMAGED ELEMENTS, SEALS AN OTHER MALFUNCTIONS!

**3. OPEN THE DETECTORS IN A HAZARDOUS AREA WITH POWER ON**  
*Detector's housing must be grounded.*

**Output signal and LED indicators description**

FD 330-4-1 «VEGA» generates the following output signals:

- analogue signal with the following meanings:

- a)  $(2 \pm 0,1)$  mA – «Failure»;
- b)  $(4 \pm 0,1)$  mA – «Standard»;
- c)  $(18 \pm 0,1)$  mA – «Fire»;
- d)  $(4.1 \pm 0,1)$  mA – «Testing».

- digital signal via standard communication channel RS-485 with MODBUS protocol;

- actuating of the «dry» contacts of two relays «Fire» and «Failure». Relays are designed for switching current 1 A at a voltage of 30 VDC.

FD 330-4-1 «VEGA» is equipped with LED indicators, displaying the current operation mode of the detector.

Table 1 lists output signals, states of the relay contacts and indicator LEDs for FD 330-4-1 «VEGA» different states.

Table 1

No	FD 330-4-1 «VEGA» state	«Fire» relay contacts state	«Failure» relay contacts state	Output signal, mA	LED indicators state
1	No supply voltage	Open	Open	0	Off
2	After switching on during up to 45 seconds	Open	Open	2	First 5 seconds continuous, then flashing yellow glow
3	Dirty optics or presence of an object at a distance of 5-10 cm from the entrance window	Open	Open	2	Periodic switching of the glow from yellow to green
4	Failure	Open	Open	2	Continuous yellow glow
5	Standard	Open	Closed	4	Continuous green glow
6	Warning	Open	Open	4	Periodic switching of the glow from green to red (once a second)
7	Fire	Closed	Closed	18	Continuous red glow
8	Testing	Open	Closed	4,1	Depending on the presence of radiation, one of the above modes is possible
9	Checking mode (with a magnetic key on)	Open	Open	2	Depending on the previous mode the indication remains

*It is possible to fix the output signal "Fire" after the end of the alarm cause.*

It is possible to change the sensitivity and signal processing time to reduce the effect of interference when identifying a fire or a nearby location of the alleged fire site («far/near» and «fast/slow» modes).

## 9.1 Functionality check

After the equipment mounting and wiring it is necessary to perform FD 330-4-1 «VEGA» functionality check. In addition, this check should be carried out regularly at intervals of once every 6 months during maintenance.

### 9.1.1 Manual mode

To check the detector's functionality by the method of illumination, a special test radiation source is used.

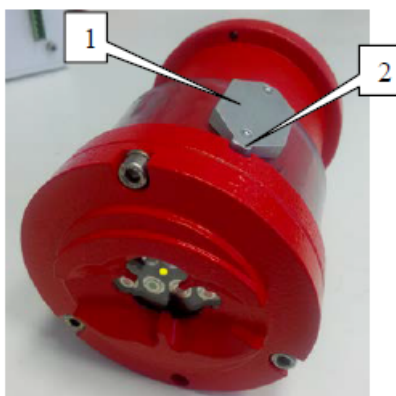
The test radiation source is designed to check the operability of fire detectors without dismounting the latter from their workplaces. The radiation of the test source has characteristics that are as close as possible to the characteristics of electromagnetic radiation that accompanies the combustion of petroleum products and their vapors, natural gas and other hydrocarbons.

The test source generates a directional complex modulated radiation with an intensity sufficient for the appearance of the "Fire" signal at the FD 330-4-1 «VEGA» output, at a distance corresponding to a specific version of the detector.

**To check the detector's functionality by the method of illumination by a test radiation source** it is necessary to do the following:

1. Direct the test source to the flame detector, located at a distance of up to 2 m and press the switch button;
2. Correct the radiation direction so that the FD 330-4-1 «VEGA» receivers are illuminated by the radiation source. For FD 330-4-1 «VEGA» actuation it is necessary to endure the test source radiation on its photo emitters for 4..5 seconds. FD 330-4-1 «VEGA» actuation is indicated by LED indicators constant red glowing for 5..6 seconds.
3. After FD 330-4-1 «VEGA» actuation turn off the source.

If it is necessary that the output signal does not contain an alarm signal, then a magnetic bracelet must be put on the FD 330-4-1 «VEGA» (Figure 12). In this case FD 330-4-1 «VEGA» actuation is controlled only visually by means of LED indicators, which should glow constantly at «FIRE» signal. If the detector does not pass the test successfully, the procedures described in the «Troubleshooting» section must be followed.



lateral side

where, 1 –Magnetic key

2 - Recess in the housing for correct installation of the clamp

Switching from ModBus protocol to HART protocol and from HART protocol to ModBus protocol possible via magnetic key.

For switching, it is necessary to:

- put the magnet to the recess on the detector (see figure 12) (a click will be heard),
- turn off the power for 5 seconds,
- turn on the power and remove the magnet in 5-10 seconds.

### **9.1.2 Automatic mode**

Sensitive elements functionality is checked every 20...30 minutes by means of built-in test radiation sources. Voltage is applied to them and the generated radiation falls directly on the sensitive elements. If the value of the signals generated in this case exceeds the specified threshold value, then the detector is considered to be operational. The «Fire» signal is not generated during the optical channels functionality check. If there is a failure in the channel (optical signals are small), a «Failure» signal is generated on LED indicators, relay contacts, analogue and digital output signals. At the same time FD 330-4-1 «VEGA» continues analyzing incoming optical signals. For visual status indication, a three-color LED indicator is installed on the front of the detector, the glow mode of which indicates the FD 330-4-1 «VEGA» status.

### **9.1.3 Detector set up test program**

Detector set up test program, besides the actual FD 330-4-1 «VEGA» functionality check, to additionally configure some parameters of its operation. For example, depending on the characteristics of a particular operation object, the user can programmatically control the degree of dustiness of the optics, activate the automatic heating mode of the optics, and also configure other performance parameters of the FD 330-4-1 «VEGA».

Using test programs, it is possible to switch the operating mode from Modbus to HART, as well as from HART protocol to ModBus protocol.

Switching is performed using the «HARTOn» button on the main tab,

Switching from HART to Modbus is performed via Dev-Ice setup →Detailed setup →Sensors→Dev-Ice flags→Settings→Switch to Modbus →on → Enter→Send

## 9.2 Factory default

Table 2

No	Operation mode	Description	Factory default	Notice
1.	«Far – near»	Far 25 meters Near 15 meters	Far	Switching using the service program
2.	«Fast-slow»	Fast – standard mode Slow – analysis of simultaneous operation of UV and IR channels, delay for issuing a fire signal 5 sec	Slow	In the slow mode, high noise immunity, response time is not more than 30 seconds. Switching using the service program
3.	Fire fixation	Fixing the fire mode	w/o fixation	Removing the fire mode using the service program, removing the power supply and a magnetic key. Switching using the service program
5.	Failure fixation	Fixing the failure mode, due to the dustiness of the input windows, an increased level of IR or UV interference, according to the results of self-testing.	with fixation	Removing the mode by turning off the power or using the service program (sequentially turning off and then turning on the fixation mode) Switching using the service program
6.	Heating	Heating of the optical part of the detector to prevent condensation and icing.	Turned off Heating turn-on point +30	Switching using the service program. To calculate cable products, refer to the appendix for information on power consumption with heating on

Relays «Fire» and «Failure» have NC and NO contact groups. The company produces detectors with the following relay configuration:

«Fire» relay – normally open (always open when power off, closed when power on and fire detected)

«Failure» relay – normally open (always open when power off, closed when power on and instrument availability)

**On request, manufacturing of the detectors with normally closed contact relay groups is possible.**

«Fire» relay – normally closed (always closed when power off, open when power on and fire detected)

«Failure» relay – normally closed (always closed when power off, open when power on and instrument availability)

## 10. Maintenance service

Maintenance service includes:

- FD 330-4-1 «VEGA» visual inspection;
- FD 330-4-1 «VEGA» clearing;
- Grounding and explosion-protection state check;
- Functionality check.

**Visual inspection.** It is necessary to make sure that there are no external mechanical damages and contamination.

**Clearing** of the FD 330-4-1 «VEGA» is performed every 6 months in the absence of strong external dust or или as required in the presence of «Failure» signals or the presence of visible dust on the FD 330-4-1 «VEGA» surface. Clearing is carried out by removing dust with a sweeping brush or slightly damp cloth from the housing and clearing the windows of the FD 330-4-1 «VEGA» with a cloth dampened with rectified alcohol. After wiping with alcohol, wipe the surface again with dry cloth to eliminate residual dirt. The consumption rate of alcohol for one service - 3 gr. If the detector is still not operational, then it should be sent for repair to the manufacturer.

The grounding condition is checked by the wiring complexity and the presence of grease on the contacts.

Functionality check procedure is described in the «Manual mode» section.

## 11. Troubleshooting

Detector's possible troubles are given in table 3

Table 3

№	Trouble signs	Possible reasons	Remedy
1	Lack of the signal red LEDs glow	No supply voltage	Disconnect the base with cable gland from FD 330-4-1 «VEGA» housing and make sure that there is a voltage of $24 \pm 6$ V on the terminals.
2	«Failure» relay contacts are open, alarm LEDs flash quickly	Protective glass is dusty	Wipe the protective glass with a cloth dampened in alcohol and then wipe with a dry, clean cloth.
3	FD 330-4-1 «VEGA» do not respond to test flame	Partial glasses contamination or the ingress of substances on them that prevent the passage of radiation to sensitive elements	See steps in line 2

### Limit states and fatal failures

Fatal failures:

- loss of containment. Stop using the detector.

Any other malfunctions in the operation or due to external influences require the detector to be stopped until it is completely restored or replaced with a serviceable detector.



Troubleshooting must be done in the following order:

**1. Disconnect all fire extinguishing equipment connected to the detector.**

2. Make sure that there is no contamination on the viewing windows. Full information about viewing window clearing is given in "Maintenance service" section.

3. Check supply voltage.

4. If checking the wiring and clearing the viewing windows/reflector does not correct the fault condition, check that there is no high background UV or IR radiation. This is achieved by covering the detector with a shell or aluminum foil. If the fault condition disappears within 6 minutes, this confirms the presence of significant background UV/IR radiation. It is recommended to change detector's location and direction.

5. Turn off the power supply and check the wiring for an open circuit.

**Warning:** Before checking, disconnect the wiring from the detector.

6. If none of these actions solves the problem, then send the detector to the manufacturer.

**Notice:** *It is advisable to have a spare detector for immediate replacement of a defective device and to ensure continuous protection of the hazardous area.*

## 12. Packaging

The detectors belong to group III-1 according to GOST 9.014-78. Packaging is made for storage conditions 1 in accordance with GOST 15150-69.

The method of packaging, preparation for packaging, shipping containers and materials used in packaging, the order of placement correspond to the drawings of the manufacturer.

## 13. Transportation and storage conditions

FD 330-4-1 «VEGA», packed by the manufacturer, can be transported over any distance, by any mode of transport. During transportation, the shipping container with packed FD 330-4-1 «VEGA» must be protected from atmospheric precipitation.

When transported by aircraft FD 330-4-1 «VEGA» must be placed in heated sealed compartments. Cargo arrangement and securing in vehicles must ensure the stable position of the cargo during transportation. Cargo displacement during transportation is not allowed.

Railway wagons, containers, car bodies used for FD 330-4-1 «VEGA» transportation, must not have traces of the transportation of cement, coal, chemicals, etc.

## 14. Storage

FD 330-4-1 «VEGA», packed by the manufacturer, during the warranty storage period must be stored according to group 1L in accordance with GOST 15150-69. Storage rooms should be free of dust, acid and alkaline fumes, corrosive gases and other harmful impurities. Products in packaging containers should be stacked on racks in layers of no more than 5.

## 15. Marking and sealing

FD 330-4-1 «VEGA» marking must include:

- a) manufacturer's trademark;
- b) code name;
- c) symbol FD 330-2-1;
- d) information on certification (certification authority mark, certificate number);

MRBP.425241.001-01 UM version 1.1 01.05.2022 FD 330-4-1 «Vega»

e) EX-marking 1Ex d IIC T6...T4 Gb X, Ex tb IIIC T85°C...T135°C Db X;

f) special explosion safety mark Ex;

g) a single sign of product circulation on the market of the member states of the Eurasian Economic Union EAC

h) degree of enclosure protection IP66/IP68;

i) operational temperature conditions from minus 60 to 90 °C (up to 125 °C short-term);

j) serial number;

k) date of manufacturing.

FD 330-4-1 «VEGA» must be sealed with the manufacturer's seals.

## 16. Warranty

The manufacturer Co Ltd «IGM-Detector» guarantees the compliance of the flame detector FD 330-4-1 «VEGA» with the requirements of the technical conditions provided that the consumer follows operating, transportation and storage terms of this UM.

Warranty period – 18 months since commissioning, including components.

Warranty period of storage at the consumer's – 12 months while meeting storage conditions of this UM.

In the event of a warranty claim, please contact the manufacturer:

**Address: 27 Engels Prospect,**

**Building 5**

**Saint-Petersburg,**

**194156, Russia**

**Tel: 8 (800) 234-66-90**

**Website: [www.igm-pribor.com](http://www.igm-pribor.com)**

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

The manufacturer undertakes to eliminate the identified defects free of charge during the warranty period or to replace the failed parts of the FD 330-4-1 «VEGA», or the entire FD 330-4-1 «VEGA».

### **Warranty does not cover:**

- cases of damage (mechanical, thermal and other) to the detector, connectors, cables, sensors, etc., resulting from improper mounting and commissioning, repair of the product by persons not accredited for the right to repair and organizations that are not service centers authorized by the manufacturer;

- cases of detector's sealing disintegration, in the presence of traces of unauthorized opening and changes in design;

- in cases of defects caused by force majeure (consequences of natural disasters, fires, floods, high-voltage discharges, lightning, etc.), accident, intentional or careless actions of the consumer or third parties.

## Appendix A FD 330-4-1 «VEGA» digital output protocol parameters

\* Modbus RTU protocol support is included in the basic version,  
On request detectors are delivered with Hart interfaces support

Flame detector FD 330-4-1 «VEGA» is designed to issue an alarm to fire alarm control and indicating equipment in the event of a fire in their field of vision. Communication with fire alarm control and indicating equipment is carried out by analogue channels 4..20 mA, dry relay «Fire» and «Failure» contacts as well as by digital channel, containing all the information, available at the outputs above.

Fire presence or absence and service parameters are transmitted to the upper-level controller via the RS-485 interface using the MODBUS protocol. FD 330-4-1 «VEGA» supports the following command types:

- reading from the device. Command code 04;
- word recording. Command code 06.

Address map carrying information about the detector's state.

Address 0x01 – upper byte contains detector's number (address) (unsigned number)  
lower byte determines the exchange rate over the RS-485 channel:

- 0x01 - 1200 baud
- 0x02 - 2400 baud
- 0x04 - 4800 baud
- 0x08 - 9600 baud
- 0x10 - 19200 baud

Адрес 0x02 – 16-bit register of the detector's state with the following information bytes:

Upper byte – set detector's mode in the format XXXXXD2 D1 D0,  
where D2: 1 - fixation, 0 – fixation disabled;

D1: 1 - far, 0 – near;

D0: 1 - fast, 0 - slow.

Lower byte – current detector's mode in the format XXXXXD2 D1 D0,  
where D2: 1 – glass contamination, 0 - standard

D1: 1 - failure, 0 - standard

D0: 1 - fire, 0 - standard.

The contents of the register at address 0x02 are read-only. Detector's parameters (fixation, far/near, fast/slow) change is carried out by hardware using switches in the input compartment.

To change the detector's address it is necessary to write the number of this device in the range from 0x01 to 0xF7 into the register with address 0x01, placing it in the upper byte of the register.

To change the exchange rate over the RS-485 channel it is necessary to write a code corresponding to a certain exchange rate to the register with address 0x01, placing it in the lower byte of the register (In the upper byte - the device address).

- 0xNN01 - 1200
- 0xNN02 - 2400
- 0xNN04 - 4800
- 0xNN08 - 9600
- 0xNN10 - 19200

Fire reset: write 0 to address register 0x02.

One must bear in mind, that an attempt to change the detector's number automatically leads to a change in the exchange rate (and vice versa), therefore, when changing the detector's number, it is necessary to monitor the contents of the byte responsible for the exchange rate (and vice versa).

When changing the rate and (or) the detector's number, the upper-level controller receives a response to the command at the same speed, and only after that FD 330-4-1 «VEGA» changes the exchange rate and detectors number.

When debugging software, the cyclic use of the command with code 06 is unacceptable as registers intended for writing have a limited number of write cycles (10000).

An attempt to write to registers with other addresses results in a response with an address error code.

**WARNING:** it is not allowed to read and use information from addresses not specified in this UM.



Change	Sheet number (pages)				Total sheet number (pages)	№ of the document	№ of the accompanying document and date	Signature	Date
	changed	replaced	new	null					