

# OPERATION MANUAL MODEL 820M1 ACCELEROMETER

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### 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.

## MODEL 820M1 ACCELEROMETER

### DESCRIPTION

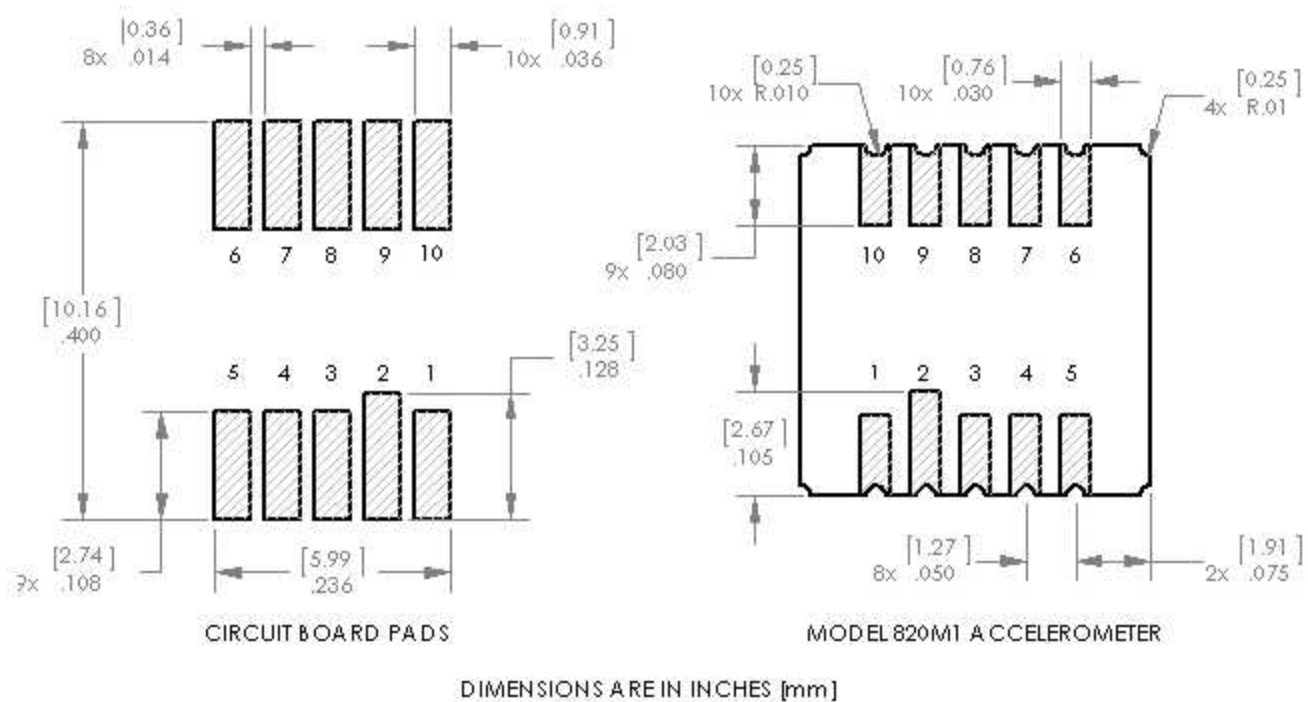
The Model 820M1 is a low cost, board mountable accelerometer designed for embedded condition monitoring and predictive maintenance applications. The piezo-electric accelerometer is ideal for harsh embedded applications and is packaged in a hermetic ceramic LCC package. The Model 820M1 features stable piezo-ceramic crystals with full power and signal conditioning that draw a maximum current of 22 micro-Amps. The accelerometer is offered in ranges from  $\pm 25g$  to  $\pm 100g$  with a flat response up to greater than 6000Hz.

### INSTALLATION

The model 820M1 accelerometer is designed to be soldered to printed circuit boards or hybrid substrates. It is critical that the substrate has a low coefficient of expansion and that you have good mechanical coupling between the sensor and the mounting surface to ensure good transmissibility. Ceramic circuit boards are recommended but FR4 boards can also be used for lower frequency applications with a suggested thickness of 0.062" (1.57mm). It is recommended to reflow solder the model 820M1 accelerometer but it can also be manually soldered in cases where reflow soldering is not practical. For reflow soldering the following guidelines should be followed.

- Design the mounting pads on the circuit board according to the recommended dimensions shown below.
- Use a suitable RMA flux coated solder paste.
- A recommended stencil thickness is .008" (0.2mm).
- Secure accelerometer during reflow soldering to ensure good coupling to solder pads.
- Use of inert N<sub>2</sub> gas is recommended.
- Don't electrically connect to undesigned pads but they are suitable for additional mechanical support.

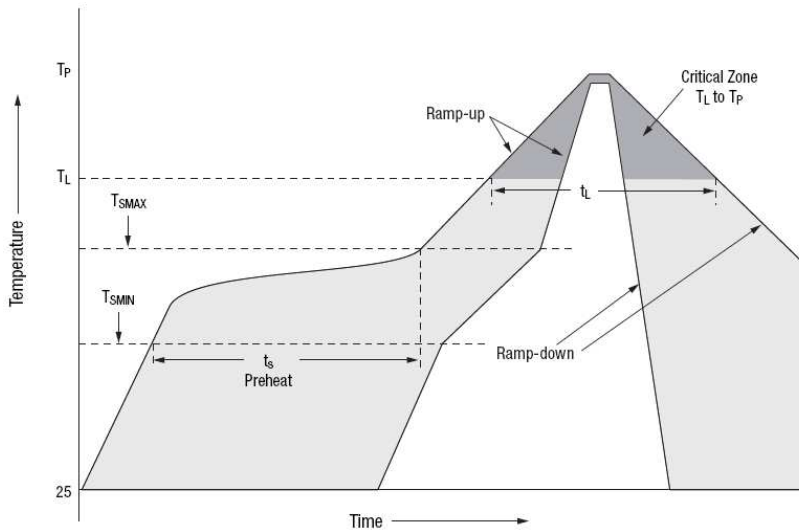
Recommended mounting solder pads:



## MODEL 820M1 ACCELEROMETER

The following table defines recommended solder reflow profiles for common Eutectic and Lead-Free solders. However, it is always recommended to consult with the solder paste manufacturer for the proper profile.

Profile Feature	SnPb Eutectic	SnAgCu Lead-Free
Ramp-up Rate	1.0-3.0 °C/sec	1.0-3.0 °C/sec
Preheat (soak) Temperature Min ( $T_{SMIN}$ ) Temperature Max ( $T_{SMAX}$ ) Time ( $t_{sMIN}$ to $t_{sMAX}$ )	Consult solder paste manufacturer recommended profile	Consult solder paste manufacturer recommended profile
Time Above Liquidus Temp (TAL) Temperature ( $T_L$ ) Time ( $t_L$ )	30-90 sec	30-90 sec
Peak Temperature ( $T_P$ )	205-220 °C	235-245 °C
Ramp-down Rate	4 °C/sec max	4 °C/sec max



If the accelerometer is to be subjected to high amplitude shocks during operation then it is also recommended to apply a thin layer of epoxy underneath the accelerometer after solder attachment. A low viscosity cyanoacrylate with a room temperature cure such as Loctite 4501 is recommended.

For maximum mounting rigidity, encapsulating the sensor with potting compound after the reflow process can be critical. Encapsulant, such as Stycast 2651-40 by Emerson & Cuming, is recommended.

Note that the gold-plated pads of the 820M1 are also suitable for conductive epoxy attachment should solder reflow not be a convenient mounting solution.

## MODEL 820M1 ACCELEROMETER

### EXCITATION

Although the model 820M1 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 2.8 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.

$$\text{Full scale range (g)} = [\text{ExcV} - 0.3\text{V} - (\text{ExcV} / 2)] / \text{Sensitivity (V/g)}$$

Example; a model 820M1-0100 with sensitivity of 10.55mV/g and 2.8Vdc excitation

$$\text{Full scale range} = [2.8\text{V} - 0.3\text{V} - (2.8\text{V} / 2)] / .01055\text{V/g} = 104\text{g}$$

### TEMPERATURE COMPENSATION

The model 820M1 accelerometer incorporates piezo-ceramic crystals that have a stable temperature performance over the operating range of the accelerometers. Additional temperature compensation can be accomplished by using an external ASIC with onboard temperature sensing to further correct temperature induced errors.

### NOISE FLOOR SPECIFICATIONS

The model 820M1 broadband and spectral noise floor specifications are detailed in table below.

		-0025	-0050	-0100
Broadband Noise (mg, 0.1Hz ~ 10kHz)	820M1	2.6	3.0	3.2
Spectral Noise ( $\mu\text{g}/\sqrt{\text{Hz}}$ )	@10Hz	160	160	160
	@100Hz	40	40	40
	@1000Hz	16	16	16

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