



НЕФТЕПРОМАВТОМАТИКА

SIGNALLING DEVICE BRIG-015-M001

Information-management unit in explosion-proof design

Operation manual

32050732.465275.001 OM



15 pages

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INTRODUCTION

Current document declares main parameters of the unit SIGNALLING DEVICE BRIG-015-M001 that were asserted by the manufacturer. Operation manual is intended to provide information on unit's design and its operation principles, it also states rules for its safe operation, technical maintenance, storage and transportation.

Only staff that have studied the operations manual and hold no less than III group on electrical safety in accordance with Guidance on job safety during usage of electronic equipment for units up to 1000V are allowed to perform works on installation, mounting and service of the unit.

Manufacturer reserves the right to make review and changes in operation manual and unit's design related to its technical characteristics improvement.

1. DESCRIPTION AND FUNCTIONING.

1.1 Product designation.

The unit is designed to provide safe loading of oil products in tank lorries and that are equipped with the system of overload control. The unit sends signal on exceeding of allowed oil product level to the automated equipment through relay contact. Additionally it displays both acceptable state (green indicating light), and unacceptable state (red indicating light). The unit provides diagnostic of faults in sensors system “break” and “short circuit”. The unit is designed in accordance with European standard EN13922:2003(E) for the system of five wire optical level signaling devices (electronic sensors). Display plug connection is suitable for sockets produced by CIVACON (models 4100 and 4200).

The unit has explosion proofing for electrical equipment marking type 1ExdIIBT3 in accordance with GOST R 51330.0 and is designed for usage in explosion hazardous zones of 1st and 2nd classes installed on stationary objects in accordance with GOST R 51330.0, GOST R 51330.13.

Unit functions under control of a master device (for example PC) in dialogue mode according to MODBUS RTU exchange protocol. EIA-485 interface is used for data exchange with master device.

The unit is designed for long-term continuous operation.

Range of application.

The unit is designed to be a part of an oil-loading post located in explosion hazardous zones

Unit operation conditions:

- on degree of protection from environmental impact IP65 in accordance with GOST 14254-96;
- on endurance and durability to sinusoidal vibrations impact – in accordance with GOST R 52931-2008 meets N3
- on durability to ambient air temperature and humidity impact in accordance with GOST 15150-69 meets U1

During purchasing and for other products' documentation where the unit can be used the unit must be indicated as follows: “SIGNALLING DEVICE BRIG-015-M001”.

1.2 Technical characteristics.

Product design is shown in picture 1.



Picture1. Unit SIGNALLING DEVICE BRIG-015-M001.

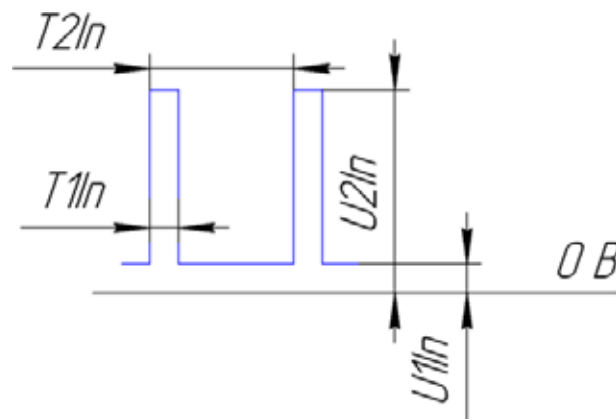
Main technical characteristics of the unit are as follows:

Supply voltage:	220 V+10%.
Power supply type:	AC, 50 Hz
Power consumption, no more than:	6 W
Indicator type:	LED
Communications interface with master device:	EIA-485
Communication protocol to master device:	Modbus RTU
Cable entry quantity	2 (4)
Working mode:	Continuous, twenty-four-hour
Degree of protection from environmental impact:	IP 65
Explosion proofing marking:	1ExdIIBT3
Ambient temperature during operation:	-40..+50°C
Relative air humidity during operation, no more than:	90%
Weight, no more than:	2 kg.
Dimensions, WxHxD:	265x216x86 mm.

Parameters of impulse input signal:	
High-level voltage U_{2In} , V, no less than	5,3
Low-level voltage U_{1In} , V, no more than	0,8
Period T_{2In} , ms	30 - 100
Impulse length T_{1In} , ms	0,8 -

	2,5
Input resistance $R_{вх}$, kilohm, no less than	30

Parameters of impulse output signal:	
Period $T2_{Out}$, ms	5,3
Impulse length $T1_{Out}$, ms	0,3 - 2
High-level voltage $U2_{Out}$, V, (pulse current value — 4mA), no less than	3,8
Low-level voltage $U1_{Out}$, V, no more than	0,7
Pulse front t , microsecond, no more than:	50
DC parameters:	
Sensors supply voltage U_s , V (no loading)	11 - 12
Sensors supply voltage U_s , V, (current load — 27 mA), no less than	8,2



Picture 2. Types of impulse in and output signals.

1. 3 Composition of the unit and package contents.

Unit delivery set includes:

- Signaling device BRIG-015-M001.
- operation documentation: 1 set;
- transport packaging: 1 set;
- parking bracket: 1 pcs;
- bracket fastening: 1 pcs;
- staple: 1 pcs.

Operation documentation includes:

- Operations manual;
- Passport.

1.4 Unit design.

1.4.1 Design.

Design of the unit includes metal case with glass front panel, electronic components boards are located inside the housing of the unit.

Cable glands are located on the side of the unit.

Grounding device with corresponding marking is located on the outer side of the unit

Power supply module provides a constant voltage of 12V and 5V DC to inner electronic of the monitor and outer five-wired optical sensors. Control scheme on the basis of micro controller generates impulses for overloading sensors, analyzed signals from sensors, sends commands “loading is permitted”, “loading is prohibited” to LED indication and to external system of loading control through interfaces “dry contact”, RS-485.

Command “loading is prohibited” is issued in the following situations:

- monitor is in parking mode,
- overload sensors are wet, there is a breakage or short circuit of control system electrical circuits during connection of the monitor to the lorry tank. Light indication in that case is as follows: red LED light is on, green LED light is off.

1.4.2 Indicator.

LED indicator is located on the front panel and allows displaying permitted/prohibited state of loading.

The following states are displayed:

- Loading is permitted;
- Loading is prohibited.

1.4.3 Marking.

Marking on the housing of the unit contains the following information:

- Type of explosion-proofing;
- Degree of protection from environmental impact;
- Manufacturer’s name;
- Serial number.

1.5 Packing.

The unit is wrapped in paper and then packed into polyethylene bag. Documentation and compact disk with software are packed into polyethylene bag. Then the package is packed into cardboard box. Hollow space is filled with corrugated cardboard or synthetic filler.

1.6 Provision of explosion proofing.

Explosion proofing type «d» (explosion-proof cover) in accordance with GOST R 51330.8.

Categories and groups of explosion hazardous zones environment where the unit is to be installed should correspond or be less dangerous than categories and groups of explosion proofing stated in explosion proofing marking of the unit.

Installing and energy supply should be performed in accordance with current operation manual, “Rules of electrical facilities maintenance” (ПУЭ) chapters 7.3, 7.4 and “Rules of electrical facilities maintenance” (ПУЭ) chapter Э3.4, Technical safety rules, other executive directives that regulate installation of electrical equipment in explosion hazardous zones.

Connection of the unit should be done through cable. Cable must not have any failures both of isolation and separate wires.

Maintenance of the unit should be performed in accordance with GOST R 51330.18 “Explosion-proof electronic equipment. Maintenance and verification”.

2. INTENDED USE.

2.1 Preparing unit to operation.

2.1.1 Unpacking

Upon receiving the unit integrity of packing should be checked. After the box is opened the unit should be taken out of package material and wiped. Package contents should be checked against paragraph 1.3.

2.1.2 Safety precautions.

Only staff that have studied current manual and possess necessary qualifications should have access to installing, operation, technical maintenance and service of the unit.

Installing, operation, technical maintenance and service of the unit should be performed in accordance with requirements of “Users rules on electrical devices technical maintenance” and “Users safety measures during electrical devices operation” as well as other department and sectoral norms that are implemented on the operation facility.

Installing, operation, technical maintenance, troubleshooting and connecting cables are allowed to perform only if the supply voltage is off.

The unit shall be grounded, this should be done before other cables are plugged in. Ground loop is connected to the grounding device that is located on the outer side of the unit's housing and is marked correspondently.

2.1.3 Installation of the unit.

Fastening of the unit is performed with fastening brackets that are located on the flanks of the unit.

Overall and connection dimensions are shown on the sketch in Appendix 1.

To plug cables in it is necessary to take of the front panel by unscrewing studs that are located along its perimeter.

Cables are to be entered through cable glands, after they are terminated cable glands should be tightened.

Before termination of the cables ensure they are de-energized and protection grounding has been arranged.

Cables should be connected in accordance with connection table (Appendix 2).

EIA-485 net interconnection should be performed in accordance with requirements of this standard.

After termination the front panel must be closed and studs that are located along its perimeter must be screwed. Front panel should be car sealed.

Installation and termination must be performed in accordance with safety requirements (paragraph 2.1.2).

2.2 Precommissioning.

After installation works are finished and the unit is powered the unit is ready to work. Using the unit as a part of automated systems may require changing Modbus address.

2.3 Maintenance check.

Maintenance check provides visual examination that is performed to make sure there cables do not have any breakages or damages, all connections are safe, there have been no mechanical damages to the housing of the unit and that plates with explosion proofing marking are provided. Safety of grounding should also be checked. Operation the device with deviations from requirements listed above is not permitted.

2.4 Technical maintenance.

Technical maintenance is conducted in order to provide normal operation and maintenance of operational and technical characteristics of the unit during service life.

Technical maintenance consists of periodical control of technical state and of emerging malfunctions repair.

During conducting all kinds of technical maintenance safety precautions listed in paragraph 2.1.2 must be followed.

Technical maintenance should be conducted no less than once a quarter. During the maintenance requirements in paragraph 2.3 should be followed.

During technical maintenance it is necessary to remove contaminations from surface of the housing; it is prohibited to use corrosive fluids of solvents.

Maintenance (as well as warranty repairs) is performed by manufacturer.

2.5 Unit operation.

Connect output cables of the unit (relay output, RS-485) to the control system (CS).

Connect the unit to power supply (plug in parking mode). Indication state – “loading is prohibited”. CS writes the state “loading is prohibited”.

Perform grounding of controlled tank lorry with the help of specialized grounding unit. Connect the plug to the control system of lorry tank overload with “dry” sensors. Indication state – “loading is permitted”. CS writes the state “loading is permitted”.

Wet one of the sensors. Indication state – “loading is prohibited”. CS writes the state “loading is prohibited”.

Dry the sensor. Indication state – “loading is permitted”. CS writes the state “loading is permitted”. АОН writes the state “loading is permitted”. The unit is faultless and ready to work.

At a later date operating the unit reduces to fulfilling requirements in accordance with paragraph 2.5.3.

The unit works as a slave device in regards to PC or higher level controller in accordance with Modbus RTU protocol. Master device initiates issuing control commands and reading variables that reflect current state of technological process.

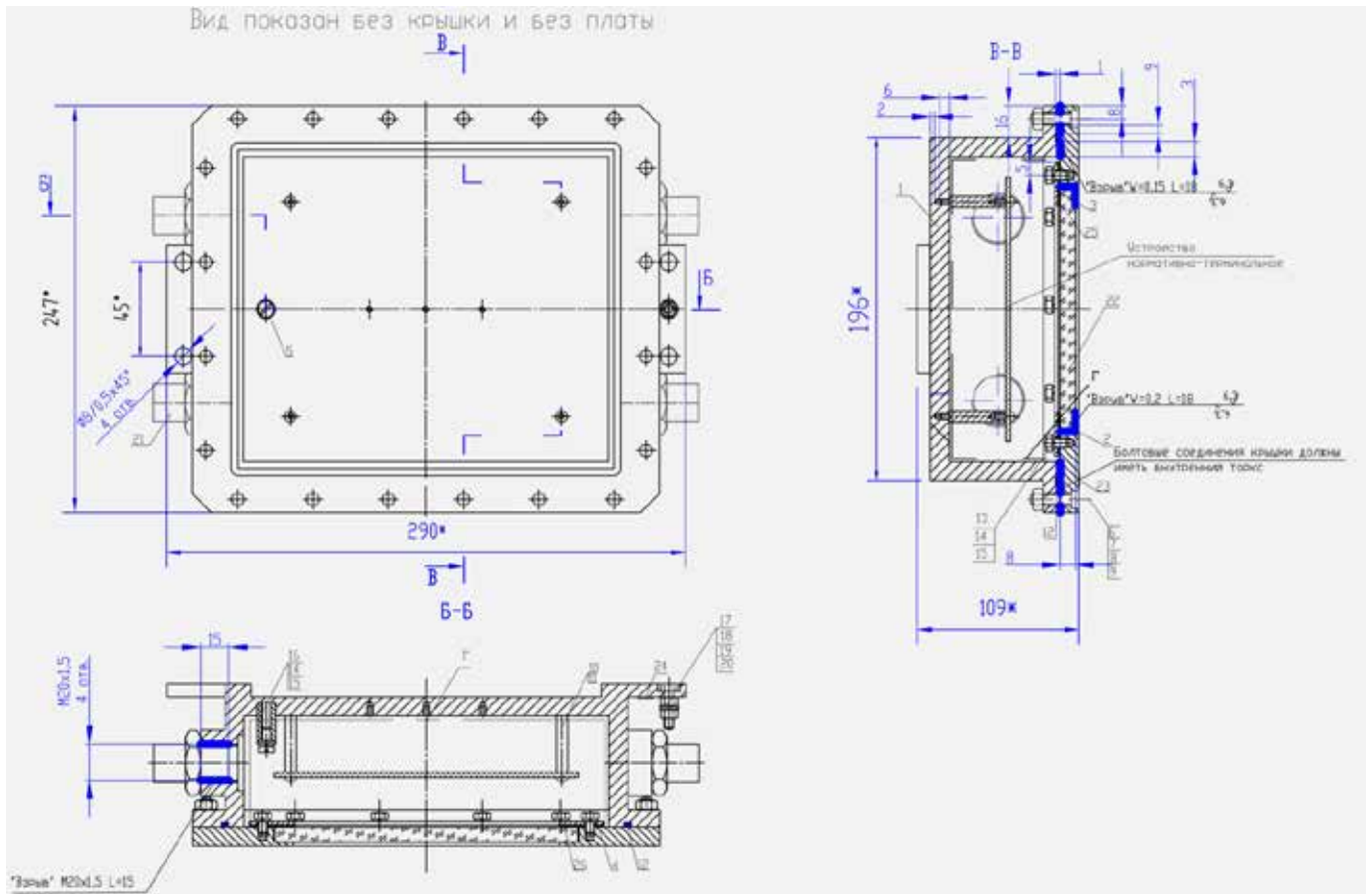
EIA-485 interface is used for connection to master device. Description of communication parameters that are used by Modbus, connection principles and register map are provided in Appendix 3

2.6 Rules of storing and transportation.

Transportation and storing should be performed in accordance with GOST 15150-69 (terms of storing 3). Before being put into operation unit should be stored in a warehouse in factory packing at temperature -40...50 °C and relative humidity up to 90% (at temperature 25 °C).

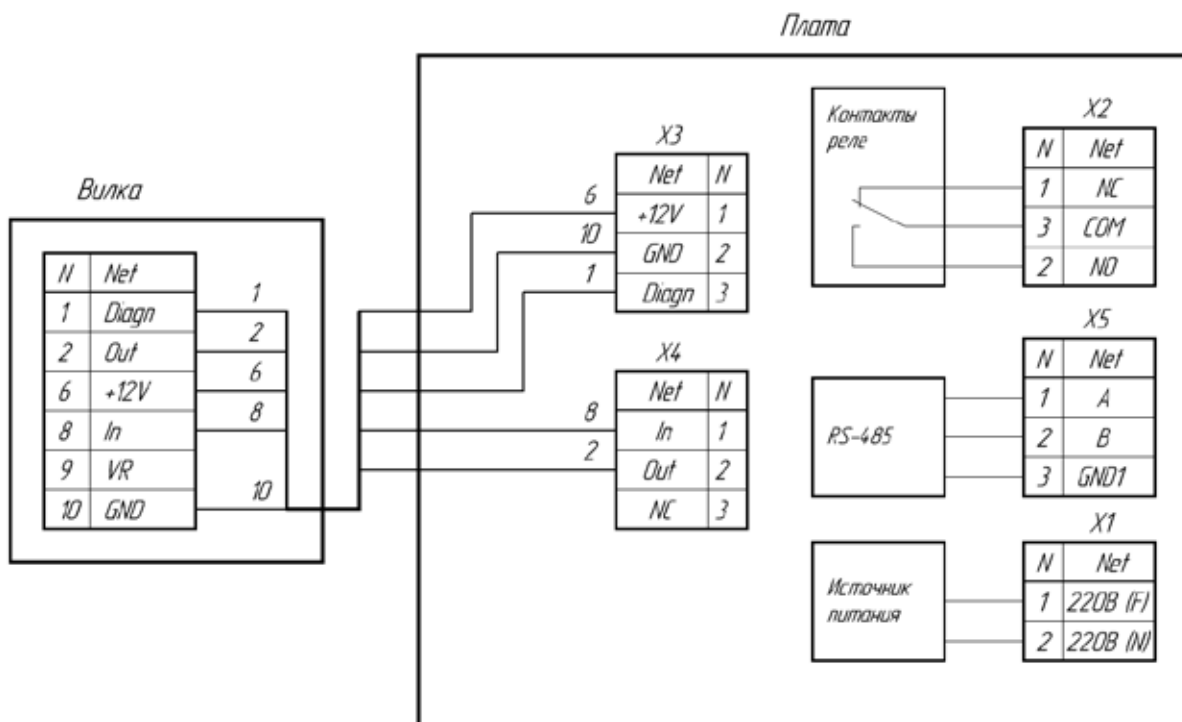
Transportation of the unit should be performed in its factory packing. Storage time for the unit in factory packing in warehouse, including time of transportation, is 3 years.

Overall and connection dimensions.



Picture 3. Overall and connection dimensions.

Unit connection.



Picture 4. Unit connection.

Plug number	Contact number	Designation	Purpose	Notes
X3	1	+12V	Sensors supply	
	2	GND	Grounding	
X4	1	Out	Impulse output	
	2	In	Impulse input	
X3	3	Diagn	Diagnostics	Reserves
		VR	Vapor recuperation	
X1	1	-220V	Display network supply 220 V	
	2	-220V		
X2	1	1	Relay contacts	In the state “loading is prohibited” contacts are closed, contacts 1-2 are open. In the state “loading is permitted” contacts 2-3 are open, contacts 1-2 are closed.
	2	2		
	3	3		
XT6	1	A	Phase A	RS - 485
	2	B	Phase B	

Notes

Cables are connected to terminals XT1-XT5 and are led out through cable glands.

Plug is connected to terminals XT1-XT3 in accordance with picture 4.

Supply cable is connected to terminal XT4, cable cores have the following marking: «L» (кор.) – XT4.1, «N» (син.) - XT4.2, «GND» (ж-3) – housing.

Blocking cable is connected to terminal XT5, cable cores have the following marking: «1» – XT5.1, «2» – XT5.2, «3» – XT5.3.

APPENDIX №3

Exchange protocol.

Supports commands Modbus RTU 3, 8, 16,

17. Memory card:

Address	Length, bytes	Rights	Design, accepted values, dimension	Notes
0x0000 0xFFFFE	2 2	read only read	Hi=0, Low – [0,1] Low =0 – loading is permitted, Low =1 – loading is prohibited Low— [0,7] Speed:	Hi – upper byte, Low – lower byte Value is saved
		write	0 —1200; 1 —2400; 2 —4800; 3 —9600; 4 —19200; 5 —38400; Hi — [0,4] Parity: 0 — NO; —ODD; —EVEN; —MARK; —SPACE.	in EEPROM, default: speed — 3; parity — 2.
0xFFFF	2	read	Hi = 0;	Value is saved
		write	Low — [1,247] Address of subordinate	in EEPROM, default – 1

By command 17 identifier of the device, working status and software version are reported. Order or information bytes:

1. 0x80 — identifier;
2. 0xFF — working status only;
3. Version number upper byte;
4. Version number lower byte;
5. Assembly number upper byte.