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OPERATING GUIDE

MODEL 3049D, 3049D1

HIGH SENSITIVITY MINIATURE LOW PROFILE

CHARGE MODE ACCELEROMETER,

HERMETICALLY SEALED, GROUND ISOLATED

3049D

3049D1

NOTE:
Model 3049D features very low mass and hermetically sealed construction. Hermeticity is obtained by all-welded construction and glass-to-metal sealed connector. Electrical connection is via a top mounted 10-32 coaxial connector. 3049D has integral 10-32 stud mount, 3049D1 is adhesive mount. Performance characteristics are identical.

This guide contains:
1) Operating instructions, Model 3049D.
2) Specifications, Model 3049D
3) Outline/installation drawing, 127-3049D
4) General Guide to Charge Mode Accelerometers.

DYTRAN INSTRUMENTS, INC.

SPECIFICATIONS MODEL 3049D, 3049D1

SPECIFICATION	VALUE	UNITS
PHYSICAL		
WEIGHT, 3049D	3.2	grams
WEIGHT, 3049D1	3.0	grams
SIZE, HEX X HEIGHT	.39 (10mm) X .54	inches
MOUNTING, 3049D	10-32 integral stud	
MOUNTING, 3049D1	adhesive mount	
CONNECTOR, TOP MOUNTED	10-32	coaxial
MATERIAL, HOUSING AND CONNECTOR	Titanium alloy	
PERFORMANCE		
SENSITIVITY, NOM.[1]	5.8	pC/g
FREQUENCY RANGE, ± 5%	to 8k	Hz
RESONANT FREQUENCY, NOM.	40	kHz
LINEARITY [2]	± 1%	% F.S.
TRANSVERSE SENSITIVITY, MAX.	5	%
STRAIN SENSITIVITY	.03	g/με @250με
ENVIRONMENTAL		
MAXIMUM VIBRATION/SHOCK	1000/2000	±g pk
TEMPERATURE RANGE	-100 to +350	°F
SEAL, HERMETIC	glass-to-metal and TIG welded	
COEFFICIENT OF THERMAL SENSITIVITY	.06	%/°F
ELECTRICAL		
CAPACITANCE, NOM.	650	pF
OUTPUT SIGNAL POLARITY FOR ACCELERATION TOWARD TOP	positive	
CASE GROUNDING	signal ground is isolated from mounting surface	

[1] Measured at 100 Hz, 1 g rms per ISA RP 37.2.
[2] Measured using zero-based best straight-line method, % of F.S. or any lesser range.

OPERATING INSTRUCTIONS, MODEL 3049D
MINIATURE CHARGE MODE ACCELEROMETER

INTRODUCTION

The Dytran Model 3049D accelerometer is a miniature low-profile piezoceramic shear, charge mode, hermetically sealed instrument, designed to measure high frequency shock and vibration at high temperatures. Its small size and mass (only 3 grams) makes it ideal for measurement of very small test objects where space is at a premium. Model 3049D has an integral 10-32 mounting stud, while Model 3049D1 is designed for adhesive mounting.

The self-generating ring shear mode seismic element, utilizing piezoceramic crystalline material, converts input acceleration (vibration and shock) to an analogous charge signal. This signal is connected to a miniature hermetically sealed 10-32 coaxial connector mounted vertical to the centerline of the instrument.

Simple in-line charge amplifiers such as Dytran's Model series 4705A or 4751B may be used to convert the signal from the 3049D to IEPE operation. Laboratory charge amplifiers may also be used to amplify and/or standardize the signal.

Model 3049D features hermetic sealed construction for normal operation in moist and dirty environments. The nominal sensitivity of Model 3049D is 5.8 pC/g.

DESCRIPTION

Model 3049D is a low-profile instrument with a 10 mm hex housing and a 10-32 electrical connector mounted vertically atop the housing on the center line of the unit.

The seismic mass, made from a very dense tungsten alloy, is bonded around the piezoceramic shear mode crystal. This means there is insignificant relative motion between mass, crystals and base keeping the non- linearity low and the natural frequency high.

The force from acceleration (vibration or shock) acting upon the mounting base, is transferred to the seismic mass through the crystal, stressing the crystal in shear mode and producing an electrostatic charge proportional to the input acceleration. This signal is connected to the axial 10-32 coaxial connector, integral to the housing.

SIGNAL POLARITY

The output polarity of Model 3049D is positive-going in response to acceleration toward the top of the instrument. Bear in mind however that Dytran charge amplifiers are inverting amplifiers and the resultant signal will be inverted, i.e., will be negative-going with acceleration toward the top of the instrument, if used with such an amplifier.

INSTALLATION

(Refer to Outline/Installation drawing 127-3049D)

To install Model 3049D or Model 3049D1 accelerometers, it is necessary to prepare (or find) a flat mounting area of approximately 0.5 inch diameter. Ideally, the mounting surface should be flat to .001 in. TIR. The flat mounting surface ensures intimate contact between accelerometer base and mounting surface for best high frequency transmissibility, thus accuracy.

To install the adhesive mounted 3049D1, clean the mounting surface with solvent, if necessary, to remove all traces of oils and other impurities including burrs or any matter which could preclude intimate contact between mating surfaces.

Apply a light coating of cynoacrylate adhesive (or other type of suitable adhesive) to either mounting surface, position the accelerometer in the desired cable orientation and press the accelerometer firmly onto the mounting surface and hold for several seconds.

NOTE: It is important to keep the bond line as thin as possible, consistent with a secure installation, for best high frequency response.

To install the stud mounted 3049D, drill and tap a 10-32 mounting hole with enough thread depth

to accommodate the integral stud. Clean the area to remove all traces of machining chips, burrs, etc. Spread a light coating of silicone grease, or other lubricant, on either of the mating surfaces and thread the accelerometer/stud combination into the tapped hole by hand, until the accelerometer base seats against the mounting surface. Check to see that the mating surfaces are meeting properly, i.e., that they are meeting flush and that there is not an angle formed between the two surfaces indicating that they are not co-planar. If this condition is observed, torquing the accelerometer down will strain the base causing possible poor frequency response and even erroneous reference sensitivity. Inspect the perpendicularity of the tapped hole. If the hand tight meeting between the two surfaces is satisfactory, torque the 3049D to the mating surface with 15 to 20 lb-inches of torque, preferably measuring the torque with a torque wrench torquing on the hex surface only.

Proper torque will ensure the best high frequency performance from the instrument as well as repeatability of sensitivity when mounting and remounting. Excessive torque could damage the ground isolation base.

Connect the cable, typically Models 6013AXX (10-32 to 10-32) or 6019AXX (10-32 to BNC) to the accelerometer snugging up the threaded lock ring tightly by hand.

NOTE: Since this is a charge mode instrument, only low-noise treated coaxial cable must be used to connect this instrument to its charge amplifier. Both cables that we recommend are low-noise treated.

NOTE: Do not use pliers or vise grips on the knurled lock ring. This could damage the connector of the 3049D and/or the cable connector.

To avoid stressing the cables which could lead to early failure, especially under larger excursions of the test object, it is good practice to tie the cable down to a fixed surface near the mounting area at a point approximately one inch from the accelerometer.

If there is excessive motion between the accelerometer and the nearest tie point, allow a strain loop of cable to let relative motion occur without stressing the cable.

Connect the other end of the cable to the input of the charge amplifier and switch the power on.

THE CHARGE AMPLIFIER

Model 3049D is a piezoceramic instrument and as such, it is usually used with an AC-coupled charge amplifier rather than a direct-coupled electrostatic charge amplifier such as those designed for use with quartz sensors. Because of the reduced insulation resistance of piezoceramic materials, direct coupled charge amplifiers may drift when the 3049D is connected to the input unless there is a provision for AC coupling at the input or reduced time constant such as featured in Dytran laboratory charge amplifiers.

For this reason, it is best to use one of the in-line series of amplifiers such as the 4705A, 4751B or a true vibration type laboratory charge amplifier which is AC coupled or has provision for piezoceramic sensor inputs. These amplifiers convert to 3049D to 2-wire IEPE operation. Again, remember that all of Dytran's charge amplifiers are inverting amplifiers which will result in a reversal of the signal polarity of the 3149C.

HIGH FREQUENCY RESPONSE

All piezoelectric accelerometers are basically rigid spring mass systems, i.e., second order mechanical systems with essentially zero damping. As a result, these instruments will exhibit a rising characteristic as the resonant frequency is approached. Some charge amplifier feature low-pass filtering to compensate for this characteristic.

The upper frequency at which the sensitivity may increase or decrease by 15% is approximately 10,000 Hz, the frequency to which the 3049D is calibrated. The accelerometer is usable above this frequency but to use it above 10,000 Hz, it must be calibrated at the specific frequencies of intended use because sensitivity deviations will increase drastically as you exceed this high frequency calibration limit. Consult the factory for special calibrations required above 10,000 Hz.

CAUTIONS

1) Do not store or use the 3049D above 400°F. This could compromise the integrity of the piezoelectric crystals and result in modified sensitivity.

2) Do not allow cables to vibrate unrestrained. This will eventually destroy the cable and could lead to system inaccuracies.

3) Avoid dropping or striking the accelerometer, especially against rigid materials such as concrete and metals. This type of damage is not covered by the warranty.

MAINTENANCE AND REPAIR

The welded construction of the Model 3049D precludes field repair.

Should the mounting surface become distorted, nicked and otherwise distressed, so as to make operation suspect, return the instrument to the factory for repair. We can re-lap the mounting surface to restore the flatness to original specifications.

Should the electrical connector become contaminated with moisture, oil, grease, etc., the entire instrument may be immersed in degreasing solvents to remove the contaminants. After degreasing, place the instrument in a +200°F to +300°F oven for one hour to remove all traces of the solvent.

Should a problem be encountered with the operation of the instrument, contact the factory for trouble shooting advice. Often our service engineers may point out something which may have been overlooked and which may save the expense and time of returning the 3049D to the factory.

If the instrument must be returned, the service department will issue you a Returned Materials Authorization (RMA) number to aid in tracking the repair through the system. Do not send the instrument back without first obtaining an RMA number. At this time you will be advised of the preferred shipping method.

A short note describing the problem, included with the returned instrument, will aid in trouble shooting at the factory and will be appreciated.

We will not proceed with a non-warranty repair without first calling to notify you of the expected charges. There is no charge for evaluation of the unit.