LENTISENS GmbH

Module Series L-MP

TECHNICAL SPECIFICATIONS	Small Titanium Pressure Sensor Modules for General Industrial Applications

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MAIN FEATURES

- Small relative pressure sensing modules with resistive Wheatstone bridge
- Small titanium sensor body designed for tight spaces
- Resolution 0.01%span
- Nominal pressure ranges from 1 MPa to 150 MPa
- Operating temperature range from -45°C up to +200°C
- Dielectric strength 700 VAC

APPLICATION

- Space saving applications
- Hydraulics and pneumatics
- Chemical industries
- Machine construction
- Pumping stations and compressors

DESCRIPTION

New solutions in pressure measurement by Silicon on Sapphire technology where tight space is key

The highly sensitive element of this mini pressure sensor family is a two-layer sapphire-titanium membrane with monocrystalline silicon resistive strain gauges. Due to a stable connection with titanium the monocrystalline sapphire membrane is a perfect elastic element that acquires the best quality at high deformation levels and preserves its elastic and insulating properties at temperatures up to 400°C. Monocrystalline silicon resistive strain gauges are atomically connected to the sapphire and provide almost no hysteresis or fatigue effects. Exceptional insulating properties and radiation resistance of sapphire enable utilization of the sensitive element within the temperature range from -200°C to +350°C even under the impact of high electromagnetic interferences and radiation. Our strain gauge elements are manufactured by solid-state microelectronic methods and provide high quality and long therm stable repeatability.

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TECHNICAL DATA

STANDARD PRESSURE RANGES

Nominal pressure range	[MPa]	**1**	**1.6**	**2.5**	**4**	**6**	**10**	**16**	**25**	**40**
Under pressure [1)]	[MPa]	-1	-1	-1	-1	-1	-1	-1	-1	-1
Over pressure	[MPa]	2	3.2	5	8	12	20	32	50	80
Burst pressure	[MPa]	3	4.8	7.5	12	18	30	48	75	120

Nominal pressure range	[MPa]	**60**	**100**	**150**
Under pressure [1)]	[MPa]	-1	-1	-1
Over pressure	[MPa]	120	150	165
Burst pressure	[MPa]	180	200	220

Note

1) Reverse pressure

All values relating to relative pressure. Customer specific pressure ranges on request.
1 MPa = 10 bar

TEMPERATURE RANGES

Standard operating temperature range, option 1	(-45 to +125)°C
Extended operating temperature range, option 2	(-45 to +155)°C
High operating temperature range, option 3	(-45 to +200)°C

ELECTRICAL PARAMETERS

If not otherwise mentioned valid in the specified operating temperature ranges.

Parameter	**Min.**	**Typ.**	**Max.**	**Unit**
Bridge offset voltage [1)]	-15		+15	mV
Offset TC	-0.05		+0.05	%span/K
Full scale output signal [1)] for nominal pressure ranges > 1 MPa for nominal pressure range 1 MPa	 100 65	 150 100	 200 135	mV
Span TC	-0.05		+0.05	%span/K
Signal resolution			0.01	%span

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Nonlinearity (best fit straight line)	-0.15		+0.15	%span
Hysteresis			0.05	%span
Output signal repeatability	-0.05		+0.05	%span
Bridge resistance [2)]	3.4		4.85	kΩ
Bridge resistance TC	1650		1850	ppm/K
Dielectric strength	700			VAC
Isolation resistance at room temperature	100			MΩ
Isolation resistance over operating temperature range	20			MΩ
Bridge supply voltage, DC	1		10	V
Long term stability of sensitivity	-0.15		0.15	%span/ year
Additional offset error caused by vibration impact [3)]	-0.05		0.05	%span
Additional offset error caused by overload pressures	-0.25		0.25	%span
Additional sensitivity error caused by overload pressures	-0.1		0.1	%span

Notes

1) At 10 V bridge supply voltage, 25°C and ambient pressure
2) At 25°C and ambient pressure
3) For condition details see section mechanical parameters

MECHANICAL PARAMETERS

Material of process media wetted sensor part	Titanium alloy with 87% titanium
Ingress protection	IP 40
Module weight depending on pressure port type [4)]	(4 to 7.7) g
Min. vibration proofness (sinus) according to IEC 68-2-6 and IEC 68-2-38	500 m/s^2 at (10 to 5000) Hz
Min. multiple shock proofness according to IEC 68-2-32	1000 m/s^2 Shock pulse width 2 ms
Max. mounting torque [5)] for pressure port types M1, U1 for pressure port types M2, U2, M3, U3	 25 Nm 5 Nm

Notes

4) For details refer also section pressure ports
5) Only with proper tools at flat side areas allowed

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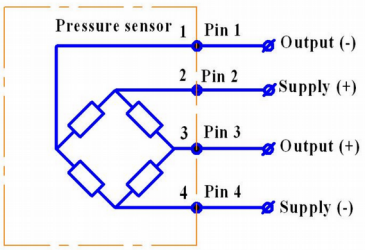
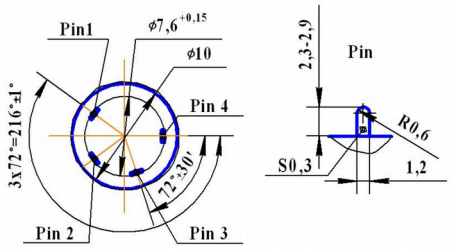
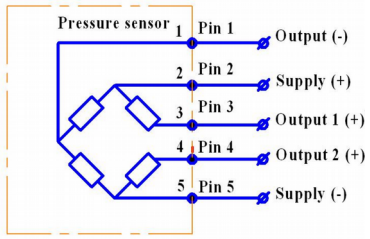
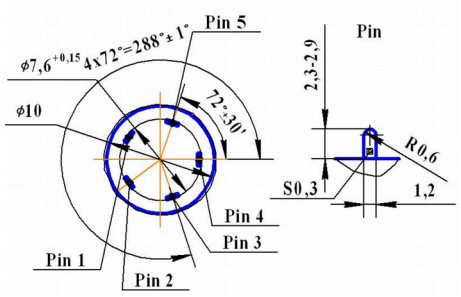
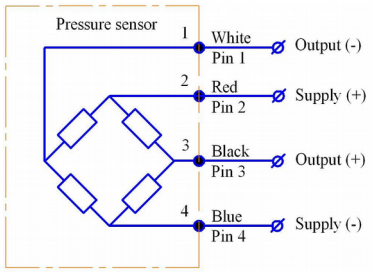
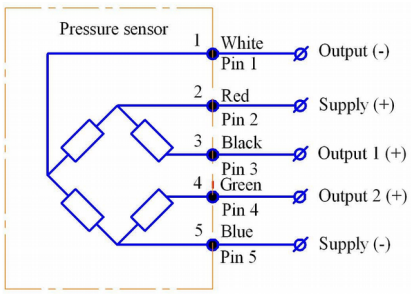
SENSOR BRIDGE CIRCUITS

Modules with solder pins		
Sensor bridge type/ pin mapping	Circuit diagram	Mechanical drawing of pin configuration
Closed Pin 1: output minus Pin 2: supply plus Pin 3: output plus Pin 4: supply minus		
Open Pin 1: output minus Pin 2: supply plus Pin 3: output plus 1 Pin 4: output plus 2 Pin 5: supply minus		

Modules with flexible wires		
Sensor bridge type/ wire mapping	Circuit diagram	Notes
Closed white: output minus red: supply plus black: output plus blue: supply minus		All wires with cross-sections of 0.08 mm and PTFE insulation
Open white: output minus red: supply plus black: output plus 1 green: output plus 2 blue: supply minus		All wires with cross-sections of 0.08 mm and PTFE insulation

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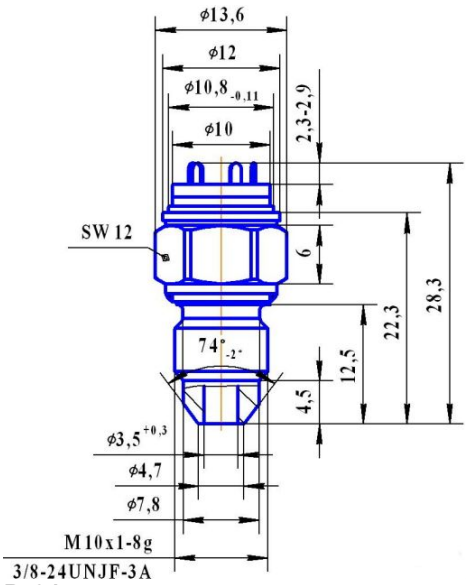
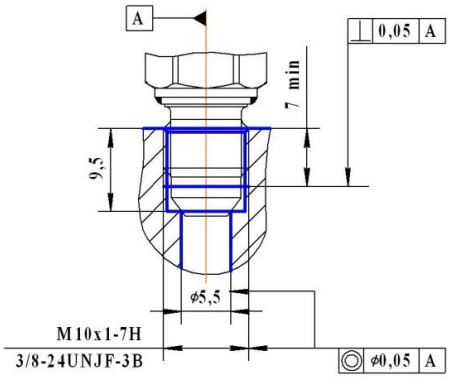
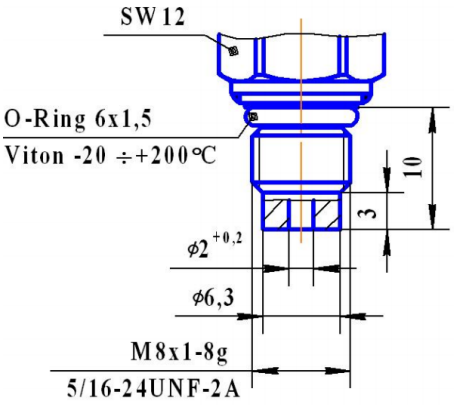
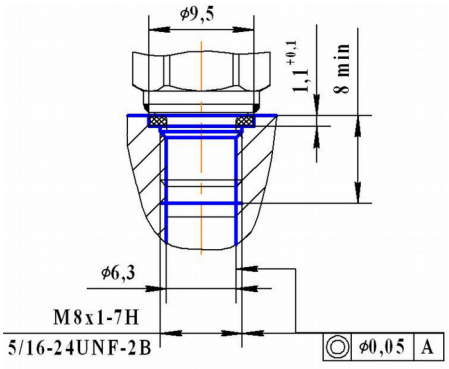
PRESSURE PORTS

Pressure modules with solder pins		
Designation	Pressure port drawing	Recommendation for mounting
Code: M1 **Nominal pressure ranges:** **(1 to 150) MPa** Thread: M10x1-8g HEX: 12 **Code: U1** **Nominal pressure ranges:** **(1 to 150) MPa** Thread: 3/8-24 UNJF-3A HEX: 12	 **D-01**	 For maximal allowed mounting torque see section mechanical parameters
Code: M2 **Nominal pressure ranges:** **(1 to 25) MPa** Thread: M8x1-8g HEX: 12 **Code: U2** **Nominal pressure ranges:** **(1 to 25) MPa** Thread: 5/16-24 UNF-2A HEX: 12	 **D-02**	 For maximal allowed mounting torque see section mechanical parameters

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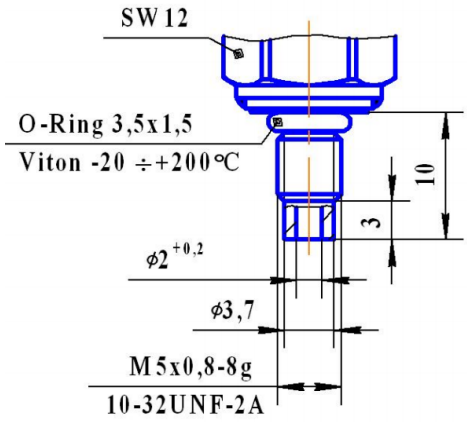
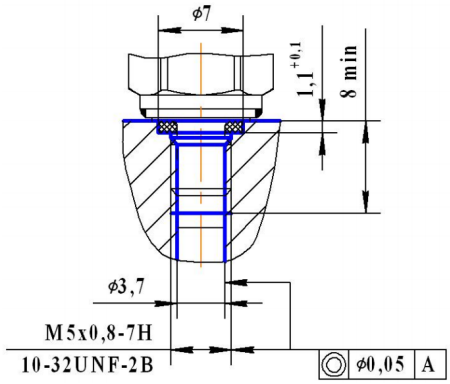
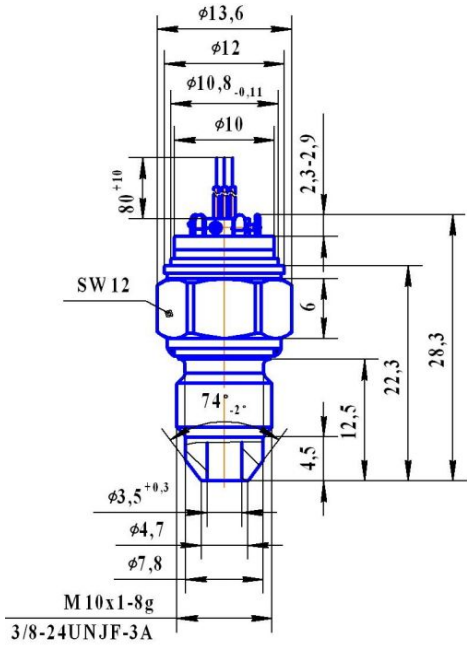
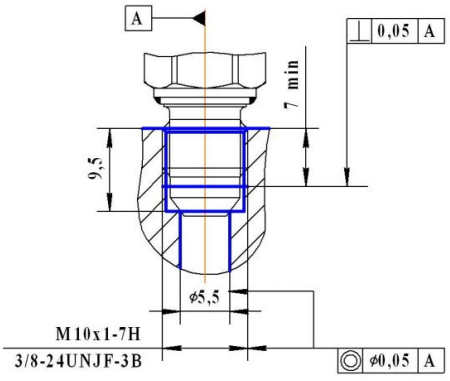
Pressure modules with solder pins		
Designation	Pressure port drawing	Recommendation for mounting
Code: M3 **Nominal pressure ranges:** **(1 to 10) MPa** Thread: M5x0.8-8g HEX: 12		 For maximal allowed mounting torque see section mechanical parameters
Code: U3 **Nominal pressure ranges:** **(1 to 25) MPa** Thread: 10-32 UNF-2A HEX: 12	**D-03**	

Pressure modules with flexible wires		
Designation	Pressure port drawing	Recommendation for mounting
Code: M1 **Nominal pressure ranges:** **(1 to 150) MPa** Thread: M10x1-8g HEX: 12		 For maximal allowed mounting torque see section mechanical parameters
Code: U1 **Nominal pressure ranges:** **(1 to 150) MPa** Thread: 3/8-24 UNJF-3A HEX: 12	**D-04**	

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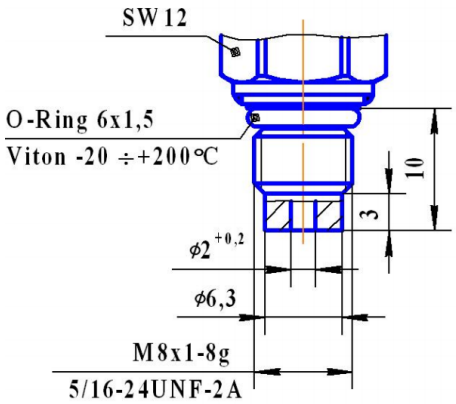
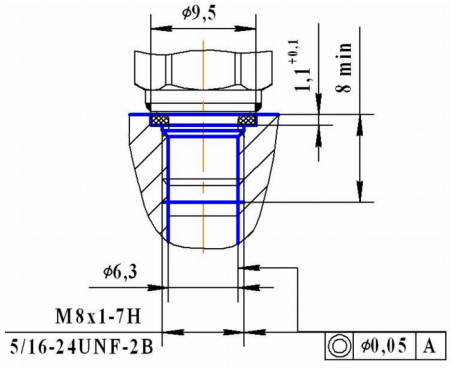
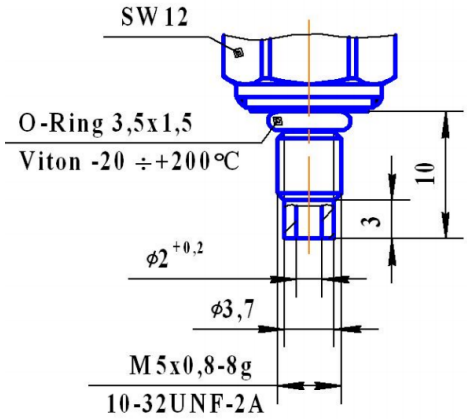
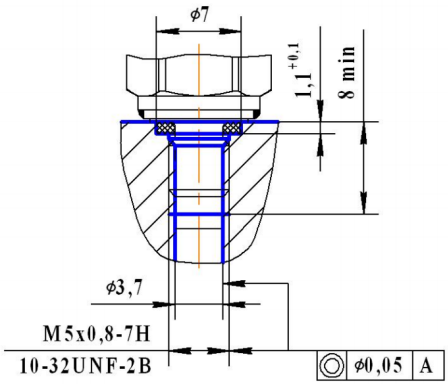
Pressure modules with flexible wires		
Designation	Pressure port drawing	Recommendation for mounting
Code: M2 **Nominal pressure ranges:** **(1 to 25) MPa** Thread: M8x1-8g HEX: 12	 **D-05**	 For maximal allowed mounting torque see section mechanical parameters
Code: U2 **Nominal pressure ranges:** **(1 to 25) MPa** Thread: 5/16-24 UNF-2A HEX: 12		
Code: M3 **Nominal pressure ranges:** **(1 to 10) MPa** Thread: M5x0.8-8g HEX: 12	 **D-06**	 For maximal allowed mounting torque see section mechanical parameters
Code: U3 **Nominal pressure ranges:** **(1 to 25) MPa** Thread: 10-32 UNF-2A HEX: 12		

RECOMMENDED PROCESS MEDIA

All gases and liquids and their mixtures which are not aggressive against titanium alloys like air, sea water, 5% vitriol acid, chlorine water, chloride solutions, mineral oils, ethyne etc.

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ORDERING CODES

	Product family	Pressure range	Tempera-ture range	Sensor bridge circuit	Pressure port type	Electrical connection
Industrial pressure sensor module	L-MP					

Standard pressure ranges

(0 to 1) MPa	1
(0 to 1.6) MPa	1.6
(0 to 2.5) MPa	2.5
(0 to 4) MPa	4
(0 to 6) MPa	6
(0 to 10) MPa	10
(0 to 16) MPa	16
(0 to 25) MPa	25
(0 to 40) MPa	40
(0 to 60) MPa	60
(0 to 100) MPa	100
(0 to 150) MPa	150

Media temperature range

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

Sensor bridge circuit

Closed bridge	0
Open bridge	1

Pressure port type

M10x1-8g (pressure port drawing D-01, D-04)	M1
3/8-24 UNJF-3A (pressure port drawing D-01, D-04)	U1
M8x1-8g (pressure port drawing D-02, D-05)	M2
5/16-24 UNF-2A (pressure port drawing D-02, D-05)	U2
M5x0.8-8g (pressure port drawing D-03, D-06)	M3
10-32 UNF-2A (pressure port drawing D-03, D-06)	U3

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	Product family	Pressure range	Tempera-ture range	Sensor bridge circuit	Pressure port type	Electrical connection
Electrical connection						
Solderable flexible wires with 80 mm length (standard)						L
Solder pins with (2.3 to 2.9) mm height						P

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In case other wire lengths are wished please add the required length to the wire code L in millimeters. For example L100 for 100 mm wire length.

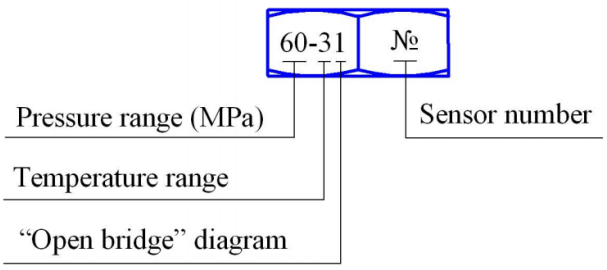
	Product family	Pressure range	Tempera-ture range	Sensor bridge circuit	Electrical connection
Ordering example					
Pressure sensor module for (0 to 600) bar and (0 to 60) MPa resp., operating temperature range (-45 to +200)°C with open sensor bridge and a wire length of 20 mm	**L-MP**	**60**	**3**	**1**	**L20**

Your order code according to this example would be:

L-MP-60-31-L20

PRODUCT MARKING

All pressure sensor modules are marked on hex including the presure range, temperature range, bridge type and a sensor number like shown in the picture below.



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