

- **Low Noise:**  $10 \mu\text{g}/\sqrt{\text{Hz}}$  Typical for  $\pm 2\text{g}$  Full Scale Versions
- **-55 to +125°C Operating Temperature Range**
- **+5V DC Power**
- **Excellent Long Term Stability**
- **$\pm 4\text{V}$  Differential Output or 0.5V to 4.5V Single Ended Output**
- **Responds to both DC and AC Acceleration (0 to 2000+ Hz)**
- **Acceleration and Vibration Sensing**
- **Integrated 3' Cable**
- **Rugged Anodized Aluminum Case**
- **Fully Calibrated and Serialized for Traceability**

**AVAILABLE G-RANGES**

FULL SCALE ACCELERATION	MODEL SUFFIX
$\pm 2 \text{ g}$	-002
$\pm 5 \text{ g}$	-005
$\pm 10 \text{ g}$	-010
$\pm 25 \text{ g}$	-025
$\pm 50 \text{ g}$	-050
$\pm 100 \text{ g}$	-100
$\pm 200 \text{ g}$	-200
$\pm 400 \text{ g}$	-400



The SDI Models 2012 and 2422 Specialty Low Voltage +5V DC MEMS Variable Capacitive Accelerometers from Silicon Designs (SDI) are low-cost, integrated plug-and-play measurement devices for applications with a +5V regulated power supply. They are suitable for zero-to-medium frequency commercial and industrial applications, and particularly where reliable performance, extremely low noise, and long-term stability are absolute requirements.



The 2012 and 2422 are relatively insensitive to temperature changes and gradients between -55 and +125°C. The cable's shield is electrically connected to the case while the ground (GND) wire is isolated from the case. The anodized aluminum case is epoxy sealed and is easily mounted via two screws, an adhesive, or by attaching a magnet.

**ZERO (DC) TO MEDIUM FREQUENCY APPLICATIONS**

**PERFORMANCE BY G RANGE**

INPUT RANGE	SENSITIVITY, DIFFERENTIAL	*FREQUENCY RESPONSE (TYPICAL, 5%)	*FREQUENCY RESPONSE (TYPICAL, 3 DB)	*FREQUENCY RESPONSE (MINIMUM, 3 DB)	OUTPUT NOISE, DIFFERENTIAL (RMS, TYPICAL)	MAX. MECHANICAL SHOCK (0.1 MS)
g	mV/g	Hz	Hz	Hz	$\mu\text{g}/(\text{root Hz})$	g (peak)
$\pm 2$	2000	0 – 250	0 – 525	0 – 300	7	2000
$\pm 5$	800	0 – 400	0 – 800	0 – 420	12	
$\pm 10$	400	0 – 700	0 – 1100	0 – 660	18	
$\pm 25$	160	0 – 1300	0 – 1750	0 – 1050	25	
$\pm 50$	80	0 – 1600	0 – 2100	0 – 1400	50	
$\pm 100$	40	0 – 1700	0 – 3000	0 – 1700	100	5000
$\pm 200$	20	0 – 1900	0 – 3600	0 – 2100	200	
$\pm 400$	10	0 – 2000	0 – 4200	0 – 2400	400	

By Model:  $V_{DD}=V_R=5.0 \text{ VDC}$ ,  $T_C=25^\circ\text{C}$

Single ended sensitivity is half of values shown.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

## PERFORMANCE - ALL VERSIONS

**All Models:** Unless otherwise specified,  $V_s=+5V$  DC,  $T_C=25^\circ C$ , Differential Mode. Span =  $\pm g$  range = 8000 mV.

PARAMETER	MIN	TYP	MAX	UNITS
Bias Calibration Error (%)		0.25	0.6	$\pm$ % of span
Bias Calibration Error (mV)		25	60	$\pm$ mV
Bias Temperature Shift ( $T_C = -55$ to $+125^\circ C$ )	-200	0	+200	(PPM of span)/ $^\circ C$
Scale Factor Calibration Error <sup>1</sup>		0.5	1.25	$\pm$ %
Scale Factor Temperature Shift ( $T_C = -55$ to $+125^\circ C$ )	-200	0	+200	PPM/ $^\circ C$
Non-Linearity (-90 to +90% of span) <sup>1</sup>		0.15	0.5	$\pm$ % of span
Cross Axis Sensitivity		2	3	$\pm$ %
Power Supply Rejection Ratio		25		dB
Output Impedance (2012/2422)		90/1		$\Omega$
Output Common Mode Voltage		2.5		VDC
Operating Voltage	4.75	5.0	5.25	VDC
Operating Current (AOP & AON open, 2012/2422)		8/21	10/30	mA DC
Mass 2012/2422		8/21		grams
Cable Mass (3' integrated cable, 2012/2422)		14/25		grams/meter

Note 1: For 2g thru 50g only; 100g and greater versions are tested and specified from -65 to +65g.

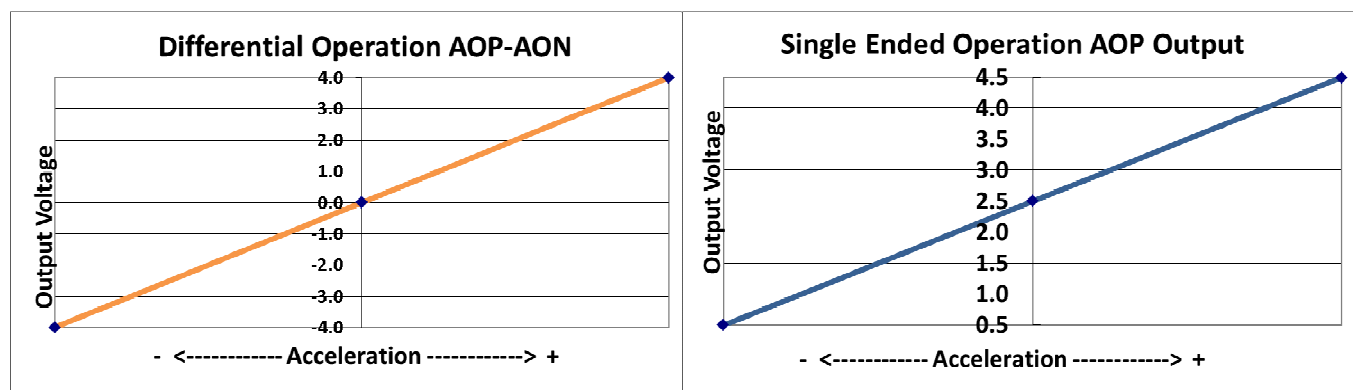
**NOTICE:** Stresses greater than those listed may cause permanent damage to the device. These are maximum stress ratings only. Functional operation of the device at or above these conditions is not implied.

## OPERATION

SDI Models 2012 and 2422 MEMS Specialty Low Voltage 5V DC Variable Capacitive Accelerometers provide optimal performance when they are connected to instrumentation in a differential configuration using both the AOP and AON output signals, but they also support single ended operation for complete flexibility.

These Accelerometers produce differential analog output voltage pairs (AON & AOP) which vary with acceleration. The signal outputs are fully differential about a common mode voltage of approximately 2.5 volts. At zero acceleration, the output differential voltage is nominally 0 volts DC; at  $\pm$ full scale acceleration, the output is  $\pm 4$  volts DC, respectively, as shown in the figure (below).

When a differential connection is not possible, SDI recommends connecting the accelerometer to instrumentation in single ended mode by **connecting AOP and GND** to the instrumentation and **leaving AON disconnected**. Keep in mind that the signal to noise ratio is reduced by half for a single-ended vs. a differential connection.



## SIGNALS & CABLE SPECIFICATIONS

**Model 2012:** The standard 3' integrated cable consists of four 28 AWG (7x36) tin-plated copper wires with Teflon FEP insulation surrounded by a 40 AWG tin plated copper braided shield. The shield jacket is Teflon FEP with a nominal outer diameter of 0.096". The cable's braided shield is electrically connected to the case. The black ground (GND) wire is isolated from the case.

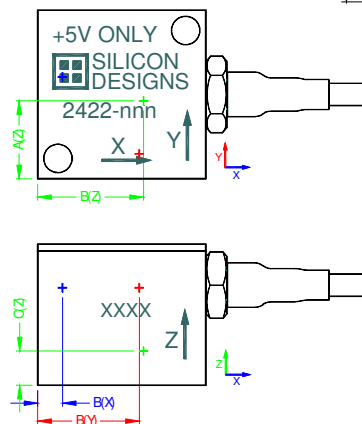
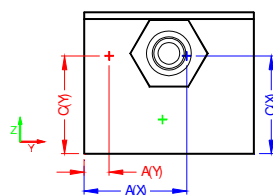
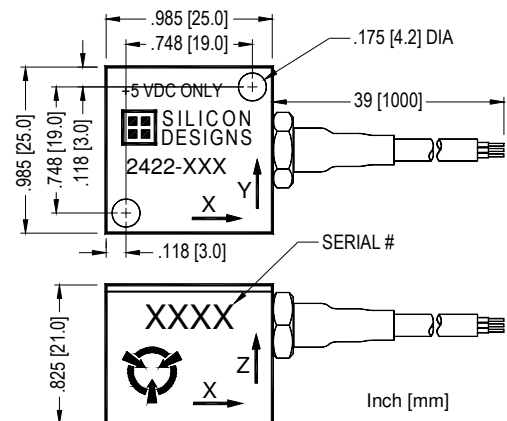
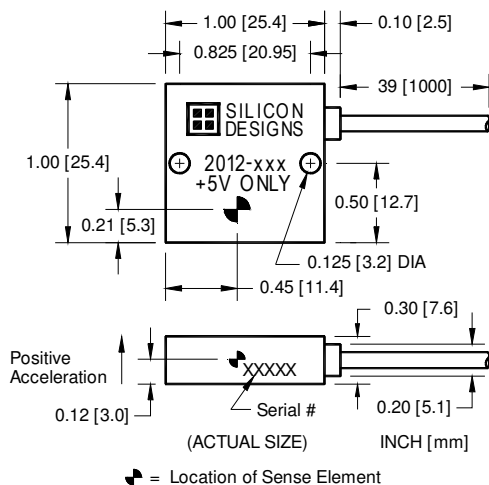
**Model 2422:** The SDI 2422 has an integrated 1-meter (approx. 3 feet) cable with strain relief attached at the connection to the case and consists of seven 28 AWG (7x36) and one 26 AWG (7x34) tin-plated copper wires. The seven smaller 28 AWG wires are covered by 5.5 mils of Teflon FEP insulation. The large single 26 AWG wire is covered by 8.5 mils of black Teflon FEP insulation. The seven smaller gauge wires surround the single larger gauge (black) wire. The cable's braided shield is electrically connected to the case. The black ground (GND) wire is isolated from the case. The wire bundle is surrounded by a braided shield and covered by a 10 mil thick Teflon FEP jacket with a nominal outer diameter of 0.136".

VS: red wire	5V Power		VS: red wire	5V Power	
GND: black wire	Ground		GND: black wire	Ground	
AOP: (Output) green wire	Positive output		AOPX: (Output) green wire	X-Axis positive output	
AON: (Output) white wire	Negative output		AONX: (Output) white wire	X-Axis negative output	
			AOPY: (Output) brown wire	Y-Axis positive output	
			AONY: (Output) orange wire	Y-Axis negative output	
			AOPZ: (Output) blue wire	Z-Axis positive output	
			AONZ: (Output) yellow wire	Z-Axis negative output	

## CABLE LENGTH CONSIDERATIONS

Extending the cable length is possible but not recommended on Models 2012 and 2422 due to the limited voltage.

## PACKAGE DIMENSIONS



	For serial numbers:	
	up to 3000	after 3000
A(X)	0.61	0.58
B(X)	0.16	0.13
C(X)	0.59	0.55
A(Y)	0.16	0.13
B(Y)	0.59	0.60
C(Y)	0.59	0.55
A(Z)	0.54	0.37
B(Z)	0.64	0.60
C(Z)	0.22	0.18

dimensions in inches

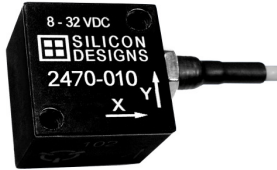
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## ALTERNATIVE MODELS



Silicon Designs provides an all-encompassing Universal Accelerometer Module Family for applications with higher voltage available. SDI's Universal Accelerometer Modules support +8 to +32V DC, and onboard voltage regulation and an internal voltage reference eliminate the need for precision power supplies.

The SDI Models 2210, 2220, 2260, 2266, and 2276 are the Single Axis MEMS Variable Capacitive Accelerometers from Silicon Designs and come in multiple sizes and performance levels. The triaxial models 2460, 2466, 2470, and 2476 represent orthogonal three-axis versions with similar performance.



The SDI Models Models 2220 and 2276 are the high-performance single axis modules. The 2220 and 2276 have an upgraded SDI accelerometer chip inside, reducing the bias and scale factor temperature shift performance. The SDI Models 2210, 2260 and 2266 offer a cost savings for applications that still need SDI's excellent performance but have less demanding environments.

The high performance SDI Models 2470 and 2476 are the three axis versions of the 2220 and 2276 with similarly upgraded SDI accelerometer chips and improved bias and scale factor temperature shift performance. The SDI Models 2460 and 2466 are the triaxial versions of the 2210 and 2260/2266, respectively, rounding out the SDI Universal Module family for lower-cost solutions in less demanding environments.



***Data sheets dated 1-November-2015 and newer apply to 2012's with serial numbers above 3000 and 2422's with serial numbers above 3253. Contact SDI for data sheets pertaining to parts made prior to these.***