



Dynamic Transducers and Systems

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OPERATING GUIDE MODEL 3224A4

ULTRA-MINIATURE QUARTZ PLANAR SHEAR

IEPE ACCELEROMETER

WITH ATTACHED 3 ft. CABLE



This manual contains:

- 1) Specifications, Model 3224A4
- 2) Outline/Installation drawing 127-3224A4

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 other comparable systems labeled **LIVM™**.

OPERATING INSTRUCTIONS

MODEL 3224A4 MINIATURE IEPE ACCELEROMETER

INTRODUCTION

Model 3224A4 is one of the world's smallest IEPE piezoelectric accelerometers. It is designed to mount in spaces inaccessible to other types of accelerometers.

Featuring a titanium case and weighing only 0.2 grams, (less cable), 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 3224A4 may be mounted in very narrow spaces only slightly greater than .138 inch (3.51 mm) wide. The height is .118 inch (3.00 mm).

Model 3224A4 features a permanently mounted coaxial cable that has a 10-32 coaxial jack at the end. This cable is three feet long and is designed to mate with several models of extension cables.

A built-in, impedance converting electronics package converts the high impedance voltage output from the quartz shear mode seismic element to a low impedance voltage able to drive long cables with little or no attenuation.

DESCRIPTION

Refer to outline/installation drawing 127-3224A4

Model 3224A4 is constructed in a basically rectangular form with the integral cable exiting at one end of the rectangle. The case and cover are made from titanium for low mass and high stiffness.

Model 3224A4 generates an electrostatic voltage mode signal by stressing a "planar shear" type self-generating quartz crystal element in response to input acceleration. The planar quartz crystals are supported by a flat post and the seismic masses are fastened together by a preload screw, essentially holding the crystals and mass to the post with a high compressive force.

When the 3224A4 is accelerated along its 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 MOSFET input stage of a miniature on-board IC amplifier which drops the impedance level 10 orders of magnitude and adds a voltage gain of 3X. This allows the 3224A4 to have a fixed voltage sensitivity 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 high resonant frequency. This means that it may be used to measure high frequency vibrations with very little error.

INSTALLATION

IMPORTANT: Before mounting the Model 3224A4, identify the mounting surface. It is the slightly raised .129 diameter boss at the bottom of the instrument. The flat side is the top of the instrument. **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 3224A4, it is necessary to select (or prepare) a flat surface to accept the .129 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 3224A4 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 3224A4 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 3224A4, 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 LIVM power units suitable for powering the 3224A4. The output from these power units is a low impedance voltage mode signal, which may then be fed directly to the readout instrument(s).

Many measuring instruments such as spectrum analyzers and other types contain built-in current sources to power this type of accelerometer. These outputs are usually labeled "ICP" or IEPE. In this case, no power unit is required.

The fixed cable used on Model 3224A4 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 6010AXX (XX is the length in feet) has a 10-32 plug at the end and would be used with power units which have a 10-32 "Sensor" jack. The Model 60011AXX 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 3224A4 is positive for acceleration toward the top of the unit.

UNMOUNTING THE ACCELEROMETER

In order to "unmount" (remove) the Model 3224A4, use the Model 6725 removal tool. The 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 with a steady torque 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