Brendel Associates Limited

Motion Sensor Products

- Low g Accelerometer Solutions
- PCB Accelerometer Solutions
- Accelerometer Solution Data Sheets
- Inclineometer & Tilt Sensor Solutions
- Rate Gyro Solution Data Sheets
- Integrated Accelerometer & Rate Gyro Inertial Solutions

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Low g Accelerometer Solutions

- **FEATURES**
- **1, 2 & 3 Axis Integrated Measurement Solutions**
- **Dynamic Ranges from ±1g to ±100g**
- **A.C. or D.C. Internal Signal Coupling**
- **Frequency Response to 10,000 Hz**
- **+5 V Single Supply Operation**
- **Temperature Spans: -40°C to +85°C**
- **>2000g Unpowered Shock Survival**
- **<10 Grams per Axis Weight**
- **Custom Spans, Bandwidths, Calibrations, Terminations and Packages**

Description:

The SAA, DAA, and TAA Series of Low g Accelerometer Solutions offer the motion analysis professional a new set of sensor based tools to measure, characterize and control the dynamics of physical displacement. From classical vibration and motion sensing to active damping and modal analysis, the accelerometer solutions open new windows of measurement opportunities for cost sensitive applications.

The entry level product series provides a complete low g acceleration measurement solution in an integrated package. A 5 volt power supply is all that is required to measure accelerations from ±1g to ±100g. Each assembly is calibrated to provide ±2 volts of signal span per specified scale range with signal biasing at +2.5 volt for 0g output conditions. Standard full scale calibration tolerance is ±5% with ±1% optional. The device internal signal can be D.C. or A.C. coupled with selectable bandwidths. An axis signal with D.C. response can provide orientation in conjunction with acceleration.

The fundamental acceleration measuring technology utilizes a structure micro-machined in silicon. A change in the capacitive property of the structure as a function of the rate of change of velocity (acceleration) is converted to an electrical signal which is amplified, filtered, and voltage compensated, resulting in a highly accurate and linear measurement device. The device is robust enough to be used in harsh industrial and automotive environments and will survive shocks of more than 2000 g unpowered and 500 g powered. The temperature is specified for the industrial range of -40°C to +85°C.

The entry level low g accelerometer solutions are available in multiple packaging configurations. A 1.0" cube of 6/6 Nylon composite is standard for 1, 2 or 3 axis designs. Various metallic enclosures and bare printed circuit board packaging solutions are also available.

APPLICATIONS

- **Position & Motion Sensing**
- **Tilt Sensing**
- **Vibration Analysis**
- **Active Damping**
- **Robotic & Tactile Sensing**
- **Shipping & Transportation Analysis**
- **Crash Sensor**
- **Active Suspension**
- **Micropositioners**
- **Jerk Compensation**
- **Medical Analysis**
- **Active Sound Wave Correction**
- **Shock Recording**
- **Seismic Measurements**
- **Modal Analysis**

Custom Solutions:

For unique applications not directly supported by the standard accelerometer solutions, we can modify existing products or design new solutions to meet or exceed our customers' special needs.

- **Custom Packaging**
- **Digital Output**
- **Analog & Digital Signal Processing**
- **Special Calibration**
- **Automated Sorting**
- **Application Design & Analysis**
- **Sub-Assembly Integration**

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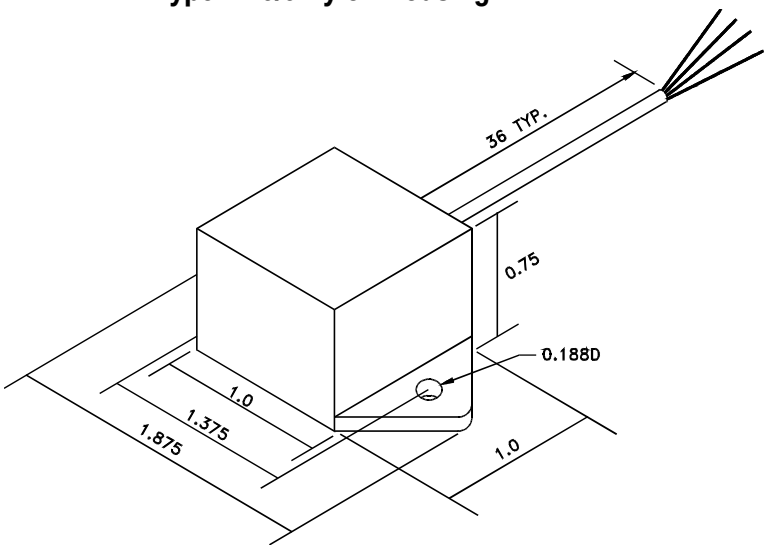
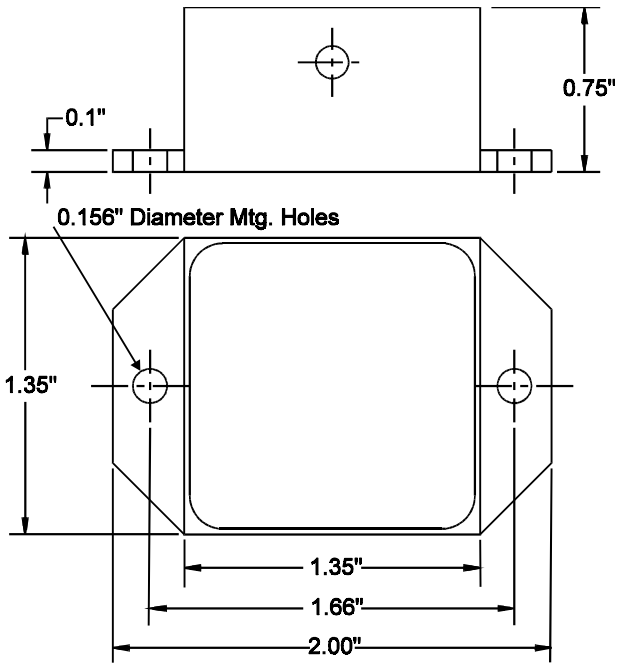
Low g Accelerometer Solutions - Packaging Options:

Multi-Axis Accelerometer Series
Type 2 - 6/6 Nylon Housing

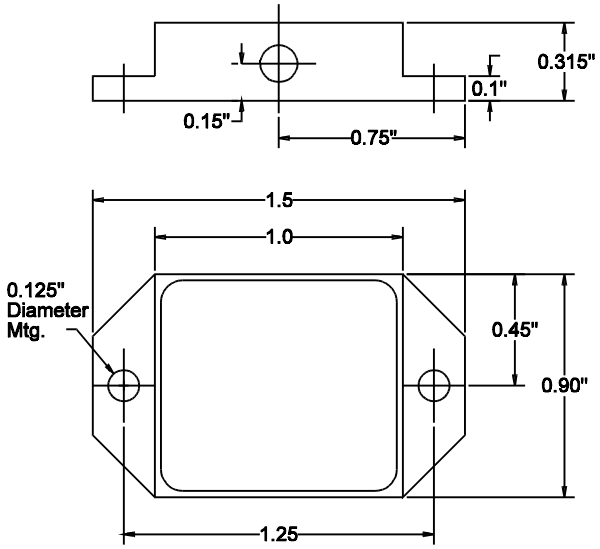


Signal Cable Color Code		
Function	Color	Series
DC Power (+5)	Red	
Common	Black	
A1 (X) Signal	White	SAA
A2 (Y) Signal	Yellow	DAA
A3 (Z) Signal	Green	TAA

Multi-Axis Accelerometers Series
Type M4 - Aluminum Housing



Single Axis, Low Profile Accelerometer
Type M6 - Aluminum Housing



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Low g Accelerometer Ordering Information:

Part Number Sequence - Series Type, Mounting, & Termination:

SAA-1000 SERIES UNI AXIAL				DAA-2000 SERIES BI AXIAL				TAA-3000 SERIES TRI AXIAL			
SAA	**Mount**	**Signal**	**Axis**	**DAA**	**Mount**	**Signal**	**Axis**	**TAA**	**Mount**	**Signal**	**Axis**
11gg	Flange	Cable	Horiz	**21gg**	Flange	Cable	2 Horiz	**31gg**	Flange	Cable	2H & V
12gg	Flange	Conn	Horiz	**22gg**	Flange	Conn	2 Horiz	**32gg**	Flange	Conn	2H & V
				23gg	Flange	Cable	1 H & V				
				24gg	Flange	Conn	1 H & V				
15gg	Non-Fl	Cable	Horiz	**25gg**	Non-Fl	Cable	2 Horiz	**35gg**	Non-Fl	Cable	2H & V
16gg	Non-Fl	Conn	Horiz	**26gg**	Non-Fl	Conn	2 Horiz	**36gg**	Non-Fl	Conn	2H & V
				27gg	Non-Fl	Cable	1 H & V				
				28gg	Non-Fl	Conn	1 H & V				
18gg	PCB	S/Term		**28gg**	PCB	S/Term	2 Horiz	**38gg**	PCB	S/Term	2H & V

Series Type:
SAA = Uni-axial
DAA = Bi-axial
TAA = Tri-axial

Mounting & Termination:
See above table

P/N Example > TAA-3150AM4-1%-0.1~100

±Span:
01~100
= ±1 to ±100g

Interstage Coupling:
Blank = DC
A = AC

Packaging:
Blank = 6/6 Nylon
Mn = Metallic & Type#

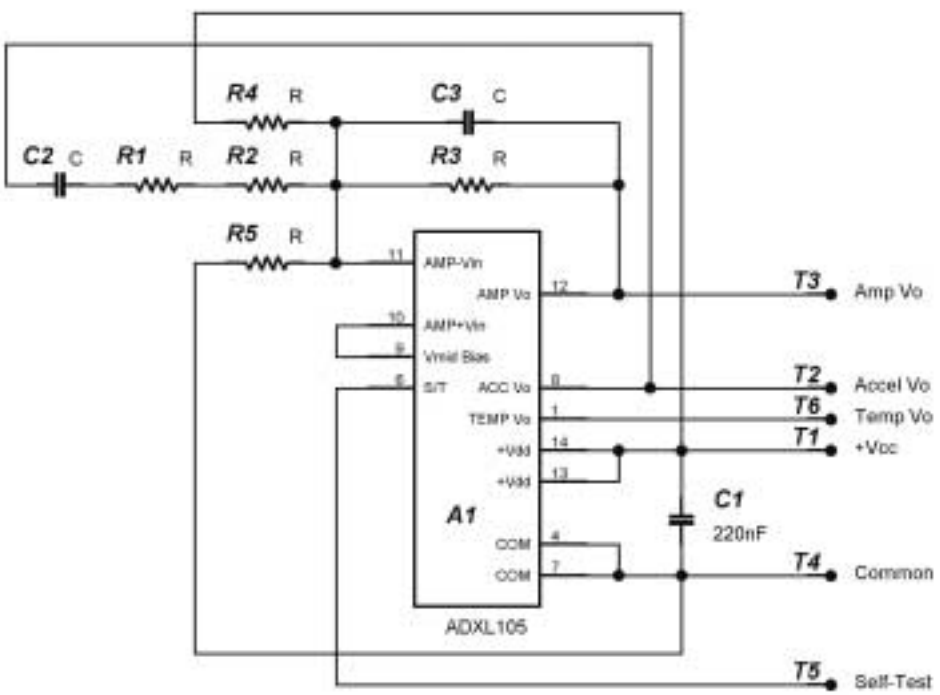
High Frequency Bandwidth:
= from 0.1 to 10,000 Hz

Low Frequency Bandwidth:
(AC interstage coupling only)
= from 0.1 Hz to max BW

Tolerance:
Blank = ±5%
Option = ±1%

Order from:
Brendel Associates Limited
Tel: 313-729-9898
E-Mail: brent@brendelassociates.com

XL105-5 Single Axis Accelerometer PCB



R1 = _____

R2 = _____

R3 = _____

R4 = _____

R5 = _____

C1 = _____

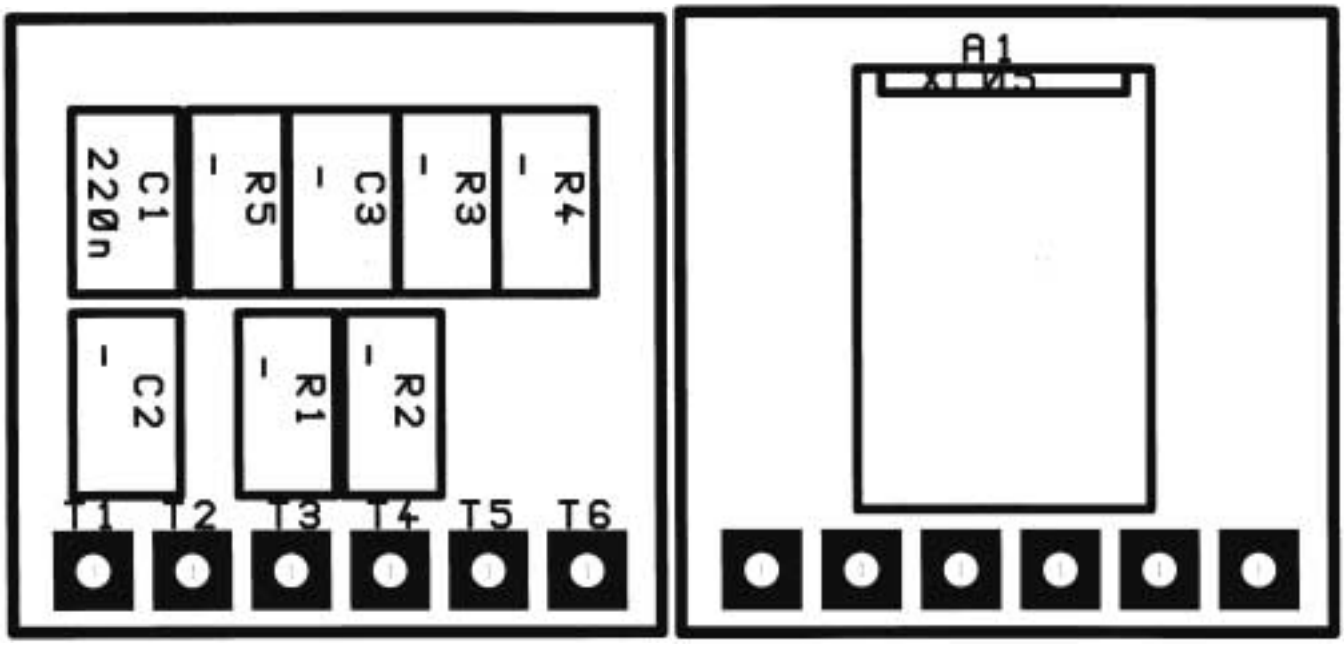
C2 = _____

C3 = _____

T1~6 = _____

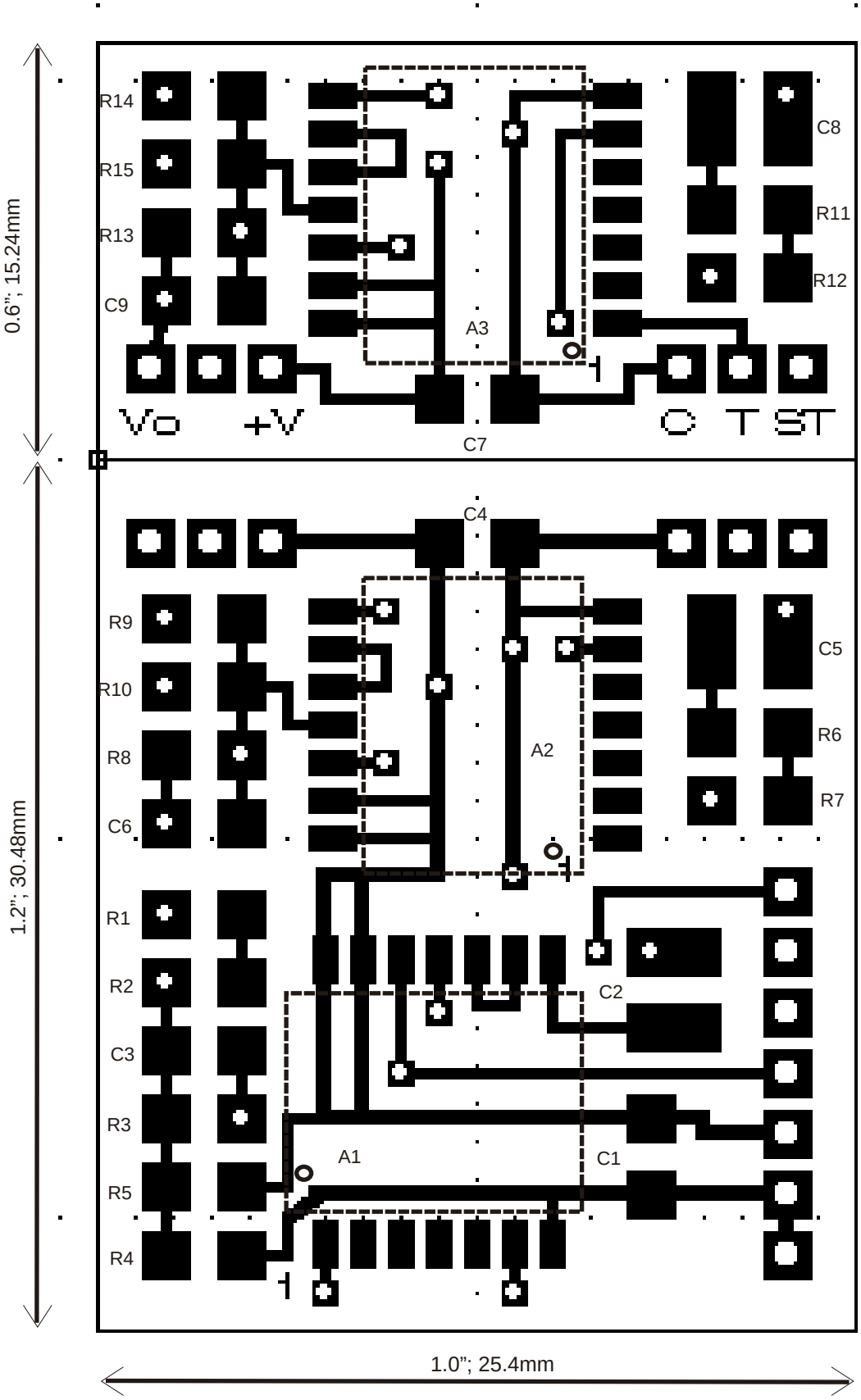
PCB = 26601_1

XL105-5 Schematic
26601_1 PCB Design
01 Oct 02 GVG/NGT



XL105-5 PCB Layout.cdr
22601_1 PCB Design
01 Oct 02 GVG/NGT

ADXL105 PCB LAYOUT - 1, 2, 3 AXIS CONFIGURATION



PCB used for single axis and for the third axis (A3 / Z) on tri-axial assemblies where the board is mounted 90 degrees to the base.

PCB used for single (A1 / X), bi-axial (A2 / Y), plus base for tri-axial assemblies

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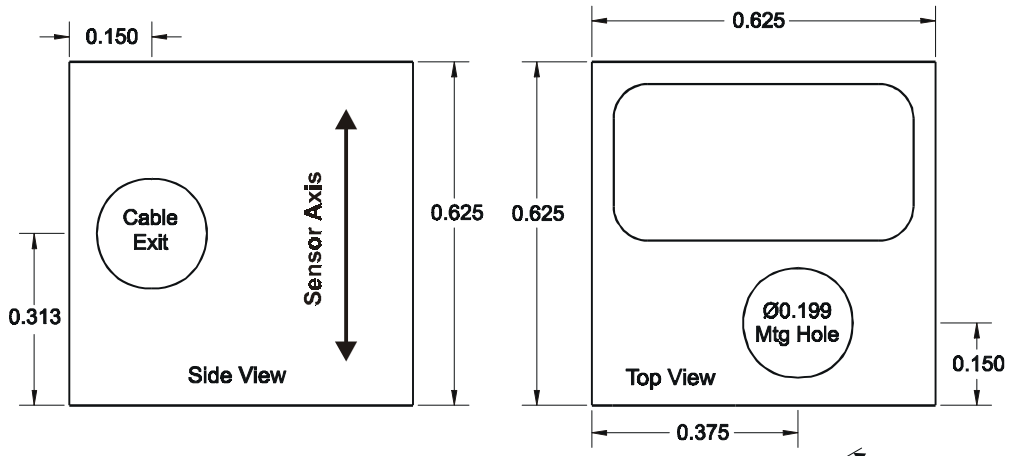
Specifications:

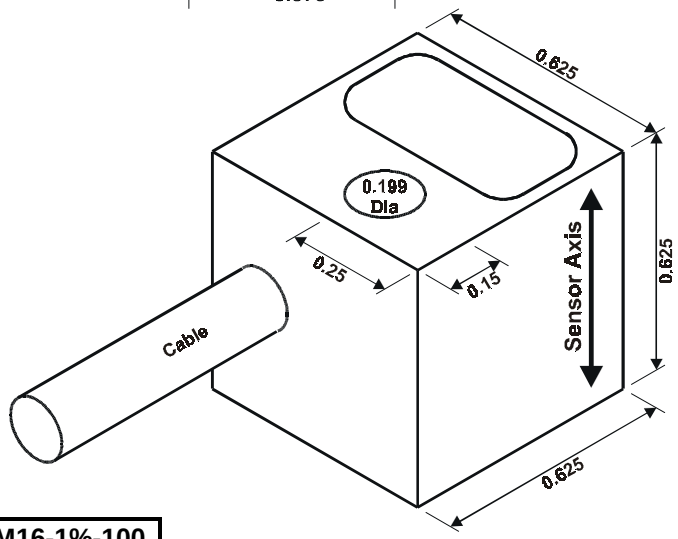
Parameter	XL102/202 Series	XL105 Series	XL110/210 Series	XL150/250 Series	XL190 Series	
Full Scale Span	to ±2g	to ±8g	to ±10g	to ±50g	to ±100g	
Full Scale Signal	±2.0 Vdc	±2.0 Vdc	±2.0 Vdc	±2.0 Vdc	±2.0 Vdc	
Sensitivity at FS	1 V/g	250 mV/g	200 mV/g	40 mV/g	20 mV/g	
Zero g Bias	+2.5 ±0.1 V	+2.5 ±0.1 V	+2.5 ±0.1 V	+2.5 ±0.1 V	+2.5 ±0.1 V	
Frequency Response	DC to 5,000 Hz	DC to 10,000 Hz	DC to 5,000 Hz	DC to 1,000 Hz	DC to 400 Hz	
RMS Equivalent Noise (max)	0.001 g/√Hz	0.0003 g/√Hz	0.001 g/√Hz	0.0025 g/√Hz	0.012 g/√Hz	
Nonlinearity	±0.2% FS	±0.2% FS	±0.2% FS	±0.2% FS	±0.2% FS	
Alignment	±3 Deg.; ±1° Option	±3 Deg.; ±1° Option	±3 Deg.; ±1° Option	±3 Deg.; ±1° Option	±3 Deg.; ±1° Option	
Transverse Sensitivity	±2% FS Span	±2% FS Span	±2% FS Span	±2% FS Span	±2% FS Span	
Supply Voltage: Vdc	4.75 to 5.25	4.75 to 5.25	4.75 to 5.25	4.75 to 5.25	4.75 to 5.25	
Supply Current per Axis (No Load): mA	0.6 to 1.0 mA	1.9 to 2.6 mA	0.6 to 1.0 mA	1.8 to 3.0 mA	2.0 to 5.0 mA	
Temperature Range	-40~+85°C	-40~+85°C	-40~+85°C	-40~+85°C	-40~+85°C	
Sensitivity Drift -40°C to +85°C	±0.5% typical	±0.5% typical	±0.5% typical	±0.5% typical	±0.5% typical	
Zero g Bias Drift -40°C to +85°C	0.25g typical	0.2g typ.; 0.5g max.	0.25g typical	0.3g typical	1g typical	
Shock (Powered)	>500g	>500g	>500g	>500g	>1000g	
Shock (Unpowered)	>1000g	>1000g	>1000g	>2000g	>2000g	
Analog Output Loading	>10kΩ @ <1000pF	>10kΩ @ <1000pF	>10kΩ @ <1000pF	>10kΩ @ <1000pF	>10kΩ @ <1000pF	

Notes:

1. The standard sensitivity calibration tolerance is ±5%. ±1% tolerance is available as an option.
2. Special full scale sensitivities, spans, offsets, bandwidths, and power supply voltages are available. Please consult factory.
3. AC inter-stage high-pass coupling, DC 0g offset blocking, is available starting from 0.1 Hz @ -3dB. Please consult factory.
4. Low-pass frequency response is factory adjustable from 0.1 Hz @ -3dB to the design limit of the rated bandwidth. Please consult factory.
5. The accuracy parameter is derived from the root-sum-of-the-squares of all contributing system errors including transfer sensitivity tolerance, span error, nonlinearity, mechanical and device alignment, and transverse sensitivity.
6. An optional TTL/CMOS compatible input signal connection can be provided to allow device self-test verification. Please consult factory.

SAA-11100M16-100
Single Axis Accelerometer Module
6061 Aluminum Housing



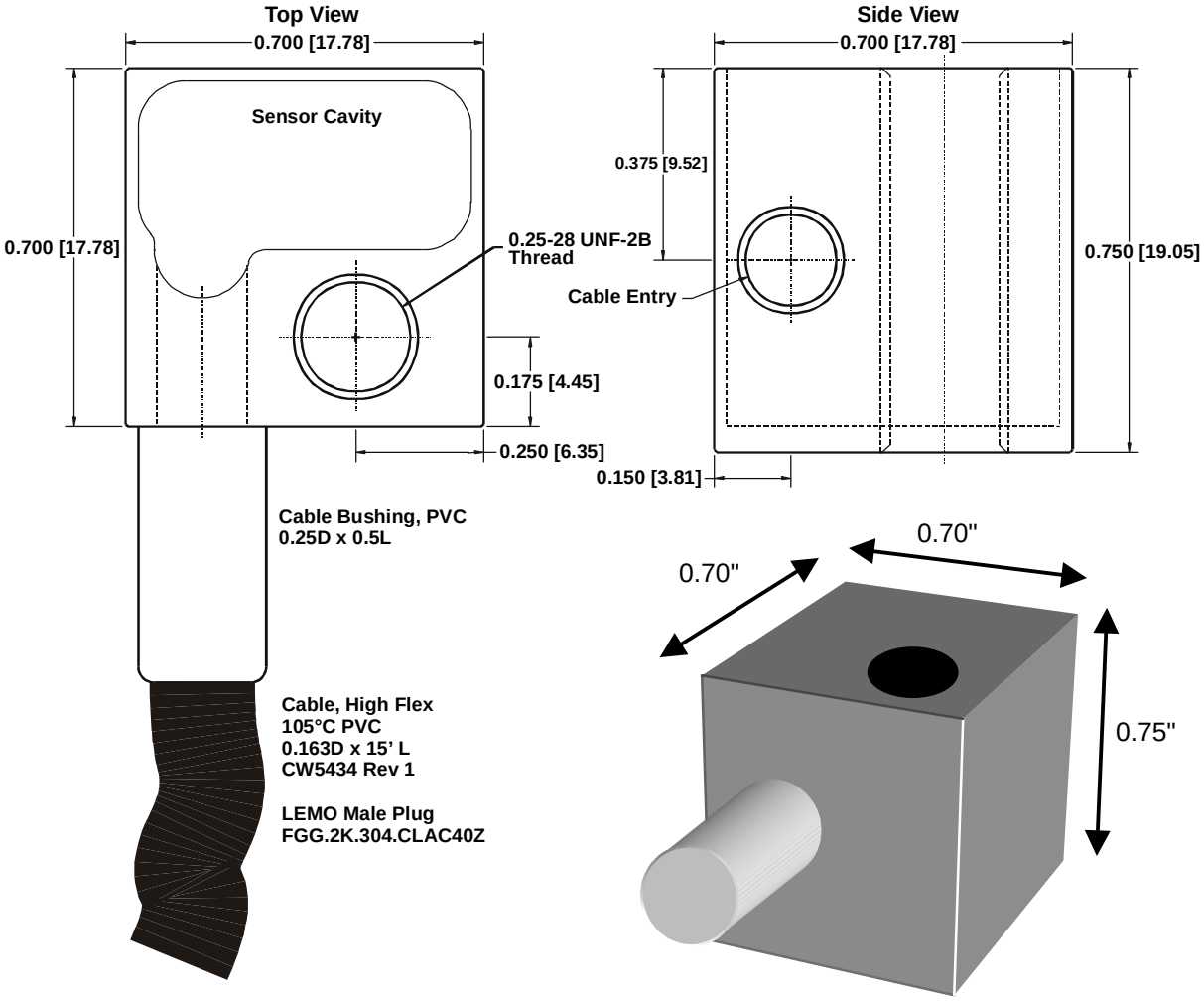


Part Number:	SAA-11100M16-1%-100
g Span:	±100g
Span Vo	±2 Vdc @ ±100g
Sensitivity	20 mV/g, Vps = 5.000 Vdc; Ratiometric to Power Supply
0g Bias	+2.5 Vdc, ±100mV; Ratiometric to Power Supply
Bandwidth	DC to 100 Hz., -3dB
+g Magnitude	+2.5 to 0 Vdc
-g Magnitude	+2.5 to +5 Vdc
Temperature	-40°C to +125°C
0g Bias Drift	1.0g typical over temp.
Sensitivity Drift	±0.5g typical over temp.
Noise	0.040g RMS typical
Shock	1000g powered, 2000g un-powered
Module Power	+5.00 Vdc, < 5 mA

Connections		
Function	Color	
+5 V Pwr Input	Red	
Pwr Common	Black	
A1 Signal Vo	White	
Sig Common	Green	
Shield; Case	Braid	

11/11/02 Brendel Associates Limited; Mobile: (313) 729-9898 Phone: (313) 278-1872 Email:brent@brendelassociates.com

SAA-1150M20SS-1000-VR-OB-15 ft.-LEMO
±50g Single Axis Accelerometer Module
Type M20 Stainless Steel Housing



Part Number:	**SAA-1150M20SS-1000-VR-OB-LEMO**
Customer P/N:	**61-1026SS**
g Span:	**±50g**
Span Vo	**±1 Vdc at ±50g Span**
Sensitivity	**20 mV/g, ±1%;**
0g Bias	**+2.5 Vdc, ±100 mV**
Bandwidth	**DC to 1000 Hz., -3dB**
Temperature	**-30°C to +85°C**
Bias Drift	**0.2g per °C**
Noise	**0.031g RMS; 1000 Hz BW**
Shock	**1000g powered, 2000g unpowered**
Output Loading	**200 ohms || 100nF**
Module Power	**+4.5 to +7.0 Vdc, < 5 mA Test Condition: 5.00 Vdc, ±250 mV**

Connections		
Function	**Color**	**Conn**
+5 V Pwr	**Red**	**1**
Common	**Black**	**2**
Common	**Blue**	**4**
Self-Test	**Yellow**	**N/C**
A1 Signal	**White**	**3**
Shield	**Braid**	**Shell**