Microelectronic gauge pressure sensors
MD Series

- ► **Resolution 0,01 %**
- ► **Operating pressure range from 0-0,25 to 0-150 MPa**
- ► **Operating temperature range from -45 to +200 °C**
- ► **Electrical insulation strength – 700 V**
- ► **Titanium body**

Applications

- **Industrial automatics**
- **Oil and gas industry**
- **Hydraulics/Pneumatic**
- **Pumping stations/ Compressors**
- **Heat metering**

■ **The sensors are intended for proportional conversion of pressure into electric signal.**

New solutions in pressure measurement – "Silicon-on-Sapphire" Technology

∨ Sensitive element of pressure sensors is a two-layer sapphire-titanium diaphragm with monocrystal silicon resistance strain gauges.

∨ Monocrystal sapphire diaphragm is a perfect elastic element that due to connection with titanium acquires the best quality as to the deformation level, and preserves its elastic properties up to +400°C.

∨ Monocrystal silicon resistance strain gauges are automatically connected with sapphire (heteroepitaxy method) and provide almost no hysteresis or fatigue effects.

∨ Exceptional insulating properties and radiation resistance of sapphire enable to use the sensitive element within temperature range from -200 to +350°C under the effect of high electromagnetic interferences and radiation.

∨ Strain gauges elements are manufactured in groups by solid-state micro-electronic methods and provide high quality and good repeatability of the output parameters.

1 Nominal, overload and burst pressure

Designation	Nominal pressure, MPa	Overload pressure, MPa	Burst pressure, MPa
MD 0,25...	0...0,25	-0,1...0,5	0,75
MD 0,4...	0...0,4	-0,1...0,8	1,2
MD 0,6...	0...0,6	-0,1...1,2	1,8
MD 1...	0...1	-0,1...2	3
MD 1,6...	0...1,6	-0,1...3,2	4,8
MD 2,5...	0...2,5	-0,1...5	7,5
MD 4...	0...4	-0,1...8	12
MD 6...	0...6	-0,1...12	18
MD 10...	0...10	-0,1...20	30
MD 16...	0...16	-0,1...32	48
MD 25...	0...25	-0,1...50	75
MD 40...	0...40	-0,1...80	120
MD 60...	0...60	-0,1...120	180
MD 100...	0...100	-0,1...150	250
MD 150...	0...150	-0,1...165	300

2 Temperature ranges

2.1 Operating temperature range

2.1.1 Version 1 . . . . . from - 45 to + 125°C

2.1.2 Version 2 . . . . . from - 45 to + 155°C

2.1.3 Version 3 . . . . . .from - 45 to + 200°C

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2.2 Limiting temperature range

2.2.1 Version 1 . . . . . .from minus 60 to plus 130°C

2.2.2 Version 2 . . . . . .from minus 60 to plus 160°C

2.2.3 Version 3 . . . . . .from minus 60 to plus 205°C

3 Accuracy parameters

3.1 Resolution, % FS 0,01

3.2 Non-linearity, % FS

3.2.1 For MD 0,25... - MD 1,6... . . . . .±0,2

3.2.2 For MD 2,5... - MD 150... . . . . ±0,15

3.3 Hysteresis, % FS 0,05

3.4 Output signal repeatability, % FS . . . . . .±0,05

3.5 Long-term stability of the output signal range within 12 months, %

3.5.1 For MD 0,25... - MD 1... . . . . .±0,25

3.5.2 For MD 1,6... - MD 150... . . . . .±0,15

3.6 Output signal error caused by the influence of overload pressure, % FS

for zero output signal . . . . . ±0,2

for output signal range . . . . . ±0,05

3.7 Additional ambient temperature error, % FS/1°C

3.7.1 For zero output signal

3.7.1.1 V type . . . . . .±0,05

3.7.1.2 C type . . . . . 0,03±0,05

3.7.2 For output signal range

operating temperature range from -45 to +125 °C . . . . . .±0,05

operating temperature range from +125 to +200 °C . . . . . -0,05±0,025

3.8 Additional vibration error of the output signal, % FS . . . . . ±0,05

4 Electrical characteristics

4.1 Output signal at room temperature, mV

4.1.1 Zero output signal . . . . . ±10

4.1.2 Output signal range (FS) . . . . . 150±50

for MD 0,25 . . . . . 100±35

4.2 Strain gauge bridge resistance at room temperature, kOhm 3,40-4,85

4.3 Temperature resistance coefficient of the strain gauge bridge, K^{-1}

4.3.1 V type . . . . . $(1,70\pm0,15)\cdot10^{-3}$

4.3.2 C type . . . . . $(1,2\pm0,2)\cdot10^{-3}$

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4.4 Insulation resistance, MOhm
at room temperature 100
at the upper ambient temperature value 20
4.5 Electrical insulation strength (AC voltage), V 700
4.6 Power supply
4.6.1 V type - stabilized DC voltage, V 1-10
4.6.2 C type - stabilized DC, mA 0,2-2
Output signal is rated by the voltage 10 V and by the current 1,5 mA.

5 Mechanical characteristics

5.1 Vibration resistance (sinusoidal vibration):
Frequency range, Hz . . . . . from 10 to 5000
Acceleration amplitude, m/s^2 500
5.2 Shock resistance (multiple mechanical shocks):
Shock acceleration peak, m/s^2 1000
Shock pulse width, ms 2-5
5.3 Torque effect while installation should not be higher, N·m
5.3.1 For MD 0,25... - MD 1... 15
5.3.2 For MD 1,6... - MD 150... 30

6 Operating conditions

6.1 IP level IP40
6.2 Sensor body (pressure connection) and membrane are made of titanium alloy with 87 % of titanium.
6.3 Pressure media - gases, liquids and their mixtures not aggressive to the titanium alloy (air, sea water, 5 % vitriol acid , chlorine water, chloride solutions, oils, ethyne etc)

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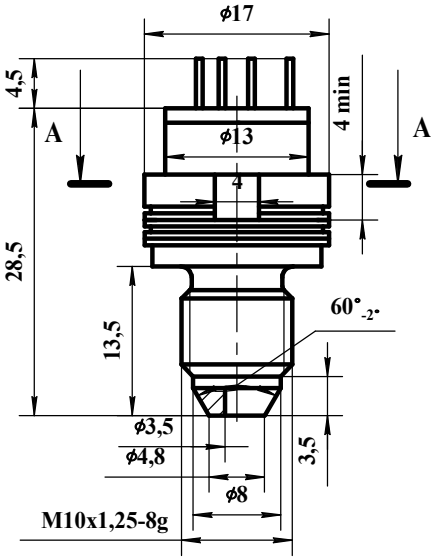
7 Overall and mounting dimensions

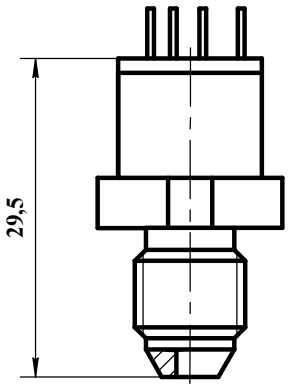
7.1 Version with pins

MD 0,25(0,4...1)-...-P



Drawing 1

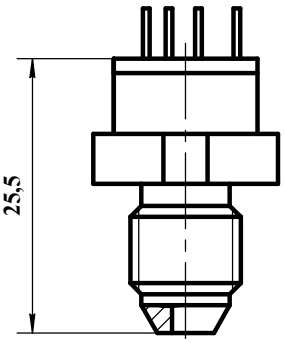
MD 1,6(2,5...10)-...-P



The rest - ref. drawing 1

Drawing 2

MD 16(25...150)-...-P

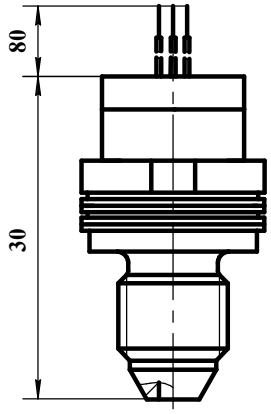


The rest - ref. drawing 1

Drawing 3

7.2 Version with wires

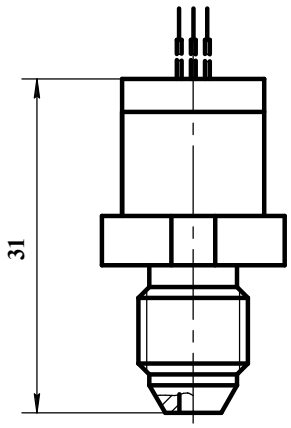
MD 0,25(0,4...1)-...-L



The rest - ref. drawing 1

Drawing 4

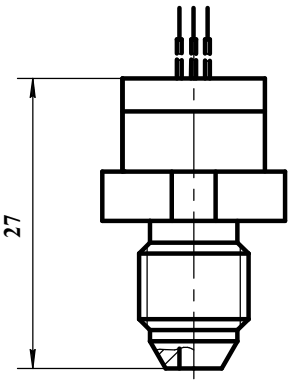
MD 1,6(2,5...10)-...-L



The rest - ref. drawings 1 and 4

Drawing 5

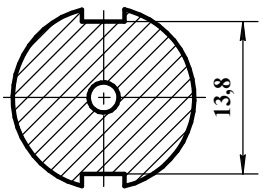
MD 16(25...150)-...-L



The rest - ref. drawings 1 and 4

Drawing 6

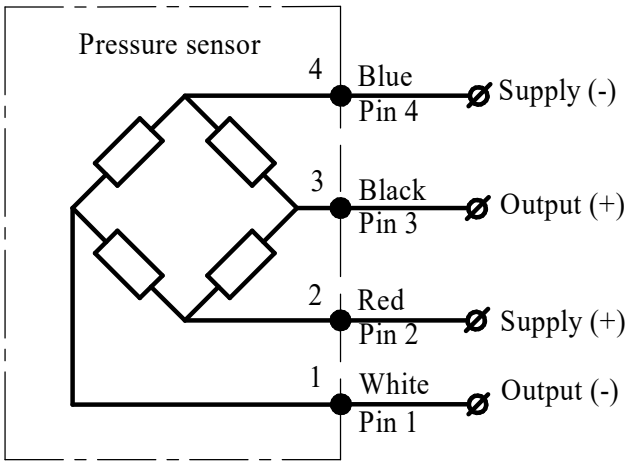
A-A



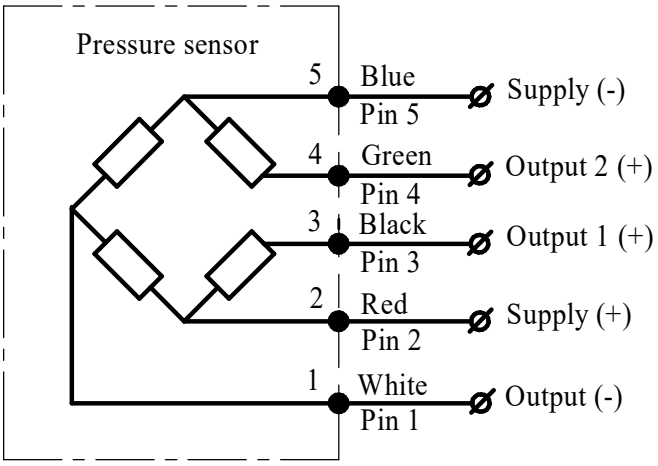
8 Circuit diagram

Electrical connection - flexible wire with section 0,08 or 0,12 mm^2 in teflon insulation

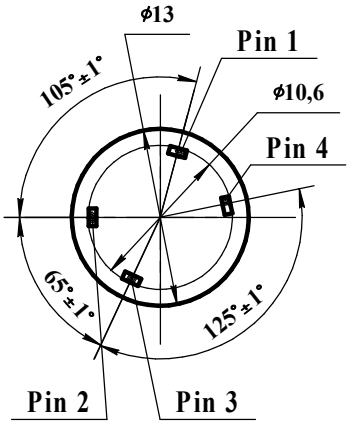
"Closed bridge" diagram

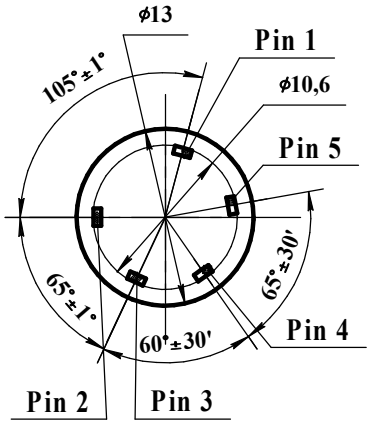


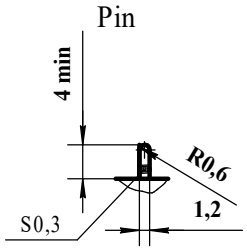
"Open bridge" diagram



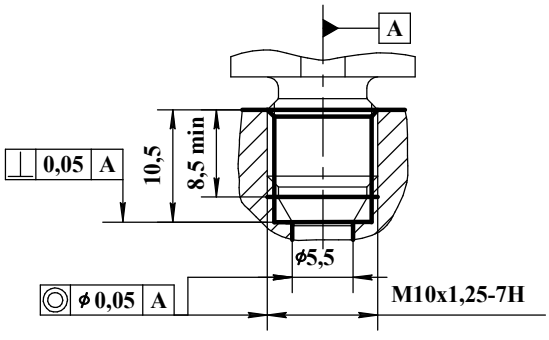
Location of pins on a collector







9 Mounting diagram



10 Type designation

MD XXX - XX - X - X

Series

Upper gauge pressure limit

0,25; 0,4; 0,6; 1; 1,6; 2,5; 4; 6;
10; 16; 25; 40; 60; 100; 150 MPa

Operating ambient temperature range

Version 1 - from - 45 to + 125 °C;
Version 2 - from - 45 to + 155 °C;
Version 3 - from - 45 to + 200 °C

Curcuit

0 - “closed bridge”circuit;
1 - “open brigde” circuit

Power supply type

V - stabilized DC voltage (1-10 V);
C - stabilized DC (0,2-2 mA)

Electrical connection

L - flexible wire 80 mm length;
P - pin 4,5 mm height

Order example of pressure sensor

Pressure sensor of MD series, intended for pressure conversion from 0 to 1,6 MPa, for operation within temperature range from - 45 to + 125 °C, with “open bridge” circuit, DC voltage power supply and flexible wire 80 mm length:

Pressure sensor MD 1,6-11-V-L.

Note: if wished, typical size and wire length (standard 80 mm) can be changed in this case - in the order should be denoted thread designation and the required length should be added to the wire code L, for example:

Pressure sensor MD 1,6-11-V-M10x1-8g-L120.

11 Marking

Marking on the sensor body must contain following information: designation of the sensor (no code of connection with external electric circuits) and order number.

Note: the marking on the customer's request is available.