PUBLIC JOINT STOCK COMPANY "SARANSK INSTRUMENT WORKS"

PRODUCT CATALOG

Dear Partners!

Public Joint Stock Company "Saransk Instrument Works" is a manufacturing company having a 60-year history, with a large range of equipment and technologies allowing for manufacturing products for shipbuilding, oil and gas industry, nuclear power plants, military-industrial complex, transport machine building, chemical and food manufacturing industry, housing and utilities sector.

The company's core activities are:

- development and production of devices for monitoring and control of process procedures, such as pressure indicator units, heads, and indicators; pressure and temperature switches; membrane indicating draft gauges, head gauges, draft-head gauges, and differential pressure gauges; tachometers; electro-pneumatic transducers and positioners; membrane phase separators, etc.
- development and production of single-, double-, multi-layer and welded diaphragm bellows of over 200 typical sizes as well as expansion joints, units and assemblies based on them;
- rendering services such as design and manufacture of process equipment, dies and molds, and other process tools; manufacture of aluminum and plastic parts; repair and mechanical services.

High industrial and engineering level of the company is confirmed by certificates and licenses issued by the Federal Agency on Technical Regulating and Metrology as per GOST ISO 9001-2015, GOST RV 0015-002-2012, Maritime Register of Shipping and River Register, licenses for construction and manufacture of equipment for nuclear power plants; and there is also a permanent Military Representative Office of the Ministry of Defense of the Russian Federation at the company.

PJSC "SIW" was the first Russian company to obtain a certificate of conformity for bellows units in line with the requirements applicable to products used in the nuclear power sector.

We have been working at improvement of existing products and development of new ones to suit customers and market requirements. Working with our company, you will benefit from order fulfilment time, and our quality and ability to comply with customers' requirements of any difficulty.

With its 60 years' experience, PJSC "SIW" is highly rated both in the Russian Federation and in near-abroad countries as a plant that guarantees reliability of partnership and world-class quality of its products.

We are open to dialogue and ready to discuss any cooperation options on mutually beneficial terms, including pricing issues.

PJSC "SIW": the best devices for the world to measure!

Pursuant to Contract 472/17 of 23.06.2017, SIW LLC TD is the official agent of PJSC "SIW" for customer search and selection.

Best regards

Director General
Igor Egorov

TABLE OF CONTENTS

SECTION I.
PRESSURE AND TEMPERATURE CONTROL DEVICES

PRESSURE SWITCHES ДЕМ-102С, ДЕМ-105С

Pressure switches ДЕМ-102С, ДЕМ-105С (hereinafter – devices) are intended to monitor and regulate pressure in alarm systems, diesel engine protection and control systems, locomotive-type diesel engine systems, refrigeration plants and other systems used in vessels, railway and motor transport, relay pressure control by opening or closing electric contacts.

Controlled medium:	Water, air, freons, oils and other liquids and gas, with a maximum viscosity of 0.8 Pa·s, nonaggressive to the used structural materials.
Climatic version and placement category:	В2,5 (for ДЕМ-105С only), УХЛ3, ОМ5 as per GOST 15150-69.
IP rating:	IP64 as per GOST 14254-2015.
Ambient air temperature:	–60 to +50 °C
Controlled medium temperature:	–40 to +60 °C
Air relative humidity:	up to 100 % at 35 °C.
Atmospheric pressure:	0.084 to 0.113 MPa (630 to 850 mm Hg).
Device weight:	≤ 1.0 kg.
Average service life:	≥ 12 years.
Guarantee period of storage:	24 months since the date of manufacture.
Guarantee service life:	24 months within the guarantee period of storage from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, specified setpoint range, basic absolute error, actuation range and threshold return area value of devices are in compliance with those given in Tables 1 and 2.

TABLE 1

Device designation	Specified setpoint range*, MPa	Basic absolute error, MPa, maximum	Actuation range, MPa, maximum	Return area, MPa, maximum		
				controllable		uncontrollable
				minimum	maximum	maximum
ДЕМ-102С-1-01	0.02 to 0.4	±0.005	0.004	0.04	0.25	-
ДЕМ-102С-2-01	0.02 to 0.4	±0.005	0.004	-	-	0.05
ДЕМ-102С-1-02	0.1 to 1.4	±0.15	0.02	0.05	0.4	-
ДЕМ-102С-2-02	0.1 to 1.4	±0.15	0.02	-	-	0.06
ДЕМ-102С-1-03	–0.09 to 0.32	±0.012	0.004	0.03	0.3	-
ДЕМ-102С-2-03	–0.09 to 0.32	±0.012	0.004	-	-	0.03
ДЕМ-102С-1-04	0.02 to 0.4	±0.005	0.004	0.04	0.25	-
ДЕМ-102С-2-04	0.02 to 0.4	±0.005	0.004	-	-	0.05
ДЕМ-102С-1-05	0.2 to 3.0	±0.15	0.02	0.1	0.6	-
ДЕМ-102С-2-05	0.2 to 3.0	±0.15	0.02	-	-	0.35
ДЕМ-102С-1-06	1.0 to 6.0	±0.25	0.05	0.4	3	-
ДЕМ-102С-2-06	1.0 to 6.0	±0.25	0.05	-	-	0.6

* "Specified setpoint range" – values of setpoints at which the requirements of technical conditions are satisfied for each device version.

NOTE

Devices ДЕМ-102С-1 with controllable return area, devices ДЕМ-102С-2 with uncontrollable return area.

TABLE 2

Device designation*	Specified setpoint range**, kPa	Basic absolute error, kPa, maximum	Actuation range, kPa, maximum	Uncontrollable return area, kPa, maximum
ДЕМ-105С-01-1	20 to 400	±5	±4	30
ДЕМ-105С-01-2	20 to 400	±5	±4	30
ДЕМ-105С-02-1	20 to 900	±25	±10	70
ДЕМ-105С-02-2	20 to 900	±25	±10	70

* The designation for ДЕМ-105С with ШР or 2РТТ type connectors shall include additional number 1 or 2, respectively, after the return area designation.

**"Specified setpoint range" – values of setpoints at which the requirements of technical conditions are satisfied for each device version.

NOTES

1. Setting devices to a specific actuation setpoint and to a specific value of return area (for ДЕМ-102С-1 only) shall be done by the manufacturer according to the order.
Setpoint value shall be selected from the setpoint range in increments of:
– 5 kPa – for ДЕМ-105С-01;
– 10 kPa – for ДЕМ-105С-02;
– 0.005 MPa – for ДЕМ-102С-1(2)-01, ДЕМ-102С-1(2)-03, ДЕМ-102С-1(2)-04;
– 0.01 MPa – for ДЕМ-102С-1(2)-02;
– 0.1 MPa – for ДЕМ-102С-1(2)-05;
– 0.5 MPa – for ДЕМ-102С-1(2)-06.

2. If the order does not specify an actuation setpoint, devices shall be set by the manufacturer to the following actuation setpoints within the appropriate specified setpoint range:
– ДЕМ-102С-1(2)-01 – 0.1 MPa ± 0.005 MPa;
– ДЕМ-102С-1(2)-02 – 0.75 MPa ± 0.15 MPa;
– ДЕМ-102С-1(2)-03 – 0.1 MPa ± 0.012 MPa;
– ДЕМ-102С-1(2)-04 – 0.1 MPa ± 0.005 MPa;
– ДЕМ-102С-1(2)-05 – 1.5 MPa ± 0.25 MPa;
– ДЕМ-102С-1(2)-06 – 3.0 MPa ± 0.25 MPa;
– ДЕМ-105С-01 – 100 kPa ± 5 kPa;
– ДЕМ-105С-02 – 500 kPa ± 25 kPa.

3. If the order does not specify the value of return area for ДЕМ-102С-1, devices shall be set by the manufacturer to the minimum value of return area.

4. The customer is allowed to reset a setpoint and return area (for devices with controllable return area only) within the range of values specified in Table 1.

Maximum operating pressure of the controlled medium, maximum allowable pressure of the controlled medium for ДЕМ-102С devices are given in Table 3.

TABLE 3

Designation	Maximum operating pressure of the controlled medium, MPa	Maximum allowable pressure of the controlled medium*, MPa
ДЕМ-102С-1-01 / ДЕМ-102С-2-01	0.7	1.3
ДЕМ-102С-1-02 / ДЕМ-102С-2-02	1.5	2.5
ДЕМ-102С-1-03 / ДЕМ-102С-2-03	1.7	2.2
ДЕМ-102С-1-04	0.4	1.3
ДЕМ-102С-1-05 / ДЕМ-102С-2-05	3.2	3.6
ДЕМ-102С-1-06 / ДЕМ-102С-2-06	9.0	9.3

* Maximum exposure duration is 5 min.

TABLE 4

Designation	Maximum operating pressure of the controlled medium, kPa	Maximum allowable pressure of the controlled medium*, kPa
ДЕМ-105С-01-1	800	1,300
ДЕМ-105С-01-2	800	1,300
ДЕМ-105С-02-1	1,500	2,000
ДЕМ-105С-02-2	1,500	2,000

Maximum operating pressure of the controlled medium, maximum allowable pressure of the controlled medium for ДЕМ-105С devices are given in Table 4.

* Maximum exposure duration is 5 min.

Switching wear resistance of contacts (number of switching cycles) is 250,000 actuation cycles at the load specified in Table 5.

TABLE 5

Current type	Voltage, V	Switching power, W	Current, A		Cos φ, minimum	Frequency, Hz
			min.	max.		
DC	12 to 24	60	0.1	–	–	–
AC	127; 220	–	0.1	6	0.6	50 or 60

NOTES

1. Minimum value of switched current is 0.1 A with maximum inductance for DC of 5 mH.
2. It is not allowed to use devices for switching minimum currents if they were used at other current loads.

DESIGNATION STRUCTURE

Pressure switch ДЕМ-102С – X – X – X , X , X , X , X , X , X

Direction of return area in relation to the setpoint:
"1" – towards pressure increase;
"2" – towards pressure decrease

Setpoints range, MPa:
"01" – from 0.02 to 0.4;
"02" – from 0.1 to 1.4;
"03" – from –0.09 to 0.32;
"04" – 0.02 to 0.4;
"05" – 0.2 to 3.0;
"06" – 1.0 to 6.0

Electrical connector[1]:
"1" – ШР type;
"2" – EN 175301-803 form A;
"3" – 2PTT type

Climatic version and placement category as per GOST 15150-69:
"ОМ5" – for supply to all macroclimatic regions with both moderately cold and tropical marine climate, including vessels of unrestricted navigation.
"УХЛ3" – for supply to macroclimatic regions with moderate and cold climate.

"Э" – if supplied for export

Nipple version: "H0" – no nipple; "H1" – nipple No. 1; "H2" – nipple No. 2; "H3" – nipple No. 3; "H4" – nipple No. 4; "H5" – nipple No. 5.

Setpoint (the actuation setpoint value as per Table 1 including measurement units)

Return area[2] (controllable return area value from Table 1 including measurement units)

Installation kit "K1"[3]

NOTE

1 – ШР type (socket with straight branch pipe) only in climatic version УХЛ3, 2РТТ type (socket with straight branch pipe) only in climatic version ОМ5;
2 – for devices with controllable return area only;
3 – supplied as an option.

ORDERING INFORMATION FOR ДЕМ-102С DEVICES:

pressure switch ДЕМ-102С with return area directed towards pressure decrease in relation to the setpoint, with setpoint range from 0.1 to 1.4 MPa, with EN 175301-803 form A connector, climatic version УХЛ3, with an actuation setpoint of 0.6 MPa, with К1 installation kit:
"Pressure switch ДЕМ-102С-2-02-2, УХЛ3, setpoint 0.6 MPa, К1 ТУ 4212-147-00227471-2012".

the same if a setpoint actuation value is not specified in the order:
"Pressure switch ДЕМ-102С-2-02-2, УХЛ3, К1 ТУ 4212-147-00227471-2012".

pressure switch ДЕМ-102С with return area directed towards pressure increase in relation to the setpoint, with setpoint range from 0.2 to 3 MPa, with 2РТТ type connector, climatic version ОМ5, when supplied for export, with nipple No. 5:
"Pressure switch ДЕМ-102С-1-05-3, ОМ5, Э, Н5, ТУ 4212-147-00227471-2012".

DESIGNATION STRUCTURE

Pressure switch ДЕМ-105С – X – X – X , X , X , X , X , X

Setpoint range, kPa:
"01" – 20 to 400;
"02" – 20 to 900

Direction of return area in relation to the setpoint:
"1" – towards pressure increase;
"2" – towards pressure decrease

Electrical connector[1]:
not specified – EN 175301-803 form A;
"1" – ШР type;
"2" – 2РТТ type

Climatic version and placement category as per GOST 15150-69:
"В2,5" – for supply to all macroclimatic regions, including land and sea, except the climatic region with cold antarctic climate.
"ОМ5" – for supply to all macroclimatic regions with both moderately cold and tropical marine climate, including vessels of unrestricted navigation.
"УХЛ3" – for supply to macroclimatic regions with moderate and cold climate.

"Э" – if supplied for export

Nipple version: "Н0" – no nipple; "Н1" – nipple No. 1; "Н2" – nipple No. 2; "Н3" – nipple No. 3; "Н4" – nipple No. 4; "Н5" – nipple No. 5.

Setpoint (the actuation setpoint value as per Table 2 including measurement units)

Installation kit "К1"[2]

NOTE

1 – EN 175301-803 form A in climatic version УХЛ3 and ОМ5, ШР type (socket with straight branch pipe) only with climatic version УХЛ3, 2РТТ type with climatic version В2,5 (socket with angular branch pipe), with climatic version ОМ5 (socket with straight branch pipe);
2 – supplied as an option.

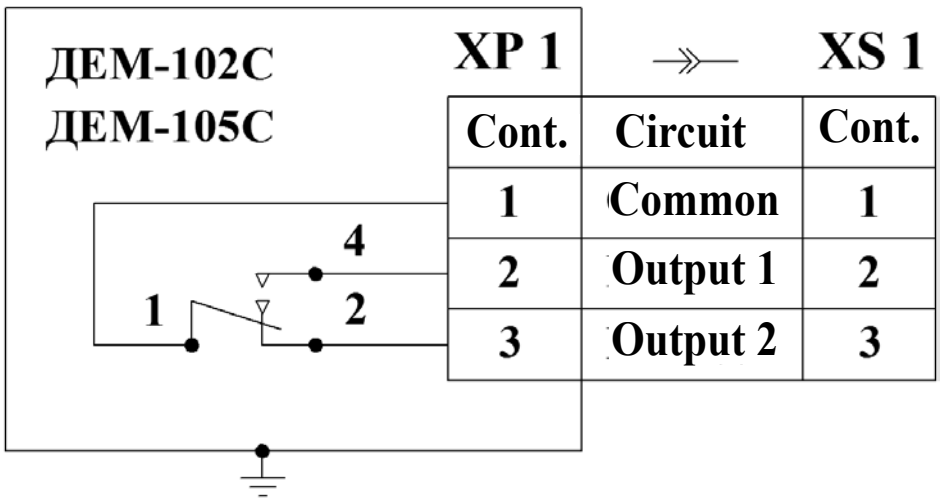
ORDERING INFORMATION FOR ДЕМ-105С DEVICES:

pressure switch ДЕМ-105С with setpoint range from 20 to 400 kPa, with return area directed towards pressure increase of the controlled medium in relation to the setpoint, with 2РТТ type connector, climatic version В2,5, with nipple No. 3, with actuation setpoint at 100 kPa:
"Pressure switch ДЕМ-105С-01-1-2, В2,5, Н3, setpoint 100 kPa ТУ 4212-147-00227471-2012";

pressure switch ДЕМ-105С with setpoint range from 20 to 900 kPa, with return area directed towards pressure decrease of the controlled medium in relation to the setpoint, with EN 175301-803 form A connector, climatic version УХЛ3, with actuation setpoint at 400 kPa, if supplied for export, and with installation kit К1:
"Pressure switch ДЕМ-105С-02-2, УХЛ3, setpoint 400 kPa, Э, К1 ТУ 4212-147-00227471-2012";

pressure switch ДЕМ-105С with setpoint range from 20 to 400 kPa, with return area directed towards pressure decrease of the controlled medium in relation to the setpoint, with 2РТТ type connector, climatic version ОМ5:
"Pressure switch ДЕМ-105С-01-2-2, ОМ5 ТУ 4212-147-00227471-2012".

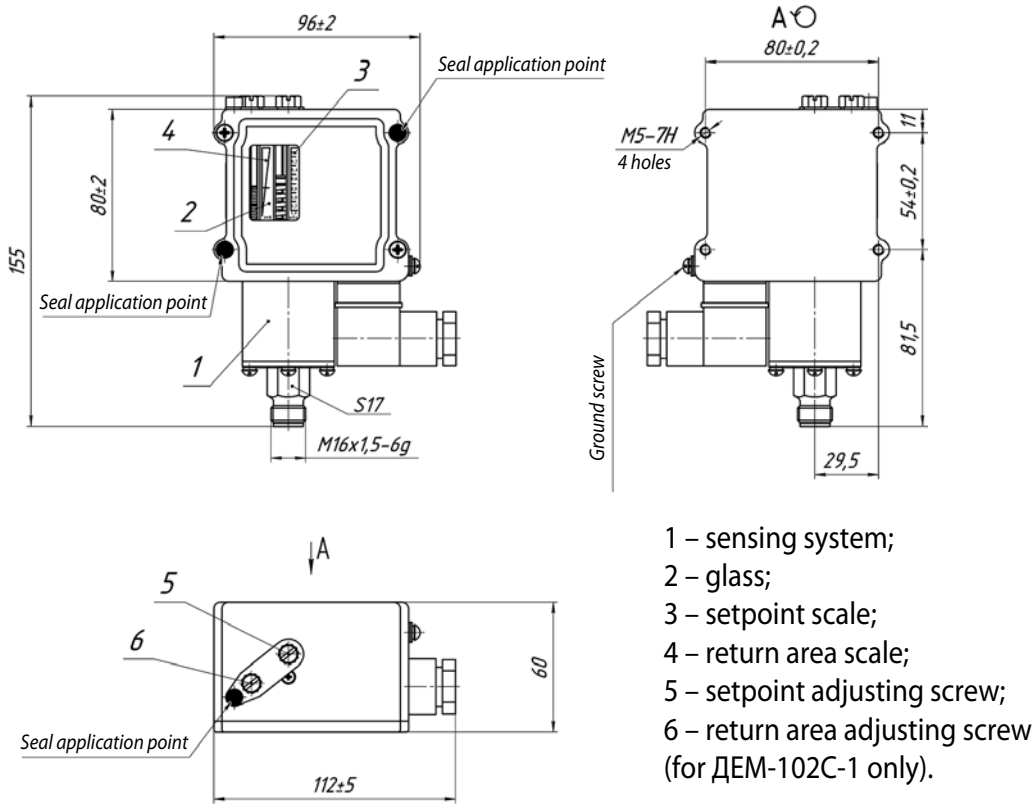
ELECTRIC CIRCUIT DIAGRAM



Connector designation		Document designation
XP1	XS1	
Plug ШР20П3Ш7	Socket ШР20П3НШ7	ГЕ0.364.107 ТУ
Plug 2РТТ20Б3Ш5В	Socket 2РТТ20КПН3Г5В	ГЕ0.364.120 ТУ
Plug 2РТТ20Б3Ш5В	Socket 2РТТ20КУН3Г5В	ГЕ0.364.120 ТУ
Base as per EN 175301-803	Electric connector GDA4080S62 form A	EN 175301-803

Figure 1 – Electric circuit diagram of pressure switches ДЕМ-102С, ДЕМ-105С

OVERALL AND MOUNTING DIMENSIONS



1 – sensing system;
2 – glass;
3 – setpoint scale;
4 – return area scale;
5 – setpoint adjusting screw;
6 – return area adjusting screw (for ДЕМ-102С-1 only).

Figure 2 – Overall and mounting dimensions of the device with EN 175301-803 form A connector

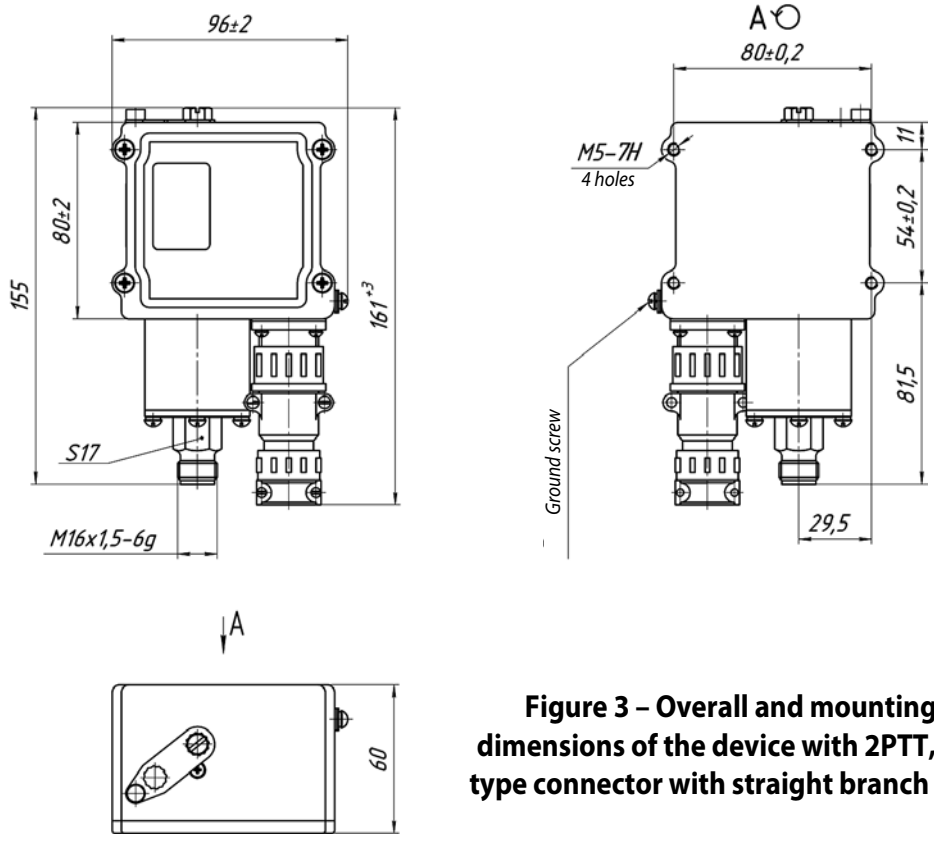


Figure 3 – Overall and mounting dimensions of the device with 2РТТ, ШР type connector with straight branch pipe

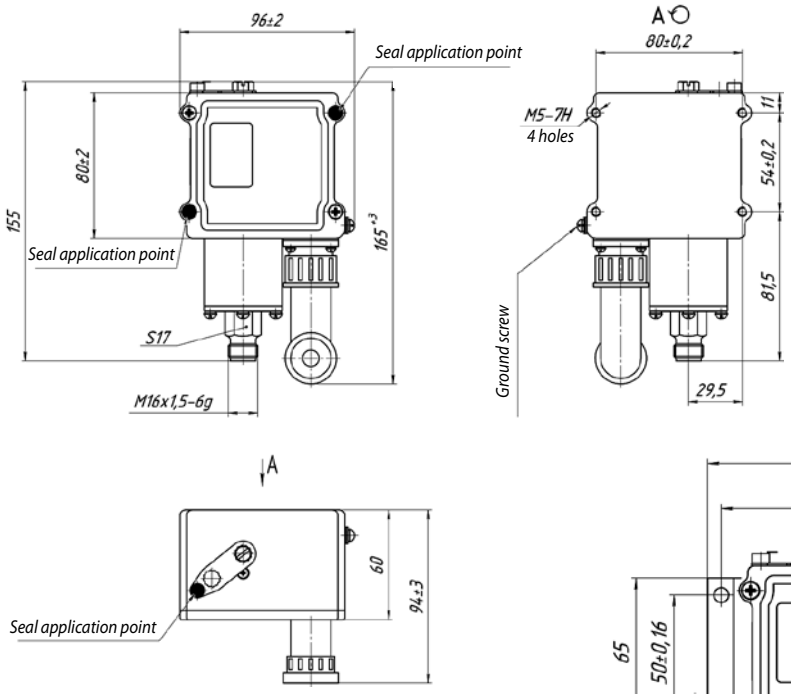


Figure 4 – Overall and mounting dimensions of the device with 2PTT type connector with angular branch pipe

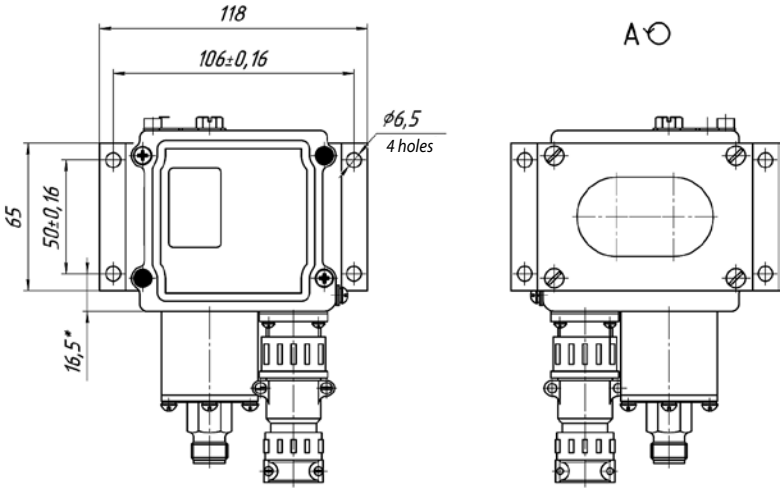
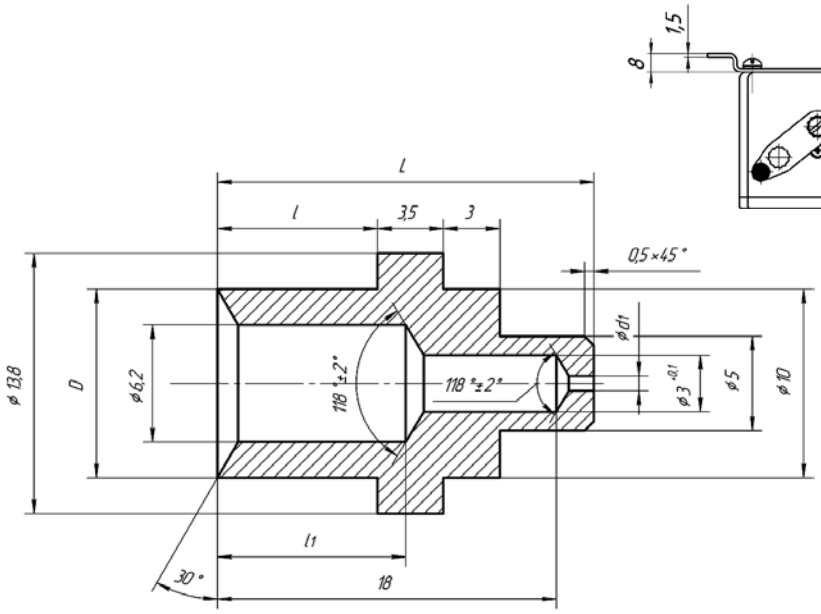


Figure 5 – Overall and mounting dimensions of the device with installation kit K1



Designation	D, mm	d1, mm	L, mm	l, mm	l1, mm	Material	Note
ДМ-000-03	10	0,8	20	8,5	10	Brass	Nipple No. 1
ДМ-000-03-01	10	3	20	8,5	10	Brass	Nipple No. 2
ДМ-000-03-02	8	3	26,5	14	12	Steel	Nipple No. 3
ДМ-000-03-03	10	0,8	20	8,5	10	Steel	Nipple No. 4
ДМ-000-03-04	10	3	20	8,5	10	Steel	Nipple No. 5

Figure 6 – Nipple attachment dimensions

DIFFERENTIAL PRESSURE CONTROL SWITCHES ДЕМ-202С

Differential pressure control switches ДЕМ-202С (hereinafter – devices) are intended to monitor and regulate pressure in alarm systems, diesel engine protection and control systems, locomotive-type diesel engine systems, refrigeration plants and other systems used in vessels, railway and motor transport, relay pressure control by opening or closing electric contacts.

Scope of application:

– ventilation, air conditioning and cold supply systems;

– pump, compressor and turbine machine building;

– local automation systems at heat, water and power supply facilities.

Controlled medium:	Water, air, freons, oils and other liquids and gas, with a maximum viscosity of 0.8 Pa·s, nonaggressive to the used structural materials.
Climatic version and placement category:	УХЛ3, ОМ5, В2,5 as per GOST 15150-69.
IP rating:	IP64 as per GOST 14254-2015.
Ambient air temperature:	–50 to +50 °C.
Controlled medium temperature:	–40 to +60 °C.
Air relative humidity:	up to 100 % at 35 °C.
Atmospheric pressure:	0.084 to 0.113 MPa (630 to 850 mm Hg).
Device weight:	≤ 1.1 kg.
Average service life:	≥ 12 years.
Guarantee period of storage:	24 months since the date of manufacture.
Guarantee service life:	24 months within the guarantee period of storage from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, specified setpoint range, basic absolute error, actuation range and threshold return area value of devices are in compliance with those given in Table 1.

TABLE 1

Device designation	Specified setpoint range*, MPa	Basic absolute error, MPa, maximum	Actuation range, MPa, maximum	Return area, MPa, maximum
				uncontrollable
				maximum
ДЕМ-202С-1-01-2	0.05 to 0.6	±0.03	0.004	0.05
ДЕМ-202С-1-02-2	0.02 to 0.25	±0.015	0.004	0.03

* "Specified setpoint range" – values of setpoints at which the requirements of technical conditions are satisfied for each device version.

NOTES

1. Setting devices to a specific actuation setpoint shall be done by the manufacturer in compliance with the order.

2. If the order does not specify an actuation setpoint, devices shall be set by the manufacturer to the minimum setpoint value within the appropriate specified setpoint range.

3. The customer is allowed to reset a setpoint within the range of values specified in Table 1.

Maximum operating pressure of the controlled medium, maximum allowable pressure, and maximum allowable differential pressure of controlled medium for the devices are given in Table 2.

TABLE 2

Designation	Maximum operating pressure of the controlled medium, MPa	Maximum allowable pressure of the controlled medium*, MPa	Maximum allowable differential pressure*, MPa
ДЕМ-202С-1-01-2	2.5	3.0	3.0
ДЕМ-202С-1-02-2	0.8	2.2	2.2

* Maximum exposure duration is 5 min.

Switching wear resistance of contacts (number of switching cycles) is 250,000 actuation cycles at the load specified in Table 3.

TABLE 3

Current type	Voltage, V	Switching power, W	Current, A		Cos φ, minimum	Frequency, Hz
			min.	max.		
DC	24 to 220	60	0.05	–	–	–
AC	127; 220; 380; 440	–	0.1	6	0.6	50 or 60

NOTES

1. Minimum value of switched current is 0.1 A with maximum inductance for DC of 5 mH.
2. It is not allowed to use the devices for switching minimum currents if they were used at other current loads.

DESIGNATION STRUCTURE

Pressure switch ДЕМ-202С – X – X – X , X , X , X , X

Direction of return area in relation to the setpoint:
"1" – towards pressure increase

Setpoints range, MPa:
"01" – 0.05 to 0.6;
"02" – 0.02 to 0.25

Electrical connector:
"2" – EN 175301-803 form A
"3" – 2PTT type

Climatic version and placement category as per GOST 15150-69:
"B2,5" – for supply to all macroclimatic regions, including land and sea, except the climatic region with cold antarctic climate
"OM5" – for supply to all macroclimatic regions with both moderately cold and tropical marine climate, including vessels of unrestricted navigation.
"УХЛ3" – for supply to macroclimatic regions with moderate and cold climate.

"Э" – if supplied for export

Setpoint (the actuation setpoint value as per Table 1 including measurement units)

Installation kit "K1"[1]

NOTE

1 – supplied as an option and specified in the order only.

ORDERING INFORMATION FOR ДЕМ-202С DEVICES:

differential pressure control switch ДЕМ-202С with return area directed towards differential pressure increase in relation to the setpoint, with setpoint range from 0.02 to 0.25 MPa, with EN 175301-803 form A connector, climatic version УХЛ3, with actuation setpoint at 0.2 MPa
"Differential pressure control switch ДЕМ-202С-1-02-2, УХЛ3, setpoint 0.2 MPa ТУ 4212-147-00227471-2012";

the same if the setpoint actuation value is not specified in the order
"Differential pressure control switch ДЕМ-202С-1-02-2, УХЛ3 ТУ 4212-147-00227471-2012";

differential pressure control switch ДЕМ-202С with return area directed towards differential pressure increase in relation to the setpoint, with setpoint range from 0.05 to 0.6 MPa, with EN 175301-803 form A connector, climatic version ОМ5, if supplied for export, and with installation kit К1
"Differential pressure control switch ДЕМ-202С-1-01-2, ОМ5, Э, К1 ТУ 4212-147-00227471-2012".

OVERALL AND MOUNTING DIMENSIONS

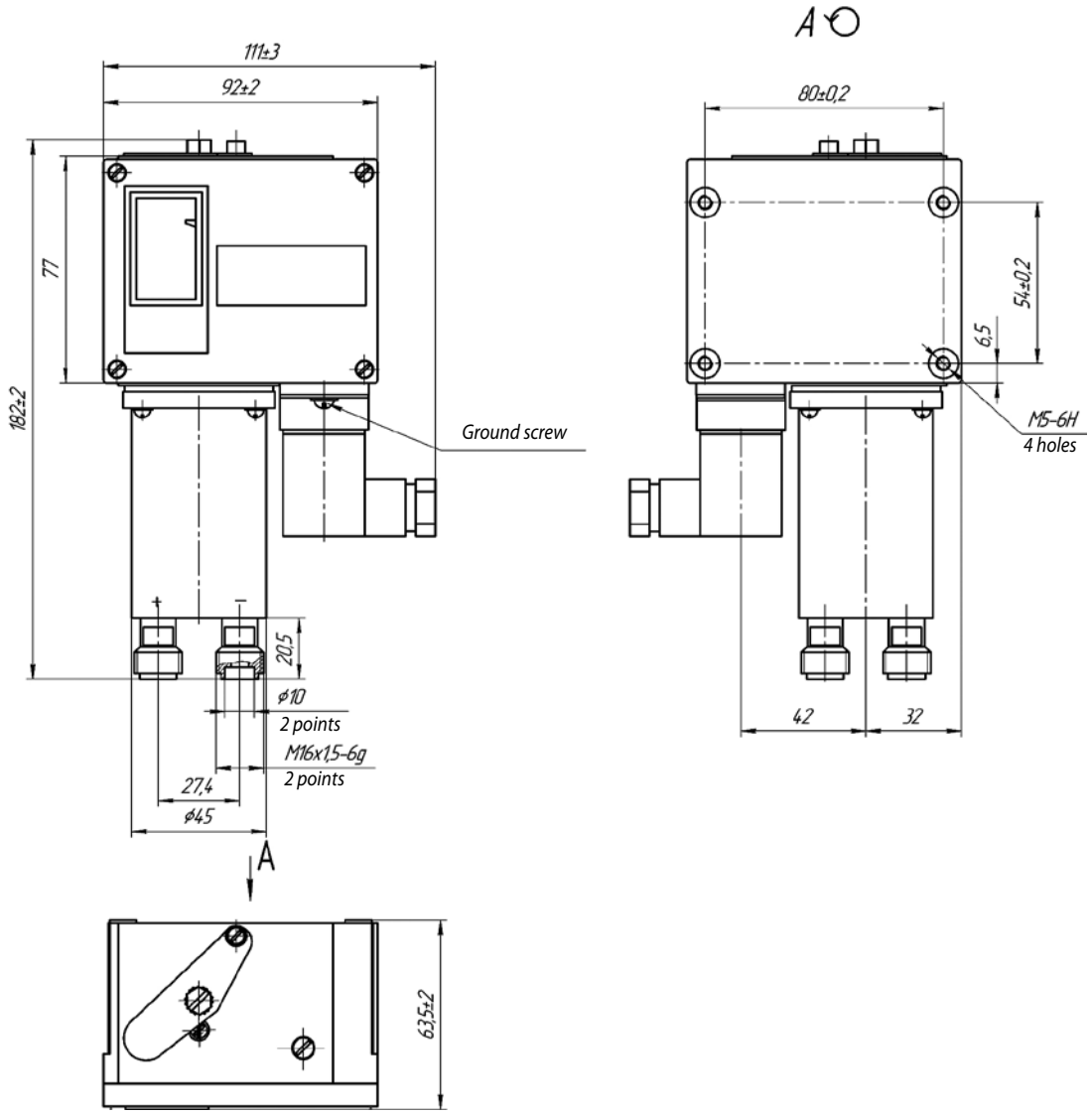


Figure 1 – Overall and mounting dimensions of ДЕМ-202С

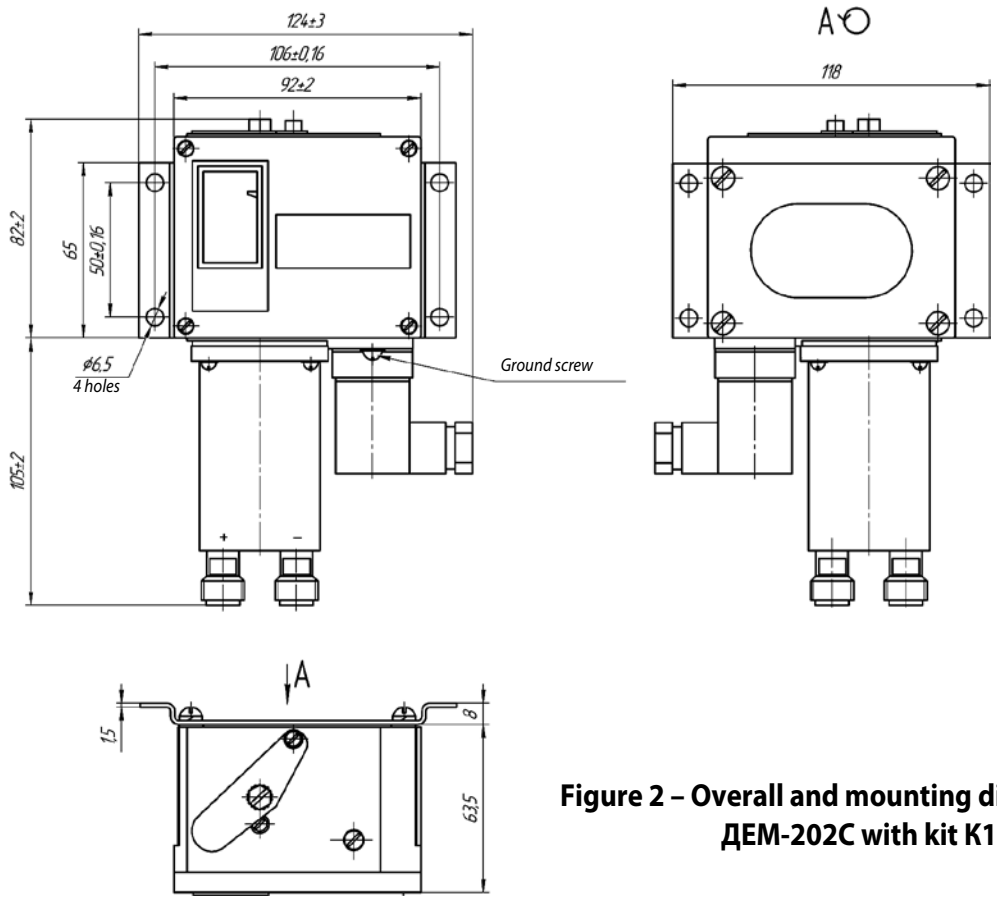
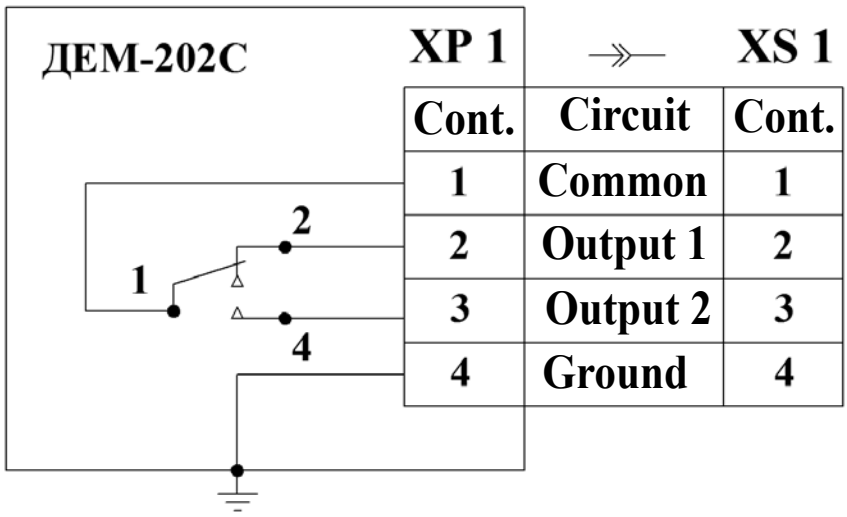


Figure 2 – Overall and mounting dimensions of ДЕМ-202С with kit K1

ELECTRIC CIRCUIT DIAGRAM



Connector designation		Document designation
XP1	XS1	
Base as per EN 175301-803	Electric connector GDA4080S62 form A	EN 175301-803

Figure 3 – Electric circuit diagram of differential pressure control switches ДЕМ-202С

PRESSURE SWITCHES ДДМВ-102

Manometric explosion-proof pressure switches ДДМВ-102 (hereinafter – devices) are intended to monitor the pressure of gaseous and liquid media in systems designed for automatic monitoring, regulation and control of heat power engineering processes as well as in refrigeration and other coal mines systems, in indoor and outdoor explosive areas as per Ex marking, GOST IEC 60079-14, PUE ("Electrical Installations Code") Chapter 7.3, and other regulatory documents governing the application of electrical equipment in explosive gaseous atmospheres as well as in underground pits and coal mines, and their surface structures.

Devices are also used for an alarm unit and to operate under conditions in which there is normally no blowing of the enclosure with dust-air flows, nor electrostatic charging of the enclosure by means of friction, electrostatic induction or contact with charged bodies.

Controlled medium:	Water, air, freons, oils, diesel fuel and other liquids and gas with a maximum viscosity of 0.8 Pa·s, nonaggressive to the used structural materials.
Climatic version and placement category:	T5 as per GOST 15150-69.
IP rating:	IP67 as per GOST 14254-2015.
Ambient air temperature:	–40 to +70 °C.
Controlled medium temperature:	–40 to +70 °C.
Air relative humidity:	up to 100 % at +50 °C.
Atmospheric pressure:	0.084 to 0.12 MPa (630 to 900 mm Hg).
Device weight:	≤ 2.2 kg.
Average service life:	≥ 12 years.
Guarantee period of storage:	6 months from the date of manufacture.
Guarantee service life:	30 months from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, specified setpoint range, basic absolute error, actuation range and threshold return area value of devices are in compliance with those given in Table 1.

TABLE 1

Device designation	Specified setpoint range*	Basic absolute error, maximum	Actuation range, maximum	Return area, maximum		
				controllable		uncontrollable
				minimum	maximum	maximum
ДДМВ-102.01.1	20 to 400 kPa	±5 kPa	4 kPa	-	-	30 kPa
ДДМВ-102.02.1	20 to 900 kPa	±25 kPa	10 kPa	-	-	70 kPa
ДДМВ-102.03.1	–0.09 to 0.32 MPa	±0.012 MPa	0.004 MPa	-	-	0.03 MPa
ДДМВ-102.03.2	–0.09 to 0.32 MPa	±0.012 MPa	0.004 MPa	0.03 MPa	0.3 MPa	-
ДДМВ-102.04.1	0.1 to 1.4 MPa	±0.15 MPa	0.02 MPa	-	-	0.06 MPa
ДДМВ-102.04.2	0.1 to 1.4 MPa	±0.15 MPa	0.02 MPa	0.05 MPa	0.5 MPa	-
ДДМВ-102.05.1	0.2 to 3 MPa	±0.15 MPa	0.02 MPa	-	-	0.35 MPa
ДДМВ-102.05.2	0.2 to 3 MPa	±0.15 MPa	0.02 MPa	0.1 MPa	0.7 MPa	-
ДДМВ-102.06.2	1.0 to 6 MPa	±0.25 MPa	0.05 MPa	0.4 MPa	3 MPa	-

* "Specified setpoint range" – values of setpoints at which the requirements of technical conditions are satisfied for each device version.

NOTES

1. Setting devices to a specific actuation setpoint shall be done by the manufacturer in compliance with the order. Setpoint value shall be selected from the setpoint range in increments of:
– 5 kPa – for ДДМВ-102-01;
– 10 kPa – for ДДМВ-102-02;
– 0.01 MPa – for ДДМВ-102-03, ДДМ-102-04;
– 0.1 MPa – for ДДМВ-102-05;
– 0.5 MPa – for ДДМВ-102-06.

2. If the order does not specify an actuation setpoint, devices shall be set by the manufacturer to the following actuation setpoints within the appropriate specified setpoint range:
– ДДМВ-102-01 – 100 kPa ± 5 kPa;
– ДДМВ-102-02 – 500 kPa ± 25 kPa;
– ДДМВ-102-03 – 0.1 MPa ± 0.012 MPa;
– ДДМВ-102-04 – 0.75 MPa ± 0.15 MPa;
– ДДМВ-102-05 – 1.5 MPa ± 0.25 MPa;
– ДДМВ-102-06 – 3 MPa ± 0.25 MPa.

3. If the order does not specify the value of return area (for devices with controllable return area only), devices shall be set by the manufacturer to the minimum value of return area.

4. The customer is allowed to reset a setpoint and return area (for devices with controllable return area only) within the range of values specified in Table 1.

Maximum operating pressure of the controlled medium, maximum allowable pressure of the controlled medium are given in Table 2.

TABLE 2

Designation	Maximum operating pressure of the controlled medium	Maximum allowable pressure of the controlled medium*
ДДМВ-102-01	800 kPa	1,300 kPa
ДДМВ-102-02	1,500 kPa	2,000 kPa
ДДМВ-102-03	1.7 MPa	2.2 MPa
ДДМВ-102-04	2.1 MPa	2.5 MPa
ДДМВ-102-05	3.2 MPa	3.6 MPa
ДДМВ-102-06	7.5 MPa	9.0 MPa

* Maximum exposure duration is 5 min.

Switching wear resistance of contacts (number of switching cycles) is 250,000 actuation cycles at the load specified in Table 3.

TABLE 3

Current type	Voltage, V	Switching power, W	Current, A		Cos φ, minimum	Frequency, Hz
			min.	max.		
DC	12 to 24	60	0.1	–	–	–
AC	127; 220	–	0.1	6	0.6	50 or 60

NOTES

1. Minimum value of switched current is 0.1 A with maximum inductance for DC of 5 mH.

2. It is not allowed to use the devices for switching minimum currents, if they were used at other current loads.

DESIGNATION STRUCTURE

Pressure switch ДДМВ-102 – X . X . X X – X X

Setpoint range:
"01" – from 20 to 400 kPa;
"02" – from 20 to 900 kPa;
"03" – from –0.09 to 0.32 MPa;
"04" – from 0.1 to 1.4 MPa;
"05" – from 0.2 to 3 MPa;
"06" – from 1.0 to 6 MPa

Controllability of return area:
"1" – uncontrollable return area;
"2" – controllable return area

Direction of return area in relation to the setpoint:
↓ – towards decrease;
↑ – towards increase

Setpoint (the actuation setpoint value as per Table 1 including measurement units)

Nipple version: "H0" – no nipple; "H1" – nipple No. 1;
"H2" – nipple No. 2; "H3" – nipple No. 3; "H4" – nipple No. 4; "H5" – nipple No. 5

The following may be supplied as an option:
kit K1 – adapter panel for the field installation of the device;
kit K2 – temperature bulb adapter nozzle

ORDERING INFORMATION FOR ДДМВ-102 DEVICES:

the ДДМВ-102 device with setpoint range from 20 to 900 kPa, with controllable return area, with return area directed towards pressure increase, with setpoint at 100 kPa, no nipple
"Pressure switch ДДМВ-102.02.2.↑100 kPa-H0 ТУ 4218-005-97817222-14";

the ДДМВ-102 device with setpoint range from 20 to 400 kPa, with uncontrollable return area, with return area directed towards pressure decrease, with setpoint at 40 kPa, with nipple No. 2, with installation kit K1
"Pressure switch ДДМВ-102.01.1.↓40 kPa-H2, K1 ТУ 4218-005-97817222-14."

OVERALL AND MOUNTING DIMENSIONS

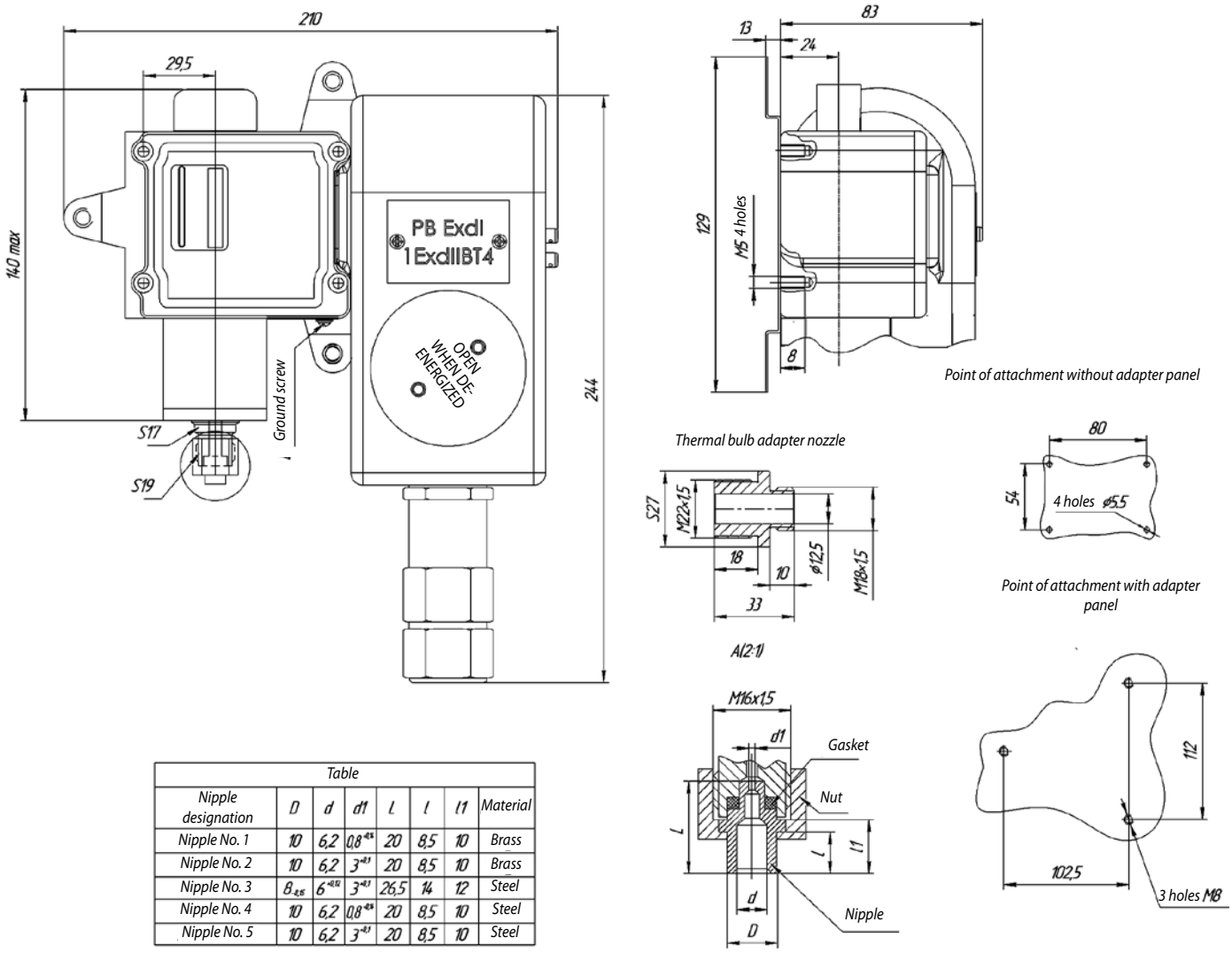


Table							
Nipple designation	D	d	d1	L	l	l1	Material
Nipple No. 1	10	6,2	$0,8^{+0,5}$	20	8,5	10	Brass
Nipple No. 2	10	6,2	$3^{+0,1}$	20	8,5	10	Brass
Nipple No. 3	$8_{\pm 0,5}$	$6^{+0,12}$	$3^{+0,1}$	26,5	14	12	Steel
Nipple No. 4	10	6,2	$0,8^{+0,5}$	20	8,5	10	Steel
Nipple No. 5	10	6,2	$3^{+0,1}$	20	8,5	10	Steel

Figure 1 – Overall and mounting dimensions of pressure switches ДДМВ-102

PRESSURE SWITCHES ДЕМ-102РАСКО AND DIFFERENTIAL PRESSURE CONTROL SWITCHES ДЕМ-202РАСКО

Pressure switches ДЕМ-102РАСКО and differential pressure control switches ДЕМ-202РАСКО (hereinafter – devices) are intended for signaling and relay control of pressure and differential pressure of operating medium by opening or closing electric contacts.

Scope of application:

– ventilation, air conditioning and cold supply systems;

– pump, compressor and turbine machine building;

– local automation systems at heat, water and power supply facilities.

Controlled medium:	Water, air, freons, oils, diesel fuel and other liquids and gas with a maximum viscosity of 0.8 Pa·s, nonaggressive to the used structural materials.
Climatic version and placement category:	T2, TM2, OM5 as per GOST 15150-69.
IP rating:	IP64 as per GOST 14254-2015 with EN 175301-803 connector
Ambient air temperature:	–50 to +60 °C.
Controlled medium temperature:	–50 to +60 °C.
Air relative humidity:	up to 100 % at 40 °C
Device weight: ДЕМ-102РАСКО ДЕМ-202РАСКО	 ≤ 0.7 kg. ≤ 0.8 kg.
Average service life:	≥ 12 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	12 months within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, setpoint thresholds, basic error, actuation range, and return area are given in Table 1.

TABLE 1

Device designation	Setpoint thresholds, MPa	Basic error, MPa, maximum	Actuation range, MPa, maximum	Return area, MPa		
				controllable		uncontrollable
				minimum	maximum	
ДЕМ-102РАСКО-01-2	0.065 to 0.6	±0.09	0.01	0.075	0.4	–
ДЕМ-102РАСКО-02-2	0.1 to 1.0	±0.1	0.01	0.1	0.3	–
ДЕМ-102РАСКО-03-2	0.5 to 2	±0.15	0.02	0.2	0.5	–
ДЕМ-102РАСКО-05-2	0.5 to 3	±0.15	0.02	0.3	1	–
ДЕМ-102РАСКО-06-2	0 to 0.15	±0.01	0.01	0.01	0.03	–
ДЕМ-102РАСКО-07-2	0 to 0.25	±0.02	0.01	0.01	0.03	–
ДЕМ-202РАСКО-01-2	0.05 to 0.5	±0.08	0.015	–	–	0.05
ДЕМ-202РАСКО-02-2	0.02 to 0.2	±0.02	0.015	–	–	0.03

NOTES

In ДЕМ-102РАСКО devices, the return area is directed towards pressure decrease in relation to the setpoint. In ДЕМ-202РАСКО devices, the return area is directed towards pressure increase in relation to the setpoint.
The devices are fitted with an electrical connector as per EN 175301-803 for coupling with external cable and a ground screw on the device housing.

Maximum allowable pressure and differential pressure of the controlled medium are given in Table 2.

TABLE 2

Designation	Maximum allowable pressure, MPa	Maximum allowable differential pressure, MPa
ДЕМ-102РАСКО-01-2	2.2	–
ДЕМ-102РАСКО-02-2	2.5	–
ДЕМ-102РАСКО-03-2	4.0	–
ДЕМ-102РАСКО-05-2		
ДЕМ-102РАСКО-06-2	0.5	–
ДЕМ-102РАСКО-07-2	0.7	–
ДЕМ-202РАСКО-01-2	–	2.2
ДЕМ-202РАСКО-02-2	–	0.8

Switching wear resistance of contacts (number of switching cycles) is 250,000 actuation cycles at the load specified in Table 3.

TABLE 3

Current type	Voltage, V	Switching power, W	Current, A		cos φ, minimum	Frequency, Hz
			min.	max.		
DC	24 to 220	60	0.05	–	–	–
AC	127; 220; 380; 440	–	0.1	6	0.6	50; 60

ORDERING INFORMATION FOR ДЕМ-202РАСКО DEVICES:

ДЕМ-102РАСКО-01-2 with EN 175301-803 connector
"Pressure switch ДЕМ-102РАСКО-01-2 ТУ 4212-140-00227471-2010".

ДЕМ-202РАСКО-01-2 with EN 175301-803 connector
"Differential pressure control switch ДЕМ-202РАСКО-01-2 ТУ 4212-140-00227471-2010".

OVERALL AND MOUNTING DIMENSIONS

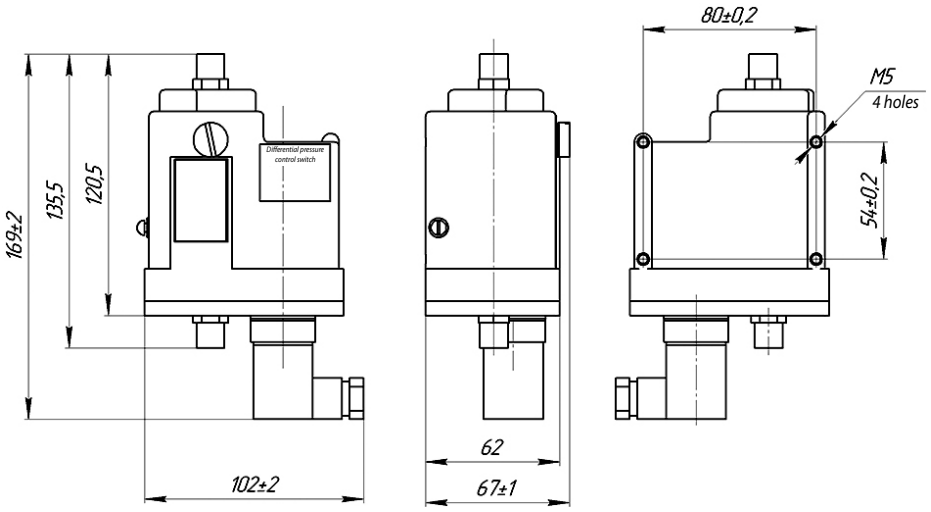


Figure 1 – Differential pressure control switches ДЕМ-202РАСКО with EN 175301-803 connector

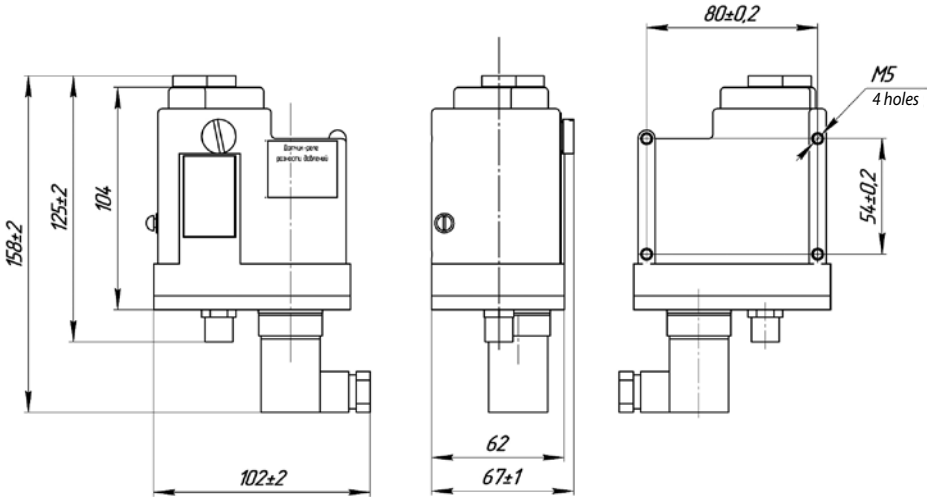


Figure 2 – Pressure switches ДЕМ-102РАСКО with EN 175301-803 connector

ELECTRIC CIRCUIT DIAGRAM

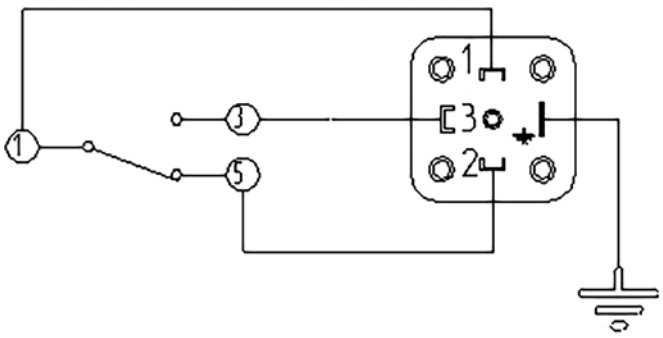


Figure 3 – Electric circuit diagram of ДЕМ-102РАСКО pressure switches and ДЕМ-202РАСКО differential pressure control switches

PRESSURE SWITCHES ДЕМ-105М-РАСКО

Pressure switches ДЕМ-105М-РАСКО (hereinafter – devices) are intended for signaling and relay control of operating medium pressure by opening or closing electric contacts.

Scope of application:

– ventilation, air conditioning and cold supply systems;

– pump, compressor and turbine machine building;

– local automation systems at heat, water and power supply facilities.

The devices are fitted with an electrical connector as per EN 175301-803 for coupling with external cable.

The devices are supplied with coupling thread M12x1.5, G1/4 and G1/2.

Controlled medium:	Water, air, freons, oils and other liquids and gas, with a maximum viscosity of 0.8 Pa·s, nonaggressive to the used structural materials.
Climatic version and placement category:	OM5 as per GOST 15150-69.
IP rating:	IP64 as per GOST 14254-2015
Ambient air temperature:	–20 to +85 °C.
Air relative humidity:	up to 80 % at 35 °C.
Atmospheric pressure:	0.084 to 0.113 MPa (630 to 850 mm Hg).
Device weight:	≤ 1.3 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	18 months from the date of manufacture.
Guarantee service life:	12 months within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, setpoint thresholds, basic error, actuation range and threshold return area value of devices are in compliance with those given in Table 1.

TABLE 1

Device designation	Setpoint thresholds*, MPa	Basic error, MPa, maximum	Actuation range, MPa, maximum	Uncontrollable return area, MPa, maximum
ДЕМ-105М-РАСКО-01	0.01 to 0.2	±0.02	0.005	0.02
ДЕМ-105М-РАСКО-02	0.02 to 1.0	±0.05	0.01	0.05

* "Setpoint thresholds" – values of setpoints at which the requirements of technical conditions are satisfied for each device version.

NOTES

1. Setting devices to a specific actuation setpoint shall be done by the manufacturer in compliance with the order.
2. The return area of devices is directed towards pressure decrease in relation to the setpoint.
3. The consumer is allowed to reset a setpoint within the range of values specified in Table 1.

Maximum allowable pressure of the controlled medium is not higher than 1.5 MPa with maximum exposure duration 5 min.

Switching wear resistance of contacts (number of switching cycles) is 100,000 actuation cycles at minimum current as per Table 2.

TABLE 2

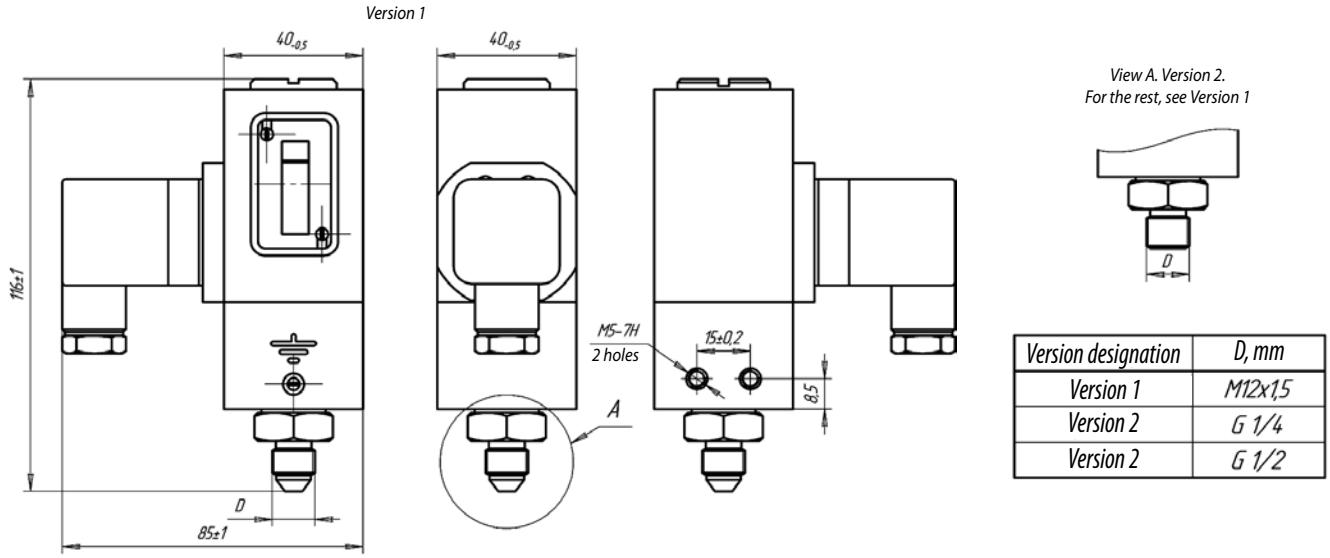
Current type	Voltage, V	Current, A		cos φ, minimum	Frequency, Hz
		min.	max.		
DC	30	0.1	1	–	–
AC	250	1	10	0.6	50; 60

ORDERING INFORMATION FOR ДЕМ-105М-РАСКО DEVICES:

The ДЕМ-105М-РАСКО device with setpoint thresholds from 0.02 to 1 MPa without indication of specific setpoint value with M-12x1.5 thread:
"Pressure switch ДЕМ-105М-РАСКО-02 САФП.422319.001 ТУ".

The ДЕМ-105М-РАСКО device with setpoint thresholds from 0.02 to 1 MPa and setpoint at 0.6 MPa with G1/4 thread:
"Pressure switch ДЕМ-105М-РАСКО-02-0,6МПа-G1/4 САФП.422319.001 ТУ".

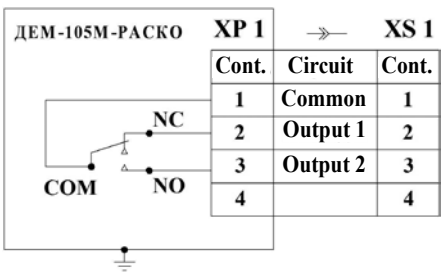
OVERALL AND MOUNTING DIMENSIONS



Version designation	D, mm
Version 1	M12x1,5
Version 2	G 1/4
Version 2	G 1/2

Figure 1 – Overall and mounting dimensions of ДЕМ-105М-РАСКО pressure switches

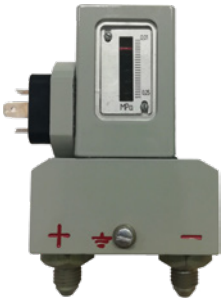
ELECTRIC CIRCUIT DIAGRAM



Connector designation		Document designation
XP1	XS1	
Base as per EN 175301-803	Electric connector GDA4090S61 form A	EN 175301-803 [DIN43650]

Figure 2 – Electric circuit diagram of ДЕМ-105М-РАСКО pressure switches

DIFFERENTIAL PRESSURE CONTROL SWITCHES ДЕМ-202М-РАСКО



Differential pressure control switches ДЕМ-202М-РАСКО (hereinafter – devices) are intended for signaling and relay control of differential pressure of operating medium by opening or closing electric contacts.

Scope of application:

– ventilation, air conditioning and cold supply systems;

– pump, compressor and turbine machine building;

– local automation systems at heat, water and power supply facilities.

The devices are fitted with an electrical connector as per EN 175301-803 for coupling with external cable.

The devices are supplied with coupling thread M12x1.5, G1/4 and G1/2.

Controlled medium:	Water, air, freons, oils and other liquids and gas, with a maximum viscosity of 0.8 Pa·s, nonaggressive to the used structural materials.
Climatic version and placement category:	OM5 as per GOST 15150-69.
IP rating:	IP64 as per GOST 14254-2015
Ambient air temperature:	–20 to +85 °C.
Air relative humidity:	up to 80 % at 35 °C.
Atmospheric pressure:	0.084 to 0.113 MPa (630 to 850 mm Hg).
Device weight:	≤ 1.5 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	18 months from the date of manufacture.
Guarantee service life:	12 months within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, setpoint thresholds, basic error, actuation range and threshold return area value of devices are in compliance with those given in Table 1.

TABLE 1

Device designation	Setpoint thresholds*, MPa	Basic error, MPa, maximum	Actuation range, MPa, maximum	Uncontrollable return area, MPa, maximum
ДЕМ-202М-РАСКО-01	0.01 to 0.6	±0.04	0.006	0.04
ДЕМ-202М-РАСКО-02	0.01 to 0.25	±0.03	0.006	0.02
ДЕМ-202М-РАСКО-03	0.007 to 0.15	±0.02	0.004	0.02

* "Setpoint thresholds" – values of setpoints at which the requirements of technical conditions are satisfied for each device version.

NOTES

1. Setting devices to a specific actuation setpoint shall be done by the manufacturer in compliance with the order.

2. The return area of devices is directed towards increase of the controlled medium differential pressure in relation of the setpoint.

3. The consumer is allowed to reset a setpoint within the range of values specified in Table 1.

Maximum allowable pressure of the controlled medium is not higher than 1.25 MPa with maximum exposure duration 5 min.

Switching wear resistance of contacts (number of switching cycles) is 100,000 actuation cycles at minimum current as per Table 2.

TABLE 2

Current type	Voltage, V	Current, A		cos φ, minimum	Frequency, Hz
		min.	max.		
DC	30	0.1	1	–	–
AC	250	1	10	0.6	50; 60

ORDERING INFORMATION FOR ДЕМ-202М-РАСКО DEVICES:

The ДЕМ-202М-РАСКО device with setpoint thresholds from 0.01 to 0.6 MPa with M-12x1.5 thread:
"Differential pressure control switch ДЕМ-202М-РАСКО-01 САФП.422319.001 ТУ".

The ДЕМ-202М-РАСКО device with setpoint thresholds from 0.01 to 0.25 MPa with G1/2 thread:
"Differential pressure control switch ДЕМ-202М-РАСКО-02-G1/2 САФП.422319.001 ТУ".

OVERALL AND MOUNTING DIMENSIONS

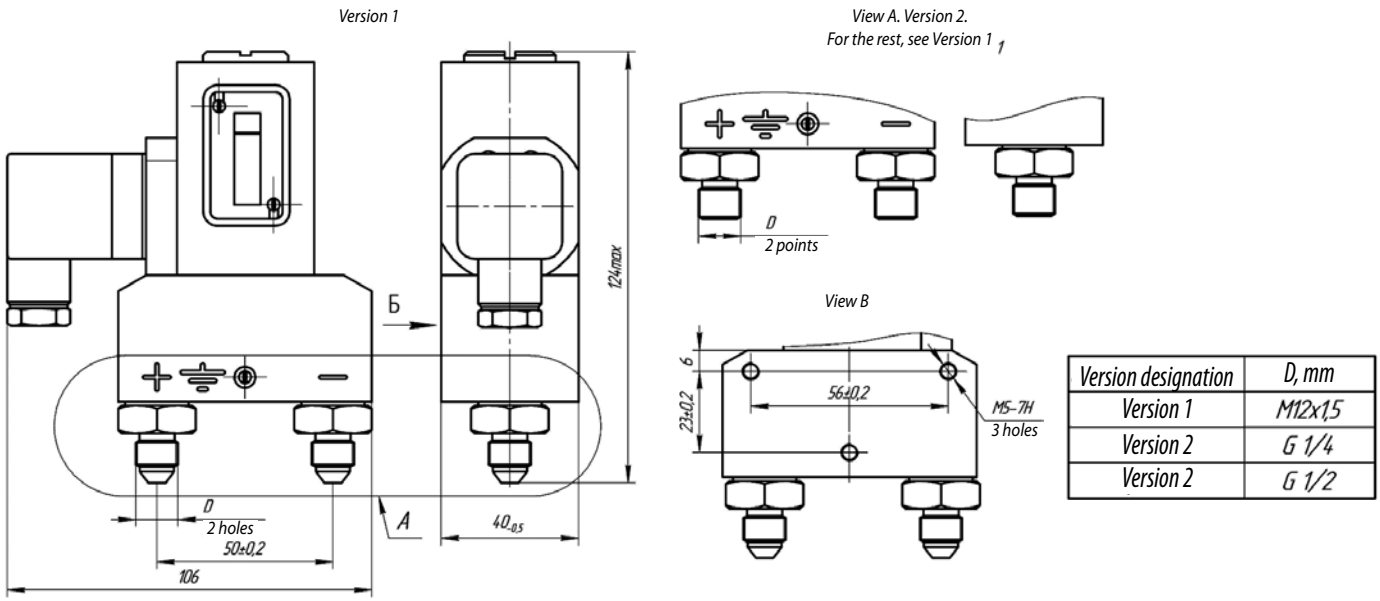
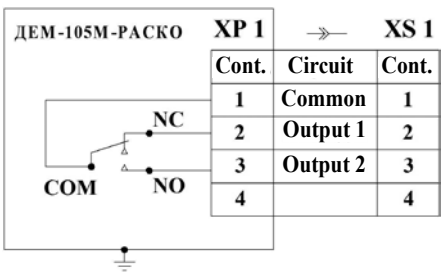


Figure 1 – Overall and mounting dimensions of ДЕМ-202М-РАСКО differential pressure control switches

ELECTRIC CIRCUIT DIAGRAM



Connector designation		Document designation
XP1	XS1	
Base as per EN 175301-803	Electric connector GDA4090S61 form A	EN 175301-803 [DIN43650]

Figure 2 – Electric circuit diagram of ДЕМ-202М-РАСКО differential pressure control switches

PRESSURE SWITCHES WITH INTEGRAL PRESSURE GAUGE ДЕМ-105М1-РАСКО

Pressure switches with integral pressure gauge ДЕМ-105М1-РАСКО (hereinafter – devices) are intended for signaling and relay control of the medium pressure by opening or closing electric contacts.

Scope of application:

– ventilation, air conditioning and cold supply systems;

– pump, compressor and turbine machine building;

– local automation systems at heat, water and power supply facilities.

The devices are fitted with an electrical connector as per EN 175301-803 for coupling with external cable.

The devices are supplied with coupling thread M12x1.5, G1/4 and G1/2.

Controlled medium:	Water, air, freons, oils and other liquids and gas, with a maximum viscosity of 0.8 Pa·s, nonaggressive to the used structural materials.
Climatic version and placement category:	OM5 as per GOST 15150-69.
IP rating:	IP40 as per GOST 14254-2015
Ambient air temperature:	–20 to +60 °C
Air relative humidity:	up to 80 % at 35 °C.
Atmospheric pressure:	0.084 to 0.113 MPa (630 to 850 mm Hg).
Device weight:	≤ 1.3 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	18 months from the date of manufacture.
Guarantee service life:	12 months within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, setpoint thresholds, basic error, actuation range and threshold return area value of devices are given in Table 1.

TABLE 1

Device designation	Setpoint thresholds*, MPa	Basic error, MPa, maximum	Actuation range, MPa, maximum	Uncontrollable return area, MPa, maximum
ДЕМ-105М1-РАСКО-01	0.01 to 0.2	±0.02	0.005	0.02
ДЕМ-105М1-РАСКО-02	0.02 to 1.0	±0.05	0.01	0.05

* "Setpoint thresholds" – values of setpoints at which the requirements of technical conditions are satisfied for each device version.

NOTES

1. Setting devices to a specific actuation setpoint shall be done by the manufacturer in compliance with the order.
2. The return area of devices is directed towards pressure decrease in relation to the setpoint.
3. The consumer is allowed to reset a setpoint within the range of values specified in Table 1.

Maximum allowable pressure of the controlled medium is not higher than 1.5 MPa with maximum exposure duration 5 min.

Switching wear resistance of contacts (number of switching cycles) of 100,000 actuation cycles at minimum current is specified in Table 2.

TABLE 2

Current type	Voltage, V	Current, A		cos φ, minimum	Frequency, Hz
		min.	max.		
DC	30	0.1	1	–	–
AC	250	1	10	0.6	50; 60

ORDERING INFORMATION FOR ДЕМ-105М1-РАСКО DEVICES:

ДЕМ-105М1-РАСКО device with setpoint thresholds from 0.02 to 1 MPa without indication of specific setpoint value with M-12x1.5 thread:
"Pressure switch ДЕМ-105М1-РАСКО-02 САФП.422319.001 ТУ".

ДЕМ-105М1-РАСКО device with setpoint thresholds from 0.02 to 1 MPa and setpoint at 0.6 MPa with G1/4 thread:
"Pressure switch ДЕМ-105М1-РАСКО-02-0,6МПа-G1/4 САФП.422319.001 ТУ".

OVERALL AND MOUNTING DIMENSIONS

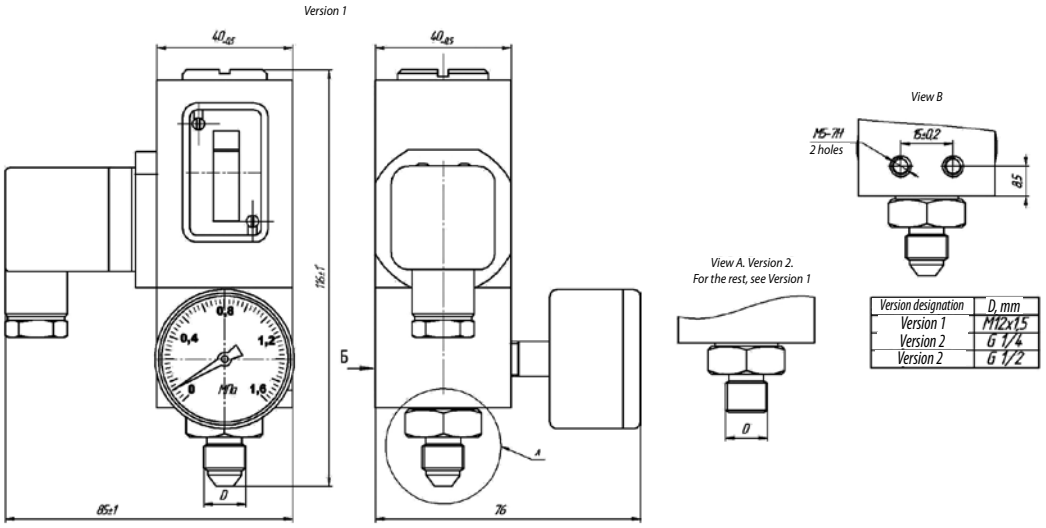
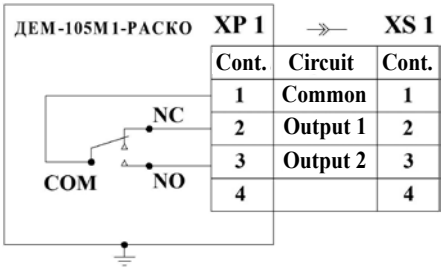


Figure 1 – Overall and mounting dimensions of pressure switches with integral pressure gauge ДЕМ-105М1-РАСКО

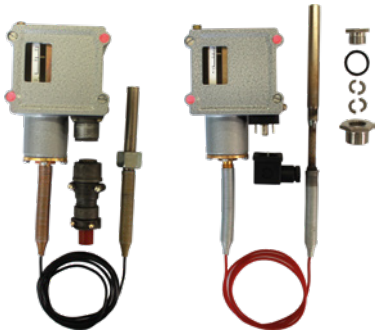
ELECTRIC CIRCUIT DIAGRAM



Connector designation		Document designation
XP1	XS1	
Base as per EN 175301-803	Electric connector GDA4090S61 form A	EN 175301-803 [DIN43650]

Figure 2 – Electric circuit diagram of ДЕМ-105М1-РАСКО pressure switches with integral pressure gauge

TEMPERATURE RELAY-SENSORS TAM-102C



Temperature relay-sensors TAM-102C (hereinafter – devices) are intended for monitoring and regulating the temperature of liquid and gaseous media in refrigeration plants used in railway and motor transport, vessels as well as stationary refrigeration plants and other devices.

Controlled medium:	Air, freons, oils, fresh water and other media not leading to corrosion of device part materials, copper or copper alloys, lead-tin solder, silver brazing alloys, or steels contacting with them.
Climatic version and placement category:	УХЛ3, В2,5 as per GOST 15150-69.
IP rating:	IP64 as per GOST 14254-2015.
Ambient air temperature:	–50 to +70 °C.
Air relative humidity:	up to 100 % at 50 °C.
Atmospheric pressure:	0.084 to 0.113 MPa (630 to 850 mm Hg).
Device weight:	≤ 1.0 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	12 months within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, specified setpoint range, basic absolute error, actuation range and threshold return area value of devices are in compliance with those given in Table 1.

TABLE 1

Device designation	Setpoint range, °C	Capillary length (pipe remotability)	Basic error at numerical and reference marks, °C, maximum	Uncontrollable return area, °C, maximum	Actuation range, °C, maximum
TAM-102C-1 (2)-1-1	+5 to +35	1.5	±1.5	6	1
TAM-102C-1 (2)-1-2		2.5			
TAM-102C-1 (2)-1-3		4			
TAM-102C-1 (2)-2-1	+30 to +60	1.5		8	
TAM-102C-1 (2)-2-2		2.5			
TAM-102C-1 (2)-2-3		4			
TAM-102C-1 (2)-3-1	+55 to +100	1.5	±3.0	10	
TAM-102C-1 (2)-3-2		2.5			
TAM-102C-1 (2)-3-3		4			
TAM-102C-1 (2)-4-1	+10 to +60	1.5		8	
TAM-102C-1 (2)-4-2		2.5			
TAM-102C-1 (2)-4-3		4			
TAM-102C-1 (2)-5-1	+50 to +130	1.5		10	
TAM-102C-1 (2)-5-2		2.5			
TAM-102C-1 (2)-5-3		4			
TAM-102C-1 (2)-6-1	+50 to +130	1.5			
TAM-102C-1 (2)-6-2		2.5			
TAM-102C-1 (2)-6-3		4			
TAM-102C-1 (2)-7-1	–20 to +10	1.5	±2.0	8	
TAM-102C-1 (2)-7-2		2.5			
TAM-102C-1 (2)-7-3		4			
TAM-102C-1 (2)-8-1	–35 to –5	1.5			
TAM-102C-1 (2)-8-2		2.5			
TAM-102C-1 (2)-8-3		4			

NOTES

1. Setting devices to a specific actuation setpoint shall be done by the manufacturer in compliance with the order. Setpoint value is selected from the setpoint range in increments of 1 °C.
2. If the order does not specify an actuation setpoint, devices shall be set by the manufacturer to the minimum setpoint value within the appropriate specified setpoint range.
3. The customer is allowed to reset a setpoint within the range of values specified in Table 1.

Switching wear resistance of contacts (number of switching cycles) is 250,000 actuation cycles at the load specified in Table 3.

TABLE 2

Device designation	Setpoint range, °C	Maximum allowable temperature of the controlled medium, °C
TAM-102C-1 (2)-1	+5 to +35	+70
TAM-102C-1 (2)-2	+30 to +60	+85
TAM-102C-1 (2)-3	+55 to +100	+130
TAM-102C-1 (2)-4	+10 to +60	+85
TAM-102C-1 (2)-5	+50 to +130	+145
TAM-102C-1 (2)-6	+50 to +130	+145
TAM-102C-1 (2)-7	+20 to +10	+45
TAM-102C-1 (2)-8	+35 to +5	+40

* Maximum exposure duration is 5 min.

Devices are designed for operation at contact loads specified in Table 3.

TABLE 3

Current type	Voltage, V	Switching power, W	Current, A		Cos φ, minimum	Frequency, Hz
			min.	max.		
DC	12 to 24	60	0.1	–	–	–
AC	127; 220	–	0.1	6	0.6	50 or 60

NOTES

1. Minimum value of switched current is 0.1 A with maximum inductance for DC of 5 mH.
2. It is not allowed to use the devices for switching minimum currents, if they were used at other current loads.

DESIGNATION STRUCTURE

Temperature relay-sensor TAM-102C – X – X – X – X , X , X , X , X

Direction of return area in relation to the setpoint:
"1" – towards temperature increase;
"2" – towards temperature decrease

Setpoint range, °C:
"1" – plus 5 to plus 35;
"2" – plus 30 to plus 60;
"3" – plus 55 to plus 100;
"4" – plus 10 to plus 60;
"5" – plus 50 to plus 130;
"6" – plus 50 to plus 130;
"7" – minus 20 to plus 10;
"8" – minus 35 to minus 5

Capillary pipe length, m:
"1" – 1.5;
"2" – 2.5;
"3" – 4

Electrical connector[1]:
"1" – EN 175301-803 form A;
"2" – ШР type;
"3" – 2РТТ type

Climatic version and placement category as per GOST 15150-69:
"УХЛ3" – for supply to macroclimatic regions with moderate and cold climate.
"В2,5"[2] – for supply to all macroclimatic regions, including land and sea, except the climatic region with cold antarctic climate.

Export version:
"Э" – if supplied for export

Setpoint (the actuation setpoint value as per Table 1 including measurement units)

Installation kit [3]:
– "К1" – with bracket ЦТКА.745323.143;
– "К2" – with bracket ЦТКА.745323.145;
– "К3" – sleeve with seal packing;
– "К4" – with protective shroud

NOTE

1 – EN 175301-803 form A and ШР type connectors are installed on devices with climatic version УХЛ3, 2РТТ type on devices with climatic version В2,5;
2 – rated values of climatic factors for operation of devices in operating condition – as per GOST 15150-69 for version В, category 2, but the value of ambient air humidity is assumed to be the same as for category 5.
3 – supplied as an option;
4 – when several installation kits are ordered, comma separation is allowed.

ORDERING INFORMATION FOR TAM-102C DEVICES:

temperature relay-sensor TAM-102C, return area directed towards decrease of temperature in relation to the setpoint, with setpoint range from 55 to 100 °C, with capillary pipe length of 2.5 m, with 2PTT type electrical connector, climatic version B2,5, setpoint at 70 °C, with installation kit K1:
"Temperature relay-sensor TAM-102C-2-3-2-3, B2,5, setpoint 70 °C, K1 ТУ 4218-144-00227471-2012".

the same if a setpoint actuation value is not specified in the order:
"Temperature relay-sensor TAM-102C-2-3-2-3, B2,5, K1 ТУ 4218-144-00227471-2012".

temperature relay-sensor TAM-102C, return area directed towards decrease of the temperature in relation to the setpoint, with setpoint range from 30 to 60 °C, with capillary pipe length of 2.5 m, with 2PTT type electrical connector, climatic version B2,5, setpoint at 50 °C, with installation kits K1, K4:
"Temperature relay-sensor TAM-102C-2-2-2-3, B2,5, setpoint 50 °C, K1, K4 ТУ 4218-144-00227471-2012".

temperature relay-sensor TAM-102C, return area directed towards increase of the temperature in relation to the setpoint, with setpoints range from 50 to 130 °C, with capillary pipe length of 4 m, with ШР type electrical connector, climatic version УХЛ3, for export, setpoint at 50 °C, with installation kit K2:
"Temperature relay-sensor TAM-102C-1-5-3-2, УХЛ3, Э, setpoint 50 °C, K2 ТУ 4218-144-00227471-2012".

OVERALL AND MOUNTING DIMENSIONS

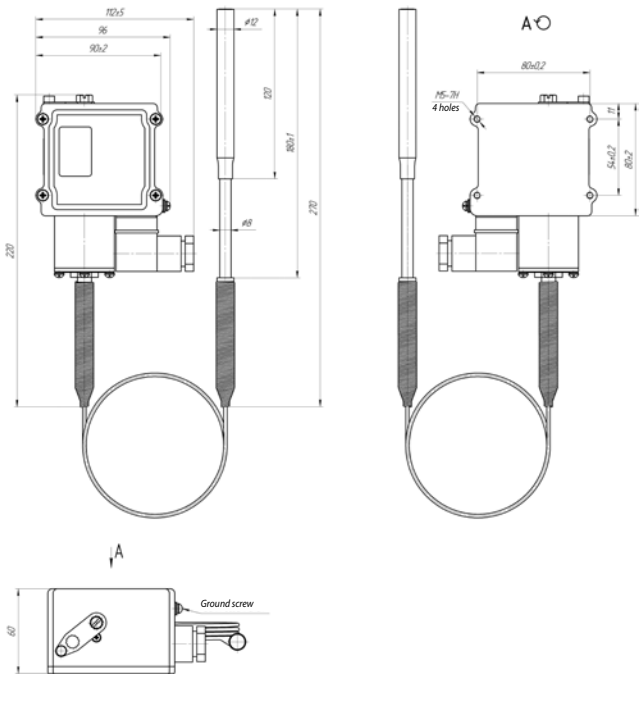


Figure 1 – Overall and mounting dimensions of TAM-102C temperature relay-sensors with setpoint range "1", "2", "3", "6", "7", "8" with EN 175301-803 connector

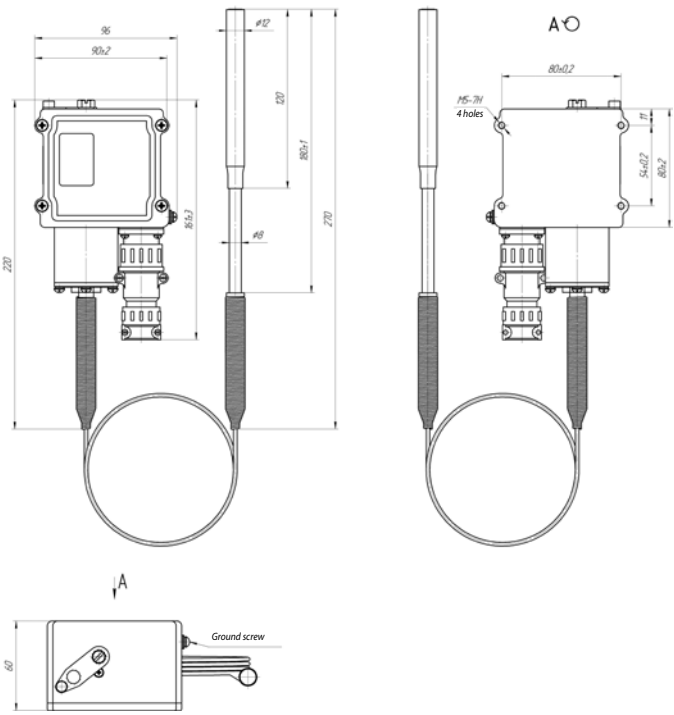


Figure 2 – Overall and mounting dimensions of TAM-102C temperature relay-sensors with setpoint range "1", "2", "3", "6", "7", "8" with 2PTT, ШР type connector

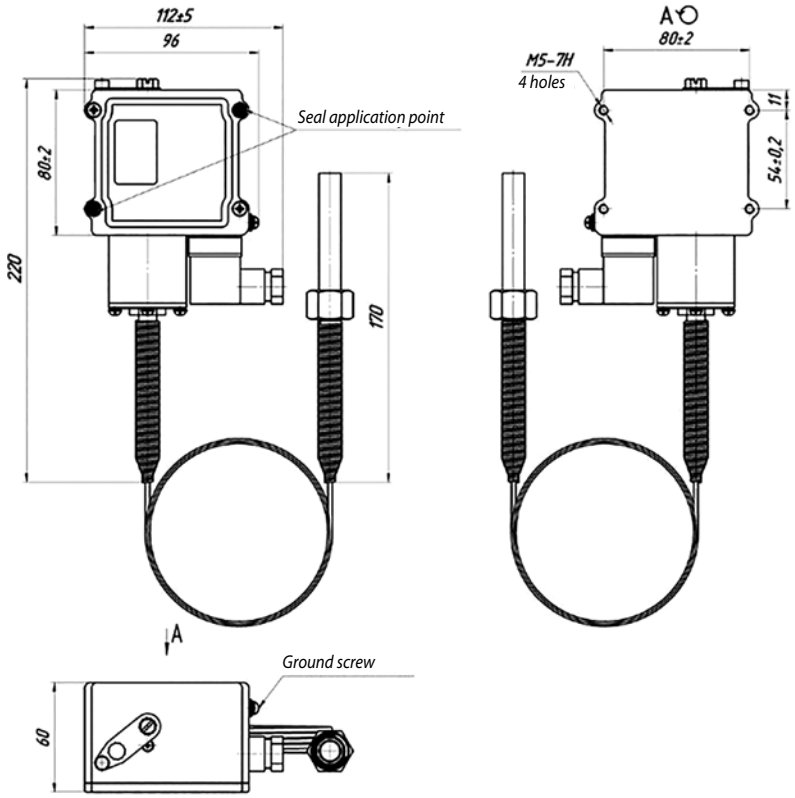


Figure 3 – Overall and mounting dimensions of TAM-102C temperature relay-sensors with setpoint range "4", "5" with EN 175301-803 connector

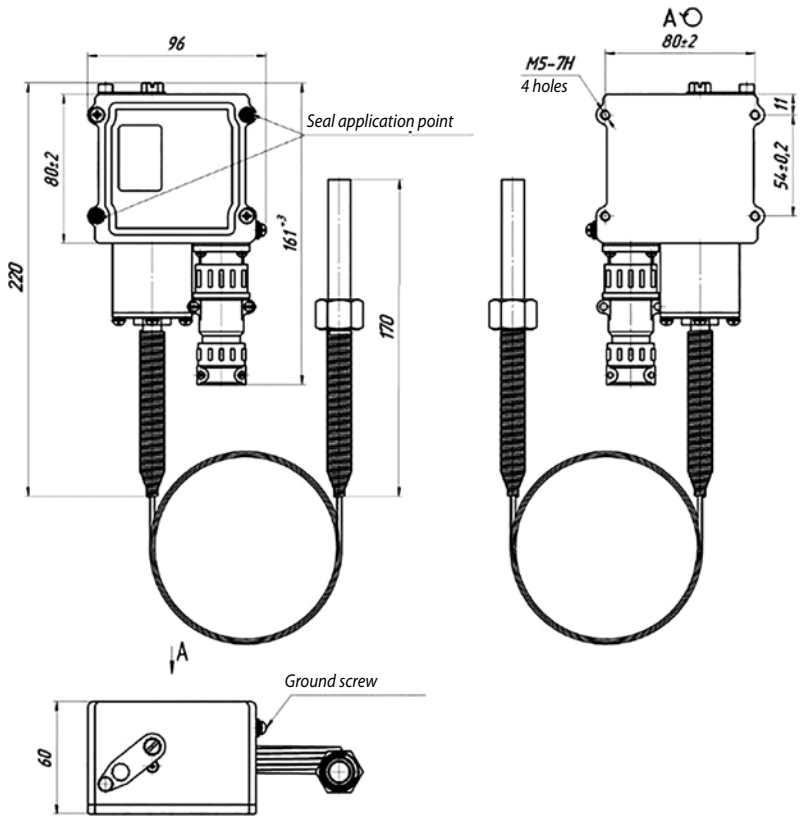


Figure 4 – Overall and mounting dimensions of TAM-102C temperature relay-sensors version with setpoint range "4", "5" with 2РТТ, ШР type connector

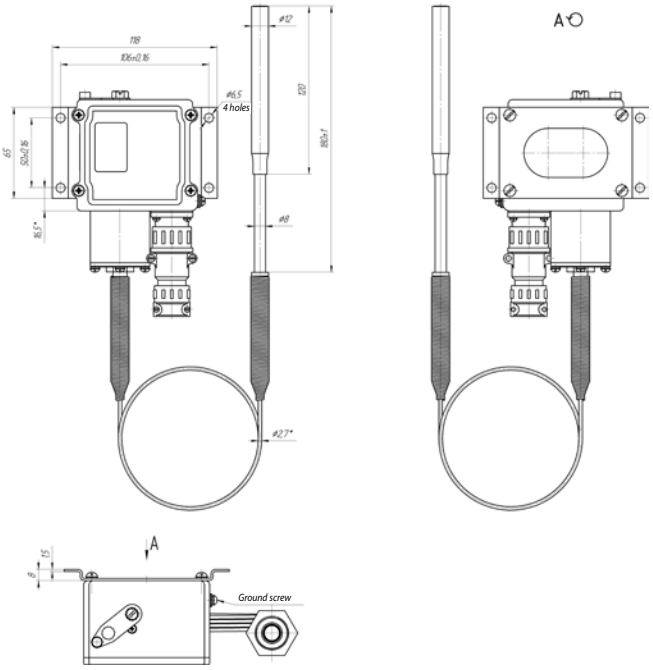


Figure 5 – Fastening of TAM-102C with installation kit K1

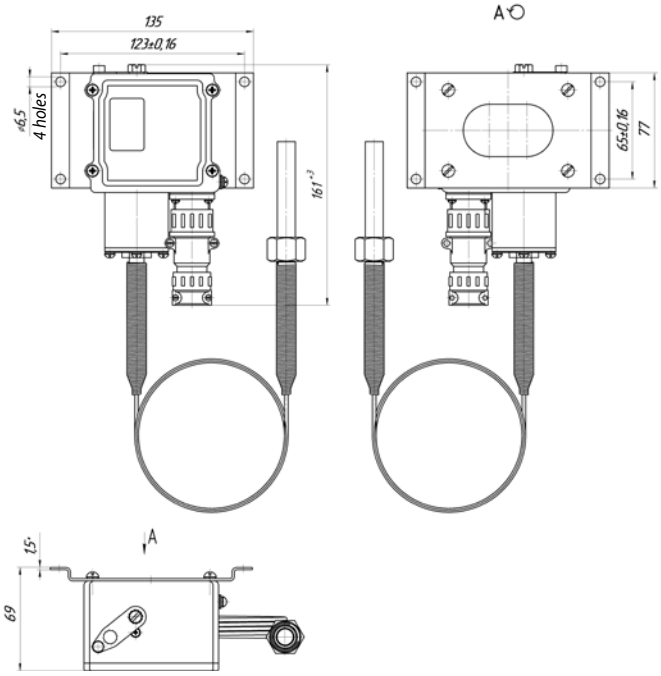
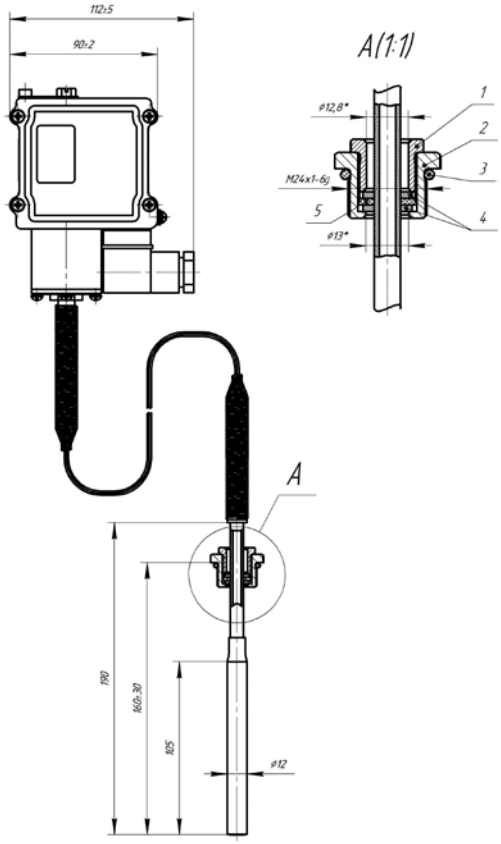


Figure 6 – Fastening of device TAM-102C with installation kit K2



1 – sleeve ЦТКА.753126.246; 2 – sleeve ЦТКА.753126.245;
3 – ring 022-027-30-2-2; 4 – cotter ЦТКА.753613.004;
5 – line

Figure 7 – Fastening of TAM-102C with installation kit K3

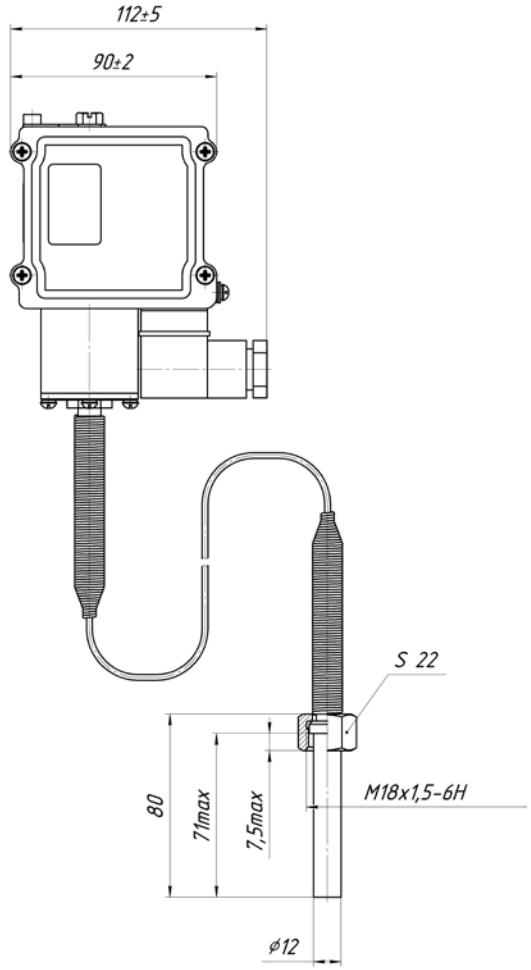


Figure 8 – Fastening of TAM-102C using M18x1.5 nut

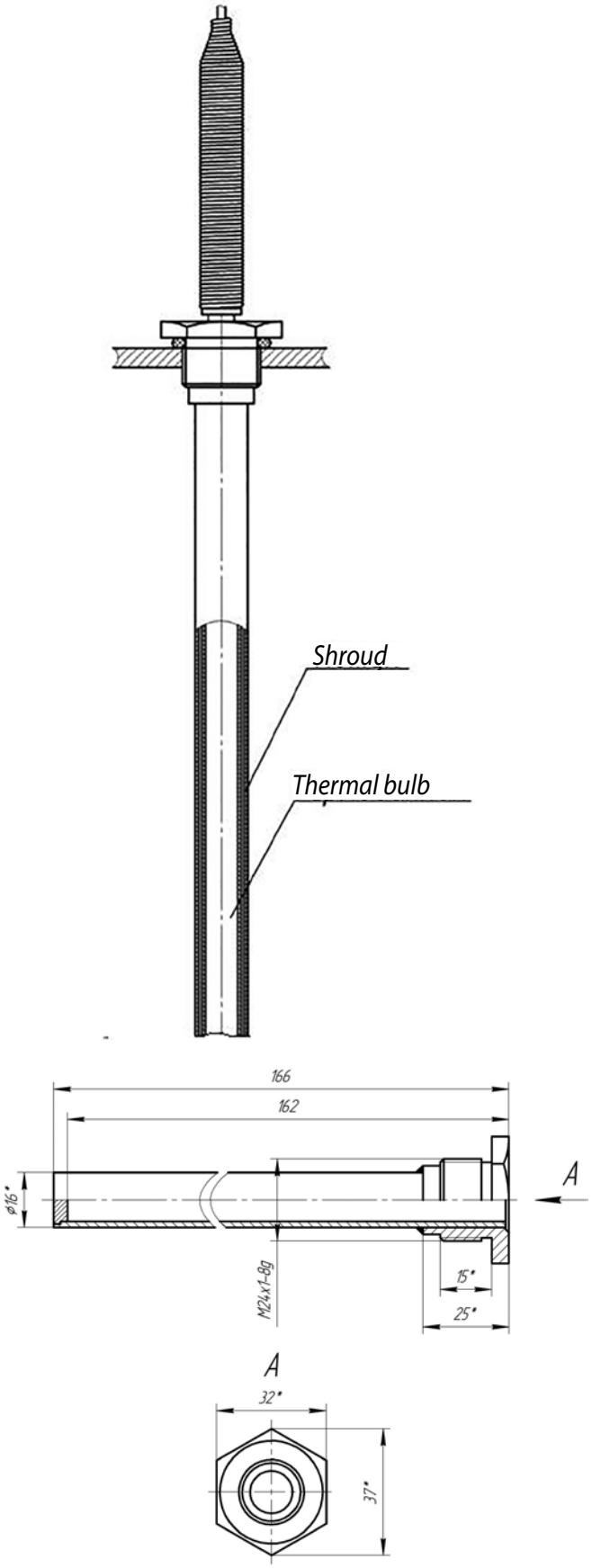
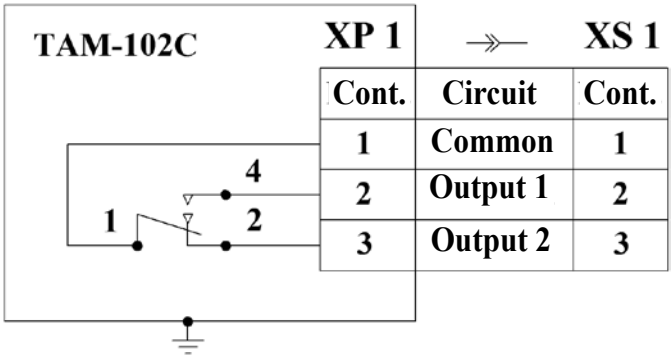
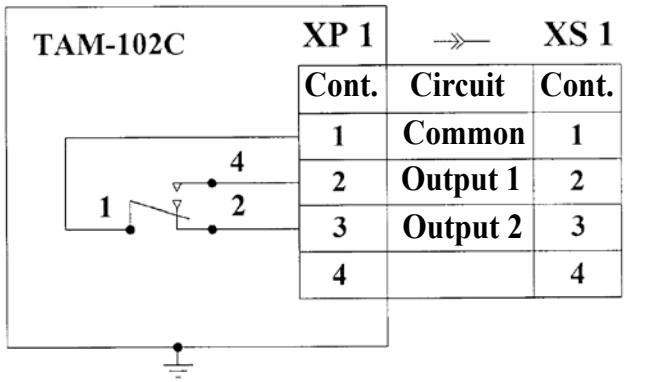


Figure 9 – Fastening of TAM-102C with shroud (kit K4)

ELECTRIC CIRCUIT DIAGRAMS



Connector designation		Document designation
XP1	XS1	
Plug 2РТТ20Б3Ш5В	socket 2РТТ20КПН3Г5В	ГЕ0.364.120 ТУ
Plug ШР20П3Ш7	socket ШР20П3НШ7	ГЕ0.364.107 ТУ



Connector designation		Document designation
XP1	XS1	
base 628300 of form A electrical connector	GDA4090S61 form A electric connector	EN 175301-803

Figure 10 – Electric circuit diagrams of TAM-102C temperature relay-sensors

TEMPERATURE RELAY-SENSORS TAM-103C

Temperature relay-sensors TAM-103C (hereinafter – devices) are intended for use in refrigeration plants and other systems for monitoring and regulating the temperature of gaseous and liquid media.

Controlled medium:	Water, freons, oils, fresh water and other media not leading to corrosion of device part materials, copper and copper alloys, lead-tin solder, silver brazing alloys, steels contacting with them.
Climatic version and placement category:	УХЛ3, ОМ5 as per GOST 15150-69.
IP rating:	IP65 as per GOST 14254-2015.
Ambient air temperature:	–50 to +70 °C.
Air relative humidity:	up to 100 % at 35 °C
Atmospheric pressure:	0.084 to 0.113 MPa (630 to 850 mm Hg).
Device weight:	≤ 0.45 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	12 months within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, range of setpoints, basic absolute error, actuation range and threshold return area value of devices are in compliance with those given in Table 1.

TABLE 1

Device designation	Setpoint range*, °C	Basic absolute error, °C, maximum	Actuation range, °C, maximum	Return area, °C uncontrollable	
				minimum	maximum
TAM-103C-01	0 to +100	±2	0.8	2	6
TAM-103C-02	+70 to +170				
TAM-103C-03	–30 to +70				
TAM-103C-04	–50 to +50				

* "Setpoint range" – values of setpoints at which the requirements of technical conditions are satisfied for each device version.

NOTES

1. Setting devices to a specific actuation setpoint shall be done by the manufacturer in compliance with the order.
2. The consumer is allowed to reset a setpoint within the range of values specified in Table 1, but the manufacturer's warranty related to the basic absolute error will not be kept.

Maximum allowable temperature of the controlled medium for the devices is given in Table 2.

TABLE 2

Designation	Maximum allowable temperature of the controlled medium, °C
TAM-103C-01	+130
TAM-103C-02	+200
TAM-103C-03	+100
TAM-103C-04	+80

Switching wear resistance of contacts (number of switching cycles) is 250,000 actuation cycles at the load specified in Table 3.

TABLE 3

Current type	Voltage, V	Switching power, W	Current, A		Cos φ, minimum	Frequency, Hz
			min.	max.		
DC	12 to 24	60	0.1	–	–	–
AC	127; 220	–	0.1	6	0.6	50 or 60

NOTES

1. Minimum value of switched current is 0.1 A with maximum inductance for DC of 5 mH.
2. It is not allowed to use the devices for switching minimum currents, if they were used at other current loads.

DESIGNATION STRUCTURE

Temperature relay-sensor TAM-103C – X . X . X – X , X , X

Setpoint range:
"01" – 0 to 100 °C;
"02" – 70 to 170 °C;
"03" – minus 30 to 70 °C;
"04" – minus 50 to 50 °C

Direction of return area in relation to the setpoint:
"1" – towards increase;
"2" – towards decrease

Shroud availability:
"1" – yes;
"2" – no

Electrical connector[1]:
"2" – 2РМДТ type;
"3" – EN 175301-803 form A

Setpoint (actuation setpoint value
as per Table 1 with measurement units specified)

Climatic version and placement category as per GOST 15150-69:
"ОМ5" – for supply to all macroclimatic regions with moderately cold as well as tropical marine climate, including vessels of unrestricted navigation.
"УХЛ3" – for supply to macroclimatic regions with moderate and cold climate.

NOTE

1 – EN 175301-803 form A connectors are installed on devices with climatic version УХЛ3, 2РМДТ type on devices with climatic version УХЛ3, ОМ5.

ORDERING INFORMATION FOR TAM-103C DEVICES:

temperature relay-sensor TAM-103C with return area directed towards temperature decrease, without shroud, with EN 175301-803 form A connector, setpoint at 55 °C, climatic version УХЛ3:
"Temperature relay-sensor TAM-103C-01.2.2-3, setpoint 55 °C, УХЛ3 ТУ 4218-145-00227471-2012".

temperature relay-sensor TAM-103C, return area directed towards temperature increase, with a shroud, with 2РМДТ type electrical connector, setpoint at 70 °C, climatic version ОМ5:
"Temperature relay-sensor TAM-103C-01.1.1-2, setpoint 70 °C, ОМ5 ТУ 4218-145-00227471-2012".

OVERALL AND MOUNTING DIMENSIONS

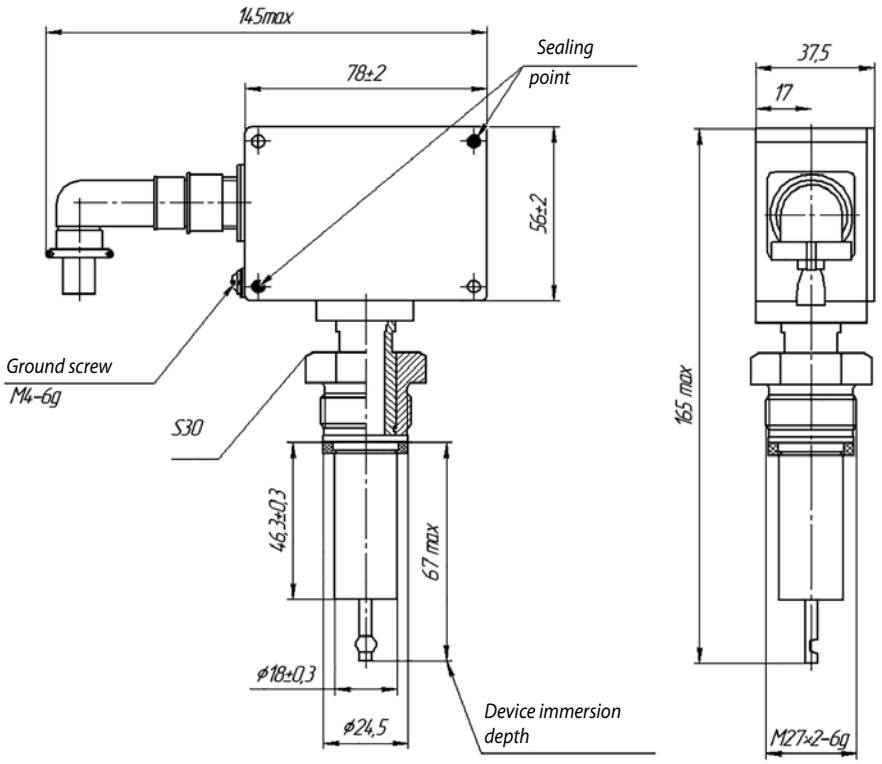


Figure 1 – Temperature relay-sensor TAM-103C with 2РМДТ type connector

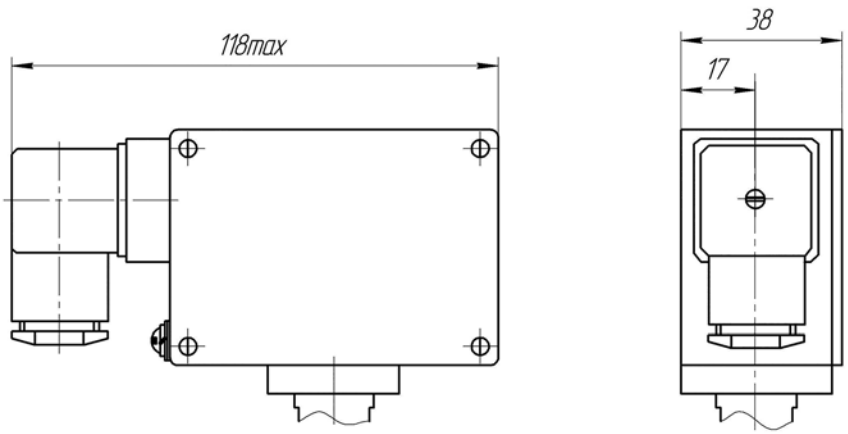
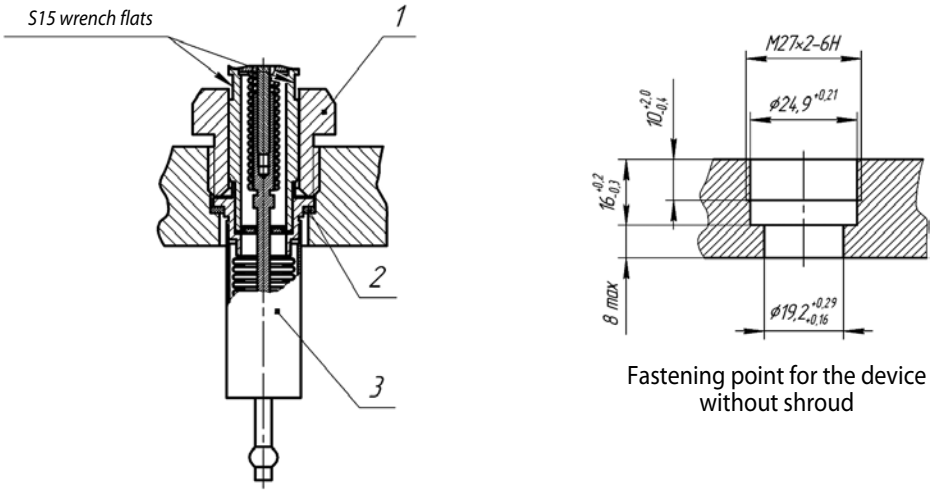


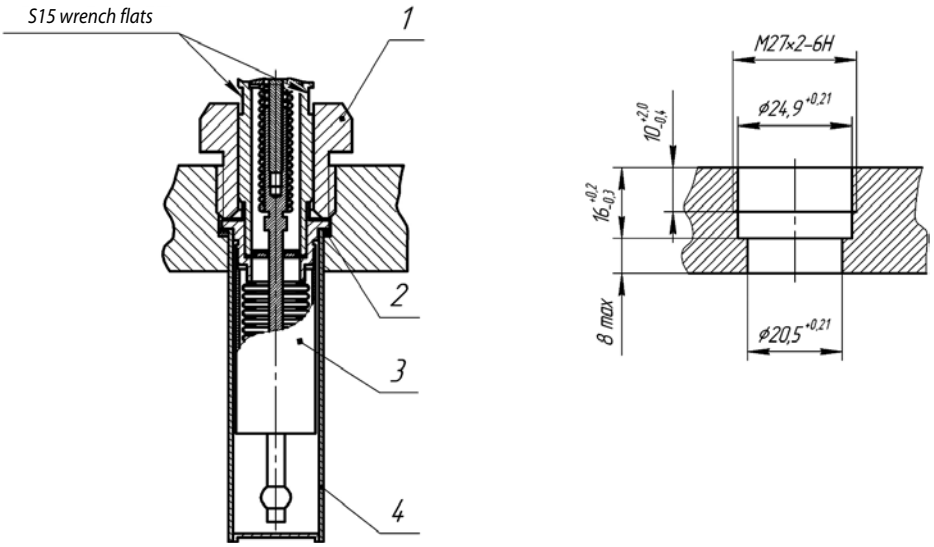
Figure 2 – Temperature relay-sensor TAM-103C with EN 175301-803 form connector



Fastening point for the device without shroud

1 – nut; 2 – gasket; 3 – thermal bulb

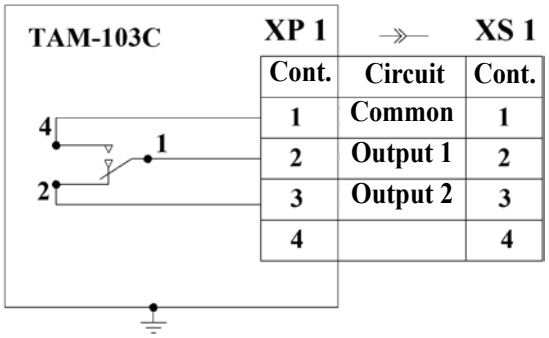
Figure 3 – Fastening of the device without shroud



1 – nut; 2 – gasket; 3 – thermal bulb; 4 – protective shroud

Figure 4 – Fastening of the device with a shroud

ELECTRIC CIRCUIT DIAGRAM



Connector designation		Document designation
XP1	XS1	
Plug 2РМДТ18Б4Ш5В1В	socket 2РМДТ18КУН4Г5В1В	ГЕ0.364.126 ТУ
base 628300 form A of electrical connector	GDA4090S61 form A electric connector	EN 175301-803

Figure 5 – Electric circuit diagram of TAM-103C temperature relay-sensors

MANOMETRIC EXPLOSION-PROOF TEMPERATURE RELAY-SENSORS ТДМВ-102

Manometric explosion-proof temperature relay-sensors ТДМВ-102 (hereinafter – devices) are intended for monitoring and regulating the temperature of gaseous and liquid media in stationary refrigeration plants and other systems of coal mines, in indoor and outdoor explosive areas as per Ex marking, GOST IEC 60079-14, PUE ("Electrical Installations Code") Chapter 7.3, and other regulatory documents governing the application of electrical equipment in explosive gaseous atmospheres as well as in underground pits and coal mines, and their surface structures.

Devices are also used for an alarm unit and to operate under conditions in which there is normally no blowing of the enclosure with dust-air flows, nor electrostatic charging of the enclosure by means of friction, electrostatic induction or contact with charged bodies.

Controlled medium:	Water, air, freons, oils, diesel fuel and other liquids and gas with a maximum viscosity of 0.8 Pa·s, nonaggressive to the used structural materials.
Climatic version and placement category:	T5 as per GOST 15150-69
IP rating:	IP67 as per GOST 14254-2015.
Ambient air temperature:	–40 to +70 °C
Air relative humidity:	up to 100 % at 50 °C
Atmospheric pressure:	0.084 to 0.12 MPa (630 to 850 mm Hg).
Device weight:	≤ 2.2 kg.
Average service life:	≥ 12 years.
Guarantee period of storage:	6 months from the date of manufacture.
Guarantee service life:	30 months from the date of commissioning.

GENERAL SPECIFICATIONS

Device designation, specified setpoint range, basic absolute error, actuation range and threshold return area value of devices are in compliance with those given in Table 1.

TABLE 1

Device designation	Specified setpoint range*, °C	Basic absolute error, °C, maximum	Actuation range, °C, maximum	Uncontrollable return area, °C, maximum
ТДМВ-102.01.1	–20 to +10	±1.5	0.3 °C – for devices without shroud; 0.5 °C – for devices with thermal bulb shroud	5
ТДМВ-102.02.1	+5 to +45			
ТДМВ-102.03.1	+10 to +60			
ТДМВ-102.04.1	+ 0 to +130	±4		10

* "Specified setpoint range" – values of setpoints at which the requirements of technical conditions are satisfied for each device version.

NOTES

1. Setting the device to a specific actuation setpoint shall be done by the manufacturer in compliance with the order. Setpoint value is selected from the setpoint range in increments of 1 °C.

2. If the order does not specify an actuation setpoint, devices shall be set by the manufacturer to the following actuation setpoints within the appropriate specified setpoint range:

ТДМВ-102.01 – 0 ± 3 °C;
ТДМВ-102.02 – plus 20 ± 3 °C;
ТДМВ-102.03 – plus 50 ± 3 °C;
ТДМВ-102.04 – plus 100 ± 3 °C.

Maximum allowable temperature of the controlled medium for the devices is given in Table 2.

TABLE 2

Designation	Maximum allowable temperature of the controlled medium*, °C
ТДМВ-102.01	50
ТДМВ-102.02	
ТДМВ-102.03	105
ТДМВ-102.04	145

* Maximum exposure duration is 5 min.

Switching wear resistance of contacts (number of switching cycles) is 250,000 actuation cycles at electrical load as per Table 3.

TABLE 3

Current type	Voltage, V	Switching power, W	Current, A		Cos φ, minimum	Frequency, Hz
			min.	max.		
DC	12 to 24	60	0.1	–	–	–
AC	127; 220	–	0.1	6	0.6	50 or 60

NOTES

1. Minimum value of switched current is 0.1 A with maximum inductance for DC of 5 mH.

2. It is not allowed to use the devices for switching minimum currents, if they were used at other current loads.

DEVICE DESIGNATION EXAMPLES:

ТДМВ-102 device with setpoint range from plus 10 to plus 60 °C, with uncontrollable return area, with return area directed towards temperature increase in relation to the setpoint, with setpoint at plus 50 °C, with a capillary length of 2.5 m

"Temperature relay-sensor ТДМВ-102.03.1.↑50°С-2,5м ТУ 4218-005-97817222-14";

ТДМВ-102 device with setpoint range from plus 5 to plus 45 °C, with controllable return area, with return area directed towards temperature decrease in relation to the setpoint, with setpoint at plus 40 °C, with a capillary length of 4 m, with installation kit K2

"Temperature relay-sensor ТДМВ-102.02.2.↓40°С-4м, К2 ТУ 4218-005-97817222-14";

DESIGNATION STRUCTURE

Temperature relay-sensor ТДМВ-102 – X . X . X X – X X

Setpoint range:
"01" – minus 20 to plus 10 °C;
"02" – plus 5 to plus 45 °C;
"03" – plus 10 to plus 60 °C;
"04" – plus 50 to plus 130 °C

Controllability of return area:
"1" – uncontrollable return area;
"2" – controllable return area

Direction of return area in relation to the setpoint:
↓ – towards decrease;
↑ – towards increase

Setpoint (setpoint value from the setpoint range with increments of 1 as per Table 1 with measurement units specified)

Capillary length:
– 2.5 m;
– 4.0 m
Note – Upon agreement with the customer, devices are allowed to be manufactured with a capillary length of 1 to 10 m.

The following may be supplied as an option:
kit K1 – adapter panel for the field installation of the device;
kit K2 – temperature bulb adapter nozzle;
kit K3 – temperature bulb shroud

OVERALL AND MOUNTING DIMENSIONS

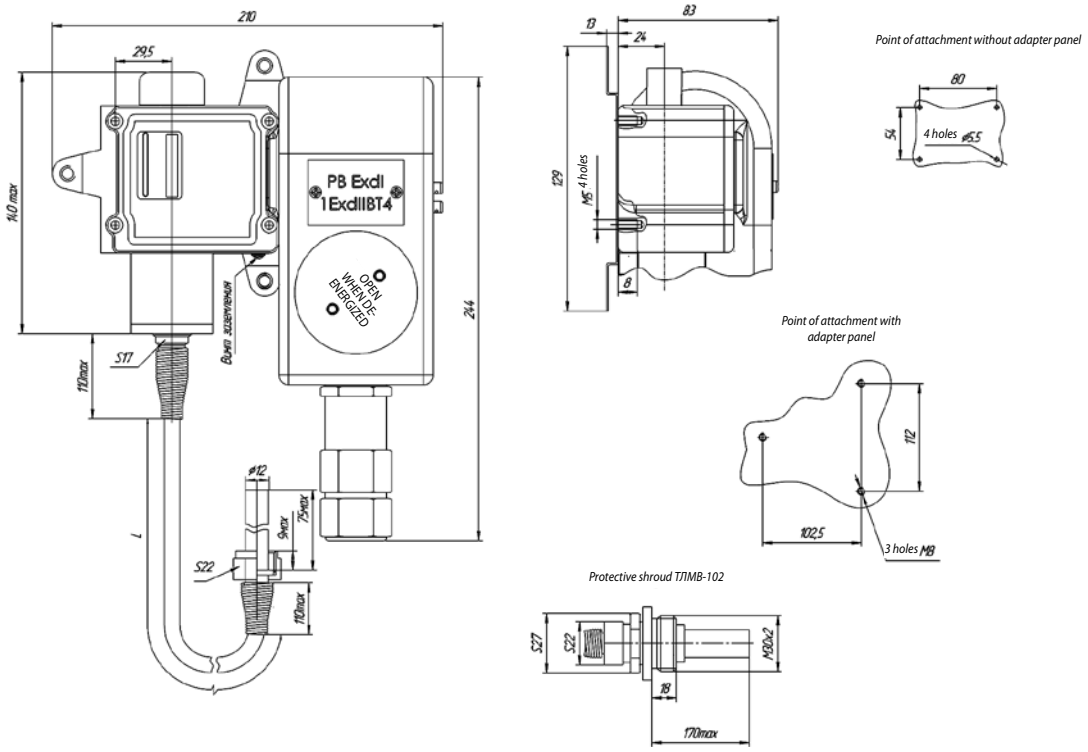
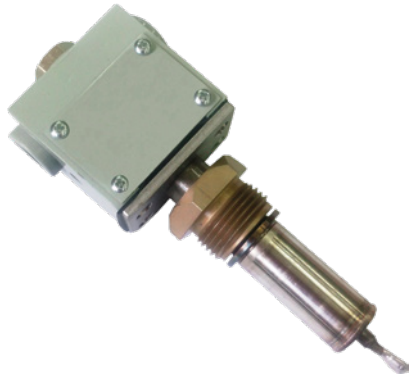


Figure 1 – Overall and mounting dimensions of ТДМВ-102 temperature relay-sensors

TEMPERATURE TRANSMITTERS ДТПМ-Р



Temperature transmitters ДТПМ-Р (hereinafter – devices) are designed to convert a temperature deviation of the controllable medium to a proportional pneumatic signal supplied to the amplifier-convertor or to actuators of the automatic temperature control system of locomotive-type diesel engines.

Controlled medium:	Rapidly mixed fresh water, oils, and other liquids that are nonaggressive to stainless steels as per GOST 5632-2014
Climatic version and placement category:	0 category 2 as per GOST 15150-69
IP rating:	IP00 as per GOST 14254-2015.
Ambient air temperature:	–10 to +80 °C
Device weight:	≤ 0.8 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	12 months within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, setpoint thresholds, proportional band, proportional band and dead-band area shall comply with those given in Table 1.

TABLE 1

Designation	Setpoint threshold		Proportional band		Dead-band area, °C, maximum
	Lower limit, °C	Upper limit, °C	Lower limit, °C	Upper limit, °C	
ДТПМ-Р-1	+50	+80	4	9	3
ДТПМ-Р-2	+40	+70	10	15	3
ДТПМ-Р-3	+70	+90	12	20	3
ДТПМ-Р-4	–30	–10	35	55	5

NOTES

1. The ambient air temperature at which the device was set up, t = 25 °C, the temperature variation velocity of the calibration medium is not higher than 0.5 °C per minute, the calibration medium is liquid.
2. Devices shall be set up to a specific setpoint at the manufacturing site.

The output variation range of transmitters in the event that the temperature changes by the magnitude of proportional band shall be:
– for ДТПМ-Р-1, ДТПМ-Р-2, ДТПМ-Р-3 – 0.196–0.490 MPa;
– for ДТПМ-Р-4 – 0.098–0.490 MPa.
Transmitters shall be air-fed at a pressure of 0.539–0.588 MPa or 0.735–0.784 MPa.
Designation of the ДТПМ-Р X^1 – X^2 device.
X^1 – temperature range (Table 1).
X^2 – setpoint.

OVERALL AND MOUNTING DIMENSIONS

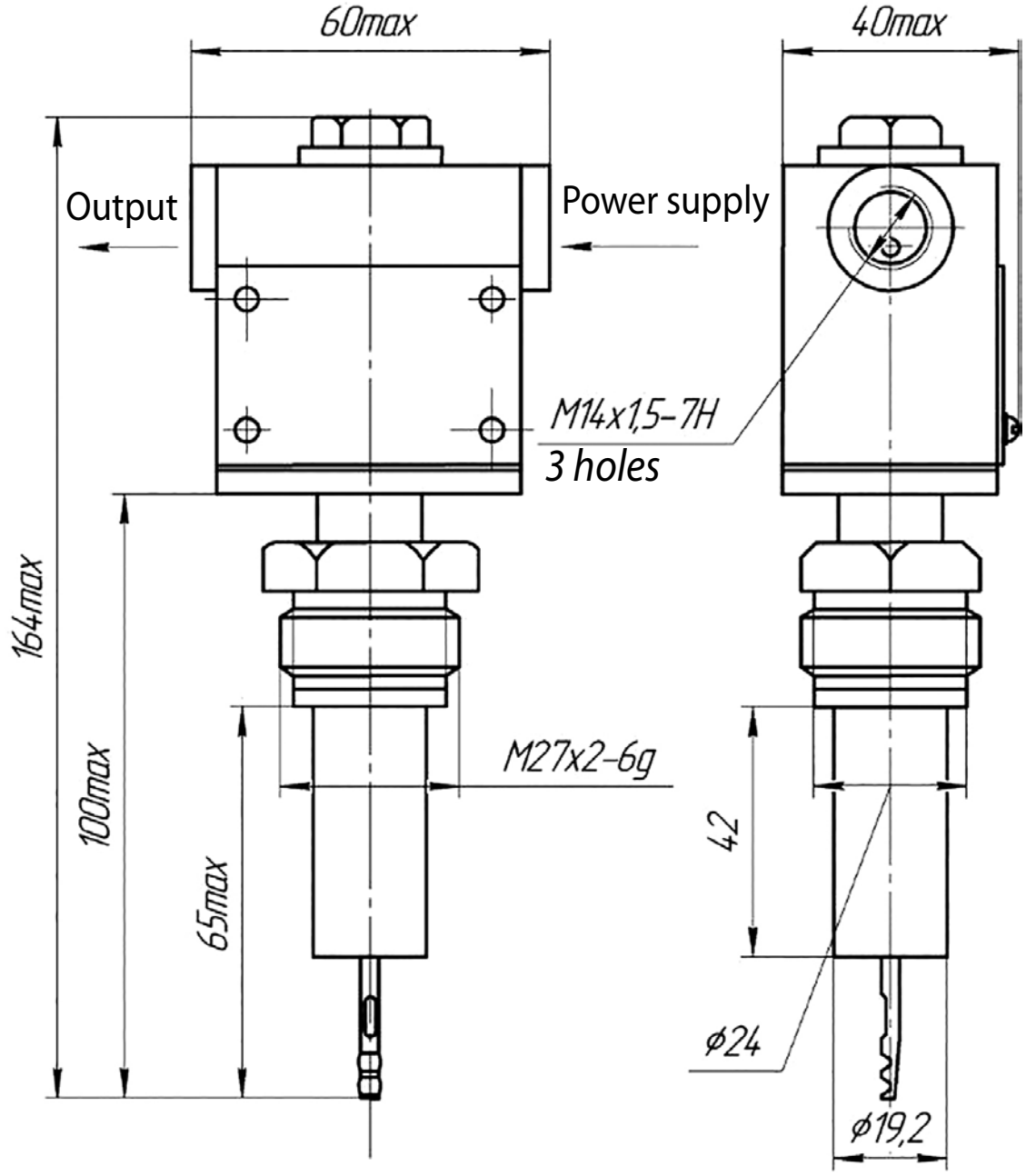


Figure 1 – Overall and mounting dimensions of ДТПМ-Р temperature transmitters

SECTION II.
PROCESS MONITORING AND MEASURING DEVICES

MEMBRANE INDICATING DRAFT GAUGES ТмМП-52-М3, HEAD GAUGES НМП-52-М3, DRAFT-HEAD GAUGES ТНМП-52-М3

Membrane indicating draft gauges ТмМП-52-М3, head gauges НМП-52-М3, draft-head gauges ТНМП-52-М3 (hereinafter – devices) are intended for measuring vacuum gauge and gauge pressure of air and nonaggressive gases.

The devices are restorable, single-function, repairable products.

Climatic version and placement category:	У3 – for operation at a temperature of –50 to +60 °C and relative air humidity up to 98 % at 35 °C and lower temperatures. Т3 – for operation at a temperature of –25 to +55°C and relative air humidity up to 100 % at 35 °C and lower temperatures.
IP rating:	IP40 as per GOST 14254-2015.
Calibration interval:	2 years.
Device weight:	≤ 0.5 kg.
Average service life:	≥ 10 years.
Guarantee period of the devices storage:	30 months from the date of manufacture.
Guarantee service life:	2 years within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Designations of devices, upper values of indication range and accuracy classes of devices are given in Table 1.

TABLE 1

Device description and designation	Upper value of indication range, kPa (kgf/m²)		Accuracy class
	Gauge pressure	Vacuum gage pressure	
Draft gauge ТмМП-52-М3	—	–0.16 (–16)	2.5
		–0.25; –0.4; –0.6; –1; –1.6; –2.5; –4; –6; –10; –16; –25; –40 (–25; –40; –60; –100; –160; –250; –400; –600; –1,000; –1,600; –2,500; –4,000)	1.5 2.5-1.5-2.5 2.5
Head gauge НМП-52-М3	+0.16 (+16)	—	2.5
	+0.25; +0.4; +0.6; +1; +1.6; +2.5; +4; +6; +10; +16; +25; +40 (+25; +40; +60; +100; +160; +250; +400; +600; +1,000; +1,600; +2,500; +4,000)		1.5 2.5-1.5-2.5 2.5
Draft-head gauge ТНМП-52-М3	+0.08 (8)	–0.08 (8)	2.5
	+0.125; +0.2; +0.3; +0.5; +0.8; +1.25; +2; +3; +5; +8; +12.5; +20 (+12.5; +20; +30; +50; +80; +125; +200; +300; +500; +800; +1,250; +2,000)	–0.125; –0.2; –0.3; –0.5; –0.8; –1.25; –2; –3; –5; –8; –12.5; –20 (–12.5; –20; –30; –50; –80; –125; –200; –300; –500; –800; –1,250; –2,000)	1.5 2.5-1.5-2.5 2.5

For head gauges and draft gauges, the lower (upper) value of indication range is "0" and, for head-and-draft gauges, the upper (gauge) and lower (vacuum gage) values of indication range are specified.

The limits of the basic allowable error in device indications shall comply with those given in Table 2.

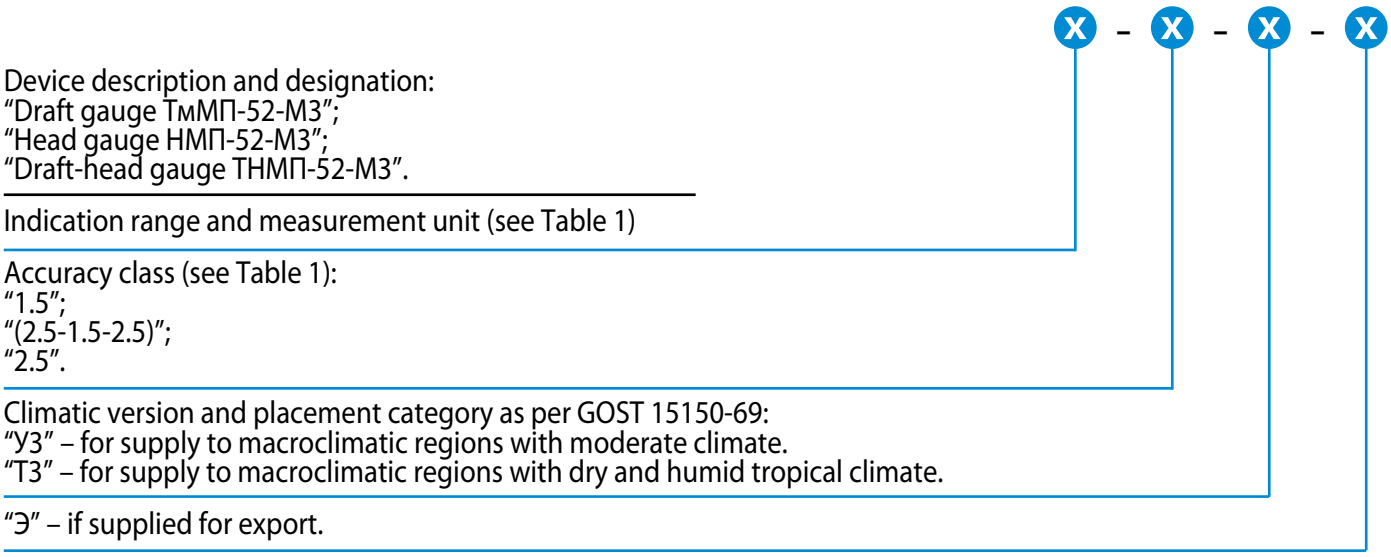
TABLE 2

Accuracy class designation	Basic allowable error limit, % of indication range, in the range of scale		
	0 to 25 %	25 to 75 %	75 to 100 %
1.5	±1.5	±1.5	±1.5*
2.5-1.5-2.5	±2.5	±1.5	±2.5
2.5	±2.5	±2.5	±2.5

* Upon agreement with the consumer, ±2.5 is allowed.

The measuring range shall be equal to the indication range.
The devices withstand gauge pressure overload exceeding the upper value of the indication range by 25 %.
The devices are resistant to atmospheric pressure and comply with P1 version group as per GOST R 52931-2008.

DESIGNATION STRUCTURE

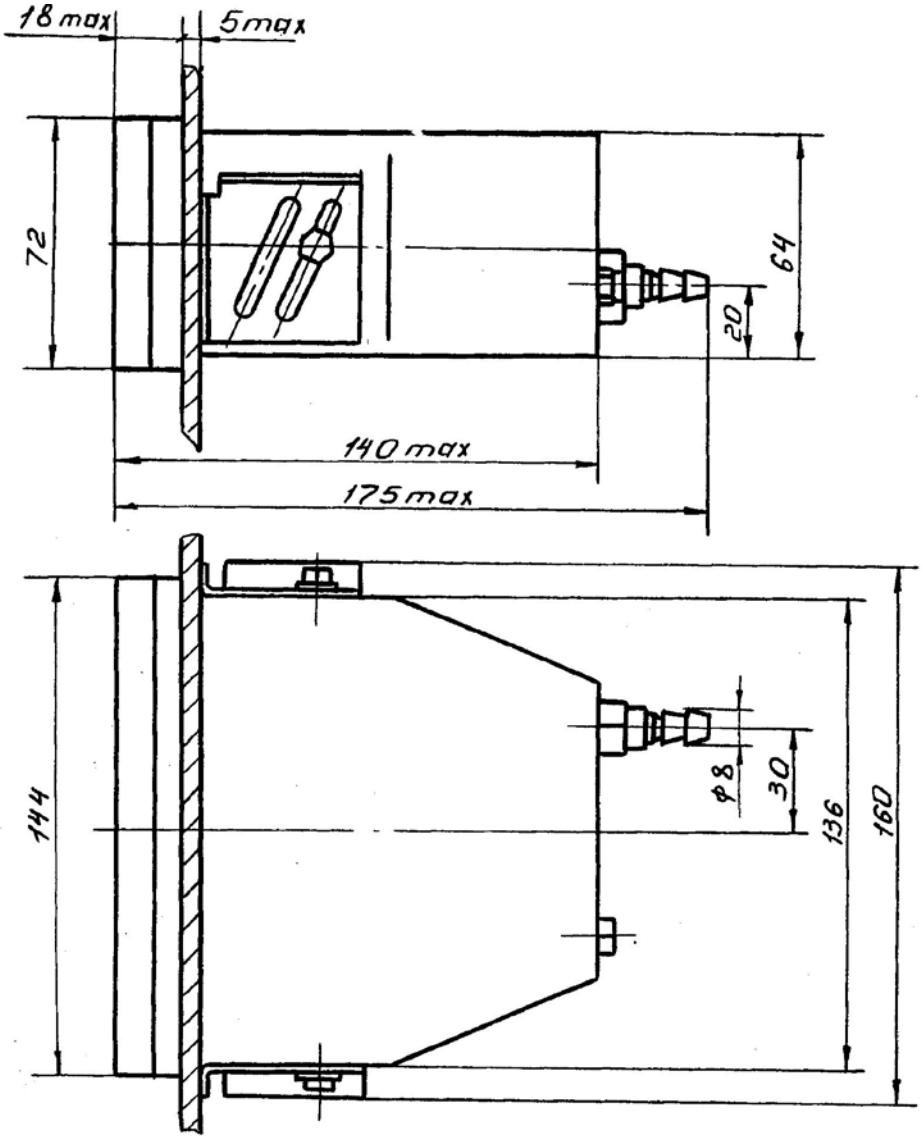


ORDERING INFORMATION FOR DEVICES:

Head gauge version У3 with an upper range limit of 10 kPa, accuracy class 2.5-1.5-2.5:
"Head gauge НМП-52-М3-10кПа-(2,5-1,5-2,5)-У3 ТУ 4212-160-00227471-2017".

Head gauge version У3 with an upper range limit of 10 kPa, accuracy class 2.5, if supplied for export:
"Head gauge НМП-52-М3-10кПа-2,5-У3 Э ТУ 4212-160-00227471-2017".

OVERALL AND ATTACHMENT DIMENSIONS



Cutout in the board

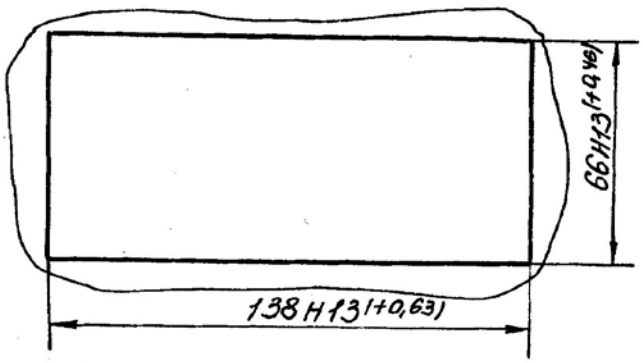


Figure 1 – Overall and attachment dimensions

INDICATING AND SIGNALING DRAFT GAUGES ДТ-С2, ДТ-СН, ДТ-СВ, HEAD GAUGES ДН-С2, ДН-СН, ДН-СВ, DRAFT-HEAD GAUGES ДГ-С2, ДГ-СН, ДГ-СВ

Indicating and signaling draft gauges ДТ-С2, ДТ-СН, ДТ-СВ, head gauges ДН-С2, ДН-СН, ДН-СВ, draft-head gauges ДГ-С2, ДГ-СН, ДГ-СВ (hereinafter – devices) are intended for measuring vacuum gage and gauge pressure of air, natural and other gases, nonaggressive to contacted materials, and for switching external electrical circuits in systems of general purpose industrial automation, including boiler house automation, upon reaching the preset value of measured pressure.

Devices ДТ-С2, ДН-С2, ДГ-С2 are fitted with two signaling devices (hereinafter – setpoints) for lower and upper threshold values of measured pressure (devices with two setpoints).

Devices ДТ-СН, ДН-СН, ДГ-СН have a low setpoint to deliver a signal upon reaching the lower threshold value of measured pressure (devices with low setpoint).

Devices ДТ-СВ, ДН-СВ, ДГ-СВ have a high setpoint to deliver a signal upon reaching the upper threshold value of measured pressure (devices with high setpoint).

Climatic version and placement category:	У3 – for operation at a temperature of –5 to +50 °C and relative humidity up to 98 % at 25 °C; Т3 – for operation at e temperature of –5 to +50 °C and relative humidity up to 98 % at 35 °C.
IP rating:	IP40 as per GOST 14254-2015.
Calibration interval:	1 year.
Device weight:	≤ 0.7 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	30 months from the date of manufacture.
Guarantee service life:	2 years within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

The description, designation and indication range of devices are specified in Table 1.

TABLE 1

Description	Designation	Indication range, kPa
Indicating and signaling draft gauge with two setpoints	ДТ-С2	–0.4 to 0 –0.6 to 0 –1.0 to 0 –1.6 to 0 –2.5 to 0 –4.0 to 0 –6.0 to 0 –10 to 0 –16 to 0 –25 to 0 –40 to 0 –60 to 0
Indicating and signaling draft gauge with low setpoint	ДТ-СН	
Indicating and signaling draft gauge with high setpoint	ДТ-СВ	

TABLE 1. CONTINUED

Description	Designation	Indication range, kPa
Indicating and signaling head gauge with two setpoints	ДН-С2	0 to 0.4 0 to 0.6 0 to 1.0 0 to 1.6 0 to 2.5 0 to 4.0 0 to 6.0 0 to 10 0 to 16 0 to 25 0 to 40 0 to 60
Indicating and signaling head gauge with low setpoint	ДН-СН	
Indicating and signaling head gauge with high setpoint	ДН-СВ	
Indicating and signaling draft-head gauge with two setpoints	ДГ-С2	−0.2 to 0.2 −0.3 to 0.3 −0.5 to 0.5 −0.8 to 0.8 −1.25 to 1.25 −2.0 to 2.0 −3.0 to 3.0 −5.0 to 5.0 −8.0 to 8.0 −12.5 to 12.5 −20 to 20 −30 to 30
Indicating and signaling draft-head gauge with low setpoint	ДГ-СН	
Indicating and signaling draft-head gauge with high setpoint	ДГ-СВ	

The limits of the basic allowable error in indication and alarm actuation of devices, expressed in percent of the indication range, shall comply with those given in Table 2.

TABLE 2

Accuracy class designation	Basic allowable error limit, % of indication range, in the range of scale					
	0 to 25 %		25 to 75 %		75 to 100 %	
	indications	alarm actuation	indications	alarm actuation	indications	alarm actuation
4-2, 5-4	±4	±5	±2.5	±3	±4	±5
2.5	±2.5	±4	±2.5	±3	±2.5	±4

The devices shall be powered from a ($24^{+2.4}_{-3.6}$) Vdc source. Current consumption does not exceed 25 mA per setpoint.
Head gauges and draft-head gauges can withstand gauge pressure overload exceeding the upper value of indication range by 50 %.
Draft-head gauges can withstand gauge pressure overload exceeding the upper value of indication range by 100 %.

ORDERING INFORMATION FOR DEVICES:

Draft gauge ДТ-СН with indication range from 0 to 1.6 kPa with climatic version У3:
"Draft gauge ДТ-СН-1,6кПа-У3 ТУ 311-00227471.038-94".

DESIGNATION STRUCTURE

X - X - X - X

Device description and designation:
"Draft gauge ДТ-С";
"Head gauge ДН-С";
"Draft-head gauge ДГ-С".

Signaling device (setpoint):
"2" – two setpoints: low and high;
"H" – low setpoint only;
"B" – high setpoint only;)

Indication range and measurement unit (see Table 1)

Accuracy class (see Table 1):
"(4-2.5-4)";
"2.5".

Climatic version and placement category as per GOST 15150-69:
"У3" – for supply to macroclimatic regions with moderate climate.
"Т3" – for supply to macroclimatic regions with both dry and humid tropical climate.

OVERALL AND ATTACHMENT DIMENSIONS

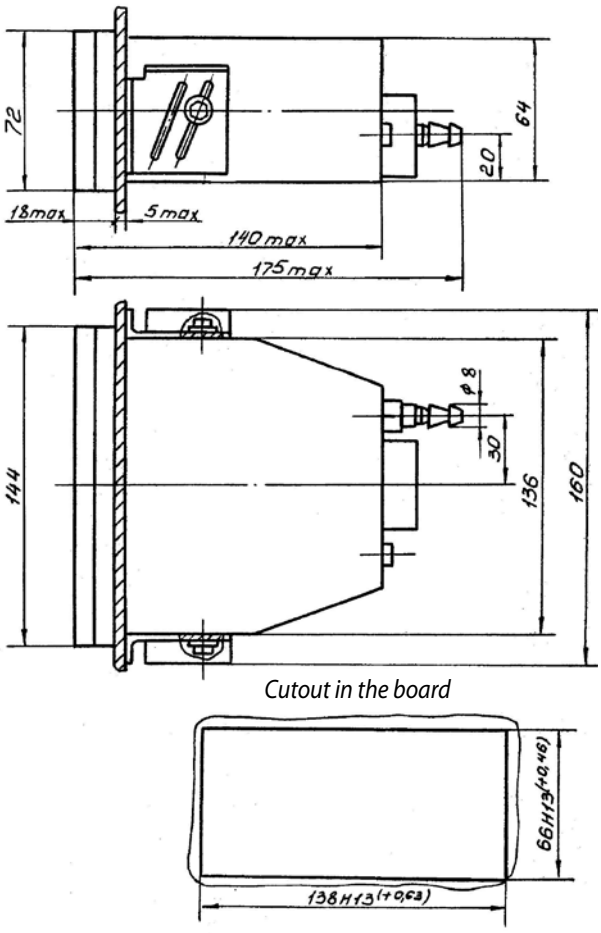


Figure 1 – Overall and attachment dimensions

MEMBRANE INDICATING DRAFT GAUGES ТмМП-100-М1, HEAD GAUGES НМП-100-М1, DRAFT-HEAD GAUGES ТНМП 100 М1, DIFFERENTIAL PRESSURE-DRAFT GAUGES ДТмМП-100-М1, DIFFERENTIAL PRESSURE HEAD GAUGES ДНМП-100-М1, DIFFERENTIAL PRESSURE DRAFT-HEAD GAUGES ДТНМП-100-М1

Membrane indicating draft gauges ТмМП-100-М1, head gauges НМП-100-М1, draft-head gauges ТНМП-100-М1, differential pressure draft gauges ДТмМП-100-М1, differential pressure head gauges ДНМП-100-М1, differential pressure draft-head gauges ДТНМП-100-М1 (hereinafter – devices) are intended for measuring vacuum gauge and gauge pressure as well as differential vacuum gauge and gauge pressures:

– of air and nonaggressive gases;

– of gaseous aggressive media with hydrogen sulfide and carbon dioxide content (version "Астр").

Climatic version and placement category:	У3 – for operation at a temperature of –50 to +60 °C and relative humidity up to 98 % at 35 °C. Т3 – for operation at a temperature of –25 to +55 °C and relative humidity up to 100 % at 35 °C.
IP rating:	IP53 as per GOST 14254-2015.
Calibration interval:	2 years.
Device weight:	≤ 0.8 kg.
Average service life:	≥ 10 years, for corrosion-resistant device versions – 3 years.
Guarantee period of the devices storage:	3 years from the date of manufacture.
Guarantee service life:	2 years (for version "Астр" – 1 year) within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

The description, designation, upper values of indication range, and accuracy classes of devices are given in Table 1.

TABLE 1

Device description	Designation	Upper value of indication range, kPa		Accuracy class
		gauge pressure	vacuum gauge pressure	
Membrane indicating draft gauge Membrane indicating differential pressure draft gauge	ТмМП-100-М1 ДТмМП-100-М1	–	–0.4*; –0.6*	2.5
			–1; –1.6; –2.5; –4; –6; –10; –16; –25; –40	2.5; 2.5-1.5-2.5; 1.5
Membrane indicating head gauge Membrane indicating differential pressure head gauge	НМП-100-М1 ДНМП-100-М1	+0.4*; +0.6*	–	2.5
		+1; +1.6; +2.5; +4; +6; +10; +16; +25; +40		2.5; 2.5-1.5-2.5; 1.5
Membrane indicating draft-head gauge Differential pressure draft-head gauge	ТНМП-100-М1 ДТНМП-100-М1	+0.2*; +0.3*	–0.2*; –0.3*	2.5
		+0.5; +0.8; +1.25; +2; +3; +5; +8; +12.5; +20	–0.5; –0.8; –1.25; –2; –3; –5; –8; –12.5; –20	2.5; 2.5-1.5-2.5; 1.5

NOTES

1. The devices with accuracy class 2.5-1.5-2.5 have accuracy class 1.5 for the second and the third quarters of the scale; and class 2.5 for the first and the last quarters.
2. *Do not apply to version "Астр".

The limits of the basic allowable error in device indications comply with those given in Table 2.

TABLE 2

Accuracy class designation	Basic allowable error limit, % of indication range, in the range of scale		
	0 to 25 %	25 to 75 %	75 to 100 %
1.5	±1.5	±1.5	±2.5
2.5-1.5-2.5	±2.5	±1.5	±2.5
2.5	±2.5	±2.5	±2.5

Maximum allowable operating vacuum gauge or gauge pressure and differential pressure (for differential pressure draft gauges, differential pressure head gauges and differential pressure draft-head gauges) shall not exceed the measuring range.
Devices are resistant to single impacts with acceleration up to 500 m/s^2.

DESIGNATION STRUCTURE

X – 100-M1 – X – X – X – X – X – X

Device description and designation:
"Draft gauge ТмМП";
"Head gauge НМП";
"Draft-head gauge ТНМП";
"Differential pressure draft gauge ДТмМП";
"Differential pressure head gauge ДНМП";
"Differential pressure draft-head gauge ДТНМП".

Indication range and measurement unit (see Table 1)

Accuracy class (see Tables 1, 2):
"1.5";
"2.5-1.5-2.5";
"2.5".

Climatic version and placement category as per GOST 15150-69:
"У3" – for supply to macroclimatic regions with moderate climate.
"Т3" – for supply to macroclimatic regions with dry and humid tropical climate.
or "Астр" – corrosion-resistant version.

"Э" – if supplied for export.

"Л" – with a phosphor-covered scale.

ORDERING INFORMATION FOR DEVICES:

Head gauge with an upper range limit of 10 kPa, accuracy class 1.5, version У3:
"Head gauge НМП-100-М1-10кПа-1,5-У3 ТУ 25-7305.016-90".

The same for version "Астр".
"Head gauge НМП-100-М1-10кПа-1,5-У3-Астр ТУ 25-7305.016-90".

Head gauge with an upper range limit of 10 kPa, accuracy class 2.5, version У3, export, with a phosphor-covered scale.
"Head gauge НМП-100-М1-10кПа-2,5-У3-Э-Л ТУ 25-7305.016-90".

OVERALL AND ATTACHMENT DIMENSIONS

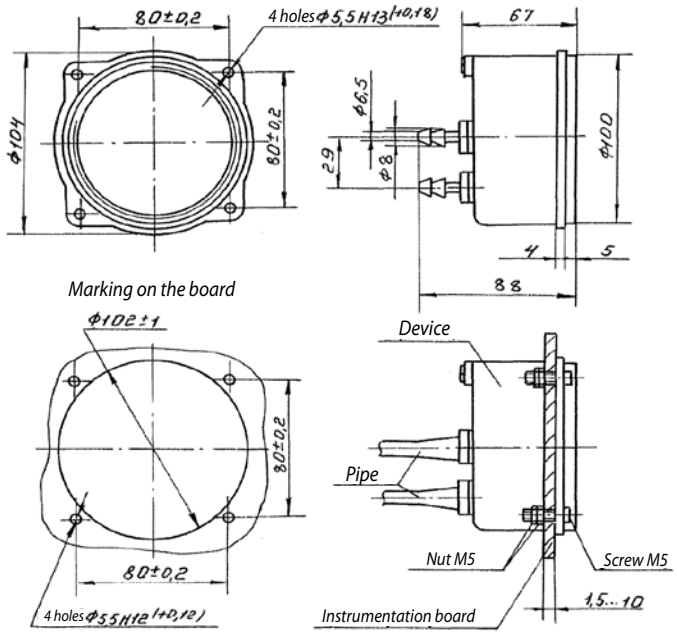


Figure 1 – Overall and attachment dimensions

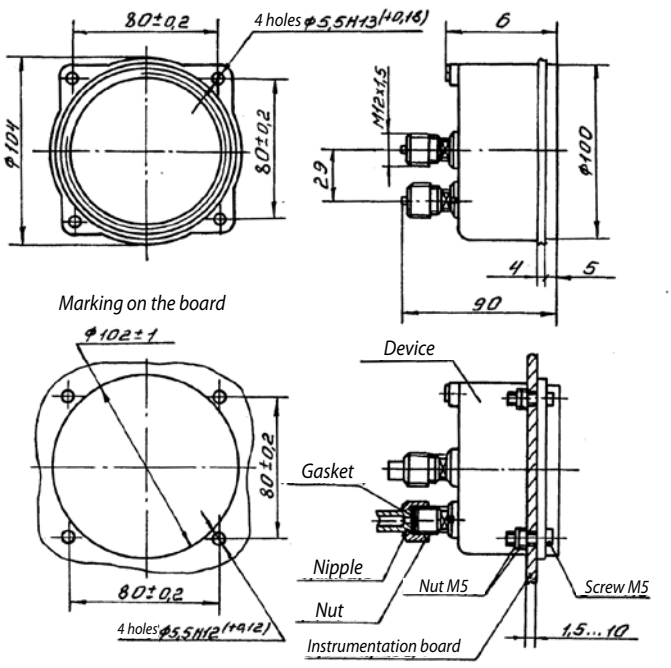


Figure 2 – Overall and attachment dimensions of "Астр" devices

MEMBRANE INDICATING (WITH RADIAL NOZZLE VERSION) DRAFT GAUGES ТмМП-100-М1Р, HEAD GAUGES НМП-100-М1Р, DRAFT-HEAD GAUGES ТНМП-100-М1Р

Membrane indicating draft gauges ТмМП-100-М1Р, head gauges НМП-100-М1Р, and draft-head gauges ТНМП-100-М1Р (hereinafter – devices) are intended for measuring vacuum gauge and gauge pressure of air and nonaggressive gases.

Climatic version and placement category:	У3 – for operation at a temperature of −50 to +60 °C and relative humidity up to 98 % at 35 °C. Т3 – for operation at a temperature of −25 to +55 °C and relative humidity up to 100 % at 35 °C.
IP rating:	IP40 as per GOST 14254-2015
Calibration interval:	2 years.
Device weight:	≤ 0.8 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	3 years from the date of manufacture.
Guarantee service life:	2 years within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

The description, designation, upper values of indication range, and accuracy classes of devices are given in Table 1.

TABLE 1

Device description	Designation	Upper value of indication range, kPa		Accuracy class
		gauge pressure	vacuum gauge pressure	
Membrane indicating draft gauge	ТмМП-100-М1Р	–	−0.4; −0.6	2.5
			−1; −1.6; −2.5; −4; −6; −10; −16; −25; −40	2.5; 1.5
Membrane indicating head gauge	НМП-100-М1Р	+0.4; +0.6	–	2.5
		+1; +1.6; +2.5; +4; +6; +10; +16; +25; +40		2.5; 1.5
Membrane indicating draft-head gauge	ТНМП-100-М1Р	+0.2; +0.3	−0.2; −0.3	2.5
		+0.5; +0.8; +1.25; +2; +3; +5; +8; +12, +5; +20	−0.5; −0.8; −1.25; −2; −3; −5; −8; −12.5; −20	2.5; 1.5

NOTES

1. The devices with accuracy class 2.5-1.5-2.5 have accuracy class 1.5 for the second and the third quarters of the scale; and class 2.5 for the first and the last quarters.

The limits of the basic allowable error in device indications comply with those given in Table 2.

TABLE 2

Accuracy class designation	Basic allowable error limit, % of indication range, in the range of scale		
	0 to 25 %	25 to 75 %	75 to 100 %
1.5	±1.5	±1.5	±2.5
2.5	±2.5	±2.5	±2.5

Maximum allowable operating vacuum gauge or gauge pressure and differential pressure (for differential pressure draft gauges, differential pressure head gauges and differential pressure draft-head gauges) shall not exceed the measuring range.
Devices are resistant to single impacts with acceleration up to 500 m/s^2.

DESIGNATION STRUCTURE

X – 100-M1P – X – X – X – X – X

Device description and designation:
"Draft gauge ТмМП";
"Head gauge НМП";
"Draft-head gauge ТНМП".

Indication range and measurement unit (see Table 1)

Accuracy class (see Tables 1, 2):
"1.5";
"2.5".

Climatic version and placement category as per GOST 15150-69:
"У3" – for supply to macroclimatic regions with moderate climate.
"Т3" – for supply to macroclimatic regions with dry and humid tropical climate.

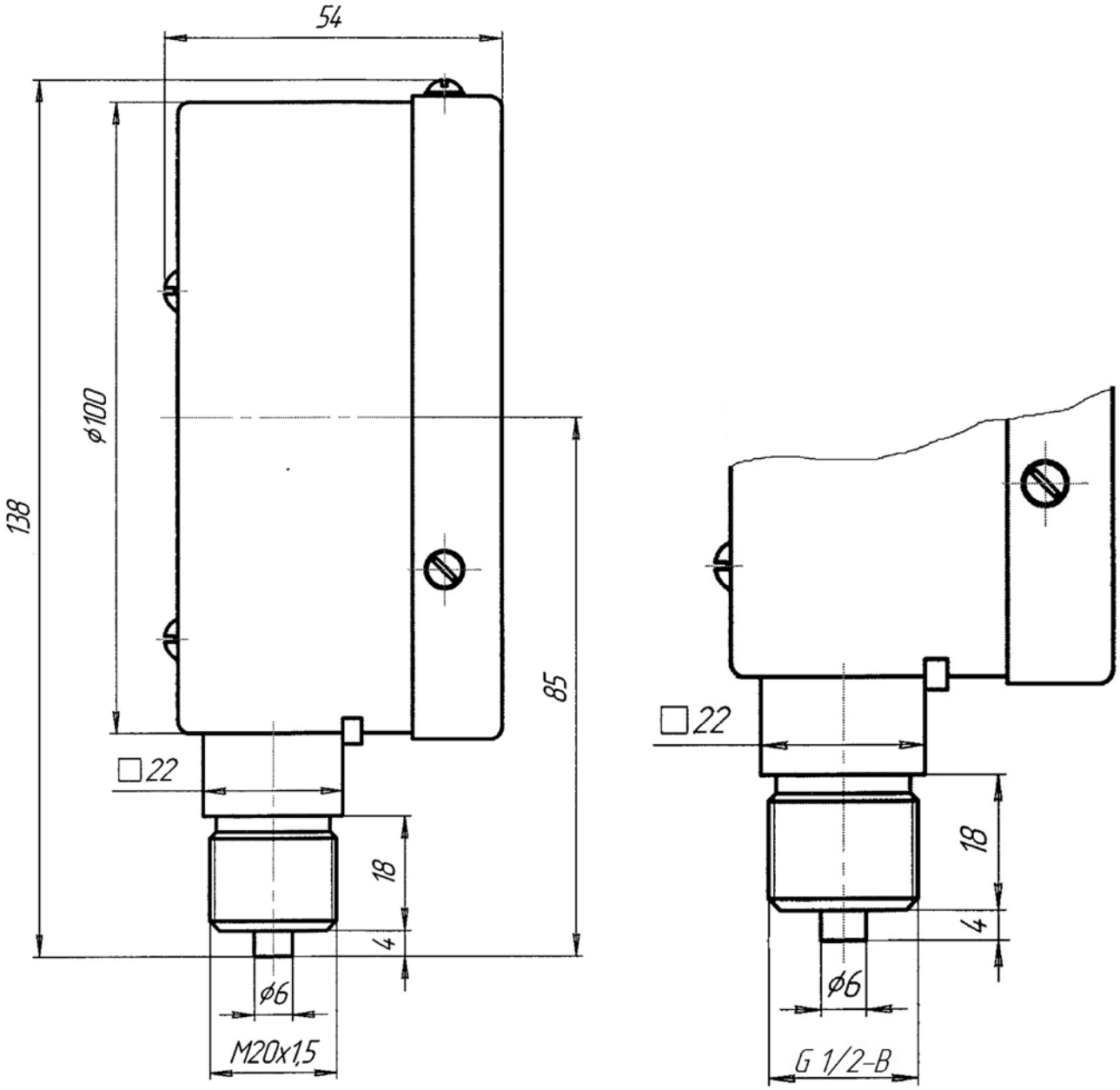
"Э" – if supplied for export

"Л" – with a phosphor-covered scale

ORDERING INFORMATION FOR DEVICES:

Head gauge with an upper range limit of 10 kPa, accuracy class 1.5, version У3 with M20x1.5 thread:
"Head gauge НМП-100-М1Р-10кПа-1,5-У3-М20х1,5 ТУ 25-7305.016-90".

OVERALL AND ATTACHMENT DIMENSIONS



a) b)

a – nozzle M 20x1.5; b – nozzle G/2-B

Figure 1 – Overall and attachment dimensions of the device with radial nozzle version

INDICATING PRESSURE GAUGES ДМГ-60

Indicating pressure gauges ДМГ-60 (hereinafter – devices) are intended for measuring gauge pressure of air and nonaggressive gases.

Climatic version and placement category:	У3 – for operation at a temperature of –50 to +60 °C and relative air humidity of 98 % at 35 °C and lower temperatures.
IP rating:	IP40 as per GOST 14254-2015.
Calibration interval:	1 year.
Device weight:	≤ 0.2 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	18 months from the date of commissioning.

GENERAL SPECIFICATIONS

DESIGNATION STRUCTURE

Indicating pressure gauge ДМГ 60 – X – X – X – X – X

Upper range limit with measurement unit specified:
"6 kPa";
"10 kPa";
"40 kPa".

Accuracy class:
"1.5";
"2.5".

Climatic version and placement category as per GOST 15150-69:
"У3" – for supply to macroclimatic regions with moderate climate.

"Э" – if supplied for export.

Attachment dimensions of the nozzle
"M12x1.5" Fig. 20 GOST 2405 (see Fig. 1 a);
"Б1" 4-01 GOST 25165 (see Fig. 1 b);
"Б2" 4-03 GOST 25165 (see Fig. 1 c).

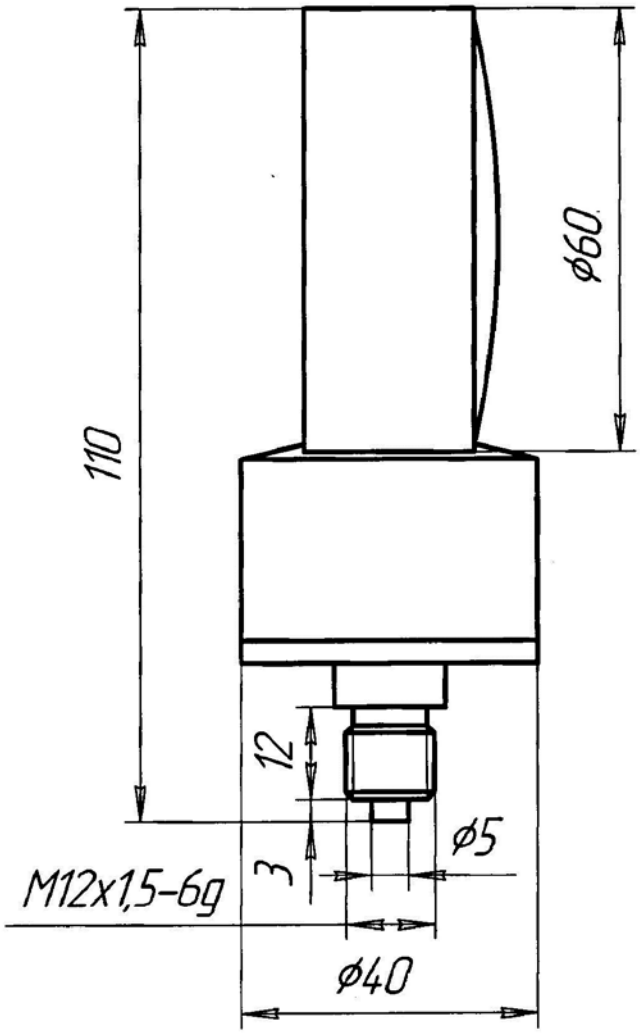
ORDERING INFORMATION FOR DEVICES:

Indicating pressure gauge for climatic version У3 with an upper range limit of 6 kPa, accuracy class 1.5, with threaded nozzle (drawing 20 GOST 2405):
"Indicating pressure gauge ДМГ-60-6кПа-1,5-У3 ТУ 4212-118-00227471-2005";

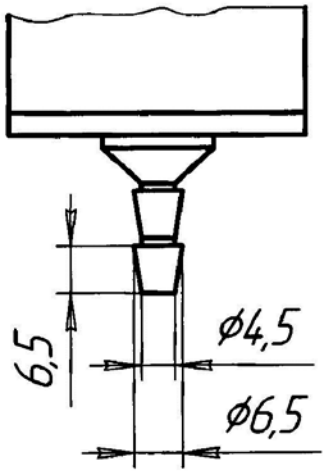
Indicating pressure gauge for climatic version У3, for export, with an upper range limit of 40 kPa, accuracy class 1.5, with unthreaded connection for tubing (connection typical size 4 01 GOST 25165), nozzle diameter 6.5 mm:
"Indicating pressure gauge ДМГ-60-40кПа-1,5-У3-Э-Б1 ТУ 4212-118-00227471-2005";

Indicating pressure gauge for climatic version У3, for export, with an upper range limit of 40 kPa, accuracy class 1.5, with unthreaded connection for tubing (connection typical size 4 03 GOST 25165), nozzle diameter 10 mm:
"Indicating pressure gauge ДМГ-60-40кПа-1,5-У3-Э-Б2 ТУ4212-118-00227471-2005".

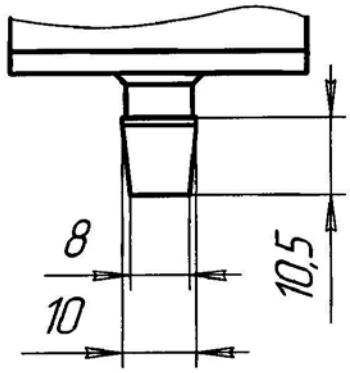
OVERALL AND ATTACHMENT DIMENSIONS



а)



б)



в)

MEMBRANE PHASE SEPARATORS PM

Membrane phase separators PM (hereinafter – separators) are designed to protect internal cavities of sensing elements of measuring devices from penetration of aggressive, hot, crystallizing media containing suspended solids.

PM devices are connected to a measurement device directly or through a coupling hose.

PM devices are used as part of measurement devices such as pressure detectors, pressure gauges, vacuum pressure gauges, pressure transmitters.

Device weight:	
5319 M; 5320	≤ 1.3 kg.
5321	≤ 1.6 kg.
5322	≤ 1 kg.
5319	≤ 3 kg.
Average service life:	≥ 6 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	12 months from the date of commissioning.

GENERAL SPECIFICATIONS

The separator model, pressure upper range limit, volume of an elastic sensing element, variation in volume of a sensing element filled with liquid, separator internal volume are specified in Table 1.

TABLE 1

Separator model	Pressure upper range limit of the device equipped with a separator, MPa (kgf/cm^2)	*Sensing element volume, maximum, cm^3	Variation in volume of sensing element filled with liquid when exposed to maximum pressure, maximum, cm^3	Internal volume of separator filled with separating liquid, cm^3
PM 5319 CM	0.025–2.5 (0.25–25)	20	0.25	0.8
PM 5319 C		40	1.0	20.6
PM 5319				
PM 5320 C				
PM 5320				
PM 5321 C	4–60 (40–600)	20	0.5	6
PM 5321				
PM 5322 C				
PM 5322				

NOTE:

* Phase separator will also be serviceable with higher volumes of the sensing element of the measurement device than those specified in table. However, the additional error of the measurement device with separator will significantly increase should the temperature of ambient air and operating medium deviate from 25 °C.

ORDERING INFORMATION FOR SEPARATORS:

Membrane separator PM, model 5319C with M20x1.5 thread, with lower flange of steel 45, for fuel oil and other viscous media, with a 2-meter coupling hose, with one nozzle for filling:
"Separator PM5319C-02-∅ 10-Р2м-Ш1 ТУ 4212-128-00227471-2007"

The temperature of measured medium upstream of the separator shall be minus 40 to plus 200 °C.

Separators are always used with a coupling hose if the temperature of the measured medium upstream of the separator exceeds the temperature set for the operation of the measurement device.

Separators shall operate at an ambient temperature of minus 30 to plus 60 °C. Relative humidity is (95 ± 3) % at 35 °C and lower temperatures without moisture condensation.

Membrane separators PM 5319, PM 5320, PM 5321, PM 5322 have the same specifications and versions as separators PM 5319C, PM 5320C, PM 5321C, PM 5322C. The differences between them are that there is no special channel for filling with separating liquid.

Separator versions, attachment dimensions, and materials are given in Tables 2, 3.

TABLE 2

Separator version	Separator lower flange	
	On-site attachment dimension	Material
*PM 5319 CM	M20x1.5	Steel 12X18H10T GOST 5949-75
*PM 5319 CM-01		
*PM 5319 CM-G1/2	G1/2″	
*PM 5319 CM-01-G1/2		
*PM 5319 CM-Ш10	M20x1.5; hole ∅ 10 mm	Steel 12X18H10T GOST 5949-75
*PM 5319 CM-01-Ш10		
PM 5319 M-01-Ш10		
*PM 5319 CM-Ш10-G1/2	G1/2″; hole ∅ 10 mm	Steel 12X18H10T GOST 5949-75
PM 5319 M-Ш10-G1/2		
*PM 5319 CM-01-Ø10-G1/2		
PM 5319 M-01-Ш10-G1/2		
PM 5319 CM-02	M20x1.5	Steel 45 GOST 1050-88 + coating Ц.9Хр.
PM 5319 M-02		
PM 5319 CM-02-G1/2	G1/2″	
PM 5319 M-02-G1/2		
PM 5319 CM-02-Ш10	M20x1.5; hole ∅ 10 mm	
PM 5319 M-02-Ш10		
PM 5319 CM-02-Ш10-G1/2	G1/2″; hole ∅ 10 mm	
PM 5319 M-02-10-G1/2		
*PM 5319 C	M20x1.5	Steel 12X18H10T GOST 5949-75
PM 5319		
*PM 5319 C-01		
PM 5319-01		
*PM 5319 C-G1/2	G1/2″	
PM 5319-G1/2		
*PM 5319 C-01-G1/2		
PM 5319-01-G1/2		
*PM 5319 C-Ш10	M20x1.5; hole ∅ 10 mm	Steel 12X18H10T GOST 5949-75
PM 5319-Ш10		
*PM 5319 C-01-Ш10		
PM 5319-01-Ш10		
*PM 5319 C-Ш10-G1/2	G1/2″; hole ∅ 10 mm	Steel 12X18H10T GOST 5949-75
PM 5319-Ш10-G1/2		
*PM 5319 C-01-Ш10-G1/2		
PM 5319-01-Ш10-G1/2		

TABLE 2. CONTINUED

Separator version	Separator lower flange	
	On-site attachment dimension	Material
PM 5319 C-02	M20x1.5	Steel 45 GOST 1050-88 + coating Ц.9Хр.
PM 5319-02		
PM 5319 C-02-G1/2	G1/2"	
PM 5319-02-G1/2		
PM 5319 C-02-Ш10	M20x1.5; hole ∅ 10 mm	
PM 5319-02-Ш10		
PM 5319 C-02-Ш10-G1/2	G1/2"; hole ∅ 10 mm	
PM 5319-02-Ш10-G1/2		
*PM 5321 C	M20x1.5	Steel 12X18H10T GOST 5949-75
PM 5321		
*PM 5321 C-01		
PM 5321-01		
*PM 5321 C-G1/2	G1/2"	
PM 5321-G1/2		
*PM 5321 C-01-G1/2		
PM 5321-01-G1/2		
*PM 5321 C-Ш10	M20x1.5; hole ∅ 10 mm	
PM 5321-Ш10		
*PM 5321 C-01-Ø10		
PM 5321-01-Ш10		
*PM 5321 C-Ш10-G1/2	G1/2"; hole ∅ 10 mm	Steel 12X18H10T GOST 5949-75
PM 5321-Ш10-G1/2		
*PM 5321 C-01-Ш10-G1/2		
PM 5321-01-Ш10-G1/2		
PM 5321 C-02	M20x1.5	Steel 45 GOST 1050-88 + coating Ц.9Хр.
PM 5321-02		
PM 5321 C-02-G1/2	G1/2"	
PM 5321-02-G1/2		
PM 5321 C-02-Ш10	M20x1.5; hole ∅ 10 mm	
PM 5321-02-Ш10		
PM 5321 C-02-Ш10-G1/2	G1/2"; hole ∅ 10 mm	
PM 5321-02-Ш10-G1/2		

TABLE 3

Separator model	Size of fastening bolts
*PM 2320 C	M 10
PM 5320	
*PM 5320 C-01	
PM 5320-01	
*PM 5320 C-M 30	
*PM 5320 C-M 30-01	
*PM 5322 C	M 14x1.5
PM 5322	
*PM 5322 C-01	
PM 5322-01	

NOTE:

* Separator models are also manufactured with code – "Op" (all parts exposed to the environment are made of corrosion-resistant steel 12X18H10T).

Separator models with code -01 are equipped with an additional fluoroplastic membrane.

DESIGNATION STRUCTURE

Separator X – X – X – X – X –P X –Ш X

Model: “PM 5319 CM”; “PM 5319 C”; “PM 5319”;
“PM 5320 C”; “PM 5320”; “PM 5321 C”; “PM 5321”;
“PM 5322 C”; “PM 5322”

“01” – version with an additional fluoroplastic membrane;
“02” – version with a lower flange of steel 45

“∅ 10” – version for viscous media

“G1/2” – version with pipe threaded flange

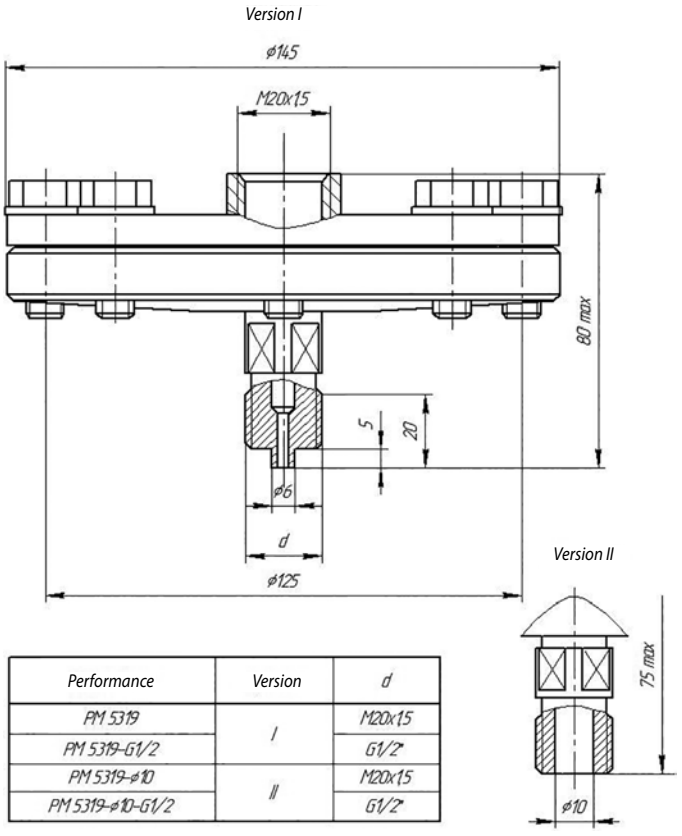
“Op” – corrosion-resistant version

Length of coupling hose, m: 2; 2.5; 3; 3.5; 4; 4.5; 5.

Number of nozzles for filling (qty – as required)

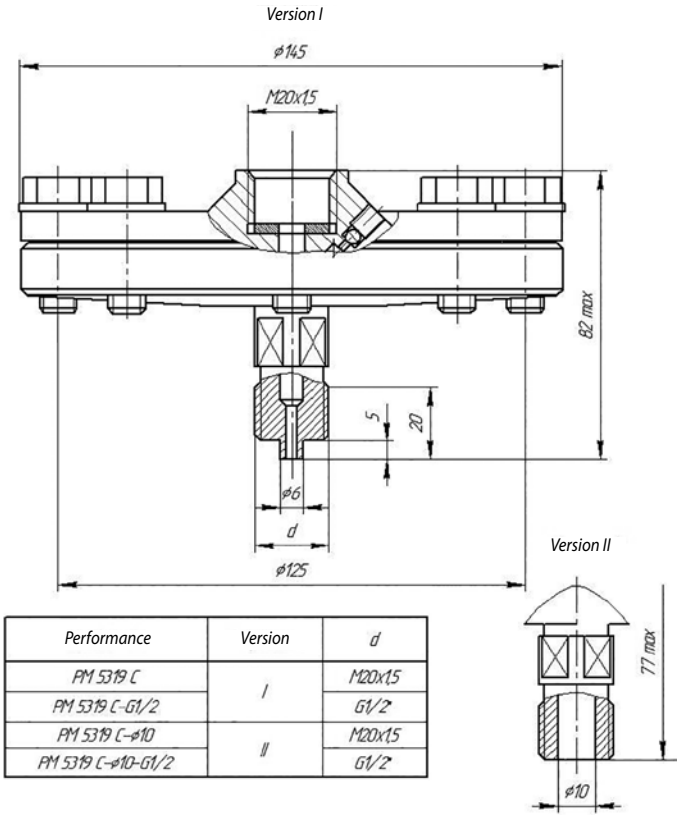
Separator models are also manufactured with code – “Op” (all parts exposed to the environment are made of corrosion-resistant steel 12X18H10T).
Separator models with code – 01 are equipped with an additional fluoroplastic membrane.
Overall and attachment dimensions
D – M20x1.5 or G1/2.

OVERALL AND ATTACHMENT DIMENSIONS



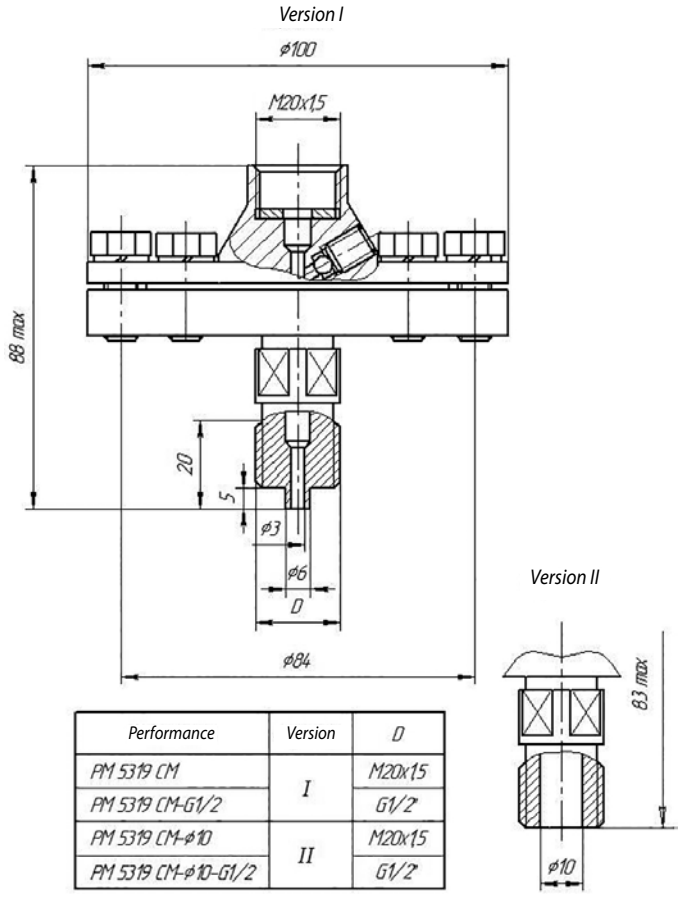
Performance	Version	d
PM 5319	I	M20x15
PM 5319-G1/2		G1/2"
PM 5319-ø10	II	M20x15
PM 5319-ø10-G1/2		G1/2"

Figure 1 – Structure, overall and attachment dimensions of PM 5319



Performance	Version	d
PM 5319 C	I	M20x15
PM 5319 C-G1/2		G1/2"
PM 5319 C-ø10	II	M20x15
PM 5319 C-ø10-G1/2		G1/2"

Figure 2 – Structure, overall and attachment dimensions of PM 5319 C



Performance	Version	D
PM 5319 CM	I	M20x15
PM 5319 CM-G1/2		G1/2"
PM 5319 CM-ø10	II	M20x15
PM 5319 CM-ø10-G1/2		G1/2"

Figure 3 – Structure, overall and attachment dimensions of PM 5319 CM

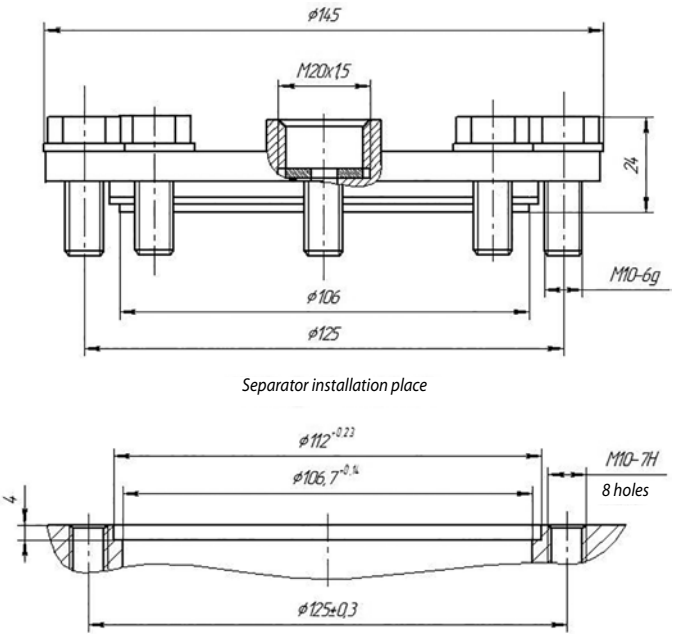


Figure 4 – Structure, overall and attachment dimensions of PM 5320

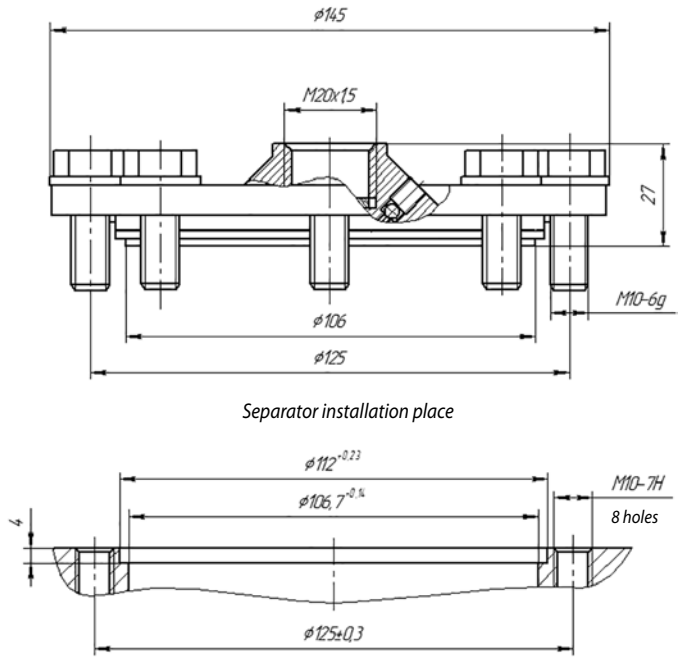


Figure 5 – Structure, overall and attachment dimensions of PM 5320C

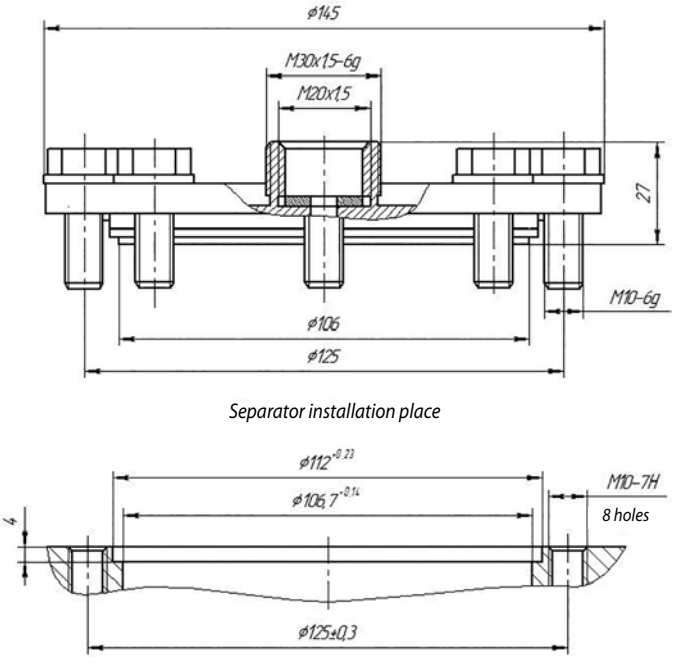
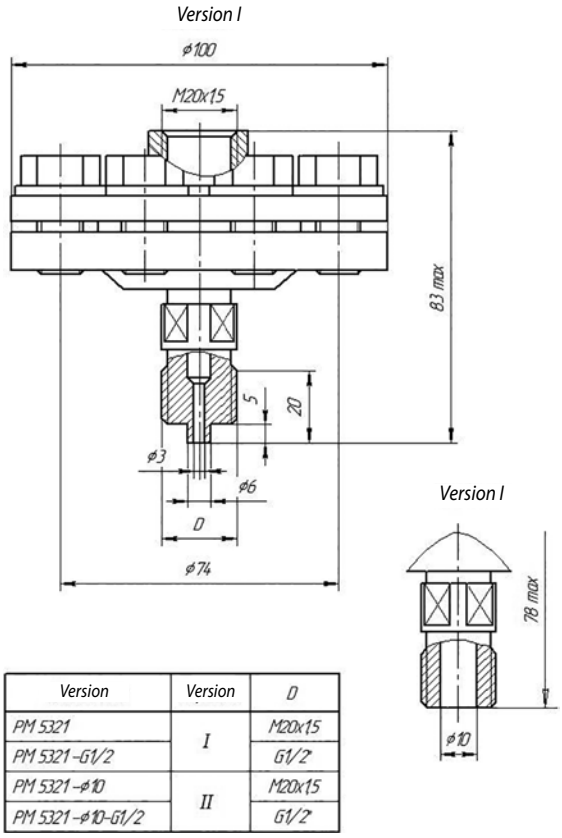
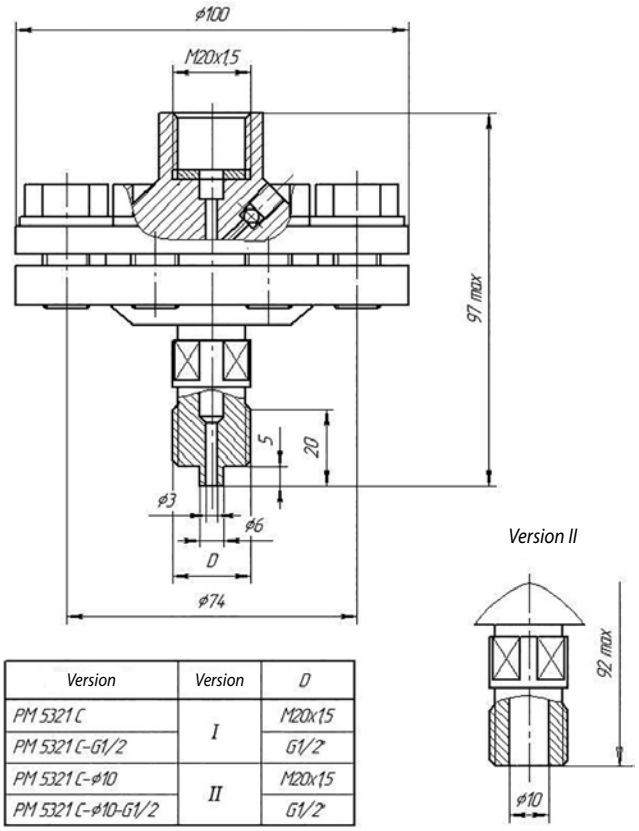


Figure 6 – Structure, overall and attachment dimensions of PM 5320 C-M30



Version	Version	D
PM 5321	I	M20x15
PM 5321-G1/2		G1/2
PM 5321-ø10	II	M20x15
PM 5321-ø10-G1/2		G1/2

Figure 7 – Design, overall and attachment dimensions of PM 5321



Version	Version	D
PM 5321C	I	M20x15
PM 5321C-G1/2		G1/2
PM 5321C-ø10	II	M20x15
PM 5321C-ø10-G1/2		G1/2

Figure 8 – Design, overall and attachment dimensions of PM 5321C

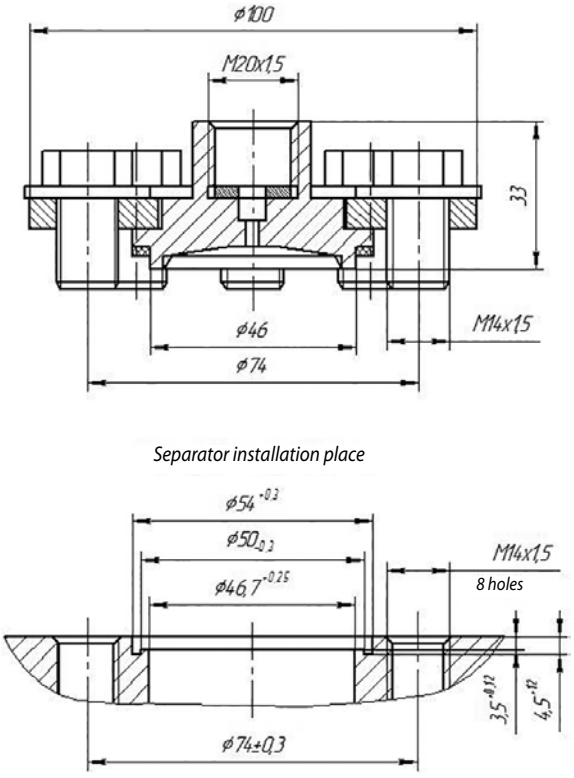


Figure 9 – Design, overall and attachment dimensions of PM 5322

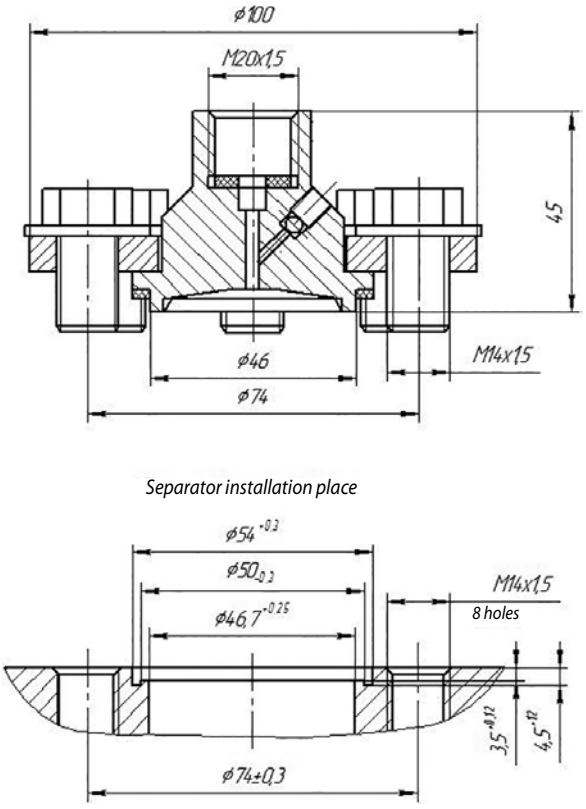


Figure 10 – Design, overall and attachment dimensions of PM 5322C

AIR CLEANER CLOGGING INDICATORS ИЗВ-500, ИЗВ-600, ИЗВ-700

Air cleaner clogging indicators ИЗВ-500, ИЗВ-600, ИЗВ-700 (hereinafter – indicators) are designed to monitor clogging of air cleaners in engines of heavy duty vehicles, tractors, and agricultural machinery.

Design and operating principle.

ИЗВ uses a red drum (signal position) as a signaling device. There is a knurled disc on the top of the indicator designed to turn the drum into operating position. The disc is turned in the direction indicated by the pointer until it stops and then released.

The drum remains fixed in this position and automatically moves to signal position when the maximum allowable clogging of the air cleaner is reached.

At the same time, red paint appears in the indicator housing windows, which means that the air cleaner requires maintenance. After maintenance, it is necessary to reset the indicator drum to operating position. The indicators are non-restorable, single-function, non-repairable products.

Climatic version and placement category:	У2 – for operation at a temperature of –40 to +80 °C and relative air humidity up to 95 % at 35 °C.
Device weight:	≤ 0.1 kg.
Average service life:	≥ 8 years.
Guarantee period of storage:	16 months from the date of manufacture.
Guarantee service life:	24 months from the date of commissioning.

GENERAL SPECIFICATIONS

The value of measured vacuum at which ИЗВ signal is followed, kPa, is specified in Table 1.

TABLE 1

Indicators	The value of measured vacuum at which the signal is followed, kPa
ИЗВ-500	5 ± 0.25
ИЗВ-600	6 ± 0.30
ИЗВ-700	7 ± 0.35

The operating position of ИЗВ is vertical with the 30° deflection angle.

Indicators are resistant to:

– sinusoidal vibration with acceleration up to 5 g at a frequency up to 90 Hz and amplitude not higher than 1 mm;

– impact loads with acceleration up to 10 g.

ИЗВ DESIGNATION STRUCTURE

Air cleaner clogging indicator ИЗВ – X – X X

The value of vacuum gauge pressure at which the signal is processed:
"500" 5 ± 0.25 kPa
"600" 6 ± 0.30 kPa
"700" 7 ± 0.35 kPa

Climatic version and placement category as per GOST 15150-69:
"У2" – for supply to macroclimatic regions with moderate climate.

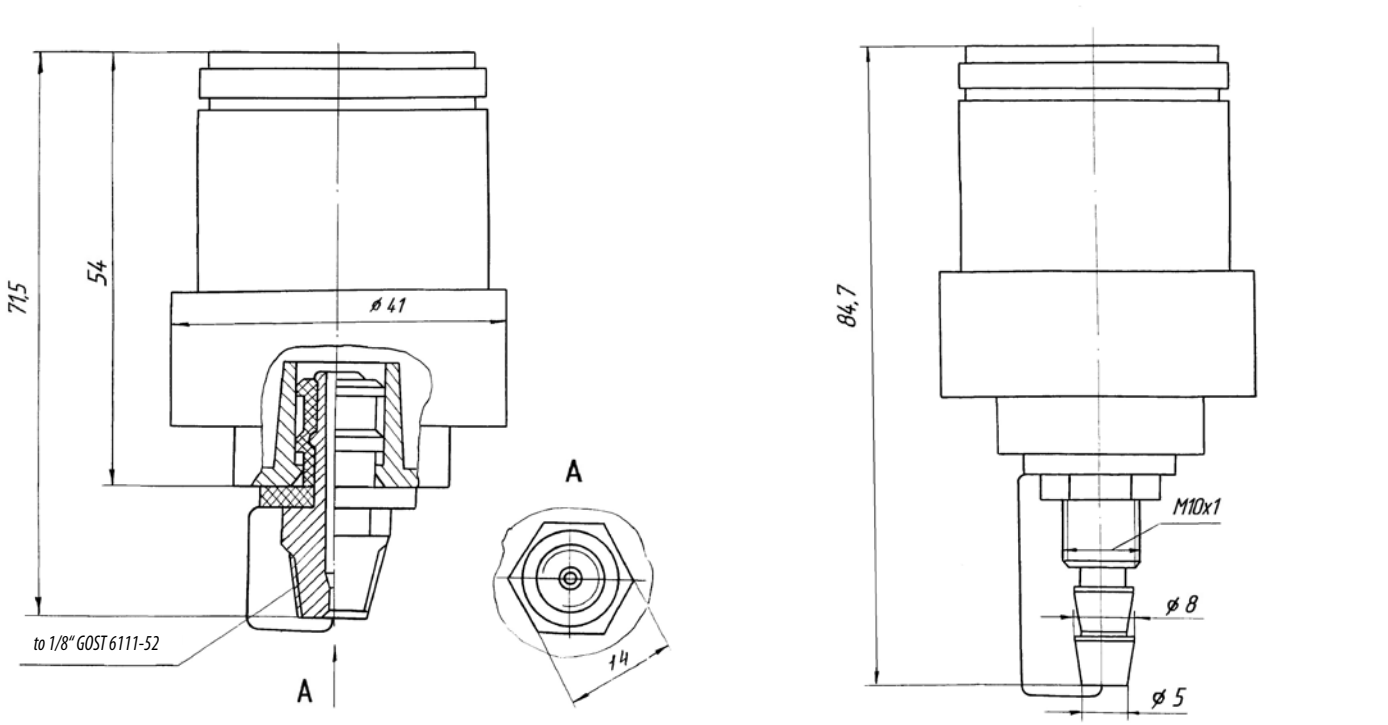
"ТУ 25.02-1749-75"
"ТУ 25.02.ЭД1.1749-78" – export version.

ORDERING INFORMATION FOR THE INDICATOR:

Clogging indicator with a measuring limit of 7 kPa, connecting nozzle threaded as per GOST 6111-52, climatic version У2:
"Air cleaner clogging indicator ИЗВ-700, threaded nozzle, ТУ 25.02-1749-75".

Clogging indicator with a measuring limit of 5 kPa, connecting nozzle for tubing, climatic version У2, supplied for export:
"Air cleaner clogging indicator ИЗВ-500-У2, tubing, ТУ 25.02.ЭД1.1749 78".

OVERALL AND ATTACHMENT DIMENSIONS



a) threaded nozzle; **b) tubing.**

Figure 1 – Overall and attachment dimensions of ИЗВ.

INDICATING POINTER DIFFERENTIAL PRESSURE GAUGES ДСП-80 РАСКО, ДСП-80В РАСКО

Indicating pointer differential pressure gauges ДСП-80 РАСКО (hereinafter – devices) are intended for measuring differential pressure of various gases that are nonaggressive to the used structural materials, including those on gas meters, gas filters, flow straighteners and other devices in order to monitor their technical condition and contamination level.

Differential pressure gauges are used in gas supply systems for household and industrial facilities and are connected to pressure tap points upstream and downstream of monitored gas equipment in compliance with Regulations ПР50.2.019 2006.

Differential pressure gauges are restorable, repairable, single-function products.

Climatic version and placement category:	У3 – for operation at a temperature of –40 to +70 °C and relative humidity up to 98 % at temperature 35 °C.
IP rating:	IP55 as per GOST 14254-2015
Calibration interval:	1 year.
Device weight: differential pressure gauge differential pressure gauge with three-valve block	≤ 1.1 kg. ≤ 2.8 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	18 months from the date of commissioning.

GENERAL SPECIFICATIONS

The maximum allowable operating gauge pressure – 0.6; 1; 1.6 MPa.
The differential pressure measuring range is 0 to 1; 1.6; 2.5; 4; 6; 10; 16; 25; 40 kPa.
The operating medium temperature is –30 to +60 °C.
The accuracy class and allowable basic error limit, expressed in percent of indication range, shall comply with Table 1.

TABLE 1

Accuracy class	Allowable basic error limit, %
1.5	±1.5
2.5	±2.5

ДСП-80 DESIGNATION STRUCTURE

Differential pressure gauge ДСП-80 – (X) РАСКО (X) – (X) – (X) – (X) – (X) – (X)

"" without three-valve block;
"B" – with three-valve block.

Upper range limit of differential pressure with measurement unit specified:
1; 1.6; 2.5; 4; 6; 10; 16; 25; 40 kPa.

Maximum allowable operating gauge pressure:
"0.6 MPa";
"1 MPa";
"1.6 MPa".

Accuracy class:
"1.5";
"2.5";
"И" accuracy class 4 (indicator version)

Installation kit:
"K" – with bracket for rack mounting

Coupling thread type:
"M12" – M12x1.5;
"M20" – M20x1.5.

With threaded-end connecting pipe:
"TC M12" – M12x1.5;
"TC M20" – M20x1.5;
"TC G 1/2" – G 1/2-B.

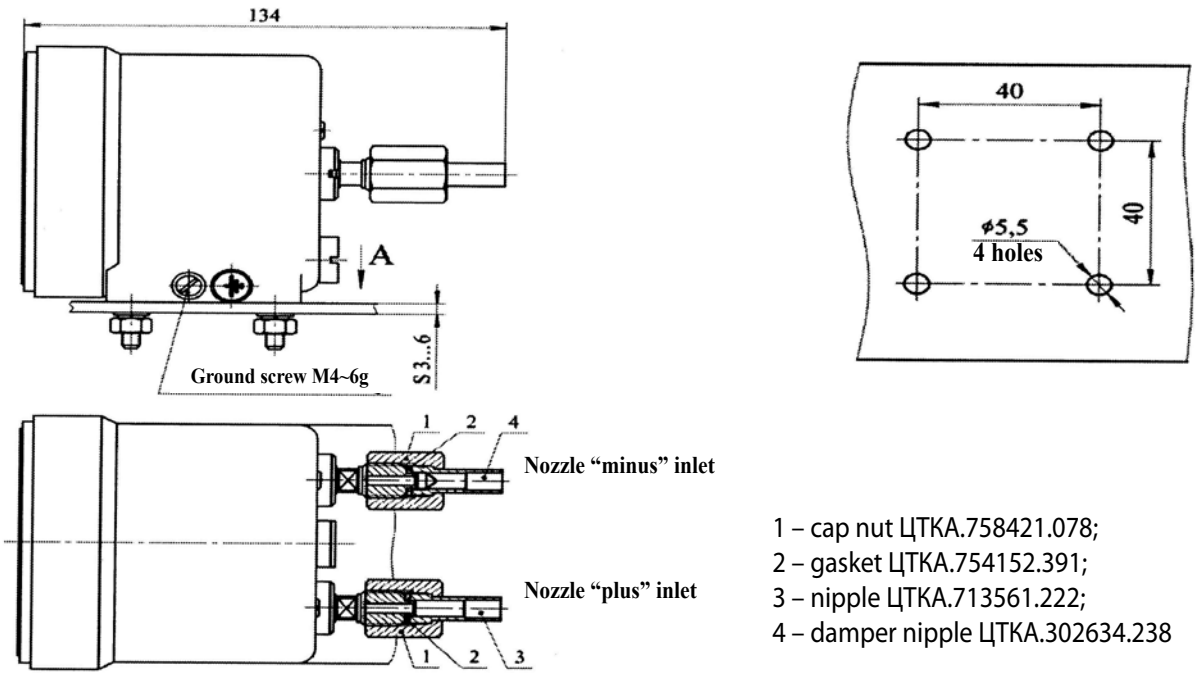
ORDERING INFORMATION FOR THE DIFFERENTIAL PRESSURE GAUGE:

Indicating pointer differential pressure gauge ДСП-80 "РАСКО" with upper range limit of differential pressure of 4 kPa, operating pressure limit of 1 MPa, accuracy class 1.5, with M12 coupling thread:
"Differential pressure gauge ДСП-80 РАСКО – 4 кПа-1 МПа-1,5-М12 ТУ 4212-127-00227471-2007".

The same when supplied with valve block and bracket:
"Differential pressure gauge ДСП-80В РАСКО – 4 кПа-1 МПа-1,5-К-М12 ТУ 4212-127-00227471-2007".

Indicating pointer differential pressure gauge ДСП-80 "РАСКО" with upper range limit of differential pressure of 4 kPa, operating pressure limit of 1 MPa, indicator type, with coupling thread M12, with M20x1.5 threaded-end connecting pipe:
"Differential pressure gauge ДСП-80В РАСКО – 4 кПа-1 МПа-И-М12-ТС М20 ТУ 4212-127-00227471-2007".

OVERALL AND ATTACHMENT DIMENSIONS



1 – cap nut ЦТКА.758421.078;
2 – gasket ЦТКА.754152.391;
3 – nipple ЦТКА.713561.222;
4 – damper nipple ЦТКА.302634.238

Figure 1 – Overall and attachment dimensions of differential pressure gauge ДСП-80 РАСКО with installation kit

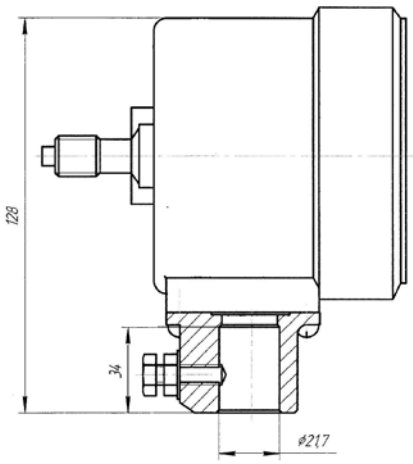


Figure 2 – Overall and attachment dimensions of differential pressure gauge ДСП-80 РАСКО with a bracket

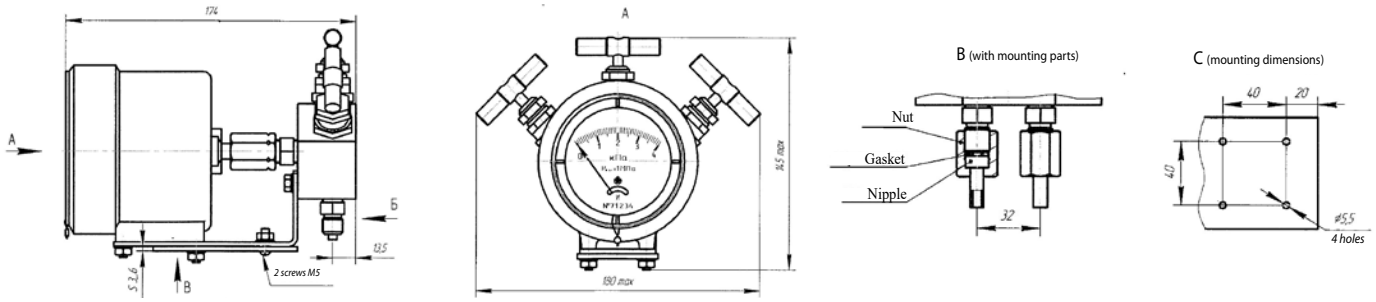


Figure 3 – Overall and attachment dimensions of differential pressure gauge ДСП-80В РАСКО

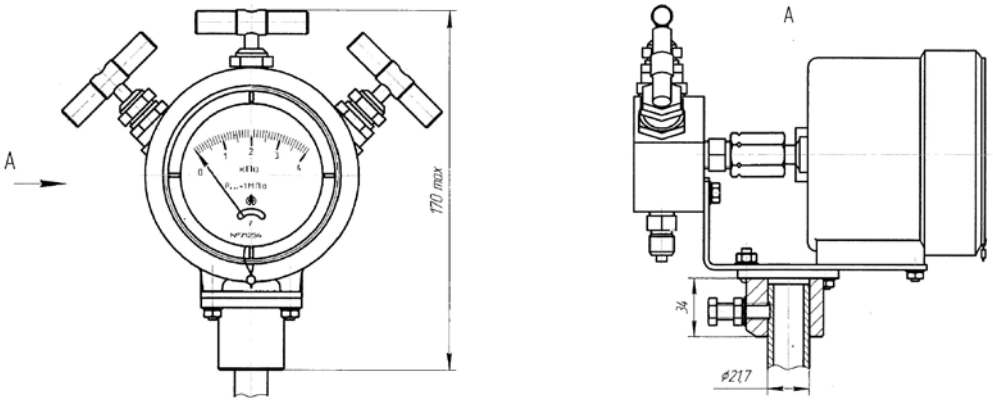
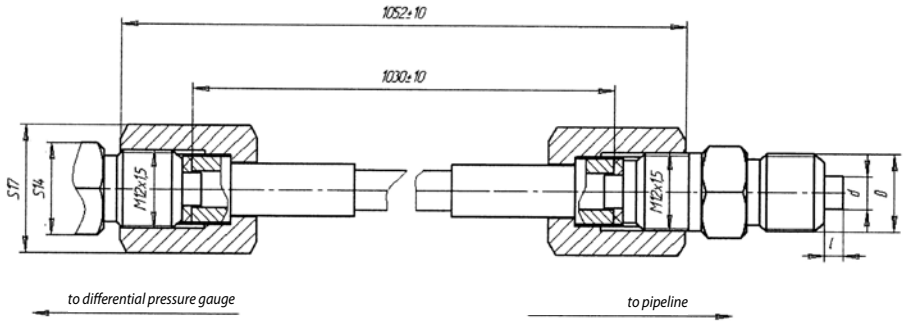


Figure 4 – Overall and attachment dimensions of the ДСП-80В РАСКО differential pressure gauge with a bracket



D	d, mm	L, mm
M12x1.5	5	3
M20x1.5	6	5
G 1/2-B	6	5

Figure 5 – Overall and attachment dimensions of connecting pipe

DIFFERENTIAL PRESSURE INDICATORS ИРД-80 РАСКО

Differential pressure indicators ИРД-80 РАСКО (hereinafter – indicators) are intended for monitoring the clogging level of cleaning units, flow straighteners, and other devices for monitoring of gas equipment, and also for monitoring the differential pressure of water and other pressurized nonaggressive liquids.

Indicators ИРД-80С РАСКО-Ex shall operate jointly with IS devices or power sources with integrated IS barrier with appropriate scope of application and Ex marking [Exib] IIB guaranteeing intrinsic safety of the output circuit of the ИРД-80С РАСКО-Ex indicator and installed outside the explosion hazard area.

Indicators ИРД-80С РАСКО-Ex can operate jointly with the following IS devices with Ex marking [Exib]IIB:

БПД-24Ex or БПД-24Ex (DIN) ТУ 4264-001-29301297-04;
Корунд М2 or Корунд М21 ТУ 4217-003-29301297-07;
Корунд М3 or Корунд М31 ТУ 4217-003-29301297-07;
Корунд М4 ТУ 4217-003-29301297-07.

It is allowed to use any IS devices or power sources with integrated IS barriers from other manufacturers with appropriate scope of application and Ex marking [Exib] IIB guaranteeing intrinsic safety of the output circuit of the ИРД-80С РАСКО-Ex indicator.

Indicators ИРД-80С РАСКО-Ex have Ex-marking "1Ex ib IIB T4 Gb X" with explosion protection level Gb for electrical equipment group II and explosion protection type "intrinsic safety "ib" for application in explosion hazardous gas mixes, containing gas of subgroup IIB, with maximum surface temperature below 135 °C, shall comply with the requirements of GOST 12.2.007.0, GOST 31610.0 (IEC 60079-0), GOST31610.11(IEC60079-11), GOST IEC 60079-14, GOST R 52350.14 (IEC 60079-14), and are designed to be mounted in indoor and outdoor explosion hazard areas of class 1 and 2 as per GOST IEC 60079-10-1 according to Ex marking, requirements of PUE ("Electrical Installations Code") Chapter 7.3, GOST 31610.10 (IEC 60079-10) and other regulatory documents governing the use of electrical equipment designed for operation in hazardous areas with the risk of explosion of the surrounding explosive gas mixture.

Climatic version and placement category:	У3 – for operation at a temperature of –40 to +70 °C and relative humidity up to 98 % at 35 °C.
IP rating:	IP55 as per GOST 14254-96.
Indicator weight:	≤ 0.8 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	12 months from the date of commissioning.

GENERAL SPECIFICATIONS

Range of differential pressure indications:
– 0 to: 4; 6; 10; 16; 25; 40; 60 kPa – 1.6 MPa;
– 0 to 100; 160; 250; 400 kPa – 4 MPa.

Allowable basic error limit:
±5 % of indication range.

Allowable setpoint actuation error limit:
– on forward stroke ±5 % of indication range;
– on back stroke ±10 % of indication range.

Hysteresis (uncontrollable) of setpoint actuation:
≤ 5 % of indication range.

Threshold setpoint setting range: 20 to 90 % of indication range.

Rated supply voltage – 24 ± 10 V.

Maximum allowable supply voltage – 100 V.

Rated allowable input current – 0.3 A.

Maximum allowable power of switching load – 10 W.

Threshold parameters of external intrinsically safe electrical circuits of ИРД-80С РАСКО-Ex indicators are given in Table 1.

TABLE 1

Parameter description	Parameter value
Maximum input voltage U, V, maximum	40
Maximum input current I, mA	120
Maximum internal inductance L, μH, maximum	10
Maximum internal capacitance C, pF, as maximum	0.05
Maximum external inductance L, mH, maximum	2.0
Maximum external capacitance C, μF, maximum	0.5
Current type	DC, AC
Load type	active

The delivery kit shall comply with that specified in Table 2.

TABLE 2

Document designation	Device description and designation	Qty, pcs. Kit									
		К1	К2	К3	К4	К5	К6	К3Ш***	К4Ш***	К3ШУ**	К4ШУ**
ЦТКА.406123.076	Indicator ИРД-80 РАСКО, or ИРД-80С РАСКО, or ИРД-80С РАСКО –Ex*	1	1	1	1	1	1	1	1	1	1
ЦТКА.715193.028	Nozzle	2	–	–	–	–	–	–	–	–	–
ЦТКА.743561.222	Nipple	2	–	–	–	–	–	–	–	–	–
ЦТКА.754152.391	Gasket	4	2	2	2	–	–	–	–	–	–
ЦТКА.758421.078	Cap nut	2	–	–	–	–	–	–	–	–	–
ЦТКА.715193.032	Nozzle	–	2	–	–	–	–	–	–	–	–
GOST 28941.26-91	Cap nut 2 – 6	–	2	–	–	–	–	–	–	–	–
GOST 28941.27-91	Nipple 2 – 6	–	2	–	–	–	–	–			
ЦТКА.715193.033 – 01	Nozzle	–	–	2	–	–	–	–	–		
		–	–	–	2	–	–	–	–		
GOST 23353-78	Cap nut 1 – 8	–	–	2	–	–	–	2	–	2	–
	Cap nut 2 – 6	–	–	–	2	–	–	–	2	–	2
GOST 23354-78	Ring 1 – 8	–	–	2	–	–	–	2	–	2	–
	Ring 3 – 6	–	–	–	2	–	–	–	2	–	2
ЦТКА.753137.270 – 01	Nozzle	–	–	–	–	–	–	2	–	–	–
		–	–	–	–	–	–	–	2	–	–
ЦТКА.753137.271 – 01	Nozzle	–	–	–	–	–	–	–	–	2	–
		–	–	–	–	–	–	–	–	–	2
	**Electric connector GIC4070S61 form C EN 175301-803	1	1	1	1	1	1	–	–	–	–
ЦТКА.406123.076 РЭ	Operating Manual	1	1	1	1	1	1	–	–	–	–
ЦТКА.406123.076 ПС	Certificate	1	1	1	1	1	1	–	–	–	–

NOTES

1. The K1-K5 kit includes the indicator with M12x1.5 thread, the K6 kit – with thread G1/4.

2. When delivering indicators to the same address, it is allowed, with the consent of the consumer, to enclose one copy of the operating manual for three indicators.

3. *Supplied as per the consumer's order.

4. **Except ИРД-80 РАСКО.

5. ***Designed to connect the monitored item to the coupling line of the indicator (Figure 4).

6. Connecting pipe ЦТКА.302656.010 (Figure 4) can be supplied as per the consumer's order.

ORDERING INFORMATION FOR DIFFERENTIAL PRESSURE INDICATORS:

Differential pressure indicator ИРД-80 РАСКО with differential pressure indication range of 10 kPa, with delivery kit К1:
"Indicator ИРД-80 РАСКО-10кПа-К1– ТУ 4212 135 00227471 2009";

– the same for the version with setpoint:
"Indicator ИРД-80С РАСКО-10кПа-К1– ТУ 4212 135 00227471 2009";

– the same for the explosion-proof version:
"Indicator ИРД-80С РАСКО– Ex-10кПа-К1-ТУ 4212 135 00227471 2009".

ИРД-80 DESIGNATION STRUCTURE

Differential pressure indicator ИРД-80 – X РАСКО X – X – X

"" – without setpoint;
"С" – version with setpoint.

"Ex" – explosion-proof version;

Upper range limit with measurement unit specified:
4; 6; 10; 16; 25; 40; 60; 100; 160; 250; 400 kPa

Delivery kit (see Table 2).

OVERALL AND ATTACHMENT DIMENSIONS

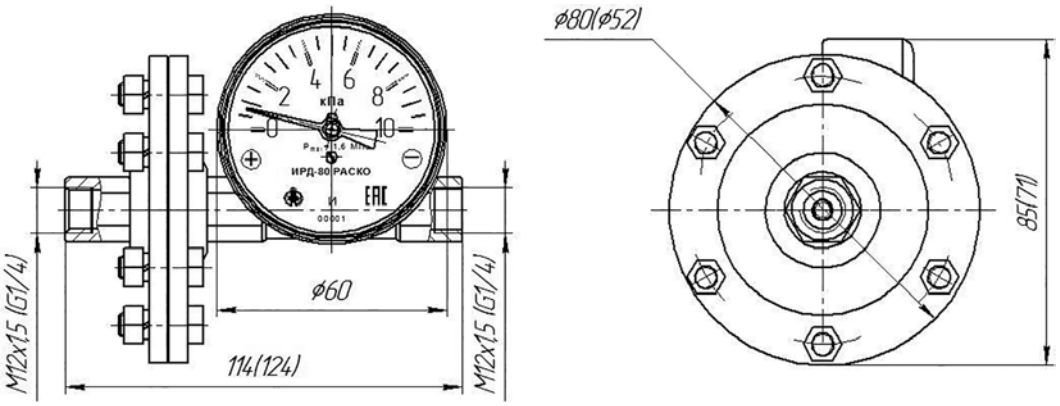
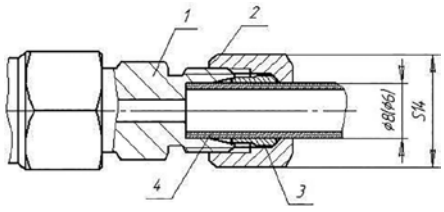
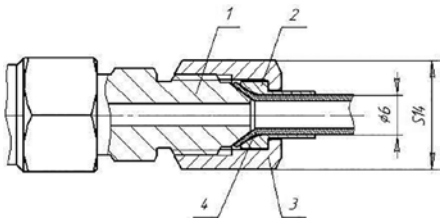


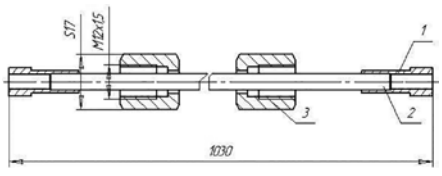
Figure 1 – Overall and attachment dimensions of the indicator



1 – nozzle, 2 – nipple,
3 – gasket, 4 – cap nut,
5 – connecting pipe
Figure 2 – Flared pipe connection



1 – nozzle, 2 – cap nut,
3 – cut ring,
4 – connecting pipe
Figure 3 – Cut ring connection



1 – nipple, 2 – pipe,
3 – cap nut
Figure 4 – Connecting pipe

GAUGE PRESSURE TRANSMITTERS ПД-Р

Gauge pressure transmitters ПД-Р (hereinafter – transmitters) are intended for the proportional conversion of the gauge pressure of liquids, gases, or vapors to standard DC output signal.

Transmitters are used in central process monitoring and control systems at power, heat, water, oil and gas supply facilities; at housing and utilities facilities, in local automation systems for pump, compressor, etc. equipment, and in process monitoring systems.

Climatic version:	УХЛ 3.1 – for operation at a temperature of –10 to +80 °C and relative humidity up to 95 % at 35 °C and lower temperatures.
IP rating:	IP65 as per GOST 14254-96.
Measured medium temperature:	–20 to +150 °C.If the temperature exceeds +80 °C, it is necessary to connect transmitters with the use of a cooling radiator or pulse tube.
Calibration interval:	4 years
Device weight:	0.2 kg.
Average service life:	12 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	18 months from the date of commissioning.

GENERAL SPECIFICATIONS

Output measuring range: 4–20 mA.
Supply voltage: $24^{+6}_{-0,5}$ V.

Load resistance: 0.1 to 500 Ohm.
Power consumption: 1.0 V.

TABLE 2

D	d, mm	l, mm	l1, mm	Lmax, mm
M20×1.5-8h	–	20	–	90
G1/2"	–	20	–	90
G1/4"	–	12	–	83
M12x1.5-8h	∅5	12	3	85

ПД-Р DESIGNATION STRUCTURE

Pressure transmitter ПД-Р – X – X – X

Upper range limit with measurement unit specified:
0.16; 0.25; 0.4; 0.6; 1.0; 1.6; 2.5; MPa

Allowable basic error limit:
"0.25" – ±0.25; "0.5" – ±0.5; "1.0" – ±1.0.

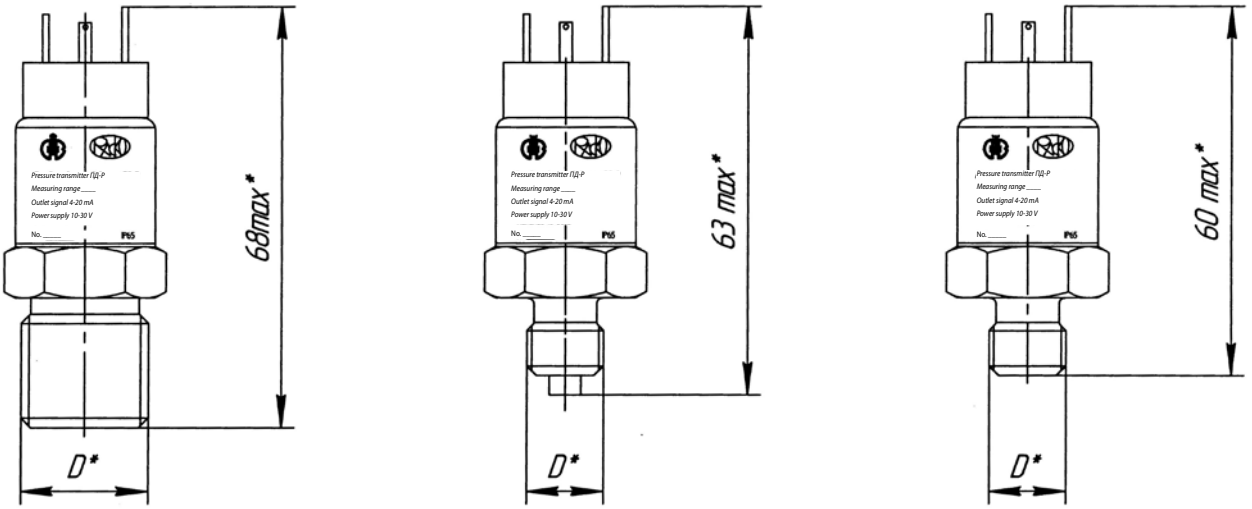
Coupling thread
"M12" – M12×1.5; "G1/2" – G1/2";
"M20" – M20×1.5; "G1/4" – G1/4".

ORDERING INFORMATION FOR THE GAUGE PRESSURE TRANSDUCER:

Gauge pressure transmitter ПД-Р with a upper range limit of 0.6 MPa, with an allowable basic error limit of ±0.5 %, with M20x1.5 coupling thread:
"Gauge pressure transmitters ПД-Р-0,6МПа-0,5-М20 ТУ 4212-133-00227471-2008".

Gauge pressure transducer ПД-Р with an upper range limit of 2.5 MPa, with an allowable basic error limit of ±1.0 %, with G1/2 coupling thread:
"Gauge pressure transmitters ПД-Р-2,5МПа-1,0-G1/2 ТУ 4212-133-00227471-2008".

OVERALL AND ATTACHMENT DIMENSIONS



D – M20x1.5; G1/2 D – M12x1.5 D – G1/4"

Figure 1 – Gauge pressure transmitter ПД-Р

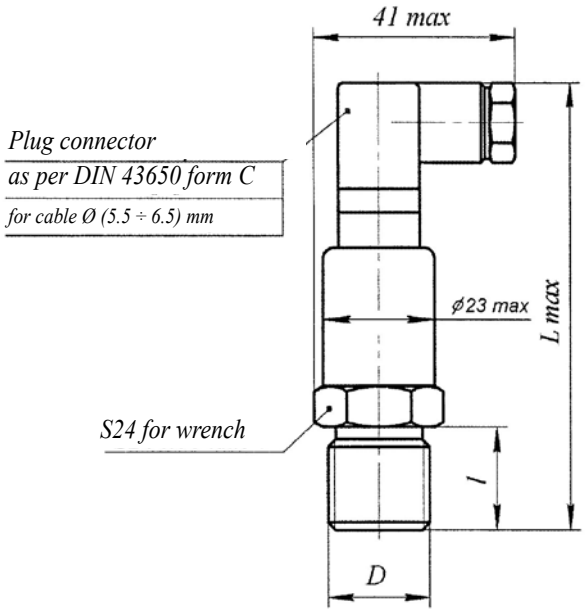


Figure 2 – Overall and attachment dimensions for transmitters with M20x1.5; G1/2", G1/4" coupling thread

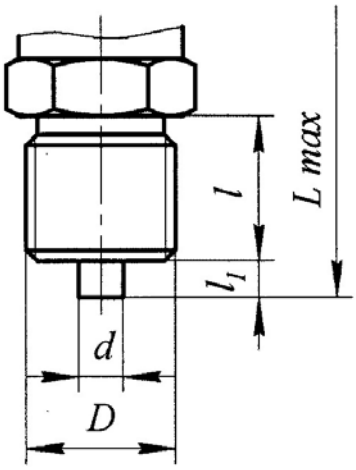


Figure 3 – Overall and attachment dimensions for transducers with M12x1.5 coupling thread

BUTTON VALVES VE-PACKO

Button valves VE-PACKO (hereinafter – devices), normally closed (NC) and normally open (NO) versions. Normally closed (NC) button valves are intended for short-term supply of pressure to pressure gauges (and other mechanical measurement devices) during measurement, and for subsequent pressure release (relief) upon completion of measurement. They help extend the operational lifetime of pressure gauges by eliminating permanent exposure of the sensing element of the pressure gauge to pressure pulsations and by preventing premature wear of its measurement mechanism.

Normally open (NO) button valves are intended for continuous supply of pressure to electronic sensors and pressure transmitters during measurement, and for subsequent short-term pressure release, ensuring convenient zero checking. They are used in gas distribution points (GDP) and plants (GDP), gas supply systems for household and industrial facilities, ventilation and air conditioning systems, boiler houses, heat stations, compressor plants, and other process equipment.

Valves are restorable and repairable products.

Controlled medium:	Air, natural gas, argon, and other gases and liquids that are nonaggressive to copper alloys, stainless steel, and oil and gasoline-resistant rubber.
Climatic version and placement category:	У3 – for operation at a temperature of –40 to +70 °C and relative humidity up to 95 % at 35 °C. УХЛ3.1 – for operation at –10 to +70 °C and relative humidity up to 95 % at 35 °C.
Valve weight:	≤ 0.3 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	12 months from the date of commissioning.

GENERAL SPECIFICATIONS

Maximum operating pressure: 0.6; 1.6 MPa
Type of input and output connection when the button is not pressed:
NC – normally closed
NO – normally open
Coupling thread at the input D and output D1 (from the pressure meter side):
G1/2″, M20x1.5-6H, M12x1.5-8H (for maximum operating pressure 0.6 MPa only)

ORDERING INFORMATION FOR THE BUTTON VALVE:

The VE-PACKO button valve of normally closed type, used at mains operating pressure up to 1.6 MPa, with attachment dimensions G1/2" for the mains (input) and M20x1.5 for measurement equipment (output); operating temperature range from –10 to +70 °C.
"Button valve VE-PACKO-H3-1,6-G1/2-M20-10 ТУ 4212-134-00227471-2009";

The VE-PACKO button valve of normally open type, used at mains operating pressure up to 0.6 MPa, with attachment dimensions M20x1.5 for the mains (input) and M20x1.5 for measurement equipment (output); operating temperature range from –40 to +70 °C.
"Button valve VE-PACKO-HO-0,6-M20-M20-40 ТУ 4212-134-00227471-2009".

BUTTON VALVE DESIGNATION STRUCTURE

Button valve VE-PACKO – X – X – X – X X

Version:
"NC" – normally closed;
"NO" – normally open.

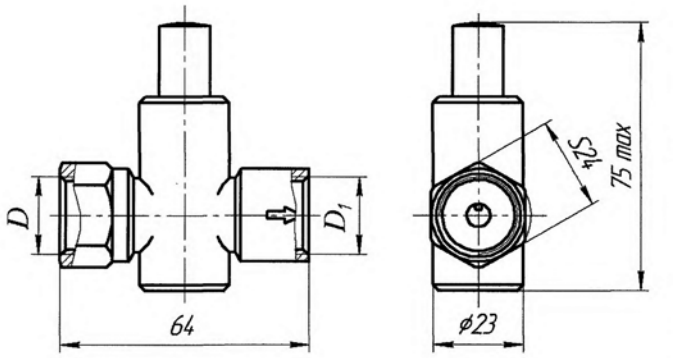
Operating pressure:
"0.6" – 0.6 MPa;
"1.6" – 1.6 MPa.

Coupling thread to connect to the mains (inlet) D (see Fig. 1, 2)

Coupling thread to connect to the measurement equipment (output) D1 (see Fig. 1, 2)

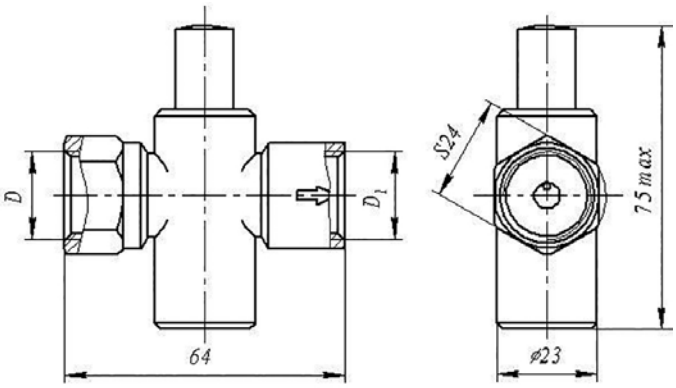
Climatic version and placement category as per GOST 15150-69:
"10" – УХЛ3.1 – for supply to macroclimatic regions with moderate and cold climate.
"40" – У3 – for supply to macroclimatic regions with moderate climate.

OVERALL AND MOUNTING DIMENSIONS



D, mm	D1, mm
G1/2"A	M20x1,5-6H
G1/2"A	G1/2"A
M20x1,5-6H	M20x1,5-6H
G1/2"A	M12x1,5-8H
G1/2"A	G1/4"A

Figure 1 – Valve VE-PACKO of normally closed (NC) type



D	D1
G1/2"A	M20x1,5-6H
G1/2"A	G1/2"A
M20x1,5-6H	M20x1,5-6H

Figure 2 – Valve VE-PACKO of normally open (NO) type

PRESSURE INDICATOR UNITS ИД-1 (WITH PRESSURE HEADS ПД-1)

Climatic version and placement category:	УХЛ2.1, В2.1 Pressure head – for operation at a temperature of –60 to + 75 °C and relative humidity up to 95 % at 35 °C. Indicator – for operation at a temperature of –60 to +60 °C and relative humidity up to 95 % at 35 °C.
IP rating:	Pressure head – IP-55 as per GOST 14254-2015. Indicator – dust-proof and moisture-proof.
Device weight:	≤ 0.8 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	18 months from the date of commissioning.

Pressure indicator units ИД-1 (hereinafter – indicator units) with pressure heads ПД-1 (hereinafter – pressure heads) are intended for remote monitoring of the gauge pressure of liquids in fuel supply, lubrication and cooling systems for internal combustion engines, and also can be used in other systems requiring remote monitoring of the gauge pressure of nonaggressive liquids and gases.

Pressure indicator units consist of pressure head ПД-1 and pressure indicator УД-800/1.

Pressure heads and pressure indicators can be supplied separately.

Indicator units for a pressure up to 1.5 MPa may be equipped with flexible hoses.

As required by the customer, hoses may be supplied separately.

GENERAL SPECIFICATIONS

Upper range limits and operating measuring ranges are specified in Table 1.

TABLE 1

Designation	Upper range limit, MPa	Operating measuring range, MPa
ИД-1	0.1	0.02–0.06
	0.3	0.06–0.24
	0.6	0.1–0.5
	1.5	0.2–1.2
	2.4	0.4–2
	8.0	1–5
	15	2–12
	24	4–20

The allowable basic error limit of the indicator unit in case of complete delivery shall not exceed ±4 % (±1.5 % for the indicator) in the operating range and ±6 % (±2 % for the indicator) in the remaining range of the upper range limit.

When making up the indicator units at consumers' site out of separately supplied pressure heads and pressure indicators, the allowable basic error limit of the indicator unit shall not exceed ±6 % of the upper range limit.

The current consumed by indicator units shall not exceed 0.15 A – at voltages 24 and 27 V.

The length of connecting cable between the pressure head and the pressure indicator along the route shall not be longer than 60 m with a cross section of at least 0.5 mm^2.

ИД-1 DESIGNATION STRUCTURE

Pressure indicator ИД-1 – X – X – X – X – X . X . X

Upper range limit (see Table 1)

DC power voltage:
"24" – 24 $^{+6}_{-2,4}$ V;
"27" – 27 $^{+2,7}_{-3}$ V.

Supply kit (see Table 2): "К1" or "К2"

Length of flexible hose ШГ-16 (for "К2" only):
"Ш550" – 550 mm;
"Ш650" – 650 mm;
"Ш700" – 700 mm;
"Ш800" – 800 mm.

Climatic version and placement category as per GOST 15150-69:
"УХЛ2.1" – for supply to macroclimatic regions with moderate and cold climate.
"В2.1" – for supply to all macroclimatic regions, including land and sea, except the climatic region with cold antarctic climate.

"Д" – when supplied with damper

"Э" – export version

ПД-1 DESIGNATION STRUCTURE

Pressure head ПД 1 – X – X – X – X – X . X . X

Upper range limit (see Table 1)

DC power voltage:
"24" – 24 $^{+6}_{-2,4}$ V;
"27" – 27 $^{+2,7}_{-3}$ V.

Supply kit (see Table 2): "К3" or "К4"

Length of flexible hose ШГ-16 (for "К4" only):
"Ш550" – 550 mm;
"Ш650" – 650 mm;
"Ш700" – 700 mm;
"Ш800" – 800 mm.

Climatic version and placement category as per GOST 15150-69:
"УХЛ2.1" – for supply to macroclimatic regions with moderate and cold climate.
"В2.1" – for supply to all macroclimatic regions, including land and sea, except the climatic region with cold antarctic climate.

"Д" – when supplied with damper

"Э" – export version

УД DESIGNATION STRUCTURE

Pressure indicator УД-800/1 – X – X – X . X

Upper range limit (see Table 1)

DC power voltage:
"24" – 24 $^{+6}_{-2,4}$ V;
"27" – 27 $^{+2,7}_{-3}$ V.

Climatic version and placement category as per GOST 15150-69:
"УХЛ2.1" – for supply to macroclimatic regions with moderate and cold climate.
"В2.1" – for supply to all macroclimatic regions, including land and sea, except the climatic region with cold antarctic climate.

"Э" – export version

ORDERING INFORMATION FOR THE INDICATOR OR ITS COMPONENTS:

indicator unit ИД-1 with an upper range limit of 1.5 MPa, voltage 27 V, kit K1, climatic version and placement category УХЛ2.1:
"Pressure indicator unit ИД-1-1,5МПа-27-К1-УХЛ2.1 ТУ 25-02.110331-84";

pressure head ПД-1 with an upper range limit of 1.5 MPa, voltage 27 V, kit K3, climatic version and placement category УХЛ2.1:
"Pressure head ПД-1-1,5МПа-27-К3-УХЛ2.1 ТУ 25-02.110331-84";

indicator unit ИД-1 with an upper range limit of 1.5 MPa, voltage 24 V, kit K1, climatic version and placement category В2.1, with a damper
"Pressure indicator unit ИД-1-1,5МПа-24-К1-В2.1.Д ТУ 25-02.110331-84";

indicator unit ИД-1 with an upper range limit of 1.5 MPa, voltage 24 V, kit K2, with a 650 mm long flexible hose, climatic version and placement category В2.1
"Pressure indicator unit ИД-1-1,5МПа-24-К2-Ш650-В2.1 ТУ 25-02.110331-84";

pressure head ПД-1 with an upper range limit of 1.5 MPa, voltage 27 V, kit K3, climatic version and placement category УХЛ2.1, when supplied for export
"Pressure head ПД-1-1,5МПа-27-К3.УХЛ2.1.Э ТУ 25-02.110331-84".

The delivery kit of the indicator unit and its components shall comply with that specified in Table 2

TABLE 2

Designation	Device description and designation	Qty, pcs. (copies) Kits				Note
		K1	K2	K3	K4	
2В0.283.940 ПС	Pressure indicator unit ИД-1. Certificate	1	1	-	-	
2В0.283.940 РЭ	Operating Manual	1	1	1	1	
2В2.832.392	Pressure head kit Pressure head ПД-1	1	1	1	1	
ГЕ0.364.126 ТУ	Socket 2РМДТ18КПН4Г5В1В	1	1	1	1	
2В2.832.392 ПС	Pressure head ПД-1. Certificate	-	-	1	1	
ТУ 25-0415.038-84	Indicator kit Pressure indicator unit УД 800/1 or	1	1	-	-	
ТУ 25-0415.038-85	УД801/1 or					
ЦТКА.406222.050	УДМ					
ТУ ОПМ.566.003	Socket connector ШПЛМ – 3	1	1	-	-	2РМДТ18КПН4Г5В1В for УДМ
6ПМ.022.002	Fastening ring	1	1	-	-	
МП4.470.000	Hose kit Flexible hose ШГ-16	-	1	-	1	Supplied when specified in the contract. Hose length to be specified upon order
МП8.652.193-01	Nozzle	-	1	-	1	
МП8.946.001	Washer	-	2	-	2	
МП4.470.000ПС	Flexible hose ШГ-16. Certificate					

NOTES:

1. Pressure indicators units for pressures up to 1.5 MPa (15 kgf/cm^2) are fitted with hoses.
2. When ordered by customers, hoses may be supplied separately.
3. Pressure heads with a damper are supplied as required by the customer.
4. Upon delivery of a batch of devices to the same address, it is allowed to enclose one manual for every 10 devices, unless otherwise stated in the contract.
5. When supplying devices for export, the quantity of certificates shall be as specified in the contract (agreement).

OVERALL AND MOUNTING DIMENSIONS

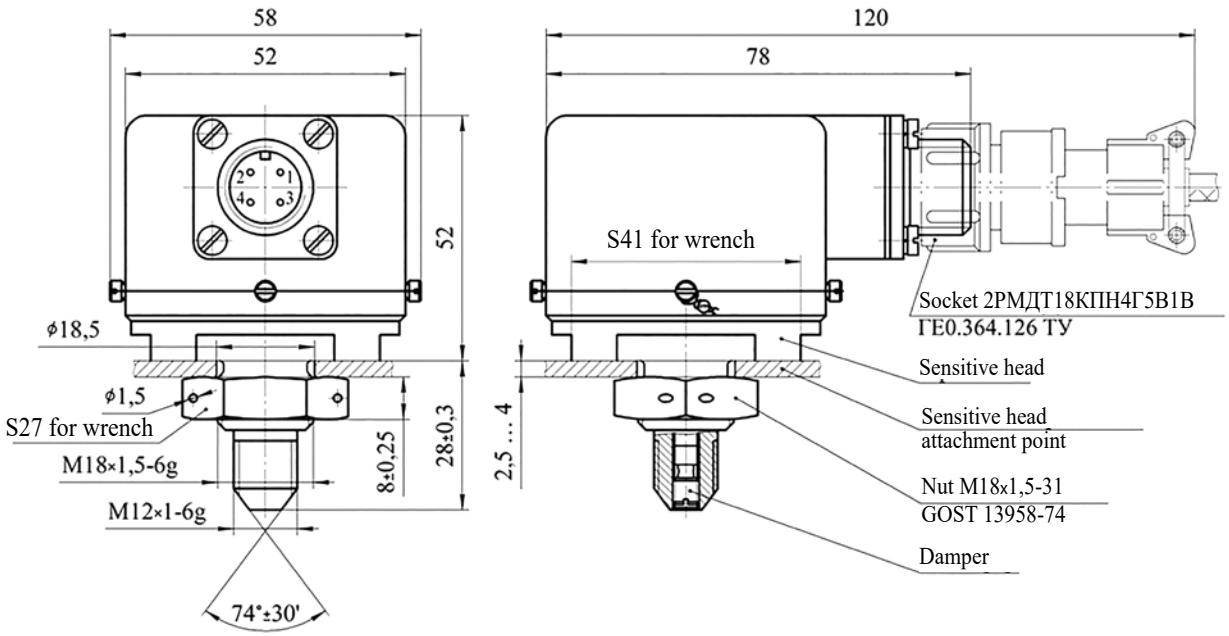


Figure 1 – Overall and attachment dimensions of ПД-1 pressure head

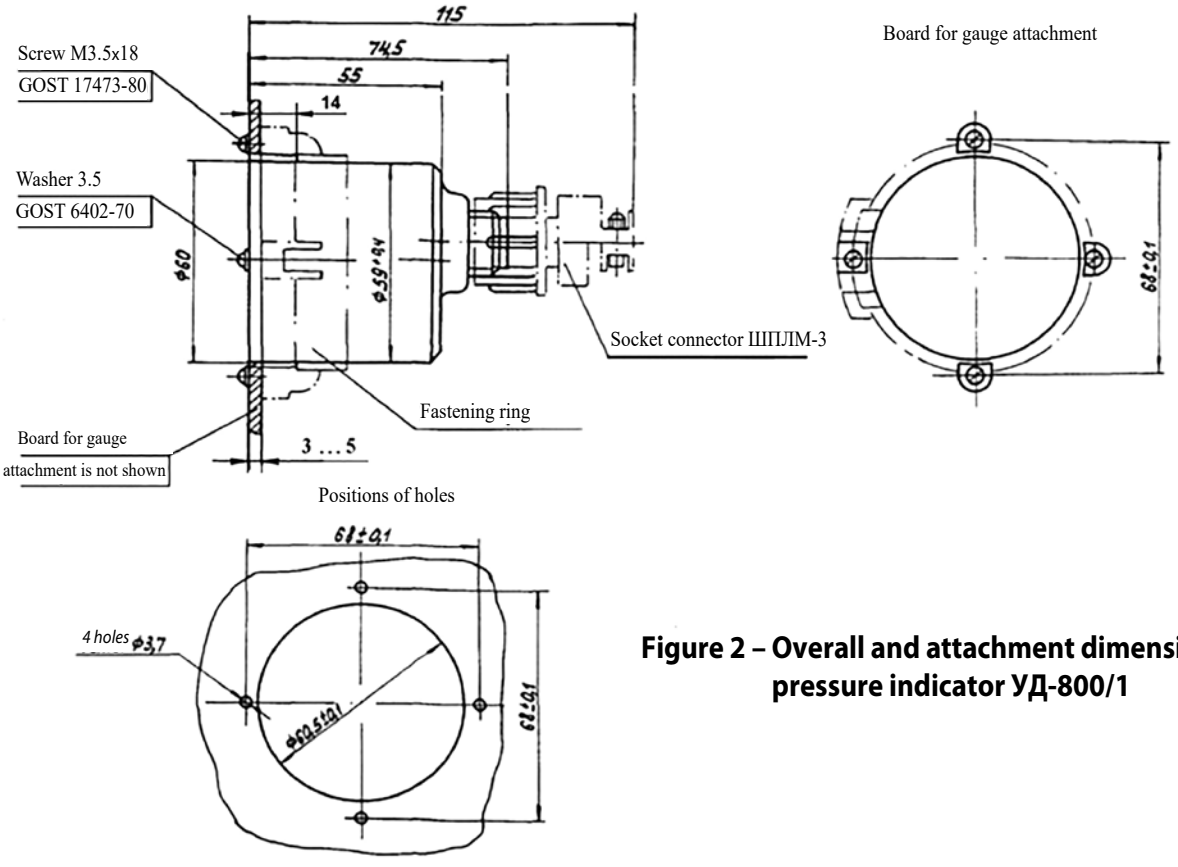


Figure 2 – Overall and attachment dimensions of pressure indicator УД-800/1

PRESSURE HEADS ИД-2

Pressure heads ИД-2 (hereinafter – pressure heads) are designed to convert the gauge pressure of oil in the lubrication systems of internal combustion engines and transmissions, and other nonaggressive liquids to standard current output.

To be issued with the acceptance by the customer's Military Representative Office.

Climatic version and placement category:	O – for operation at a temperature of –50 to +125 °C and relative humidity up to 80 % at 27 °C.
IP rating:	Dust-proof and moisture-proof.
Device weight:	≤ 0.34 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	15 years from the date of manufacture.
Guarantee service life:	10 years within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Pressure heads are resistant to:
– sinusoidal vibration at a frequency of 1–500 Hz and acceleration up to 100 m/s^2.
– atmospheric precipitation (rain) with an upper rate of 15 mm/min during operation.
– dynamic dust (sand) with a concentration of (5 ± 2) g/m^3 at an air velocity of 15 m/s.
– hoar frost and dew.
The output current value is 4 to 20 mA with linear characteristic.
Allowable basic error limit is not higher than ±2 %.
DC power voltage is 27 V.
Power consumption: not higher than 1.5 V·A

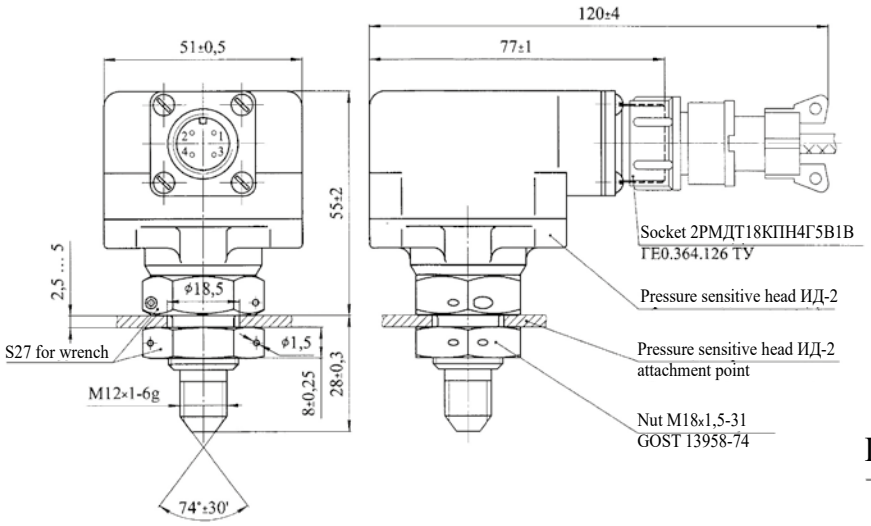


Figure 1 – Pressure head ИД-2 without damper

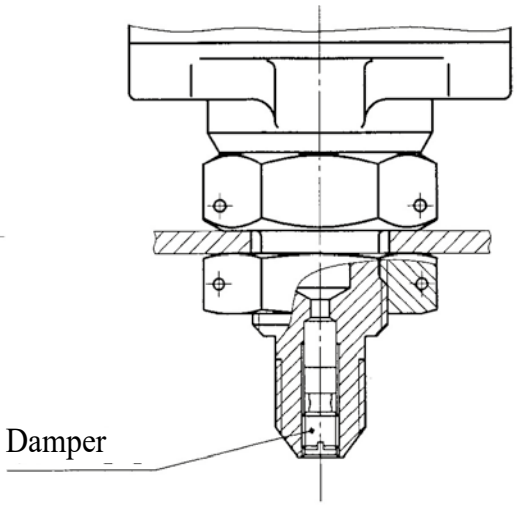
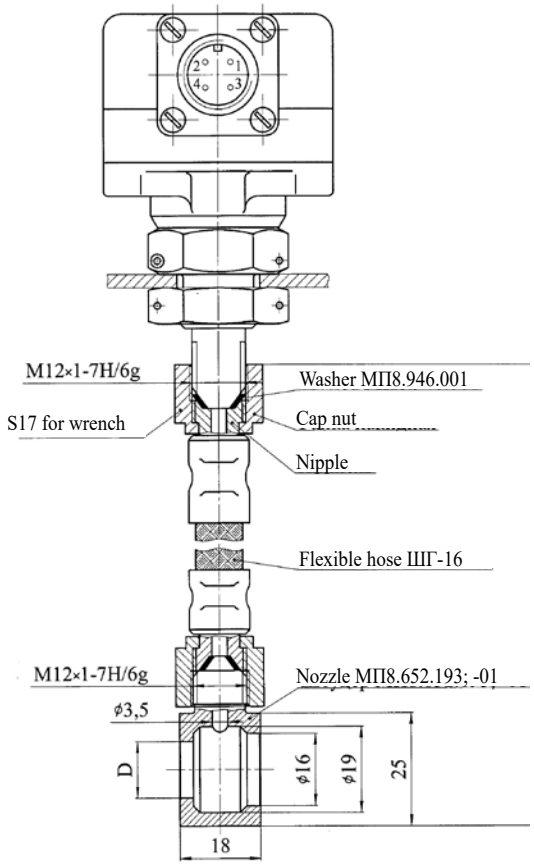


Figure 2 – Pressure head ИД-2 with a damper



Hose length L is selected from the range: 550, 650, 700, 800 mm.
Nozzle tapping diameter D, mm: 12,5H14(+0.43); 16H14(+0.43).

Figure 3 – Pressure head ИД-2 with installation kit M1

SYMBOL DESIGNATION OF ИД-2 PRESSURE HEADS

Pressure head ИД-2 – X – X – X – X – X X

Upper range limit with measurement unit specified:
0.6; 0.7; 1.0; 1.5; 1.6; 2.0; 2.4; 2.5; 4.0; 6.0;
8.0; 10.0; 15.0; 16.0; 20.0; 24.0; 25.0; 40.0 MPa

Coupling thread type:
"M12" – M12x1

"Д" – when supplied with a damper (see Fig. 2)

"Э" – if supplied for export

"M1" – installation kit M1 (see Fig. 3)

The length of ШГ-16 flexible hose (hereinafter – flexible hose), mm, included in installation kit M1:
"(550)" – 550 mm flexible hose;
"(650)" – 650 mm flexible hose;
"(700)" – 700 mm flexible hose;
"(800)" – 800 mm flexible hose

ORDERING INFORMATION FOR SENSITIVE HEADS:

pressure sensitive head ИД-2 with upper measuring limit of 0.7 MPa, with a damper, when supplied to export
"Pressure head ИД-2 – 0,7 МПа – Д – Э ТУ 4212-122-00227471-2006";

the same with installation kit M1, with a 700 mm flexible hose
"Pressure head ИД-2 – 0,7 МПа – Д – Э – М1 (700) ТУ 4212-122-00227471-2006".

SECTION III.
MOTION MEASURING DEVICES

MAGNETIC INDUCTION TACHOMETERS 8TM

Magnetic induction tachometers 8TM (hereinafter – tachometers) are designed to continuously measure the rotation speed of machine and mechanism parts.

Tachometers are connected via a spring-load coupling when rigidly attached to the object or via a flexible shaft when attached to the object by means of shock absorbers. 8TM consists of encased measurement mechanism and drive.

8TM with right/left zero are manufactured with left-handed direction of drive shaft rotation. Left-hand direction of drive shaft rotation means counterclockwise rotation when viewing the tachometer from the drive side.

Climatic version and placement category:	У3 – for operation at a temperature of –50 to +50 °C and relative humidity up to 80 %; Т3 – for operation at a temperature of –10 to +55 °C and relative humidity up to 80 %.
IP rating:	IP54 as per GOST 14254-2015.
Air relative humidity:	up to 95 % at 35 °C.
Accuracy class:	1.0
Tachometer weight: with a dial diameter of 56 mm. with a dial diameter of 89 mm.	 ≤ 0.45 kg. ≤ 0.60 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	30 months from the date of commissioning.

GENERAL SPECIFICATIONS

Allowable basic error of the tachometer, %, maximum:

– within the operating measuring range ±1;

– in the remaining part of the scale (for tachometers with right/left zero – from the upper range limit; for tachometers with center-zero scale – from the sum of upper range limits) ±1.5.

TABLE 1

Tachometer version	Measuring limits, rpm	Operating measuring range, rpm		Tachometer factor	Scale division value, rpm	Dial diameter, mm
		Lower range	Upper range			
with right/left zero						
8TM0,1	5–100	30	100	10:1, 15:1, 20:1, 30:1	1	56
8TM0,5	25–500	150	500	2:1, 3:1, 4:1, 6:1	5	56, 89
8TM1	50–1,000	300	1,000	1:1, 2:1, 3:1	10	56, 89
8TM1.5	75–1,500	450	1,500	1:1, 2:1	20	56, 89
8TM2	100–2,000	600	2,000	1:1, 1:2	20	56, 89
8TM3	150–3,000	900	3,000	1:1, 1:2, 1:3	50	56, 89
8TM4	200–4,000	1,200	4,000	1:1	50	56, 89
with center-zero scale						
8TM0,06-0	3–60	20	60	25:1, 50:1	2	89
8TM0,1-0	5–100	30	100	5:1, 10:1, 15:1, 20:1, 30:1	2	56
8TM0,5-0	25–500	150	500	1:1, 2:1, 3:1, 4:1, 6:1	10	56, 89
8TM1-0	50–1,000	300	1,000	1:2, 1:1, 2:1, 3:1	20	56, 89
8TM1.5-0	75–1,500	450	1,500	1:3, 1:1, 2:1	50	56, 89
8TM2-0	100–2,000	600	2,000	1:1, 1:2, 1:4	50	56, 89
8TM3-0	150–3,000	900	3,000	1:1, 1:2, 1:3, 1:6	100	56, 89

NOTE

Tachometer factor means a ratio of the input rotation speed to the rotation speed indicated by the tachometer.

OVERALL AND ATTACHMENT DIMENSIONS

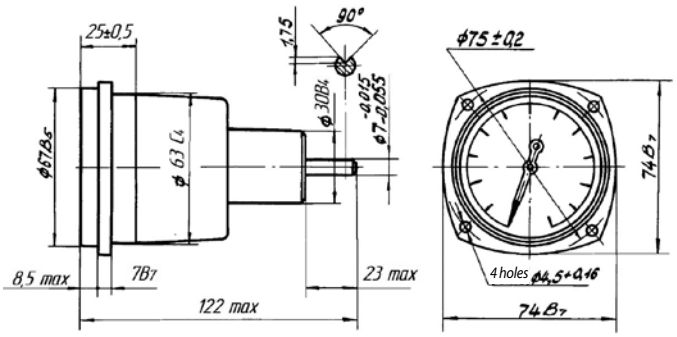


Figure 1 – Overall and attachment dimensions of tachometers with a dial diameter of 56 mm.

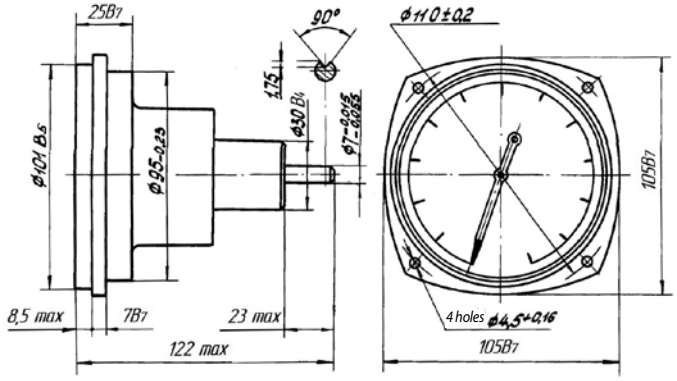


Figure 2 – Overall and attachment dimensions of tachometers with a dial diameter of 89 mm.

8TM DESIGNATION STRUCTURE

Tachometer – X – X . X . X . X

Tachometer version (see Table 1)

Scale type:
"" – right/left zero; "0" – center-zero.

Dial diameter:
"56"; "89".

Tachometer factor (see Table 1)

Climatic version and placement category as per GOST 15150-69:
"У3" – for supply to macroclimatic regions with moderate climate.
"Т3" – for supply to macroclimatic regions with both dry and humid tropical climate.

ORDERING INFORMATION FOR TACHOMETERS:

With an upper range limit of 2,000 rpm, right/left zero scale, dial diameter of 56 mm, factor 1:2, climatic version У3:
"Tachometer 8TM2.56.1:2.У3 ТУ 25.02.111568-77";

the same with center-zero scale:
"Tachometer 8TM2-0.56.1:1.У3 ТУ 25.02.111568-77".

With an upper range limit of 2,000 rpm, right/left zero scale, dial diameter of 56 mm, factor 1:2, climatic version Т3 (export version):
"Tachometer 8TM2.56.1:2.Т3. ТУ 25.02.ЭД1.111568-77".

MAGNETIC INDUCTION TACHOMETERS TM

Magnetic induction tachometers TM (hereinafter – tachometers) are designed to continuously measure the rotation speed of machine and mechanism parts.

Tachometers are connected via a spring-load coupling when rigidly attached to the object or via a flexible shaft when attached to the object by means of shock absorbers.

Climatic version and placement category:	У3 – for operation at a temperature of –60 to +60 °C and relative humidity up to 80 %; Т3 – for operation at a temperature of –10 to +55 °C and relative humidity up to 80 %.
IP rating:	IP54 as per GOST 14254-2015.
Air relative humidity:	up to 95 % at 35 °C.
Accuracy class:	1.0
Tachometer weight:	≤ 1.4 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	30 months from the date of commissioning

GENERAL SPECIFICATIONS

Allowable basic error:

– maximum ±1 % within the operating measuring range;

– maximum ±1.5 % within the remaining part of the scale (for tachometers with right/left zero – % of the upper range limit; for tachometers with center-zero scale – % of the sum of upper range limits).

Tachometer connection method: via a spring-loaded coupling with a shank bore diameter of 25 or 40 mm; with a flexible shaft.

Direction of tachometer drive shaft rotation:

For tachometers with right/left zero – left- or right-handed (the left-handed rotation of the tachometer drive shaft means counterclockwise rotation, the right-handed rotation – clockwise rotation when viewing the tachometer from the drive shaft side);

For tachometers with center-zero scale – two-way.

TABLE 1

Tachometer version	Measuring range, rpm	Operating measuring range, rpm	Tachometer factor	Maximum rotation speed of the tachometer drive shaft, rpm	Scale type	Division value, rpm
TM0,5	25–500	150–500	2:1, 4:1	1,000; 2,000	right/left zero center-zero	5 10
TM0,75	40–750	250–750	2:1, 4:1	1,500; 3,000	right/left zero	10
TM1	50–1,000	300–1,000	1:1, 2:1	1,000; 2,000	right/left zero center-zero	10 20
TM1,5	75–1,500	450–1,500	1:1, 2:1	1,500; 3,000	right/left zero	20
TM2	100–2,000	600–2,000	1:1, 1:2	2,000; 1,000	right/left zero center-zero	20 50
TM2,5	125–2,500	750–2,500	1:1	2,500	right/left zero	1 %
TM3	150–3,000	900–3000	1:1	3,000	right/left zero	50
TM4	200–4,000	1,200–4,000	1:1, 1:2, 1:4	4,000; 2,000; 1,000	right/left zero center-zero	50 100

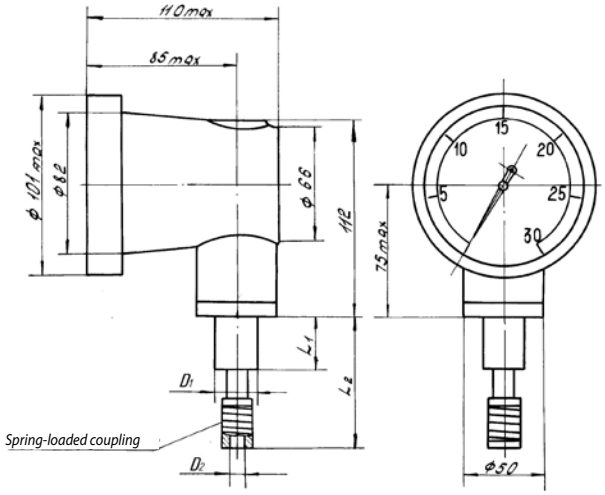
TABLE 1. CONTINUED

Tachometer version	Measuring range, rpm	Operating measuring range, rpm	Tachometer factor	Maximum rotation speed of the tachometer drive shaft, rpm	Scale type	Division value, rpm
TM6	300–6,000	1,800–6,000	1:3	2,000	right/left zero	50
					center-zero	200
TM8	400–8,000	2,400–8,000	1:4	2,000	right/left zero	100
					center-zero	200
TM12	600–12,000	3,600–12,000	1:6	2,000	right/left zero	100
					center-zero	400
TM16	800–16,000	4,800–16,000	1:8	2,000	right/left zero	200
					center-zero	400

NOTES:

- The scale of magnetic induction tachometer TM 2,5 is calibrated in percent.
- Tachometer factor means a ratio of the input rotation speed to the rotation speed indicated by the tachometer.

OVERALL AND ATTACHMENT DIMENSIONS



D1	D2	L1	L2
25 – 0.13	8 + 0.2	30 ± 0.105	77 max
40 – 0.16	12 + 0.2	40 ± 0.105	112 max

Figure 1 – Overall and attachment dimensions of TM connected to the measurement object via a spring-loaded coupling

Flexible shaft is not shown

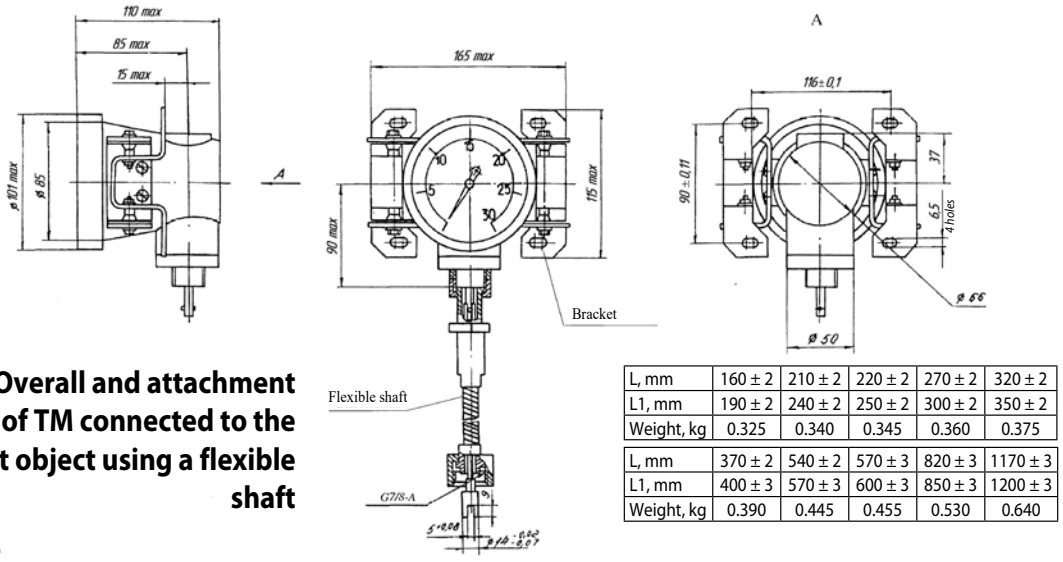


Figure 2 – Overall and attachment dimensions of TM connected to the measurement object using a flexible shaft

L, mm	160 ± 2	210 ± 2	220 ± 2	270 ± 2	320 ± 2
L1, mm	190 ± 2	240 ± 2	250 ± 2	300 ± 2	350 ± 2
Weight, kg	0.325	0.340	0.345	0.360	0.375

L, mm	370 ± 2	540 ± 2	570 ± 3	820 ± 3	1170 ± 3
L1, mm	400 ± 3	570 ± 3	600 ± 3	850 ± 3	1200 ± 3
Weight, kg	0.390	0.445	0.455	0.530	0.640

TM DESIGNATION STRUCTURE

Tachometer – X – X . X . X – X . X X

Tachometer version (see Table 1)

Shaft rotation direction and connection method:
"0" – two-way, using a spring-loaded coupling;
"01" – two-way, using a flexible shaft;
"Л" – left-handed, using a spring-loaded coupling;
"П" – right-handed, using a spring-loaded coupling;
"1Л" – left-handed, using a flexible shaft;
"1П" – right-handed, using a flexible shaft.

Flexible shaft length, mm:

"190" – 190 ± 2;	"400" – 400 ± 3;
"240" – 240 ± 2;	"570" – 570 ± 3;
"250" – 250 ± 2;	"600" – 600 ± 3;
"300" – 300 ± 2;	"850" – 850 ± 3;
"350" – 350 ± 2;	"1200" – 1,200 ± 3.

Tachometer factor (see Table 1).

Climatic version and placement category as per GOST 15150-69:
"У3" – for supply to macroclimatic regions with moderate climate.
"Т3" – for supply to macroclimatic regions with dry and humid tropical climate.

Shank bore diameter (for versions with a spring-loaded coupling), mm:
"25";
"40".

Position of the drive shaft in relation to the dial:
"shaft is down";
"shaft is up";
"shaft is to the right";
"shaft is to the left".

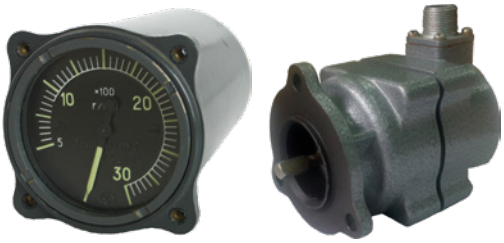
ORDERING INFORMATION FOR TACHOMETERS:

With an upper range limit of 2,000 rpm, 190 mm long flexible shaft, right-handed direction of tachometer drive shaft rotation, right/left zero scale, tachometer factor 1:1, climatic version У3, with the drive shaft in the down position:
"Tachometer ТМ2-1П.190.1:1.У3. shaft down ТУ 25.02.110279-77";

the same for left-handed direction of tachometer drive shaft rotation:
"Tachometer ТМ2-1Л.190.1:1.У3. shaft down ТУ 25.02.110279-77".

With an upper range limit of 4,000 rpm, spring-loaded coupling, shank bore diameter of 25 mm, center-zero scale, tachometer factor 1:4, climatic version У3, with the drive shaft positioned to the right:
"Tachometer ТМ4-0.1:4.У3.25. shaft to the right ТУ 25.02.110279-77".

REMOTE MAGNETIC INDUCTION REMOTE TACHOMETERS TYPE ТМи
(WITH PRIMARY TRANSDUCERS Д-1М, Д-2М, Д-1ММ OR Д-2ММ)



Remote magnetic induction tachometers ТМи type (hereinafter – tachometers) are designed for continuous remote measurement of the rotation speed of machine and mechanism parts. Tachometers consist of primary transducers Д-1М, Д-2М, Д-1ММ, Д-2ММ (hereinafter – primary transducer) and an indicating device of the ТМи type remote magnetic induction remote tachometer (hereinafter – indicating device).

The Д-1М or Д-1ММ primary transducer uses one indicating device, and the Д-2М or Д-2ММ primary transducer – two.

Primary transducers and indicating devices of the same type are respectively interchangeable. Primary transducers and indicating devices can be supplied separately.

The climatic version and placement category of primary transducers:	У2 – for operation at a temperature of –60 to +80 °C and relative humidity up to 80 %; Т2 – for operation at a temperature of –20 to +80 °C and relative humidity up to 80 %
The climatic version and placement category of indicating devices:	У2 – for operation at a temperature of –50 to +50 °C and relative humidity up to 80 %; Т2 – for operation at a temperature of –20 to +50 °C and relative humidity up to 80 %
IP rating:	IP54 as per GOST 14254-2015.
Air relative humidity:	up to 95 % at 35 °C
Accuracy class:	1.0
Weight of indicating device: **Weight of primary transducer:**	≤ 0.55 kg. ≤ 0.90 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	6.5 years from the date of manufacture.
Guarantee service life:	6.5 years within the guarantee period of the devices storage from the date of commissioning

GENERAL SPECIFICATIONS

Allowable basic error of the tachometer, %, maximum:
– within the operating range ±1;
– in the remaining part of the scale (% of the upper range limit) ±1.5.
Communication line between the primary transducer and the indicating device is no longer than 50 m.

TABLE 1

Magnetic induction tachometer version	Measuring range, rpm	Operating measuring range, rpm		Tachometer factor
		Lower range	Upper range	
ТМи1-М1	250–2,500	750	2,500	1:1
ТМи1М	125–1,000	300	1,000	2:1
ТМи1,5	250–1,500	450	1,500	1:1
ТМи2-М1	250–2,000	600	2,000	1:1
ТМи3-М1	300–3,000	900	3,000	1:1
ТМи3М-М1	500–3,000	900	3,000	1:2
ТМи4-М1	400–4,000	1,200	4,000	1:1
ТМи4М-М1	500–4,000	1,200	4,000	1:2
ТМи6	1,000–6,000	1,800	6,000	1:4

NOTE:

- Tachometer factor means a ratio of the input rotation speed to the rotation speed indicated by the tachometer.
- The scale of the ТМи1-М1 tachometer is calibrated in percent.

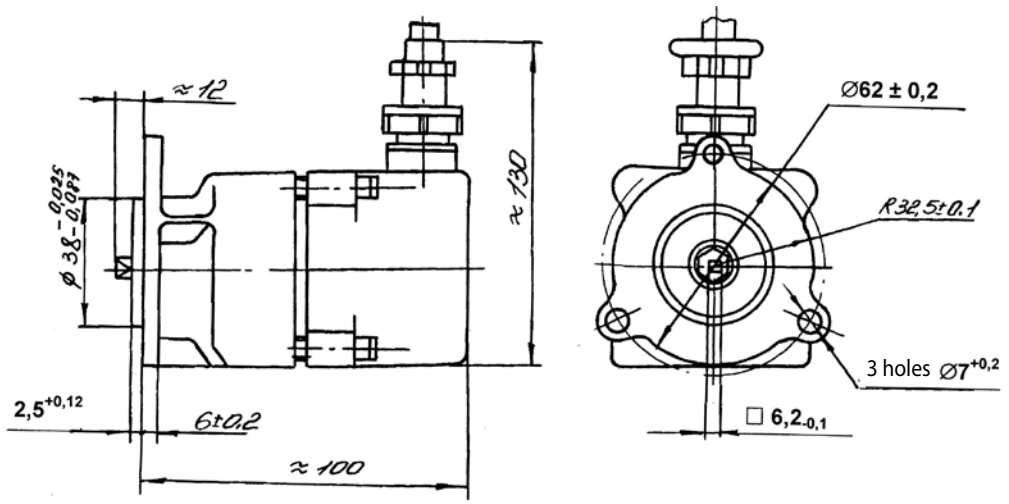


Figure 1 – Overall dimensions of Д-1М, Д-2М primary transducers

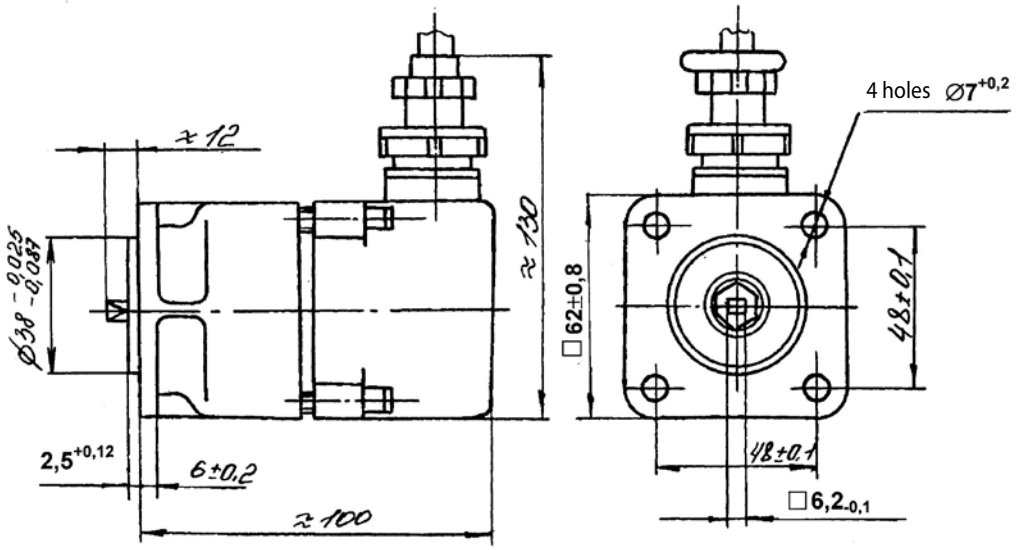


Figure 2 – Overall dimensions of Д-1ММ, Д-2ММ primary transducers

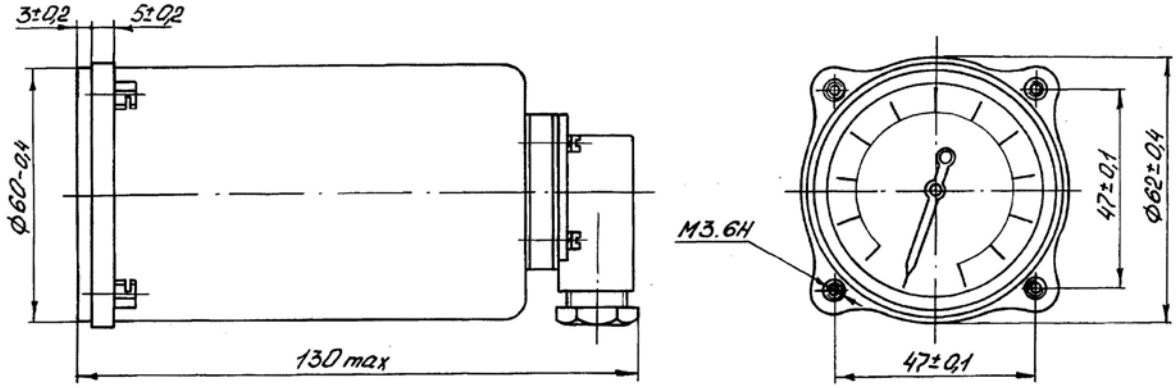


Figure 3 – Overall dimensions of ТМи type indicating devices

The delivery kit shall comply with that specified in Table 2.

TABLE 2

Item No.	Description	Kit number			
		1	2	3	4
		Qty, pcs.			
	Indicating device	1	2	1	2
	Primary transducer:				
1	Д-1М	1	–	–	–
2	Д-2М	–	1	–	–
3	Д-1ММ	–	–	1	–
4	Д-2ММ	–	–	–	1

ORDERING INFORMATION FOR THE TACHOMETER OR ITS COMPONENTS:

ТМи2-М1 tachometer with an upper range limit of 2,000 rpm, climatic version У placement category 2, with installation kit No. 1:
"Tachometer TMu2-M1 У2, kit 1 ТУ25.02.111970-77";

ТМи3М-М1 tachometer with an upper range limit of 3,000 rpm, climatic version Т placement category 2, with installation kit No. 3:
"Tachometer TMu3M-M1 Т2, kit 3 ТУ25.02.111970-77";

ТМи3М-М1 tachometer indicating device with an upper range limit of 3,000 rpm, climatic version Т placement category 2, designed for export:
"Indicating device TMu3M-M1 Т2 ТУ25.02.ЭД1.111970-77";

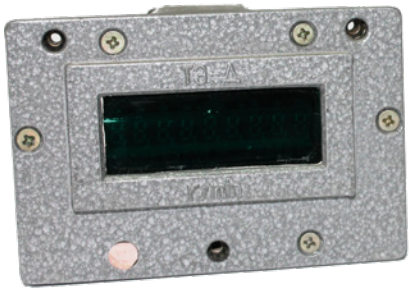
Д-1М tachometer primary transducer operating with one indicating device with a 3-lug flange, climatic version У placement category 2, designed for export:
"Primary transducer Д-1М У2.Э ТУ25.02.ЭД1.111970-77";

Д-2ММ tachometer primary transducer operating with two indicating devices with a 4-lug flange, climatic version Т placement category 2:
"Primary transducer Д-2ММ Т2 ТУ25.02.111970-77".

ELECTRONIC TACHOMETERS ТЭ-Д (WITH PRIMARY TRANSDUCERS ППЭ-Д1, ППЭ-Д2, ДЭМ, ДЭМ-1 OR ДЭМ С)

Electronic tachometers ТЭ-Д (hereinafter – tachometers) are intended for continuous remote measurement of the rotation speed of machine and mechanism parts and output of results on a six-bit digital display.

Tachometers consist of ППЭ-Д1 (ППЭ-Д2) primary transducer (hereinafter – primary transducer) and ТЭ-Д indicating device (hereinafter – indicating device).



The indicating device can be operated with the following frequency conversion sensors: ДЭМ (ТУ В 25-7305.011-89), ДЭМ-1 (ТУ В 311-0227471.025-91), ДЭМ С (ТУ В 25-7305.011-89).

The primary transducer operates with one or two indicating devices.

Indicating devices and primary transducers of the same type are respectively interchangeable.

The indicating device has two discrete outputs to control external devices (setpoints), intended for relay and LED alarm when the threshold rotation speed values are exceeded.

The indicating device has a version with two actuation setpoints of the measured quantity "НУ" and "ВУ" in case of an increase in shaft rotation speed:

"НУ" – low actuation threshold of the rotation speed operating range;

"ВУ" – high actuation threshold of the rotation speed operating range.

Actuation threshold values are programmed in compliance with the order in the course of manufacturing the indicating device.

To be issued with the acceptance by the customer's Military Representative Office.

Climatic version and placement category:	ОМ4 – for operation at a temperature of –10 to +60 °C and relative humidity up to 98 % at 35 °C; ОМ5 – for operation at a temperature of –40 to +60 °C and relative humidity up to 98 % at 35 °C.
IP rating:	IP64 as per GOST 14254-2015
Air relative humidity:	up to 98 % at 35 °C
Accuracy class:	0.1
Measuring element weight: **Sensor weight (ППЭ-Д):**	≤ 0.48 kg. ≤ 0.55 kg.
Average service life:	≥ 12 years.
Guarantee period of storage:	11 years from the date of manufacture.
Guarantee service life:	10 years within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Measurement resolution is 1 rpm.

Measuring cycle – 2 s.

The tachometer provides control (of electromagnetic relay) at a rated voltage of 24 V and has an indicating lamp for setpoint actuation.

Upon actuation of the setpoint, the allowable switching current does not exceed 0.5 A or 70 mA depending on the version of the indicating device with setpoints.

The tachometer operates with the primary transducer distanced within 100 m from the indicating device. The resistance of each wire connecting the primary transducer with the indicating device shall not exceed 2 Ω.

The quantity of significant bits of the indicator is 6. The height of the indicator digits is 9.2 mm (green light).

The indicating device produces a stabilized current in mA to supply power to the primary transducer at load resistance values from 0 to 300 Ohm.

TABLE 1

Primary transducer type	Indication range of the input rotation speed, rpm	Tachometer factor
ППЭ-Д1	1–5,000	1:1
ППЭ-Д2	1–10,000	1:2
ДЭМ, ДЭМ С	100–10,000	1:2
ДЭМ-1	100–5,000	1:1

NOTE

Tachometer factor means a ratio of the input rotation speed to the rotation speed indicated by the indicating device.

METROLOGICAL CHARACTERISTICS AND SPECIFICATIONS

General metrological characteristics and specifications are given in Table 2.

TABLE 2

Characteristic name	Value
Rotation speed measuring ranges f rpm, when a primary transducer is used: – ППЭ-Д1, ППЭ-Д2 – ДЭМ, ДЭМ-1, ДЭМ С	 1 to 5,000 100 to 5,000
Indication range of the input rotation speed, rpm	1 to 10,000
Limits of the allowable basic error in measurement of rotation speed Δ, rpm	± (0.001·f + 1M) M – least division value
The limits of the allowable additional absolute error of the tachometer, caused by variation in ambient air temperature at the site of installation of the indicating device from 20 °C to the extreme operating temperature, rpm – within the range of –40 to 20 °C – within the range of 20 to 60 °C	 ± 3·(0.001·f + 1M) ± 2·(0.001·f + 1M)
The limits of the allowable additional absolute error in tachometer indications, caused by variation in DC power voltage of the indicating device, rpm	± 0.5·Δ
The limits of the allowable additional absolute error of the tachometer, caused by variation in rectified current power voltage of the indicating device, rpm	± 0.5·Δ
The limits of the allowable absolute error in tachometer setpoint actuation, rpm	± (0.001·f + 1M)
Tachometer accuracy class	0.1
Quantity of significant bits of the indicator	6
Measurement resolution, rpm	1
Operating conditions. – atmospheric pressure, kPa – relative humidity at an ambient air temperature of 27 °C, % **Ambient temperature, °C, for:** **1. Indicating device** – ТЭ-Д-ОМ5 – ТЭ-Д-ОМ4 **2. Primary transducer ППЭ-Д1 (ППЭ-Д2)** **3. Primary transducer ДЭМ:** – ДЭМ, ДЭМ-1 – ДЭМ С	 63–101 30 to 80 –40 to +60 –10 to +60 –40 to +80 –40 to +80 –40 to +100
Tachometer power voltage, V: – DC – rectified current	 24^{+12}_{-6} $27^{+2,7}_{-4}$
Tachometer power consumption, V·A, maximum	6
Overall dimensions, mm, maximum: – indicating device – primary transducer ППЭ-Д – primary transducer ДЭМ – cable sealing box	 92.5x62.5x117 62.5x75x108.5 105.5x63x137 50x59x27
Weight, kg, maximum – indicating device – primary transducer ППЭ-Д – primary transducer ДЭМ – cable sealing box	 0.48 0.55 0.7 0.07
Sinusoidal vibration strength: for indicating devices: – frequency, Hz – vibration displacement amplitude, mm – vibration acceleration amplitude, m/s^2 **for primary transducers:** – frequency, Hz – vibration displacement amplitude, mm, – vibration acceleration amplitude, m/s^2	 5–50 (50–5,000) 0.4 (40–100) 5–50 (50–5,000) 1 (100)

PRODUCT COMPOSITION

The delivery kit shall comply with that specified in Table 3.

TABLE 3

Document designation	Device description and designation	Qty, pcs. Kit No.											
		1	2	3	4	5	6	7	8	9	10	11	12
МП5.178.031	Primary transducer ППЭ-Д1	1	1	–	–	1	1	–	–	1	1	–	–
МП5.178.031-01	Primary transducer ППЭ-Д2	–	–	1	1	–	–	1	1	–	–	1	1
МП6.672.005	Cable sealing box	–	1	–	1	–	1	–	1	–	1	–	1
МП7.750.006	Tip	1	1	1	1	1	1	1	1	1	1	1	1
МП7.750.006-01	Tip	1	1	1	1	1	1	1	1	1	1	1	1
ЦТКА.402233.001	Indicating device ТЭ-Д	1	2	1	2	–	–	–	–	–	–	–	–
ЦТКА.402233.001-01	Indicating device ТЭ-Д	–	–	–	–	1	2	1	2	–	–	–	–
ЦТКА.402233.001-02	Indicating device ТЭ-Д	–	–	–	–	–	–	–	–	1	2	1	2
GOST 11371-78	Washer 3.01.08кп.029	3	6	3	6	3	6	3	6	3	6	3	6
GOST 17473-80	Screw ВМ3-6gх16.58.029	3	6	3	6	3	6	3	6	3	6	3	6
ГЕ0.364.126 ТУ	Socket 2РМДТ18КПН4Г5В1В or 2РМДТ18КПН7Г5В1В*	1	2	1	2	1	2	1	2	1	2	1	2
МП5.178.031 ПС	Certificate	1	1	–	–	1	1	–	–	1	1	–	–
МП5.178.031-01 ПС	Certificate	–	–	1	1	–	–	1	1	–	–	1	1
ЦТКА.402233.001 ПС	Certificate	1	2	1	2	1	2	1	2	1	2	1	2
ЦТКА.402233.001 РЭ	Operating Manual	1	1	1	1	1	1	1	1	1	1	1	1

TABLE 3. CONTINUED 1

Document designation	Device description and designation	Qty, pcs. Kit No.											
		13	14	15	16	17	18	19	20	21	22	23	24
МП5.178.031	Primary transducer ППЭ-Д1	1	1	–	–	1	1	–	–	1	1	–	–
МП5.178.031-01	Primary transducer ППЭ-Д2	–	–	1	1	–	–	1	1	–	–	1	1
МП6.672.005	Cable sealing box	–	1	–	1	–	1	–	1	–	1	–	1
МП7.750.006	Tip	1	1	1	1	1	1	1	1	1	1	1	1
МП7.750.006-01	Tip	1	1	1	1	1	1	1	1	1	1	1	1
ЦТКА.402233.001	Indicating device ТЭ-Д	1	2	1	2	–	–	–	–	–	–	–	–
ЦТКА.402233.001-01	Indicating device ТЭ-Д	–	–	–	–	1	2	1	2	–	–	–	–
ЦТКА.402233.001-02	Indicating device ТЭ-Д	–	–	–	–	–	–	–	–	1	2	1	2
GOST 11371-78	Washer 3.01.08кп.029	3	6	3	6	3	6	3	6	3	6	3	6
GOST 17473-80	Screw ВМ3-6gх16.58.029	3	6	3	6	3	6	3	6	3	6	3	6
ГЕ0.364.126 ТУ	Socket 2РМДТ18КПН4Г5В1В or 2РМДТ18КПН7Г5В1В*	1	2	1	2	1	2	1	2	1	2	1	2
МП5.178.031 ПС	Certificate	1	1	–	–	1	1	–	–	1	1	–	–
МП5.178.031-01 ПС	Certificate	–	–	1	1	–	–	1	1	–	–	1	1
ЦТКА.402233.001 ПС	Certificate	1	2	1	2	1	2	1	2	1	2	1	2
ЦТКА.402233.001 РЭ	Operating Manual	1	1	1	1	1	1	1	1	1	1	1	1

TABLE 3. CONTINUED 2

Document designation	Device description and designation	Qty, pcs. Kit No.											
		25	26	27	28	29	30	31	32	33	34	35	36
МП5.178.031	Primary transducer ППЭ-Д1	1	1	–	–	1	1	–	–	1	1	–	–
МП5.178.031-01	Primary transducer ППЭ-Д2	–	–	1	1	–	–	1	1	–	–	1	1
МП6.672.005	Cable sealing box	–	1	–	1	–	1	–	1	–	1	–	1
МП7.750.006	Tip	1	1	1	1	1	1	1	1	1	1	1	1
МП7.750.006-01	Tip	1	1	1	1	1	1	1	1	1	1	1	1
ЦТКА.402233.001	Indicating device ТЭ-Д	1	2	1	2	–	–	–	–	–	–	–	–
ЦТКА.402233.001-01	Indicating device ТЭ-Д	–	–	–	–	1	2	1	2	–	–	–	–
ЦТКА.402233.001-02	Indicating device ТЭ-Д	–	–	–	–	–	–	–	–	1	2	1	2
GOST 11371-78	Washer 3.01.08кп.029	3	6	3	6	3	6	3	6	3	6	3	6
GOST 17473-80	Screw ВМ3-6gх16.58.029	3	6	3	6	3	6	3	6	3	6	3	6
ГЕ0.364.126 ТУ	Socket 2РМДТ18КПН4Г5В1В or 2РМДТ18КПН7Г5В1В*	1	2	1	2	1	2	1	2	1	2	1	2
МП5.178.031 ПС	Certificate	1	1	–	–	1	1	–	–	1	1	–	–
МП5.178.031-01 ПС	Certificate	–	–	1	1	–	–	1	1	–	–	1	1
ЦТКА.402233.001 ПС	Certificate	1	2	1	2	1	2	1	2	1	2	1	2
ЦТКА.402233.001 РЭ	Operating Manual	1	1	1	1	1	1	1	1	1	1	1	1

TABLE 3. CONTINUED 3

Document designation	Device description and designation	Qty, pcs. Kit No.											
		37	38	39	40	41	42	43	44	45	46	47	48
МП5.178.031	Primary transducer ППЭ-Д1	1	1	–	–	1	1	–	–	1	1	–	–
МП5.178.031-01	Primary transducer ППЭ-Д2	–	–	1	1	–	–	1	1	–	–	1	1
МП6.672.005	Cable sealing box	–	1	–	1	–	1	–	1	–	1	–	1
МП7.750.006	Tip	1	1	1	1	1	1	1	1	1	1	1	1
МП7.750.006-01	Tip	1	1	1	1	1	1	1	1	1	1	1	1
ЦТКА.402233.001	Indicating device ТЭ-Д	1	2	1	2	–	–	–	–	–	–	–	–
ЦТКА.402233.001-01	Indicating device ТЭ-Д	–	–	–	–	1	2	1	2	–	–	–	–
ЦТКА.402233.001-02	Indicating device ТЭ-Д	–	–	–	–	–	–	–	–	1	2	1	2
GOST 11371-78	Washer 3.01.08кп.029	3	6	3	6	3	6	3	6	3	6	3	6
GOST 17473-80	Screw ВМ3-6gх16.58.029	3	6	3	6	3	6	3	6	3	6	3	6
ГЕ0.364.126 ТУ	Socket 2РМДТ18КПН4Г5В1В or 2РМДТ18КПН7Г5В1В*	1	2	1	2	1	2	1	2	1	2	1	2
МП5.178.031 ПС	Certificate	1	1	–	–	1	1	–	–	1	1	–	–
МП5.178.031-01 ПС	Certificate	–	–	1	1	–	–	1	1	–	–	1	1
ЦТКА.402233.001 ПС	Certificate	1	2	1	2	1	2	1	2	1	2	1	2
ЦТКА.402233.001 РЭ	Operating Manual	1	1	1	1	1	1	1	1	1	1	1	1

NOTES

1. The specified designations of indicating devices ЦТКА.402233.001, -01; -04; -05; -08; -09 correspond to climatic version ОМ5 as per GOST 15150-69.
2. The specified designations of indicating devices ЦТКА.402233.001-02, -03; -06, -07, -10, -11 correspond to climatic version ОМ4 as per GOST 15150-69.
3. The specified designations of indicating devices ЦТКА.402233.001 ... 03 correspond to the version of the indicating device without setpoints.
4. The specified designations of indicating devices ЦТКА.402233.001-04 ... 07 correspond to the version of indicating device with setpoints and a switching current of 1 A.
5. The specified designations of indicating devices ЦТКА.402233.001-08 ... 11 correspond to the version of indicating devices with setpoints and a switching current of 70 mA.
6. The versions of indicating devices ЦТКА.402233.001-01, ЦТКА.402233.001-03, ЦТКА.402233.001-05, ЦТКА.402233.001-07, ЦТКА.402233.001-09, ЦТКА.402233.001-11 correspond to the export version.
7. Cable sealing box МП6.672.005 is supplied as an option when requested by the consumer.
8. * The designation of socket 2РМДТ18КПН7Г5В1В corresponds to the version of indicating device with setpoints.
9. Primary transducers and indicating devices can be supplied separately.
10. When delivering a batch of at least 10 indicating devices and (or) primary transducers to the same address, one copy of the Operating Manual shall be enclosed per three indicating devices and (or) three primary transducers. Other quantities of Operating Manuals, where necessary, shall be stipulated by the contract.
11. If tachometers are supplied in the export version, a package of operating documentation МП5.178.031 ПС, МП5.178.031-01 ПС, ЦТКА.402233.001 ПС, ЦТКА.402141.001 РЭ in Russian and (or) foreign languages shall be enclosed as per requirements of GOST 2.601-2013, GOST 2.610-2006, GOST R 2.901-99.
12. * When supplying tachometers for export, the quantity of certificates shall be as specified in the contract.
13. The manufacturer shall guarantee the quality of translation of the supplied documentation into a foreign language.
Notes: For delivery of tachometers ТЭ-Д, primary transducers ППЭ-Д1 can be replaced with ДЭМ-1, and ППЭ-Д2 can be replaced with ДЭМ.
ДЭМ primary transducers provide operation with one or two indicating devices ТЭ-Д, and ДЭМ-1 – with one, two or three indicating devices.

ORDERING INFORMATION FOR TACHOMETER OR ITS COMPONENTS:

Electronic tachometer ТЭ-Д, climatic version ОМ5, installation kit No. 2, with two setpoints of lower (100 rpm) and upper (1,100 rpm) threshold values of the measured quantity:
"Electronic tachometer ТЭ-Д-ОМ5-К2-НУ100-ВУ1100 ТУ 25-7304.0001-86".

Electronic tachometer ТЭ-Д, climatic version ОМ4, installation kit No. 1 (without setpoints) when supplied for export: ***"Electronic tachometer ТЭ-Д-ОМ4-К1, Э ТУ25-7304.0001-86".***

Indicating device of the electronic tachometer ТЭ-Д, climatic version ОМ5:
"Indicating device ТЭ-Д-ОМ5 ТУ 25-7304.0001-86".

The same when supplied for export: ***"Indicating device ТЭ-Д-ОМ5, Э ТУ 25-7304.0001-86".***

Primary transducer ППЭ-Д1 of the electronic tachometer ТЭ-Д:
"Primary transducer ППЭ-Д1 ТУ 25-7304.0001-86".

The same when supplied for export: ***"Primary transducer ППЭ-Д1, Э ТУ 25-7304.0001-86".***

OVERALL AND ATTACHMENT DIMENSIONS

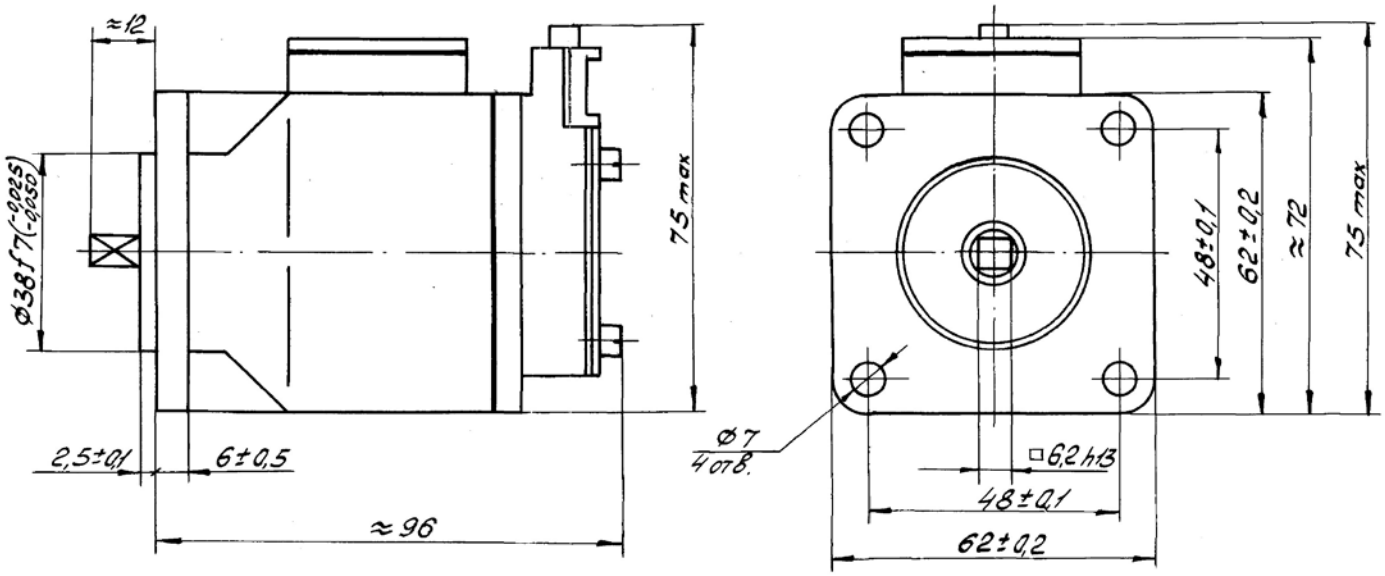


Figure 1 – Overall and attachment dimensions of ППЭ-Д primary transducer

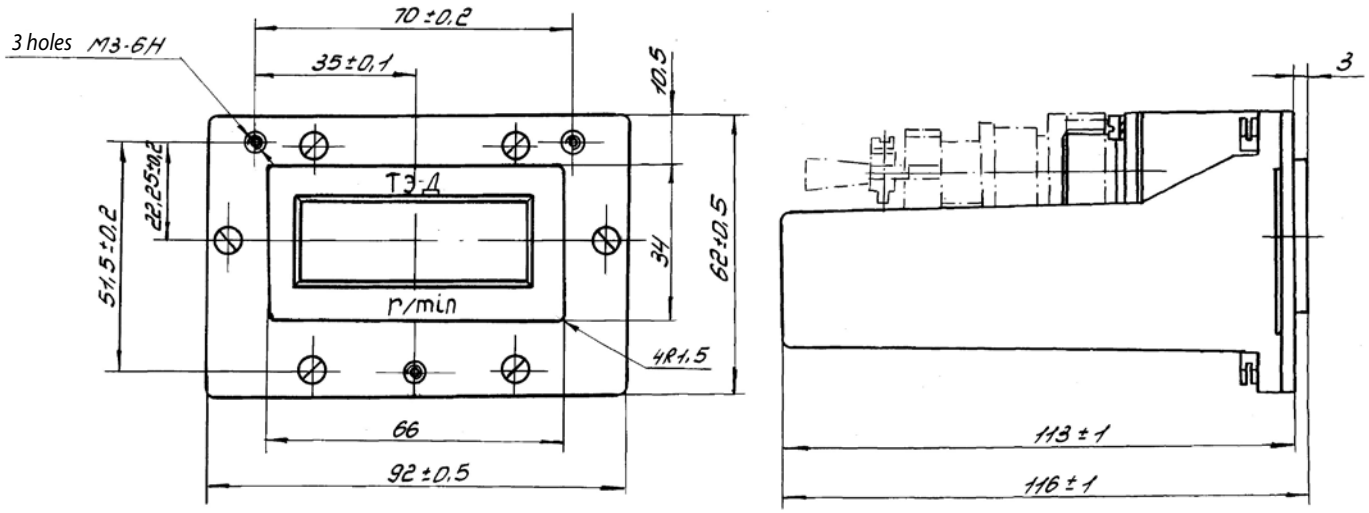


Figure 2 – Overall and attachment dimensions of indicating device ТЭ-Д

ELECTRONIC MAGNETIC INDUCTION SENSORS ДЭМ, ДЭМ-1, ДЭМ С

Magnetic induction electronic sensors ДЭМ, ДЭМ-1, ДЭМ С (hereinafter – sensors) are intended for conversion of rotation speed of machine and mechanism parts to an electric pulse signal with a frequency proportional to rotation speed.

Sensors are restorable, unrepairable, single-function products.

Sensors are serviceable when positioned within 70 m from the indicating device ТЭ-Д.

Probability of fail-safe operation of the sensor for 2,000 h shall be 0.96.

Climatic version and placement category:	О – for operation at a temperature of –40 to +80 °С.
IP rating:	ДЭМ – against rain ДЭМ-1 – IP64 as per GOST 14254-2015 ДЭМ С – against rain
Air relative humidity:	up to 100 % at 35 °С.
Atmospheric pressure:	up to 460 mm Hg
Sensor weight:	≤ 0.7 kg.
Average service life:	≥ 12.5 years.
Guarantee period of storage:	8 years from the date of manufacture.
Guarantee service life:	8 years within the guarantee period of the devices storage from the date of commissioning.

GENERAL SPECIFICATIONS

Upper range limit of the input rotation speed is 5,000 rpm.

Lower range limit of the input rotation speed is 100 rpm.

Supply current value:
ДЭМ – 30 to 86 mA.
ДЭМ-1 – 30 to 130 mA.
ДЭМ С – 30 to 37 mA.

ORDERING INFORMATION FOR THE SENSOR:

- ***"Electronic magnetic induction sensor ДЭМ ТУ В 25-7305.011-89".***
- ***"Electronic magnetic induction sensor ДЭМ-I ТУ В 311-0227471.025-91"***
- ***"Electronic magnetic induction sensor ДЭМ-I ТУ В 311-0227471.025-91. Export"***

OVERALL AND ATTACHMENT DIMENSIONS

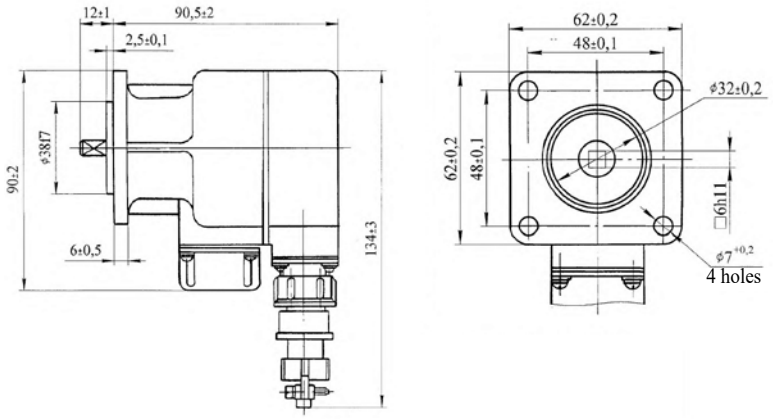


Figure 1 – Overall dimensions of the ДЭМ sensor

TACHOMETER SENSORS Д-4, Д-5

Tachometer sensors – Д-4 and Д-5 (hereinafter – tachometer sensors) are used in magnetic induction tachometers intended for continuous remote measurement of the rotation speed of the engine shaft in systems of transport vehicles and special-purpose machinery.

Tachometer sensors are a three-phase AC generator with a permanent-magnet rotor.

The Д-4 sensor is intended for operation with one measuring device, and Д-5 – for operation with two measuring devices.

Climatic version and placement category:	У2 – for operation at an ambient air temperature of –60 to +125 °C and relative humidity from 30 to 80 %; Т2 – for operation at an ambient air temperature of –60 to +80 °C and relative humidity from 30 to 80 %
Sensor weight:	≤ 0.98 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	3 years from the date of manufacture.
Guarantee service life:	10 years from the date of commissioning.

GENERAL SPECIFICATIONS

Sensors are dust- and splash-proof.

Sensors are resistant to vibration loads at a frequency of 10 to 200 Hz and at acceleration of 100 m/s^2.

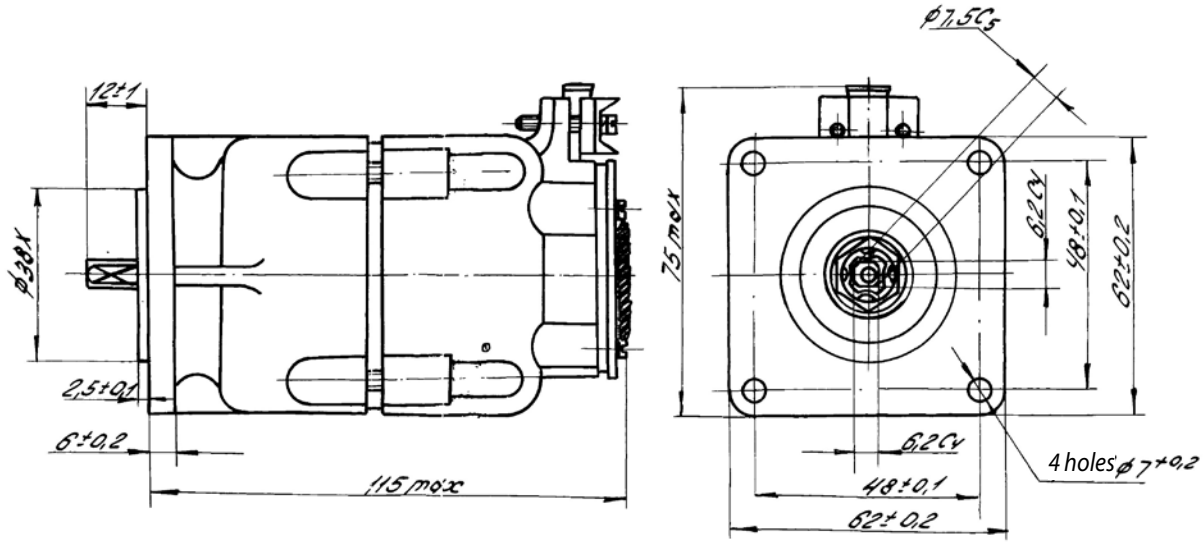
Insulation resistance between the electric circuits and the sensor housings rated at 500 V shall be at least:

– 20 MΩ – at an ambient air temperature of (20 ± 5) °C and relative humidity from 45 to 80 %;

– 2 MΩ – at an ambient air temperature of 35 °C and relative humidity (95 ± 3) %.

Voltage between every two phases of sensor Д-4, loaded with one measuring element, and sensor Д-5, loaded with two measuring elements, is within 10.5 to 12.5 V after one minute of operation at 3,000 rpm on 1:2 scale of the measuring element or 750 rpm on 2:1 scale of the measuring element

OVERALL AND ATTACHMENT DIMENSIONS



SECTION IV.
PROCESS AUTOMATION DEVICES

AIR PRESSURE STABILIZING FILTERS ФСДВ

Climatic version:	У1 – for operation at a temperature of –50 to +60 °C and relative humidity up to 95 % at 35 °C. Т1 – for operation at a temperature of –25 to +60 °C and relative humidity up to 100 %.
IP rating	IPX3 as per GOST 14254-2015.
As to mechanical resistance – vibration resistant and vibration-proof version:	group N3 as per GOST R 52931-2008.
Device weight:	≤ 0.7 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	24 months from the date of commissioning.

Stabilizing filters ФСДВ (hereinafter – stabilizing filters) are intended for final cleaning from mechanical impurities and oil, and also regulation and automatic maintenance of air pressure for feeding pneumatic devices and automation equipment.

They are manufactured in two versions: ФСДВ-6 and ФСДВ-10.

Type of connection to external pneumatic lines of the air pressure stabilizing filter: 00-01-1 (pipe 8 x 1 mm) or 00-02-2 (pipe 6 x 1 mm) as per GOST 25165-82.

Stabilizing filters in corrosion-resistant version "Op" are intended for operation in an environment containing up to 10 mg/m^3 of hydrogen sulfide and/or sulfur dioxide and, in emergency conditions (for 3–4 h), up to 100 mg/m^3 of hydrogen sulfide and/or sulfur dioxide up to 200 mg/m^3.

GENERAL SPECIFICATIONS

Input air contamination classes: 3 or 5 as per GOST 17433-80.
Input pressure:
ФСДВ-6 – 0.25 to 0.6 MPa.
ФСДВ-10 – 0.6 to 1 MPa.
Setting variation range for the controllable output pressure:
ФСДВ-6 – 0.03 to 0.25 MPa.
ФСДВ-10 – 0.03 to 0.6 MPa.
Output air flow rate:
ФСДВ-6 – 8 m^3/h.
ФСДВ-10 – 15 m^3/h.
Allowable difference between the lower input pressure and the upper output pressure: ≤ 0.2 MPa.
Allowable variation in output pressure setting in case of variation in output air flow rate: within ±0.0135 MPa per 1 m^3/h of flow rate variation.

ФСДВ DESIGNATION STRUCTURE

Air pressure stabilizing filter ФСДВ – X – X X

Upper value of input air pressure:
"6" – 0.6 MPa;
"10" – 1 MPa.

Climatic version and placement category as per GOST 15150-69:
"У1" – for supply to macroclimatic regions with moderate climate.
"Т1" – for supply to macroclimatic regions with dry and humid tropical climate.
Version:
"Ор" – corrosion-resistant.

"" – when supplied to domestic market;
"Э" – if supplied for export

ORDERING INFORMATION FOR STABILIZING FILTERS:

Air pressure stabilizing filter ФСДВ with input pressure up to 1.0 MPa, climatic version У1: ***"Air pressure stabilizing filter ФСДВ–10–У1 ТУ 311-00002648.032-93";***

Air pressure stabilizing filter ФСДВ with inlet pressure up to 0.6 MPa, climatic version "Ор": ***"Air pressure stabilizing filter ФСДВ–6–Ор ТУ 311-00002648.032-93".***

OVERALL AND ATTACHMENT DIMENSIONS

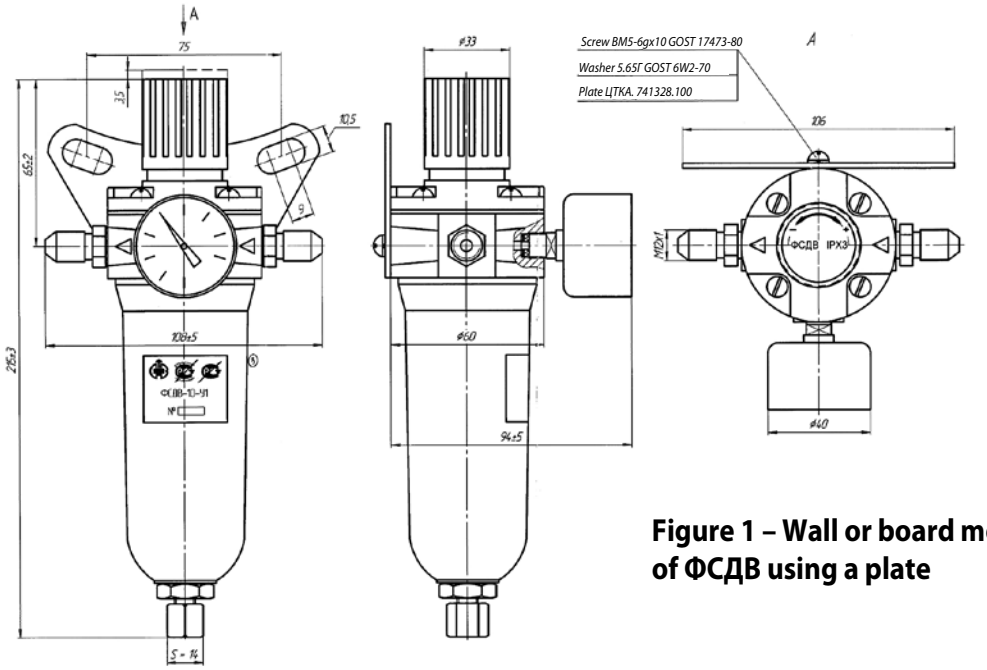


Figure 1 – Wall or board mounting of ФСДВ using a plate

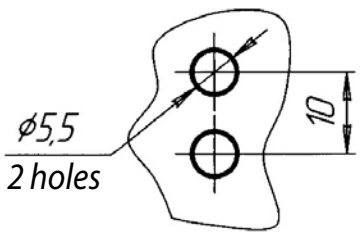


Figure 2 – Marking for board mounting of ФСДВ without plate

ELECTRO-PNEUMATIC TRANSDUCERS ЭП

Electro-pneumatic transducers ЭП (hereinafter – transducers) are intended for conversion of the unified continuous DC signal to the unified proportional pneumatic continuous signal.

The following transducer versions are available: ЭП-0010, ЭП-0020, ЭП-0030, ЭП-0040.

Transducers are intended for data communication with other products as per GOST R 52931-2008.

GENERAL SPECIFICATIONS

Climatic version and placement category: **ЭП-0010, ЭП-0040** **ЭП-0020, ЭП-0030**	УХЛ4.2; О4.2 – for operation at a temperature of +5 to +60 °C and relative humidity up to 98 % at 35 °C У1, Т2 – for operation at a temperature of –50 to +60 °C and relative humidity up to 100 % at 35 °C.
IP rating: ЭП-0020, ЭП-0030	IP54 GOST 14254-96.
As regards environment immunity: ЭП-0010 ЭП-0020 ЭП-0030 ЭП-0040	 standard; protected against penetration of dust and water (ingress protected); protected against aggressive medium (corrosion-resistant); standard version of the transducer module.
Accuracy class: ЭП-0010 ЭП-0020 ЭП-0030 ЭП-0040	 0.25; 0.5; 1.0; 1.0; 1.0; 0.25; 0.5; 1.0.
Transducer weight: ЭП-0010 ЭП-0020 ЭП-0030 ЭП-0040	 ≤ 1.0 kg. ≤ 1.1 kg. ≤ 1.2 kg. ≤ 0.4 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	24 months from the date of commissioning.

Variation ranges for input electrical current signals:
0–5 mA; 0–20 mA or 4–20 mA.

Variation range for output pneumatic signal:
20–100 kPa.

Input resistances of transducers at (20 + 5) °C:– for an input signal of 0–5 mA
– within 610 Ohm
– for an input signals of 0–20, 4–20 mA
– within 130 Ohm.

Rated supply air pressure: 140 kPa.

ЭП-0010, ЭП-0020, ЭП-0030 type **transducers are equipped with mounting parts to provide:**– wall, pipe, or board mounting;
– nozzle connection 00-01-1, 00-02-2, 00-03-3, 00-04-3 as per GOST 25165-82.

The version, input signal, basic error, environmental resistance and climatic version are specified in Table 1.

TABLE 1

Version	Input signal, mA	Basic error, %	Environmental resistance version	Climatic version
ЭП-1211	0–5	0.5	Standard	УХЛ4.2
ЭП-2211	0–20	0.5		
ЭП-3211	4–20	0.5		
ЭП-1311	0–5	1.0		
ЭП-2311	0–20	1.0		
ЭП-3311	4–20	1.0		
ЭП-1212	0–5	0.5		УХЛ4.2 (export)
ЭП-2212	0–20	0.5		
ЭП-3212	4–20	0.5		
ЭП-1312	0–5	1.0		
ЭП-2312	0–20	1.0		
ЭП-3312	4–20	1.0		
ЭП-1213	0–5	0.5		04.2 (tropical)
ЭП-2213	0–20	0.5		
ЭП-3213	4–20	0.5		
ЭП-1313	0–5	1.0		
ЭП-2313	0–20	1.0		
ЭП-3313	4–20	1.0		
ЭП-1334	0–5	1.0	Corrosion-resistant, ingress-protected	У1
ЭП-2334	0–20	1.0		
ЭП-3334	4–20	1.0		
ЭП-1335	0–5	1.0		У1 (export)
ЭП-2335	0–20	1.0		
ЭП-3335	4–20	1.0		
ЭП-1336	0–5	1.0		У1 (tropical)
ЭП-2336	0–20	1.0		
ЭП-3336	4–20	1.0		
ЭП-1241	0–5	0.5	Modular	УХЛ4.2
ЭП-2241	0–20	0.5		
ЭП-3241	4–20	0.5		
ЭП-1341	0–5	1.0		
ЭП-2341	0–20	1.0		
ЭП-3341	4–20	1.0		
ЭП-1242	0–5	0.5		УХЛ4.2 (export)
ЭП-2242	0–20	0.5		
ЭП-3242	4–20	0.5		
ЭП-1342	0–5	1.0		
ЭП-2342	0–20	1.0		
ЭП-3342	4–20	1.0		
ЭП-1243	0–5	0.5		УХЛ4.2 (tropical)
ЭП-2243	0–20	0.5		
ЭП-3243	4–20	0.5		
ЭП-1343	0–5	1.0		
ЭП-2343	0–20	1.0		
ЭП-3343	4–20	1.0		

Transducers ЭП-0010, ЭП-0020, ЭП-0030 are equipped with mounting parts to provide:
– wall, pipe, or board mounting;
– nozzle connection 00-01-1, 00-02-2, 00-03-3, 00-04-3 as per GOST 25165-82.

ЭП DESIGNATION STRUCTURE

Electro-pneumatic transducer ЭП – X X X X

Input signal:
"1" – 0–5 mA
"2" – 0–20 mA
"3" – 4–20 mA

Accuracy class:
"2" – 0.5
"3" – 1.0

Environmental resistance version:
"1" – standard
"2" – ingress-protected
"3" – corrosion-resistant
"4" – modular

Climatic version and placement category as per GOST 15150-69:
"1"– УХЛ4.1 – for supply to macroclimatic regions with moderate and cold climate.
"2" – УХЛ4.2 (export) – for supply to macroclimatic regions with moderate and cold climate.
"3" – О4.2 (tropical) – for supply to macroclimatic regions, including land, except the climatic region with cold antarctic climate.
"4" – У1 – for supply to macroclimatic regions with moderate climate.
"5" – У2 (export) – for supply to macroclimatic regions with moderate climate.
"6" – Т2 (tropical) – for supply to macroclimatic regions with dry and humid tropical climate.

ORDERING INFORMATION FOR STABILIZING FILTERS:

Transducer with an output signal of 0–20 mA, with an error limit of 0.5 %, standard version, climatic version УХЛ 4.2:
"Electro-pneumatic transducer ЭП-2211 ТУ25-7304.008-87".

OVERALL AND ATTACHMENT DIMENSIONS

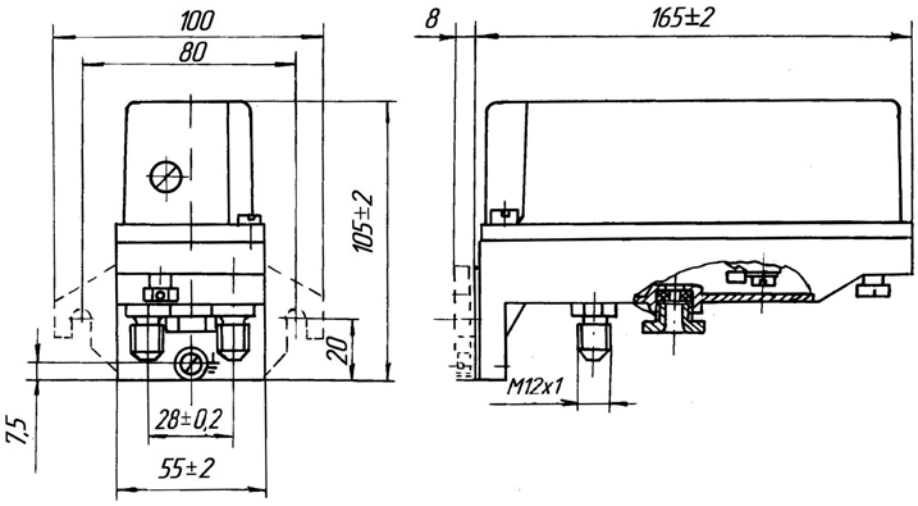


Figure 1 – Overall and attachment dimensions of ЭП

ELECTRO-PNEUMATIC TRANSDUCERS ЭП-Ex

Electro-pneumatic transducers ЭП (hereinafter – ЭП-Ex) are intended for conversion of the unified DC signal to the unified pneumatic signal.

ЭП-Ex shall operate with passive IS barrier БИП-1 (hereinafter – БИП-1) as well as IS barriers (intrinsic safety) similar to БИП-1 with appropriate scope of application and with Ex-marking [ExiaGa]IIC, ensuring intrinsic safety of the ЭП-Ex input circuit and installed outside the explosion hazard area.

ЭП-Ex shall have Ex-marking "0Ex ia IIC T6 Ga X" with protection level Ga (extra-explosion-proof) of electrical equipment group II and protection type "intrinsic safety "ia" for application in explosive gaseous atmospheres containing subgroup IIC gas, with maximum surface temperature below 85 °C, with extended range of ambient temperatures from –50 to +50 °C, shall comply with requirements of the Technical Regulation of the Customs Union TR CU 012/2011 "On equipment safety for operation in explosive atmospheres", GOST 31610.0 (IEC 60079-0:2011), GOST 31610.11 (IEC 60079-11:2011), GOST IEC 60079-14, GOST 12.2.007.0 and intended for installation in indoor and outdoor explosive areas of class 0.1 and 2 as per GOST IEC 60079-10-1 according to Ex marking, requirements of PUE-99 ("Electrical Installations Code", 6th edition) Chapter 7.3, and other regulatory documents governing the application of electrical equipment in explosive areas.

The transducer has corrosion-resistant version ЭП-Ex-Op intended for operation in an environment containing up to 10 mg/m^3 of hydrogen sulfide and/or sulfur dioxide and, in emergency situations (for 3–4 hours), up to 100 mg/m^3 of hydrogen sulfide and/or sulfur dioxide up to 200 mg/m^3.

Climatic version and placement category:	У1 – for operation at a temperature of –50 to +50 °C. Т2 – for operation at a temperature of –50 to +50 °C and relative humidity up to 100 % at 35 °C.
IP rating:	IP54 GOST 14254-96.
Transducer weight:	≤ 1.3 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	24 months from the date of commissioning.

GENERAL SPECIFICATIONS

The limit of allowable basic error, expressed in percent of the rated measuring range of the output signal 80 kPa: ±1.0 %.

Variation in output signal: 0.5 %.
Variation ranges for input electrical current signals: 0–5 mA; 0–20 mA or 4–20 mA.
Variation range for output pneumatic signal: 20–100 kPa.
Input resistances of transducers at (20 + 5) °C:
– for an input signal of 0–5 mA – within 580 Ohm
– for input signals of 0–20, 4–20 mA – within 115 Ohm.
Rated supply air pressure: 140 kPa.

Transducers are equipped with mounting parts to provide:
– wall, pipe, or board mounting:
– nozzle connection 00-01-1, 00-02-2, 00-03-3, 00-04-3 as per GOST 25165-82.

ЭП-ЕХ DESIGNATION STRUCTURE

Electro-pneumatic transducer ЭП-Ex – X – X X X X

"Ор" – corrosion-resistant version, except У2 and Т2.

Input signal:
"1" – 0–5 mA;
"2" – 0–20 mA;
"3" – 4–20 mA.

Accuracy class:
"3" – 1.0.

Environmental resistance version:
"2" – ingress-protected;
"3" – corrosion-resistant.

Climatic version and placement category as per GOST 15150-69:
"4" – У1 – for supply to macroclimatic regions with moderate climate.
"5" – У2 (export) – for supply to macroclimatic regions with moderate climate.
"6" – Т2 – for supply to macroclimatic regions with dry and tropical climate.

ELECTRO-PNEUMATIC POSITIONERS ЭПП, ЭПП-Ex

Electro-pneumatic positioners ЭПП, ЭПП-Ex (hereinafter – ЭПП, ЭПП – Ex) are designed to reduce the misalignment of stroke and increase the rapidity of one- and two-way piston reciprocating and rotating pneumatic actuators and membrane pneumatic actuators in automatic process regulation or remote control systems in oil refining, petrochemical, gas, cryogenic and other industrial sectors.

ЭП-Ex shall operate with passive IS barrier БИП-1 (hereinafter – БИП-1) as well as IS barriers БИП-1 (intrinsic safety) similar to БИП-1 with appropriate scope of application and with Ex-marking [Ex ia Ga]IIC, ensuring intrinsic safety of the ЭПП-Ex positioner input circuit and installed outside the explosion hazard area.

ЭПП-Ex shall have Ex-marking "0Ex ia IIC T6 Ga X" with protection level Ga (extra-explosion-proof) of electrical equipment group II and protection type "intrinsic safety "ia" for application in explosive gaseous atmospheres containing subgroup IIC gas, with maximum surface temperature below 85 °C, with extended range of ambient air temperatures from –50 to +60 °C, shall comply with requirements of the Technical Regulation of the Customs Union TR CU 012/2011 "On equipment safety for operation in explosive atmospheres", GOST 31610.0 (IEC 60079-0:2011), GOST 31610.11 (IEC 60079-11:2011), GOST IEC 60079-14, GOST 12.2.007.0 and intended for installation in indoor and outdoor explosive areas of class 0,1 and 2 as per GOST IEC 60079-10-1 according to Ex-marking, requirements of PUE-99 ("Electrical Installations Code", 6th edition) Chapter 7.3, and other regulatory documents governing the application of electrical equipment in explosive areas.

The transducer has corrosion-resistant version ЭП-Ex-Op intended for operation in an environment containing up to 10 mg/m^3 of hydrogen sulfide and/or sulfur dioxide and, in emergency situations (for 3–4 hours), up to 100 mg/m^3 of hydrogen sulfide and/or sulfur dioxide up to 200 mg/m^3.

Climatic version and placement category:	У1 – for operation at a temperature of –50 to +60 °C and relative humidity up to 95 % at 35 °C. Т2 – for operation at a temperature of –25 to +60 °C and relative humidity up to 100 % at 35 °C.
IP rating:	IP54 GOST 14254-96.
Accuracy class:	1.0
Transducer weight: one-way action two-way action	 ≤ 2.3 kg. ≤ 2.5 kg.
Average service life:	≥ 10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	24 months from the date of commissioning.

GENERAL SPECIFICATIONS

Variation ranges for input electrical current signals of БИП-1 and positioners: 0–5 mA; 0–20 mA or 4–20 mA.
Input resistance of transducers at (20 + 5) °C:
– for an input signal of 0–5 mA – within 580 Ohm
– for input signals of 0–20, 4–20 mA – within 115 Ohm.
Rated supply air pressure: 250, 400, 600, 630 kPa.
The limit of allowable basic error, expressed in percent of the nominal stroke, shall not exceed ±1.0.

Supply air flow rate in steady-state condition as per Table 1.

TABLE 1

Supply air pressure, kPa	Supply air flow rate for one-way ЭПП, m^3/h, maximum	Supply air flow rate for two-way ЭПП, m^3/h, maximum
250	0.6	0.9
400	0.8	1.2
600–630	1.2	1.5

Maximum air flow rate at the output of ЭПП in transient mode at an supply air pressure of 400 kPa is 18 m^3/h.

DESIGNATION STRUCTURE

ЭПП (ЭПП-Ex) – X – X – X . X . X . X . X . X

Positioner type

"Op" – for the corrosion-resistant version of positioners (as per the order).

"1" – one-way action;
"2" – two-way action.

"90" – for rotary actuators.

Input signal:
0–5 mA;
0–20 mA;
4–20 mA.

Supply pressure:
250 kPa;
400 kPa;
600–630 kPa.

Installation kit designation (see Tables 2, 3, 4).

Climatic version and placement category as per GOST 15150-69:
"У1" – for supply to macroclimatic regions with moderate climate
"Т2" – for supply to macroclimatic regions with dry and humid tropical climate.

Designation of technical conditions

Installation kits for series 2000 membrane actuators and piston actuators described in Table 2.

TABLE 2

Installation kit designation	Positioner type	Type of equipped actuator	Nominal stroke of the output element, mm	Action type	Actuator rack structure
"1"	ЭПП-2, ЭПП-Ex-2	Pneumatic membrane drives series 2000 СП "Стерхавтоматизация" (Sterkhavtomatizatsiya)	10–60	ППХ and ОПХ	Round
"2"			60–100		
"3"		Piston actuators	10–60		-
"4"			60–100		
"5"	ЭПП-1, ЭПП-Ex-1	Pneumatic membrane drives series 2000 СП "Стерхавтоматизация" (Sterkhavtomatizatsiya)	10–60		Round
"6"			60–100		

where ППХ is a direct-acting actuator;
ОПХ is a back-acting actuator.

Installation kits for membrane actuators are described in Table 3.

TABLE 3

Installation kit designation	Positioner type	Type of equipped actuator			
		membrane fitting diameter, mm	nominal stroke of the output element, mm	action type	rack structure
"7"	ЭПП-1, ЭПП Ex 1	160, 200, 250, 320, 400, 500	10–60	ППХ and ОПХ	-
"8"		400, 500	60–100		
"9"		160	10, 16, 25		Cast
"10"		200	10, 16, 25		Cast
		250	10, 16, 25, 40		
		400	25, 40	ППХ	ДАЗ
"11"		320	16, 25, 40	ППХ	Cast
			16, 25, 40, 60	ОПХ	
		400	25, 40		ДАЗ
"12"		320	60	ППХ	Cast
		400			ДАЗ
		400		ОПХ	
"13"		200	10, 16	ППХ and ОПХ	Weld
		250	16, 25, 40		
"14"		320	25, 40	ППХ	Weld
			16, 25, 40	ОПХ	
		400	25, 40	ППХ	
			25	ОПХ	
		500	40	ППХ	
"15"		320	60	ППХ and ОПХ	Weld
		400			
		500			
"16"		400	40	ОПХ	Weld
		500			
"17"		400	100	ППХ and ОПХ	Weld
		500			

where ДАЗ is rack structure manufactured by Dunaevetsky steel reinforcing plant.

Installation kits for rotary actuators are specified in Table 4.

TABLE 4

Installation kit designation	Positioner type
"18"	ЭПП-1-90, ЭПП-Ex-1-90, ЭПП-"Ор"-1-90, ЭПП-Ex-"Ор"-1-90
"19"	ЭПП-2-90, ЭПП-Ex-2-90, ЭПП-"Ор"-2-90, ЭПП-Ex-"Ор"-2-90

"20" is a universal installation kit and can be used with any type of ЭПП.

Installation kits are supplied in the same climatic version as the positioner.
For installation kit, see Tables 3, 4.

ORDERING INFORMATION FOR POSITIONERS:

The ЭПП one-way positioner, input signal range 0–20 mA, supply pressure 400 kPa (4.0 kgf/cm^2), for МИМ-400-ППХ, nominal stroke of the output element of 60 mm, climatic version У1 (export), set for back stroke:
"ГСП. Positioner ЭПП-1.0-20мА.400кПа.12.У1Э ТУ 311-022-7471.030-93 with back stroke".

Positioner ЭПП-Ex, corrosion-resistant version, two-way action, input signal range 4–20 mA, supply pressure 250 kPa (2.5 kgf/cm^2), for piston actuator, nominal stroke of the output element of 100 mm, climatic version У1, with IS barrier БИП-1:
"ГСП. Positioner ЭПП-Ex-Ор-2.4-20мА.250кПа.4.У1 ТУ 311-022-7471.030-93 with IS barrier БИП-1".

OVERALL AND ATTACHMENT DIMENSIONS

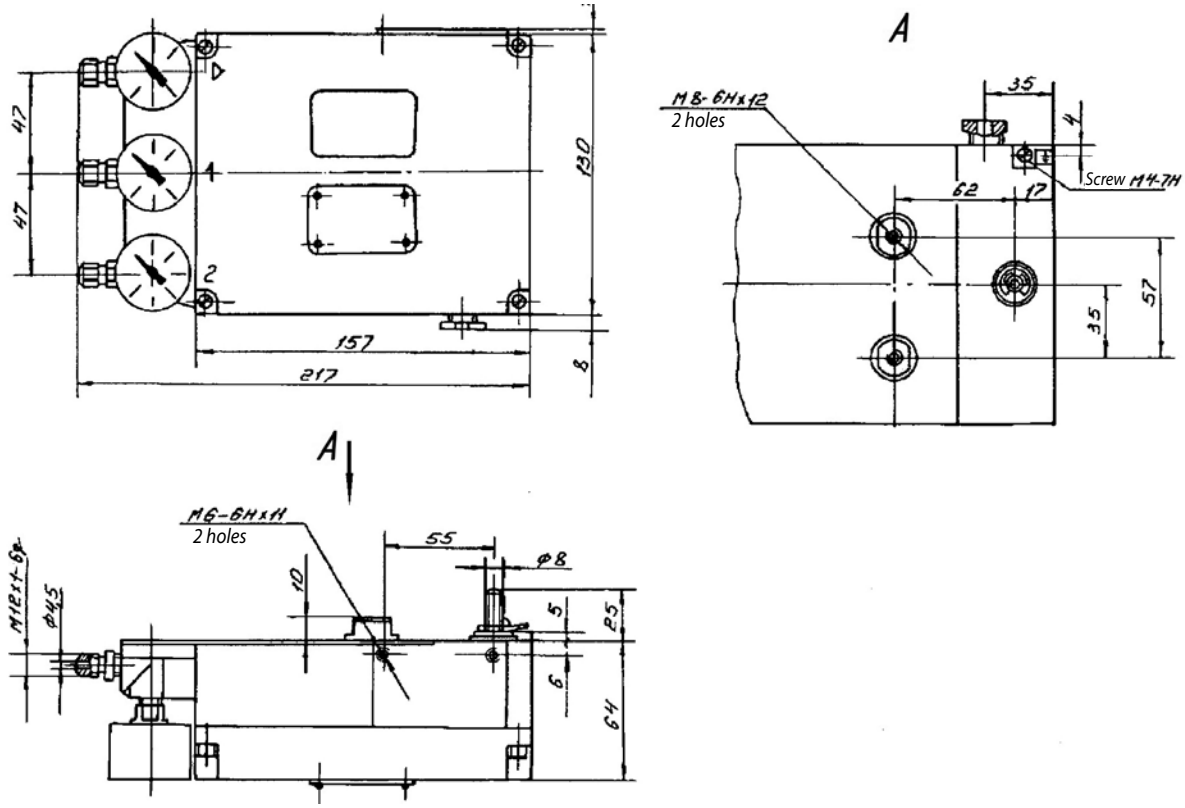


Figure 1 – Overall and attachment dimensions of ЭПП, ЭПП-Ex.

PNEUMATIC POSITIONERS ПП

Pneumatic positioners ПП (hereinafter – ПП) are designed to reduce the misalignment of stroke and increase the rapidity of one- and two-way piston reciprocating and rotating pneumatic actuators and membrane pneumatic actuators by introducing feedback in response to the position of the actuator output element.

Scope of application of ПП includes automatic process regulation or remote control systems in pulp-and-paper, oil refining, petrochemical, and other industrial sectors.

ПП are component parts for actuators.

Climatic version and placement category:	У1 – for operation at a temperature of –50 to +60 °C and relative humidity up to 95 % at 35 °C. Т2 – for operation at a temperature of –25 to +70 °C and relative humidity up to 100 % at 35 °C.
IP rating: dust protection water protection	 IP5X as per GOST 14254-2015 IP3X as per GOST 14254-2015
Accuracy class:	1.0
Transducer weight (without installation parts): one-way action two-way action	 ≤ 2.3 kg. ≤ 2.5 kg.
Average service life:	≥ 8 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	18 months from the date of commissioning.

GENERAL SPECIFICATIONS

Input (control) signal: 20–100 kPa
Supply pressure:
– one-way action ПП-1: 250, 400, 630 kPa
– two-way action ПП-2: 400, 630 kPa

Limits of allowable basic error: ±1 %
Air flowrate in steady-state condition, maximum: ±1 m^3/h

General parameters of positioners are specified in Table 1.

TABLE 1

Parameter description	Pneumatic positioner	
	one-way action ПП-1	two-way action ПП-2
Nominal stroke of the actuator output rod, mm	250,400,630	400,630
ПП-1.25	4; 6; 10; 16; 25	400,630
ПП-1.100	25; 40; 60; 100	400,630
ПП-2.25		10; 16; 25
ПП-2.100		25; 40; 60; 100
Air flow rate in steady-state condition, maximum, m^3/h:	±1	±1
at a supply pressure of 250 kPa	0.6	–
at a supply pressure of 400 kPa	0.8	1.0
at a supply pressure of 600–630 kPa	1.2	1.5
Air flow rate in transient mode, maximum, m^3/h:	1.2	1.5
at a supply pressure of 250 kPa	9.1	–
at a supply pressure of 400 kPa	13	13
at a supply pressure of 600–630 kPa	19	19

ПП DESIGNATION STRUCTURE

Pneumatic positioner ПП – X – X X X X

Purpose:
"1" – one-way action
"2" – two-way action

Setting limits for the nominal stroke of the actuator output element:
"25" – up to 25 mm,
"100" – 25 to 100 mm,
"90" – for rotary actuators

Installation kit order number (see Tables 2, 3).

Supply air pressure:
250 kPa; 400 kPa; 630 kPa

Climatic version and placement category as per GOST 15150 69:
"У1" – for supply to macroclimatic regions with moderate climate.
"Т1" – for supply to macroclimatic regions with dry and tropical climate.

Types of actuators equipped with ПП are specified in Table 2.

TABLE 2

Version and typical size	Type of equipped mechanism			Rack structure
	membrane fitting diameter, mm	nominal stroke of the output element, mm	action type	
ПП-1.25.1**	160	4, 6, 10, 16, 25	Direct and back	Cast
ПП-1.25.2	200	6, 10, 16, 25	Direct and back	Cast
	250	10, 16, 25		
	400	25	Direct	ДАЗ*
ПП-1.25.3	320	16, 25	Direct	Cast
ПП-1.25.4	320	16, 25	Back	Cast
ПП-1.25.5	200	6, 10, 16	Direct and back	Weld
	250	16		
ПП-1.25.6	320	16	Back	Weld
	400	25		
ПП-1.25.14	250	25	Direct	Hexagon or round
ПП-1.100.2	250	40	Back	Cast
ПП-1.100.4	320	40, 60	Direct and back	Cast
	400	25	Back	ДАЗ
ПП-1.100.5	250	25, 40	Direct and back	Weld
ПП-1.100.6	320	25	Direct and back	Weld
	320	40, 60	Back	
	400	25	Direct	
	400; 500	40	Direct and back	
ПП-1.100.7	320	40	Direct	Weld
ПП-1.100.8	250	40	Direct	Cast
	400, 500	40, 60	Direct and back	ДАЗ
ПП-1.100.9	320, 400, 500	60	Direct	Weld
ПП-1.100.10	400, 500	100	Direct and back	Weld
ПП-1.100.11	400, 500	60	Back	Weld
ПП-1.100.14	250	40, 60	Direct	Hexagon or round

* – rack structure manufactured by Dunaevetsky steel reinforcing plant (ДАЗ)
** – The last digit in the designation of a typical size corresponds to the order number of the installation kit

Types of actuators equipped with ПП are specified in Table 3.

TABLE 3

Version and typical size	Type of equipped mechanism
ПП-2.25.12	Piston actuators with the nominal stroke of the output element from 10 to 25 mm, including rotating actuators ФЦ 99
ПП-2.100.13	Piston actuators with the nominal stroke of the output element from 25 to 100 mm
ПП-1.90.18	One-way rotating actuators with a rotation angle of 90 %
ПП-2.90.19	Two-way rotating actuators with a rotation angle of 90 %

ORDERING INFORMATION FOR POSITIONERS:

One-way positioner designed to be used in an actuator as per GOST 13373, direct-acting, with membrane fitting diameter 250 mm, nominal stroke of the output element 16 mm, with cast rack, operating at a supply air pressure of 250 kPa:
"Pneumatic positioner ГСП type ПП-1.25.2.1 У1 ТУ 25-7333.036-90";

One-way positioner manufactured to be supplied for export to countries with moderate climate and designed to be used in an actuator as per GOST 13373, back-acting, with membrane fitting diameter 500 mm, nominal stroke of the output element 40 mm, with rack structure manufactured by Dunaevetsky steel reinforcing plant (ДАЗ), operating at a supply air pressure of 400 kPa:
"Pneumatic positioner ГСП type ПП-1.100.8.2 У1Э ТУ 25-7333.036-90";

Two-way positioner manufactured to be supplied for export to countries with tropical climate and designed to be used in a piston actuator with the nominal stroke of the output element from 25 to 100 mm, operating at a supply air pressure of 630 kPa:
"Pneumatic positioner ГСП type ПП-2.100.13.3 Т1 ТУ 25-7333.036-90";

One-way positioner for rotating actuators with a rotation angle of 90°, manufactured for the national economy, operating at a supply air pressure of 400 kPa:
"Pneumatic positioner ГСП type ПП-1.90.15.2 У1 ТУ 25-7333.036-90".

OVERALL AND ATTACHMENT DIMENSIONS

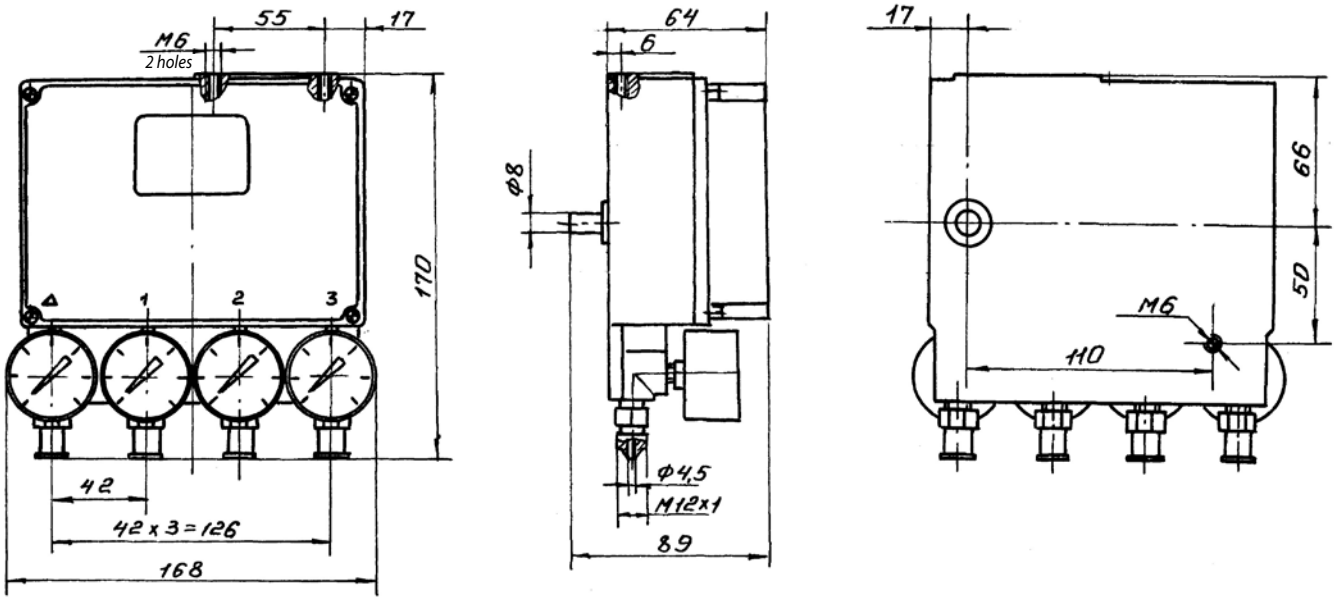


Figure 1 – Overall and attachment dimensions of ПП

PASSIVE IS BARRIERS БИП-1

Climatic version:	T2 – for operation at a temperature of –50 to +50 °C and relative humidity up to 100 % at 35 °C.
Weight of БИП-1:	≤ 0.07 kg.
Average service life:	10 years.
Guarantee period of storage:	12 months from the date of manufacture.
Guarantee service life:	18 months from the date of commissioning.

IS barriers БИП-1 (hereinafter – БИП-1) are intended for ensuring intrinsic safety of circuits of electro-pneumatic transducers ЭП-Ex and electro-pneumatic positioners ЭПП-Ex that are located in an explosion hazard area.

БИП-1 bears the explosion-proof marking [Exia]IIC with the protection type "intrinsic safety "ia" and with protection level "extra-explosion-proof", complies with requirements of GOST 12.2.007.0-75, GOST R IEC 60079-0-2011, GOST R IEC 60079-11-2010 (IEC 60079-11:2011), GOST R IEC 60079-14-2008 (IEC 60079-14-2011), and is designed to be installed out of indoor and outdoor explosion hazardous areas according to requirements of PUE-99 ("Electrical Installations Code", 6th edition) Chapter 7.3, PTEEP Chapter 3.4, and GOST R IEC 60079-10-1-2008.

Scope of application of БИП-1 includes process monitoring and control systems at petroleum, petrochemical, and fertilize industry enterprises, and in other industries associated with refining, receipt, use, or storage of explosive mixtures, gases or vapors with air.

Parameters of the communication line between the IS barrier and ЭП-Ex, ЭПП-Ex:

– length ≤ 1,000 m.
– inductance ≤ $1 \cdot 10^{-3}$ H;
– resistance ≥ 25 Ohm.
– capacitance ≤ $0.25 \cdot 10-6$ F.

Parameters of power sources for secondary devices connected on the intrinsically safe side of the IS barrier (terminals 3-4):

– AC mains voltage – 220 V.
– AC mains frequency – 50 Hz.

Rated fuse current: ≤ 20 mA.

Leak current between input (output) and ground terminals:

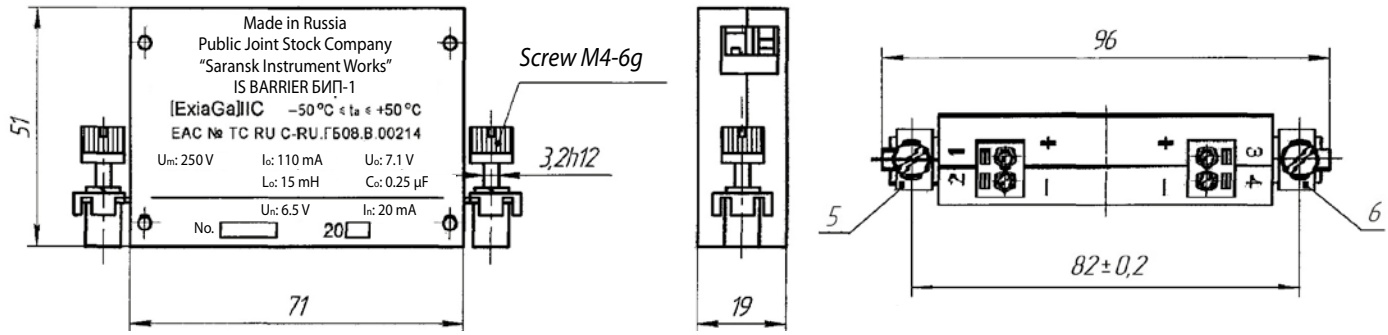
– at a voltage of 3.5 V ≤ 60 mA;
– at a voltage of 4 V ≤ 170 mA.

Allowable short-circuit current between terminals 3-4 of the IS barrier: 110 mA.

Barrier actuation voltage does not exceed 6.5 V.

ORDERING INFORMATION FOR БИП-1:

Passive IS barrier БИП-1, climatic version T2:
"Passive IS barrier БИП-1 T2 ТУ 311-00227471.062-98".



Designation of terminals: 1-2 – on non intrinsically safe side; 3-4 – on intrinsically safe side; 5-6 – ground.

Figure 1 – Overall and attachment dimensions of БИП-1

SECTION V.
BELLOWS PRODUCTS

Bellows is a thin-wall metal pipe with corrugated (undulated) lateral surface.

The bellows are manufactured of: alloy grade 36НХТЮ, beryllium copper grade БрБ2, stainless steel 12Х18Н10Т, and brass grade Л-80.

We manufacture over 200 typical sizes of measuring metal bellows with diameters of 9 to 100 mm with a wall thickness of 0.08 to 0.25 mm, suitable for operation in atmospheres causing no metal corrosion at temperatures:

213 to 473 K (–60...+200 °C) – for bellows made of alloy grade 36НХТЮ;

213 to 373 K (–60...+100 °C) – for bellows made of beryllium copper grade БрБ2 and of low brass grade Л-80;

373 to 673 K (–200... +400 °C) – for bellows made of stainless steel grade 12Х18Н10Т.

Metal corrugated bellows can be classified into several main groups:
Group I. Single- and double-layer measuring bellows.
Group II. Single-layer bellows used as phase separators, compensators, power elements, pressure-to-force transducers.
Group III. Multi-layer bellows manufactured as per GOST VD 21744-83, GOST R 55019-2012.
Group IV. Welded steel diaphragm bellows.

SINGLE- AND DOUBLE-LAYER MEASURING BELLOWS

Single- and double-layer metal measuring bellows are intended for operation as flexible sensing elements in various types of measuring, monitoring and control devices. They include:

BELLOWS AS PER GOST 21482-76

36 НХТЮ						
9x8x0.08	16x10x0.08	22x6x0.10	28x10x0.08	34x6x0.20	38x16x0.16	55x10x0.20
9x10x0.08	16x4x0.10	22x6x0.12	28x10x0.10	34x10x0.10	38x16x0.20	55x16x0.16
9x6x0.10	16x6x0.10	22x16x0.12	28x10x0.12	34x10x0.12	42x4x0.08	55x16x0.20
9x10x0.10	16x6x0.12	22x10x0.16	28x10x0.16	34x10x0.16	42x4x0.10	65x4x0.10
9x10x0.12	16x10x0.12	22x10x0.20	28x10x0.20	34x10x0.20	42x4x0.20	65x6x0.10
11x10x0.08	16x10x0.25	22x10x0.25	28x10x0.25	34x10x0.25	42x6x0.08	65x6x0.12
11x16x0.08	18x10x0.10	25x10x0.08	28x16x0.10	34x16x0.10	42x6x0.10	65x6x0.20
11x6x0.10	18x4x0.12	25x6x0.10	28x16x0.12	34x16x0.12	42x6x0.12	65x6x0.25
11x8x0.16	18x6x0.12	28x4x0.08	28x16x0.20	38x4x0.12	42x10x0.08	65x10x0.10
11x10x0.16	18x20x0.12	28x4x0.10	28x16x0.25	38x4x0.25	42x10x0.12	65x10x0.12
14x6x0.08	18x25x0.16	28x4x0.12	28x20x0.12	38x6x0.08	42x10x0.25	65x10x0.16
14x10x0.08	18x10x0.25	28x4x0.16	30x4x0.08	38x6x0.10	48x10x0.12	65x10x0.25
14x4x0.10	20x10x0.08	28x4x0.20	30x10x0.10	38x6x0.12	48x12x0.16	65x16x0.20
14x6x0.10	20x6x0.10	28x4x0.25	30x10x0.12	38x6x0.16	48x16x0.16	65x16x0.25
14x10x0.10	20x10x0.10	28x6x0.08	30x16x0.12	38x6x0.20	55x4x0.16	75x6x0.12
14x6x0.12	20x10x0.12	28x6x0.10	34x4x0.08	38x6x0.25	55x6x0.12	75x10x0.10
14x10x0.12	20x6x0.16	28x6x0.12	34x4x0.10	38x10x0.08	55x6x0.16	75x10x0.12
14x4x0.16	20x10x0.16	28x6x0.16	34x4x0.12	38x10x0.10	55x6x0.20	75x16x0.20
14x10x0.16	20x10x0.20	28x6x0.20	34x4x0.16	38x10x0.12	55x6x0.25	85x16x0.16
14x4x0.20	20x10x0.25	28x6x0.25	34x6x0.12	38x10x0.16	55x10x0.12	85x16x0.25
14x10x0.25	22x6x0.08	28x8x0.12	34x6x0.16	38x10x0.20	55x10x0.16	

БрБ2						
11x10x0.16	18x6x0.16	22x10x0.12	28x4x0.16	28x12x0.16	34x16x0.10	42x10x0.08
11x12x0.12	18x10x0.12	22x10x0.16	28x4x0.20	28x16x0.12	38x6x0.08	42x10x0.10
14x6x0.12	18x10x0.25	22x10x0.25	28x4x0.25	28x16x0.16	38x6x0.16	42x10x0.12
14x10x0.08	18x12x0.12	22x16x0.12	28x5x0.1	30x16x0.12	38x6x0.20	48x10x0.12
14x10x0.10	20x4x0.16	22x16x0.16	28x5x0.12	34x4x0.12	38x6x0.25	48x10x0.16
14x10x0.12	20x10x0.08	24x5x0.09	28x6x0.12	34x6x0.12	38x8x0.08	55x6x0.16
14x12x0.12	20x10x0.10	25x6x0.08	28x6x0.16	34x6x0.16	38x8x0.12	55x6x0.20
16x10x0.08	20x10x0.12	25x6x0.10	28x6x0.20	34x6x0.20	38x8x0.16	55x6x0.25
16x10x0.10	20x10x0.16	25x6x0.12	28x6x0.25	34x6x0.25	38x10x0.16	55x16x0.08
16x10x0.12	22x6x0.08	25x6x0.16	28x8x0.12	34x8x0.20	38x16x0.12	55x16x0.20
16x10x0.16	22x6x0.10	25x10x0.08	28x10x0.12	34x10x0.16	38x16x0.16	65x10x0.25
18x6x0.08	22x6x0.12	25x10x0.16	28x10x0.16	34x10x0.20	38x16x0.20	75x10x0.16
18x6x0.12	22x8x0.16	28x4x0.12	28x10x0.25	34x10x0.25	42x4x0.12	75x10x0.20

12X18H10T and 08X18H10T						
11x4x0.08	16x6x0.08	22x6x0.20	28x20x0.12	38x6x0.12	48x8x0.16	65x16x0.25
11x6x0.08	16x10x0.12	22x10x0.08	30x10x0.12	38x9x0.12	48x16x0.16	75x10x0.16
11x6x0.12	18x4x0.08	22x10x0.12	34x4x0.12	38x10x0.12	48x16x0.20	85x8x0.25
11x10x0.08	18x6x0.2	22x16x0.12	34x6x0.20	38x10x0.25	48x18x0.16	85x16x0.25
11x10x0.10	18x10x0.2	25x10x0.12	34x6x0.25	38x16x0.12	55x10x0.12	
11x10x0.12	18x12x0.12	25x10x0.25	34x8x0.25	38x16x0.16	55x10x0.20	
14x4x0.08	20x6x0.08	28x4x0.16	34x10x0.12	38x16x0.20	55x13x0.16	
14x6x0.08	20x10x0.12	28x8x0.20	34x10x0.25	38x16x0.25	55x16x0.16	
14x6x0.12	22x4x0.08	28x10x0.12	34x12x0.16	38x20x0.20	65x4x0.16	
14x10x0.08	22x4x0.12	28x10x0.16	34x16x0.12	42x12x0.12	65x10x0.16	
14x10x0.12	22x4x0.20	28x10x0.20	38x4x0.12	42x12x0.16	65x10x0.25	
16x4x0.12	22x6x0.08	28x10x0.25	38x6x0.08	42x16x0.12	65x16x0.16	

ORDERING INFORMATION FOR BELLOWS:

Bellows with the outside diameter D = 28 mm, number of corrugations n = 10, wall thickness S = 0.12 mm, made of alloy 36НХТЮ:

Bellows 28x10x0.12 – 36НХТЮ GOST 21482-76.

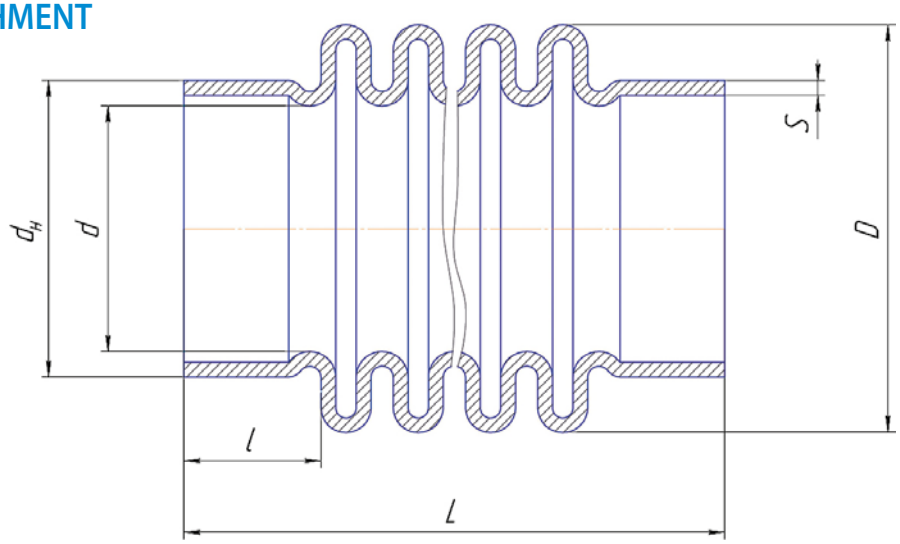
Bellows with the outside diameter D = 28 mm, number of corrugations n = 10, wall thickness S = 0.12 mm, made of stainless steel 12Х18Н10Т:

Bellows 28x10x0.12 – 12Х18Н10Т GOST 21482-76.

SPECIAL SINGLE-LAYER BELLOWS AS PER ТУ 25.02.110737-82

TYPE I

OVERALL AND ATTACHMENT DIMENSIONS



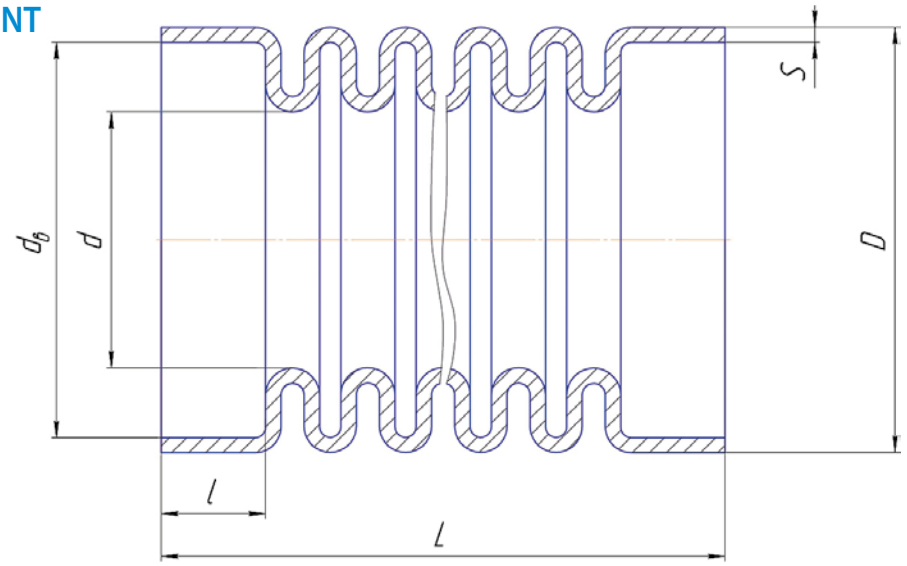
Bellows designation	D, mm	d, mm	d_o, mm	l, mm	L, mm	Number of corrugations n	Tube blank	
							outside diameter (reference)	S, wall thickness max. dev. ±10 %
17x12x0.13-I	17 ± 0.7	$9^{+0.8}$	$10.5_{-0.7}$	$2.5_{-0.5}$	22.5 ± 1.05	12	12	0.13
28.5x8x0.12-I	28.5 ± 1	18.1^{+08}	$19.3_{-0.28}$	$3_{-0.25}$	21.5 ± 1.05	8	19	0.12

GENERAL SPECIFICATIONS

Bellows designation	Effective area F_{eff}, cm^2	Rigidity, N/mm (kgf/mm)		Working stroke, mm		Maximum operating pressure (internal or external) P_{max} MPa (kgf/cm^2)
		maximum	minimum	full	recommended	
17x12x0.13-I	1.35	8.5 (0.85)	2.5 (0.25)	4.0	2.0	0.49 (4.9)
28.5x8x0.12-I	4.40	9.07 (0.907)	2.28 (0.228)	4.0	2.0	0.65 (6.5)

TYPE II

OVERALL AND ATTACHMENT DIMENSIONS



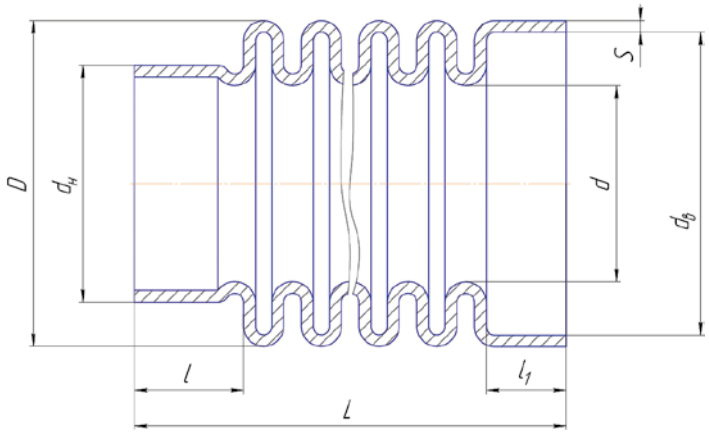
Bellows designation	D, mm	d, mm	d_i, mm	l, mm	L, mm	Number of corrugations n	Tube blank	
							outside diameter (reference)	S, wall thickness max. dev. ±10 %
12x15x0.14-II	$12^{+0,5}_{-0,7}$	$7^{+0.6}$	$11^{+0.24}$	$1.9_{-0.25}$	21 ± 1.05	15	9.7	0.14
28x16x0.12-II	28 ± 1	$18.1^{+0.8}$	$27.5^{+0.28}$	$3_{-0.25}$	36 ± 1.25	16	19	0.12

GENERAL SPECIFICATIONS

Bellows designation	Effective area F_{eff}, cm^2	Rigidity, N/mm (kgf/mm)		Working stroke, mm		Maximum operating pressure (internal or external) P_{max} MPa (kgf/cm^2)
		maximum	minimum	full	recommended	
12x15x0.14-II	0.75	32.0 (3.20)	6.0 (0.6)	2.8	1.4	1.03 (10.3)
28x16x0.12-II	4.30	5.35 (0.535)	1.28 (0.128)	9.3	4.6	0.33 (3.3)

TYPE III

OVERALL AND ATTACHMENT DIMENSIONS



Bellows designation	D, mm	d, mm	d_i, mm	d_o, mm	l,l_1 mm	L, mm	Number of corrugations n	Tube blank	
								outside diameter (reference)	S, wall thickness max. dev. ±10 %
28.5x9x0.12-III	28.5 ± 1	$18.76_{-0.76}$	$28.25^{+0.28}$	$19.3_{-0.28}$	$1.5_{-0.25}$	$26_{-0.84}$	9	19	0.12

GENERAL SPECIFICATIONS

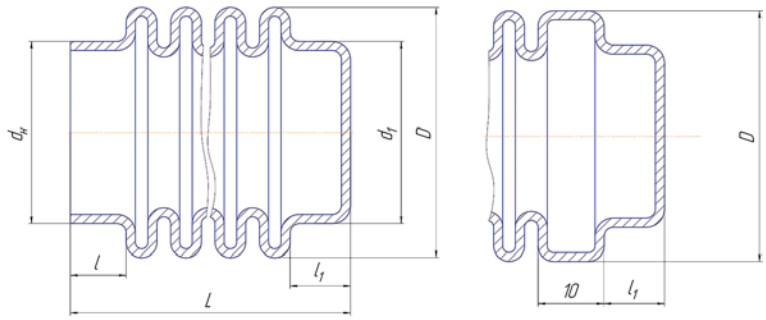
Bellows designation	Effective area F_{eff}, cm^2	Rigidity, N/mm (kgf/mm)		Working stroke, mm		Maximum operating pressure (internal or external) P_{max} MPa (kgf/cm^2)
		maximum	minimum	full	recommended	
28.5x9x0.12-III	4.40	8.3 (0.83)	2.1 (0.210)	9.5	4.8	0.65 (6.5)

TYPE IV

OVERALL AND ATTACHMENT DIMENSIONS

Fig. 1

Fig. 2
for the rest, see Fig. 1



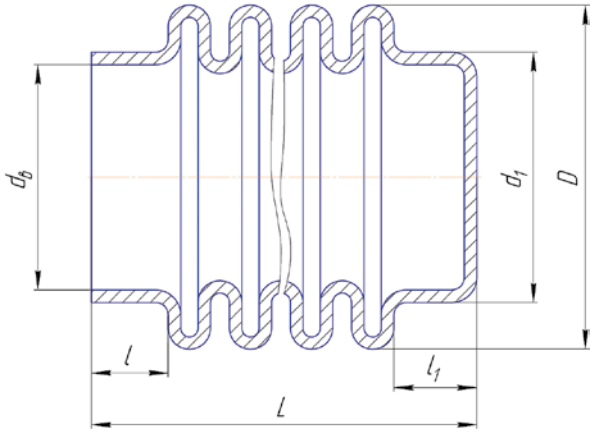
Bellows designation	Fig.	D, mm	d, mm	d_h, mm	d_1, mm	l, mm	l_1, mm	L, mm	Number of corrugations n	Tube blank	
										Outside diameter (reference)	S, wall thickness max. dev. ±10 %
17x12x0.13-IV	1	17 ± 0.7	$9^{+0.6}$	$10_{-0.2}$	$10.5_{-0.7}$	$2.5_{-0.25}$	$6_{-0.3}$	26 ± 1.05	12	9.7	0.13
32x11x0.12-IV		32 ± 1.0	$18.5^{+0.7}$	$22_{-0.28}$	$20_{-0.84}$	$6_{-0.3}$	$6_{-0.3}$	47 ± 1.25	11	19.3	0.12
38x8x0.11-IV		38 ± 1.0	$25^{+0.8}$	$26.2_{-0.28}$	$26.5_{-0.84}$	$1.5_{-0.25}$	$6_{-0.3}$	28.7 ± 1.05	8	25.8	0.11
44,5x17x0.14-IV		44.5 ± 1	$31.72_{-0.72}$	$32_{-0.25}$	32_{-1}	$3.5_{-0.3}$	$6_{-0.3}$	$41_{-1.0}$	17	32	0.14
51x16x0.12-IV		51 ± 1	$35^{+0.8}$	$36_{-0.34}$	36.8_{-1}	$6_{-0.3}$	$12_{-0.43}$	72 ± 1.5	16	35.8	0.12
79x13x0.2-IV	2	79 ± 1.5	54.5^{+1}	$55.8_{-0.4}$	$56.5_{-1.2}$	$8_{-0.35}$	$8_{-0.36}$	96.2 ± 1.75	13	55.4	0.2
100x11x0.2-IV		$100_{-2.2}$	78^{+1}	$76.5_{-0.4}$	$76.5_{-1.2}$	$6_{-0.3}$	$8_{-0.36}$	92.2 ± 1.75	11	76.4	0.2
100x14x0.15-IV	1	100 ± 1.5	76^{+1}	$76.5_{-0.4}$	$76.5_{-1.2}$	$4.5_{-0.3}$	$6_{-0.36}$	94 ± 1.75	14	76.4	0.15

GENERAL SPECIFICATIONS

Bellows designation	Effective area F_{eff}, cm^2	Rigidity, N/mm (kgf/mm)		Working stroke, mm		Maximum operating pressure (internal or external) P_{max} MPa (kgf/cm^2)
		maximum	minimum	full	recommended	
17x12x0.13-IV	1.35	8.5 (0.85)	2.5 (0.25)	4.0	2.0	0.49 (4.9)
32x11x0.12-IV	5.15	3.3 (0.33)	1.00 (0.10)	12.0	6.0	0.28 (2.8)
38x8x0.11-IV	8.00	4.5 (0.45)	1.40 (0.14)	7.5	3.8	0.10 (1.0)
44,5x17x0.14-IV	11.4	3.85 (0.385)	1.3 (0.13)	9.3	4.7	0.15 (1.5)
51x16x0.12-IV	15.00	2.5 (0.25)	---	17.0	8.5	0.18 (1.8)
79x13x0.2-IV	35.00	3.7 (0.37)	1.6 (0.16)	20.0	10.0	0.16 (1.6)
100x11x0.2-IV	60.00	8.1 (0.81)	3.4 (0.34)	24.0	12.0	0.16 (1.6)
100x14x0.15-IV	60.00	2.27 (0.227)	0.85 (0.085)	20	10	0.08 (0.8)

TYPE V

OVERALL AND ATTACHMENT DIMENSIONS



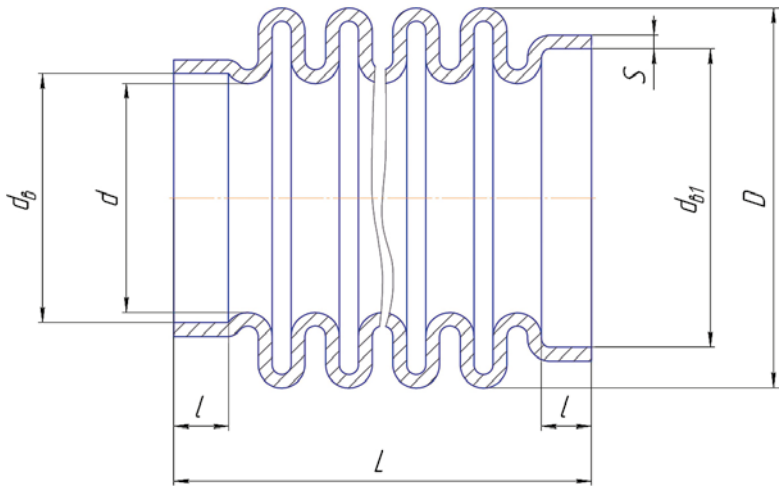
Bellows designation	D, mm	d, mm	d_h, mm	d_1, mm	l, mm	l_1, mm	L, mm	Number of corrugations n	Tube blank	
									Outside diameter (reference)	S, wall thickness max. dev. ±10 %
28.5x11x0.12-V	$28.5^{\pm 1}$	$18.1^{+0.8}$	$21^{+0.28}$	$19.8_{-0.84}$	$1.5_{-0.25}$	$6_{-0.3}$	38.8 ± 1.25	11	19	0.12
28.5x11x012-V (no bottom)	$28.5^{\pm 1}$	$18.1^{+0.8}$	$21^{+0.28}$	$19.8_{-0.84}$	$1.5_{-0.25}$	_	38.8 ± 1.25	11	19	0.12

GENERAL SPECIFICATIONS

Bellows designation	Effective area F_{eff}, cm^2	Rigidity, N/mm (kgf/mm)		Working stroke, mm		Maximum operating pressure (internal or external) P_{max} MPa (kgf/cm^2)
		maximum	minimum	full	recommended	
28.5x11x0.12-V	4.40	6.3 (0.63)	1.73 (0.173)	9.0	4.5	0.65 (6.5)
28.5x11x012-V (no bottom)	4.40	6.3 (063)	1.73 (0.173)	9.0	4.5	0.65 (6.5)

TYPE VI

OVERALL AND ATTACHMENT DIMENSIONS



Bellows designation	D, mm	d, mm	d_i, mm	d_{i1}, mm	l, mm	L, mm	Number of corrugations n	Tube blank	
								Outside diameter (reference)	Outside diameter (reference)
16x7x0.09-VI	16 ± 0.5	$9.5_{-0.8}$	$12.3^{+0.24}$	$15.8^{+0.24}$	$2_{-0.25}$	$12.9_{-1.1}$	7	11.5	0.09
16x20x0.09-VI	16 ± 0.5	$9.5_{-0.8}$	$12.3^{+0.24}$	$15.8^{+0.24}$	$2_{-0.25}$	$27.7_{-0.84}$	20	11.5	0.09
47x5x0.14-VI	47 ± 1	$31.7_{-0.7}$	$46.8^{+0.25}$	$46.8^{+0.25}$	$1.7_{-0.25}$	$22.8_{-0.84}$	5	35.8	0.14

GENERAL SPECIFICATIONS

Bellows designation	Effective area F_{eff}, cm^2	Rigidity, N/mm (kgf/mm)		Working stroke, mm		Maximum operating pressure (internal or external) P_{max} MPa (kgf/cm^2)
		maximum	minimum	full	recommended	
16x7x0.09-VI	1.27	7.4 (0.74)	4.0 (0.40)	1.7	0.85	0.6 (6.0)
16x20x0.09-VI	1.27	2.86 (0.286)	0.8 (080)	6.0	3.0	0.12 (1.2)
47x5x0.14– VI	12.20	8.70 (0.870)	3.12 (0.312)	4.2	2.1	0.21 (2.1)

ORDERING INFORMATION

Single-layer bellows with the outside diameter D = 12 mm, number of corrugations n = 15, wall thickness S = 0.14, type II, to be used in the order for the bellows and in the documentation of other products where it can be applied:
Special single-layer bellows 12x15x0,14 – II TY 25.02.110737 – 82.

SPECIAL DOUBLE-LAYER BELLOWS AS PER TU 25.02.110737-82

OVERALL AND ATTACHMENT DIMENSIONS

Fig. 1

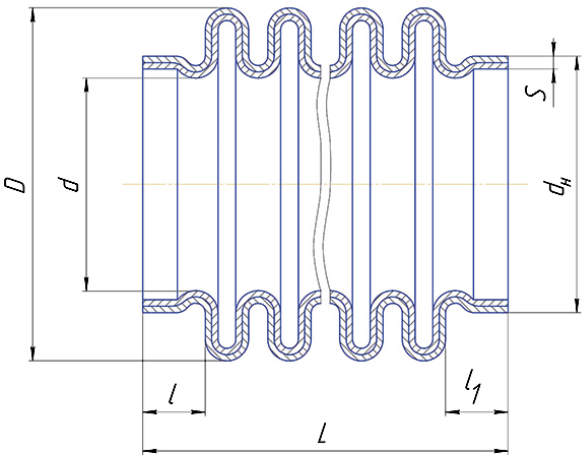
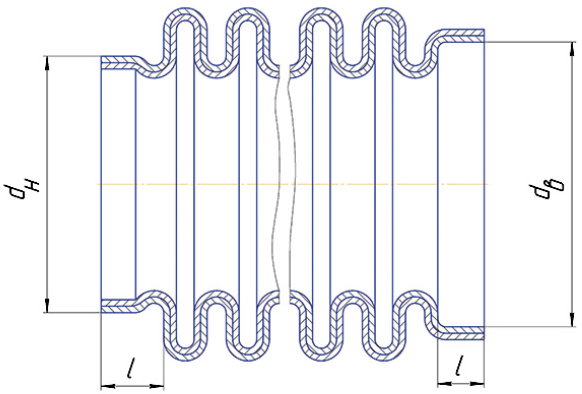


Fig. 2
for the rest, see Fig. 1



Bellows designation	Fig.	D, mm	d, mm	d_o, mm	d_i, mm	l, mm	l_1, mm	L, mm	Number of corrugations n	Tube blank	
										outside diameter (reference)	S, wall thickness max. dev. ±10 %
28x8x0.24-I	1	$28^{+0,25}_{-0,84}$	18.1^{+1}	$19.5_{-0.28}$	-	$3_{-0.25}$	$3.5_{-0.3}$	26.5 ± 1.05	8	19.3	0.24
38x6x0.22-II	2	38 ± 1	25^{+1}	$27_{-0.28}$	$31^{+0.34}$	$3_{-0.25}$	-	23.6 ± 1.05	6	25.8	0.22
50x10x0.28-I	1	$50^{+0,5}_{-1}$	$34.9^{+0,62}_{-0,25}$	$36_{-0.34}$	-	$4_{-0.3}$	$4_{-0.3}$	52 ± 1.5	10	35.8	0.28

GENERAL SPECIFICATIONS

Bellows designation	Effective area F_{eff}, cm^2	Rigidity, N/mm (kgf/mm)		Working stroke, mm		Maximum operating pressure (internal or external) P_{max} MPa (kgf/cm^2)
		maximum	minimum	full	recommended	
28x8x0.24-I	4.2	25 (2.5)	5 (0.5)	7.0	3.5	1.36 (13.6)
38x6x0.22-II	8.0	10 (1.0)	3 (0.3)	7.0	3.5	0.41 (4.1)
50x10x0.28-I	14.1	13 (1.3)	4 (0.4)	12.0	6.0	0.19 (1.9)

ORDERING INFORMATION

Double-layer bellows with the outside diameter D = 28 mm, number of corrugations n = 8, wall thickness S = 0.24, type I, the designation to be used in the order for the bellows and in the documentation of other products where it can be applied:
Special double-layer bellows 28x8x0,24 – I TU 25.02.110737-82.

BELLOWS AS PER TU BKEA

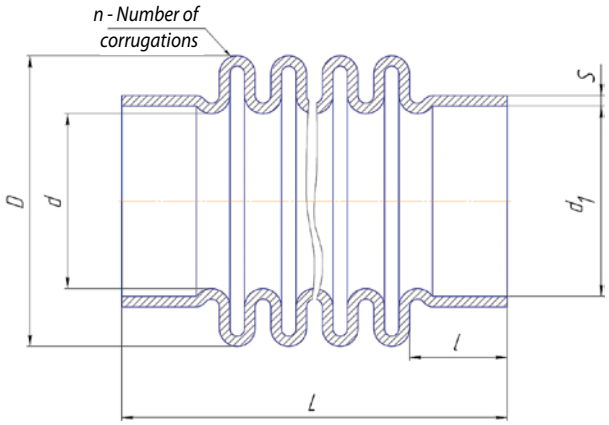
60-16-0.16-1	60-17-0.16-1	60-19-0.16-1	60-22-0.16-1

DESIGNATION EXAMPLE

Bellows with the outside diameter D = 60 mm, number of corrugations n = 19, wall thickness S = 0.16 mm:
Bellows 60-19-0.16-1 BKEA.

SPECIAL LONG-STROKE BELLOWS ЮУО.709.001 ТУ (36НХТЮ)

OVERALL AND ATTACHMENT DIMENSIONS



Bellows designation	Effective area, cm^2	D, mm	d, mm	d_1, mm	l, mm	t*	a*	L, mm	Number of corrugations n	Tube blank	
										Outside diameter	S, wall thickness
38x18x0.13	7.92	38 ± 1	25.5 ± 0.52	32 + 0.16	4 ± 0.3	3.0	1.5	63.5 ± 1.9	18	28 – 0.21	0.13 ± 0.02
52x22x0.12	15.4	52 ± 1.2	36 ± 0.62	38 + 0.16	5 ± 0.3	4.0	2.0	100 ± 2.2	22	38 – 0.25	0.15 ± 0.02

GENERAL SPECIFICATIONS

Bellows designation	Effective area, cm^2	Maximum compression value, mm	Maximum tension value, mm	Maximum operating pressure (external or internal), MPa (kgf/cm^2)
38x18x0.13	7.92	17.5	9.5	0.3 (3.0)
52x22x0.12	15.4	28.0	12.0	0.3 (3.0)

ORDERING INFORMATION

Bellows in the order for the bellows and in documentation of other products: ***Bellows 38x18x0.13 ЮУО.709.001 ТУ***
Where: 38 – outside diameter, mm; 18 – number of corrugations; 0.13 – wall thickness, mm.

SINGLE-LAYER MEASURING METAL BELLOWS ТУ 25-02.110299-77

OVERALL AND ATTACHMENT DIMENSIONS

Fig. 1

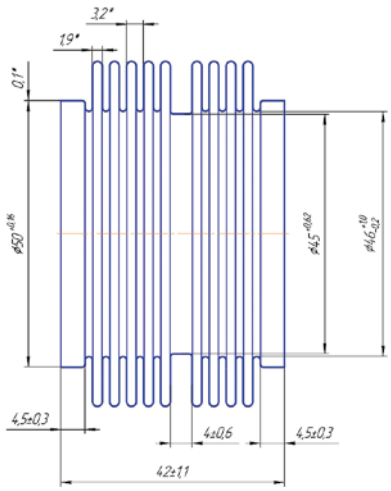
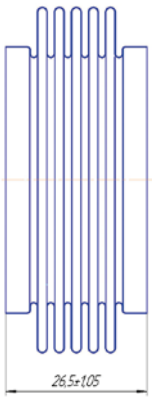


Fig. 2
for the rest, see Fig. 1



GENERAL SPECIFICATIONS

Bellows designation	Fig.	Rigidity, N/mm	Maximum working stroke, mm	Maximum operating pressure, MPa (kgf/cm^2)
65x (5+4)x0.1	1	1.00–2.20	9	0.18 (1.8)
65x5x0.1	2	1.70–3.75	5	

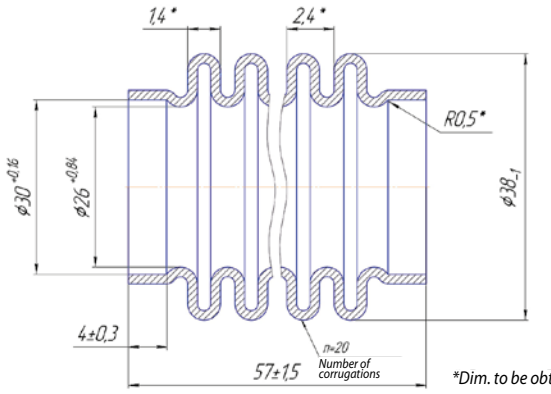
ORDERING INFORMATION

Bellows with the outside diameter D = 65 mm, number of corrugations n = 5 + 4, wall thickness S = 0.1 mm, made of material grade 36HXTIO, the designation to be used in the order for the bellows and in the documentation of other products where it can be applied:

Bellows 65x(5+4)x0.1 – 36HXTIO TY25-02.110299-77.

BELLOWS TY 25-2472.0068-88 (12X18H10T)

OVERALL AND ATTACHMENT DIMENSIONS



*Dim. to be obt. by tooling

GENERAL SPECIFICATIONS

Effective area, cm^2	Rigidity		Maximum working stroke (compression), mm	Maximum operating pressure (internal), MPa	Tube blank	
	Rated value, N/mm	max. dev., %			Outside diameter, mm	Wall thickness (max. dev. ±10 %)
8.00	2.4	+30	17.0	0.45	30.0	0.12

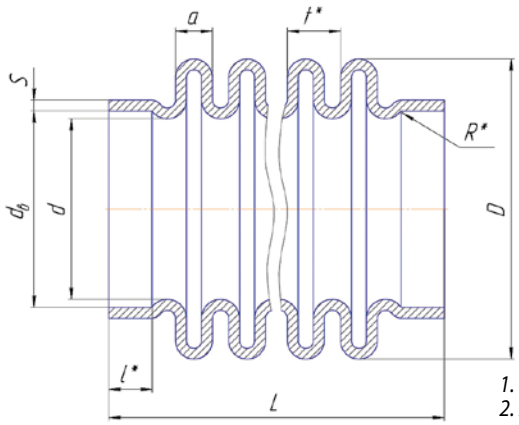
ORDERING INFORMATION

Bellows in the order for the bellows and in design and process documentation:

Bellows 38x20x0.12-12X18H10T TY 25-2472.0068-88.

SINGLE-LAYER BELLOWS TY 3-2678-92 (12X18H10T, 08X18H10T)

OVERALL AND ATTACHMENT DIMENSIONS



1. * Reference dimensions.
2. R= (0.5…1.0) mm.

Bellows designation	D, mm	d, mm	d_i, mm	l, mm	L, mm	Number of corrugations n	S, mm	t, mm	a, mm
45-17-0.16	45 ± 1	33.5 ± 0.62	39 + 0.17	5 ± 0.3	74 – 1.9	17	0.16 ± 0.02	3.7	2.7

GENERAL SPECIFICATIONS

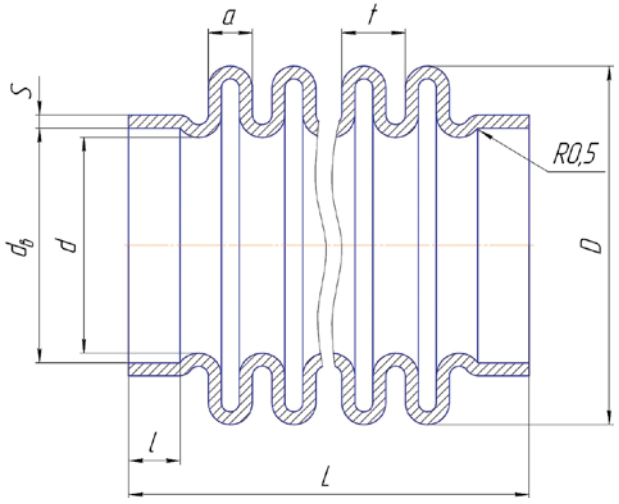
Bellows designation	Force rigidity C_0, kN/m		Working compression stroke, mm	Operating internal pressure P, MPa	Specified lifetime T_H, cycle
	max.	min.			
45-17-0.16	25.00	8.00	10	0.10	100,000

ORDERING INFORMATION

Designation of the bellows to be used in the order and in documentation of other products:
Bellows 45-17-0.16 TУ 3-2678-92.

SPECIAL SINGLE-LAYER STEEL BELLOWS TУ 25.02.110736-78 12X18H10T AND 08X18H10T

OVERALL AND ATTACHMENT DIMENSIONS



Bellows designation	D, mm	d, mm	d_i, mm	l, mm	L, mm	t	a	Number of corrugations n	Tube blank	
									outside diameter (reference)	S, wall thickness max. dev. ±10 %
12.7x5x0.15	12.7 ± 0.2	7.5 ± 0.3	$10^{+0.1}$	3.2 ± 0.15	15.5 ± 0.3	1.7	1.3	5	10	0.12
15x10x0.12	15 ± 0.7	9.5 ± 0.36	$13^{+0.24}$	3.5 ± 0.5	27 ± 1.05	1.9	1.4	10	12	0.12
15x10x0.14										0.14
15x12x0.12					30.5 ± 1.25			12		0.12
15x12x0.14										0.14
15x14x0.14					34.5 ± 1.25			14		
18x6x0.12	18 ± 0.7	11.5 ± 0.36	$14^{+0.24}$	3.5 ± 0.5	20.5 ± 1.05	2.2	1.4	6	14	0.12
18x10x0.12					30 ± 1.25			10		
38x12x0.16	38 ± 1	25.5 ± 0.52	32 ± 0.17	4 ± 0.3	$35_{-1.6}$	4.2	2.8	6	28	0.16
52x14x0.16	52 ± 1.2	33.5 ± 0.62	$38^{+0.34}$	5 ± 0.5	$99_{-1.4}$	6.2	4.2	14	38	
78x10x0.16	78 ± 1.2	55.5 ± 0.75	$60^{+0.4}$	7 ± 0.5	$87_{-1.4}$	7.1	4.9	10	60	
38x12x0.16*	38 ± 1	25.5 ± 0.52	32 ± 0.17	4 ± 0.3	$35_{-1.6}$	4.2	2.8	6	28	

GENERAL SPECIFICATIONS

Bellows designation	Effective area F_{eff}, cm^2	Rigidity, N/mm (kgf/mm)		Working stroke, mm		Maximum operating pressure (internal or external) P, MPa (kgf/cm^2)
		maximum	minimum	full	recommended	
12.7x5x0.15	0.72	-	32 (3.20)	-	-	0.50 (5.0)
15x10x0.12	1.18	24 (2.4)	7.0 (0.70)	3.6	1.8	1.7 (17.0)
15x10x0.14		34 (3.4)	13.7 (1.37)	3.6	1.8	2.15 (21.5)
15x12x0.12		20 (2.0)	6.5 (0.65)	4.4	2.2	1.70 (17.0)
15x12x0.14		28.3 (2.83)	10.0 (1.0)	4.4	2.2	2.15 (21.5)
15x14x0.14		24.3 (2.43)	9.8 (0.98)	5.2	2.6	2.15 (21.5)
18x6x0.12	1.70	32.0 (3.2)	12 (1.2)	3.0	1.5	1.70 (17.0)
18x10x0.12		19.0 (1.9)	6.0 (0.60)	5.8	2.9	1.50 (15.0)
38x12x0.16	8.0	8.0 (0.80)	4.0 (0.40)	12.0	6.0	1.15 (11.5)
52x14x0.16	14.4	9.0 (0.90)	3.0 (0.30)	21.0	10.5	0.70 (7.0)
78x10x0.16	35.2	7.0 (0.70)	2.0 (0.20)	15.7	7.9	0.55 (5.5)

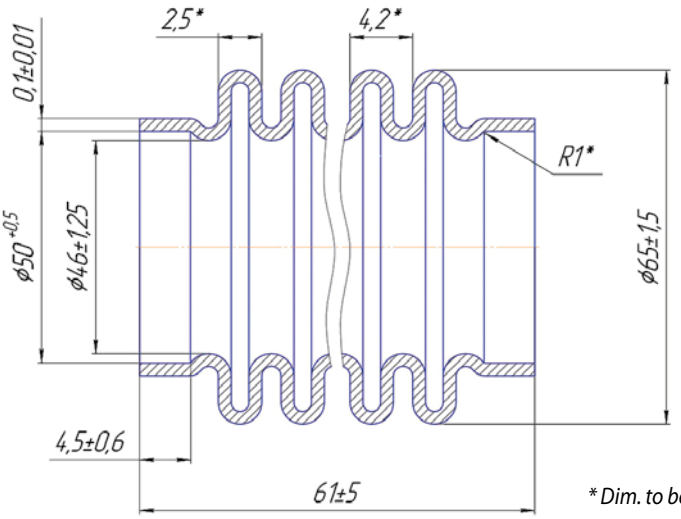
The bellows is manufactured of material 08X18H10T and 12X18H10T.

ORDERING INFORMATION

Bellows with the outside diameter D = 15 mm, number of corrugations n = 10, wall thickness S = 0.12 mm, to be used in the order for the bellows and in the documentation of other products:
Bellows 15x10x0.12 ТУ25.02.110736-78.

SINGLE-LAYER STEEL BELLOWS ТУ 35-1923-88 (12X18H10T, 08X18H10T)

OVERALL AND ATTACHMENT DIMENSIONS



** Dim. to be obt. by tooling*

GENERAL SPECIFICATIONS

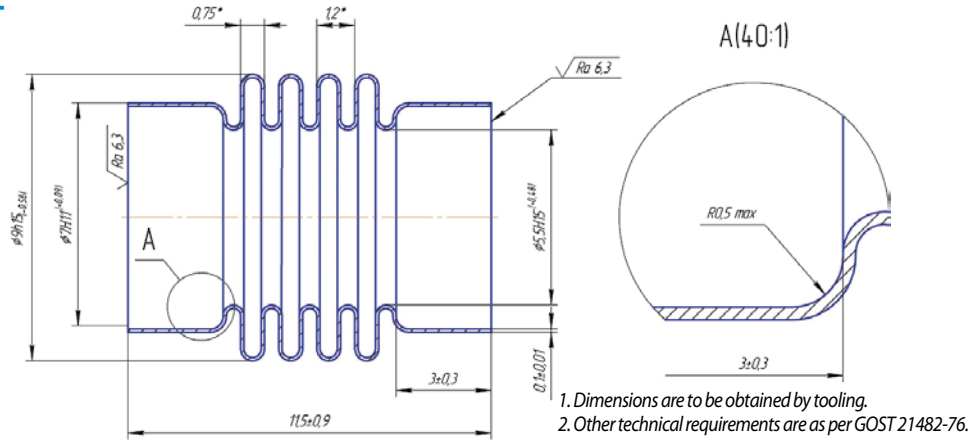
Rigidity		Maximum working stroke (compression), mm	Maximum operating pressure (internal), MPa	number of corrugations, n
Rated value, N/mm	max. dev., %			
2.7	25	20.0	0.05	10

DESIGNATION OF THE BELLOWS TO BE USED IN THE ORDER FOR THE BELLOWS AND IN DOCUMENTATION OF OTHER PRODUCTS:

Bellows 65x10x0.1 ТУ 35-1923-88.

BELLOWS 9x4x0.1 (12X18H10T) ЦТКА.3045552.057

OVERALL AND ATTACHMENT DIMENSIONS

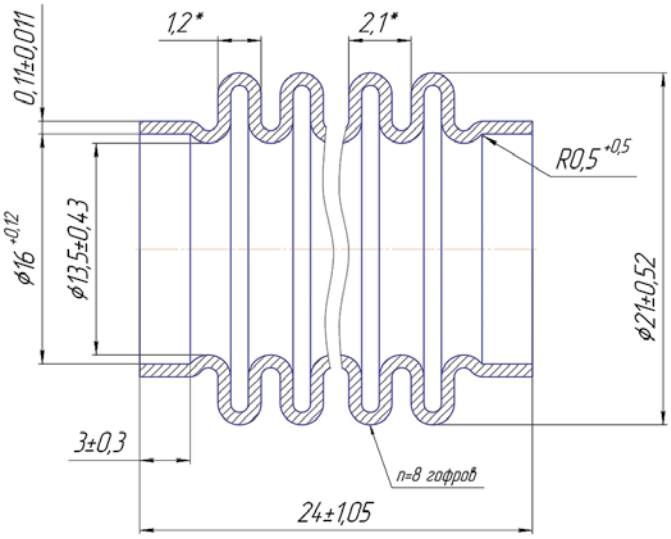


1. Dimensions are to be obtained by tooling.
2. Other technical requirements are as per GOST 21482-76.

Specifications of bellows 9x4x0.1 are as per GOST 21482-76.

SPECIAL SINGLE-LAYER BRONZE BELLOWS ТУ 25.02.110738-78 (БрБ2)

OVERALL AND ATTACHMENT DIMENSIONS



* Dim. to be obt. by tooling

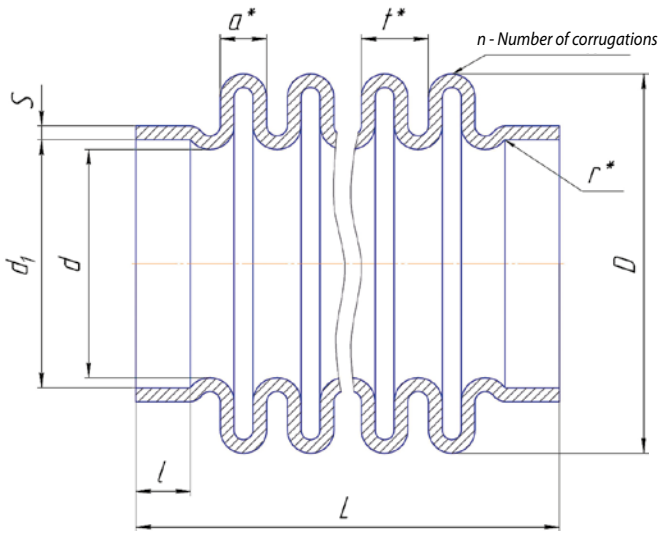
GENERAL SPECIFICATIONS

Effective area, cm^2	Rigidity, N/mm		Working stroke		Maximum operating pressure (internal or external), MPa
	Maximum	Minimum	Maximum	Recommended	
2.34	17.1	5.00	5	2.5	0.75

ORDERING INFORMATION

Designation of bellows with the outside diameter D = 21 mm, number of corrugations n = 8, wall thickness S = 0.11 mm, to be used in the order for the bellows and in documentation of other products:
Bellows 21x8x0.11 ТУ25.02.110738-78.

BELLOWS 8E38-TУ521 (36HXTЮ)



OVERALL AND ATTACHMENT DIMENSIONS

SPECIFICATIONS:

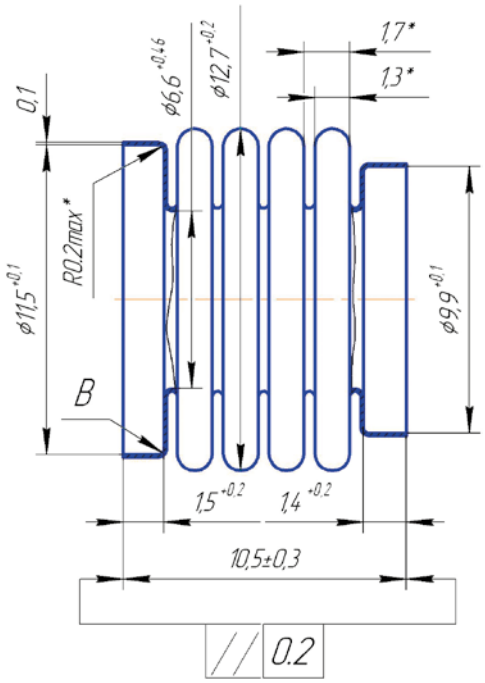
1. Working stroke is 2.0 ± 0.1 mm
2. Operating pressure is 11^{+1} kgf/cm^2.

Bellows designation	Effective area, cm^2	D, mm	d, mm	d_1, mm	l, mm	t*	a*	L, mm	Number of corrugations n	Tube blank	
										Outside diameter	S, wall thickness
28x4x0.16	4	$28_{-0.84}$	$18^{+0.7}$	$20^{+0.13}$	$4_{-0.52}$	2.6	1.6	63.5 ± 1.9	4	$20_{-0.21}$	0.16 ± 0.016

ORDERING INFORMATION

Designation of the bellows with the outside diameter D = 28 mm, number of corrugations n = 4, wall thickness S = 0.16 mm:
Bellows 28x4x0.16 8E38 TУ521.

BELLOWS 12.7x4x0.1 TУ-3695-151-00227471-2012



OVERALL AND ATTACHMENT DIMENSIONS

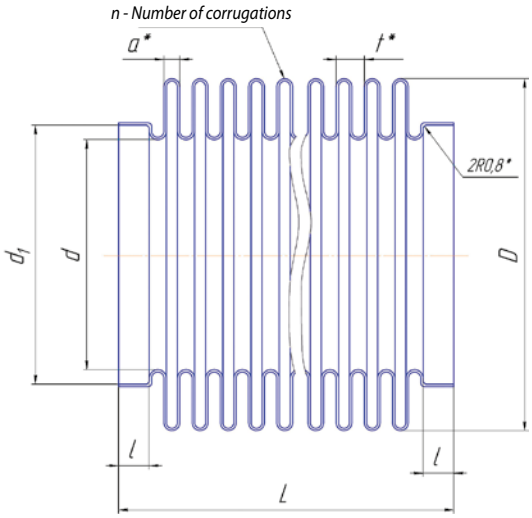
GENERAL SPECIFICATIONS

1. The bellows rigidity is 1.7 to 3.4 kgf/mm;
2. The bellows shall be leak-tight at an internal pressure of 7 kgf/cm^2;
3. The bellows working stroke (compression) is (0.32 ± 0.08) mm;
4. The bellows operating (external) pressure is 0.4 MPa;
5. Material grade 36HXTЮ-M-O-0,4x200 GOST 14117-85.

ORDERING INFORMATION FOR THE BELLOWS

With the outside diameter 12.7 mm, number of corrugations 4, wall thickness of 0.1 mm, to be used in the order for the bellows and in documentation of other products where it can be applied:
Bellows 12.7x4x0.1 TУ 3695-151-00227471-2012.

SINGLE-LAYER BRONZE BELLOWS WITH INNER FITTING SURFACES ТУ 3695-158-00227471-2014 (БрБ2)



OVERALL AND ATTACHMENT DIMENSIONS

ORDERING INFORMATION FOR THE BELLOWS

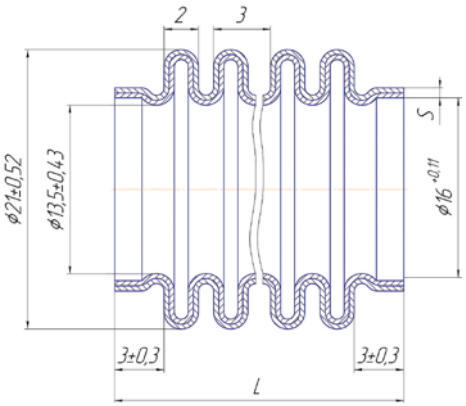
with the outside diameter 45 mm, number of corrugations 9, wall thickness of 0.12 mm, to be used in the order for the bellows and in documentation of other products where it can be applied: ***Bellows 45x9x0.12 ТУ 3695-157-00227471-2014.***

Bellows designation	D, mm	d, mm	d_1, mm	l, mm	t*	a*	L, mm	Number of corrugations n	Tube blank	
									outside diameter	S, wall thickness
45x9x0.12	45 ± 0.62	33.5 ± 0.62	$38^{+0.16}$	$4_{-0.3}$	3.3	1.9	39 ± 1	9	35.6 – 0.25	0.12 ± 0.012
52x14x0.18	52 ± 0.74	37.5 ± 0.62	$45^{+0.16}$	$5_{-0.3}$	4	2.2	68 ± 2.5	14	40 – 0.25	0.18 ± 0.018

GENERAL SPECIFICATIONS

Bellows designation	Effective area, cm^2	Rigidity, kgf/mm		Working stroke (compression or tension), mm	Maximum operating pressure (external of internal), kgf/cm^2
		max	min		
45x9x0.12	12.00	0.80	0.40	9.0	3.0
52x14x0.18	15.80	0.63	0.47	16.4	6.0

BELLOWS 6Г7.090.111-0 ТУ



OVERALL AND ATTACHMENT DIMENSIONS

ORDERING INFORMATION FOR THE BELLOWS

Specify as follows in the order and in documentation of other products where they are applied:
Bellows 6Г7.090.111-0 as per technical conditions 6Г7.090.111-0ТУ.

Bellows designation	Effective area, cm^2	Rigidity, kgf/mm	Maximum operating pressure, kgf/cm^2	Maximum working stroke (tension), mm	Maximum working stroke (compression), mm	L, mm	Number of corrugations n	S, wall thickness
6Г7.090.111-1	2.3	0.6–1.5	18	2	3	40 ± 1	11	0.2 ± 0.02
6Г7.090.111-2	2.3	0.5–1	30	4.5	6	72 ± 1.5	22	0.24 ± 0.02

SINGLE-LAYER BELLOWS USED AS PHASE SEPARATORS, COMPENSATORS, POWER ELEMENTS, PRESSURE-TO-FORCE TRANSDUCERS

These bellows include:

BELLOWS AS PER GOST 22388-90 TYPE I

08X18H10T and 12X18H10T					
15-3-0.12-1	15-16-0.12	18-12-0.12	27-12-0.16	38-10-0.12-1	52-9-0.16
15-7-0.12-1	15-18-0.12	18-14-0.22	28-12-0.16	38-10-0.14	52-14-0.16
15-8-0.12	15-18-0.14	18-22-0.18	38-2-0.12	38-10-0.16	52-14-0.14-1
15-8-0.12-1	16-16-0.12	21-10-0.18	38-8-0.16	38-10-0.22	52-17-0.16
15-10-0.12	18-6-0.12	27-8-0.16	38-8-0.22	38-12-0.16	63-9-0.16
15-10-0.14	18-6-0.14	27-10-0.14	38-6-0.12	38-12-0.22	63-9-0.22
15-12-0.12	18-5-0.12	21-18-0.18	38-6-0.16	38-16-0.22	63-15-0.16
15-12-0.14	18-6-0.22-I	27-8-0.14	38-8-0.12	52-14-0.22	63-15-0.22-1
15-14-0.12	18-10-0.12	27-10-0.16	38-8-0.14	52-14-0.16A-1	63-20-0.16-1
15-14-0.14-1	18-10-0.14	27-12-0.14	38-10-0.12	52-3-0.16	78-10-0.16

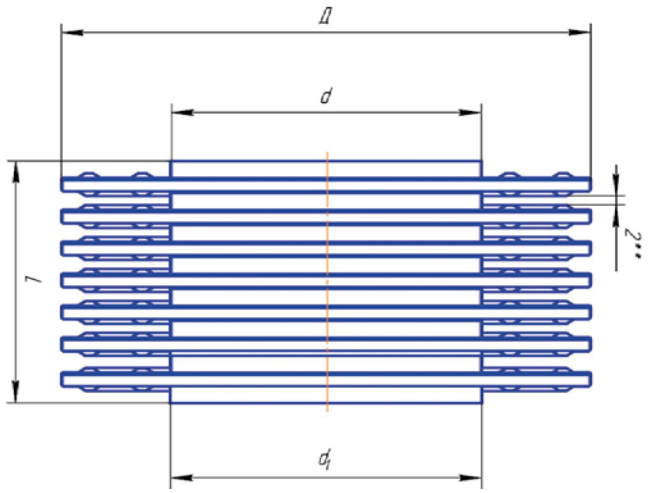
ORDERING INFORMATION

Designation of the bellows with the diameter D = 16 mm, number of corrugations n = 12, wall thickness S = 0.12 mm, version 1:

Bellows 16-12-0.12-1 GOST 22388-90.

WELDED BELLOWS TУ 25.02.112006-76 (36НХТЮ)

OVERALL AND ATTACHMENT DIMENSIONS



Bellows designation	Dimensions, mm				Number of corrugations
	D	d	d_1	L	
120x7x0.11	120 – 1.4	70.22 + 0.2	70 + 0.2	52.4 – 1.2	7

GENERAL SPECIFICATIONS:

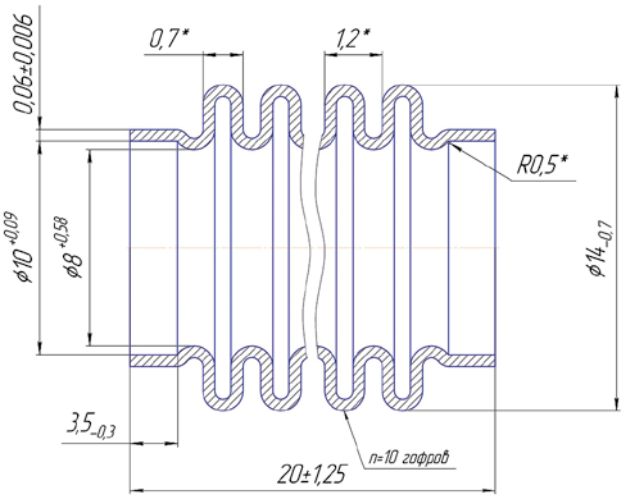
1. The effective area, F_{aa} is 70 ± 1.5;
2. The force rigidity per corrugation is 10.2 ± 1.7 N/mm;
3. The maximum working stroke is 8.19 mm;
4. The maximum operating pressure is 0.063 MPa.

ORDERING INFORMATION

Bellows with the outside diameter D = 120 mm, number of corrugations n = 7, to be used in the order for the bellows and in documentation of other products:
Bellows 120x7 ТУ25.02.112006-76.

LOW-RIGIDITY BELLOWS ТУ 25-2472.0067-88 (ЛАНКМЦ)

OVERALL AND ATTACHMENT DIMENSIONS



** Dim. to be obt. by tooling*

GENERAL SPECIFICATIONS

Effective area, cm^2	Rigidity		Maximum working stroke (compression – tension), mm	Maximum operating pressure (internal), MPa
	Rated value, N/mm	max. dev.,		
1.0	1.2	±0.3	2.5	0.2

ORDERING INFORMATION

Designation of the bellows to be used in the order for the bellows and in documentation of other products:
Bellows 14x10x0.06 ТУ 25-2472.0067-88.

MULTI-LAYER BELLOWS AS PER GOST VD 21744-83, GOST R 55019-2012

Multi-layer bellows manufactured as per GOST VD 21744-83, GOST R 55019-2012 are intended for operation as sensing elements, phase separators, sealing devices as well as power unit components in atmospheres causing no material corrosion, at a temperature of minus 260 to plus 550 °C.

They are used in glandless valves, dynamic seals, vibration-absorbing intermediate elements, heating systems, pipelines, etc.

Bellows are manufactured of corrosion-resistant and fire-resistant steel grades 08X18H10T or 12X18H10T. They provide complete leak-tightness at high pressures and temperatures in combination with excellent flexibility, which is particularly important for hazardous industries.

Bellows operating medium:

- Gaseous aggressive atmosphere (low aggressive);
- Liquid aggressive atmosphere (low aggressive);
- Steam-gas mixture;
- Water, air, nitrogen;
- Deactivation and washing solutions;
- Inert gaseous atmosphere and liquid nonaggressive media; Atmospheres to which the bellows material is corrosion-resistant.

BELLOWS AS PER GOST R 55019-2012

08X18H10T, 12X18H10T, 10X17H13M2T, 10X17H13M3T GOST R 55019-2012					
22-6-0.16x2	28-4-0.17x6	38-13-0.21x6	63-8-0.2x4	73-3-0.2x6	95-6-0.25x4
22-8-0.16x2	28-8-0.17x6	38-16-0.21x6	63-10-0.2x4	73-7-0.2x6	95-8-0.25x4
22-10-0.16x2	28-10-0.17x6	38-20-0.21x6	63-12-0.2x4	73-8-0.2x6	95-10-0.25x4
22-12-0.16x2	28-12-0.17x6	38-8-0.21x8	63-10-0.2x4	73-10-0.2x6	95-12-0.25x4
22-16-0.16x2	28-16-0.17x6	38-10-0.21x8	63-10-0.2x4A	73-16-0.2x6	95-16-0.25x4
22-20-0.16x2	28-20-0.17x6	38-12-0.21x8	63-12-0.2x4A	75-4-0.2x2	95-4-0.25x6
22-6-0.16x3	28-25-0.17x6	38-16-0.21x8	63-10-0.2x10	75-6-0.2x2	95-6-0.25x6
22-6-0.16x5	28-4-0.17x7	38-20-0.21x8	65-4-0.2x2	75-8-0.2x2	95-8-0.25x6
22-8-0.16x5	28-8-0.17x7	48-8-0.2x2	65-6-0.2x2	75-12-0.2x2	95-10-0.25x6
22-10-0.16x5	28-10-0.17x7	48-10-0.2x2	65-8-0.2x2	75-16-0.2x2	95-12-0.25x6
22-12-0.16x5	28-12-0.17x7	48-12-0.2x2	65-10-0.2x2	75-4-0.2x3	95-16-0.25x6
22-16-0.16x5	28-16-0.17x7	48-16-0.2x2	65-12-0.2x2	75-6-0.2x3	95-20-0.25x6
27-12-0.17x2	28-20-0.17x7	48-20-0.2x2	65-4-0.2x4	75-8-0.2x3	125-4-0.3x4
27-4-0.17x6	28-25-0.17x7	48-16-0.2x3	65-6-0.2x4	75-12-0.2x3	125-6-0.3x4
27-9-0.17x6	38-8-0.21x2	48-8-0.2x4	65-8-0.2x4	75-16-0.2x3	125-8-0.3x4
27-12-0.17x6	38-10-0.21x2	48-10-0.2x4	65-10-0.2x4	75-4-0.2x6	125-10-0.3x4
27-13-0.17x6	38-12-0.21x2	48-12-0.2x4	65-12-0.2x4	75-6-0.2x6	125-12-0.3x4

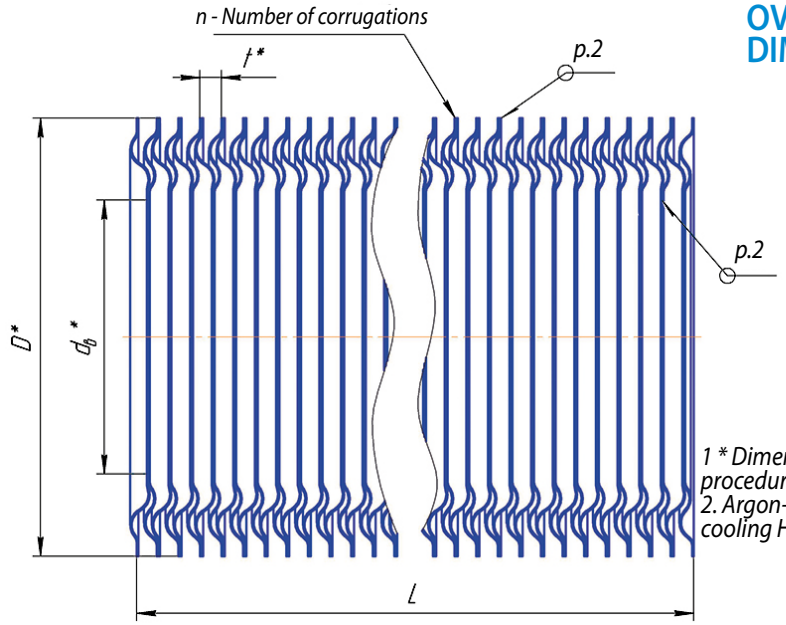
28-4-0.17x2	38-8-0.21x3	48-16-0.2x4	65-4-0.2x6	75-8-0.2x6	125-4-0.3x6
28-8-0.17x2	38-10-0.21x3	48-20-0.2x4	65-6-0.2x6	75-12-0.2x6	125-6-0.3x6
28-10-0.17x2	38-12-0.21x3	48-16-0.2x5	65-8-0.2x6	75-16-0.2x6	125-8-0.3x6
28-12-0.17x2	38-16-0.21x3	48-8-0.2x6	65-10-0.2x6	92-11-0.20x4	125-10-0.3x6
28-16-0.17x2	38-18-0.21x3	48-16-0.2x6	65-12-0.2x6	95-4-0.25x2	125-12-0.3x6
28-20-0.17x2	38-8-0.21x4	48-20-0.2x6	65-16-0.2x6	95-6-0.25x2	125-4-0.3x8
28-4-0.17x3	38-10-0.21x4	48-8-0.2x10	65-20-0.2x6	95-8-0.25x2	125-6-0.3x8
28-8-0.17x3	38-12-0.21x4	48-10-0.2x10	73-13-0.16x5	95-10-0.25x2	125-8-0.3x8
28-10-0.17x3	38-16-0.21x4	48-12-0.2x10	73-3-0.2x5	95-12-0.25x2	125-10-0.3x8
28-12-0.17x3	38-6-0.21x6	48-16-0.2x10	73-7-0.2x5	95-16-0.25x2	125-12-0.3x8
28-16-0.17x3	38-8-0.21x6	48-20-0.2x10	73-8-0.2x5	95-20-0.25x2	125-14-0.3x2
28-20-0.17x3	38-10-0.21x6	63-4-0.2x2	73-10-0.2x5	95-20-0.25x3	
28-25-0.17x3	38-12-0.21x6	63-4-0.2x4	73-16-0.2x5	95-4-0.25x4	

ORDERING INFORMATION

Ordering information for the bellows with the outside diameter D = 28 mm, number of corrugations n = 10, layer thickness S = 0.17 mm, number of layers z = 6:
Bellows 28-10-0.17x6 GOST R 55019-2012.

WELDED STEEL DIAPHRAGM BELLOWS

Welded steel diaphragm bellows are unique products consisting of annular diaphragms with desired pattern, connected in series between each other by welding on the outside and inside diameter.



OVERALL AND ATTACHMENT DIMENSIONS

*1 * Dimensions are to be obtained by assembly procedure.*
2. Argon-arc welding by edge flashing and cooling Н1-ИН GOST 14771-76.

Designation, description	Technical parameters and characteristics
Welded bellows ЦТКА.304555.004 125x84x0.2; 125x100x0.2	D-125 mm, L-126 mm, S-0.2 mm*, t-1.5 mm, n-84, di-107 mm, working stroke ±75 mm, material grade 12X18H10T GOST 5632-72. D-125 mm, L –
Diaphragm bellows ЦТКА.304555.050 51x60x0.15	D-51 mm, L-108 mm, S-0.15 mm*, t-1.8 mm, n-60, di-38.3 mm, Working stroke ±50 mm, operating pressure (external or internal) 0.3 MPa, material grade 12X18H10T GOST 5632-72.
Welded bellows ЦТКА.304552.010-01 98x43x0.2	D-98 mm, L-92 mm, S-0.2 mm*, t-2.15 mm, n-43, di-82.3 mm, working stroke ±36 mm, material grade 12X18H10T GOST 5632-72.
Diaphragm bellows ЦТКА.304555.017 35x130x0.1	D-35 mm, L-130 mm, S-0.1 mm*, t-1 mm, n-130, di-22 mm, Working stroke ±70 mm, operating pressure (external or internal) 0.2 MPa, material grade 20X13 GOST 5632-72.
Diaphragm bellows ЦТКА.304555.005 28x112x0.2; 51x88x0.2	D-28 mm, L-167 mm, S-0.2 mm*, t-1.5 mm, n-112, di-18 mm, working stroke ±100 mm, material grade 12X18H10T GOST 5632-72. D-51 mm, L-167 mm, S-0.2 mm*, t-1.9 mm, n-88, di-38.3 mm, working stroke ±100 mm, material grade 12X18H10T GOST 5632-72.
Welded bellows ЦТКА.304555.011 160x39x0.2	D-146 mm, L-100.3 mm, working stroke ±90 mm, operating pressure (external or internal) 0.2 MPa, material grade 12X18H10T GOST 5632-72.
Diaphragm bellows ЦТКА.304555.016;...-01 51x60x0.1; 51x90x0.1	D-51 mm, L-108 mm, S-0.1 mm*, t-1.8 mm, n-60, di-38.3 mm, working stroke ±65 mm, operating pressure (external or internal) 0.3 MPa, material grade 20X13 GOST 5632-72. D-51 mm, L-162 mm, S-0.1 mm*, t-1.8 mm, n-90, di-38.3 mm, working stroke ±65 mm, operating pressure (external or internal) 0.3 MPa, material grade 20X13 GOST 5632-72.
Diaphragm bellows ЦТКА.304555.015 29x120x0.1	D-29 mm, L-156 mm, S-0.1 mm*, t-1.3 mm, n-120, di-18 mm, operating pressure (external or internal) 0.2 MPa, material grade 20X13 GOST 5632-72.

Designation, description	Technical parameters and characteristics
Diaphragm bellows ЦТКА.304555.049 28x90x0.1	D-28 mm, L-117 mm, S-0.1 mm*, t-1.3 mm, n-90, di-18 mm, working stroke ±60 mm, operating pressure (external or internal) 0.2 MPa, material grade 12X18H10T GOST 5632-72.
Welded bellows ЦТКА.304552.020 160x81x0.2	D-160 mm, L-307 mm, S-0.2 mm*, t-3.77 mm, n-81, di-100.3 mm, working stroke ±180 mm, operating pressure (external or internal) 0.2 MPa, material grade 12X18H10T GOST 5632-72.
Welded bellows Ф085.944.012; -01 ТУВ 25-2472.0066-88 35x30x0.1	D-35 mm, L-30 mm, S-0.1 mm*, t-1 mm, n-30, di-22 mm, material grade 20X13 GOST 5632-72. D-35 mm, L-30 mm, S-0.1 mm*, t-1 mm, n-30, di-18.8 mm, material grade 20X13 GOST 5632-72 (for version -01).
Welded bellows ЦТКА.30455.011 160x39x0.2	D-160 mm, L-146 mm, S-0.2 mm*, t-3.77 mm, n-39, di-100.3 mm, working stroke ±90 mm, operating pressure (external or internal) 0.2 MPa, material grade 12X18H10T GOST 5632-72.
Bellows expansion joint АКШ-М3.2.999.001.99 28x124x0.2; 51x32x0.2; 51x72x0.2	D-28 mm, L-186 mm, S-0.2 mm*, t-1.5 mm, n-124, di-18 mm, working stroke ±100 mm, material grade 12X18H10T GOST 5632-72. D-51 mm, L-60.8 mm, S-0.2 mm*, t-1.9 mm, n-32, di-38.3 mm, working stroke ±100 mm, material grade 12X18H10T GOST 5632-72. D-51 mm, L-136 mm, S-0.2 mm*, t-1.9 mm, n-72, di-38.3 mm, working stroke ±100 mm, material grade 12X18H10T GOST 5632-72.
Bellows expansion joint АКЦН-М3.1.062.000.00 28x89x0.2; 51x31x0.2	D-28 mm, L-134 mm, S-0.2 mm*, t-1.5 mm, n-89, di-18 mm, working stroke ±100 mm, material grade 12X18H10T GOST 5632-72. D-51 mm, L-58.9 mm, S-0.2 mm*, t-1.9 mm, n-31, di-38.3 mm, working stroke ±100 mm, material grade 12X18H10T GOST 5632-72.
Diaphragm bellows ЦТКА.304555.057 104x14x0.4	D-104 mm, L-51 mm, S-0.4 mm*, t-3.4 mm, n-14, di-82.3 mm, working stroke for compression 20 mm, material grade 12X18H10T GOST 5632-72.
Bellows 2M295.13.01.010-1 80x40x0.25, 80x24x0.25	D-80 mm, L-176 mm, S-0.25 mm*, t-3.8 mm, n-40, di-53 mm, material grade 12X18H10T GOST 5632-72. D-80 mm, L-107.5 mm, S-0.25 mm*, t-3.8 mm, n-24, di-53 mm, material grade 12X18H10T GOST 5632-72.

NOTES:

1. Bellows designation, for example 125x84x0.2: D-125 – outside diameter; n-84 – number of corrugations; S-0.2 thickness of diaphragms. L – length of bellows in steady state; di – internal diameter of bellows

2. When requested by the customer, the number of corrugations may be changed, and also end pieces with customized structural features can be welded to diaphragm bellows.

These bellows have a range of advantages over seamless bellows.

A diaphragm bellows used in bellows-type pipeline valves extends the service life of valves by increasing the cyclic strength of a bellows unit, which is obtained by more even distribution of deformation load on a shaped corrugation. Moreover, a diaphragm bellows has a lower rigidity.

Practical experience with adopted diaphragm bellows manufactured by PJSC “SIW” show that the working stroke of a diaphragm bellows is three times as long as that of a seamless bellows per unit of length, and the rigidity is half as high, whereas the cyclic strength of a diaphragm bellows reaches 100,000 cycles, and that of a seamless bellows – 12,000.

The Russian Federation has no nationwide standards for diaphragm bellows, so it is necessary to consult a specialist when ordering them, and it should be noted that every diaphragm bellows manufactured by PJSC “SIW” has its own designation (for example, ЦТКА.304555.017) that has to be specified upon request.

BELLOWS UNITS AND ASSEMBLIES

Bellows units are intended for compensation of variations in pipeline length, release of vibration loads, pressurization of pipelines, prevention of pipeline failure and deformations.

A bellows unit provides efficient solutions to almost all problems related to pipeline deformation – temperature fluctuations, vibration, need for pressurization. Their installation allows minimization of the risk of deformation or complete failure.

A bellows unit is a component part of bellows pipeline valves where it serves for sealing purposes. It ensures that the working area is completely tight in relation to the environment and does not allow any leaks or emissions of the transported product into the atmosphere.

When used in the working conditions of hazardous chemical, oil and gas processing, nuclear, and other industrial facilities, bellows units guarantee biological protection of personnel and environment from exposure

to active and hazardous products at a high and ultra-high pressure and temperature.

We are able to develop and manufacture bellows units (including for valve engineering) as per individual requirements of the customer.

BELLOWS UNITS BASED ON SINGLE-LAYER BELLOWS

Designation and description	Technical requirements
Bellows unit ЦТКА.304552.033 (the unit includes the bellows 85x16x0.16 36НХТЮ GOST 21482-76)	Contact-roller welding Кш-0,9-0,3 GOST 15878-79. The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows unit ЦТКА.304552.032 (the unit includes the bellows 63-15-0.16 12Х18Н10Т GOST 22388-90)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Expansion joint 5БС.287.042 (the unit includes the bellows 38-12-0.16-1 12Х18Н10Т GOST 22388-90)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows unit АУДТ.304552.001 (the unit includes the bellows 65x10x0.10 12Х18Н10Т ТУ35-1923-88)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows unit ЛЗТК.004 (the unit includes the bellows 48x18x0.16 12Х18Н10Т GOST 21482-76)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows unit ИНТП-180-11 (the unit includes the bellows 28.5x9x0.12-III ТУ 25.02.110737)	Soldering Прв Кр 2 ПОС 61 GOST 21931-76. The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.

BELLOWS UNITS BASED ON MULTI-LAYER BELLOWS

Designation and description	Technical requirements
Bellows ЛПА26002-010Б (the unit includes the bellows 28-12-0.17x3 GOST 21744-83 08X18H10T)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is tested using external pressure: a) for strength – using water at 6.0 MPa (60 kg/cm^2) b) for leak-tightness – using air at 4.0 MPa (40 kg/cm^2) The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows ЛПА26002-010Б (the unit includes the bellows 28-12-0.17x3 GOST 21744-83 08X18H10T)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is tested using external pressure: a) for strength – using water at 5.0 MPa (50 kg/cm^2) b) for leak-tightness – using air at 4.0 MPa (40 kg/cm^2) The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows КПЛВ.304553.016 (the unit includes the bellows 22-3-0.16x2 08X18H10T)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is tested using external pressure: a) for strength – using water at 6.0 MPa (60 kg/cm^2) b) for leak-tightness – using air at 4.0 MPa (40 kg/cm^2) The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows ЛПА 26002-025 В (the unit includes the bellows 38-18-0.20x3 GOST 21744-83)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is tested using external pressure: a) for strength – using water at 6.0 MPa (60 kg/cm^2) b) for leak-tightness – using air at 4.0 MPa (40 kg/cm^2) The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows ЛПА 26001-050 Е (the unit includes the bellows 63-12-0.20x4A GOST 21744-83)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is tested using external pressure: a) for strength – using water at 5.0 MPa (50 kg/cm^2) b) for leak-tightness – using air at 4.0 MPa (40 kg/cm^2) The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows assembly СМ 26010-015-08 Б (the unit includes the bellows 22-12-0.16x4 GOST 21744-83)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is tested using external pressure: a) for strength – using water at 20.0 MPa (200 kg/cm^2) b) for leak-tightness – using air at 0.6 MPa (6 kg/cm^2) The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows assembly СМ 26021-010-04 А (the unit includes the bellows 22-10-0.16x4 GOST 21744-83)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is tested using external pressure: a) for strength – using water at 20.0 MPa (200 kg/cm^2) b) for leak-tightness – using air at 0.6 MPa (6 kg/cm^2) The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.
Bellows assembly СТС 200.001.027 (the unit includes the bellows 22-10-0.16x5 GOST 21744-83)	Argon-arc welding by edge flashing and cooling as per GOST 14771-76. The unit is leak-tested by blowing with helium as per OST 5P.0170-81 class II.

SECTION VI.
SERVICES

DESIGN AND MANUFACTURE OF DIES AND MOLDS

Public Joint Stock Company "Saransk Instrument Works" has powerful tool-making facilities, equipped with advanced imported high-accuracy CNC equipment manufactured by MITSUBISHI (Japan), HAAS (USA), etc., allowing computed-aided end-to-end design, from parts and processes to control programs used in manufacturing of attachments, and it also has standby capacities and can manufacture the following products for external customers:

– press dies for processing thermoplastics and thermosetting plastics;

– press dies for pressure die casting of non-ferrous metals;

– molds and chills for casting in skin-dry molds and conventional casting;

– blanking, bending, molding, and drawing dies for sheet die stamping;

– stamps for die forging;

– cutting and measuring tools;

– accessories for machining and assembly operations;

– dies, mandrels, guide rollers, gages, and other appliances, including for lines of foreign companies Proton, Rosendahl, Technocable, Caballe, Nieho, Leimbach, Nextrom, manufacturing cable products and rolled wire;

– other process appliances used in various manufacturing processes.

In addition, PJSC "SIW" offers turning, milling and electro-erosion machining of parts using CNC machines. Maximum overall dimensions of products are up to 800 mm.

PJSC "SIW" will also render such services as cutting of all metal types into blanks with maximum overall dimensions 450 x 600 mm, within the shortest possible time.

The price for products or service is to be negotiated. The lead time is from 1 to 3 months. If necessary, company specialists can help you to develop a tool design and a process procedure based on drawings or part specimens.

The company guarantees workmanship, timely manufacture, and uncompromising performance of any other contractual liabilities. All you need is to make a request by dialing any of the given telephone numbers or send your order via fax or email, and our employees will contact you as soon as possible and provide you with all required information.

PARTS MANUFACTURING AND MACHINING

The blanking and electroplating facility renders metal working services, having a fleet of CNC lathes:

– HARDINGE SV 200 (USA): D max – 284 mm, spindle D – 51 mm, working L – 450 mm, bar puller (material feeder), part collector for higher productivity and double-lathe servicing, drive tools;

– HAAS SL-20, TL-15: D max – 284 mm, spindle D – 51 mm, working L – 450 mm, bar puller (material feeder), part collector for higher productivity and double-lathe servicing, drive tools (rear spindle is available in TL-15 version);

– DMG CTX-350 (Germany): D max – 284 mm, spindle D – 51 mm, working L – 450 mm, drive tools;

– Swiss-type automatic CNC lathe from Citizen Cincom A-20 (Japan): D max – 20 mm, bar length L max – 3,000 mm, rear spindle, drive tools – very high productivity and working quality due to the automatic bar loader and long-term continuous working cycle;

– VCE 600 Pro MIKRON milling machining center (Switzerland): working table area – 700 x 500 x 500 mm, tools number – 24;

– multi-purpose turning lathes type ИЖ-250;

– multi-purpose milling lathes, including CNC lathes;

– grinding, drilling, gear-milling, and smoothing equipment;

– Swiss-type automatic lathes, one- and six-spindle automatic machines;

– electroplating shop: electroplating, zinc etching, paint shop and heat treatment.

Parts are manufactured using the following processes and machines:

– plastic molding on automatic molding machines

KUASY 170/55, KUASY 1800/400, TMC 250E, TMC 350E, SZ 250/1000, УМ 368, ЛТД 500/160: processing of fluoropolymers (polyethylene, polypropylene), polystyrenes, polycarbonates, ABS plastics, PVCs, polyamides (including glass-filled) using pressure die casting, casting of parts weighing from several grams to 1 kg;

– pressing of products from ferrous and non-ferrous metals ‡ up to 5 mm using the customer's attachments on two-crank presses up to 100 t and automatic molding machines СН 138, ПА-10, АБ, from up to 1 mm thick rolled material;

– manufacturing parts from rubber mixtures using direct extrusion method;

– casting on pressure die casting machines 711A07 and 711A08 from silumin АК-12 and brass ЛЦ 40 СД with the customer's attachments and more.

POWER AND REPAIR SHOP SERVICES

Power and repair shop renders the following services:

– repair of AMMs;

– grinding of bed slideways and carriage guideways for thread-cutting lathes, scraping and in-place fitting;

– manufacture of spare parts for metal-cutting equipment;

– manufacture of nonstandard equipment and steel structures;

– argon-arc welding;

– manufacture of vinyl plastic baths and linings;

– metal working.

If necessary, company specialists will help you to choose the correct solution.

DEVELOPMENT AND MANUFACTURE OF ANY TYPICAL SIZE OF BELLOWS AND UNITS BASED ON SENSING ELEMENTS

The Special Design Engineering Office (SDEO) of PJSC "SIW" offers:

– development and manufacture of any typical size of bellows on mutually beneficial terms;

– development, adoption, and supply of bellows units and assemblies as per your order in compliance with your personal requirements, including nonstandard products.

Having advanced equipment and producing a wide range of metal single- and multi-layer bellows, diaphragm bellows and membranes, Public Joint Stock Company "Saransk Instrument Works" guarantees that you will get high-quality products at favorable prices.

CHEMICAL LABORATORY

The Laboratory for Production Control and Industrial Hygiene is certified by Federal State-Funded Institution "Mordovian Centre for Standardization, Metrology and Certification" to conduct laboratory analyses, recognized by other organizations, and to check the conditions required for measurement until 2022.

The Laboratory for Production Control and Industrial Hygiene renders the following types of services:

– chemical analysis for the incoming inspection of materials, metals and alloys;

– analysis of electroplating baths, waste water;

– analysis of the air in production premises and sanitary protection zones;

– measurement of indoor microclimate parameters, light intensity, noise and vibration.

TESTING OF DEVICES AND EQUIPMENT

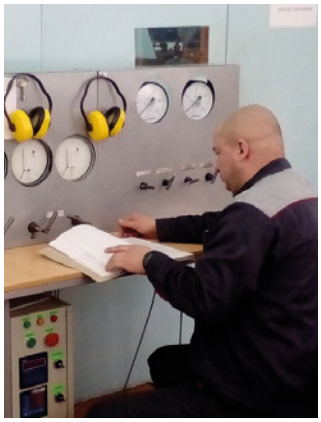
The device testing laboratory of PJSC "SIW" has been certified as a technically competent Device Testing Laboratory since 1996.

The testing laboratory offers the following services for testing of devices and equipment:

– household and similar electrical devices (code OKP 342530, 346840, 346844, 346870, 346888, 346890, 346893, 346894, 515640, 346895, 346896, 473411, 515611, 515644, 515651, 515652, 515654, 515655, 515671); – consumer radio-electronic equipment (code OKP 658300, 658400, 658500, 658510, 658520, 658530, 658560, 658900);

– wire communications (code OKP 665200);

– medical equipment (code OKP 944130, 944460, 944480);



– general-purpose automation devices and equipment (code OKP 421200, 421800, 421221, 421312, 421322, 421321, 421894, 422820, 422830, 422840, 422860)

METALLOGRAPHIC LABORATORY

Metallographic laboratory renders the following types of services:

1. Rockwell, Brinell, Vickers hardness tests (micro-hardness).

2. Tensile strength testing of strips and wire made of ferrous and non-ferrous metals, and determination of rupture strength δb and elongation δ.

3. Microstructure analysis of ferrous and non-ferrous metals as delivered.

4. Structural quality control of the heat treatment of parts subjected to bulk quenching and tempering and to chemical heat treatment.

5. Structural analysis of defects in tools, parts and semi-finished products made of ferrous and non-ferrous metals.

The German metallographic microscope Axio Scope. A1MAT fitted with software solves the following tasks:

– microstructure examination after heat treatment of tube blanks, membrane and bellows blanks, parts of devices and units;

– incoming inspection of metals, welded seams, defects of parts and tools;

– software allows calculation of parameters,

– measurement results can be printed out with microstructure photos.

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PRESSURE UNITS CONVERSION TABLE

Units	Pa	kPa	MPa	kgf/m^2	kgf/cm^2	mm Hg	mm H_2O	bar
Pascal	1	10^{-3}	10^{-6}	0.1019716	$10.19716*10^{-6}$	0.00750062	0.1019716	0.00001
Kilopascal	1,000	1	10^{-3}	101.9716	0.01019716	7.50062	101.9716	0.01
Megapascal	1,000,000	1,000	1	101,971.6	10.19716	7,500.62	101,971.6	10
Kilogram-force per square meter	9.80665	$9.80665*10^{-3}$	$9.80665*10^{-6}$	1	0.0001	0.0735559	1	$98.0665*10^{-6}$
Kilogram-force per square centimeter	98,066.5	98.0665	0.980665	10,000	1	735.559	10,000	0.980665
Millimeter of mercury column (at 0°C)	133.3224	0.1333224	0.0001333224	13.5951	0.00135951	1	13.5951	0.001333224
Millimeter of water column (at 4°C)	9.80665	$9.80665*10^{-3}$	$9.80665*10^{-6}$	1	0.0001	0.0735559	1	$98.0665*10^{-6}$
Bar	100,000	100	0.1	10,197.16	1.019716	750.062	10,197.16	1

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