



MAIN FEATURES	APPLICATION
<ul style="list-style-type: none">■ Relative pressure sensing modules with resistive Wheatstone bridge■ Titanium sensor body made as one piece part■ Resolution 0.01%span■ Nominal pressure ranges from 0.06 MPa to 200 MPa■ Operating temperature range from -45°C up to +200°C■ Dielectric strength 700 VAC	<ul style="list-style-type: none">▲ Heavy industrial applications▲ Hydraulics and pneumatics▲ Chemical industries▲ Machine construction▲ Pumping stations and compressors

DESCRIPTION

New solutions in pressure measurement by Silicon on Sapphire technology

The highly sensitive element of this 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 term stable repeatability.



TECHNICAL DATA

STANDARD PRESSURE RANGES

Nominal pressure range	[MPa]	0.06	0.1	0.16	0.25	0.4	0.6	1	1.6
Under pressure ¹⁾	[MPa]	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Over pressure	[MPa]	0.12	0.2	0.32	0.5	0.8	1.2	2.0	3.2
Burst pressure	[MPa]	0.18	0.3	0.48	0.75	1.2	1.8	3.0	4.8

Nominal pressure range	[MPa]	2.5	4.0	6.0	10	16	25	40	60
Under pressure ¹⁾	[MPa]	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Over pressure	[MPa]	5	8	12	20	32	50	80	120
Burst pressure	[MPa]	7.5	12	18	30	48	75	120	180

Nominal pressure range	[MPa]	100	150	200
Under pressure ¹⁾	[MPa]	-0.1	-0.1	-0.1
Over pressure	[MPa]	150	165	220
Burst pressure	[MPa]	200	225	300

Note

1) Reverse pressure

All values relating to relative pressure. Customer specific pressure ranges on request.
0.1 MPa = 1 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⁾	-10		+10	mV
Offset TC	-0.05		+0.05	%span/K
Full scale output signal ¹⁾ for nominal pressure ranges ≤ 0.25 MPa	65		135	mV
Full scale output signal ¹⁾ for nominal pressure ranges > 0.25 MPa	100	150	200	mV
Span TC	-0.05		+0.05	%span/K
Signal resolution			0.01	%span
Nonlinearity (best fit straight line) for nominal pressure ranges ≤ 1.6 MPa for nominal pressure ranges > 1.6 MPa	-0.2 -0.15		+0.2 +0.15	%span
Hysteresis			0.05	%span
Output signal repeatability	-0.05		+0.05	%span
Bridge resistance ²⁾	3.4	4.0	4.6	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	5		10	V
Long term stability of sensitivity for nominal pressure ranges ≤ 1 MPa for nominal pressure ranges > 1 MPa	-0.25 -0.15		0.25 0.15	%span/ year
Additional offset error caused by vibration impact ³⁾	-0.05		0.05	%span
Additional offset error caused by mounting torque ⁴⁾ for nominal pressure ranges ≤ 1 MPa for nominal pressure ranges > 1 MPa	-0.25 -0.025		0.25 0.025	%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
- 4) Refer also to section mechanical parameters

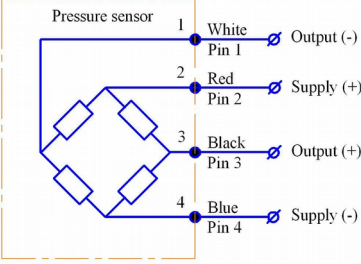
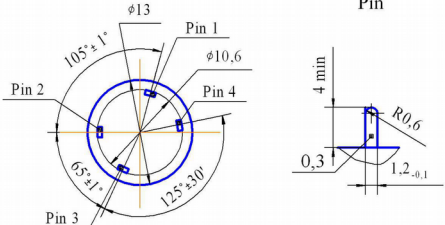
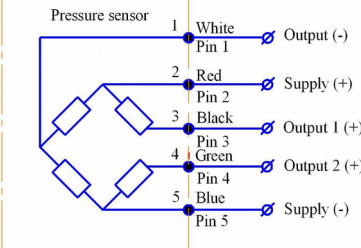
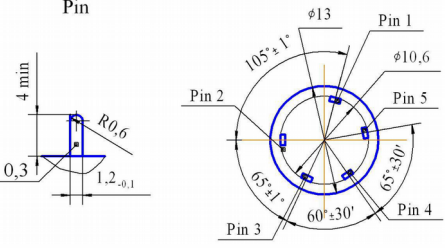
MECHANICAL PARAMETERS

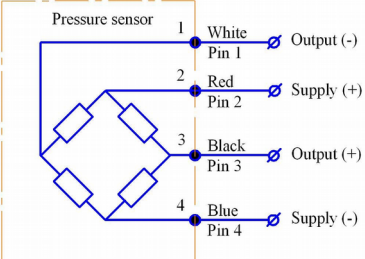
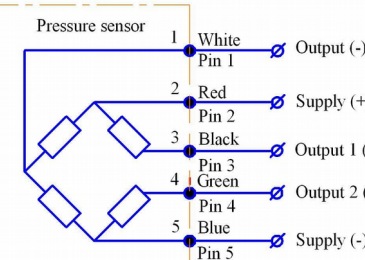
Material of process media wetted sensor part	Titanium alloy with 87% titanium
Ingress protection	IP 40
Module weight	29 g to 34 g depending on pressure port type, for details see also section pressure ports

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 at pressure port types MFA, GFA, MK1, GK1 ⁵⁾ for nominal pressure ranges (0.06 to 10) MPa for nominal pressure ranges (16 to 40) MPa for nominal pressure ranges (60 to 200) MPa	(30 to 35) Nm (50 to 60) Nm (80 to 100) Nm
Max. mounting torque at pressure port types K, MFE, GFE, MA1, GA1, MT1, GT1 ⁵⁾	(30 to 35) Nm

Notes

- 5) Only with proper tools at hex allowed. See also section pressure ports.

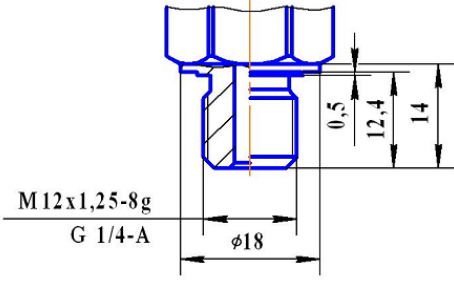
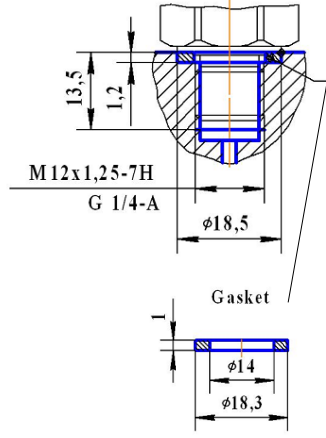
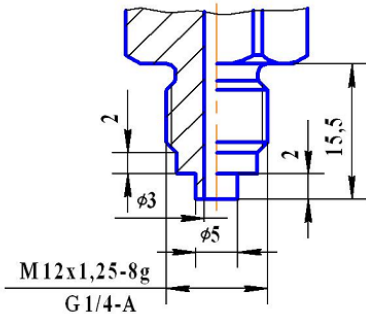
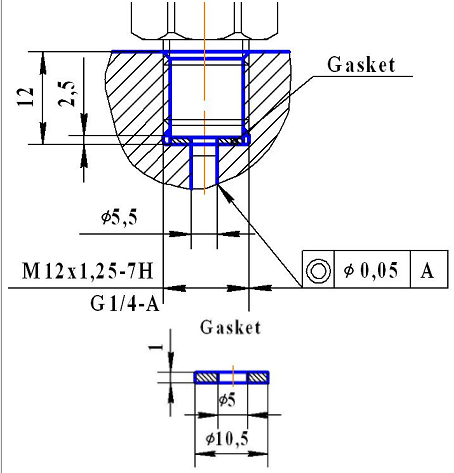
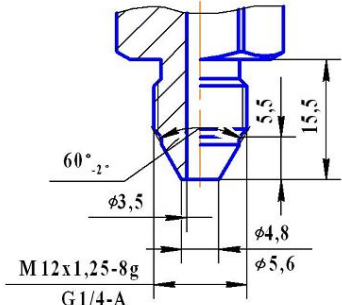
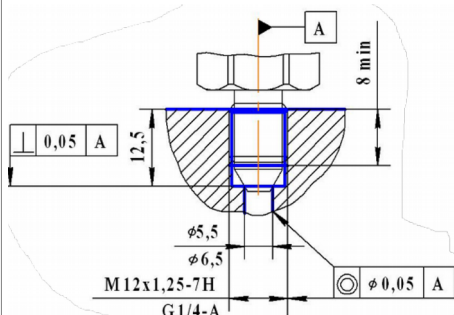
SENSOR BRIDGE CIRCUITS		
Modules with solder pins		
Sensor bridge type/ pin mapping	Circuit diagram	Mechanical drawing of pin configuration
<p>Closed</p> <p>Pin 1: output minus Pin 2: supply plus Pin 3: output plus Pin 4: supply minus</p>		
<p>Open</p> <p>Pin 1: output minus Pin 2: supply plus Pin 3: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

Modules with flexible wires		
Sensor bridge type/ wire mapping	Circuit diagram	Notes
<p>Closed</p> <p>white: output minus red: supply plus black: output plus blue: supply minus</p>		<p>All wires with cross-sections of 0.09 mm and PTFE insulation</p>
<p>Open</p> <p>white: output minus red: supply plus black: output plus 1 green: output plus 2 blue: supply minus</p>		<p>All wires with cross-sections of 0.09 mm and PTFE insulation</p>

PRESSURE PORTS

Pressure modules with solder pins		
Designation	Pressure port drawing	Recommendation for mounting
<p>Code: K Nominal pressure ranges: (0.06 to 0.16) MPa</p> <p>Thread: 1/4 -18 NPT (acc. to DIN 3866)</p> <p>HEX: 19</p>	<p>D-01</p>	<p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: K Nominal pressure ranges: (0.25 to 1) MPa</p> <p>Thread: 1/4 -18 NPT (acc. to DIN 3866)</p> <p>HEX: 19</p>	<p>D-02</p>	<p>For maximal allowed mounting torque see section mechanical parameters</p>

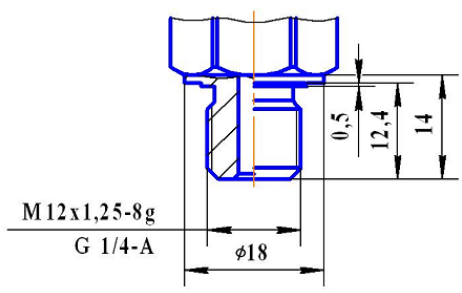
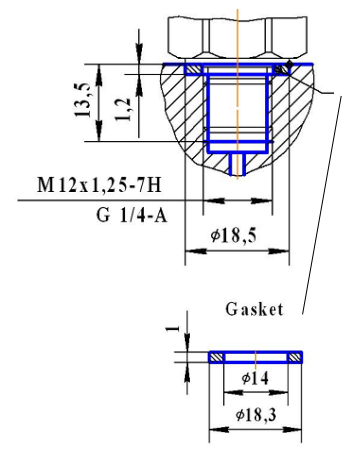
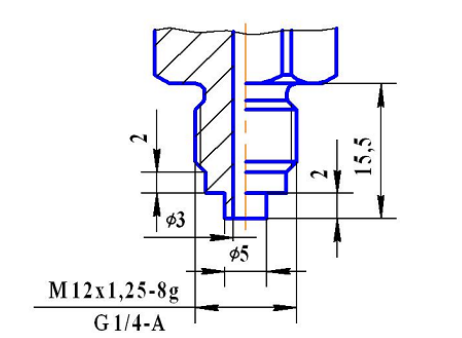
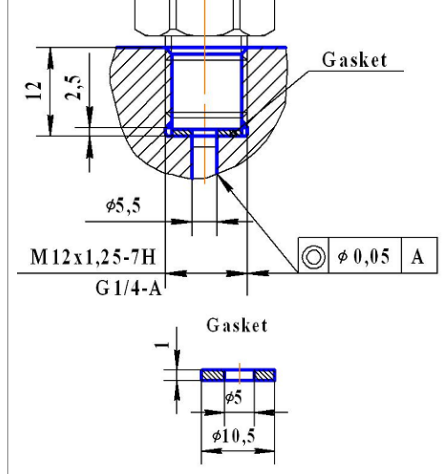
Pressure modules with solder pins		
Designation	Pressure port drawing	Recommendation for mounting
<p>Code: K Nominal pressure ranges: (1.6 to 100) MPa</p> <p>Thread: ¼ -18 NPT (acc. to DIN 3866)</p> <p>HEX: 19</p>	<p>D-03</p>	<p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: MFA Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: M14x1.5-8g, Form A (acc. to DIN 3852)</p> <p>HEX: 19</p>	<p>D-04 (other dimensions see appropriate drawing from D-01 to D-03)</p>	<p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: GFA Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: G1/4-A, Form A (acc. to DIN 3852)</p> <p>HEX: 19</p>	<p>D-05 (other dimensions see appropriate drawing from D-01 to D-03)</p>	<p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: MFE Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: M14x1.5-8g, Form E (acc. to DIN 3852)</p> <p>HEX: 19</p>		
<p>Code: GFE Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: G1/4-A, Form E (acc. to DIN 3852)</p> <p>HEX: 19</p>		

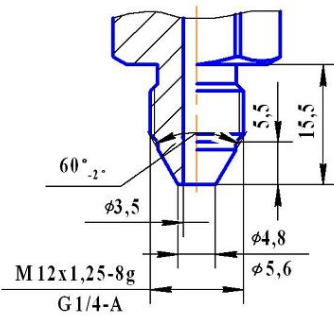
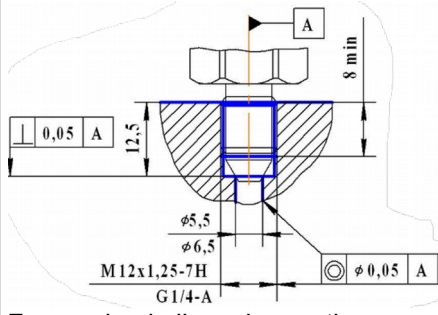
Pressure modules with solder pins		
Designation	Pressure port drawing	Recommendation for mounting
<p>Code: MK1 Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: M12x1.25-8g</p> <p>HEX: 19</p>	 <p>D-06 (other dimensions see appropriate drawing from D-01 to D-03)</p>	 <p>Gasket material: soft copper</p> <p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: GK1 Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: G1/4-A</p> <p>HEX: 19</p>	 <p>D-07 (other dimensions see appropriate drawing from D-01 to D-03)</p>	 <p>Gasket material: soft copper</p> <p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: MA1 Nominal pressure ranges: (0.06 to 200) MPa</p> <p>Thread: M12x1.25-8g</p> <p>HEX: 19</p>	 <p>D-08</p>	 <p>For maximal allowed mounting torque see section mechanical parameters</p>

Pressure modules with solder pins		
Designation	Pressure port drawing	Recommendation for mounting
Code: GT1 Nominal pressure ranges: (0.06 to 100) MPa Thread: G1/4-A HEX: 19	(other dimensions see appropriate drawing from D-01 to D-03)	

Pressure modules with flexible wires		
Designation	Pressure port drawing	Recommendation for mounting
Code: K Nominal pressure ranges: (0.06 to 0.16) MPa Thread: 1/4 -18 NPT (acc. to DIN 3866) HEX: 19	<p>D-09</p>	For maximal allowed mounting torque see section mechanical parameters
Code: K Nominal pressure ranges: (0.25 to 1) MPa Thread: 1/4 -18 NPT (acc. to DIN 3866) HEX: 19	<p>D-10</p>	For maximal allowed mounting torque see section mechanical parameters

Pressure modules with flexible wires		
Designation	Pressure port drawing	Recommendation for mounting
<p>Code: K Nominal pressure ranges: (1.6 to 100) MPa</p> <p>Thread: 1/4 -18 NPT (acc. to DIN 3866)</p> <p>HEX: 19</p>	<p>D-11</p>	<p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: MFA Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: M14x1.5-8g (acc. to DIN 3852)</p> <p>HEX: 19</p>	<p>D-12 (other dimensions see appropriate drawing from D-09 to D-11)</p>	<p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: GFA Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: G1/4-A (acc. to DIN 3852)</p> <p>HEX: 19</p>	<p>D-13 (other dimensions see appropriate drawing from D-09 to D-11)</p>	<p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: MFE Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: M14x1.5-8g (acc. to DIN 3852)</p> <p>HEX: 19</p>	<p>D-13 (other dimensions see appropriate drawing from D-09 to D-11)</p>	<p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: GFE Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: G1/4-A (acc. to DIN 3852)</p> <p>HEX: 19</p>		

Pressure modules with flexible wires		
Designation	Pressure port drawing	Recommendation for mounting
<p>Code: MK1 Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: M12x1.25-8g HEX: 19</p> <p>Code: GK1 Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: G1/4-A HEX: 19</p>	 <p>D-14 (other dimensions see appropriate drawing from D-09 to D-11)</p>	 <p>Gasket material: soft copper</p> <p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: MA1 Nominal pressure ranges: (0.06 to 200) MPa</p> <p>Thread: M12x1.25-8g HEX: 19</p> <p>Code: GA1 Nominal pressure ranges: (0.06 to 200) MPa</p> <p>Thread: G1/4-A HEX: 19</p>	 <p>D-15 (other dimensions see appropriate drawing from D-09 to D-11)</p>	 <p>Gasket material: soft copper</p> <p>For maximal allowed mounting torque see section mechanical parameters</p>

Pressure modules with flexible wires		
Designation	Pressure port drawing	Recommendation for mounting
<p>Code: MT1 Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: M12x1.25-8g HEX: 19</p>	 <p>D-16 (other dimensions see appropriate drawing from D-09 to D-11)</p>	 <p>For maximal allowed mounting torque see section mechanical parameters</p>
<p>Code: GT1 Nominal pressure ranges: (0.06 to 100) MPa</p> <p>Thread: G1/4-A HEX: 19</p>	<p>(other dimensions see appropriate drawing from D-09 to D-11)</p>	

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.

ORDERING CODES

	Product family	Pressure range	Temperature range	Sensor bridge circuit	Pressure port type	Electrical connection
Industrial pressure sensor module	L-HPL					

EN

Standard pressure ranges

(0 to 0.06 MPa)	0.06
(0 to 0.1 MPa)	0.1
(0 to 0.16 MPa)	0.16
(0 to 0.25 MPa)	0.25
(0 to 0.4 MPa)	0.4
(0 to 0.6 MPa)	0.6
(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
(0 to 200 MPa)	200

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

¼-18 NPT (pressure port drawing D-01 to D-03 and D-09 to D-11)					K
M14x1.5-8g, Form A (pressure port drawing D-04, D-12)					MFA

	Product family	Pressure range	Temperature range	Sensor bridge circuit	Pressure port type	Electrical connection
	G1/4-A, Form A (pressure port drawing D-04, D-12)				GFA	
	M14x1.5-8g, Form E (pressure port drawing D-05, D-13)				MFE	
	G1/4-A, Form E (pressure port drawing D-05, D-13)				GFE	
	M12x1.25-8g (pressure port drawing D-06, D-14)				MK1	
	G1/4-A (pressure port drawing D-06, D-14)				GK1	
	M12x1.25-8g, sealing on end face (pressure port drawing D-07, D-15)				MA1	
	G1/4-A, sealing on end face (pressure port drawing D-06, D-15)				GA1	
	M12x1.25-8g, outer conic sealing (pressure port drawing D-08, D-16)				MT1	
	G1/4-A, outer conic sealing (pressure port drawing D-08, D-16)				GT1	

Electrical connection		
Solderable flexible wires with 80 mm length (standard)		L
Solder pins with 4.5 mm height		P

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	Temperature range	Sensor bridge circuit	Pressure port type	Electrical connection
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Ordering example

Industrial pressure sensor module for (0 to 2.5) bar and (0 to 0.25) MPa resp., operating temperature range (-45 to +200)°C with G1/4-A, outer conic sealing acc. to D16 and flexible wires 200 mm long, sensor bridge closed

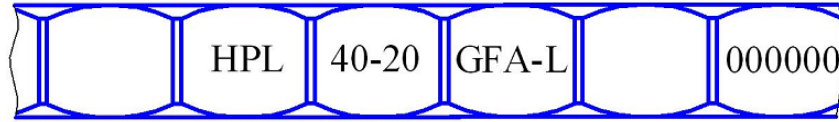
L-HPL 0.25 3 0 GT1 L200

Your order code according to this example would be:

L-HPL-0.25-30-GT1-L200

PRODUCT MARKING

All pressure sensor modules are marked on hex including the product code and a 6 digit ordering number like shown on the right side in the picture below.

**EN**