PRESSURE SENSORS

Appointment

ID pressure sensors (hereinafter referred to as sensors) are designed for continuous measurement and conversion of the measured parameter – absolute and excess pressure, including vacuum, vacuum-excess, hydrostatic pressure and pressure difference of neutral and aggressive media, gaseous oxygen and oxygen-containing gas mixtures into a unified electrical output signal of direct current or DC voltage, also into a digital signal for transmission over HART protocols (for modification of ID-F (ИД-F).

Sensors are used for automation, control, regulation and control of technological processes, accounting for the flow of gases, liquids and steam, the level, density of liquids functionally related to pressure or pressure difference in various industries, economic activities and utilities, including in explosive and fire-hazardous industries.

Type of pressure sensors

The sensors are produced in the following modifications:
ID-S (ИД-S) – small-sized overpressure sensors;
ID-Q (ИД-Q) – standard pressure sensors;
ID-F (ИД-F) – intelligent pressure sensors.

The sensors are designed to measure excess, vacuum, vacuum-excess (И), absolute (А) and differential (Р) pressure. Note: Sensors of the modification "I(И)" can be used to measure the hydrostatic pressure of liquids in open containers.

The sensors are designed to work in neutral environments, as well as aggressive environments, in relation to which the materials in contact with the measured medium are corrosion resistant.

Explosion-proof sensors

Sensors are manufactured using types of explosion protection according to GOST 31610.0 (IEC 60079-0) (hereinafter - explosion-proof). Explosion-proof sensors correspond to groups II and III of explosion-proof equipment for indoor and outdoor installations GOST 31610.0 (IEC 60079-0). Explosion-proof sensors are manufactured:- with the type of explosion protection "**explosion-proof shell**" and the marking of explosion protection:

1Ex db IIC T6…T1 Gb X, 1Ex db IIB T6…T1 Gb X, 1Ex db IIA T6…T1 Gb X, Ex tb IIIC T85°C…T450°C Db X, Ex tb IIIB T85°C…T450°C Db X, Ex tb IIIA T85°C…T450°C Db X по ГОСТ IEC 60079-1;

- with the type of explosion protection "**intrinsically safe electrical circuit**" of level "ia" and the marking of explosion protection:

0Ex ia IIC T6…T1 Ga X, 0Ex ia IIB T6…T1 Ga X, 0Ex ia IIA T6…T1 Ga X, Ex ia IIIC T85°C…T450°C Da X, Ex ia IIIB T85°C…T450°C Da X, Ex ia IIIA T85°C…T450°C Da X по ГОСТ 31610.11 (IEC 60079-11).

In addition, explosion-proof sensors are manufactured with the above-mentioned types of explosion protection and explosion protection marking combined:

1Ex db ia IIC T6…T1 Gb X, 1Ex db ia IIB T6…T1 Gb X,1Ex db ia IIA T6…T1 Gb X, Ex tb ia IIIC T85℃…T450℃ Db X, Ex tb ia IIIB T85℃…T450℃ Db X, Ex tb ia IIIA T85℃…T450℃ Db X.

Explosion protection of sensors with the type of explosion protection "intrinsically safe electrical circuit" of level "ia" must be operated as part of connected electrical equipment having an input measuring circuit with the type of explosion protection "intrinsically safe electrical circuit" of level "ia"».

Intrinsic safety of electrical circuits of sensors is provided:
- powered by an intrinsically safe power supply;
- the absence of capacitive and inductive elements in their execution, dangerous in terms of stored energy for gas mixtures of subgroup IIC.

Electrical parameters of intrinsically safe circuit of Exia sensors:
- Maximum input voltage Ui = 30 V;
- Maximum input current Ii = 100 mA;
- Maximum input power Pi = 0,8 W;
- Maximum internal capacity Ci = 0,048 μF;
- Maximum internal inductance Li = 0,1 mH.

Operating conditions of pressure sensors

The sensors correspond to the reliability indicator of the SIL (Safety Integrity Level) system with the level of completeness of safety SIL 2, SIL 3. The degree of protection provided by the shell (IP code) of sensors according to GOST 14254 including according to the NEMA 250 standard.

The sensors have a climatic version of UHL1 in accordance with clauses 2.1 and 2.7 of GOST 15150. In terms of earthquake resistance, the sensors have strength and stability according to MSK-64 of 9 points at the installation level above the zero mark up to 70 m. In terms of resistance to mechanical influences, the sensors have strength and resistance to sinusoidal vibration in the frequency range from 10 to 150 Hz with vibration acceleration amplitude of 0.35 mm.

Sensors for resistance to the effects of ambient temperature and humidity - belong to group D3 GOST 12997, with an operating ambient temperature range from minus 50 °C to 85 °C, for sensors of special design, the operating temperature range is from minus 65 °C to 85 °C. For modifications with liquid crystal and LED indicator, the operating temperature range is minus 40 °C to plus 70 °C. The use of the LCD (Liquid Crystal Display) in other ambient temperature ranges does not cause damage to it, while there may be no indication.

Temperature range of working media:

- from minus 40 °C to plus 120 °C (without separators); do not allow freezing of the measuring medium near the sensor.

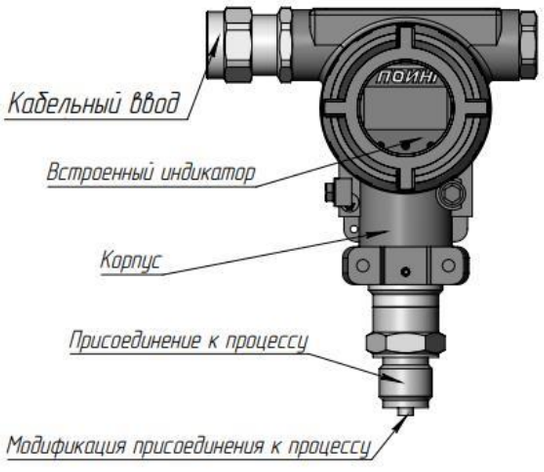
Note: over 120°C measurement using membrane separators, radiator pulse tube.

The average service life is:

- at least 12 years for ID-S (ИД-S) and ID-Q (ИД-Q) sensors;
- at least 20 years for ID-F (ИД-F) sensors (for sensors with a limit of permissible basic error of ± 0.025% and ± 0.05% - 12 years)*.

INTELLIGENT PRESSURE SENSORS ID-F (ИД-F)

The scheme of the conditional designation of pressure sensors modification ID-F (ИД-F) (order scheme)



	1	2	3	4	5	6	7	9	10	11	12	13	14	15
(ID) ИД-	F -	(I) И-	(Ti) Ти-	Ex ia	IIC	T6-	(4-20)mA-	(0…1,6)-	(±0,1)-	t(+5…+40)-	G1/2-	(I) И-	(MG) МГ(7-13)-	IP67

	Parameter	Meaning	
1	Sensor modification	F	
2	Type of measured pressure	И, А, Р	
3	Body	Tr (Тр), Tr1 (Тр1), T, Ti (Ти), N1 (Н1), N2 (Н2)	
4	Type of explosion protection	Ex db, Ex dbia, Ex ia – (gas media) Extb, Extbia – (dust media) In the absence not specified	
5	Explosion-proof equipment group	IIA, IIB, IIC, IIIA, IIIB, IIIC In the absence is not specified	
6	Temperature class	T1, T2, T3, T4, T5, T6 - (gas media) T80°C…T445°C - (dusty environments) In the absence is not specified	
7	Output interface	Linear characteristic: (4-20)mA, (0-5)mA, (0-10)mA, (0-20)mA, (0,2-10)V, (0,4 -2)V, (0,2-5)V Root-extracting characteristic: (4-20)mA√, (0-5)mA√ и т.д.	
8	Communication protocol	HART In the absence is not specified	
9	Measuring range/ set range, (measured parameter):	И	from minus 0.1 to 100
		А	from 0,01 to 3,5

	MPa[1]	P	from 0,004 to 3
10	The limits of the permissible basic reduced error from the measurement range of the output signal, (depending on the modification and configuration) ± γ, %	± 0,025[3] ± 0,05 ± 0,075 ± 0,1 ± 0,15 ± 0,2 ± 0,25 ± 0,5 ± 1	
11	Temperature compensation range[2] °C	Advanced: from minus 40 to 85 Standart: from minus 10 to 40	
12	Joining the process	M20x1,5; G1/2 and other	

	Parameter	**Meaning**
13	Modification joining the process	I1 (И1); I2 (И2); E; VR (ВР); VR1 (ВР1); VR2 (ВР2); VM (ВМ); D (Д); D9; P (П); C; Clamp; F (Ф) and other
14	Electrical connection or cable entry	PG (ПГ); LG (ЛГ); MG (МГ); MGB (МГБ); MGT (МГТ); MG-M (МГ-М); MGF (МГФ); MGB-P (МГБ-П); MGM (МГМ); MGB-M (МГБ-М); MIL- connector/ DIN A, DIN C; 4P; 6P and other
15	Degree of protection of the shell	IP20, IP45, IP54, IP65-68 (by agreement with the customer IPX9)

Note:

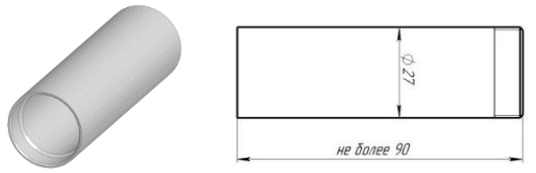
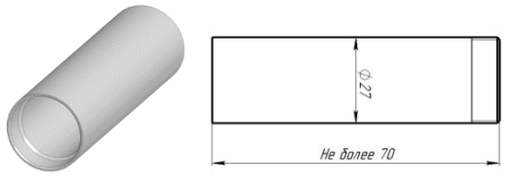
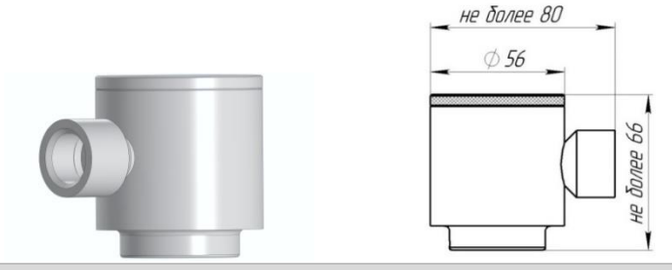
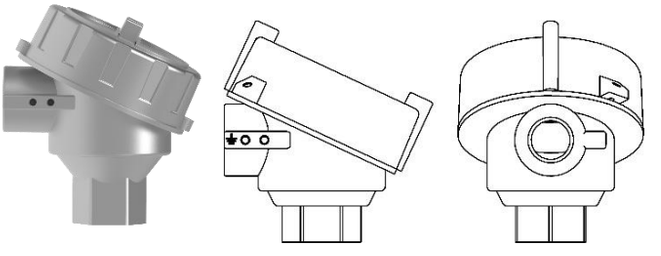
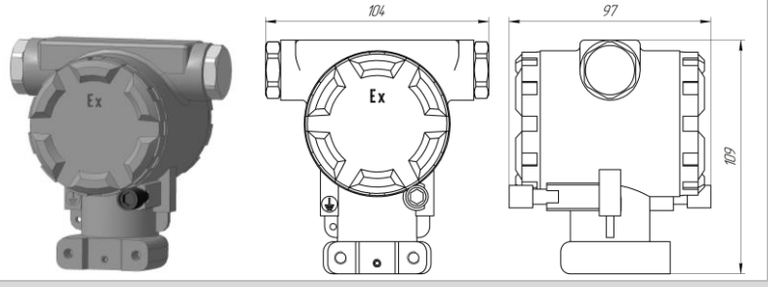
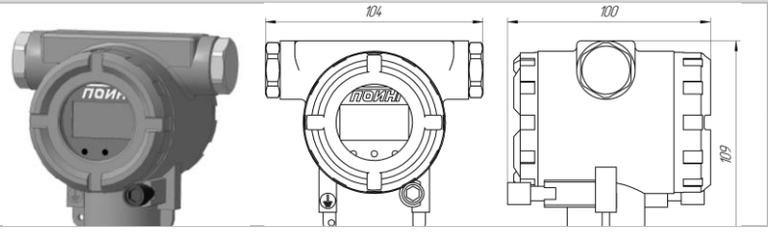
1 - Manufactured with different measurement ranges within the specified range kPa, MPa.

2 - Temperature compensation is only possible for sensors with an upper measuring limit of up to 16 MPa.

3 - only for sensors with upper measurement limits from 0,4 to 3,5 MPa.

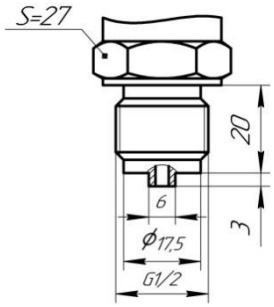
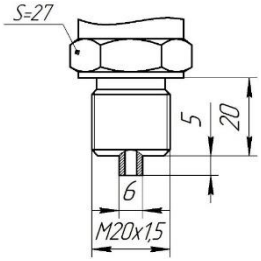
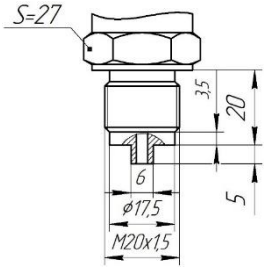
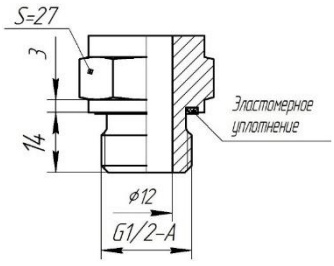
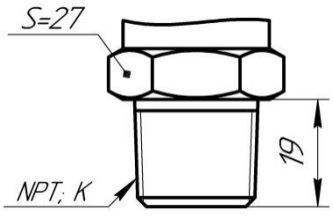
The manufacture of pressure sensors with parameters other than those listed above is possible only in agreement with the manufacturer!

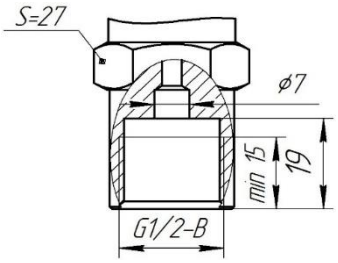
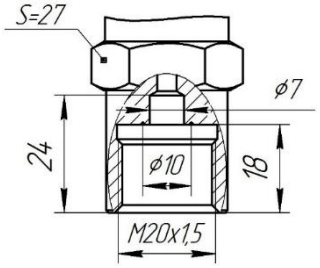
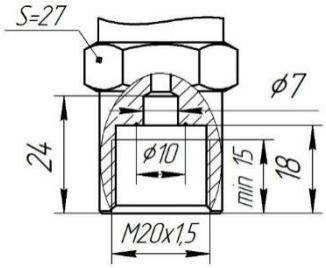
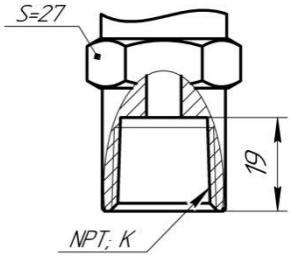
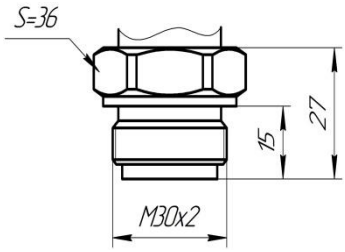
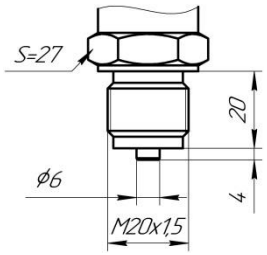
Таблица 1.1 – Sensor housing model

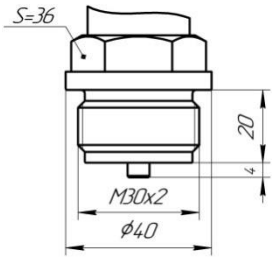
Tr (Тр)		
	**Degree of protection**	IP65-67 (depends on the type of electrical connection)
	Type of explosion protection	Ex ia
Tr1 (Тр1)		
	**Degree of protection**	IP65-67 (depends on the type of electrical connection)
	Type of explosion protection	Ex ia
N1 (Н1)		
	**Degree of protection**	IP65-68
	Type of explosion protection	Ex ia
	It can be equipped with a cable entry	
N2 (Н2)		
	**Degree of protection**	IP65-68
	Type of explosion protection	Ex db Ex ia
	It can be equipped with a cable entry	
T		
	**Degree of protection**	IP65-68
	Type of explosion protection	Ex db Ex ia
	It can be equipped with a cable entry	
Ti (Ти)		
	**Degree of protection**	IP65-68
	Type of explosion protection	Ex db Ex ia

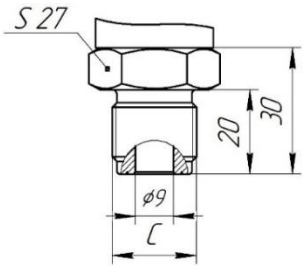
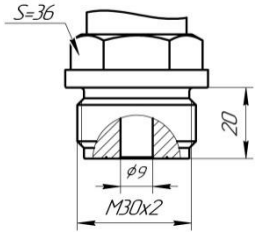
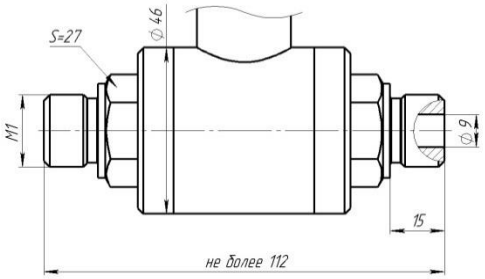
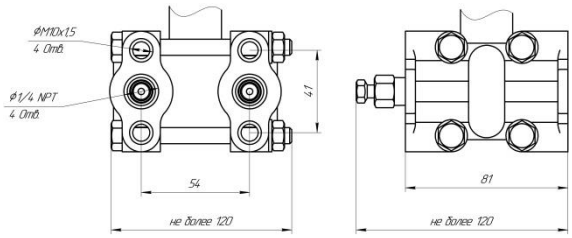
	It can be equipped with a cable entry

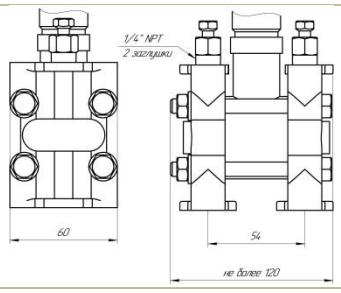
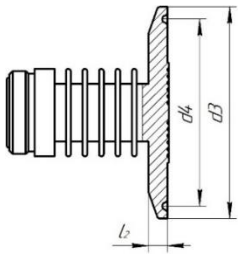
Table 1.2 – Options for joining the process

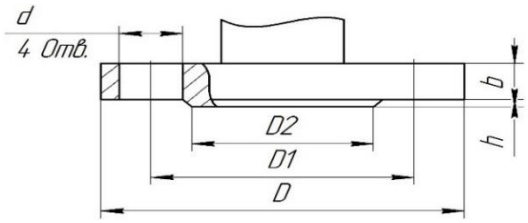
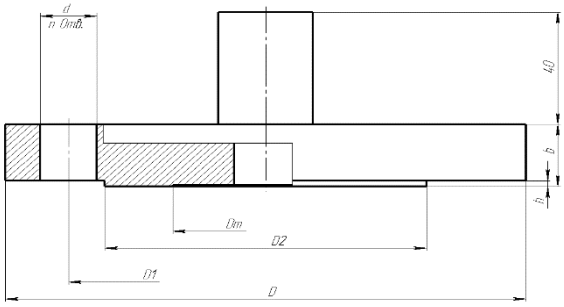
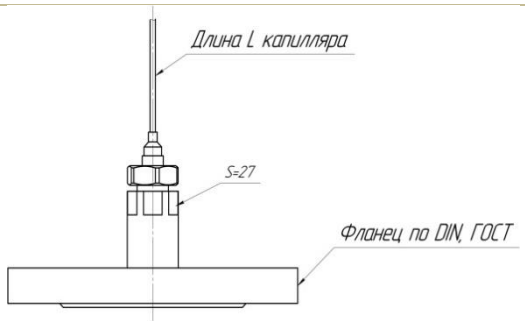
Version of execution	Image	Joining the process
1	2	3
И (with centering pin)		EN 837 G1/8" G1/4" G3/8" G1/2"
И1 and И2 (with centering pin)	Execution 1 **(И1)**  Execution 2 **(И2)** 	ГОСТ 25164 (ISO 2186) ГОСТ 2405 M10x1 M12x1,5 M16x1,5 M20x1,5 и др.
Е (with elastomeric seal (Type E))		DIN 3852-E
К (self-sealing conical thread)		Thread «NPT» ANSI/ASME B1.20.1 Thread «К» GOST 6111

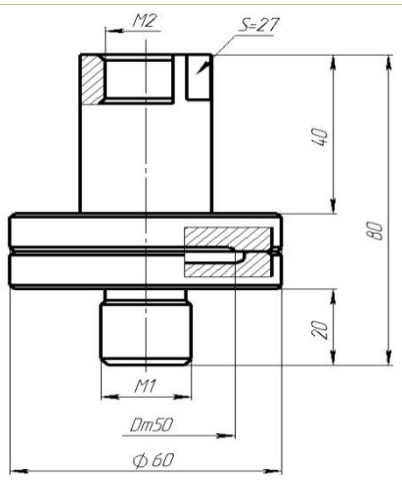
ВР internal thread (EN 837))		EN 837 G1/8" G1/4" G3/8" G1/2"
Version of execution	**Image**	**Joining the process**
ВР1 and ВР2 (internal thread (GOST 25164))	Execution 1 (BP1)  Execution 2 (BP2) 	GOST 25164 (ISO 2186) GOST 2405 M10x1 M12x1,5 M16x1,5 M20x1,5 And other
ВК (internal self-sealing conical thread)		Thread «NPT» ANSI/ASME B1.20.1 Thread «K» GOST 6111
ВМ (with protective membrane)		G3/4" G1" G1 1/2" *G1/2" M30x2 M24x1,5 *M20x1,5
Д (with throttle)		G1/2" G1/4" M20x1,5 M24x1,5

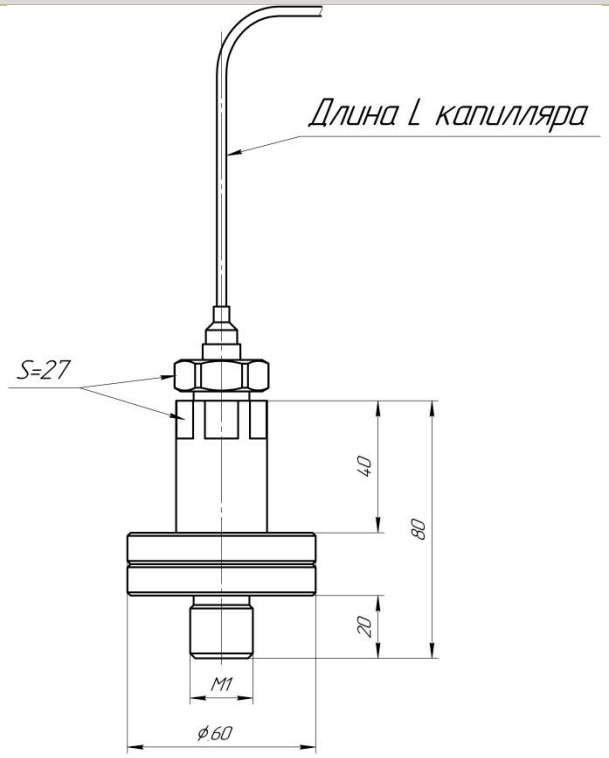
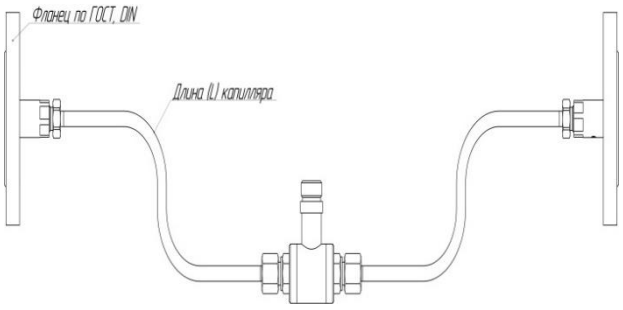
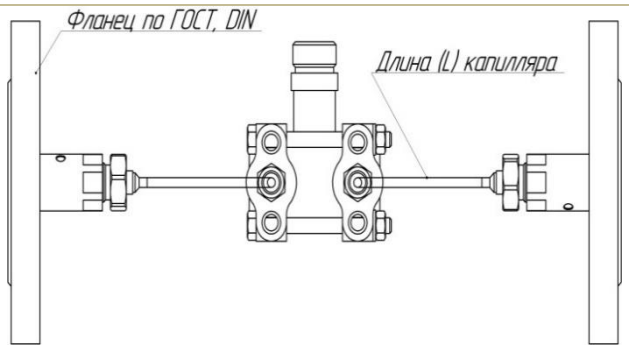
Д (with throttle)		G3/4" G1" M30x2 G1 1/2"

Version of execution	Image	Joining the process
D9 (with an inlet of no more than ø9 mm)		M20x1,5 G1/2” G1/4” M24x1,5
D9 (with an inlet of no more than ø9 mm)		G3/4” G1” M30x2 G1 1/2"
П (housing version type "П")		M20x1,5 G1/2”
С (housing version type «С»)		1/4" NPT

СН (housing version type «СН»)		1/4" NPT
Clamp (Tri-Clamp connection)		DIN 32676

Version of execution	Image	Joining the process
Ф (with flange)		Table 1.3
«ФР» (diaphragm flange separator)		Flanges according to GOST 33259-2015 Or DIN 1092-1
«ФР/К» (membrane flange separator with capillary)		Flanges according to GOST 33259-2015 or DIN 1092-1 Capillary length L= 1-5 m. Example entry: DN50L2

«PP» (membrane separator with threaded connection)		Sizes M1, M2:Thread M20x1,5,G½,G¼, ½ NPT, ¼ NPT

Version of execution	Image	Joining the process
«РР/К» (membrane separator with threaded connection)		Sizes M1, M2:Thread M20x1,5,G½,G¼, ½ NPT, ¼ NPT
«ПФР» **«ПФР/К»** (version of the housing "П" with a flange separator without or with a capillary line)		Carving according to GOST 33259-2015) or DIN1092-1 Capillary length L = 1-5 m. Recording example: PFR-DN50 PFR/K-DN50L2m
«СФР/К» (version of the housing "С" with a flange separator with a capillary line)		Flanges according to GOST 33259-2015) or DIN1092-1 Capillary length L= 1-5 m. Recording example: SFR/K-DN50L2m

Note:
Upon agreement with the customer, it is possible to manufacture options for joining the process, the design of which differs from those listed above.

Table 1.3 – Flange connection to the process

Flange connection to the process Flange design (code in the order scheme)	D, mm	D1, mm	D2, mm	d, mm	Number of holes	b, mm	h, mm
Ф1	80	55	40	11	4	10	2
Ф2	100	75	60	11	4	12	2
Ф3	130	100	80	14	4	13	3
Ф4	160	130	110	14	4	13	3
Ф5	Other parameters other than the above						

Table 1.4 – Additional error limit for ID-Q (ИД-Q) sensors

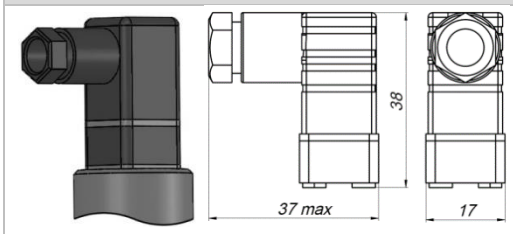
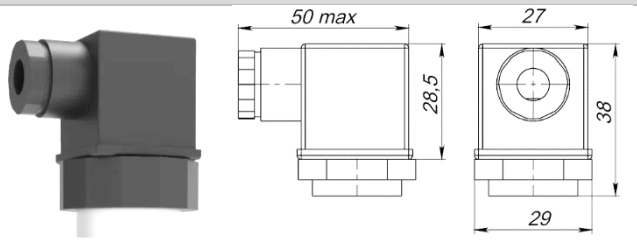
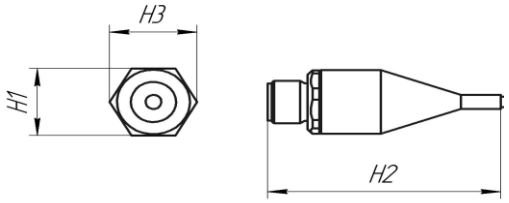
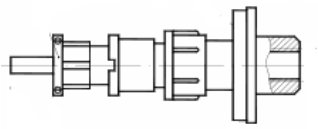
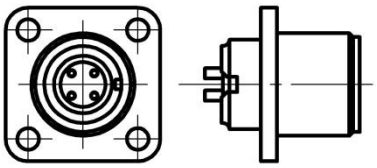
The main reduced error	Additional error
±0,20 %	±0,20 %
±0,25 %	±0,25 %;
±0,5 %	±0,45 %;
±1,0 %	±0,6 %.

Table 1.5 – Additional error limit for ID-F (ИД-F) sensors

Upper limit of Rv measurement	Additional error	
	In the compensation range Outside the compensation range	Out of the compensation range
Rv <100 kPa	±0,1 %	±0,3 %
Rv ≥ 100 kPa	±0,025 %*; ±0,05 %	±0,1 %

Note:
*** - only for sensors with a basic reduced error of ± 0.025%.**

Table 1.5 – Types of electrical connections

DIN C (plug connector DIN EN 175301-803 "C")		
	**Type of explosion protection**	Ex ia
	Degree of protection	IP65
DIN A (plug connector DIN EN 175301-803 "A")		
	**Type of explosion protection**	Ex ia
	Degree of protection	IP65
"4P" (four-pin connector)		
	**Type of explosion protection**	Ex ia
	Degree of protection	IP65-67
	It is used only for pressure sensors	
«6P» (six-pin connector)		
	**Type of explosion protection**	Ex ia
	Degree of protection	IP65
	It is used only for pressure sensors	
«2РМ*» (four-pin connector type 2РМГ, 2РМТ, 2РМД, 2РМДТ)		
	**Type of explosion protection**	Ex ia
	Degree of protection	IP65
Note:		
*- when ordering, specify the connector size: 2РМГ14, 2РМТ222, 2РМД18, etc.		