OPERATION MANUAL
MODEL 8102 ACCELEROMETER

WARRANTY

Measurement Specialties, Inc. accelerometers are warranted during a period of one year from date of shipment to original purchaser to be free from defects in material and workmanship. The liability of Seller under this warranty is limited to replacing or repairing any instrument or component thereof which is returned by Buyer, at his expense, during such period and which has not been subjected to misuse, neglect, improper installation, repair, alteration, or accident. Seller shall have the right to final determination as to the existence and cause of a defect. In no event shall Seller be liable for collateral or consequential damages. This warrant is in lieu of any other warranty, expressed, implied, or statutory; and no agreement extending or modifying it will be binding upon Seller unless in writing and signed by a duly authorized officer.

RECEIVING INSPECTION

Every Measurement Specialties, Inc. accelerometer is carefully inspected and is in perfect working condition at the time of shipment. Each accelerometer should be checked as soon as it is received. If the unit is damaged in any way, or fails to operate, a claim should immediately be filed with the transportation company.

SERVICE CONCERNS

If a Measurement Specialties, Inc. instrument requires service, first contact the nearest Measurement Specialties, Inc. representative. They may be able to solve the problem without returning the unit to the factory. If it is determined that factory service is required, call Customer Service at the regional headquarters for an RMA number before return.

RETURNS

All units being returned to the factory require an RMA (Return Material Authorization) number before they will be accepted. This number may be obtained by calling Customer Service at the regional headquarters with the following information; model number(s), quantity, serial number(s), and symptoms of the problem, if being returned for service. You must include the original purchase order number if under warranty

RECALIBRATION SERVICES

The Vibration Sensors Design Center and its two manufacturing facilities in China and France offer factory re-calibration services for Piezoresistive, Piezoelectric and Integrated Electronics Piezoelectric (IEPE, ISOTRON, ICP, etc.) accelerometers. NIST (US), DKD (Germany), COFRAC (France) traceable calibration services on sensitivity at 100 Hz (102 or 120 Hz in Europe) and full frequency sweeps are offered. Contact the regional headquarters for pricing information.

DESCRIPTION

The Model 8102 is a low power, plug & play triaxial accelerometer designed for dynamic measurements. Featuring stable piezo-ceramic crystals, the accelerometer incorporates full power and signal conditioning with a maximum current consumption of only 22 micro-amps. The accelerometer is offered in ranges from ±25g to ±6000g with a flat response up to greater than 6000Hz.

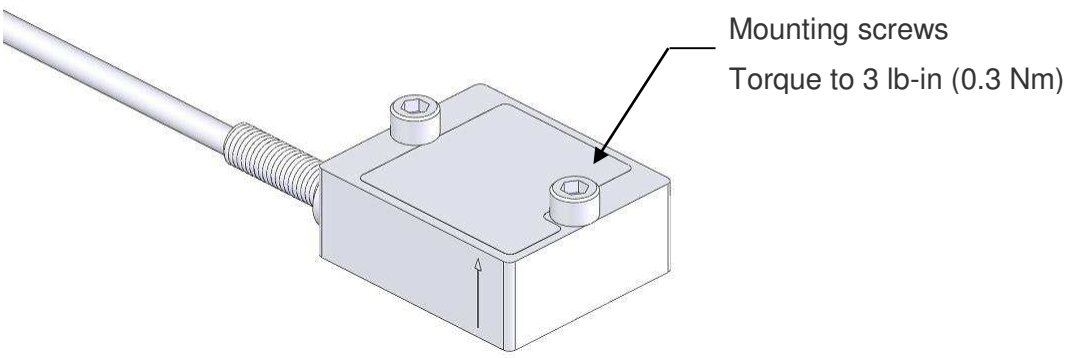
INSTALLATION

The model 8102 accelerometer is designed to be screw mounted but can also be adhesively mounted if the installation does not allow for screw mounting.

Screw Mounting

For screw mounting of accelerometers the following guidelines should be followed:

- The mounting surface should be clean and free of any residue or foreign material.
- The mounting surface should be smooth, flat, and with a maximum surface roughness of 32 micro-inches rms.
- Apply a light coating of coupling fluid (machine oil or silicone grease) on the mating surface to maximize the usable frequency range.
- Torque screws to recommended limits. Use manual torque wrench (do not use electric tools).



Adhesive Mounting

To avoid damaging the accelerometer during subsequent removal, it is recommended to use an adhesive mounting adaptor for this method of attachment (model AC-D02744 adaptor is offered). For adhesively mounting of accelerometers the following guidelines should be followed:

- The mounting surface should be clean and free of any residue or foreign material.
- The mounting surface should be smooth, flat, and with a maximum surface roughness of 64 micro-inches rms.
- For best high frequency performance a cyanoacrylate adhesive is recommend. A thin layer offers best frequency response.
- Soften adhesive cured adhesive with a chemical debonder (eg. acetone) prior to removal. Gently shear accelerometer loose from the mounting surface after waiting a few minutes for the debonding agent to penetrate the epoxy. Make sure not to use excessive force as this may damage the accelerometer.

EXCITATION

Although the model 8102 is designed to be operated by 3.3Vdc battery power for optimum performance, the accelerometer can also be powered by excitation voltages (ExcV) ranging from 2.7 to 5.5Vdc. However, excitation voltages other than 3.3Vdc will affect the full scale range of the accelerometer since the bias voltage is a function of excitation voltage.

The following formula can be used to calculate the full scale range of the accelerometer when using different excitation voltages other than 3.3Vdc.

Full scale range (g) = [ExcV – 0.2V - (ExcV / 2)] / Sensitivity (V/g)

Example; a model 8102-0200 with z-axis sensitivity of 6.41mV/g and 2.8Vdc excitation

Full scale range = [2.8V – 0.2V - (2.8V / 2)] / .00641V/g = 187g

TEMPERATURE COMPENSATION

The model 8102 accelerometer incorporates piezo-ceramic crystals in shear mode that have a stable temperature performance of the operating range of the accelerometer. Additional temperature compensation can be accomplished by using an external ASIC with onboard temperature sensing to further correct temperature induced errors.

CABLE ROUTING

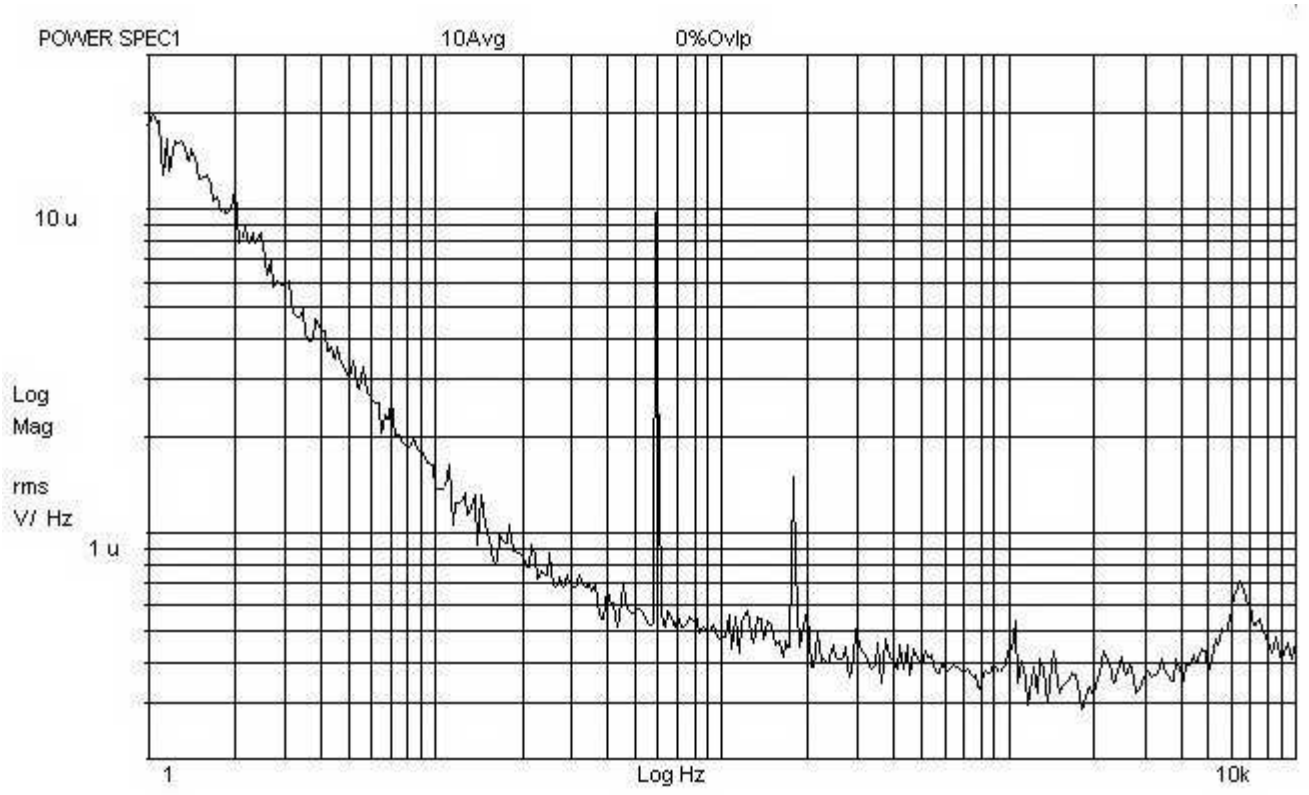
The model 8102 accelerometer incorporates a Teflon jacketed cable with an integral shield. The cable assembly should be properly secured at regular intervals during testing. It is recommended to use clamps, wax, or tape to secure the cable to minimize cable motion that can add noise to the output signal. The initial attachment should be within two to three inches of the accelerometer.

Avoid routing cables near high-voltage wires and also ground the shield at the signal conditioner to minimize ground loops.

RESIDUAL NOISE

The typical PSD noise plot for the model 8102 accelerometer is illustrated below. The spikes in the plots are 60Hz input and harmonics.

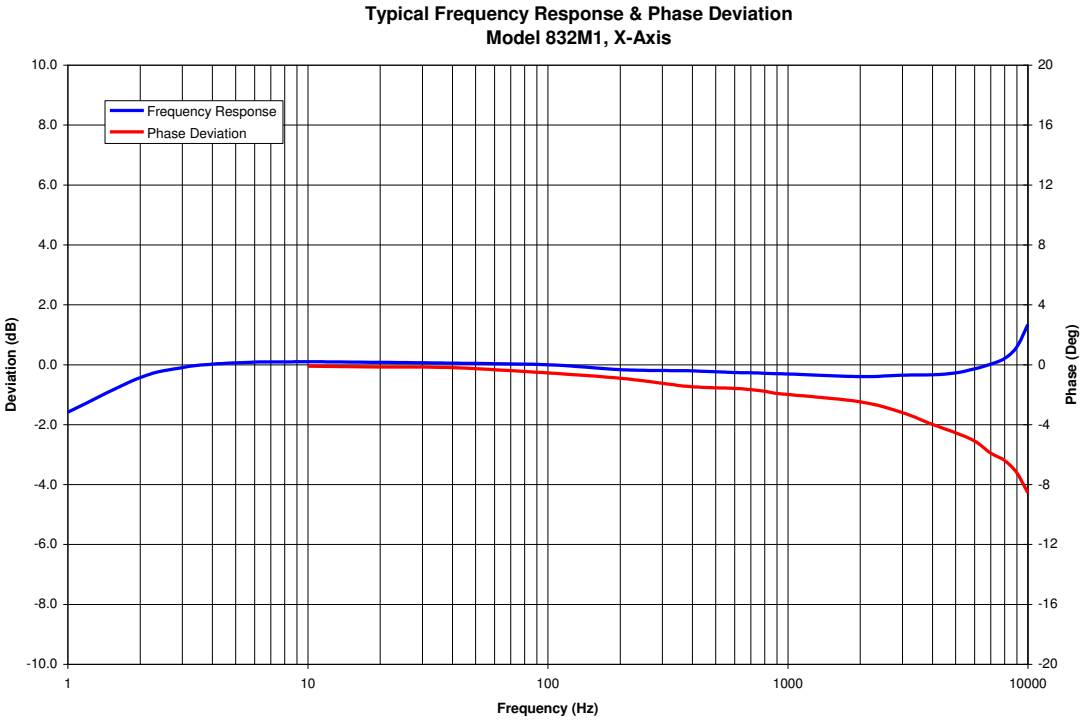
Model 8102

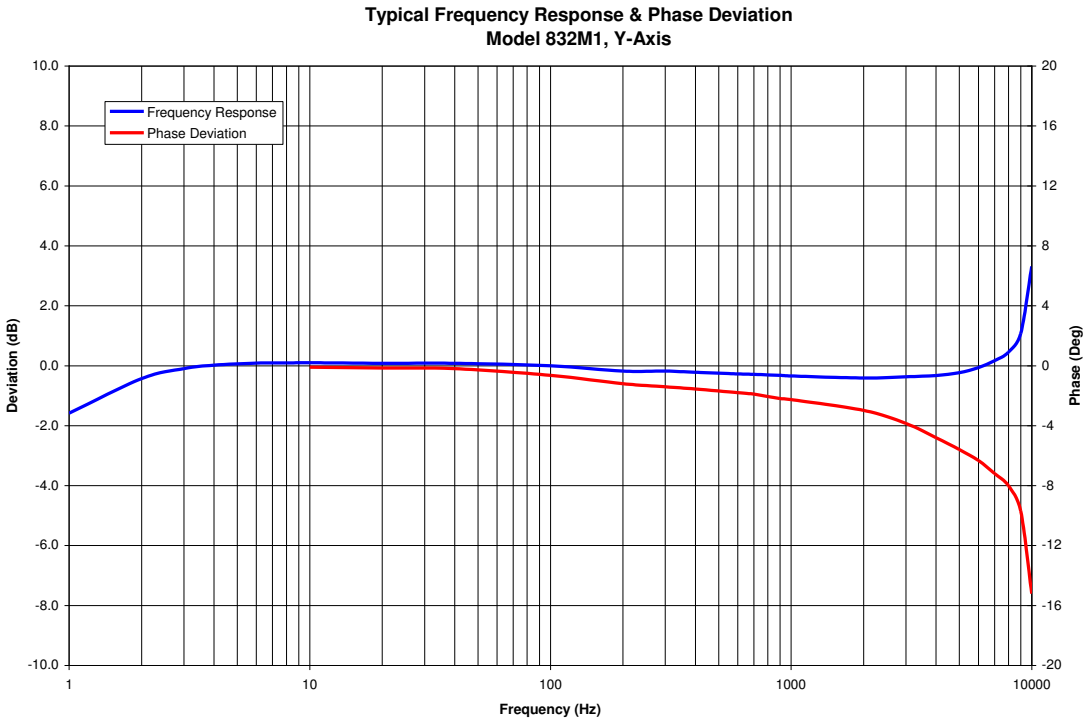


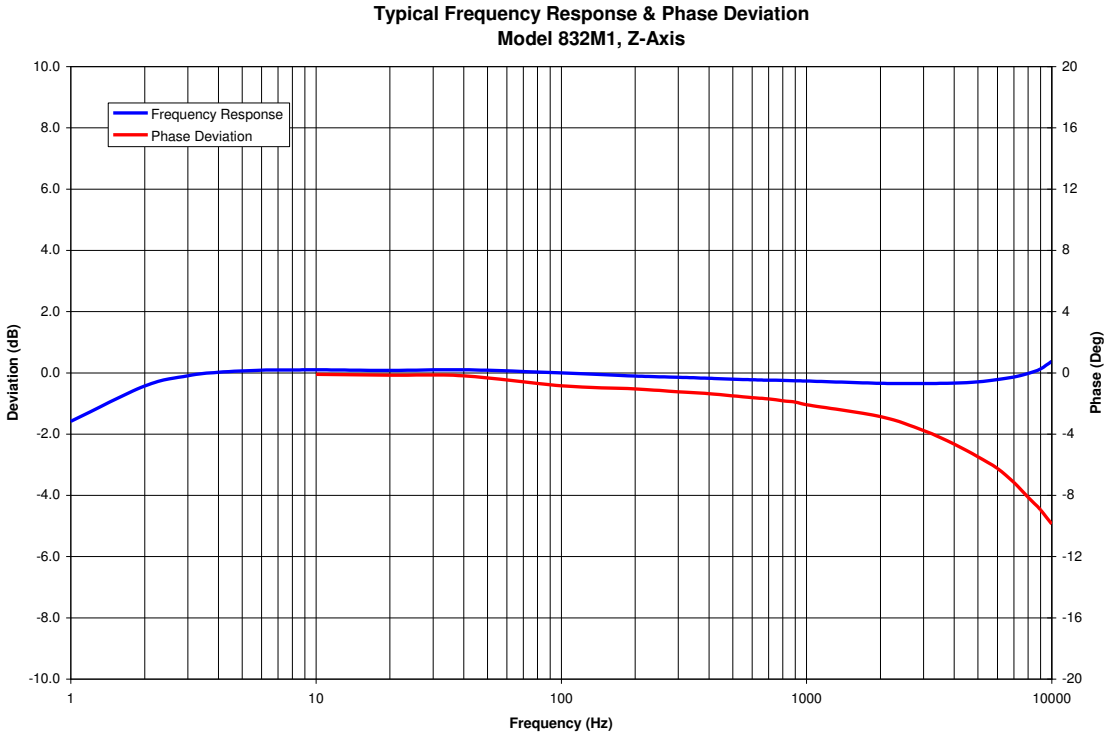
Note: The vertical scale is in V/√Hz

FREQUENCY RESPONSE & PHASE DEVIATION CURVES

The typical frequency and phase deviation curves for the model 8102 are illustrated below.






Typical Frequency Response & Phase Deviation
Model 832M1, Z-Axis
Frequency Response
Phase Deviation
Deviation (dB)
Phase (Deg)
Frequency (Hz)
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
20
16
12
8
4
0
-4
-8
-12
-16
-20
1
10
100
1000
10000

FREQUENTLY ASKED QUESTIONS

Question: The datasheet shows the operating temperature from -40°C to +125°C. -40°C is not low enough; we need beyond -55°C. What is your plan of meeting this requirement?

Response: We tested the bias at -55C. Test result of 832-0500 DC bias change with temperature is shown below, DC Bias changes about 0.5% at -55ºC compared to 25ºC:

	25ºC	-55ºC
X	1.7423 V	1.7535 V
Y	1.7412 V	1.7477 V
Z	1.7928 V	1.8035 V

Total current supply is 4.1uA at -55ºC which is still within specification. Model 832M1 has no problem working down at -55ºC

Question: Just a clarification, at 0g output, is the accelerometer output Supply Voltage/2? So that when we have a negative acceleration we approach 0 but not negative?

Response: Yes, you are correct. The output will swing nominally +/-1.25V about the bias voltage. For a +/-100g range accelerometer with 3.3V excitation (bias at 1.65V), the output would be nominally be 0.4V to 2.9V

Question: You mentioned about getting us an equation to calculate the measurement range based on our bias voltage. We talked about how the lower bias voltage would lower the maximum measurement of this accelerometer and I was hoping to get a better understanding of this.

Response: Page 4 in this manual, under the 'Excitation' paragraph, discusses how to calculate the full-scale range of the accelerometer based on excitation voltages other than the nominal 3.3V. Let us know if you need further information. Our engineers have confirmed that the minimum excitation voltage is in fact 2.7V. We specified 3.3V in our datasheet to give us some margin. We also confirmed that we had previously performed a signal warm-up test on our model 832M1. The signal converged to 98% of its final value at 30msec. There was no overshoot. It was typical of a single-pole response characteristic that was determined by its filtering …95% (lapse of three time constants).

Question: Can Measurement Specialties provide a higher temp version of Model 834M1?

Response: Yes, we can make high temp version which operates from -40°C to +150°C, but the current consumption will be 60uA.

NORTH AMERICA

Measurement Specialties, Inc.,
a TE Connectivity Company
1000 Lucas Way
Hampton, VA 23666
United States
Tel: +1 757 766 1500
Email: customercare.hmpt@te.com

Measurement Specialties, Inc.,
a TE Connectivity Company
Vibration Sensors Design Center
32 Journey, Suite 150
Aliso Viejo, CA 92656, USA
Tel: +1 949 716 7324

EUROPE

MEAS Deutschland GmbH
a TE Connectivity Company
Impasse Jeanne BENOZZI
CS 83 163, 31027 Toulouse Cedex 3, France
Tel: +33 (0) 582 08 22 00
Email: customercare.tlse@te.com

ASIA

Measurement Specialties China Ltd.,
a TE Connectivity Company
No. 26, Langshan Road
Shenzhen High-tech Park (North)
Nanshan District, Shenzhen 518057
China
Phone: +86-755-3330-5088
Email: customercare.shzn@te.com

te.com/sensorsolutions

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