

## 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 membrane with monocrystal silicon resistance strain gauges.
- ✓ Monocrystal sapphire membrane 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.



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Pressure sensors MD Series

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# Datasheet

## 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 Variation, % 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 <sup>-1</sup>	
4.3.1 V type	(1,75±0,1)·10 <sup>-3</sup>
4.3.2 C type	(1,2±0,2)·10 <sup>-3</sup>

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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 <sup>2</sup>	500
5.2 Shock resistance (multiple mechanical shocks):	
Shock acceleration peak, m/s <sup>2</sup>	1000
Shock pulse width, ms	2
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)	

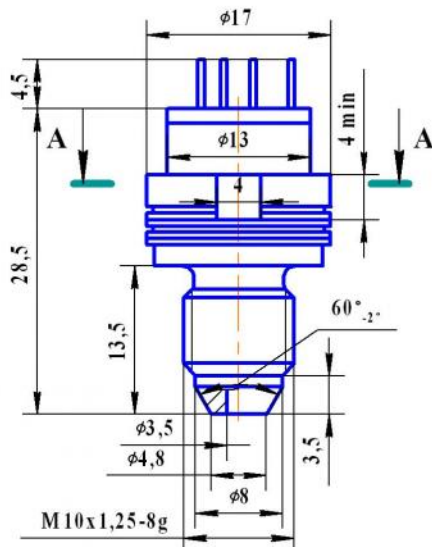
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## 7 Overall and mounting dimensions

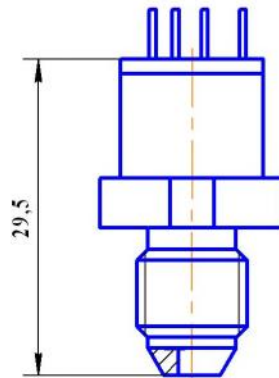
### 7.1 Version with pins

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



Drawing 1

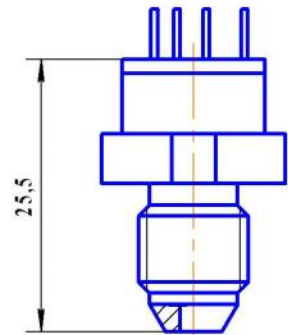
MD 1,6(2,5...10)-...-P



The rest -  
ref. drawing 1

Drawing 2

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

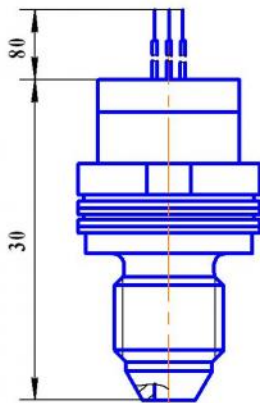


The rest -  
ref. drawing 1

Drawing 3

### 7.2 Version with wires

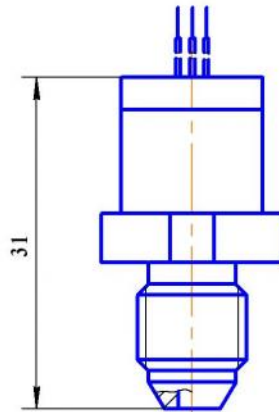
MD 0,25(0,4...1)-...-L



The rest -  
ref. drawing 1

Drawing 4

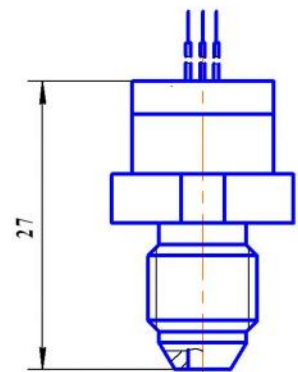
MD 1,6(2,5...10)-...-L



The rest -  
ref. drawings 1 and 4

Drawing 5

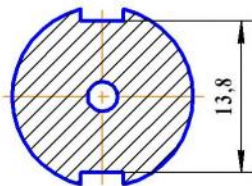
MD 16(25...150)-...-L



The rest -  
ref. drawings 1 and 4

Drawing 6

A-A

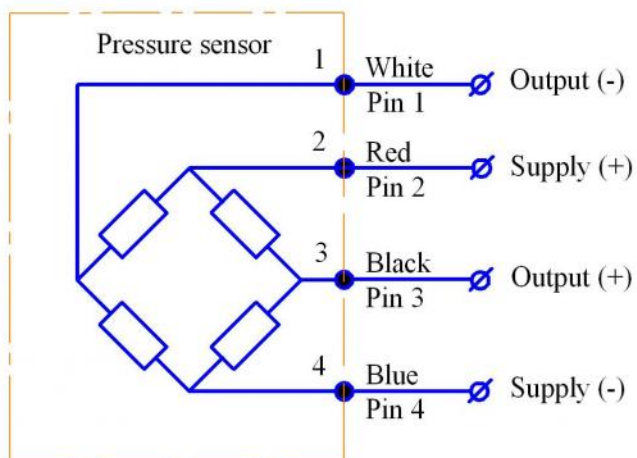


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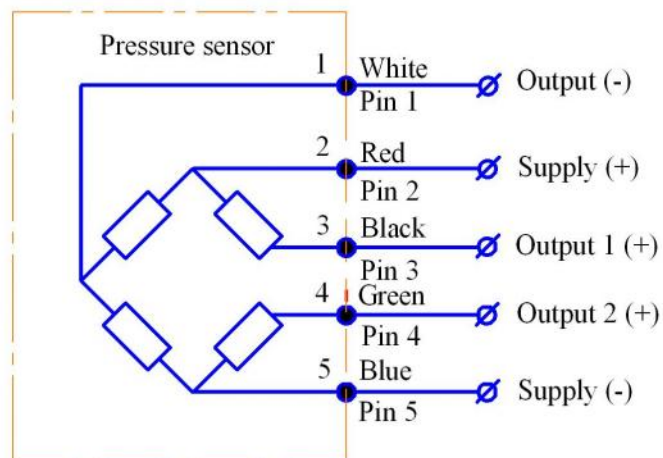
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## 8 Circuit diagram

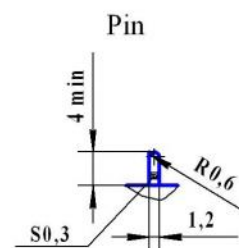
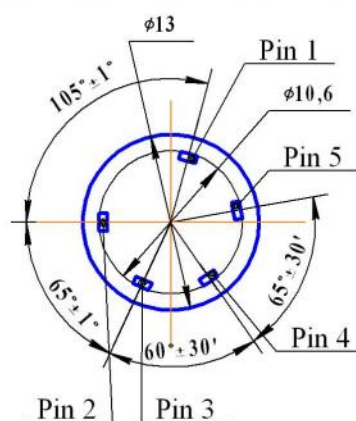
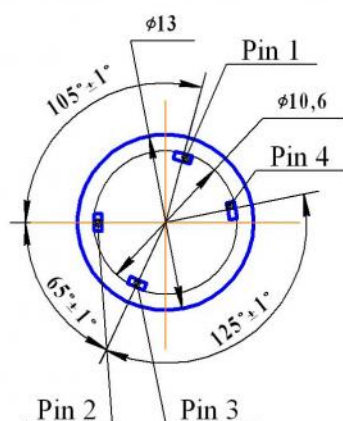
"Closed bridge" diagram



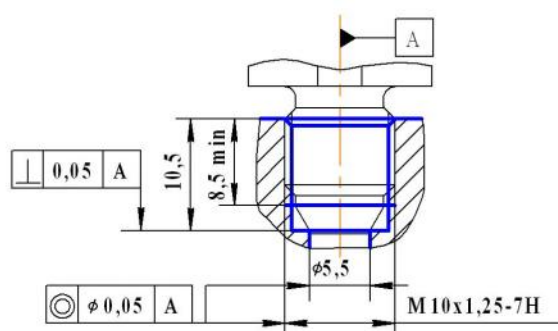
"Open bridge" diagram



Location of pins on a collector



## 9 Mounting diagram



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## 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					
Circuit					
0 - “closed bridge” circuit; 1 - “open bridge” 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.

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