



**Dynamic Transducers and Systems**

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OG3225M39  
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## **OPERATING GUIDE**

### **MODEL 3225M39**

### **MINIATURE HIGH SENSITIVITY PLANAR SHEAR MODE**

### **LIVM™ ACCELEROMETER WITH REMOVABLE CABLE**

#### **This manual contains:**

- 1) Outline/Installation drawing 127-3225M39
- 2) Paper "Low impedance Voltage Mode (LIVM) Theory and Operation"

**NOTE:** LIVM™ is Dytran's trademark for its line of Low Impedance Voltage Mode sensors with built-in amplifiers operating from constant current sources over two wires. LIVM instruments are compatible with all comparable systems designated IEPE.

## OPERATING INSTRUCTIONS

### MODEL 3225M39 MINIATURE IEPE ACCELEROMETER

#### INTRODUCTION

Model 3225M39 is a miniature, Low Impedance Voltage Mode (LIVM) 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 3225M39 may be mounted in very narrow spaces only slightly greater than .25 inch (6.4 mm) wide. The height is .23 inch (5.8 mm).

Model 3225M39 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 127-3225M39

Model 3225M39 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 3225M39 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 3225M39 to have a fixed voltage sensitivity (10 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.

#### REMOVABLE CABLE FEATURE

The cable designed for Model 3225M39 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 3225M39 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 3225M39, 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 3225M39 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 if 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 3225M39 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 3225M39, 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 3225M39. 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 3225M39 (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 3225M39 is positive for acceleration toward the top of the unit.

## **UNMOUNTING THE ACCELEROMETER**

In order to "unmount" the Model 3225M39, 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.