

# HMA Series

## Amplified pressure sensors

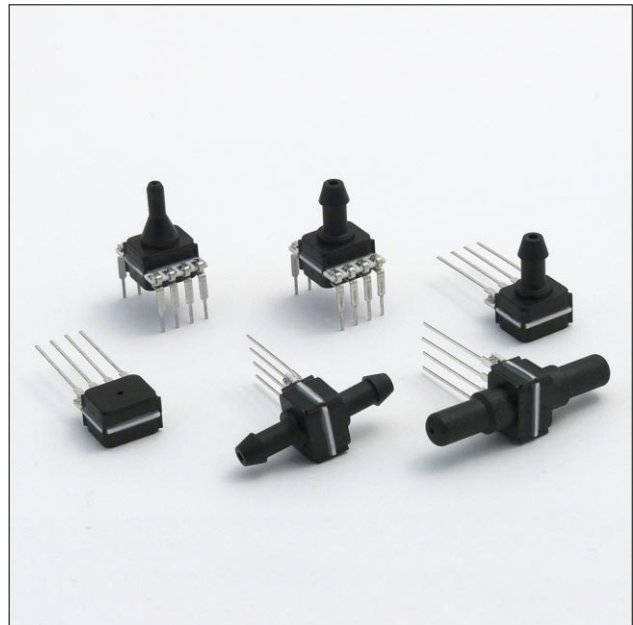
### FEATURES

- 100 mbar to 10 bar, 1 to 150 psi gage or differential pressure
- Increased media compatibility<sup>1</sup>
- Analog output
- Precision ASIC signal conditioning
- Calibrated and temperature compensated<sup>2</sup>
- SIL and DIP housings
- RoHS compliant
- Quality Management System according to ISO 13485:2003 and ISO 9001:2008

### MEDIA COMPATIBILITY<sup>1,2</sup>

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.



### SPECIFICATIONS

#### Maximum ratings

Supply voltage $V_s$	
HMA...3	2.7 ... 4.2 $V_{DC}$
HMA...5	4.2 ... 5.5 $V_{DC}$ max. 6.5 $V_{DC}$

Output current	
Sink	1 mA
Source	1 mA

#### Environmental

Temperature ranges	
Compensated	-20 ... +85 °C
Operating	-20 ... +85 °C
Storage <sup>3</sup>	-40 ... +125 °C

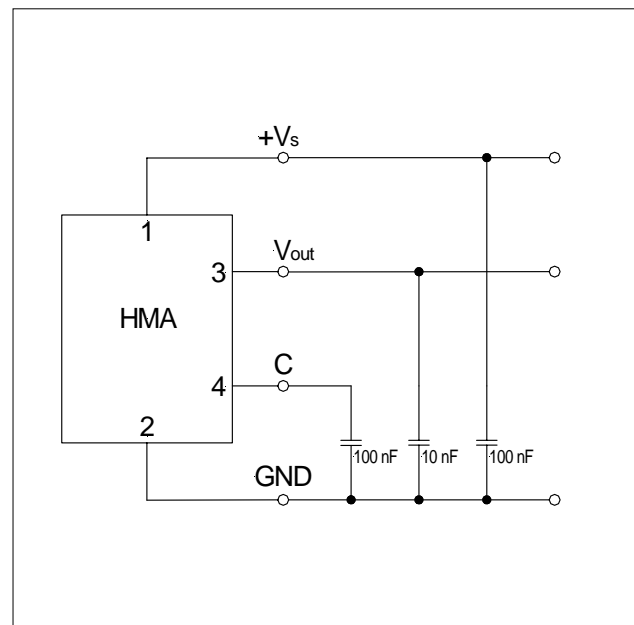
Humidity limits (non-condensing) ...95 %RH<sup>10</sup>  
(100 % condensing or direct liquid media on high pressure port<sup>1</sup>)

Vibration max. 10 g, 10...2000 Hz, random  
(EN 60068-2-64)

Mechanical shock max. 50 g, 11 ms  
(EN 60068-2-27)

Lead solder temperature max. 270 °C  
(JESD22-B106D)

### ELECTRICAL CONNECTION



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### PRESSURE SENSOR CHARACTERISTICS

( $T_A=25\text{ °C}$ , RH=50 %)

Part no.	Operating pressure	Proof pressure <sup>4</sup>
HMAM100U...	0...100 mbar	2 bar
HMAM100B...	0...±100 mbar	2 bar
HMAM250U...	0...250 mbar	2 bar
HMAM250B...	0...±250 mbar	2 bar
HMAB001U...	0...1 bar	5 bar
HMAB001B...	0...±1 bar	5 bar
HMAB2x5U...	0...2.5 bar	10 bar
HMAB005U...	0...5 bar	14 bar
HMAB010U...	0...10 bar	14 bar
HMAP001U...	0...1 psi	30 psi
HMAP001B...	0...±1 psi	30 psi
HMAP100U...	0...100 psi	200 psi

Other pressure ranges (e.g. 500 mbar, 5 psi, 150 psi) are available on request. Please contact First Sensor.

### PERFORMANCE CHARACTERISTICS<sup>2</sup>

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

#### All HMA...H5 devices ( $V_S = 5.0$ )

Characteristics	Min.	Typ.	Max.	Units
Non-linearity (-20...85 °C) <sup>6</sup>			±0.25	%FSS
Accuracy <sup>7</sup>			±0.25	
Total accuracy (-20...85 °C) <sup>8</sup>			±1.5	
Response delay <sup>9</sup>		0.5		ms
A/D resolution		12		bit
D/A resolution			11	
Current consumption		5.3		mA

#### All HMA...U...H5 (unidirectional devices)

Characteristics	Min.	Typ.	Max.	Units
Zero pressure offset	0.44	0.50	0.56	V
Full scale span (FSS) <sup>5</sup>		4.00		
Full scale output	4.44	4.50	4.56	

#### All HMA...B...H5 (bidirectional devices)

Characteristics	Min.	Typ.	Max.	Units	
Zero pressure offset	2.44	2.50	2.56	V	
Full scale span (FSS) <sup>5</sup>		4.00			
Output	at max. specified pressure	4.44	4.50		4.56
	at min. specified pressure	0.44	0.50		0.56

# HMA Series

## Amplified pressure sensors

### PERFORMANCE CHARACTERISTICS<sup>2</sup>

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

#### All HMA...H3 devices ( $V_s = 3.0$ )

Characteristics	Min.	Typ.	Max.	Units
Non-linearity (-20...85 °C) <sup>6</sup>			±0.25	%FSS
Accuracy <sup>7</sup>			±0.25	
Total accuracy (-20...85 °C) <sup>8</sup>			±1.5	
Response delay <sup>9</sup>		0.5		ms
A/D resolution		12		bit
D/A resolution			11	
Current consumption		4.5		mA

#### All HMA...U...H3 (unidirectional devices)

Characteristics	Min.	Typ.	Max.	Units
Zero pressure offset	0.264	0.30	0.336	V
Full scale span (FSS) <sup>5</sup>		2.40		
Full scale output	2.664	2.70	2.736	

#### All HMA...B...H3 (bidirectional devices)

Characteristics	Min.	Typ.	Max.	Units	
Zero pressure offset	1.464	1.50	1.536	V	
Full scale span (FSS) <sup>5</sup>		2.40			
Output	at max. specified pressure	2.664	2.70		2.736
	at min. specified pressure	0.264	0.30		0.336

#### 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.
3. Storage temperature of the sensor without package.
4. Proof pressure is the maximum pressure which may be applied without causing durable shifts of the electrical parameters of the sensing element.
5. Full Scale Span (FSS) is the algebraic difference between the output signal for the highest and lowest specified pressure.
6. Non-linearity is the measured deviation based on Best Fit Straight Line (BFSL).
7. 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.
8. 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.
9. Max. delay time between pressure change at the pressure die and signal change at the output.
10. Tested 1h, up to 85 °C.

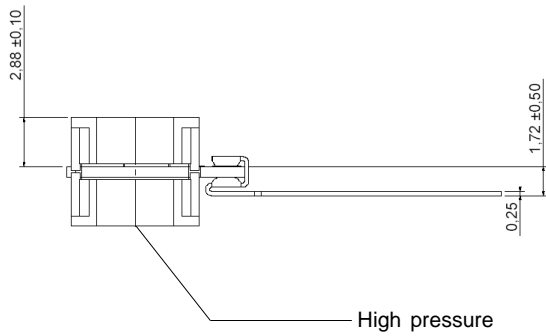
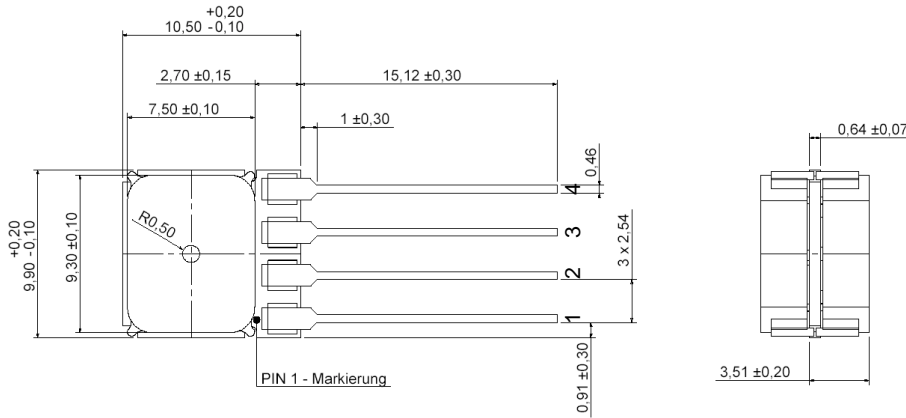
**Sensors are electronic components and should be handled only in ESD save environments.**

# HMA Series

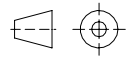
## Amplified pressure sensors

### PHYSICAL DIMENSIONS AND ELECTRICAL CONNECTION

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



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



first angle projection

dimensions in mm

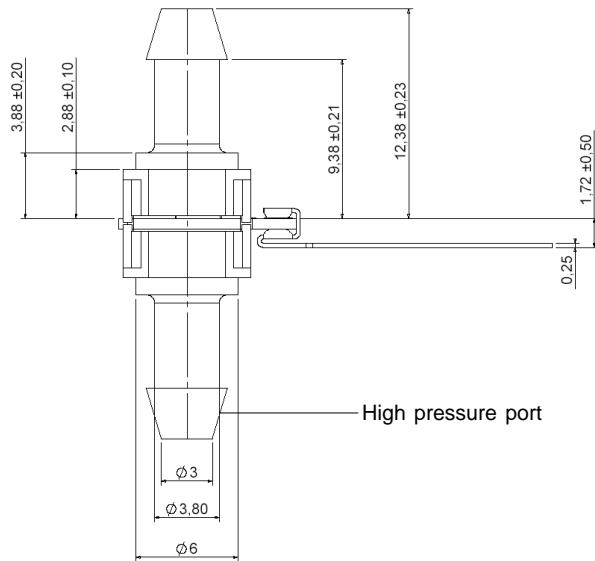
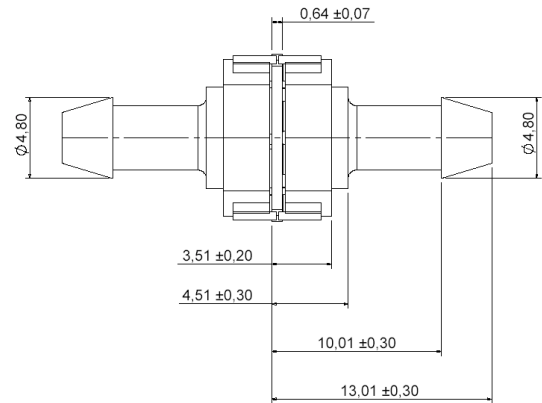
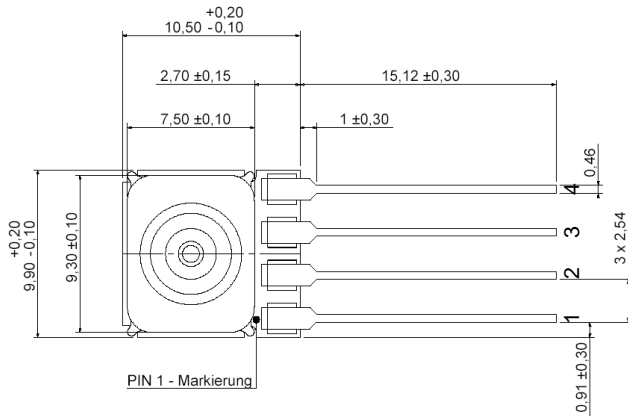


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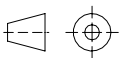
## Amplified pressure sensors

### PHYSICAL DIMENSIONS AND ELECTRICAL CONNECTION (cont.)

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



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

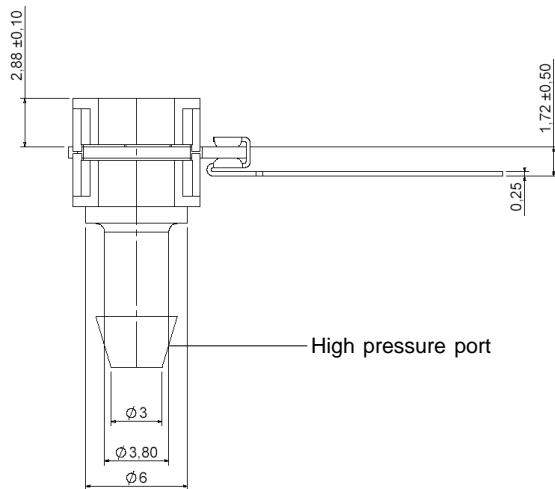
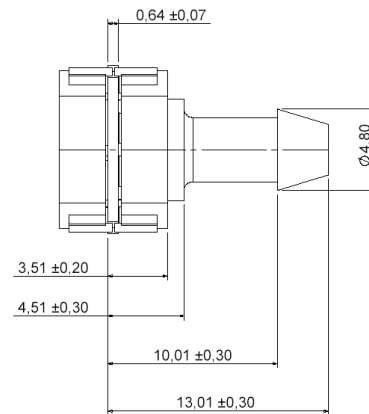
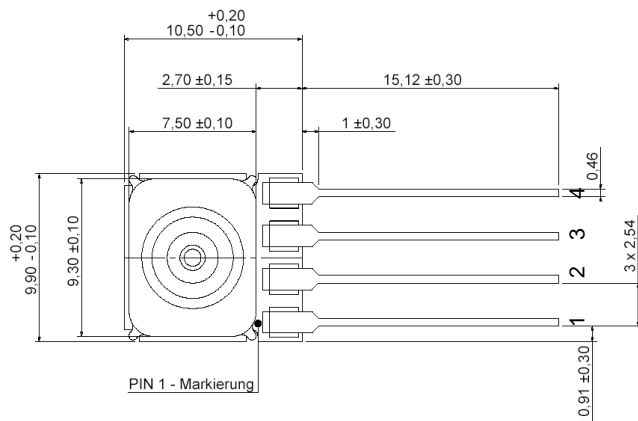

  
 first angle projection
   
 dimensions in mm

# HMA Series

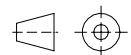
## Amplified pressure sensors

### PHYSICAL DIMENSIONS AND ELECTRICAL CONNECTION (cont.)

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



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



first angle projection

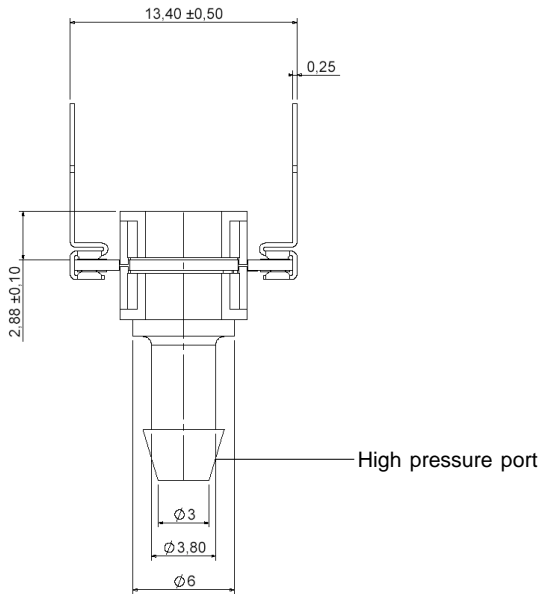
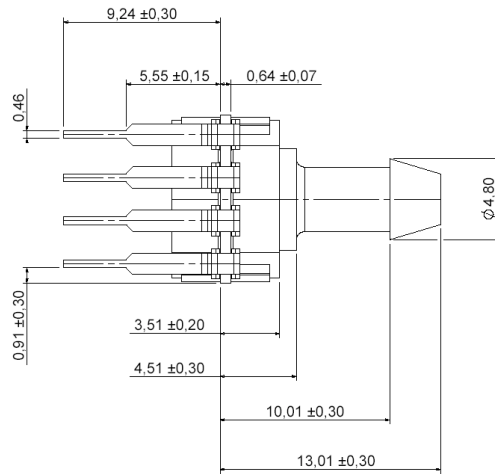
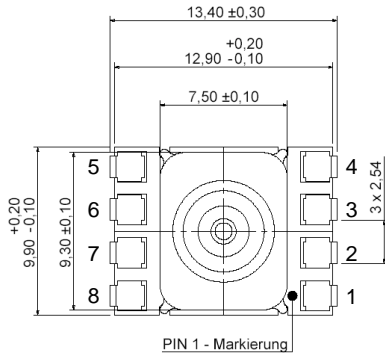
dimensions in mm

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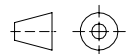
### PHYSICAL DIMENSIONS AND ELECTRICAL CONNECTION (cont.)

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



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



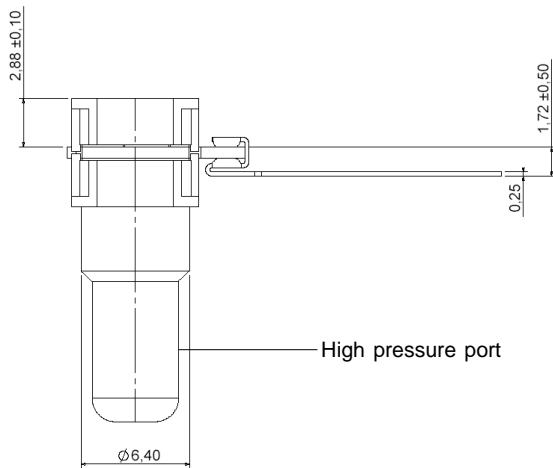
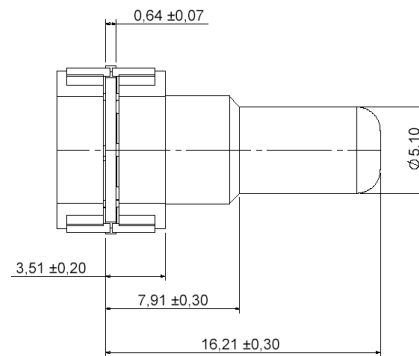
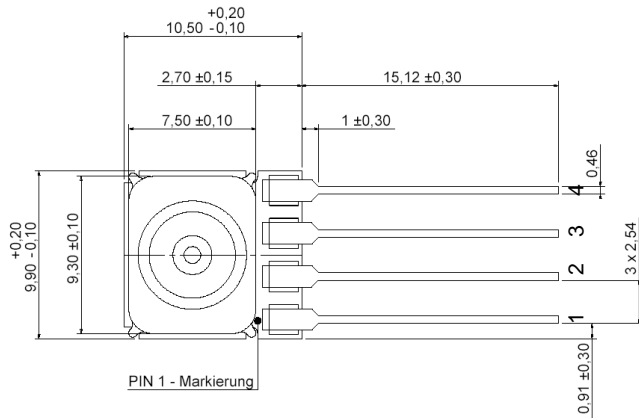


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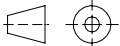
## Amplified pressure sensors

### PHYSICAL DIMENSIONS AND ELECTRICAL CONNECTION (cont.)

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



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

  
 first angle projection  
 dimensions in mm

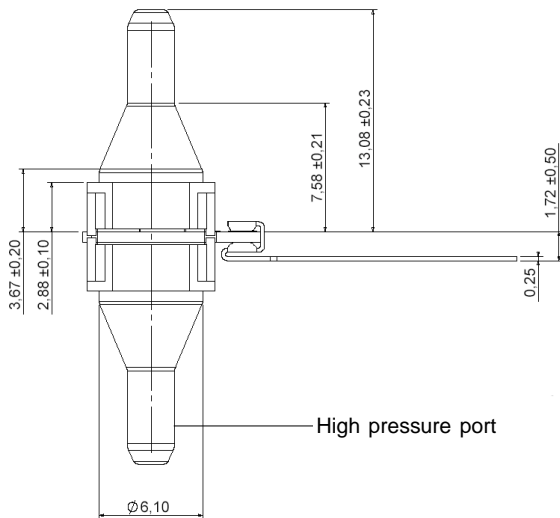
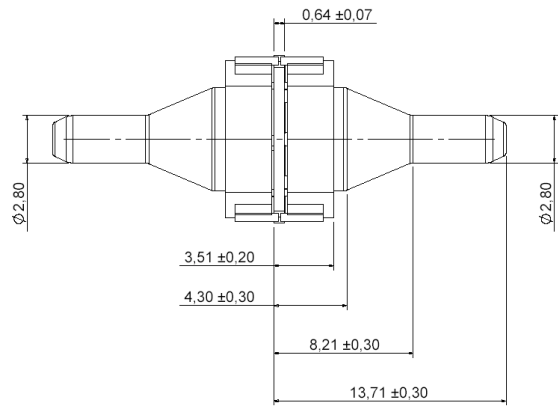
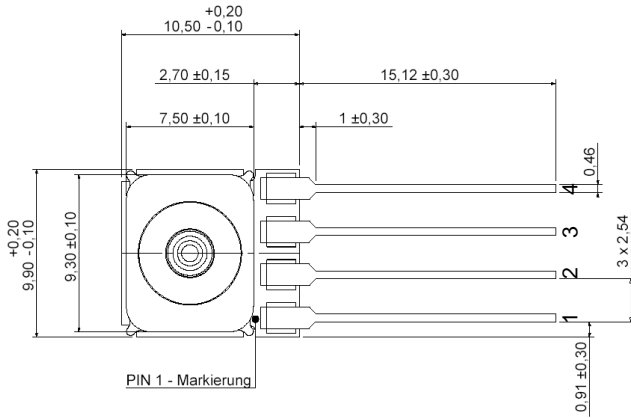


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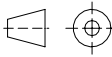
## Amplified pressure sensors

### PHYSICAL DIMENSIONS AND ELECTRICAL CONNECTION (cont.)

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



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

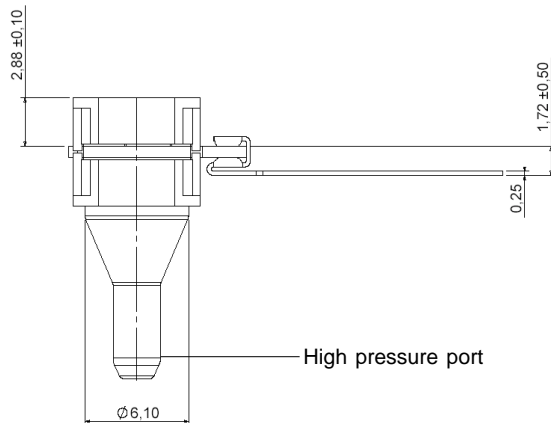
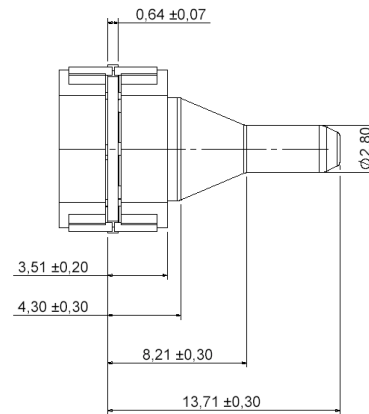
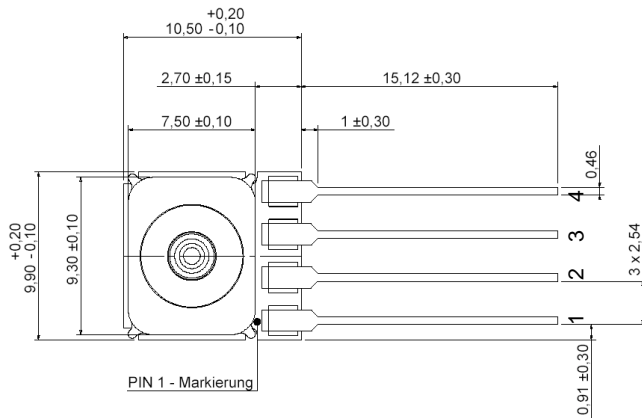
  
 first angle projection  
 dimensions in mm

# HMA Series

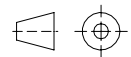
## Amplified pressure sensors

### PHYSICAL DIMENSIONS AND ELECTRICAL CONNECTION (cont.)

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

### NOMENCLATURE

Options	Series		Pressure range		Calibration		Housing		Porting		Grade		Voltage	
	HMA		M100	100 mbar	B	Bidirectional	U	SIL, 2 ports axial opposite side	(1)	no port	H	High	(3)	3 V
			M250	250 mbar	U	Unidirectional			7	Barbed			5	5 V
			B001	1 bar			(W)	DIP, 2 ports axial opposite side	(5)	Needle big				
			B2x5	2.5 bar					(6)	Straight big				
			B005	5 bar			X	SIL, 1 port axial						
			B010	10 bar			Z	DIP, 1 port axial						
			P001	1 psi										
			P100	100 psi										
( ) available on request. Please contact First Sensor.														
<b>Example: HMA M100 U U 7 H 5</b>														

### 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	Production code					
Char	M	A	-	HMA	6	1 psi	U	bar, gage/differential, unidirectional	U	SIL, 2 ports axial opposite side	1	no port	-	High, 5 V
					7	100 mbar			7	Barbed	/	High, 3 V		
					8	250 mbar	B	bar, gage/differential, bidirectional	W	DIP, 2 ports axial opposite side	5	Needle big		
					A	1 bar			6	Straight big				
					B	2.5 bar			X	SIL, 1 port, axial				
					C	5 bar			Z	DIP, 1 port axial				
					L	100 psi								
					M	10 bar								

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