



Dynamic Transducers and Systems

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OPERATING GUIDE

MODEL 3093M4 MINIATURE HIGH SENSITIVITY

TRIAxIAL LIVMtm ACCELEROMETER

WITH SINGLE 4-PIN CONNECTOR,

INTERNALLY CASE GROUND ISOLATED

Model 3093M4 is a miniature, Low Impedance Voltage Mode (LIVM)tm triaxial accelerometer featuring a single, transverse mounted, 4-pin electrical connector. This feature allows the 3093M4 to be used in situations where vertical space is limited. Model 3093M4 is internally case ground isolated.

The sensitivity of each of the three orthogonal axes of Model 3093M4 is nominally 50 mV/G.

This Guide contains:

- 1) Specifications, Model 3093M4
- 2) Outline/Installation Drawing 127-3093M4
- 3) Paper, "Low Impedance Voltage Mode (LIVM) Theory and Operation"

NOTE: LIVMtm 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 most other manufacturers' comparable systems.



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MODEL 3093M4 TRIAXIAL ACCELEROMETER

INTRODUCTION

Model 3093M4 is a miniature three-axis accelerometer using piezoceramic planar shear technology coupled with 2-wire internal LIVM electronics.

This instrument contains three miniature piezoceramic planar shear mode accelerometer elements mounted to a single ground-isolated central element support. This ground-isolated sub assembly is laser welded into a Titanium housing. The three elements are mounted orthogonal to each other so that they can measure the complete motion of a point.

Model 3093M4 mounts with adhesives.

LIVM (Low Impedance Voltage Mode) design means that three miniature amplifiers are built into the instrument, one for each axis, to lower the impedance of the piezoceramic elements by many orders of magnitude. This technique allows the driving of long cables with little effect on sensitivity.

All elements are internally isolated from the outer case and are enclosed by a Faraday shield for improved noise immunity. The sensitivity of each of the three axes is 50 mV/g.

DESCRIPTION

Refer to the outline/installation drawing 127-3093M4 for the dimensions of Model 3093M4.

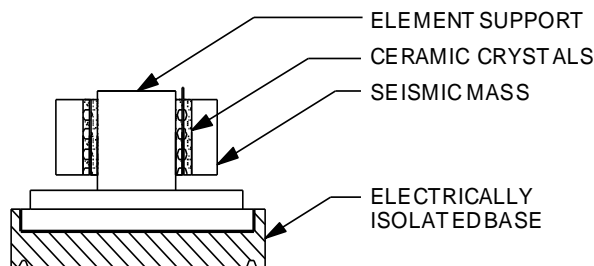


Figure 1 Representative cross section, 3093M4 element assembly

The electrical connections from the 3 charge amplifiers, are brought out to the contacts of a single four-pin connector mounted transversely to one vertical face of the housing. The three signal/power connections to the elements are connected to each of three pins while the three ground returns for the elements are tied together to one common pin of the four-pin connector. The case of this instrument is electrically isolated from electrical signal/power ground.

The housing and connector shell of model 3093M4 are made from Titanium alloy for low mass and high rigidity.

INSTALLATION

This accelerometer is designed for adhesive mounting. Identify the mounting surface by looking for the circular weld indication and no identifying markings. This is the mounting surface for Model 3093M4 and the one that is used at the factory during calibration. If the accelerometer is mounted on any other surface, its calibration cannot be guaranteed.

Select a smooth surface approx. 5/8 (.625) in. in diameter and clean off all oil, debris and any contaminants or foreign matter that would preclude a good bond. Various adhesives may be used to mount Model 3093M4 but the adhesives of choice for ease of use are any of the cyanoacrylate "instant" adhesives. They are tough and they set almost instantly. They also do not require a thick bond line which is good for high frequency response.

The selected (or prepared) mounting area should be flat to within .001 in TIR for best high frequency response.

NOTE: Before mounting, be sure to clean the mounting surface thoroughly to avoid inclusion of machining chips and other debris between mating surfaces. Intimate contact between mating surfaces is important for best performance.



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If a fair amount of motion is expected during the test, it is good practice to tie the cable down to a stationary point as close as possible to the accelerometer (but not closer than 1 inch) to avoid potentially damaging cable whip. You are now ready to connect the 3093M4 to the power unit.

OPERATION

The recommended power unit for Model 3093M4 is the 4114B1. This power unit has four channels so it can power each of the three channels of the 3093M4 with one channel left over for powering another LIVM sensor if necessary. Model 4114B1 has a switch-selected front panel voltmeter to aid in system troubleshooting. More on this topic in subsequent paragraphs.

The recommended cable for Model 3093M4 is the Model 6430AXX (XX = length in feet). This cable has a four-pin connector at one end that mates with the connector of the 3093M4. The other end terminates in 3 BNC plugs labeled, Axis 1, Axis 2 and Axis 3.

Connect the 4-pin connector of the cable to the connector of the 3093M4, taking care to align the connectors properly using the alignment groove on the cable connector to engage the matching tab on the 3093M4 connector. Press the connectors together to engage the screw threads and rotate the cable nut until the connectors mate fully. Hand tighten the cable nut. Don't use pliers to tighten.

Apply power to the power unit and allow several seconds for coupling capacitors to fully charge. Rotate the channel selector knob through the first three positions to monitor the bias voltage of each of the three accelerometer element assemblies to check for normal operation. The bias voltage level appears on the front panel mounted voltmeter on the 4114B1.

Although only one axis of the 3093M4 may be monitored with the front panel meter on the 4114B1, each axis is continuously outputting data at the respective output jack at all times. Selecting a channel for bias monitoring does not affect the signal from that channel.

NOTE: Consult the paper, "Low Impedance Voltage Mode (LIVM) Theory and Operation", included as part of this manual, for instructions in using the bias monitoring voltmeter on the power unit as a check for normal operation and as an effective trouble shooting aid.

The 4-channel 4114B1 power unit has four BNC jacks for the output signal connections. (Only three are needed for the 3093M4.) Each jack is clearly marked as to the channel it represents. Connect each of the corresponding three BNC 'Output' jacks of the power unit to the readout instrument or data collector and proceed with the measurement. The sensitivities of each of the three axes are directly in mV/g and are specified precisely in the calibration certificate supplied with each instrument.

Be sure to check the orientation of each axis with the markings on the instrument upper surface and/or the outline/installation drawing supplied with the Operating Guide. The polarity of each axis is also define with arrows engraved in the top surface of the 3093M4 and again, on the outline/installation drawing 127-3093M4. The arrows indicate the direction and sense of motion of the accelerometer that will produce positive-going output signals. The vertical axis, axis 3, produces positive-going output voltage when the accelerometer is accelerated upward, i.e., away from the mounting surface.

REMOVAL (OR UN-INSTALLATION)

It is very important when removing this instrument to remember that, although it is built to be very rugged, it is a sensitive measuring instrument and as such should be treated gently when being removed from its installation. Never strike the unit to break it free from its mounting surface. Simply grip two opposing flats with an adjustable or open-end wrench and gently twist the instrument until the adhesive bond shears. This method avoids any trauma to the instrument and will help ensure a long life for the accelerometer.



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MAINTENANCE AND REPAIR

This instrument is not field repairable. No maintenance is required, or possible. If a problem occurs, contact the factory for help. You will be assigned a Returned Material Authorization (RMA) number should the instrument have to be returned to the factory for evaluation. A short note describing the problem will facilitate the repair procedure.

There is no charge for evaluation of the instrument and we will perform no repair work until you are notified of any charges.

It is good practice to return the instrument to the factory for recalibration from time to time with frequency of recalibration dependent on usage intensity and frequency.