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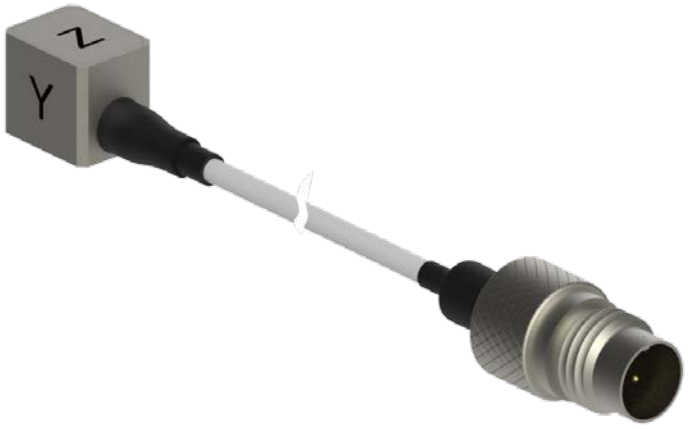
OPERATING GUIDE MODEL 3133A1

ULTRA-MINIATURE PIEZOCERAMIC PLANAR SHEAR

IEPE TRIAXIAL ACCELEROMETER

WITH ATTACHED 3 ft. CABLE



This manual contains:
1) Specifications, Model 3133A1
2) Outline/Installation drawing 127-3133A

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**^{TM}.

OPERATING INSTRUCTIONS

MODEL 3133A1 MINIATURE IEPE TRIAXIAL ACCELEROMETER

INTRODUCTION

Model 3133A1 is a miniature, low profile, voltage mode (IEPE) piezoelectric triaxial accelerometer designed to mount in spaces inaccessible to other types of triaxial accelerometers. This model is the world's smallest true IEPE accelerometer.

Featuring a titanium case and weighing only 0.8 grams, this instrument is ideal for shock and vibration testing of very small lightweight specimens such as printed circuit boards, board-mounted components and other miniature products.

Designed for adhesive mount, Model 3133A1 may be mounted in very narrow spaces only slightly greater than 0.24 inch (6.1 mm) wide. The height is 0.23 inch (5.8 mm).

Model 3133A1 features a permanently mounted coaxial cable which has a 4-pin connector at the end. This cable is three feet long and is designed to mate with several models of extension cables for connection to IEPE power sources.

Three built-in impedance-converting IEPE electronics modules convert the high impedance charge mode outputs from the three orthogonally mounted piezoceramic seismic elements to low impedance voltages able to drive long cables without insignificant attenuation.

DESCRIPTION

(Refer to outline/installation drawing 127-3133A.)

Model 3133A1 is constructed in a basically cubic form with the integral cable exiting at one side of the cube. The housing is made from titanium for low mass and high stiffness.

In each of the three orthogonal axes, Model 3133A1 generates an electrostatic charge mode signal by stressing a "planar shear" type self-generating ceramic crystal element in response to input acceleration. A central post supports the planar ceramic crystals and the three seismic masses are fastened to the post by preload screws, essentially holding the crystals and mass to the post with high compressive force. When the unit is accelerated in any of its three axes, the crystals are stressed in shear mode generating an electrostatic charge analogous to this acceleration.

These very high impedance charge mode signals are fed to the MOSFET input stages of three miniature on-board IC charge amplifiers which convert the charge signal to a low impedance voltage. This drops the impedance level 10 orders of magnitude and allows the 3133A1 to have fixed voltage sensitivity and imparts 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 3133A1, identify the mounting surface. It is the slightly raised 0.19 diameter boss at the bottom of the instrument. The flat side is the top of the instrument. **DO NOT MOUNT TO THE TOP SURFACE. T**he signal polarity will be reversed for the Z axis and the sensitivity and frequency response will be adversely affected if mounted in the inverted position.

To install Model 3133A1, it is necessary to select (or prepare) a flat surface to accept the 0.19 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 .0001 TIR will give excellent results, especially 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 quickest method of mounting is by the use of Petro Wax, a small container of which is supplied with each accelerometer. Use this method if the shock and/or acceleration levels are relatively gentle. Simply place a small amount of this wax on either the accelerometer mounting surface or the test surface and press the accelerometer firmly onto the test surface.

For a more permanent mounting for higher shock and vibration levels, 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 3133A1 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 adhesive ages, 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.

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 test specimen surface and the 3133A1. 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 3133A1, it is necessary to connect each of the three axes 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 3133A1. 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 fixed cable used on Model 3133A1 is terminated in a 4-pin connector. Dytran manufactures a series of cables suitable as extension cables for this instrument that will mate with this cable.

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 external power unit is required as these units supply the 2 to 20 mA current necessary to power the three axes of this accelerometer.

SIGNAL POLARITY

The polarity convention of Model 3133A1 is positive-going output signal voltage for acceleration in the direction of the three industry standard X, Y and Z axes designators as indicated in the outline/installation drawing 127-3133A.

UNMOUNTING THE ACCELEROMETER

In order to "unmount" or remove the Model 3133A1 when using the stronger adhesives, use the Model 6741 removal tool supplied with the instrument. Slip the tool over the accelerometer body 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 these completely with an appropriate solvent to be ready for the next installation.

MAINTENANCE, REPAIR AND RECALIBRATION

The only maintenance necessary, or possible, is to keep the 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 **R**eturned **M**aterial **A**uthorization (**RMA**) number. This will help us track the repair/recalibration through our system.