Dytran by HBK
HOTTINGER BRÜEL & KJÆR

SPACE APPLICATIONS

Advanced sensors for a dynamic world

Rocket boosters and spacecraft are subject to high levels of vibration affecting structures and on-board equipment. Dytran by HBK AC and DC response accelerometers monitor structural interactions with propulsion systems and flight sensors that can cause low frequency flight instabilities.

Space Vehicle, Ground and Flight Testing

Dytran by HBK sensors for space flight are low outgassing, lightweight, and packaged in hermetically sealed housings to withstand extreme environments.

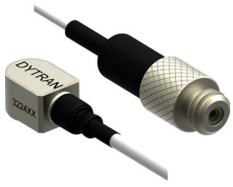
SATELLITE ROCKET AND CAPSULE GVT AND MODAL TESTING

Measure and evaluate all aspects of structural dynamics and component response including vibration, modal analysis, and shock in both large and small space structures. For use in characterizing flight and non-flight hardware in ground test vibration laboratories.

3224A Series: Ultra Miniature Accelerometer

Features: IEPE, titanium, miniature

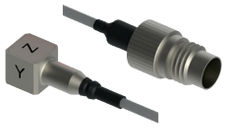
- Sensitivities (mV/g): 0.2, 1, 2, 5, 10
- Frequency ranges (±10%): 0.2 to 20,000 Hz
- -60 to +300°F (-51 to +149°C)



3133D Series: Triaxial Accelerometer

Features: IEPE, titanium, hermetically sealed, miniature, adhesive mount, low outgassing, low base strain sensitivity, TEDS options

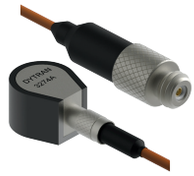
- Sensitivities (mV/g): 10, 2, 5, 0.7, 0.25
- Frequency ranges (±10%): 0.25 to 10,000 Hz
- -67 to +320°F (-55 to +160°C)



3274A Series: Miniature Accelerometer

Features: IEPE, titanium, hermetically sealed, case isolated

- Sensitivities (mV/g): 5, 10
- Frequency ranges (±10%): 1.0 to 10,000 Hz
- -40 to +185°F (-40 to +85°C)



Model 3273A: High Temperature Accelerometer

Features: Titanium, case isolated, ultra low noise, adhesive mount, extended low frequency response, lightweight

- Sensitivities (mV/g): 10, 50, 100
- Frequency ranges (±15%): 0.3 to 10,000 Hz
- -60 to +185°F (-51 to +85°C)

Model 5850B: Dynapulse™ Impulse Hammer

Features: BNC connector, 3-position sensitivity toggle switch

- Selectable sensitivity of 1, 10 or 100 mV/LbF
- Maximum force of 5,000, 500 or 50 LbF
- Interchangeable impact tips

Model 3143M16: Cryogenic Triaxial Accelerometer

Features: IEPE, hermetically sealed, case isolated, low profile, 360° cable orientation

- 10 mV/g sensitivity
- Frequency ranges (±5%): 1.6 to 5,000 Hz
- -320 to +250°F (-196 to +121°C)

3334A Series: Cryogenic Accelerometer

Features: IEPE, titanium, hermetically sealed, miniature size

- 10 mV/g sensitivity
- Frequency ranges (±5%): 1 to 10,000 Hz
- -320 to +250°F (-196 to +121°C)

Model 3313A4: Cryogenic Triaxial Accelerometer

Features: Titanium, IEPE, hermetically sealed, broad frequency response, miniature design

- Sensitivity (±10%): 5 mV/g
- Frequency ranges (±15%): 1.2 to 10,000 Hz
- -320 to +250°F (-195 to +121°C)

3023B Series: Triaxial Miniature Accelerometers

Features: Titanium, hermetic, lightweight, triaxial, TEDS options, high temp options, IEPE

- Sensitivities (–10%/+15%): 1, 5, 10 mV/g
- Ranges (±): 5,000, 1,000, 500 g pk
- Frequency ranges (±15%): 1.29-10,000 Hz
- Weight: 3 grams

7577A Series: High Precision MEMS Accelerometer

Features: Measures extended frequency range, low profile, high shock survival, differential output, hermetically sealed

- Sensitivities (mV/g): 800, 20
- Frequency ranges (±3dB): 0-1,900 to 0-7,000 Hz
- -67 to +257°F (-55 to +125°C)

3713AT Series: Triaxial Accelerometer with TEDS

Features: Stainless steel, IEPE, case isolated, hermetically sealed, robust, 360° cable orientation

- Sensitivities (mV/g): .5, 5, 10
- Frequency ranges: (±10%): 0.4-4,000 to 1.1-4,000 Hz,
- -320 to +302F (-195 - +150C)

3225F Series: Miniature Accelerometer

Features: IEPE, titanium, adhesive mount, low outgassing, TEDS options

- Sensitivities (mV/g): 1, 5, 10, 50, 100
- Frequency ranges (±10%): 1.0-10,000 to 2.0-10,000 Hz
- -60 to +250°F (-51 to +121°C)

DYNAMIC PRESSURE SENSORS

Piezoelectric pressure sensors measure small to large dynamic perturbations (typically in the range of 1Hz to tens of thousands of Hz) in the presence of high static pressure heads in closed systems, or in free-field conditions. Typical piezo microphone applications include acoustic chambers or other situations where a vibration environment is created as a result of high level acoustic noise.

2006V Series: IEPE Pressure Sensor

Features: IEPE, stainless steel, hermetically sealed, case isolated, ATEX certified, acceleration compensated

- Sensitivities (mV/psi): 50, 100
- 8,000 psi maximum pressure
- -40 to +250°F (-40 to +121°C)

2008A: Dynamic Pressure Sensor

Features: Wide temperature range, accelerometer compensation, electrically isolated housing, hermetically sealed

- 1 mV/psi sensitivity
- 10,000 psi maximum pressure
- Sensor End: -320 to +600°F (-196 to +316°C)
- Connector End: -67 to +250°F (-55 to +121°C)

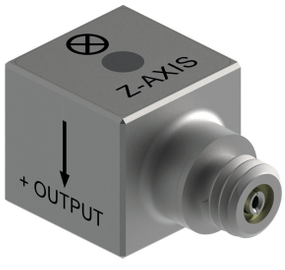
HOT FIRING / ENGINE TEST STAND VIBRATION

Measure vibration on or near engines, nozzles, pumps, impellers, high frequency bearings, shafts, and electronics enclosures mounted in high temperature areas during hot firings.

3316C7 Series: High Temperature Accelerometer

Features: Hermetically Sealed, Miniature Size, High Temperature Operation, Ruggedized Connector

- +1,100 F (+593C) operation
- Sensitivity: 1 to 2 pC/g
- Upper-frequency range (10%): 10,000 Hz*
- Weight: 6.0 grams



Model 3683C: Ground Isolated Triaxial Accelerometer

Features: Center bolt mounting allows for perfect alignment of multi-directional cable exit to reduce spiking, charge mode, hermetic, alloy 600

- +1,000°F (+538°C) operation
- Upper-frequency range (±3dB): 3,000 Hz*
- 1 to 2 pC/g sensitivity
- 65 grams

Model 3335C: Ultra High Temp Accelerometer

Features: Integral hardline cable, electrically isolated, charge mode, alloy 600, hermetic

- +1,200°F (+649°C) operation
- Upper-frequency range (±5%): 2,000 Hz*
- 1 to 2 pC/g sensitivity
- 35 grams

* Low frequency response is the function of the discharge time constant of the charge amplifier used.

STRUCTURAL FLIGHT TEST AND ENGINE TEST STAND

AC and DC response space flight sensors are used to acquire modal analysis, damping, resonant frequency, and load data during flight. Vibration in cold flow sections is addressed with IEPE cryogenic accelerometers, while DC-MEMS sensors are for modal and load analysis.

7583A Series: Triaxial VC MEMS Accelerometer

Features: Differential output, measures extended frequency response, hermetically sealed, DC-MEMS

- Sensitivities (mV/g): 800, 400, 133, 40
- Frequency ranges (±3dB): 0-1,900 Hz to 0-5,000 Hz
- -67 to +257°F (-55 to +125°C)

7577A Series: High Precision MEMS Accelerometer

Features: Measures extended frequency range, low profile, high shock survival, differential output, hermetically sealed

- Sensitivities (mV/g): 800, 20
- Frequency ranges (±3dB): 0-1,900 Hz to 0-7,000 Hz
- -67 to +257°F (-55 to +125°C)

3334A Series: Cryogenic Accelerometer

Features: IEPE, titanium, hermetically sealed, miniature

- 10 mV/g sensitivity
- Frequency ranges (±5%): 1.2 to 6,000, 1 to 10,000 Hz
- -320 to +250°F (-196 to +121°C)

3233AT: Triaxial Thru Hole Accelerometer

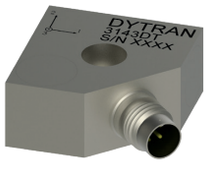
Features: IEPE, titanium, hermetically sealed, case isolated, 360° cable orientation, TEDS options

- 1,000 mV/g sensitivity
- Frequency ranges (±10%): 0.3 to 3,000 Hz All axes
- -60 to +200°F (-51 to +90°C)

3143D Series: Triaxial Accelerometer

Features: IEPE, titanium, hermetically sealed, case isolated, low profile, TEDS options

- Sensitivities (mV/g): 100, 50, 10
- Frequency ranges (±5%): 0.5 to 3,000 Hz
- -60 to +185°F (-51 to +85°C)



Model 3143D10: Mechanically Filtered Triaxial Accelerometer

Features: Hermetic, case isolated, 360° cable orientation, low profile, IEPE, mechanically and electrically filtered

- 1 mV/g sensitivity
- Frequency ranges (+-5%): 0.5 to 10,000 Hz
- -60 to 250°F (-51 to +121°C)

Model 3143M16: Cryogenic Triaxial Accelerometer

Features: IEPE, hermetically sealed, case isolated, low profile, 360° cable orientation, excellent linearity

- 10 mV/g sensitivity
- Frequency ranges (±5%): 1.6 to 5,000 Hz
- -320 to +250°F (-196 to +121°C)

Model 3533A: Triaxial Accelerometer with TEDS

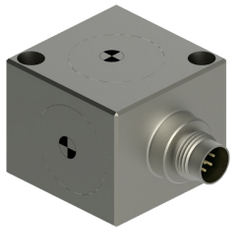
Features: IEPE, titanium, hermetically sealed, case isolated, TEDS options

- 5 mV/g sensitivity
- Frequency ranges (±1.5%): 2.2 to 3,000 Hz
- -60 to +250°F (-51 to +121°C)

Model 7503D: High Precision MEMS Accelerometer

Features: Hermetically sealed, differential output, titanium, ultra high resolution, eliminates common mode noise

- Sensitivities (mV/g): 2000, 800, 400, 160, 80, 40, 20, 10, D9: 800(X and Y), 160(Z), D10: 800(X and Y), 80(Z)
- Frequency ranges (±3dB): 0-400 Hz to 0-5,000 Hz
- -67 to +257°F (-55 to +125°C)



Model 3306M1: Cryogenic Accelerometer

Features: Stainless steel, hermetically sealed, electrically isolated, excellent linearity

- Sensitivity (mV/g): 5
- Frequency ranges (±3dB): 0.5 to 5,000 Hz
- -320 to +300°F (-195 to +149°C)

3306B Series: High Frequency Accelerometer

Features: IEPE, low temperature application, excellent linearity, electrically isolated, hermetically sealed

- Sensitivities (mV/g): 5, 2
- Frequency ranges (±10%): 1 to 10,000 Hz, 1 to 1,000 Hz
- -320 to +300°F (-195 to +149°C)

CVLD ACCELEROMETERS

These sensors are designed with an advanced internal electrical circuit to stimulate a CVLD (Constant Voltage Line Driver) sensor.

This allows for variable capacitance DC MEMS acceleration measurements to be made over data acquisition channels normally reserved for current mode sensors. These CVLD sensors are tailored for use in the following applications: flight testing, flutter testing, and low frequency aircraft/airframe vibration measurements.

7506A Series: Variable Capacitance Accelerometer

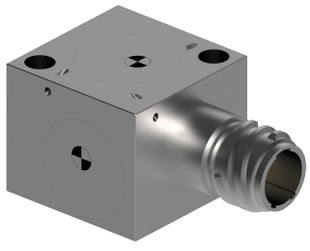
Features: DC response, stainless steel, hermetically sealed, ultra low noise, current output, 4-20 mA loop compatible

- Sensitivities (µA/g): 100, 13
- Frequency ranges (-3dB): 0 to 300 Hz
- -55 to +257°F (-48 to +125°C)

7563A Series: Triaxial VC MEMS Accelerometer

Features: Stainless steel, hermetically sealed, case isolated, differential output, 4-20 mA loop compatible

- Sensitivities (µA/g): 100, 50, 12.5
- Frequency ranges (-3dB): 0 to 2,000 Hz
- -55 to +257°F (-48 to +125°C)



Model 7508A: Variable Capacitance Accelerometer

Features: DC response, stainless steel, hermetically sealed, ultra low noise, current output, 4-20 mA loop compatible

- 13 µA/g sensitivity
- Frequency ranges (-3dB): 0 to 2,500 Hz
- -55 to +257°F (-48 to +125°C)

SHOCK AND VIBRATION TESTING

For explosive bolt, stage separation, drop testing, ship-board shock testing, and pendulous mass tests.

3200B Series: IEPE Shock Accelerometer

Features: IEPE, stainless steel, lightweight, high natural frequency of >90 kHz, TEDS options

- Sensitivities (mV/g): 0.05, 2, 0.1, 0.25, 0.5, 1
- Frequency ranges (±10%): 0.35 to 20,000 Hz
- -60 to +250°F (-51 to +121°C)

3603AXT Series: Triaxial Accelerometer

Features: IEPE, hermetically sealed, ground isolated, mechanically and electrically filtered

- Sensitivities (mV/g): 1, 5, 10
- Frequency ranges (±3dB): 0.3 to 5,000 Hz
- -60 to +250°F (-51 to +121°C)

3099AX-XX Series: Mechanically and Electrically Filtered Shock Sensor

Features: IEPE, stainless steel, hermetically sealed, case isolated, high natural frequency

- Sensitivities (mV/g): 0.05, 0.1, 0.2
- Frequency ranges (±3dB): 10 to 10,000 Hz
- -10 to +250°F (-12 to +121°C)

Model 3133A7: Ultra Miniature Triaxial IEPE Accelerometer

Features: Eliminates the need for a charge amplifier in harsh environments, reduces mass loading, adhesive mount, ideal low frequency response, 3 ft integral cable, titanium, hermetic

- +320°F (+160°C) operation
- Frequency ranges (±10%): 0.7 to 10,000 Hz
- Sensitivity: 0.14 mV/g
- 1.5 grams

Model 3425A1-03: IEPE Accelerometer

Features: Miniature size, flexible integral cable, high G range, quartz sensing element, cryogenic use

- Range (±): 35000 g pk
- Sensitivity: 0.05 – 0.14 mV/g
- Frequency ranges (±10%): 1 to 20,000 Hz
- Weight: 0.65 grams
- -320 to +300°F (-196 to +149°C)

Model 3362A: Shock Accelerometer

Features: IEPE, mechanically and electrically filtered, hermetically sealed, case isolated

- Sensitivities (mV/g): 1
- Frequency ranges (±3dB): 10 to 10,000 Hz
- -10 to +250°F (-12 to +121°C)

Model 3284A1: Ultra High Shock Miniature Sensor

Features: IEPE, miniature size, flexible integral cable, high G range, quartz sensing element

- Sensitivities (mV/g): 0.05 to 0.14
- Frequency ranges (±10%): 0.66 to 20,000 Hz
- -60 to +300°F (-51 to +149°C)
- 0.2 grams

Dytran designs and manufactures a wide variety of cables for your testing and monitoring requirements. Our cable assemblies are designed and manufactured in the USA and are made with our customer's challenging environments in mind. We offer a broad range of standard products as well as custom cables made to customer specifications.

CUSTOM LOW OUTGASSING CABLES

Measure and evaluate all aspects of structural dynamics and component response including vibration, modal analysis, and shock in both large and small space structures. For use in characterizing flight and non-flight hardware in ground test vibration laboratories.

6002A Series

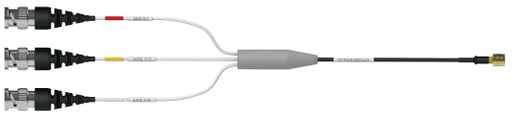
- 10–32 plug to pigtail
- Coaxial
- Red Teflon™ jacket

6017A Series

- 5–44 plug to 10–32 plug
- Coaxial
- White Teflon™ jacket
- Compatible with 3334

6997A Series

- 4–pin plug (¼–28) to (3) BNC plugs
- Four conductor, triaxial
- Black Teflon™ jacket
- Compatible with 3273A, 3233AT

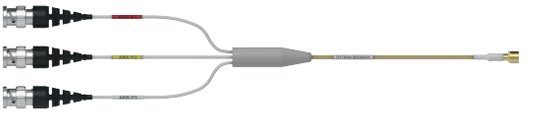


60163A Series

- 9–pin plug to flying leads
- Eight conductor
- White Teflon™ jacket
- Compatible with 6DoF/DC Triax sensors (7576A,7503D)

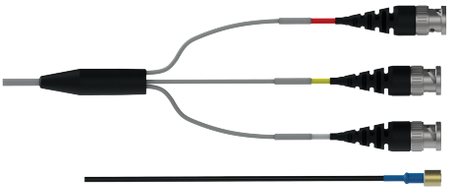
60030A Series

- 4–pin connector (¼–28) to 3 BNC connectors
- Cryogenic rated cable
- Four conductor
- White Polyimide jacket
- –320°F to +250°F (–196°C to +121°C)



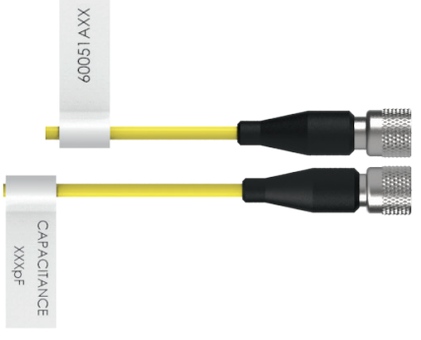
6811A Series

- 4–pin plug (¼–28) to (3) BNC plugs
- General purpose (non-low outgassing)
- Four conductor, triaxial
- Black Teflon™ jacket
- Compatible with 3133D, 3273A



60051A Series

- 10–32 plug both ends
- Ultra low noise
- Coaxial
- Yellow Teflon™ jacket



Dytran offers innovative 6 degrees of freedom sensing solutions for use in testing environments or out in the field. The models listed below can be used for rotating machinery diagnostics, vehicle testing, and large structure transportation monitoring such as spacecraft or satellites.

PORTABLE VIBRATION RECORDERS

The VibraCorder™ II captures and records on-the-spot 6DoF, static, and dynamic triaxial acceleration and rotational measurements in a portable, battery-operated package. Offered in various configurations, these compact units include easily installed, user-configurable software that optimizes data collection. Internal accelerometers eliminate the need for external cable runs and complex signal conditioning. Robust anti-aliasing filters ensure data integrity. Test data is stored on a convenient removable memory SD card that plugs directly into your laptop. Capture over-the-road events with 6DoF capability using several configurable recording options. All VibraCorder™ products feature internal rechargeable batteries and remote power options for short and long duration tests. RoHS and CE certification pending.

VibraCorder™ II: Model 4401A 6DoF Vibration Recorder

Features: Software controlled relay for the operation of external components such as cameras and indicator lights, available in two ranges

Benefits: Environmentally sealed interface connector for relay triggering, synchronous data capture between multiple units with a wired connection, and external power capability for extended data capture

- Ranges (±): 5g, 16g
- Battery Life: 24 hrs
- Sampling Rates: 250, 1,200, 4,280 Samples/sec
- IP 65 rated

VibraCorder™ III: Model 4404A Vibration Recorder

Features: Captures 6DoF data for whole-body vibration measurements in extreme environments, 3% transverse sensitivity, remote triggering capabilities

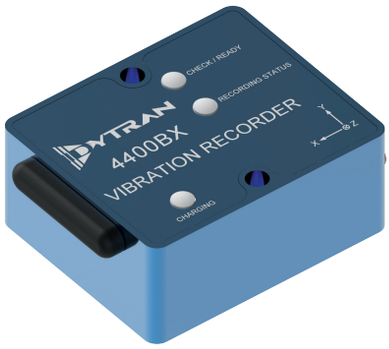
- Range (±): 10g
- Battery Life: 20 hrs
- Sampling Rates: 120, 250, 256, 500, 512, 720, 1,024, 1,200 Samples/sec
- IP 67 rated

VibraCorder™: Model 4400B Vibration Recorder

Features: General purpose vibration recorder with a built-in triaxial MEMS accelerometer, synchronization capabilities, triggered data acquisition, available in three ranges
Benefits: Compact, provides simplified data collection. Start data collection with a variety of convenient triggering methods.

Benefits: Synchronous data capture between multiple units with a wired connection, and external power capability for extended data capture.

- Ranges (±): 2g, 19g, 200g
- Battery Life: 15 hrs max
- Sampling Rates: 100, 500, 1,000, 5,000, 10,000 Samples/sec
- IP 64 rated



Model 4600A1: Miniature Three-Channel IEPE Data Logger

Features: 3 channels of IEPE data acquisition using standard 10-32 coaxial connectors, environmentally sealed, ruggedized aluminum package.

- Battery: 1400 mAh (Rechargeable)
- Sampling Rates: 100, 500, 1,000, 5,000, 10,000, 25,000
- IP64 rated
- Weight: 150 grams
- Recording time: 10 hrs max

SIX DEGREES OF FREEDOM (6DOF) SENSOR

Series 7576A provides end users with a highly capable, cost effective, small size 6DoF accelerometer for myriad sensing applications.

These sensors contain three MEMS-based single axis accelerometers and three MEMS-based gyro sensors to monitor the translational and rotational components of motion at the same physical point. This is used to determine the location of the center of rotation of a rigid body inside space. Typical uses include: rollover testing, aerospace testing, large machinery including industrial off-road, aircraft flight dynamics, and aircraft ground test.

Series 7576A: Analog 6DoF Sensor

Features: Available in various ranges, great bias stability, hermetic

Benefits: Improved electrical noise performance, enhanced frequency response, excellent for use in harsh environments

- Accel sensitivity (mV/g): 470, 235, 78.33, 11.75, 1,175, 1,200
- Accel ranges (±): 5g, 10g, 30g, 2g
- Gyro sensitivity (mV/°/sec): 25, 12.5, 7, 25, 12.5
- Accel frequency ranges (±3dB) from: 0-1,150 Hz to 0-3,800 Hz
- 55 grams

Dytran by HBK – Hottinger Brüel & Kjær
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