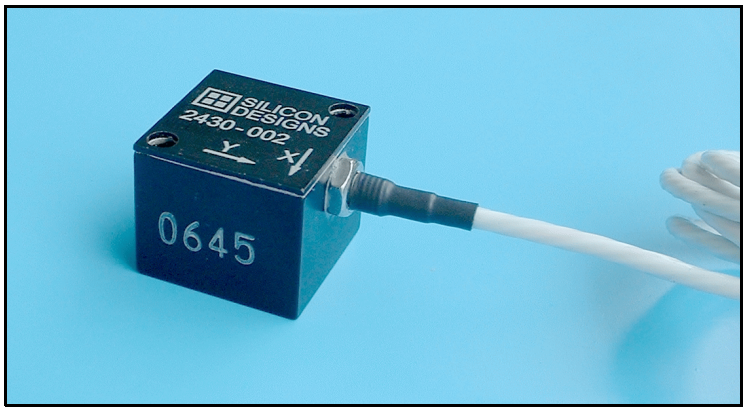
SILICON DESIGNS, INC

Model 2430

TRIAXIAL ANALOG ACCELEROMETER MODULE

- **3 Axis Acceleration Sensing**
- **Capacitive Micromachined**
- **Nitrogen Damped**
- **±5V Single Ended Outputs**
- **Fully Calibrated**
- **Low Power Consumption**
- **-40 to +85°C Operation**
- **±11 to ±16 VDC Power**
- **6 Wire Connection**
- **Serialized for Traceability**
- **Responds to DC & AC Acceleration**
- **Outputs Referenced to External Ground**
- **Non Standard g Ranges Available**
- **Rugged Black Anodized Aluminum Module**



ORDERING INFORMATION

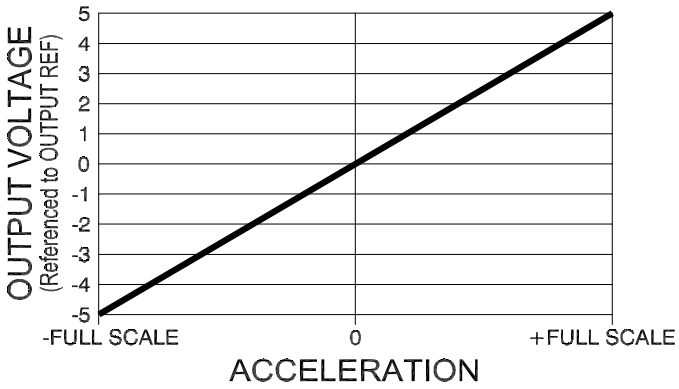
Full Scale Acceleration	Model Number
± 2 g	2430-002
± 5 g	2430-005
± 10 g	2430-010
± 25 g	2430-025
± 50 g	2430-050
± 100 g	2430-100
± 200 g	2430-200

DESCRIPTION

The Model 2430 triaxial accelerometer combines three orthogonally mounted Model 1210 accelerometers in a rugged case for measuring accelerations in commercial and industrial environments. It is tailored for zero to medium frequency instrumentation applications. The anodized aluminum case is epoxy sealed and is easily mounted via two #8 (or M4) screws. The design includes an instrumentation amplifier on each axis providing high drive capability and low output impedance. On-board voltage regulation and an internal voltage reference eliminate the need for precision power supplies. No power supply current flows through the **OUTPUT REF** wire; this high impedance input is used only as a reference for the acceleration outputs which reduces cross talk among the three channels by rejecting noise from voltage differences between the user's data acquisition equipment and power supply grounds. The 2430 is relatively insensitive to temperature changes and gradients. An optional initial calibration sheet (2430-CAL) and periodic calibration checking are also available.

OPERATION

The Model 2430 produces three analog voltage outputs which vary with acceleration. The **Z** axis is perpendicular to the bottom of the package, with positive acceleration defined as a force pushing on the bottom of the package. The **X** and **Y** axis directions are marked on the cover with positive acceleration defined as acceleration in the direction of the axis arrow. The outputs are single ended and vary with respect to the voltage at the **OUTPUT REF** input which should be approximately centered between the $+V_S$ and $-V_S$ supply voltages. The output scale factor is independent of the supply voltages from ±12 to ±16 volts. At zero acceleration, the output voltage is nominally zero volts; at ±full scale acceleration the output voltage is ±5 volts respectively.



APPLICATIONS

VIBRATION MONITORING	CRASH TESTING	MACHINE CONTROL	MODAL ANALYSIS
VIBRATION ANALYSIS	ROBOTICS	INSTRUMENTATION	ROTATING MACHINERY MONITOR

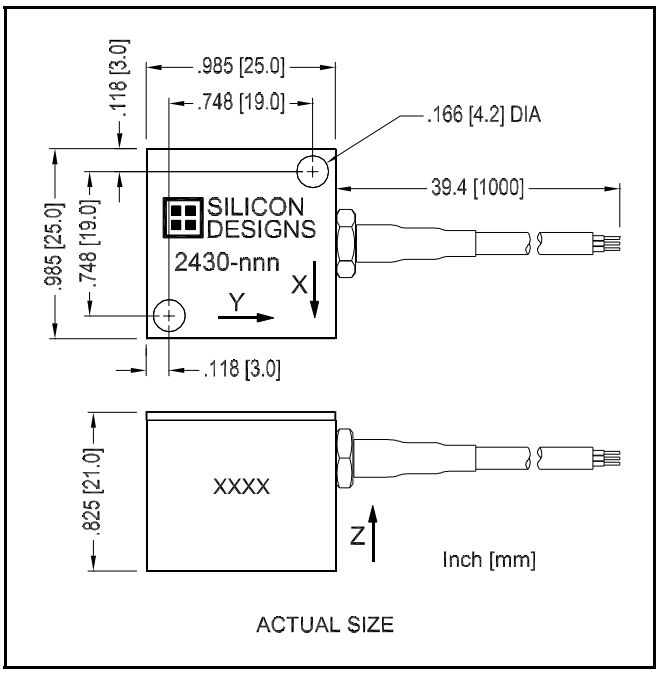
SIGNAL DESCRIPTIONS

+Vs (Power): Reddish brown wire. Apply +11 to +16 Volts DC with respect to **OUTPUT REF**.

-Vs (Power): Black wire. Apply -11 to -16 Volts DC with respect to **OUTPUT REF**.

OUTPUT REF (Input): White wire. The **X**, **Y** & **Z** outputs are referenced to this potential. This input is usually tied to a potential halfway between the **+Vs** and **-Vs** voltages. This input may also be used to offset the output but the voltage difference between this input and either supply voltage (**+Vs** or **-Vs**) must be greater than or equal to 7V.

X, **Y** & **Z** (Outputs): Green, Light Brown & Light Blue wires respectively. These output voltages are proportional to acceleration; they increase with positive acceleration and decrease with negative acceleration. At zero acceleration the output is nominally equal to zero volts with respect to **OUTPUT REF**.



PERFORMANCE - By Model: V_S=±12 to ±16VDC, T_C=25°C.								
MODEL NUMBER	**2430-002**	**2430-005**	**2430-010**	**2430-025**	**2430-050**	**2430-100**	**2430-200**	**UNITS**
Input Range	±2	±5	±10	±25	±50	±100	±200	g
Frequency Response (Nominal, 3 dB)	0 - 300	0 - 400	0 - 600	0 - 1000	0 - 1500	0 - 2000	0 - 2500	Hz
Sensitivity	2500	1000	500	200	100	50	25	mV/g
Output Noise (RMS, typical)	15	38	76	190	380	760	1520	µg/(root Hz)
Max. Mechanical Shock (0.1 ms)	2000							g

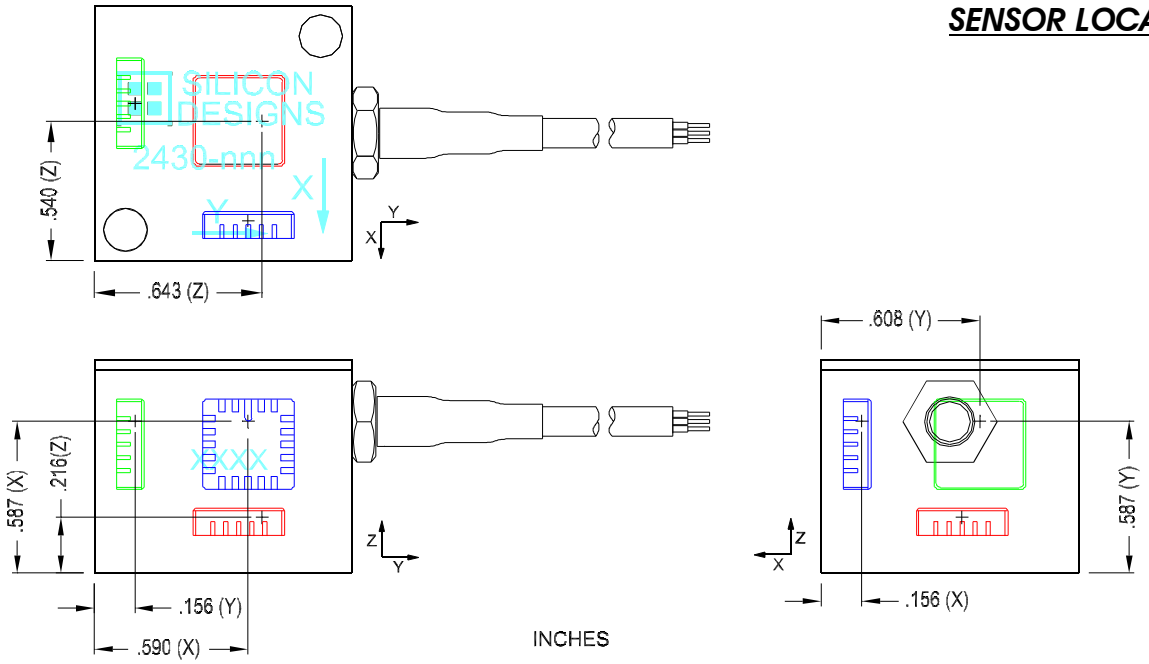
PERFORMANCE - All Models: Unless otherwise specified V_S=±12 to ±16VDC, T_C=25°C.					
PARAMETER		**MIN**	**TYP**	**MAX**	**UNITS**
Cross Axis Sensitivity			2	3	%
Bias Calibration Error	-002		2	4	% of span
	-005 thru -200			3	
Bias Temperature Shift (T_C= -40 to +85°C)	-002 & -005		100	300	(ppm of span)/°C
	-010 thru -200		50	200	
Scale Factor Calibration Error [1]			2	3	%
Scale Factor Temperature Shift (T_C= -40 to +85°C)			+300		ppm/°C
Non-Linearity (-90 to +90% of Full Scale) [1]	-002 thru -100		0.5	1.0	% of span
	-200		0.7	1.5	
Power Supply Rejection Ratio		50	>65		dB
Output Impedance			1		Ohm
Operating Voltage (V_S)		±11 [2]		±16	V
Operating Current (X, Y & Z outputs open) [3]			30	40	mA
Mass (not including cable)			30		grams
Cable Mass			15		grams/meter

Notes: 1. 100g versions and above are tested from -65g to +65g.
2. Operation with V_S below ±12V may result in some performance degradation.
3. Power source must be capable of providing 3 times the operating current at turn-on.

CABLE SPECIFICATIONS & LENGTH CONSIDERATIONS

The cable consists of six 28 AWG (7x36) tin plated copper wires with FEP insulation. The cable jacket is an FEP tape wrap with a nominal outer diameter of 0.125". Cable lengths of up to 15 meters (50 feet) can be added to the model 2430's standard 1 meter cable without the need to test for output instability. For lengths longer than 15 meters we recommend you check each individual installation for oscillation by tapping the accelerometer and watching the differential output for oscillation in the 20kHz to 50kHz region. If no oscillation is present then the cable length being used is OK. From the standpoint of output current drive and slew rate limitations, the model 2430 is capable of driving over 600 meters (2000 feet) of its cable type but at some length between 15 and 600 meters, each device will likely begin to exhibit oscillation.

SENSOR LOCATIONS



SINGLE SUPPLY OPERATION

The model 2430 can be powered using a single +20 to +32V supply but two additional resistors are needed and you must make the following connections. Connect the **$-V_S$** wire to your power supply's ground. Connect the **$+V_S$** wire to the positive output of your power supply **V_P**. Connect one resistor (**R_{UPPER}**) between your supply voltage and the **OUTPUT REF** wire. Connect another resistor (**R_{LOWER}**) between ground and the **OUTPUT REF** wire. The two resistors form a resistive divider which creates a +5V source for **OUTPUT REF**. This +5V reference needs to have a source impedance of about 1000Ω so use the following equations to calculate values for the resistors depending upon your supply voltage **V_P**.

$$R_{LOWER} = \frac{1000 \cdot V_P}{V_P - 5} \qquad R_{UPPER} = R_{LOWER}\left(\frac{V_P - 5}{5}\right)$$

For this mode of operation, the voltage swing of the three outputs is limited to 8V (+1 to +9V) so the g-range over which each model will operate is reduced according to the table below.

MODEL NUMBER	2430x-002	2430x-005	2430x-010	2430x-025	2430x-050	2430x-100	2430x-200	UNITS
Input Range (single supply mode)	± 1.6	± 4	± 8	± 20	± 40	± 80	± 160	g
Sensitivity	2500	1000	500	200	100	50	25	mV/g
Output Range (single supply mode)	8V (+1 to +9V)							Volts

A custom version of the model 2430 that can operate with a single supply as low as 12V can be special ordered but a custom order charge may apply for quantities less than 10.