



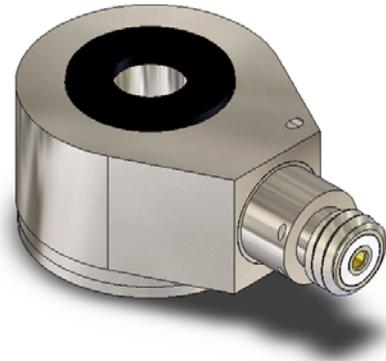
Dynamic Transducers and Systems

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OPERATING GUIDE

SERIES 3211A

GENERAL PURPOSE IEPE ACCELEROMETER



NOTE:

Series 3211A are low noise general purpose accelerometers. Series 3211A accelerometers mount with standard screws, either #8 or M3 threads.

These models features ceramic shear mode crystals combined with proven IEPE (built-in electronics) technology.

All models feature ground isolation construction to minimize ground loops.

This guide includes:

- 1) Specifications, Model 3211A
- 2) Outline/Installation drawing 127-3211A.
- 3) Paper, "Low Impedance Voltage Mode (IEPE) Theory and Operation"

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 most other manufacturers' comparable systems.



SPECIFICATIONS, SERIES 3211A IEPE ACCELEROMETERS

SPECIFICATIONS BY MODEL

MODEL	RANGE F.S. (g)	MAXIMUM SHOCK (g)	SENSITIVITY (NOM) (mV/g)	ELECTRICAL NOISE (g)	NATURAL FREQUENCY (kHz)
3211A1	500	5000	10	0.0005	38
3211A2	50	5000	100	0.0001	38

COMMON SPECIFICATIONS

SPECIFICATION	VALUE	UNITS
DISCHARGE TIME CONSTANT, NOM.	0.5	SECOND
LOW FREQUENCY -3db POINT, NOM.	0.2	Hz
LOW FREQUENCY -5% POINT	0.6	Hz
LINEARITY [1]	±1	% F.S.
TRANSVERSE SENSITIVITY, MAXIMUM	5	%
OUTPUT IMPEDANCE, NOM.	120	OHMS
OUTPUT VOLTAGE BIAS, NOM.	+12	VDC
SUPPLY CURRENT RANGE [2]	2 to 20	mA
COMPLIANCE (SUPPLY) VOLTAGE RANGE [4]	+18 to +20	VDC
OPERATING TEMPERATURE RANGE	-60 to +250	°F
SIZE (DIA x HEIGHT) [3]	0.6 x 0.42	INCHES
WEIGHT	10	GRAMS
CONNECTOR, SIDE MOUNTED	10-32 COAXIAL	
MATERIAL, HOUSING/CONNECTOR	TITANIUM ALLOY	
MOUNTING PROVISION, 3211A/3211AT/3211AM	THRU HOLE FOR #8 OR M4 THREAD SCREW	
ENVIRONMENTAL SEAL	HERMETIC	
ISOLATION, CASE TO MOUNTING SURFACE, MIN	10	MΩ

[1] Percent of full scale or any lesser designated full scale range, zero-based best fit straight line method.

[2] Power only with Dytran or Dytran approved current source type power unit. Do not supply power without current limiting. You will destroy the integral electronics. This will void the warranty.

[3] Height measured from mounting surface to top of connector. Integral mounting studs are .20 in. long.



OPERATING GUIDE

SERIES 3211A ACCELEROMETERS

INTRODUCTION

Series 3211A accelerometers are designed for general purpose measurement of acceleration. These rugged instruments feature shear design ceramic seismic elements for high natural frequency and ruggedness. On-board miniature IC amplifiers convert the very high impedance voltage signals from the crystals to a much lower impedance level which allows these instruments to drive long cables with negligible signal loss. The output signals are directly in units of mV/g.

This series of instruments are part of Dytran's line of IEPE instrumentation and as such, may be compatible with existing installations from other manufacturers which use similar principles.

DESCRIPTION

NOTE: Refer to Outline/Installation drawing (127-3211A) supplied with this manual for a physical outline of Series 3211A.

The ceramic element is mounted within the housing by means of a rigid clamping mechanism. The crystal is tightly preloaded in place between the base and the seismic mass. When the instrument senses acceleration into its base, the seismic mass is accelerated through the crystal accordingly. The inertial force from the seismic mass acting upon the crystal, produces a force equal to the mass times the acceleration. This force then squeezes or relaxes the preload on the crystal, depending upon its sense, producing a voltage analogous to the impinging acceleration input.

This signal is processed by the IC amplifier which drops the impedance level approximately 10 orders of magnitude to 120Ω . This allows the signal and constant current power to be carried over long cables with little or no loss.

The amplifier is connected to the OUTPUT/POWER pin of the connector where it can be connected to the IEPE power unit.

The inner body of the 3211A is electrically isolated from the mounting surface. This is to eliminate annoying "ground loops" which can cause spurious signals to interfere with the measurements.

INSTALLATION

Consult the Outline/Installation drawing (127-3211A), provided with this Operation Guide, for instructions as to mounting port preparation for your particular model.

When preparing the accelerometer mounting ports, it is important to first prepare a smooth, flat $\text{Ø}.50$ min. mounting surface, flat to at least .0005 TIR. At the center, drill and tap the mounting hole.

It is especially important that the mating surfaces of accelerometer and mounting surface be in intimate contact for best high frequency performance of the accelerometer. This is doubly important when measuring fast rise time events which may excite lower frequency resonances in the accelerometer which may exist due to poor contact between surfaces. Make sure that there are no foreign particles clamped between these surfaces when the instrument is installed. Clean both surfaces well to remove any machining chips which may linger due to the drilling and tapping operations. Blow the port out with compressed air if available to ensure that all chips are gone. Check surfaces for other contaminants as well.

Before installing the accelerometer, coat the mounting surface with a thin layer of silicone grease. This will help to attain optimum mechanical coupling between mating surfaces.

Torque the accelerometer in place in accordance with instructions on Outline/Installation drawing (127-3211A). Torquing to the prescribed torque level will ensure that the calibration figures will be most accurate and that you are not overtorquing, (which could damage the unit) or undertorquing (which could cause the accel. to loosen while in use).



POWERING AND ELECTRICAL CONNECTIONS

Dytran manufactures several IEPE current source power units suitable for powering Series 3211A accels. The battery powered 4102C and the line powered 4110C are the least expensive, single channel power units available for this purpose. For multi-channel installations, the 4-channel 4114B1, the 6-channel 4120 and the 12 channel 4121 are all capable of powering these units.

Connection to Series 3211A is made with a 10-32 coaxial cable. Connect the accelerometer to the "Sensor" jack of the power unit. Verify that the proper bias voltage is present at the 3211A by observing the bias monitoring voltmeter located on the front panel of most Dytran power units. A mid-scale reading of approx. +12 VDC is typical and indicates that the internal amplifier and cables are operating normally.

After powering the system, allow several seconds for the bias voltage to settle and for coupling capacitors to fully charge before taking measurements.

SENSOR DRIVE CURRENT

Many Dytran power units have adjustable constant current settings over the range from 2 to 20 mA. The higher sensor drive current increases the slew rate capabilities of the internal amplifier which is necessary for high fidelity reproduction of very short rise time pulses. We suggest using 10 mA for driving of short cables (3 to 10 ft.) and 20 mA for longer cables.

SIGNAL POLARITY

The unit is designed to give positive-going output voltage when the acceleration acts from the base upward toward the top of the instrument.

It is perfectly acceptable to reverse the direction of the acceleration and create a negative-going output pulse. The calibration factor is valid in both directions.

PRECAUTIONS

To maximize the useful life of this instrument, the following precautions should be observed:

Do not connect any source of power to these instruments which **does not** include current limiting protection. This would include batteries and other DC power supplies. Series 3211A must be powered from constant current sources with current limiting ranges from 2 to 20 milliamps. If a DC power source without this limitation is connected to the input connector, the instrument will try to draw infinite current and will immediately self destruct.

Whenever possible, use a Dytran (or Dytran approved) power unit to avoid such problems.

Do not subject the Model 3211A to temperatures above +250°F (121°C). To do so may destroy the internal amplifier.

Always inspect the mounting surfaces for burrs and other inclusions which could preclude intimate contact between mounting surfaces. Damage to mounting surfaces can occur and further, it is very important, for accurate transmissibility of high frequency information, that the mounting surfaces be in tight, intimate contact.

MAINTENANCE AND REPAIR

Because of the small size and sealed construction, very little maintenance is possible or required. The connector may be cleaned, if necessary, with a solvent such as alcohol. Inspect the mounting surface from time to time and if it sustains damage (nicks, gouges, etc.), it should be returned to the factory for refacing of the mounting surface along with recalibration.

If it is decided that the unit needs repair or recalibration, before returning the instrument to Dytran for service, please contact the factory to obtain a Returned Material Authorization (RMA) number. This will aid in moving the instrument through the repair and recalibration cycle.