

# Solid State Pressure Sensor

*PRELIMINARY*  
V1.0

## *Model 89B*

### FEATURES

- ✓ Robust SS housing
- ✓ Compact Board Mount
- ✓ Oil-filled SS Isolated
- ✓ Custom Configurable
- ✓ Analog or Digital Output



Sold in North America by:  
Servoflo Corporation  
75 Allen Street  
Lexington, MA 02421  
781-862-9572

[www.servoflo.com/info@servoflo.com](http://www.servoflo.com/info@servoflo.com)

### DESCRIPTION

The Series 89B is a miniature and robust pressure transducer with calibrated and temperature compensated output . It incorporates MEMS sensing chip which is oil-filled and SS isolated. The sensor is configured with excellent media compatibility in its class of board-mount.

Multi-order compensation for correction of offset, sensitivity, thermal errors and nonlinearity are accomplished in factory via an internal DSP running a correction algorithm with calibration coefficients stored in on-chip EEPROM.

A variety of output configuration, including resolution, sampling rate, output interface are available to provide simple and ready-to-use solution for a wide range of application. Multiple chosen for pneumatic interface are suitable for system integration.

Multiple choice for gas or fluid interface are available upon request.

## Specifications – Basic

Parameters	Min	Typ	Max	Unit
Temp - Operating <sup>1</sup>	-20		85	°C
Temp - Compensated <sup>2</sup>	0		50	°C
Temp - Storage	-40		125	°C
Humidity <sup>3</sup>	0		95	%RH
Over-pressure <sup>4,7</sup>	3x			FS
Burst Pressure <sup>4,8</sup>	6x			FS
Long-term Stability <sup>5</sup>			1.0	%FS
Orientation Sensitivity <sup>6</sup>			0.04	%FS/g
ESD – HBM	-4		+4	kV
Vibration	20g, 10Hz to 2Hz			

### NOTES:

- 40 to 85 °C is available upon request.
- Custom temperature compensation is available upon request.
- Gas only, no condensation.
- Range dependent. Refer to individual data sheet.
- Zero stability to be tested with 120 hour hot storage at 85 °C , which is roughly equivalent to accelerated aging of the part for over a year at Room Temperature.
- Measured orientation effect on the zero output of 0.15 psi sensor with a standard deviation of 0.035% Full-Scale/g.
- The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the pressure range at 25°C [77°F]. Includes all errors.
- The maximum deviation from the ideal transfer function over the entire compensated temperature and pressure range. Includes all errors due to offset, span, NOL, hysteresis, non-repeatability, TCO, TCS and thermal hysteresis
- Over-pressure (OP): the maximum pressure that may be applied to the sensor without causing a change in performance with respect to the specifications.
- Burst-pressure (BP): The maximum pressure that may be applied to the sensor without a catastrophic failure.

# Ordering Information

## Series 89B

**89B D L - XXX G - 9 8 00**

**Series**

**Type of Output**

A = Analog Output  
D = Digital Output

**Supply**

Blank = 5.0 V  
L = 3.3 V

**Type of Pressure**

G: Gauge  
I: Negative  
D: Dual polarity

\*Absolute is available only for pressure equal or greater than 1000 mbar/15 psi.

**Configuration**

00: Standard  
xx: Refer to individual data sheet

**Output**

2 = 0.5 to 4.5 V  
5 = 0 to 1 V  
7 = 0 to 5 V  
8 = I2C  
9 = SPI  
S = Special

mbar	
1000	102
2000	202
4000	402
7000	702

Notes:  
Custom ranges and units are available upon request. Please contact factory.

**Port Type**

2 = Barb  
3 = 1/4-28 UNF  
4 = O-ring  
5 = M3.0 female  
9 = Other

Notes:  
Refer to Configuration code for detail specifications



## Specifications – Analog Output

Parameters	Min	Typ	Max	Unit
Supply ( $V_{DD}$ ) – 3.3V <sup>1</sup>	2.75	3.3	3.6	V
Supply ( $V_{DD}$ ) – 5.0V <sup>1</sup>	4.75	5.0	5.25	V
Operating Current <sup>2</sup>		2.2	3.2	mA
Resolution - DAC <sup>3</sup>		13	16	bits
Output (-P) <sup>4</sup>		10%		$V_{DD}$
Output (Zero) <sup>4</sup>		50%		$V_{DD}$
Output (+P) <sup>4</sup>		90%		$V_{DD}$
Accuracy <sup>5</sup>		±1.5		%FS
Overall Error <sup>6</sup>		± 2.5		%FS
Update Rate <sup>7</sup>		1.2		kHz
Start-up Time <sup>8</sup>			2.3	ms

### NOTES:

1. 3.3V or 5.0V supply should be ordered separately. Other supply voltage from 2.75 to 5.5V is available upon request. With external JFET, supply voltage from 5 to 48V can be applied providing a special configuration should be ordered.
2. Continuously running measurement sequence is executed.
3. Higher resolution longer step response settling time. Dithering is available upon request and can be switched on or off.
4.  $V_{DD}$ -ratiometric voltage. For vented gauge pressure, zero is 10%. Absolute voltage output (0/1V, 0/5V) is also available upon request.
5. Combines errors at 25°C after reflow mounting and auto-zero. Pressure range dependent.
6. The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the pressure range and compensated temperature.. Combines errors of NOL, hysteresis, and repeatability. Pressure range dependent.
7. Single measurement duration in 16-bit with SSC on-chip temperature sensor. Resolution dependent.
8.  $V_{DD}$  ramps up to activate Digital data to ADC plus DAC settling time.
9. Recommended operating condition with external resistive load 1k $\Omega$  and capacitive load 10nF as low-pass filtering configuration at analog output for output bandwidth from 1kHz to 5kHz.

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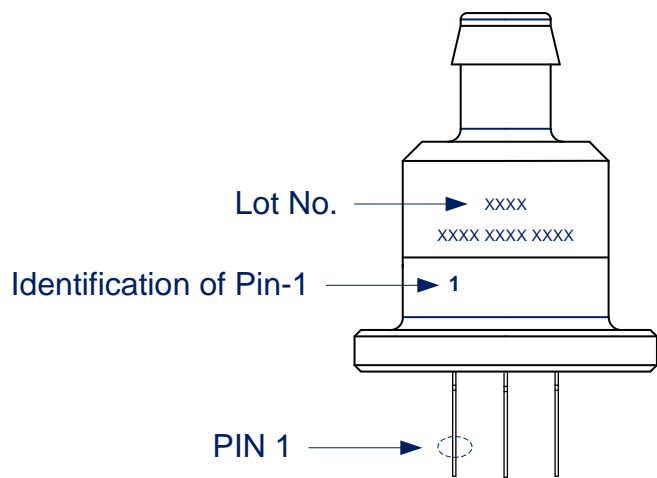
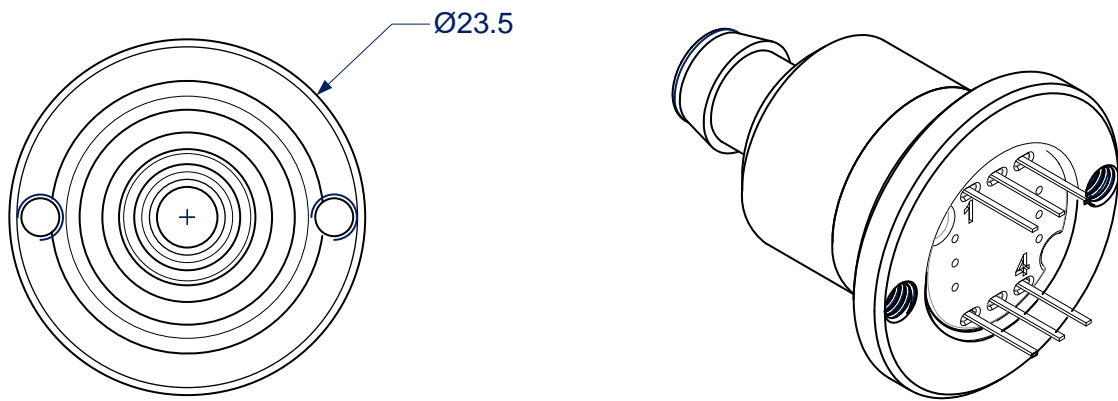
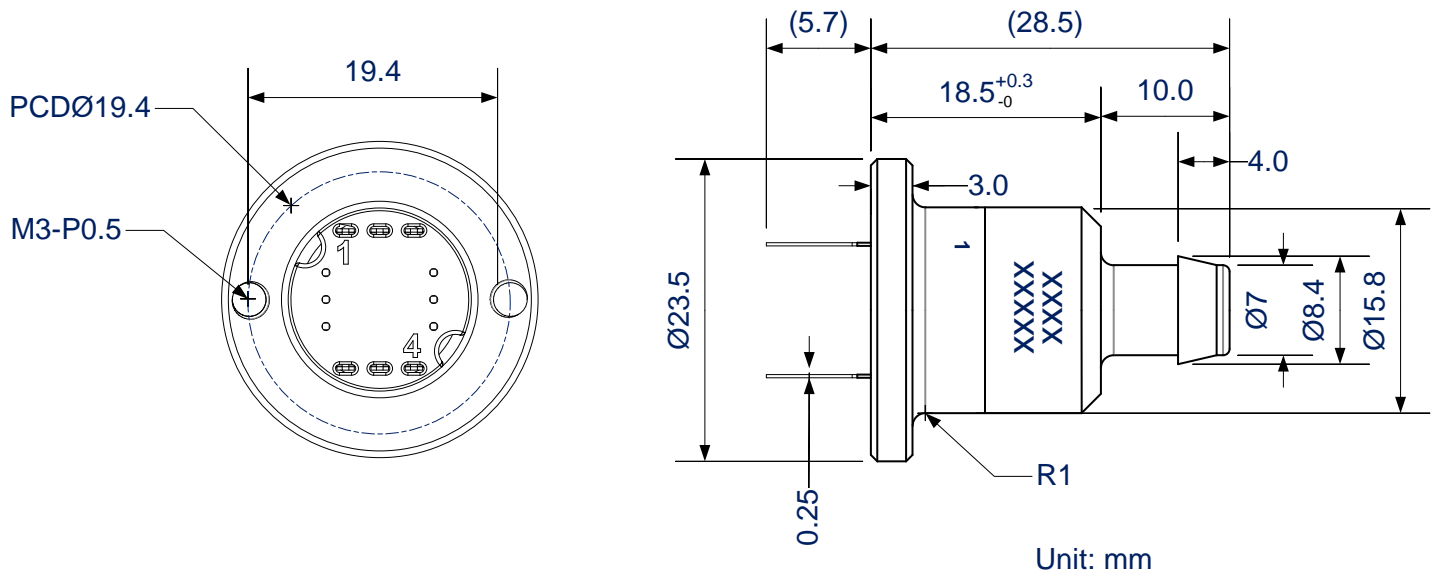
## Specifications – Digital Output

Parameters	Min	Typ	Max	Unit
Supply ( $V_{DD}$ ) – 3.3V <sup>1</sup>	2.75	3.3	3.6	V
Supply ( $V_{DD}$ ) – 5.0V <sup>1</sup>	4.75	5.0	5.25	V
Operating Current <sup>2</sup>		2.2	3.2	mA
Stand-by Current <sup>3</sup>		0.8	1.5	uA
Resolution - ADC	12	16	24	bits
Output (-P) <sup>4</sup>	6553 (dec) / 1999 (hex)			
Output (Zero) <sup>4</sup>	32767 (dec) / 7FFF (hex)			
Output (+P) <sup>4</sup>	58982 (dec) / E666 (hex)			
Accuracy <sup>5</sup>		±1.5		%FS
Overall Error <sup>6</sup>		± 2.5		%FS
Update Rate <sup>7</sup>		1.2		kHz
Start-up Time <sup>8</sup>			2	ms
Wake-up Time <sup>9</sup>		2	10	us
Input High Level <sup>10</sup>	0.7		1.0	$V_{DD}$
Input Low Level <sup>10</sup>	0		0.3	$V_{DD}$
Interface Clock – I <sup>2</sup> C	0.1		3.4	MHz
Interface Clock – SPI	0.05	1	12	MHz

### NOTES:

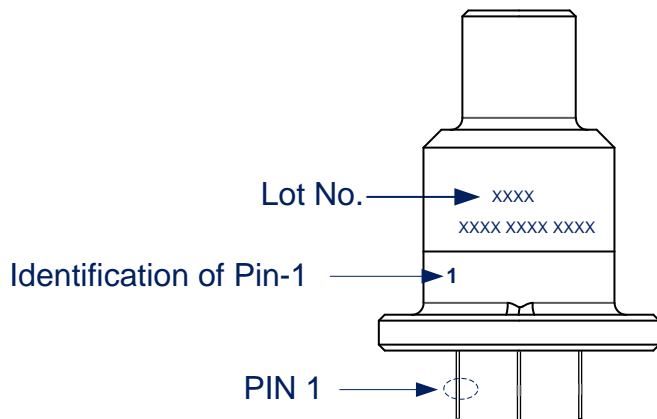
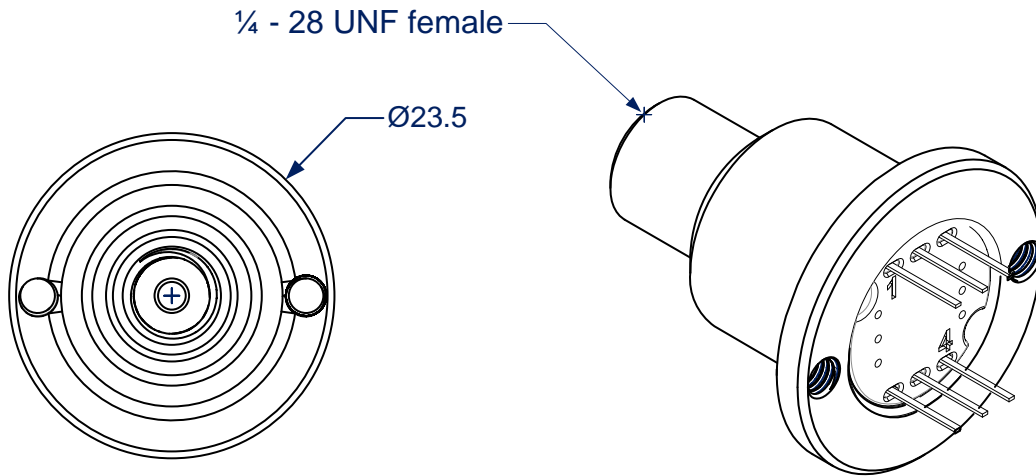
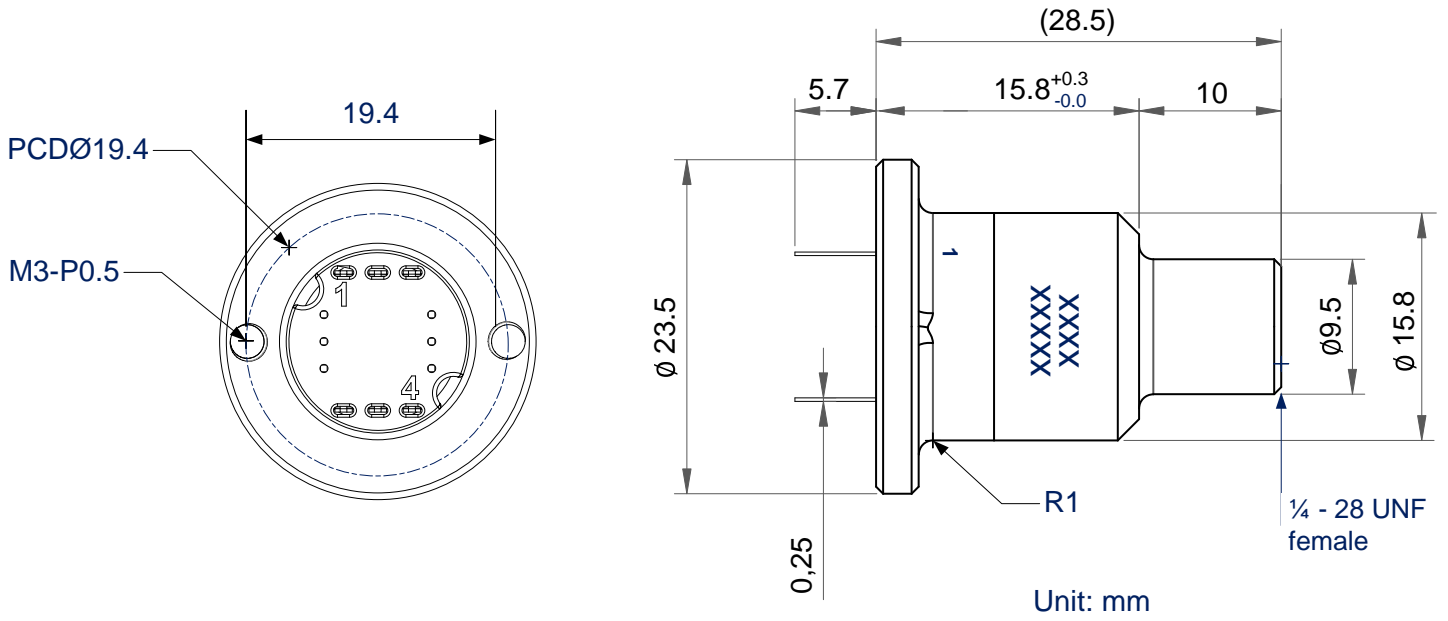
- 3.3V or 5.0V supply should be ordered separately. Other supply voltage from 2.75 to 5.5V is available upon request. With external JFET, supply voltage from 5 to 48V can be applied providing a special configuration should be ordered.
- 5V supply and analog output referenced. Current consumption are varied according to supply, response rate and resolution chosen. Normally sensing element is not always excited. Mean current consumption for one complete measurement cycle would be lower than the rated value.
- Stand-by is for digital output only. Sensor automatically enters into Sleep mode after command execution for minimum current consumption, whereas the interface is still listening and accepts commands.
- Unsigned integer. Resolution dependent and custom is applicable. For vented gauge, zero is 6553 (dec) 1999 (hex).
- Combines errors at 25°C after reflow mounting and auto-zero. Pressure range dependent.
- The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the pressure range and compensated temperature. Combines errors of NOL, hysteresis, and repeatability. Pressure range dependent.
- Single measurement duration in 16-bit with SSC on-chip temperature sensor. Resolution dependent.
- $V_{DD}$  ramps up to activate Interface Communication.
- Command mode or Sleep mode to active state of interface communication
- Referenced to external supply voltage  $V_{DD}$

# Dimension - Barb fitting



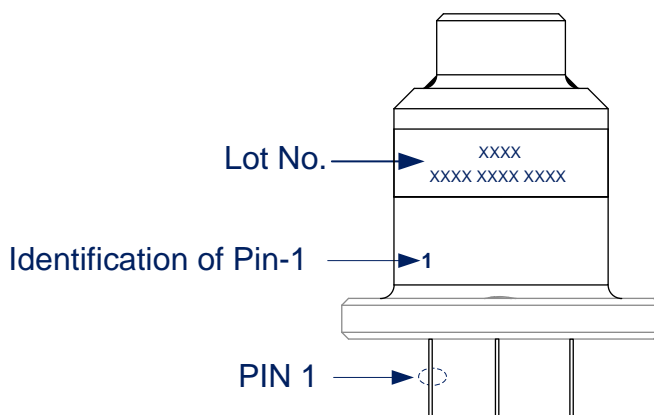
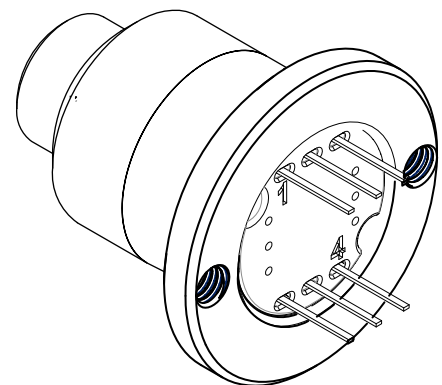
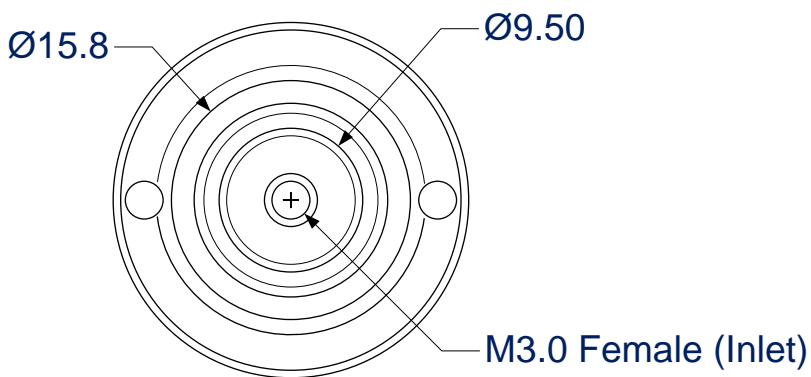
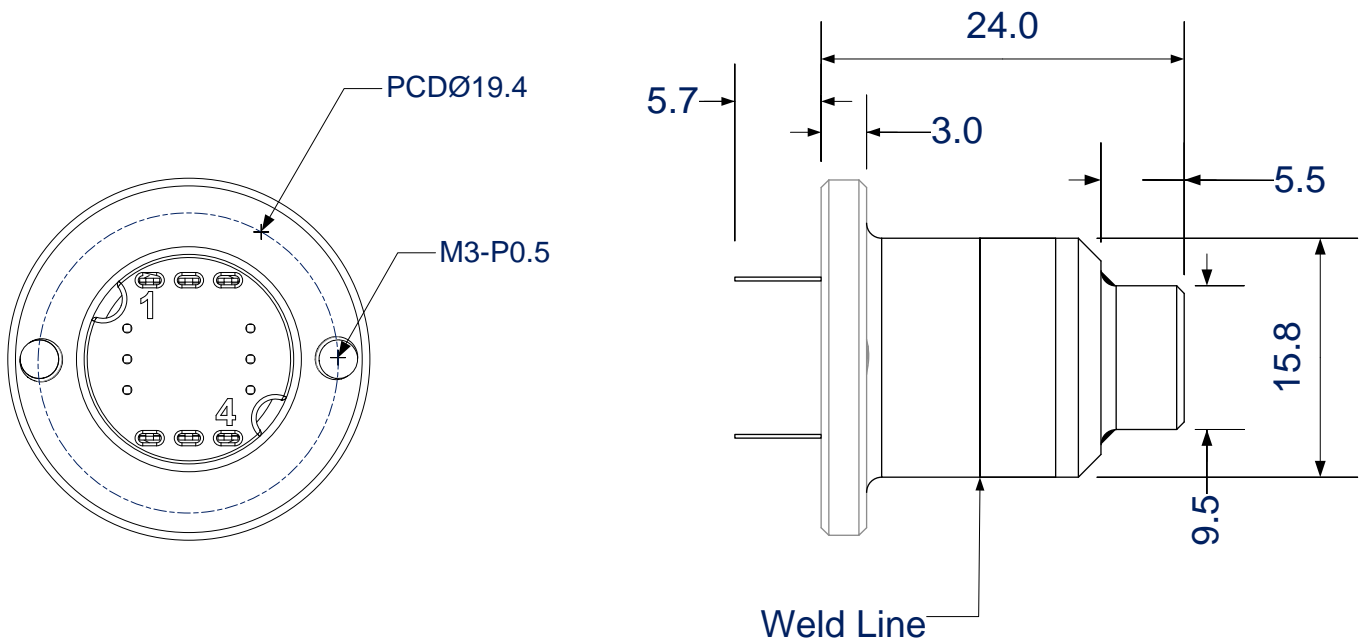
## Marking Information

# Dimension 1/4-28 UNF fitting



## Marking Information

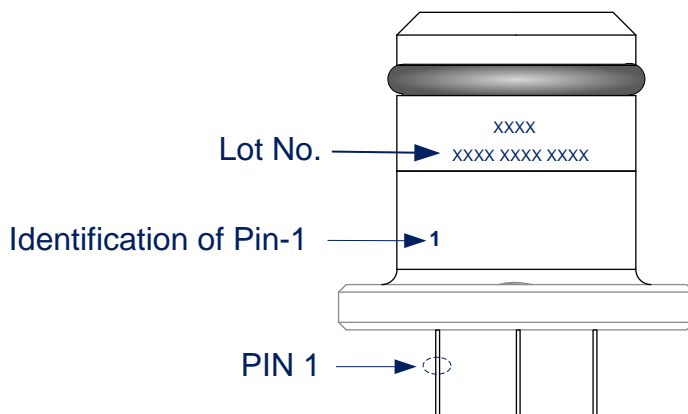
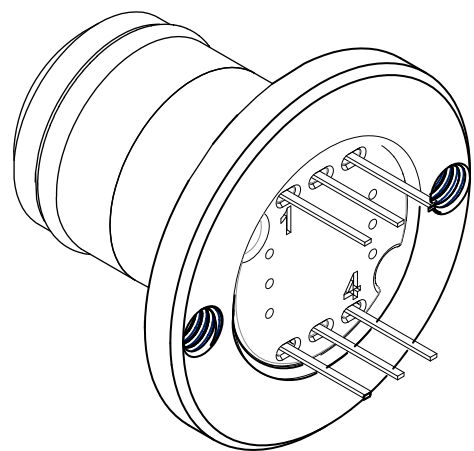
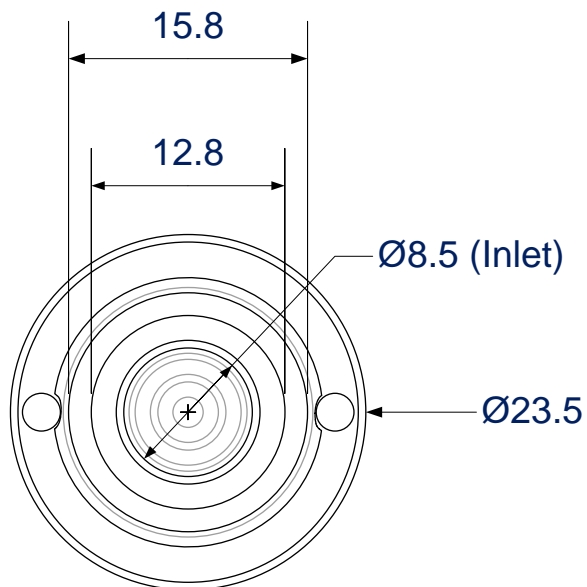
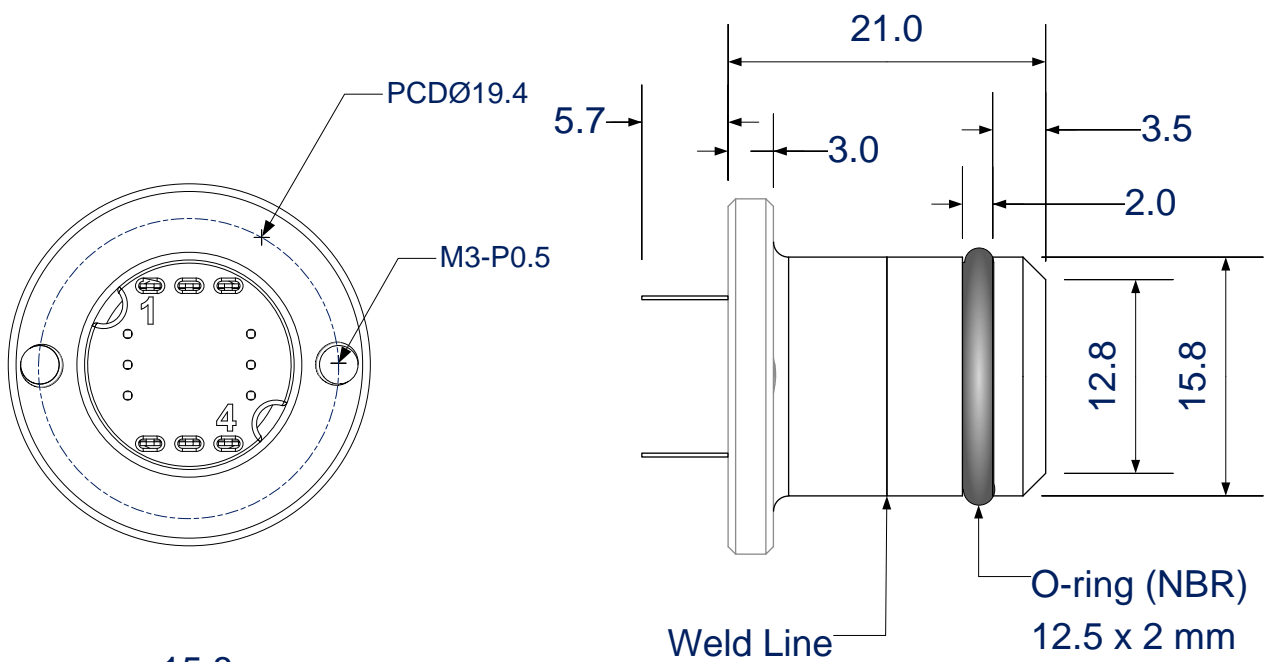
# Dimension - Thread fitting



Marking Information

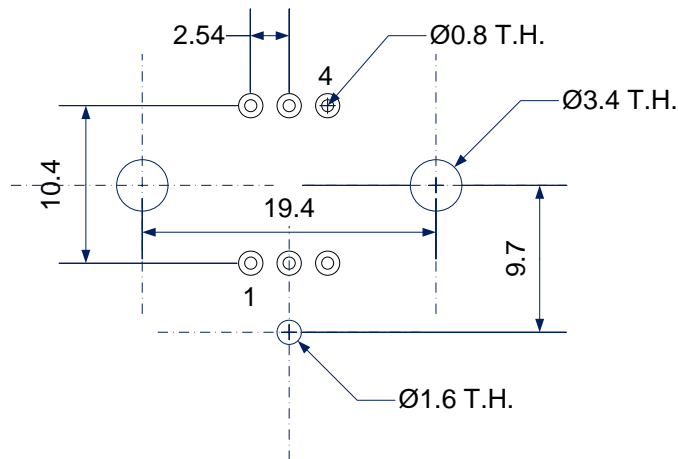


# Dimension – O-ring fitting



## Marking Information

# Foot Print



## Pinout Assignment

Pad	Description
1	V <sub>DD</sub>
2	V <sub>SS</sub>
3	N.C.
4	N.C.
5	SCL
6	SDA

Table 1 - I<sup>2</sup>C

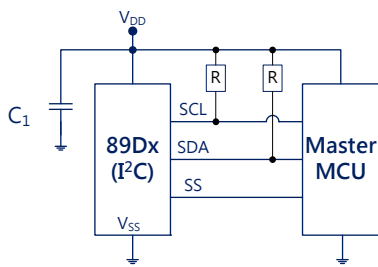
Pad	Description
1	V <sub>DD</sub>
2	V <sub>SS</sub>
3	SS
4	MISO
5	SCLK
6	MOSI

Table 2 - SPI

Pad	Description
1	V <sub>DD</sub>
2	V <sub>SS</sub>
3	SIG
4	N.C.
5	N.C.
6	N.C.

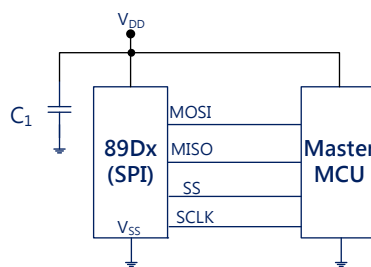
Table 2 - Analog

## Application Circuit

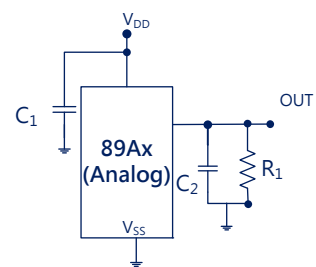


I<sup>2</sup>C

R = 10k  
C<sub>1</sub> = 0.1μ



SPI



Analog

R<sub>1</sub> = 1k  
C<sub>2</sub> = 10nF