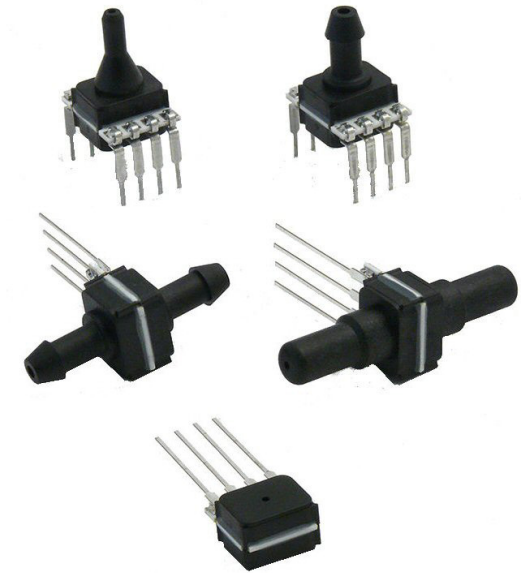


HMA series – amplified pressure sensors

The HMA pressure sensors provide amplified analog output signals and utilize precision digital signal conditioning to achieve high accuracies. The sensors offer an increased media compatibility to measure gases and liquids. 5 V and 3 V supply versions are available. Very small SIL and DIP housings allow for space-saving PCB-mounting. All HMA pressure sensors can be modified according to customer specific requirements.



Features

- Pressure ranges from 2.5 mbar to 1 bar, 1 psi to 150 psi gage or differential pressure
- Increased media compatibility⁽¹⁾
- Analog output
- Precision ASIC signal conditioning
- Calibrated and temperature compensated⁽²⁾
- SIL and DIP housings

Certificates

- Quality Management System according to EN ISO 13485:2003 and EN ISO 9001:2008
- RoHS and REACH compliant

Media compatibility^{(1), (2)}

High pressure port:

To be used with gases and liquids which are compatible with the wetted materials (high temperature polyamide, ceramic AL_2O_3 , epoxy, fluorosilicone, glass, silicon).

Low pressure port:

To be used with non-corrosive, non-ionic working fluids such as clean dry air, dry gases and the like.

Applications

- Industrial controls
- Pneumatic controls
- Environmental controls
- HVAC
- Instrumentation
- Analytical instruments
- Medical devices

Specification notes

(1) All wetted materials are selected to give a high level of media compatibility. Media compatibility refers to media inside the pressure port and lid. Improved media compatibility on high pressure port (backward side of sensor chip) since media has no contact to electronic components. Nevertheless tests with the media used in the specific application are recommended.

(2) Sensor is calibrated in air, changes in sensor behaviour based on physical effects caused by the specific media can occur. Weight of the media and wetting forces can influence the sensor characteristics.

HMA series – amplified pressure sensors

Maximum ratings

Parameter		Min.	Typ.	Max.	Unit
Supply voltage (V_s) ⁽³⁾	HMA...3	2.7	3.0	4.2	V_{dc}
	HMA...5	4.2	5.0	5.5	
Output current	Sink		1		mA
	Source		1		
Temperature ranges	Compensated	-20		+85	°C
	Operating	-20		+85	
	Storage ⁽⁴⁾	-40		+125	
Humidity limits (non-condensing) ⁽⁵⁾				95	%RH
Vibration	10...2000 Hz, random (EN 60068-2-64)			10	g
Mechanical shock	11 ms (EN60068-2-27)			50	
Lead solder temperature	(JESD22-B106D)			270	°C

Pressure sensor characteristics

Part no.	Operating pressure	Proof pressure ⁽⁶⁾
HMAM2x5U...	0...2.5 mbar	100 mbar
HMAM2x5B...	0...±2.5 mbar	
HMAM005U...	0...5 mbar	
HMAM005B...	0...±5 mbar	
HMAM010U...	0...10 mbar	
HMAM010B...	0...±10 mbar	300 mbar
HMAM020U...	0...20 mbar	
HMAM020B...	0...±20 mbar	
HMAM050U...	0...50 mbar	
HMAM050B...	0...±50 mbar	
HMAM100U...	0...100 mbar	2 bar
HMAM100B...	0...±100 mbar	
HMAM250U...	0...250 mbar	
HMAM250B...	0...±250 mbar	
HMAB001U...	0...1 bar	
HMAB001B...	0...±1 bar	10 bar
HMAB2x5U...	0...2.5 bar	
HMAB005U...	0...5 bar	
HMAB010U...	0...10 bar	14 bar
HMAP001U...	0...1 psi	30 psi
HMAP001B...	0...±1 psi	
HMAP100U...	0...100 psi	

Other pressure ranges are available on request. Please contact First Sensor.

Specification notes

(3) The sensor might not function or be operable above an absolute maximum rating of $V_s=6.5$ V.

(4) Storage temperature of the sensor without package.

(5) Tested 1h, up to 85 °C. 100 % condensing or direct liquid media on high pressure port.

(6) Proof pressure is the maximum pressure which may be applied without causing durable shifts of the electrical parameters of the sensing element.

HMA series – amplified pressure sensors

Performance characteristics – 5 V devices⁽⁷⁾

($V_S = 5.0 V_{DC}$, $T_A = 25\text{ °C}$, RH=50 %, analog output signal is ratiometric to V_S in the range of $V_S = 4.2...5.5 V$)

Parameter	Min.	Typ.	Max.	Unit
Non-linearity (-20...85 °C) ⁽⁸⁾			±0.25	
Accuracy ⁽⁹⁾			±0.25	
Total accuracy (-20...85 °C) ⁽¹⁰⁾	up to 5 mbar		±2	%FSS
	10 mbar to 50 mbar / 1 psi		±1.25	
	all others		±0.75	
Response delay ⁽¹¹⁾		0.5		ms
A/D resolution		12		bit
D/A resolution			11	
Current consumption	<1 bar	4.2		mA
	all others	5.3		

Pressure ranges up to 5 mbar

Unidirectional devices

Parameter	Min.	Typ.	Max.	Unit
Zero pressure offset	0.42	0.50	0.58	
Full scale span (FSS) ⁽¹²⁾		4.00		V
Full scale output	4.42	4.50	4.58	

Bidirectional devices

Parameter	Min.	Typ.	Max.	Unit
Zero pressure offset	2.42	2.50	2.58	
Full scale span (FSS) ⁽¹²⁾		4.00		V
Full scale output	@ max. specified pressure	4.42	4.58	
	@ min. specified pressure	0.42	0.50	0.58

Specification notes (cont.)

(7) Sensor is calibrated in air, changes in sensor behaviour based on physical effects caused by the specific media can occur. Weight of the media and wetting forces can influence the sensor characteristics.

(8) Non-linearity is the measured deviation based on Best Fit Straight Line (BFSL).

(9) Accuracy is the combined error from non-linearity and hysteresis. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure.

(10) Total accuracy is the combined error from offset and span calibration, non-linearity, pressure hysteresis, and temperature effects. Calibration errors include the deviation of offset and full scale from nominal values.

(11) Max. delay time between pressure change at the pressure die and signal change at the output.

(12) Full Scale Span (FSS) is the algebraic difference between the output signal for the highest and lowest specified pressure.

HMA series – amplified pressure sensors

Performance characteristics – 5 V devices (cont.)⁽⁷⁾

($V_S=5.0\text{ V}_{DC}$, $T_A=25\text{ °C}$, RH=50 %, analog output signal is ratiometric to V_S in the range of $V_S=4.2\text{...}5.5\text{ V}$)

Pressure ranges from 10 mbar to 50 mbar / 1 psi

Unidirectional devices

Parameter	Min.	Typ.	Max.	Unit
Zero pressure offset	0.45	0.50	0.55	
Full scale span (FSS) ⁽¹²⁾		4.00		V
Full scale output	4.45	4.50	4.55	

Bidirectional devices

Parameter	Min.	Typ.	Max.	Unit	
Zero pressure offset	2.45	2.50	2.55		
Full scale span (FSS) ⁽¹²⁾		4.00		V	
Full scale output	@ max. specified pressure	4.45	4.50	4.55	
	@ min. specified pressure	0.45	0.50	0.55	

All other pressure ranges

Unidirectional devices

Parameter	Min.	Typ.	Max.	Unit
Zero pressure offset	0.47	0.50	0.53	
Full scale span (FSS) ⁽¹²⁾		4.00		V
Full scale output	4.47	4.50	4.53	

Bidirectional devices

Parameter	Min.	Typ.	Max.	Unit	
Zero pressure offset	2.47	2.50	2.53		
Full scale span (FSS) ⁽¹²⁾		4.00		V	
Full scale output	@ max. specified pressure	4.47	4.50	4.53	
	@ min. specified pressure	0.47	0.50	0.53	

Specification notes (cont.)

(7) Sensor is calibrated in air, changes in sensor behaviour based on physical effects caused by the specific media can occur. Weight of the media and wetting forces can influence the sensor characteristics.

(12) Full Scale Span (FSS) is the algebraic difference between the output signal for the highest and lowest specified pressure.

HMA series – amplified pressure sensors

Performance characteristics – 3 V devices⁽⁷⁾

($V_S = 3.0 V_{DC}$, $T_A = 25\text{ °C}$, RH=50 %, analog output signal is ratiometric to V_S in the range of $V_S = 2.7...4.2 V$)

Parameter	Min.	Typ.	Max.	Unit
Non-linearity (-20...85 °C) ⁽⁸⁾			±0.25	
Accuracy ⁽⁹⁾			±0.25	
Total accuracy (-20...85 °C) ⁽¹⁰⁾	up to 5 mbar		±2	%FSS
	10 mbar to 50 mbar / 1 psi		±1.25	
	all others		±0.75	
Response delay ⁽¹¹⁾		0.5		ms
A/D resolution		12		bit
D/A resolution			11	
Current consumption	<1 bar	3.7		mA
	all others	4.5		

Pressure ranges up to 5 mbar

Unidirectional devices

Parameter	Min.	Typ.	Max.	Unit
Zero pressure offset	0.252	0.30	0.348	
Full scale span (FSS) ⁽¹²⁾		2.40		V
Full scale output	2.652	2.70	2.748	

Bidirectional devices

Parameter	Min.	Typ.	Max.	Unit
Zero pressure offset	1.452	1.50	1.548	
Full scale span (FSS) ⁽¹²⁾		2.40		V
Full scale output	@ max. specified pressure	2.652	2.70	
	@ min. specified pressure	0.252	0.30	0.348

Specification notes (cont.)

(7) Sensor is calibrated in air, changes in sensor behaviour based on physical effects caused by the specific media can occur. Weight of the media and wetting forces can influence the sensor characteristics.

(8) Non-linearity is the measured deviation based on Best Fit Straight Line (BFSL).

(9) Accuracy is the combined error from non-linearity and hysteresis. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure.

(10) Total accuracy is the combined error from offset and span calibration, non-linearity, pressure hysteresis, and temperature effects. Calibration errors include the deviation of offset and full scale from nominal values.

(11) Max. delay time between pressure change at the pressure die and signal change at the output.

(12) Full Scale Span (FSS) is the algebraic difference between the output signal for the highest and lowest specified pressure.

HMA series – amplified pressure sensors

Performance characteristics – 3 V devices (cont.)⁽⁷⁾

($V_S=3.0\text{ V}_{DC}$, $T_A=25\text{ °C}$, RH=50 %, analog output signal is ratiometric to V_S in the range of $V_S=2.7\text{...}4.2\text{ V}$)

Pressure ranges from 10 mbar to 50 mbar / 1 psi

Unidirectional devices

Parameter	Min.	Typ.	Max.	Unit
Zero pressure offset	0.27	0.30	0.33	
Full scale span (FSS) ⁽¹²⁾		2.40		V
Full scale output	2.67	2.70	2.73	

Bidirectional devices

Parameter	Min.	Typ.	Max.	Unit	
Zero pressure offset	1.47	1.50	1.53		
Full scale span (FSS) ⁽¹²⁾		2.40		V	
Full scale output	@ max. specified pressure	2.67	2.70	2.73	
	@ min. specified pressure	0.27	0.30	0.33	

All other pressure ranges

Unidirectional devices

Parameter	Min.	Typ.	Max.	Unit
Zero pressure offset	0.282	0.30	0.318	
Full scale span (FSS) ⁽¹²⁾		2.40		V
Full scale output	2.682	2.70	2.718	

Bidirectional devices

Parameter	Min.	Typ.	Max.	Unit	
Zero pressure offset	1.482	1.50	1.518		
Full scale span (FSS) ⁽¹²⁾		2.40		V	
Full scale output	@ max. specified pressure	2.682	2.70	2.718	
	@ min. specified pressure	0.282	0.30	0.318	

Specification notes (cont.)

(7) Sensor is calibrated in air, changes in sensor behaviour based on physical effects caused by the specific media can occur. Weight of the media and wetting forces can influence the sensor characteristics.

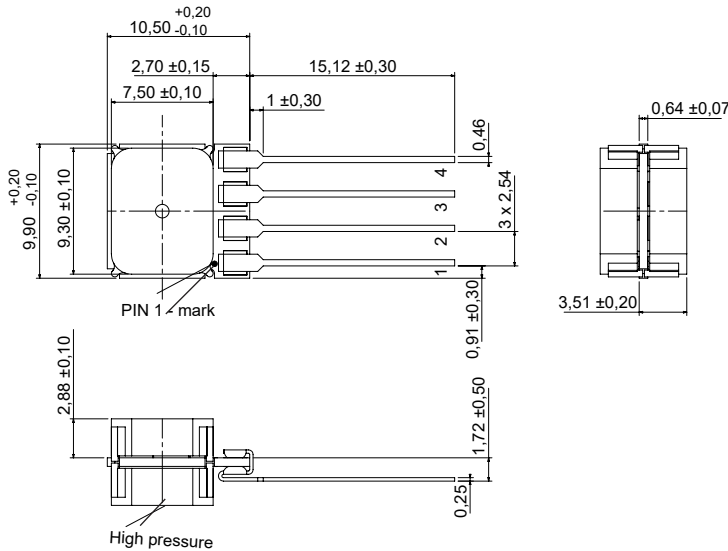
(12) Full Scale Span (FSS) is the algebraic difference between the output signal for the highest and lowest specified pressure.

HMA series – amplified pressure sensors

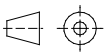
Dimensional drawing

Electrical connection

HMA...U1... (SIL, axial no ports)

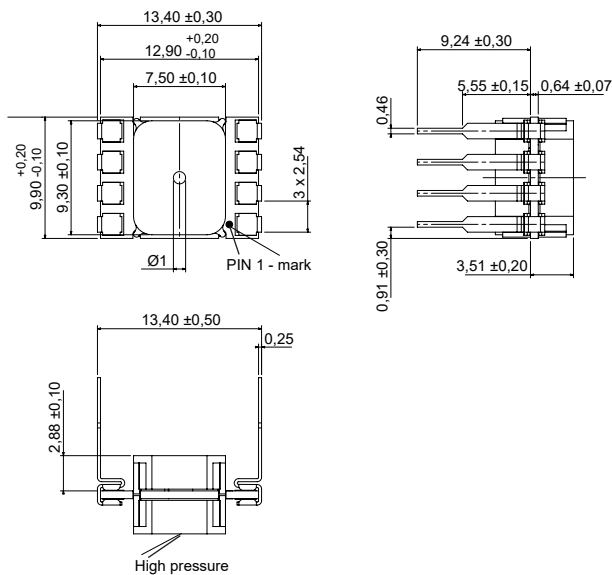


Pin	connection
1	+Vs
2	GND
3	+Vout
4	C



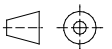
first angle projection
dimensions in mm

HMA...W1... (DIP, axial no ports)



Pin	connection
1	+Vs
2	GND
3	+Vout
4	C
5	I/C*
6	I/C*
7	I/C*
8	I/C*

* internal connection. Do not connect for any reason

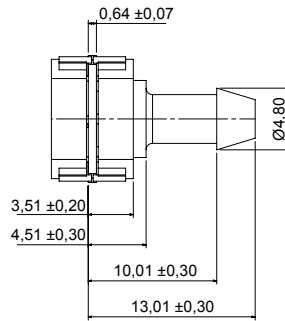
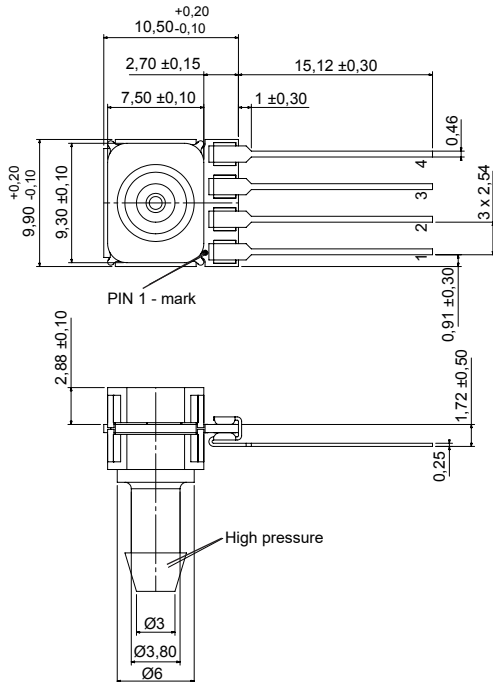


first angle projection
dimensions in mm

HMA series – amplified pressure sensors

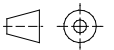
Dimensional drawing

HMA...X7... (SIL, 1 port axial, barbed)



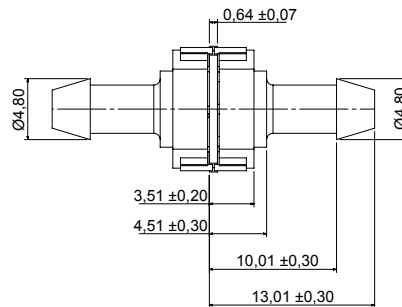
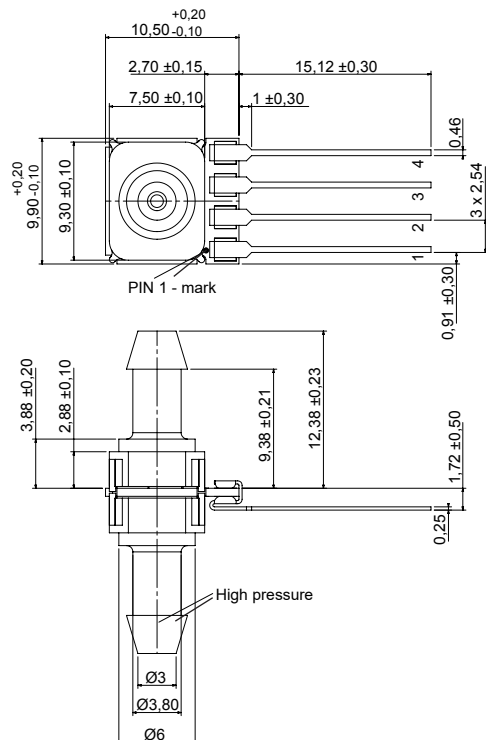
Electrical connection

Pin	connection
1	+Vs
2	GND
3	+Vout
4	C

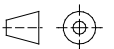


first angle projection
dimensions in mm

HMA...U7... (SIL, 2 ports axial, opposite side, barbed)



Pin	connection
1	+Vs
2	GND
3	+Vout
4	C

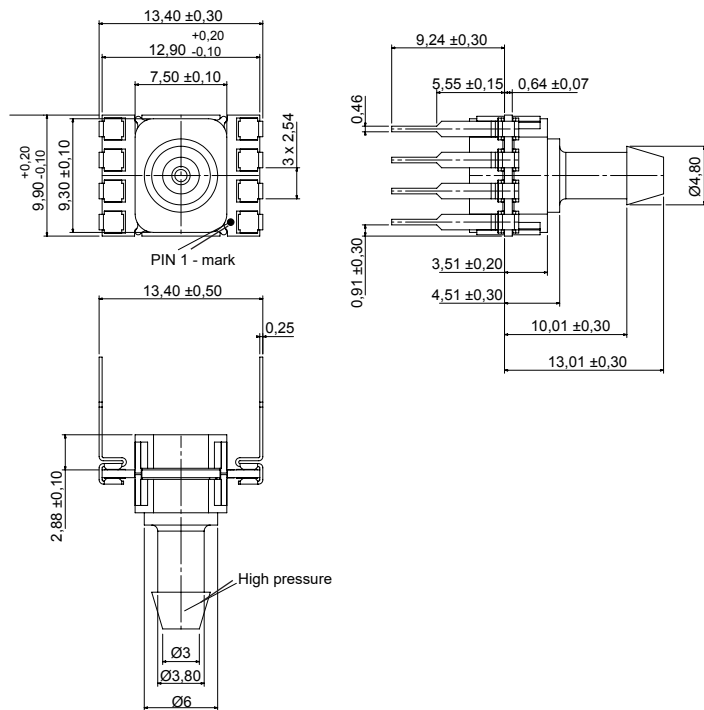


first angle projection
dimensions in mm

HMA series – amplified pressure sensors

Dimensional drawing

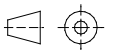
HMA...Z7... (DIP, 1 port axial, barbed)



Electrical connection

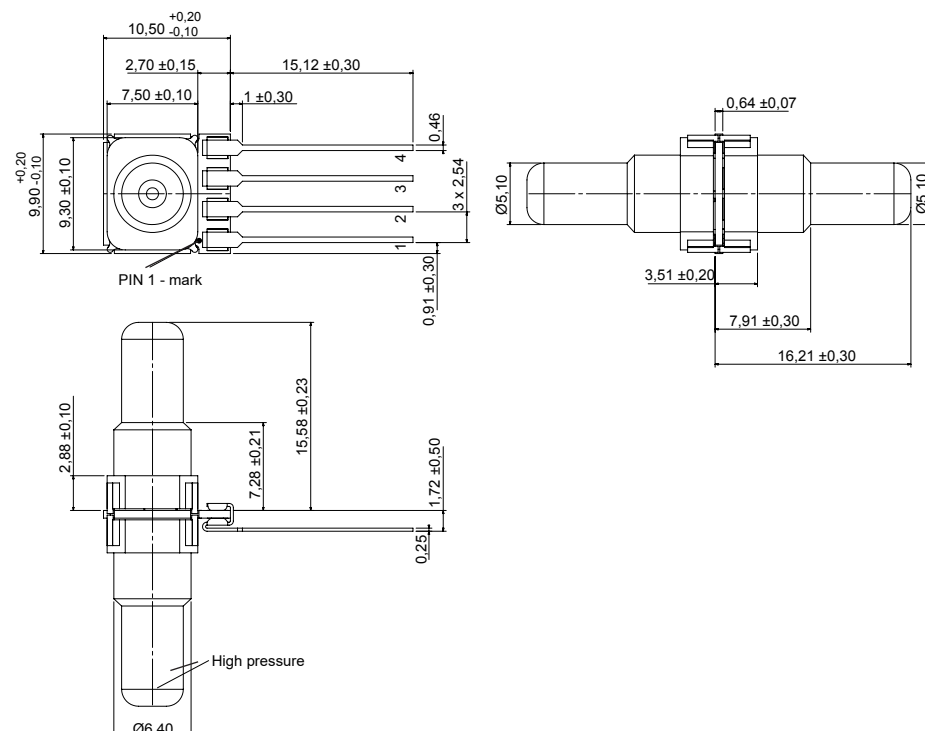
Pin	connection
1	+Vs
2	GND
3	+Vout
4	C
5	I/C*
6	I/C*
7	I/C*
8	I/C*

* internal connection. Do not connect for any reason

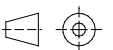


first angle projection
dimensions in mm

HMA...U6... (SIL, 2 ports axial, opposite side, straight big)



Pin	connection
1	+Vs
2	GND
3	+Vout
4	C



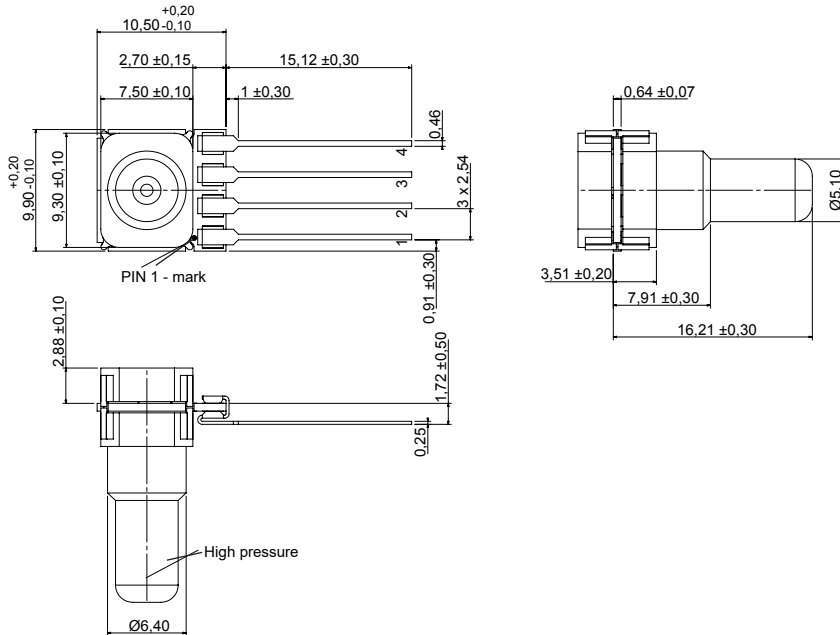
first angle projection
dimensions in mm

HMA series – amplified pressure sensors

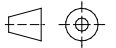
Dimensional drawing

Electrical connection

HMA...X6... (SIL, 1 port axial, straight big)

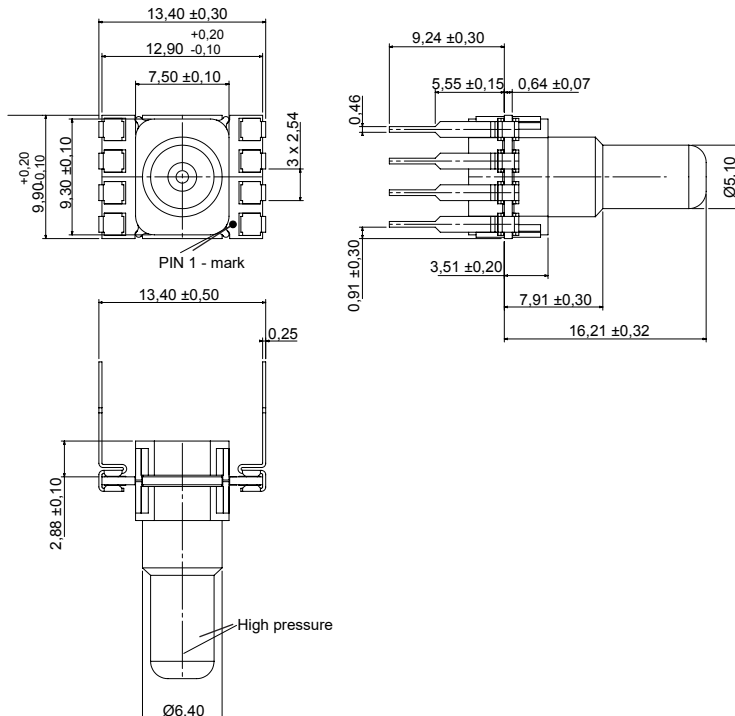


Pin	connection
1	+Vs
2	GND
3	+Vout
4	C



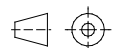
first angle projection
dimensions in mm

HMA...Z6... (DIP, 1 port axial, straight big)



Pin	connection
1	+Vs
2	GND
3	+Vout
4	C
5	I/C*
6	I/C*
7	I/C*
8	I/C*

* internal connection. Do not connect for any reason



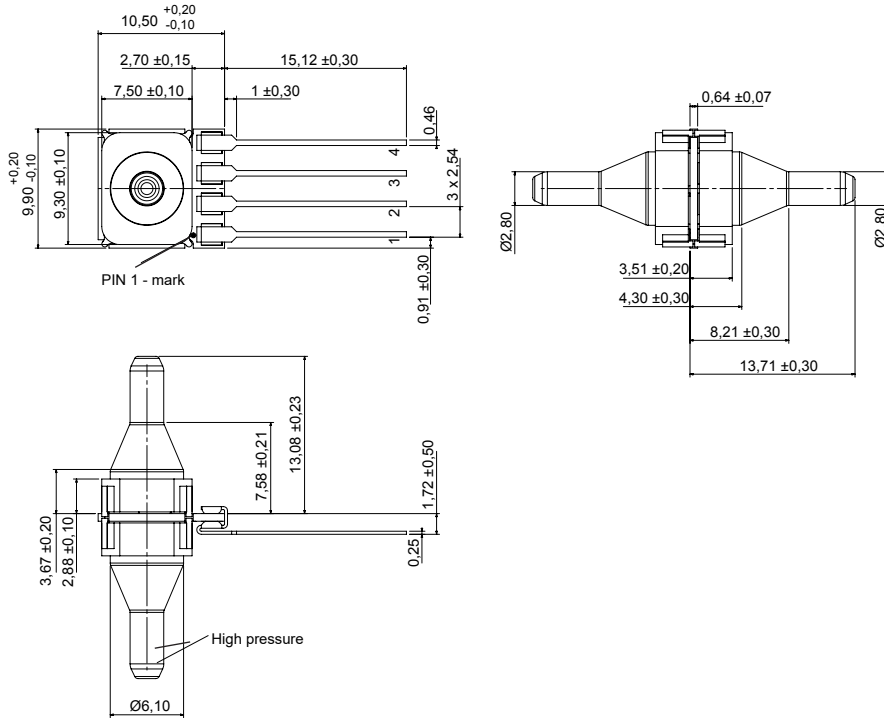
first angle projection
dimensions in mm

HMA series – amplified pressure sensors

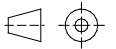
Dimensional drawing

Electrical connection

HMA...U5... (SIL, 2 ports axial, opposite side, needle big)

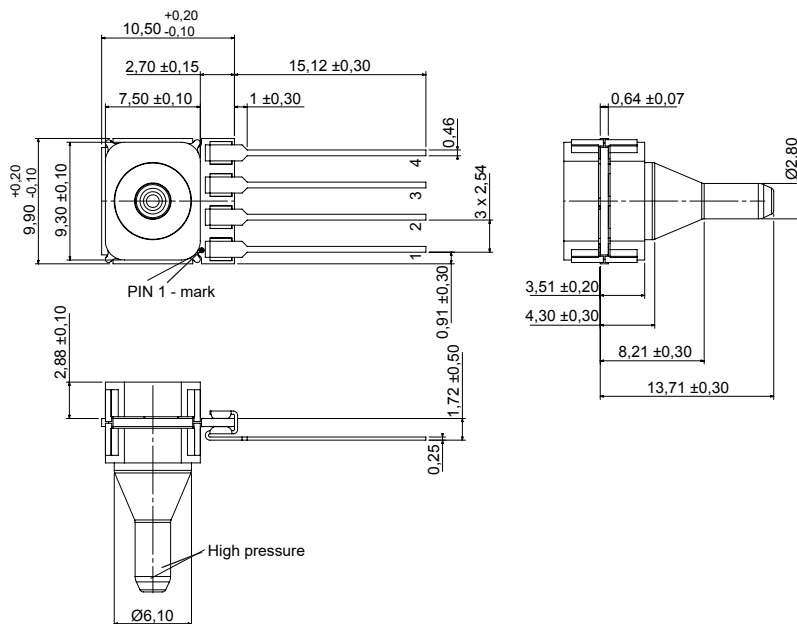


Pin	connection
1	+Vs
2	GND
3	+Vout
4	C

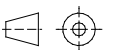


first angle projection
dimensions in mm

HMA...X5... (SIL, 1 port axial, needle big)



Pin	connection
1	+Vs
2	GND
3	+Vout
4	C



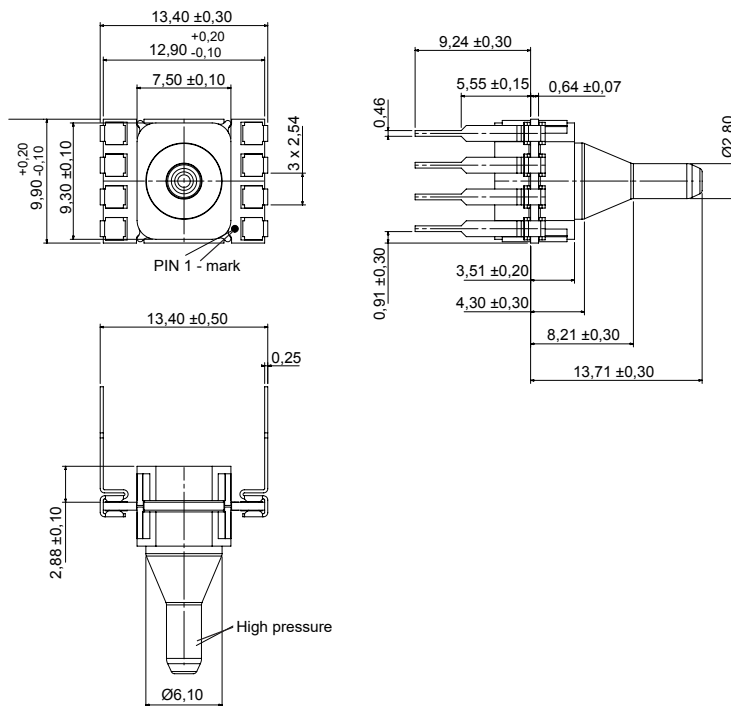
first angle projection
dimensions in mm

HMA series – amplified pressure sensors

Dimensional drawing

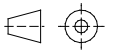
Electrical connection

HMA...Z5... (DIP, 1 port axial, needle big)



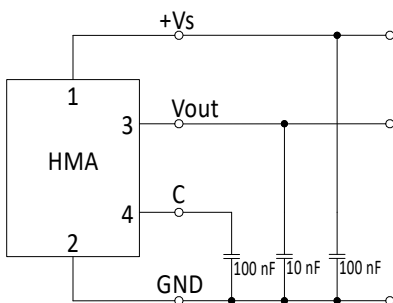
Pin	connection
1	+Vs
2	GND
3	+Vout
4	C
5	I/C*
6	I/C*
7	I/C*
8	I/C*

* internal connection. Do not connect for any reason



first angle projection
dimensions in mm

Electrical connection (cont.)



HMA series – amplified pressure sensors

Ordering information

Series	Pressure range	Calibration	Housing	Porting	Grade	Voltage	
HMA	M2x5	2.5 mbar	B Bidirectional	U [SIL, 2 ports axial, opposite side]	1 no port	H High	3 3 V
	M005	5 mbar	U Unidirectional	W [DIP, 2 ports axial, opposite side]	7 Barbed		5 5 V
	M010	10 mbar		X [SIL, 1 port axial]	5 Needle big		
	M020	20 mbar		Z [DIP, 1 port axial]	6 Straight big		
	M050	50 mbar					
	M100	100 mbar					
	M250	250 mbar					
	B001	1 bar					
	B2x5	2.5 bar					
	B005	5 bar					
	B010	10 bar					
	P001	1 psi					
	P100	100 psi					

Order code example: HMAB001BX7H5

Note: Not all possible sensor configurations are active products. MOQ may apply.
 Custom specific pressure and temperature ranges as well as mechanical or electronic sensor modifications are widely available.
 Please contact First Sensor.

Label information

Digit	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Series		Pressure range	Pressure unit / pressure mode / calibration	Housing	Porting	Grade / voltage	Rev	Date code (year)	Production code				
Char	M	A	HMA	1 2.5 mbar	U bar, gage/differential, unidirectional	U SIL, 2 ports axial, opposite side	1 no port	-	High, 5 V					
			2 5 mbar	7 Barbed			/	High, 3 V						
			3 10 mbar	B bar, gage/differential, bidirectional	W DIP, 2 ports axial, opposite side	5 Needle big								
			4 20 mbar			6 Straight big								
			5 50 mbar			X SIL, 1 port axial								
			6 1 psi			Z DIP; 1 port axial								
			7 100 mbar											
			8 250 mbar											
			A 1 bar											
			B 2.5 bar											
			C 5 bar											
			L 100 psi											
			M 10 bar											

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