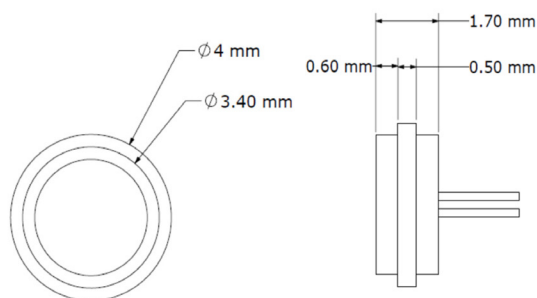


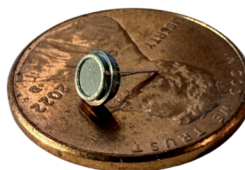
Making medical devices smarter, **long-term.**

TiSense™ Module

The TiSense™ Module is a MEMS piezo-resistive sensor integrated into a titanium chronic implantable module, purposefully designed for medical devices requiring implantation periods > 5 years. It is an absolute half-bridge sensor that measures incident pressure relative to an internal vacuum, with connections exiting through a hermetically sealed feedthrough and requiring two external 3K Ω resistors to complete the bridge.



Left (Front view) and Right (Sideview) of TiSense module.

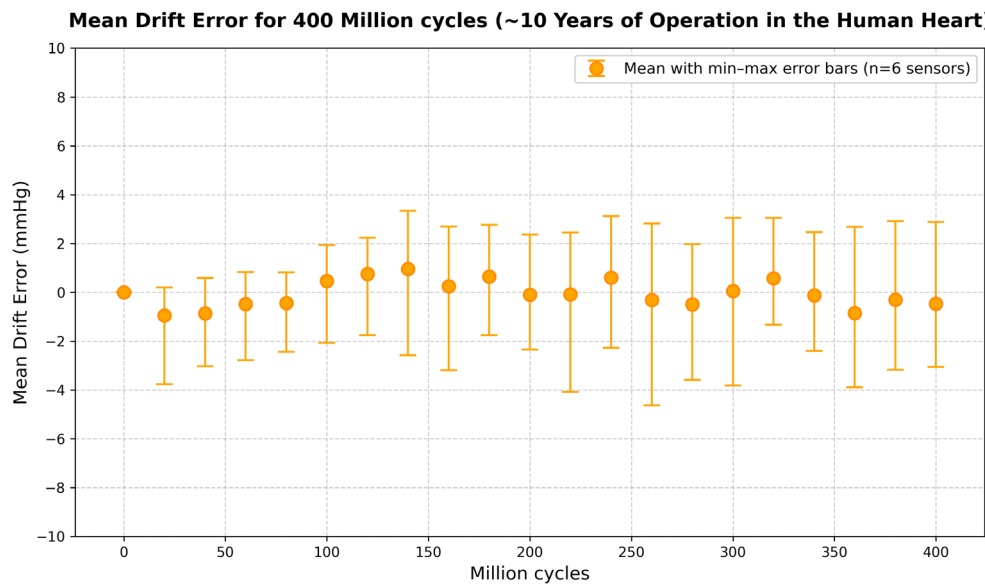


TiSense in comparison to a penny.

Technical Specifications

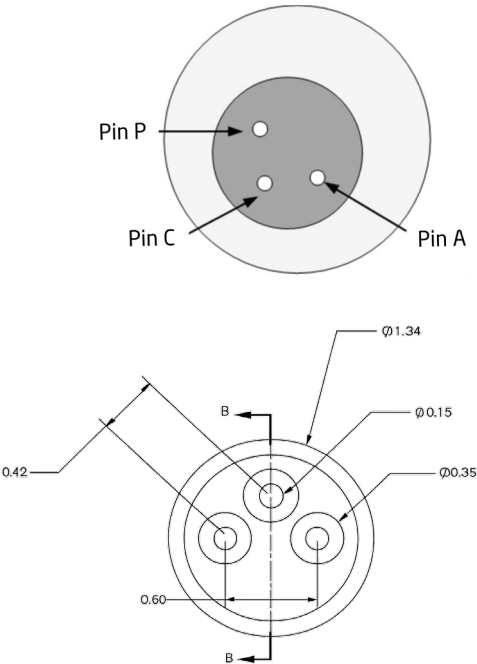
Parameter	Range	Notes
Sensor Operation Specifications		
Operational Pressure Range	510 - 1010 mmHgA	Range is ± 250 mmHg centered around atmospheric pressure (760 mmHg). There can be ± 0.5 mmHg variation in atmospheric pressure at the time of characterization.
Accuracy Error	± 0.5 % of applied pressure	Includes errors from non-linearity over a range of 500 mmHg applied pressure.
Mean Drift Error	± 2 mmHg	Mean drift error for TiSense modules from various batches
Electrical Specifications		
Resistance	2.2 - 4.2 K Ω	Resistance of each sensing element as measured from C-A pin or C-P pin.
Excitation Range	1 - 6 Volts DC	
Sensitivity of Sensor	8 - 14 $\mu V/V/mmHg$	Typically 10 μV signal per volt of excitation per mmHg incident pressure. When completed with equivalent 3K resistors into a full bridge.
Mechanical Specs		
Height of Module	1.57 - 1.83mm	Pin length not included
Diameter of Module		3.87 - 4.13mm
Material		Titanium Grade
Environmental Specifications		
Temperature Coefficient of Offset (TCO)	<10 mmHg/°C	TCO is <10 mmHg/°C for the operating temperature range of 25 - 39 °C
Storage Temperature Range	0 - 60 °C	Storage range until further testing is performed.

Drift Testing



- Sensors performed in saline at 37degrees C, to simulate actual body conditions.
- Sensors were exposed to 400 million sinusoidal pressure cycles with a range of 80-120 mmHg at 50 Hz.
- 400 million pressure cycles (equivalent to >10 years of cardiac cycles at normal sinus rhythm of 72 BPM).
- The mean drift data were corrected for temperature and atmospheric pressure changes.

Connection Diagram



Wires can be soldered to the pins. However, care should be taken to not expose the pins to extended duration of heat from the soldering process. The three pins can be trimmed to desired length.

		Parameter	Value
Pin	Function	Metallic Pin Material	Platinum-Iridium
P	Negative (-) Signal pin	Metallic Pin Diameter	0.127 ± 0.015mm
C	Center pin of half-bridge	Center of Feedthrough to Center of Sensor	0.21 ± 0.03mm
A	Positive (+) Signal pin	Angular Orientation of Feedthrough	± 30 deg.