



Dynamic Transducers and Systems

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OG3225M23
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OPERATING GUIDE

MODEL 3225M23

MINIATURE HIGH SENSITIVITY PLANAR SHEAR MODE

IEPE ACCELEROMETER WITH REMOVABLE CABLE

This manual contains:

- 1) Specifications, model 3225M23
- 2) Outline/Installation drawing 127-3225M23

NOTE: IEPE is an acronym for Integrated Electronics Piezoelectric types of low impedance voltage mode sensors with built-in amplifiers operating from constant current sources over two wires. IEPE instruments are compatible with most other manufacturers' comparable system



SPECIFICATIONS

MODEL 3225M23 MINIATURE IEPE ACCELEROMETER

SPECIFICATION	VALUE	UNITS
PHYSICAL		
WEIGHT	1	gram
SIZE (DIA x LENGTH HEX x HEIGHT)	0.25 x 0.43 x .215	inch
MOUNTING PROVISION	Flat mounting surface for adhesive mount	
CONNECTOR, RADIALLY MOUNTED [1]	3-56	
CASE MATERIAL	Titanium	
SENSING ELEMENT TYPE	Piezoceramics, planar shear	
PERFORMANCE		
SENSITIVITY, $\pm 10\%$ [2] [3]	50	mV/g
RANGE F.S. FOR ± 5 VOLTS OUT	± 100	g
FREQUENCY RESPONSE, $\pm 10\%$ [3]	2 to 10,000	Hz
MOUNTED RESONANT FREQUENCY	>40	kHz
EQUIVALENT ELECTRICAL NOISE FLOOR	.0005	grms
AMPLITUDE NON-LINEARITY, (ZERO BASED BEST-FIT ST.LINE METHOD)	2	% F.S., MAX.
TRANSVERSE SENSITIVITY, MAX.	5	%
STRAIN SENSITIVITY @ 250 $\mu\epsilon$.05	g/ $\mu\epsilon$
ENVIRONMENTAL		
MAXIMUM VIBRATION	400	grms
MAXIMUM SHOCK	5000	gpk
TEMPERATURE RANGE	-60 TO +220	$^{\circ}\text{F}$
THERMAL COEFFICIENT OF SENSITIVITY	.15	%/ $^{\circ}\text{F}$
ENVIRONMENTAL SEAL	Hermetic, TIG welded & glass-to-metal seal connector	
ELECTRICAL		
SUPPLY CURRENT [4]	2 to 20	mA
COMPLIANCE VOLTAGE RANGE	+18 to +30	Volts
OUTPUT IMPEDANCE, TYP.	70	Ω
BIAS VOLTAGE	+11 to +13	Vdc
DISCHARGE TIME CONSTANT	0.5 to 1.8	sec
OUTPUT SIGNAL POLARITY FOR ACCELERATION TOWARD TOP	Positive	

SUPPLIED ACCESSORIES:

- (1) MODEL 6591A INSTALLATION REMOVAL WRENCH
- (2) 6298 SMALL PETRO WAX

NOTES:

- [1] CONNECTOR MATES ONLY WITH DYTRAN CABLE MODEL 6003AXX (XX IS LENGTH IN FEET)
- [2] MEASURED AT 100 Hz, 1 grms PER ISA RP37.2.
- [3] ACTUAL SENSITIVITY IS GIVEN ON A CALIBRATION CERTIFICATE TRACEABLE TO NIST, SUPPLIED WITH EACH INSTRUMENT.
- [4] DO NOT APPLY POWER TO THIS DEVICE WITHOUT CURRENT LIMITING, 20 mA MAX. TO DO SO WILL DESTROY THE INTEGRAL IC AMPLIFIER.



OPERATING INSTRUCTIONS

MODEL 3225M23 MINIATURE IEPE ACCELEROMETER

INTRODUCTION

Model 3225M23 is a miniature, low profile, voltage mode (IEPE) piezoelectric accelerometer designed to mount in spaces inaccessible to other types of accelerometers.

Featuring a titanium housing and weighing only 1 gram, this instrument is ideal for the measurement of shock and vibration of very small, lightweight specimens such as printed circuit boards and board-mounted components.

Designed for adhesive mount, Model 3225M23 may be mounted in very narrow spaces only slightly greater than .25 inch (6.4 mm) wide. The height is .215 inch (5.5 mm).

Model 3225M23 features a special 3-56 coaxial connector which mates with a replaceable coaxial cable, with a 10-32 coaxial jack at the end. This cable is model 6003A03. (XX is the cable length in feet)

A built-in impedance converting electronics package converts the high impedance voltage output from the piezoelectric shear mode seismic element to a low impedance voltage able to drive long cables without attenuation.

DESCRIPTION

Refer to outline/installation drawing 127-3225M23

Model 3225M23 is constructed in "teardrop" form with the a miniature coaxial connector exiting at the end of the teardrop. The case and cover are made from anodized aluminum for low mass and electrical isolation from the mounting surface.

Model 3225M23 generates an electrostatic voltage mode signal by stressing a "planar shear" type self-generating piezoelectric crystal element in response to input acceleration. The planar piezoelectric crystals are supported by a flat post and the seismic masses are fastened together by a preload screw.

When the unit is accelerated along the main axis, the quartz crystals are stressed in shear mode generating a voltage analogous to this acceleration.

This very high impedance voltage is fed to the JFET input stage of a miniature on-board IC amplifier which drops the impedance level 10 orders of magnitude and adds a voltage gain. This allows the 3225M23 to have a fixed voltage sensitivity (50 mV/g nominal) and to have the ability to drive long cables with little or no attenuation.

Because of its very low mass and high crystal stiffness, this instrument has a resonant frequency of about 40 kHz. This means that it may be used to measure high frequency vibrations with very little error.

THE REMOVABLE CABLE FEATURE

The cable designed for Model 3225M23 is one of the smallest in the industry. Use care when attaching and removing the 6003A03 cable. The knurled cable nut is very small, of necessity, and must be engaged and disengaged carefully and only by hand. Do not, under any circumstances, use a pliers to tighten and loosed this cable nut. Damage would most likely occur to the cable nut and/or to the connector. With reasonable care, the cable and connector should give no problems under normal use.

INSTALLATION

IMPORTANT: Only mount the Model 3225M23 on its mounting surface. **DO NOT MOUNT TO THE TOP SURFACE.** Not only will the signal polarity be reversed and the sensitivity and frequency response be adversely affected but also there is danger of damaging the top cap of the accelerometer when removing it, if mounted in the inverted position. This type of damage is considered abuse and is not covered by the manufacturer's warranty.

To install Model 3225M23, it is necessary to select (or prepare) a flat surface to accept the .25 diameter mounting surface of the instrument. As a rule of



thumb, the flatter the mounting surface, the better the high frequency response will be. A surface flat to .001 TIR will give excellent results when a thin glue line is used during mounting. Clean the mounting surfaces with solvents such as alcohol or Freon, etc., to remove debris, oils and greases before mounting.

The recommended adhesives are the "instant" setting cyanoacrylate cements such as Eastman 910 and "Crazy Glue". Apply a very small drop to either mating surface, and simply press the 3225M23 to the mating surface with the finger and hold for 30 seconds. If the adhesive does not set, check the expiration date on the container. It is our experience that when the glue gets old, the first indication is that it will not set up properly. Replace if necessary.

Other types of adhesive may be used but consider them carefully. Dental cement is not recommended for this instrument because of its tenacity. Removal when this adhesive is used may harm the instrument.

In some cases, mounting waxes such as "Petro" wax may be used to mount the 3225M23 but this method is not suitable for measurements at high temperature and high frequency.

Irrespective of which adhesive is used, keep the glue line thin, i.e., don't use too much adhesive. Too much adhesive places a "spring" between the specimen and the instrument. This can create another second order spring mass system (the mass being the weight of the accelerometer) and can cause serious measurement errors at high frequencies.

OPERATION

To operate Model 3225M23, it is necessary to connect it to a source of constant current in the range of 2 to 20 mA with a compliance voltage of +18 to +30 VDC. Dytran offers a variety of IEPE power units suitable for powering the 3225M23. The output from these power units is a low impedance voltage mode signal which may then be fed directly to the readout instrument(s).

The replaceable cable used with Model 3225M23 (model 6003A03) is terminated in a jack type (male thread) 10-32 coaxial connector. Dytran manufactures a series of cables suitable as extension cables for this instrument that will mate with this cable. The Model

6010A03 has a 10-32 plug at the end and would be used with power units which have a 10-32 "Sensor" jack. The Model 6011A03 cable has a BNC plug at the end and would be used when the power unit has a BNC "Sensor" jack.

The polarity convention of Model 3225M23 is positive for acceleration toward the top of the unit.

UNMOUNTING THE ACCELEROMETER

In order to "unmount" the Model 3225M23, use the Model 6591A tool. The larger slotted end of the tool is used for this purpose. Slip the tool over the accelerometer body from the rounded end (as opposed to the connector end) and gently rotate the tool in either direction until the adhesive shears and the instrument is released.

Do not use pliers, wrenches and other tools to remove the instrument as these are certain to mar or otherwise damage the unit.

After unmounting, inspect the mounting surface for traces of residual adhesive and remove completely to be ready for the next installation.

MAINTENANCE AND REPAIR AND RECALIBRATION

The only maintenance necessary is to keep the miniature coaxial connector and other cable connections clean and free from moisture and other contaminants.

Should a problem arise with the accelerometer or should it require routine recalibration, contact the factory for assistance in trouble shooting or returning the instrument for evaluation and/or repair. Do not send the instrument back without first calling the factory to obtain a Returned Material Authorization (RMA) number. This will help us track the repair/recalibration