LOW COST & HIGH PERFORMANCE TRIAXIAL DC ACCELEROMETER MODULES

- **Low Noise: 10 µg√ Hz Typical for ±2g Full Scale Versions**
- **-55 to +125°C Operating Temperature Range**
- **Acceleration and Vibration Sensing Across Three Orthogonal Axes**
- Excellent Long Term Stability
- Flexible +8 to +32 VDC Power
- ±4V Differential Output or 0.5V to 4.5V Single Ended Output
- Responds to both DC and AC Acceleration (0 to 2000+ Hz)
- Low Impedance Outputs Support up to 2000 Feet of Cable
- Choice of Integrated Cable or Connector
- Simple Eight (8) Wire Connection
- Rugged Anodized Aluminum Case
- Fully Calibrated and Serialized for Traceability

AVAILABLE G-RANGES

FULL SCALE ACCELERATION	MODEL SUFFIX
± 2 g	-002
± 5 g	-005
± 10 g	-010
± 25 g	-025
± 50 g	-050
± 100 g	-100
± 200 g	-200
± 400 g	-400

The SDI Models 2460, 2466, 2470, and 2476 Three-Axis MEMS Variable Capacitive Accelerometers from Silicon Designs are rugged plug-and-play measurement devices for suitable for a wide array of demanding applications. All four models excel in zero-to-medium frequency commercial and industrial applications, particularly where reliable performance, extremely low noise, and long-term stability are absolute requirements.

The 2460 and 2470 include a 3-foot integrated cable and are operationally identical to the 2466 and 2476, which feature connectors for easily customized cable lengths and positions. **The High Performance models 2470 and 2476 include initial calibration certificates, and their upgraded accelerometers greatly reduce bias and scale factor temperature shift.**

LOW COST SDI 2460 & 2466 — HIGH PERFORMANCE SDI 2470 & 2476

Each SDI triaxial accelerometer features three orthogonally mounted low noise accelerometers within a single, rugged, epoxy sealed, anodized aluminum case. Onboard voltage regulation and an internal voltage reference eliminate the need for precision power supplies. They are relatively insensitive to temperature changes and gradients. Individual axis directions are marked on the case with positive acceleration defined as acceleration in the direction of the axis arrow. The case is easily mounted via two screws, adhesive, or by attaching a magnet.

ZERO (DC) TO MEDIUM FREQUENCY APPLICATIONS

PERFORMANCE BY G RANGE

INPUT RANGE	FREQUENCY RESPONSE (MINIMUM, 3 DB)	SENSITIVITY, DIFFERENTIAL	OUTPUT NOISE, DIFFERENTIAL (RMS, TYPICAL)	MAX. MECHANICAL SHOCK (0.1 MS)
g	Hz	mV/g	µg/(root Hz)	g (peak)
±2	0 – 300	2000	10	2000
±5	0 – 400	800	15	
±10	0 – 600	400	23	5000
±25	0 – 900	160	38	
±50	0 – 1200	80	60	
±100	0 – 1400	40	121	
±200	0 – 1750	20	243	
±400	0 – 2000	10	475	

V_{DD}=V_R=5.0 VDC, T_C=25 °C *Single ended sensitivity is half of values shown.*

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

PERFORMANCE - ALL VERSIONS

All Models: Unless otherwise specified, Vs=+8 to +32 VDC, TC=25°C, Differential Mode. Span = ±g range = 8000 mV.

PARAMETER	MIN	TYP	MAX	UNITS
Bias Calibration Error		0.25	0.9	± % of span
Scale Factor Calibration Error [1]		0.5	1.25	± %
Non-Linearity (-90 to +90% of span) [1]		0.15	0.5	± % of span
Cross Axis Sensitivity		2	3	± %
Power Supply Rejection Ratio	50	>65		dB
Output Impedance		1		Ω
Output Common Mode Voltage		2.5		VDC
Operating Voltage	8		32	VDC
Operating Current (AOP & AON open)	19	23	27	mA DC
Mass (not including cable)		21		grams
Cable Mass (3' integrated cable, 2460 & 2470)		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.*

MODELS	PARAMETER (T_C= -55 to +125°C)	MIN	TYP	MAX	UNITS
Low Cost 2460 / 2466	Bias Temperature Shift (Coefficient)	-200	0	+200	(PPM of span)/°C
	Scale Factor Temperature Shift (Coefficient)	-200	0	+200	PPM/°C
High Performance 2470 / 2476	Bias Temperature Shift (Coefficient)	-100	0	+100	(PPM of span)/°C
	Scale Factor Temperature Shift (Coefficient)	-150	0	+50	PPM/°C

BIAS & SCALE FACTOR TEMPERATURE SHIFT EXPLAINED

Bias	The accelerometer output with no acceleration present. For SDI's differential output analog accelerometers it is a signed quantity that is expressed in terms of either g or output volts and is ideally equal to zero g or zero volts.
Bias Temperature Shift (Coefficient)	The amount of bias to expect with change in temperature expressed as PPM of span per °C. For example, the percent of span bias shift that would occur for a 25g full scale device with a +/-200 PPM of span per °C rating and a 55 °C rise from room temperature would be: +/-200 / 1,000,000 x (80C - 25C) x 100% of span = +/-1.1% of span. The g shift would be +/-1.1% of 50g = 0.55 g. This error in terms of output voltage for a 25 g analog accelerometer would be +/-1.1% of span = +/-1.1% of 8 V = 88 mV.
Scale Factor	The ratio of the change in output to a unit change in the input acceleration expressed in millivolts per g (mV/g). Since the output of most accelerometers is slightly non-linear, the scale factor value is defined as the slope of the least-squares-fit line to the acceleration input vs output curve. SDI measures -90% to +90% of full scale or from -65g to +65g, whichever range is smaller.
Scale Factor Temperature Shift (Coefficient)	The amount of scale factor to expect with change in temperature expressed as PPM per °C. For example, the percent shift in scale factor that would occur for a device with a +200 PPM per °C rating and a 60 °C rise from room temperature would be: +200 / 1,000,000 x (85C - 25C) x 100% = +1.2%. For an analog 10g device, the scale factor would rise from its nominal (8 V)/(20 g) = 400 mV/g at +25C to 400 mV/g +1.2% = 404.8 mV/g.

Every accelerometer has a bias and scale factor temperature coefficient, meaning the output shifts slightly due to temperature changes. Many applications operate within a relatively small temperature band or at room temperature, and therefore rarely encounter interference from the bias or scale factor temperature shifts. These customers are ideal candidates for SDI's Low Cost accelerometer modules.

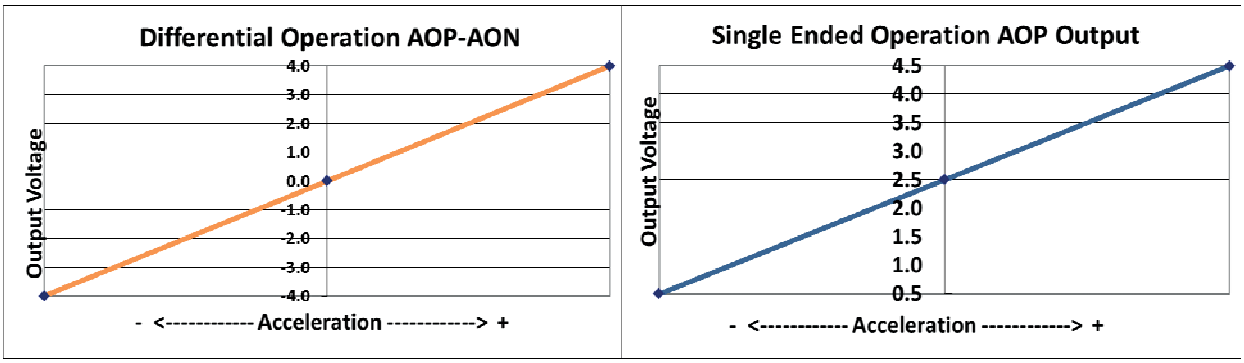
For applications experiencing larger temperature variations (i.e. exposure to engine temperatures or arctic testing) SDI suggests the upgraded High Performance accelerometer modules. These have enhanced, temperature compensated, proprietary SDI accelerometer chips, which are individually tested, calibrated and verified in a climate chamber to provide the most accuracy and come with an initial calibration certificate.

OPERATION

SDI's Universal Triaxial MEMS 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 still support single ended operation for complete flexibility.

These Accelerometers produce three 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 ±full scale acceleration, the output is ±4 volts DC, respectively, as shown in the figure (below). The output scale factor is independent from the supply voltage of +8 to +32 volts.

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

2460/2470: The SDI 2460 and SDI 2470 have an integrated 3' 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".

2466/2476: The SDI 2466 and SDI 2476 have a 9-pin connector; the cable consists of eight 26 AWG tin-plated copper wires and only eight pins are used for the 8-wire cable. All eight of the 26 AWG wires are covered by 8.5 mils of Teflon insulation.

Both cable styles end in an 8-wire pigtail (shown below).

WIRE	SIGNAL
VS: red wire	Power
GND: black wire	Ground
AOPX: (Output) green wire	X-Axis positive 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

2466 & 2476 STANDARD CABLE LENGTHS

The 8PIN-CAB is available in five standard lengths, and custom lengths may be available for special order.

NAME	LENGTH - FEET	LENGTH - METERS (APPROXIMATE)
8PIN-CAB-04	4 Feet	1.2 Meters
8PIN-CAB-10	10 Feet	3 Meters
8PIN-CAB-20	20 Feet	6 Meters
8PIN-CAB-33	33 Feet	10 Meters
8PIN-CAB-50	50 Feet	15.4 Meters

CABLE LENGTH CONSIDERATIONS

Cable lengths of up to 15 meters (50 feet) can be used without the need to test for output instability. For cable lengths exceeding 15 meters, Silicon Designs recommends checking each individual installation for oscillation by tapping the accelerometer and watching the differential output for oscillation in the 20 kHz to 50 kHz region. If no oscillation is present, extended cable length should behave as expected. From the standpoint of output current drive and slew rate limitations, all SDI Universal Accelerometers are capable of driving over 600 meters (2000 feet) of cable. However, at some length ranging between 15 and 600 meters, each device will likely begin to exhibit oscillation.

ALTERNATIVE MODELS

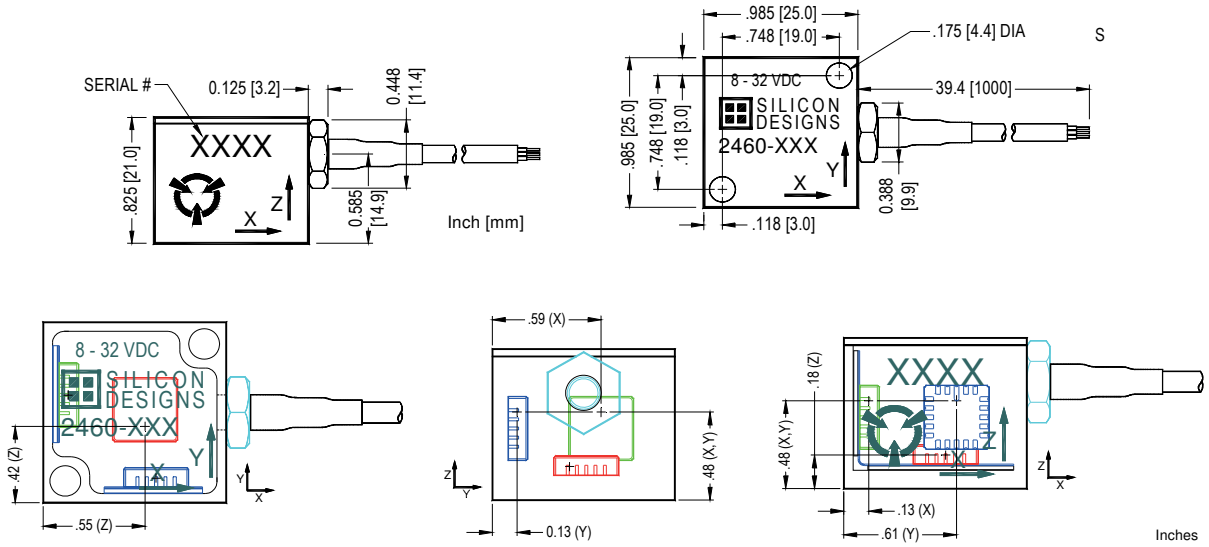
The Silicon Designs Models 2210, 2220, 2260, 2266, and 2276 are SDI's Single Axis MEMS Variable Capacitive Accelerometers and come in multiple sizes and performance levels to complement the triaxial configurations.

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.

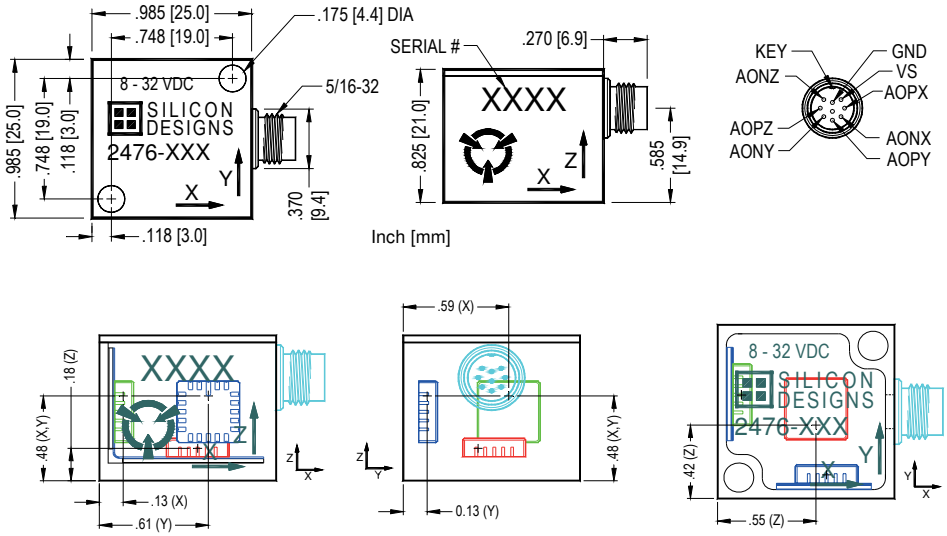
The high performance SDI Models 2220 and 2276 are the single axis versions of the 2470 and 2476 with similarly upgraded SDI accelerometer chips, improved bias and scale factor temperature shift performance, and include an initial calibration certificate.

The 2210 and 2220 come in a traditional 1-inch square package with an integrated cable. They are operationally identical to the 2260, 2266, and 2276, the small footprint devices for tight spaces.

2460 & 2470 DIMENSIONS



2466 & 2476 DIMENSIONS



Data sheets dated 1-November-2015 and newer apply to 2460/2466/2470/2476 serial numbers above 2000. Contact SDI for data sheets pertaining to prior parts with serial number below 2000.