

EXTREME ENVIRONMENTS

TEST & MEASUREMENT SENSOR CATALOG

Accelerometers

Pressure transducers

Signal conditioners

Inertial sensors

Cable assemblies

Supporting instrumentation

Calibration equipment

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Product technology



Variable capacitance accelerometers

Variable capacitance (VC) accelerometers are DC-response sensors for measuring low frequency vibration, motion (constant acceleration) and tilt. With gas damping and internal over-range stops, Endevco VC accelerometers are capable of measuring whole body motion immediately after being subjected to a shock motion, even in the presence of severe vibrational inputs and variable temperatures.



Piezoresistive accelerometers

Piezoresistive (PR) accelerometers are ideal for measuring impacts and shock events. Typical applications include automotive crash testing, commercial drop testing and high g weapons testing. These highly specialized MEMS sensing elements are micro-machined at the facility in Sunnyvale, California. Some units are damped to prevent ringing, while others are undamped to provide high bandwidth. Multiple package configurations support the mounting requirements of a variety of applications.



Inertial sensors

Angular rate sensors measure relative rotational motion directly and provide an output in degrees per second. This measurement of angular velocity offers great improvement over the previous method of using three accelerometers and doing complex calculations. Multiple ranges are provided to enable measurement of slow or fast moving events.



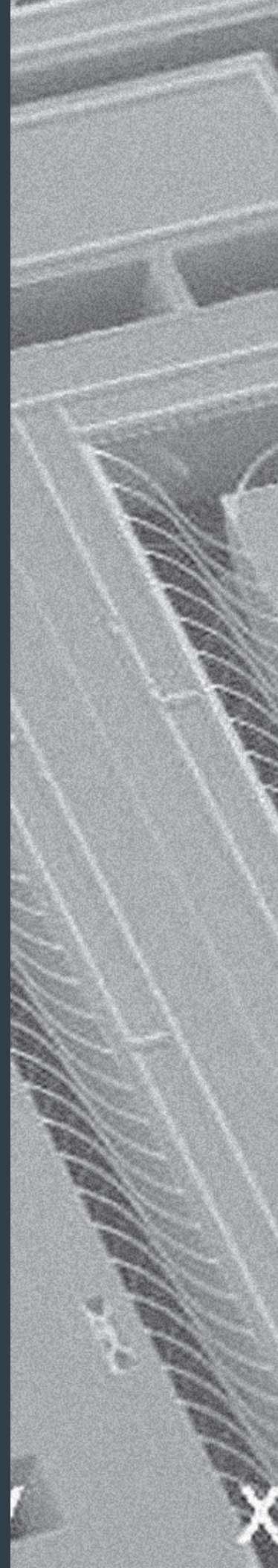
Piezoresistive pressure sensors

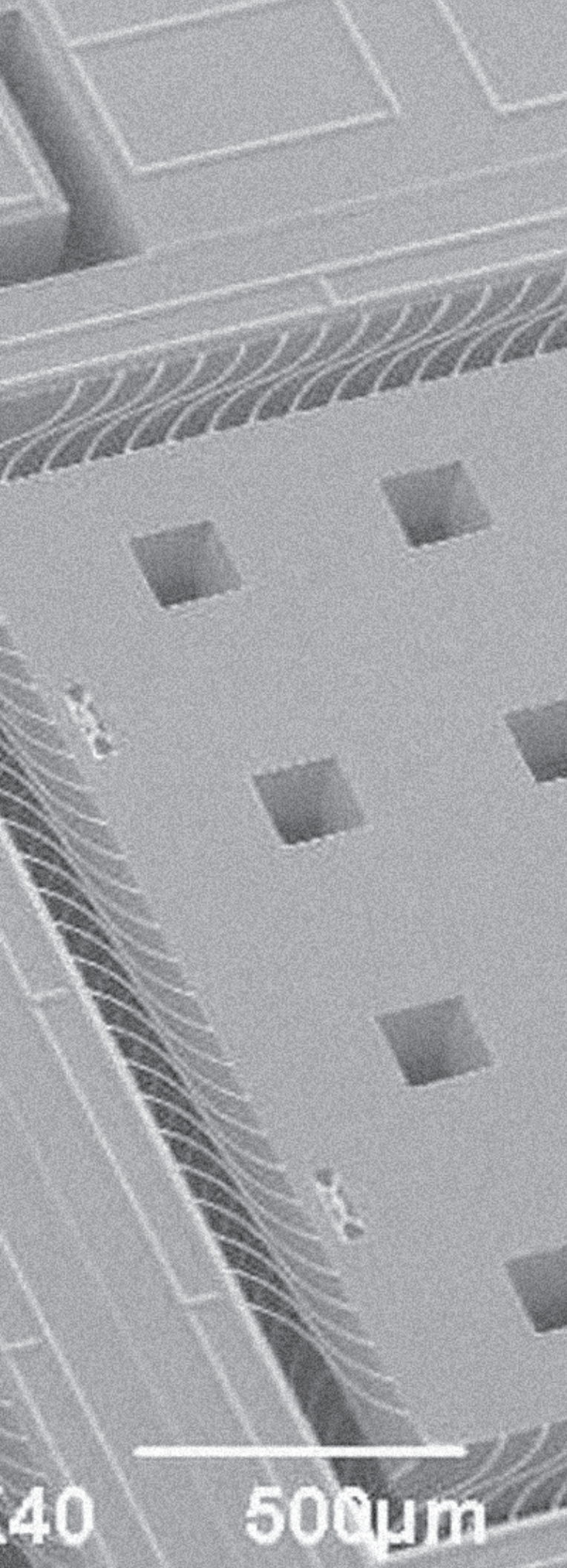
Miniature piezoresistive pressure sensors measure both dynamic and static pressure in process control applications, blast testing, automotive airbag testing, rocket motor analysis, jet engine inlet pressure measurements, transmission testing and hydraulics measurements. A four-arm strain gage bridge MEMS sensing element, implanted into a sculpted diaphragm, offers wideband frequency response with exceptional sensitivity for improved resolution, high resonance frequency, exceptional linearity and hysteresis performance.



Signal conditioners and supportive instrumentation

Endevco offers a comprehensive family of high-performance electronics, ranging from simple battery operated signal conditioners to computer-controlled laboratory quality instrumentation. They are compatible with Endevco's own IEPE, PE, VC and PR accelerometers and pressure sensors, as well as those commonly available in industry.





Piezoelectric accelerometers

Piezoelectric (PE) accelerometers are charge-mode accelerometers that require the use of an external charge amplifier. This allows for long term, reliable operation over wide temperature and amplitude ranges. These accelerometers are ideal for use in extreme environment conditions, from cryogenic to extreme-high temperatures and in radiation environments. They are offered in a wide variety of sizes and configurations.



IEPE accelerometers

Integrated Electronics Piezo-Electric (IEPE) accelerometers feature an integral electronic charge converter. Integrated electronics eliminate the need for in-line amplifiers and specialty cable.



High intensity microphones

Piezoelectric microphones measure high-intensity acoustic noise parameters and very low pressure fluctuations. Hermetically sealed units operate over a wide temperature range and are insensitive to altitude changes and ambient vibration.



Cable assemblies

For optimal performance, Endevco relies upon in-house expertise to design and manufacture its own cables and connectors. Off-the-shelf and custom assemblies include low-noise treated, high-temperature and multi-conductor options.

There is more than one type of accelerometer!

Endevco designs and manufactures a variety of accelerometers for measurements of vibration, shock and inertial motion. To meet various testing requirements, several types of accelerometer technologies are available each differing in terms of their recommended usage, performance specifications, power requirements and signal conditioning characteristics. The following is a general overview of accelerometer technology types and their application considerations.

Piezoelectric (PE) accelerometers

All mechanical accelerometer designs are based on a simple spring-mass principle in which strain is generated in relation to amplitude and frequency of the dynamic motion. In a PiezoElectric (PE) accelerometer, this strain is applied directly to the PE element, which develops an electrical charge proportional to mechanical motion. Different material and configurations of PE accelerometer elements are used to support specific applications.

Advantages of PE sensors

- The dynamic range of PE accelerometers can be greater than 130dB. When used with a proper charge converter/amplifier, it offers unmatched performance in terms of total measurement range and reliability. Transduction efficiency may also be optimized with PE crystals to allow for the miniaturization of accelerometer within a given physical envelope.
- Single-ended compression type is optimum for low level measurements because of the high sensitivity that can be achieved by stacking multiple PE crystals and connecting them in parallel.
- A shear mode design allows for the construction of miniature, lightweight sensors suitable for monitoring of small components and test articles. A key advantage of the shear design is the isolation of the sensing element from the base, which provides excellent protection from base strain and temperature transients.

- Due to the broad temperature range of most piezoelectric materials, PE accelerometers are often specified for extreme high or low temperature applications, from cryogenic conditions in rocket engines to the extreme heat environment of a turbine generator.
- PE accelerometers are available in a wide range of shapes and sizes, from micro-miniature in electronics component testing to larger sizes used in seismic or engine applications.

Piezoresistive (PR) accelerometers

Strain gauge accelerometer designs based on a Wheatstone bridge arrangement consist of a rugged monolithic assembly with solid-state MEMS resistors that change in resistance in proportion to applied mechanical strain.

Advantages of PR sensors

- PR accelerometers feature DC response which makes it useful for measuring long duration pulses. Its acceleration outputs can therefore be integrated to yield velocity and displacement accurately.
- Monolithic MEMS sensors exhibit high sensitivity with an excellent signal-to-noise ratio and outstanding stability.
- The simplicity and miniature size of MEMS PR element lend itself to broad bandwidth (>100,000Hz) and wide dynamic range (>100,000g) designs.



Integrated electronics piezoelectric (IEPE) accelerometers

The acronym IEPE refers to a type of piezoelectric (PE) accelerometer with internal electronics (IE) that allows it to convert charge to a low-impedance voltage output. Its temperature response is somewhat limited due to its onboard electronics. This type of accelerometer is primarily specified for applications in which environmental conditions permit its use, including HALT/HASS/ESS testing, industrial vibration monitoring and general purpose vibration and shock testing.

Since both PE and IEPE types are AC-coupled designs, the acceleration output of these accelerometers cannot be used to yield correct velocity and displacement information by numerical integration.

Advantages of IEPE sensors

- Less operator attention, training and installation expertise required.
- Uses standard coaxial cable.
- Drives long cables without noise increase or loss of resolution.
- Operates directly into many data collectors with built-in constant current input.

Variable capacitance (VC) accelerometers

Feature a silicon MEMS capacitive sensing element that is anodically bonded to a lid and base to form a parallel plate, differential capacitor pair. The accelerometers feature DC response, gas damping for good frequency coverage and rugged construction. Integral electronics with DC excitation provide a high-level, low-impedance output signal that is stable.

Advantages of VC sensors

- Designed for low-g measurement, yet can also withstand very high g shocks.
- Suitable for trajectory monitoring, modal analysis, flutter testing, vehicle dynamics measurements for automotive suspensions and ride quality.

Accelerometer performance characteristics

To obtain meaningful acceleration data, one must fully understand the performance characteristics of the accelerometers under consideration.

Parameters include:



Sensitivity

Higher sensitivity typically results in a higher signal-to-noise ratio. Interfering electrostatic and electromagnetic noise will be less bothersome with a higher-sensitivity device. Higher sensitivity, however, may bring two disadvantages: greater accelerometer mass and a lower resonance frequency.



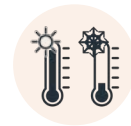
Low-frequency response

With a PE accelerometer, the low-end response can only be assessed together with the charge converter as a system. With IEPE sensors, the charge converter is built into the sensor, which has a preset low frequency cutoff. The cutoff in a typical charge converter is often set at 1 to 5 Hz to reject any pyroelectric output. PR and VC accelerometers offer DC response and have no roll-off characteristics at low frequency.



Temperature sensitivity

Accelerometer sensitivity varies with temperature. Many models are optimized for stable sensitivity over a wide temperature range. Typically, the higher the temperature, the higher the degree of measurement error potential, unless compensated. Temperature sensitivity compensation may be passive (capacitors and resistors) or active (ASIC), both have advantages and disadvantages in their executions.



Transient temperature effects

Compression mode PE and IEPE accelerometers can produce an output with rapid temperature changes, also known as pyroelectric output. This problem has been virtually eliminated with the advent of shear mode accelerometers (most Endevco accelerometers are shear mode types). Thermal transient response errors tend to manifest themselves as low frequency signals and often go undetected. PR and VC devices have no significant response to rapid temperature changes.



High-frequency response

This is a function of both mechanical characteristics and the method used to attach the device. Most accelerometers exhibit an undamped single degree-of-freedom response when securely mounted. Response is relatively flat, to about 20% of the mounted resonant frequency. Correction factors can be derived for data obtained at higher frequencies. Electronic filtering can increase flat response to 50% of the mounted resonant frequency.



Transverse sensitivity

Also known as crosstalk. The sensor must not produce any significant response when motion is applied in the lateral axes. Sensitivity to lateral motion can be held to less than 5% of normal sensitivity on an Endevco device.



Amplitude linearity

PE accelerometers have a predictable nonlinearity that can be expressed as a percentage increase in sensitivity as acceleration increases, such as 1% per 500 g. The upper limit can be determined and expressed for each model. With most Endevco PE and PR models, the output of the device can still be usable at two to three times its rated full scale range if the higher non-linearity is acceptable to the application.



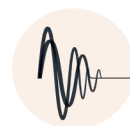
Strain effects

The test item may flex, stretch, or bend at the point where an accelerometer is mounted, causing it to produce an erroneous output due to the deformation. The situation may be improved by using mounting adapters but at the expense of reduced transmissibility. Shear type PE/IEPE accelerometers are much less sensitive to such errors than conventional compression types. The output of PR and VC types are less susceptible to strain effect in general.



Mass loading

Frequency response of the unit under test can be appreciably changed if the dynamic mass of the accelerometer approaches the dynamic mass of the test article. Consequently, it is recommended to use an accelerometer which weighs no more than 10% of the unit under test.



Damping

Most commonly used accelerometers are undamped which may be excited into resonance in applications where it is exposed to mechanical impact. When an accelerometer resonates, it runs a risk of amplifier overload, offset error, or even damage to the device. A more suitable approach incorporates damping such that high frequency content above the passband of interest is directly mitigated. Certain PR and VC sensor use gas or fluid damping built into the sensing element design to control resonance.

APPLICATION

Automotive design & test

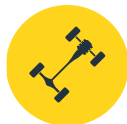
Endevco has sensors for all your automotive development applications. Our IEPE accelerometers are best for vehicle dynamic testing of engines, exhaust systems, and other components due to their miniature packaging, high temperature performance and rugged construction. Endevco VC accelerometers feature high stability, low frequency measurement suited to suspension and ride quality testing. Our PR pressure sensors are used in the testing of automotive systems such as Anti-Lock Brake Systems (ABS), transmissions, fuel and oil due to their wide frequency response and high level of output in a miniature housing.

Applications

- Road load
- Powertrain
- Transmission testing
- Modal/chassis design
- Component qualification testing
- Noise, Vibration, and Harshness (NVH)

Features

- TEDS enabled for high channel count applications
- Static and dynamic pressure measurements
- Miniature size



Model	Application attributes	Find on page
65HT	Small high temperature triaxial accelerometer	33
65HTLPF	Small high temperature triaxial accelerometer. Integral low pass filter for attenuation of high-frequency, high-g signals that can obscure the required low-frequency information	33
770A - 770F	Low g DC accelerometer for suspension testing	19
773	Triaxial low g DC accelerometer for suspension testing	19
7250B	High frequency, miniature single axis accelerometer with versatile mounting configuration	33
8510B	Pressure sensor in high and low ranges for automotive development	27



Automotive safety testing

Since the earliest days of vehicle safety testing, Endevco has worked with OEMs, test laboratories and ATD manufacturers' design and test personnel to ensure accurate measurements of front, side and rear impact; crush zones; in-vehicle occupant and pedestrian safety. High-precision, DC responding Endevco piezoresistive accelerometers are widely specified within these applications due to their high-output, low mass designs and compact size for mounting within difficult-to-reach areas. Their survivability, miniature size and DC response measurement capabilities offer solutions for a diverse set of automobile testing requirements.

Applications

- Anthropomorphic Test Device (ATD)
- Pedestrian safety study
- Frontal, rear and side impact
- Vehicle roll-over test
- Global regulatory compliance testing
- Vehicle crush zones and crash sleds

Features

- SAE J211, J2570 and ISO 6487 compliant
- Standard equipment on all ATDs
- Exceptional frequency response
- Small and lightweight
- Rugged to 10,000g
- Multi-mode damping



Model	Application attributes	Find on page
701AH-701FH	Damped, rugged accelerometer for on-vehicle crash testing	21
713AL-713FL	Damped triaxial accelerometer for on-vehicle crash testing	20
726CH	Damped accelerometer for ATD, cg meets NHTSA standard	21
757AH-757FH	Damped, miniature accelerometer for on-vehicle crash testing	21
758H	Damped, rugged accelerometer for on-vehicle crash testing	21
7264B	Undamped accelerometer for ATD, cg between the screws	21
7264C	Undamped accelerometer for ATD. Meets NHTSA SA-572	21
7264H	Multi-mode damped accelerometer for pedestrian head form studies	21
7268C	Undamped triaxial accelerometer for World SID ATD	20
7310A	Angular rate sensor for whiplash and rollover measurements	25
8510B	Pressure sensor in high and low ranges for automotive development	27
8530BM37	Pressure sensor in high ranges for airbag and ABS	27



Aircraft / spacecraft design & test

As the leading sensor provider for development and flight test of aircraft and spacecraft, Endevco's advanced measurement devices are proven to withstand the challenges of extreme environments. Our accelerometers, pressure sensors and electronics are trusted solutions found in hundreds of flight tests worldwide and have provided the industry performance and reliability for several decades.

Aircraft / spacecraft
design & test

Applications

- Flutter testing
- Turbulent airflow measurements
- Rocket engine testing
- Vibroacoustic testing
- Vehicle dynamics studies
- Missile and rocket launches

Features

- Cryogenic temperatures (-452°F, -269°C)
- Flight / space qualified electronics
- High thermal stability
- Low frequencies down to DC



Model	Application attributes	Find on page
65HT	Small triaxial accelerometer. Hermetically sealed, high temperature IEPE (175°C, 347°F)	33
2262B	Highest damping, stud mount for ship shock	22
2510	High temperature microphone for high intensity acoustic measurements	36
2680MX	Compact and lightweight charge amplifier with gain and filter options	35
4830B	Handheld accelerometer simulator. A highly configurable tool for verification and troubleshooting of test systems	44
7290G	DC response accelerometer for low frequency flight and flutter measurements	19
7722 / 7724	Cryogenic accelerometer (-268°C, 452°F) with grounded or isolated designs available	30
8510B	General purpose pressure in high and low ranges for aircraft development	27
8515C	0.03 inch thin surface mount pressure for aerodynamic studies	27



High g shock testing

Endevco's high g accelerometers have long been the industry standard for reliable shock measurements in extreme environments. Our piezoresistive accelerometers are DC responding with minimal zero shift to avoid integration errors which is critical to the quality of your measurements. In-house MEMS capability enables compact size, high sensitivity and exceptional over-range while ensuring the repeatability and reliability required for mission critical applications. Our newest generation of gas damped accelerometers are the world's most survivable and come in multiple packages including single axis or triaxial configurations; screw, stud and surface mounting options, with our newest products fully SMT compatible.

High g shock testing

Applications

- Weapons and rocket testing
- High-shock data recorders
- Shock wave monitoring
- Drop and impact testing
- Portable electronic device testing
- Near- and far-field pyroshock testing
- Fuze/safe and arm
- Mechanical shock testing

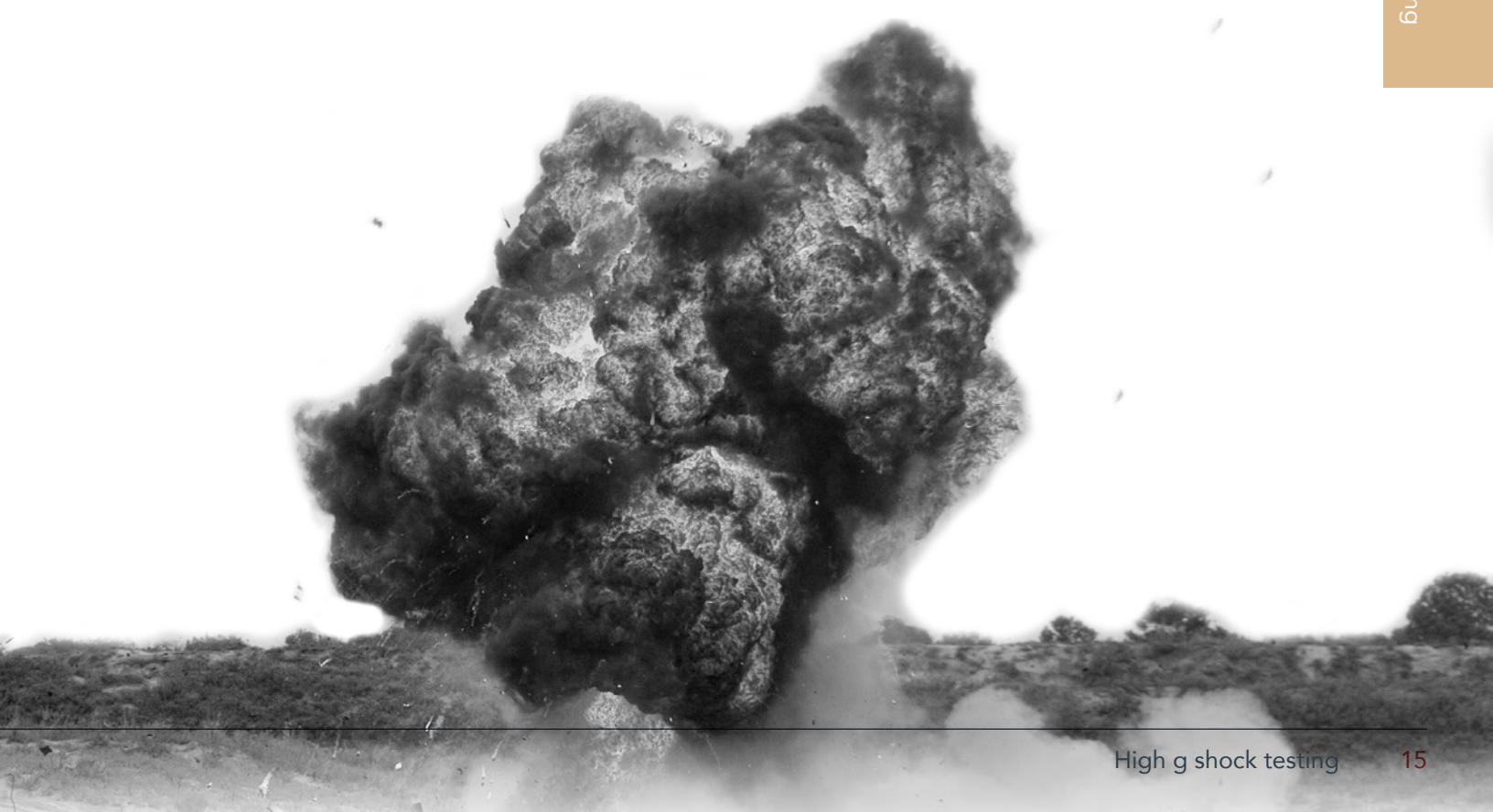
Features

- Undamped for broad frequency response or damped for exceptional survivability
- Multiple mounting configurations
- Minimal zero shift after shock
- High survivability in overrange environments
- DC response for long duration transient events
- Ranges up to 200,000 g
- Miniature SMT versions for embedded applications



Model	Application attributes	Find on page
71M	High bandwidth surface mount for missiles, fuzes	22
72	High survivability surface mount for missiles, fuzes	22
74	Damped triaxial, surface mount for data recorders, fuzes	22
75	Undamped triaxial, surface mount for data recorders, fuzes	22
7270A	Highest bandwidth, screw mount for weapons testing	23
7270AM4	Highest bandwidth, stud mount for weapons testing	23
7270AM6	Mechanical damping for pyroshock	23
7270AM7	Highest bandwidth, ruggedized for blast conditions	23
7274A	Undamped triaxial, screw mount for weapons testing	23
7280A	Highest survivability, screw mount for weapons testing	23
7280AM4	Highest survivability, stud mount for weapons testing	23
7280AM7	Highest survivability, ruggedized for pyroshock	23
7284A	Damped triaxial, screw mount for pyroshock	23

High g shock testing



APPLICATION

Pressure testing

Endevco's miniature piezoresistive pressure sensors offer accurate and reliable performance at pressure extremes. For several decades, Endevco's pressure sensors have been addressing demanding test environments for automobiles, trains, aircraft and weapons. The MEMS sensing elements are designed for extremely high output and high resonance combined with exceptional linearity and hysteresis performance. Whether your application calls for measurement of 1 psi or 20,000 psi, a light wind or an explosive blast, Endevco has a pressure sensor that will give you the data you need.

Applications

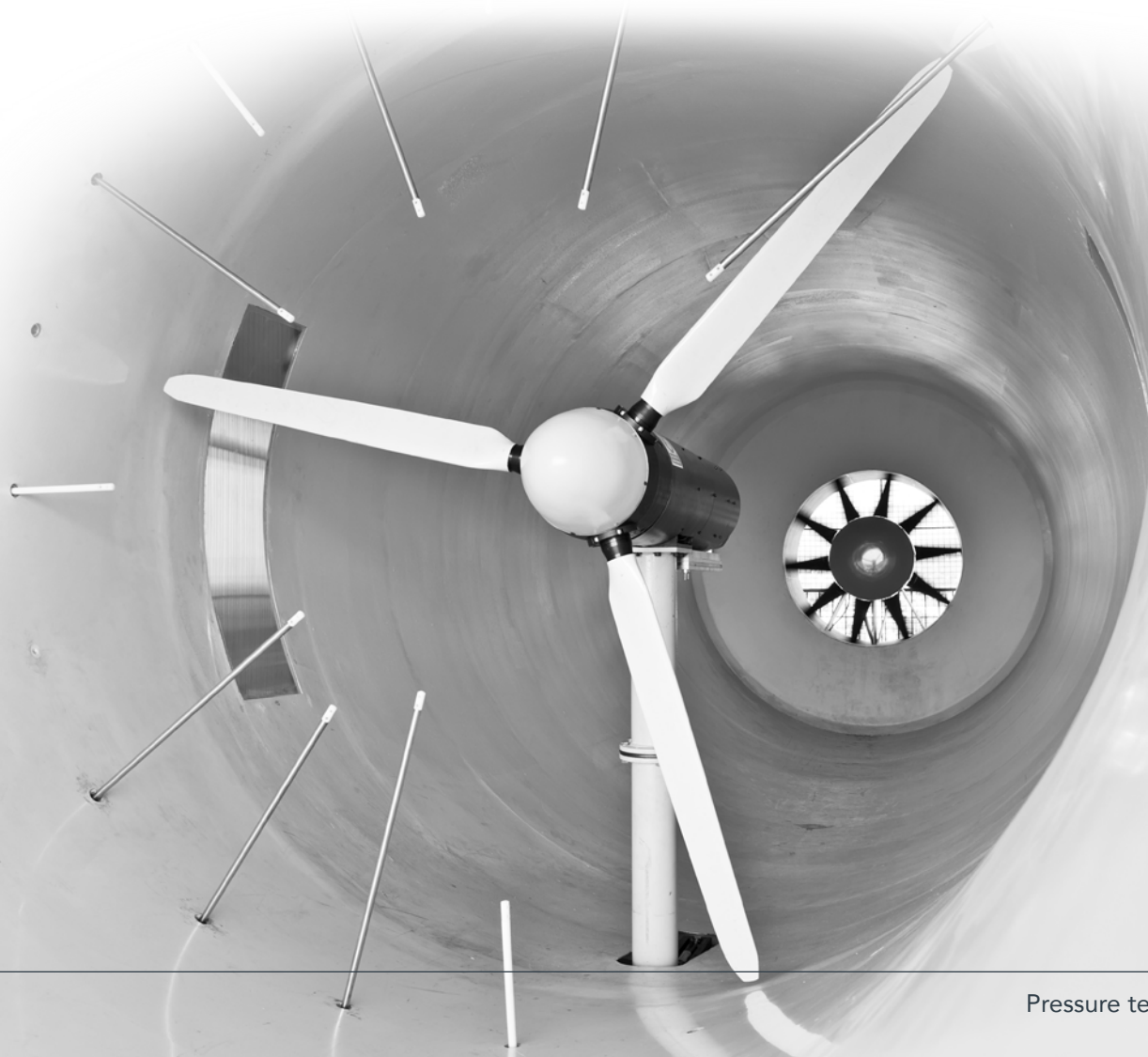
- Hypersonic, transonic and "quiet flow" wind tunnel testing
- Blast testing
- Automotive airbag inflation testing
- Jet airflow fields and inlet pressure
- Rocket acoustics
- Turbulent airflow measurements
- Vehicle transmission testing
- Hydraulics measurements

Features

- Gage and absolute models
- High sensitivity for better signal-to-noise ratio
- High resonance frequency for fast response time
- Industry leading over-range (3x) and burst pressure
- Excellent linearity (to 3x full scale on some models)
- Insensitive to vibration
- Many special modifications available including metric threads, integral connectors, and special protections against humidity or photo-flash



Model	Application attributes	Find on page
8507C	0.092 diameter for wind tunnel, scale models	27
8510B	General purpose in high and low ranges for automotive development	27
8510C	General purpose in mid ranges for launch vehicle	27
8511A	Rugged, high pressure for blast testing	27
8515C	0.03 inch thin surface mount for flight testing	27
8530B	General purpose in high ranges for airbag and ABS	27
8530C	General purpose in mid ranges for rail and launch vehicle	27



Variable capacitance accelerometers

Applications

- Aircraft flight and flutter testing
- Automotive ride quality testing
- Train ride quality testing
- Engine load cycle
- Road Load Data Acquisition (RLDA)



Variable capacitance (VC) accelerometers

Feature a silicon MEMS capacitive sensing element that is anodically bonded to a lid and base to form a parallel plate, differential capacitor pair. The accelerometers feature DC response, gas damping for good frequency coverage and rugged construction. Integral electronics with DC excitation provide a high-level, low-impedance output signal that is stable.

Advantages of VC sensors

- Designed for low-g measurement, yet can also withstand very high g shocks.
- Suitable for trajectory monitoring, modal analysis, flutter testing, vehicle dynamics measurements for automotive suspensions and ride quality.

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Model number	770A-770F	771	773
Description	Low g DC measurement Rugged Al housing 28 AWG cable	Low g DC measurement Hermetic SS package Military temperatures	Triaxial Low g DC Rugged Al housing Separate power & ground
Linear range g	$\pm 2/\pm 10/\pm 30/\pm 50/\pm 100/\pm 200$	$\pm 2/\pm 10/\pm 30/\pm 50/\pm 100/\pm 200$	$\pm 2/\pm 10/\pm 30/\pm 50/\pm 100/\pm 200$
Sensitivity mV/g typical	1,000/200/66/40/20/10	1,000/200/66/40/20/10	1,000/200/66/40/20/10
Frequency response $\pm 5\%$	0-200/0-900/0-900/0-900/ 0-1500/0-1500	0-200/0-900/0-900/0-900/ 0-1,500/0-1,500	0-200/0-750/0-750/0-750/ 0-1,000/0-1,000
Non linearity % FSO typical	0.5	0.5	0.5
Shock limit g	10,000	10,000	10,000
Operating temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)	-40 to +100 [-40 to +212]	-55 to +125 [-67 to +257]	-40 to +100 [-40 to +212]
Dimensions mm (in)	15.24 (0.6) cube (A) 15.24 x 22.88 x 15.24 (0.600 x 0.885 x 0.600) (F)	15.88 hex base x 24.89 (0.625 hex base x 0.980)	22.86 x 22.86 x 19.56 (0.900 x 0.900 x 0.770)
Weight grams	6	29	24
Excitation voltage Vdc	7 to 36 or 5V (R option)	7 to 36 or 5V (R option)	7 to 36 or 5V (R option)
Mounting method	Adhesive (A); 2-56 screws (F)	Stud	4-40 screws

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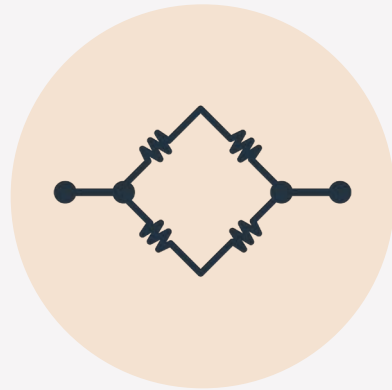
Model number	7290G	7290GM5
Description	Wide bandwidth DC response High stability	DC accelerometer Watertight to IP67 Temperature compensated
Linear range g	$\pm 2 / \pm 5 / \pm 10 / \pm 30 / \pm 50 / \pm 100 / \pm 200$	$\pm 2 / \pm 5 / \pm 10 / \pm 30 / \pm 50 / \pm 100 / \pm 200$
Sensitivity mV/g typical	1,000 / 400 / 200 / 66 / 40 / 20	1,000 / 400 / 200 / 66 / 40 / 20
Frequency response $\pm 5\%$	0-15 / 0-30 / 0-500 / 0-1000 / 0-2000 / 0-2,000	0-15 / 0-30 / 0-500 / 0-1000 / 0-2000 / 0-2,000
Non linearity % FSO typical	0.2 / 1.0 (100g and 200g)	0.2 / 1.0 (100g and 200g)
Shock limit g	5,000 (2g / 5g / 10g) / 10,000	5,000 (2g / 5g / 10g) / 10,000
Operating temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)	-55 to +125 [-67 to +257]	-55 to +125 [-67 to +257]
Dimensions mm (in)	25.4 x 21.6 x 7.6 (1.00 x 0.85 x 0.30)	25.4 x 21.6 x 7.6 (1.00 x 0.85 x 0.30)
Weight grams	10	10
Excitation voltage Vdc	8 to 40	8 to 40
Mounting method	4-40 screws	4-40 screws

Piezoresistive accelerometers

Piezoresistive accelerometers

Applications

- Vehicle crush zones, crash sleds and rollover
- Anthropomorphic Test Devices (ATD)
- Pedestrian safety
- Weapons and rocket testing
- High-shock data recorders
- Drop and impact testing
- Fuze/safe and arm



Piezoresistive (PR) accelerometers

Strain gauge accelerometer designs based on a Wheatstone bridge arrangement consist of a rugged monolithic assembly with solid-state MEMS resistors that change in resistance in proportion to applied mechanical strain.

Advantages of PR sensors

- PR accelerometers feature DC response which makes it useful for measuring long duration pulses. Its acceleration outputs can therefore be integrated to yield velocity and displacement accurately.
- Monolithic MEMS sensors exhibit high sensitivity with an excellent signal-to-noise ratio and outstanding stability.
- The simplicity and miniature size of MEMS PR element lend itself to broad bandwidth (>100,000Hz) and wide dynamic range (>100,000g) designs.



Model number	713AL - 713FL	7268C
Description	Miniature Triaxial Meets SAEJ211/J2570 Frequency Response Multi-mode damping	Triaxial Undamped World SID ATD
Linear range g	±2,000	±500 / ±2,000
Sensitivity mV/g typical	0.30	0.80 / 0.20
Frequency response ±5%, Hz	0 to 3500	0-3,000 (Z) / 0-1500 (X&Y)
Shock limit g	10,000	5,000 / 10,000
Operating temperature °C (°F)	-40 to +100 (-40 to +212)	-18 to +66 (0 to +150)
Dimensions mm (in)	16.0 x 16.0 x 6.5 (0.630 x 0.630 x 0.254)	12.70 x 14.73 x 10.67 (0.500 x 0.580 x 0.420)
Weight grams	3.5 (AL) / 4 (FL)	8
Mounting method	Adhesive (AL) / 2x #2-56 socket head cap screws (FL)	M2 screw

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Model number	701AH-701FH	726CH	757AH-757FH	758H
Description	Rugged Al housing Damped for survivability 28 AWG cable	SAE J211/J2570 Compliant Multi-mode damping Broad frequency response	Small and lightweight Damped for survivability Flexible cable	Rugged Mounting flexibility 28 AWG cable
Linear range g	±1,000	±2,000	±2,000	±2000
Sensitivity mV/g typical	0.3	0.3	0.3	0.3
Frequency response ±5%, Hz	0-4,000	0-5,000	0-3,000	0-4000
Shock limit g	10,000	10,000	10,000	10,000
Operating temperature °C (°F)	-40 to +100 (-40 to +212)	-40 to +100 (-40 to +212)	-40 to +100 (-40 to +212)	-40 to +100 (-40 to +212)
Dimensions mm (in)	8.90 (0.350) cube (A) 8.90 x 15.88 x 9.65 (0.350 x 0.625 x 0.380) (F)	10.16 x 10.16 x 5.13 (0.400 x 0.400 x 0.202)	9.7 x 4.8 x 3.3 (0.380 x 0.190 x 0.130) (A) 11.18 x 10.2 x 3.8 (0.440 x 0.400 x 0.150) (F)	13.97 x 6.35 x 6.35 (0.550 x 0.250 x 0.250)
Weight grams	1.4 (A); 1.7 (F)	1.8	0.5 (A); 1 (F)	2
Mounting method	Adhesive (A); 2-56 screws (F)	0-80 screws	Adhesive (A); 0-80 screws (F)	Adhesive

Piezoresistive
accelerometers

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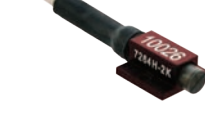
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Model number	7264B	7264C	7264D	7264H
Description	Crash test Undamped Meets SAE J211 / J2570	Industry standard Undamped Meets SAE J211 / J2570	High resonance Undamped Meets SAE J211 / J2570	Extremely rugged Multi-mode damping Pedestrian safety testing
Linear range g	±500/±2,000	±500/±2,000	±2,000	±2,000
Sensitivity mV/g typical	0.80/0.20	0.80/0.20	0.20	0.20
Frequency response ±5%, Hz	0-3,000/0-5,000	0-3,000/0-5,000	0-6,000	0-6,000
Shock limit g	5,000 / 10,000	5,000 / 10,000	10,000	10,000
Operating temperature °C (°F)	-40 to +93 (-40 to +200)	-18 to +66 (0 to +150)	-18 to +66 (0 to +150)	-18 to +66 (0 to +150)
Dimensions mm (in)	12.2 x 10.2 x 4.7 (0.48 x 0.4 x 0.185)	10.16 x 10.16 x 5.13 (0.400 x 0.400 x 0.202)	10.16 x 10.16 x 5.08 (0.400 x 0.400 x 0.200)	10.16 x 10.16 x 5.13 (0.400 x 0.400 x 0.202)
Weight grams	1	1.4	1.4	1.4
Mounting method	0-80 screws	0-80 screws	0-80 screws	0-80 screws

Piezoresistive accelerometers

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Model number	727	728	2262B
Description	Lightweight Broad frequency response Drop testing	Small and lightweight Broad bandwidth Adhesive mount	High Sensitivity Multi-mode damping Rugged to 10000 g shocks
Linear range g	±2,000 / ±6,000 / ±20,000 / ±60,000	±2,000 / ±10,000	±1,000 / ±2,000 / ±6,000
Sensitivity mV/g typical	10 / 3 / 1 / 0.3 uV/V/g	0.20 / 0.016	0.45 / 0.3 / 0.015
Frequency response ±5%, Hz	0-10,000 / 0-20,000 / 0-50,000 / 0-100,000	0 to 8,000 ±1dB	0 to 3,000
Shock limit g	3,000 / 9,000 / 30,000 / 90,000	10,000 / 30,000	10,000
Operating temperature °C (°F)	0 to +70 (+32 to +158)	0 to +70 (-32 to +158)	-67 to 257 °F -55 to 125 °C
Dimensions mm (in)	7.11 (0.28) 0.3 diameter	10.67 x 6.1 x 3.3 (0.420 x 0.240 x 0.130)	0.935 x 0.625 x 0.79 23.68 x 15.88 x 20.1
Weight grams	0.3	0.5	22
Mounting method	Adhesive	Adhesive	10-32 detachable stud

Piezoresistive
accelerometers

CE



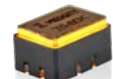
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Model number	71M	72	74	75
Description	Surface mount Undamped Low mass	Lightly damped Rugged ESD protection	Triaxial Damped Surface mount LCC	Triaxial Undamped Surface mount LCC
Linear range g	±2,000 / ±6,000 / ±20,000 / ±60,000	±2,000 / ±20,000 / ±60,000	±2,000 / ±20,000 / ±60,000	±2,000 / ±6,000 / ±20,000 / ±60,000
Shock limit g	10,000 / 18,000 / 60,000 / 120,000	10,000 / 80,000 / 240,000	10,000 / 60,000 / 180,000	10,000 / 18,000 / 60,000 / 80,000
Operating temperature °C (°F)	-54 to +66 (-65 to +150)	-54 to +71 (-65 to +160)	-55 to +121 (-67 to +250)	-55 to +121 (-67 to +250)
Weight grams	0.06	0.16	1.2	1.2
Mounting method	Adhesive	SMT or adhesive	SMT or adhesive	SMT or adhesive

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Model number	7270A	7270AM4	7270AM6	7270AM7	7274A
Description	High resonance Undamped Shock standard	High resonance Undamped Stud mount	Rugged Mechanical filter Stud mount	Extremely rugged Undamped Low noise cable	Triaxial Undamped High resonance
Linear range g	$\pm 2,000 / \pm 6,000 / \pm 20,000 / \pm 60,000 / \pm 200,000$	$\pm 2,000 / \pm 6,000 / \pm 20,000 / \pm 60,000 / \pm 200,000$	$\pm 2,000 / \pm 6,000 / \pm 20,000 / \pm 60,000$	$\pm 2,000 / \pm 6,000 / \pm 20,000 / \pm 60,000 / \pm 200,000$	$\pm 2,000 / \pm 6,000 / \pm 20,000 / \pm 60,000$
Sensitivity uV/g	100/30/10/3/1	100/30/10/3/1	100/30/10/3	100/30/10/3/1	50/15/5/1.5
Frequency response kHz +/-5%	0-10k / 0-20k / 0-50k / 0-100k / 0-150k	0-10k / 0-20k / 0-50k / 0-100k / 0-150k	0-10,000 ($\pm 10\%$)	0-10 / 0-20 / 0-50 / 0-100 / 0-150	0-18k / 0-36k / 0-70k / 0-140k
Shock limit g	10,000 / 18,000 / 60,000 / 180,000 / 200,000	10,000 / 18,000 / 60,000 / 180,000 / 200,000	10,000 / 18,000 / 60,000 / 100,000	10,000 / 18,000 / 60,000 / 180,000 / 200,000	10,000 / 18,000 / 60,000 / 180,000
Operating temperature °C (°F)	-55 to +121 (-67 to +250)	-55 to +66 (-67 to +150)	-34 to +66 (-30 to +150)	-55 to +121 (-67 to +250)	-55 to +66 (-67 to +150)
Dimensions mm (in)	14.22 x 7.1 x 2.79 (0.560 x 0.280 x 0.110)	7.92 (0.312) Hex x 8.9 (0.350)	17.15 x 14.73 x 15.78 (0.675 x 0.580 x 0.621)	14.2 x 8.9 x 4.06 (0.560 x 0.350 x 0.160)	14.22 x 7.72 x 6.22 (0.56 x .304 x .245)
Weight grams	1.5	1.5	8.4	4	2.9
Mounting method	Screw	1/4-28 integral stud	1/4-28 integral stud	4-40 screws	Screw

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Model number	7280A	7280AM4	7280AM7	7284A
Description	Extremely rugged Lightly damped Low power consumption	Extremely rugged Lightly damped Low power consumption	Extremely rugged Lightly damped Low noise cable	Triaxial Lightly damped Low power consumption
Linear range g	$\pm 2,000 / \pm 20,000 / \pm 60,000$	$\pm 2,000 / \pm 20,000 / \pm 60,000$	$\pm 2,000 / \pm 20,000 / \pm 60,000$	$\pm 2,000 / \pm 20,000 / \pm 60,000$
Sensitivity uV/g	300 / 16 / 5	300/16/5	300 / 16 / 5	150 / 8 / 2.5
Frequency response kHz +/-5%	0-10k / 0-10k / 0-13k	0-10k / 0-10k / 0-13k	0-10k / 0-10k / 0-13k	0-10 / 0-10 / 0-20 (+/-1dB)
Shock limit g	10,000 / 80,000 / 240,000	10,000 / 80,000 / 240,000	10,000 / 80,000 / 240,000	10,000 / 60,000 / 180,000
Operating temperature °C (°F)	-55 to +121 (-67 to +250)	-55 to +121 (-67 to +250)	-55 to +121 (-67 to +250)	-55 to +121 (-67 to +250)
Dimensions mm (in)	14.22 x 7.1 x 3.18 (0.560 x 0.280 x 0.125)	7.92 (0.312) Hex x 9.1 (0.360)	14.2 x 8.9 x 4.06 (0.560 x 0.350 x 0.160)	14.22 x 7.76 x 6.22 (0.560 x 0.304 x 0.245)
Weight grams	1.4	2.1	4	3.6
Mounting method	4-40 screws	1/4-28 UNF-3A stud	4-40 screws	4-40 screws

Inertial sensors

Applications

- Vehicle dynamics
- Automotive rollover
- Whiplash
- Aircraft flight testing
- Spacecraft and satellite
- Motion studies



In typical dynamic measurements, both acceleration and angular rate data are essential parameters needed to fully characterize the complex behavior of a moving object. Until recently, engineers could only conveniently gather information using linear accelerometers because the massive array of sensors required to collect rotational data was impractical due to the expense and space required. With Endevco's new angular rate and six degree of freedom (6DoF) sensors, professionals in automotive and aircraft development are now able to measure linear and rotational dynamics that previously required multiple sensors and much more space. Rather than having to make assumptions about these dynamic interactions, these analog output sensors provide reliable, empirical data to support the analytical results. What makes our sensors truly unique is that we offer the low acceleration ranges and low angular rate ranges that are most suitable for accurately characterizing motion.

CE



Model number	7310A
Description	Angular rate 2V full scale Rugged
Range deg/sec	±100 / ±500 / ±1,500 / ±6,000 / ±8,000 / ±12,000 / ±18,000
Sensitivity mV/g/sec +/-15%	20 / 4 / 1.333 / 0.333 / 0.25 / 0.167 / 0.111
Frequency response Hz +/-3dB	0-1,000 (100 / 500) / 0-2,000
Non linearity % FSO	±0.5
Shock limit g	5000
Operating temperature °C (°F)	-40 to +105 (-40 to +221)
Dimensions mm (in)	14.6 x 10.2 x 7.62 (0.580 x 0.400 x 0.300)
Weight grams	3
Rate excitation voltage Vdc	5 to 16
Mounting method	0-80 screws

CE



Model number	7360A
Description	6DoF measurement Compact package with 2 cables Rugged to 5000 g shocks
Accelerometer ranges g	±2 / ±10 / ±50 / ±200 / ±500
Range deg/sec	±100 / ±500 / ±1,500 / ±6,000 / ±8,000 / ±12,000 / ±18,000
Accelerometer sensitivity mV/g typical	1,000 / 200 / 40 / 10 / 4
Sensitivity mV/g/sec +/-15%	20 / 4 / 1.333 / 0.25 / 0.167 / 0.111
Accelerometer frequency response +/-1dB	0-300/0-1,500/0-1,800/0-1,800/0-1,800
Frequency response Hz +/-3dB	0-1,000 / 0-1,000 / 0-1,000 / 0-1,000 / 0-2,000 / 0-2,000
Non linearity % FSO	0.5
Shock limit g	5,000
Operating temperature °C (°F)	-40 to +100 (-40 to +212)
Dimensions mm (in)	30.5 x 30.5 x 27.9 (1.2 x 1.2 x 1.1)
Weight grams	35
Accelerometer excitation voltage Vdc	7 to 36 or 5V (M1 option)
Rate excitation voltage Vdc	5 to 16
Mounting method	4-40 screws

Piezoresistive pressure transducers

Applications

- Jet airflow fields and inlet pressure
- Hypersonic, transonic and “quiet flow” wind tunnel testing
- Turbulent airflow measurements
- Blast testing
- Automotive airbag inflation testing
- Rocket motor analysis
- Vehicle transmission testing
- Hydraulics measurements

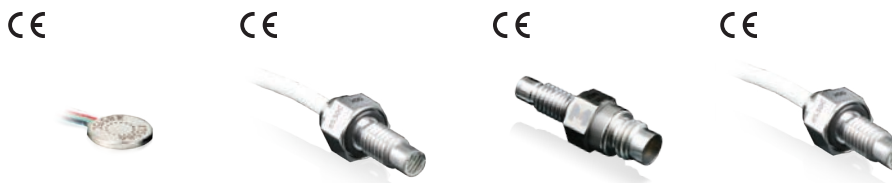


Miniature piezoresistive pressure transducers are designed to measure both dynamic and static pressure to a high degree of accuracy. MEMS sensing elements feature a unique diaphragm design manufactured at Endevco's US based MEMS facility, resulting in a range of pressure sensors with an extremely high output signal and high resonant frequency, as well as extraordinary linearity and repeatability, and virtually no hysteresis.

All models feature internal temperature compensation to provide stable performance over temperature. Absolute pressure sensors are available in ranges as low as 0–15 psia and as high as 0–2,000 psia, with gage/differential sensor models available in ranges as low as 0–1 psig and as high as 0–20,000 psig. All units are shipped in specially designed electrostatic discharge (ESD) packaging, to reduce the potentially harmful effects of static electricity on critical components, as well as to further support customer in-house ESD control procedures. Many modifications to our standard pressure transducers are available on request.

Gage
pressure transducers

Model number	8507C	8510B	8510C	8511A
Description	Gage High sensitivity Temp compensation	Gage Vent tube Temp compensation	Gage High resonance Temp compensation	Rugged Gage High pressure
Full scale pressure psi	1 / 2 / 5 / 15	1 / 2 / 5 / 200 / 500 / 2,000	15 / 50 / 100	5,000 / 10,000 / 20,000
Sensitivity mV/psi	200 / 100 / 60 / 20	200 / 100 / 60 / 1.5 / 0.6 / 0.15	15 / 4.5 / 2.25	0.1 / 0.05 / 0.025
Resonance frequency kHz	55 / 70 / 85 / 130	55 / 70 / 85 / 320 / 500 / 900	180 / 320 / 500	<1000
Non linearity (typ) %FSO	1.5 / 1.0 / 0.5 / 0.2	1.0	0.15 / 0.1 / 0.1	1.2 / 2.5 / 2.5
Operating temperature °C (°F)	-54 to +107 (-65 to +225)	-54 to +121 (-65 to +250)	-54 to +121 (-65 to +250)	-54 to +121 (-65 to +250)
Burst pressure psi	20 / 40 / 100 / 150	25 / 40 / 100 / 1000 / 2,500 / 10,000	75 / 250 / 400	20,000 / 30,000 / 40,000
Face diameter mm (in)	2.34 (0.092)	3.86 (0.152)	3.86 (0.152)	8.13 (0.320)
Weight grams	0.3	2.3	2.3	11
Mounting method	RTV bond	10-32 UNF-2A	10-32 UNF-2A	3/8-24 UNF-2A

Absolute
pressure transducers

Model number	8515C	8530B	8530BM37	8530C
Description	Absolute 0.03 inch thin Surface mount	Absolute High resonance Temp compensation	Absolute Detachable cable ABS braking studies	Absolute High sensitivity Temp compensation
Full scale pressure psi	15 / 50	200 / 500 / 1,000 / 2,000	200 / 500 / 1,000 / 2,000	15 / 50 / 100
Sensitivity mV/psi	13.3 / 4.0	1.5 / 0.6 / 0.3 / 0.3	1.5 / 0.6 / 0.3 / 0.3	15 / 4.5 / 2.25
Resonance frequency kHz	180 / 320	750 / 1,000 / >1,000 / >1,000	750 / 1,000 / >1,000 / >1,000	180 / 320 / 500
Non linearity (typ) %FSO	0.2	0.2	0.2	0.15 / 0.1 / 0.1
Operating temperature °C (°F)	-54 to +121 (-65 to +250)	-54 to +121 (-65 to +250)	-54 to +121 (-65 to +250)	-54 to +121 (-65 to +250)
Burst pressure psi	75 / 250	800 / 2,000 / 4,000 / 4,000	800 / 2,000 / 4,000 / 4,000	75 / 250 / 400
Face diameter mm (in)	6.35 (0.25)	3.86 (0.152)	3.86 (0.152)	3.86 (0.152)
Weight grams	0.08	2.3	2.3	2.3
Mounting method	Adhesive	10-32 UNF-2A	10-32 UNF-2A	10-32 UNF-2A

Piezoelectric accelerometers

Applications

- Satellite
- Turbine development
- HALT & HASS testing
- Quality assurance
- Nuclear power plant monitoring
- Cryogenic testing
- Automotive engine testing

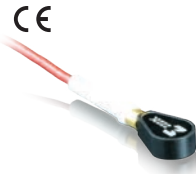


Piezoelectric (PE) accelerometers

All mechanical accelerometer designs are based on a simple spring-mass principle in which strain is generated in relation to amplitude and frequency of the dynamic motion. In a PiezoElectric (PE) accelerometer, this strain is applied directly to the PE element, which develops an electrical charge proportional to mechanical motion. Different material and configurations of PE accelerometer elements are used to support specific applications.

Advantages of PE sensors

- The dynamic range of PE accelerometers can be greater than 130dB. When used with a proper charge converter/amplifier, it offers unmatched performance in terms of total measurement range and reliability. Transduction efficiency may also be optimized with PE crystals to allow for the miniaturization of accelerometer within a given physical envelope.
- Single-ended compression type is optimum for low level measurements because of the high sensitivity that can be achieved by stacking multiple PE crystals and connecting them in parallel.
- A shear mode design allows for the construction of miniature, lightweight sensors suitable for monitoring of small components and test articles. A key advantage of the shear design is the isolation of the sensing element from the base, which provides excellent protection from base strain and temperature transients.
- Due to the broad temperature range of most piezoelectric materials, PE accelerometers are often specified for extreme high or low temperature applications, from cryogenic conditions in rocket engines to the extreme heat environment of turbine generators.
- PE accelerometers are available in a wide range of shapes and sizes, from micro-miniature in electronics component testing to larger sizes used in seismic or engine applications.



Miniature

Model number	2222C	2226C
Description	Miniature teardrop	Lightweight Miniature
Sensitivity $\mu\text{C/g}$ typical	1.4	2.8
Sinusoidal limit g	1000	1000
Shock limit g	10,000	2000
Frequency response ± 1 dB Hz	1–10,000	0.1–7000
Operating temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)	-73 to +177 (-100 to +350)	-55 to +177 (-67 to +350)
Signal/ground isolation	Yes	No
Hermetic seal	No	No
Weight grams (without cable)	0.5	2.8
Dimensions mm (in)	9.53 hex x 4.8 (\emptyset 0.25 x 0.13)	9.53 hex x 5.8 (3/8 hex x 0.19)
Mounting method	Adhesive	Adhesive
Cable included	3090C/120	3060D/120



Precision lab testing

Model number	2224C	2228C
Description	Precision lab testing	Triaxial Ground isolated
Sensitivity $\mu\text{C/g}$ typical	12	2.8
Sinusoidal limit g	1,000	1,000
Shock limit g	2,000	2,000
Frequency response ± 1 dB Hz	0.1–10,000	0.1–6,000
Operating temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)	-55 to +177 (-67 to +350)	-55 to +177 (-67 to +350)
Signal/ground isolation	No	Yes
Hermetic seal	No	No
Weight grams (without cable)	16	15
Dimensions mm (in)	14.2 hex x 13.7 (9/16 hex x 0.54)	18.72 x 18.72 x 11.68 (0.737 x 0.737 x 0.460)
Mounting method	Stud	Screw
Cable included	3090C/120	3060D/120 (3)

Piezoelectric accelerometers

Cryogenic
-269°C (-452°F)

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Model number	7722 / 7724	2271A / 2271AM20
Description	Immune to thermal transients	High sensitivity side or top exit connector
Sensitivity pC/g typical	3.7	11.5
Sinusoidal limit g	500	1,000
Shock limit g	2500	10,000
Frequency response ±1 dB Hz	1-6000	1-8,000
Operating temperature °C (°F)	-269 to +177 [-452 to +350]	-269 to +260 [-452 to +500]
Signal/ground isolation	7722 - No / 7724 - Yes	Yes
Hermetic seal	Yes	Yes
Weight grams (without cable)	29	27
Dimensions mm (in)	16.0 hex x 23.1 (5/8 hex x 0.91)	15.9 hex x 19.8 (5/8 hex x 0.78)
Mounting method	Stud	Stud
Cable included	3090C/120	3090C/120

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+260°C (+500°F)

Model number	2220E	2221F	2230E	2230EM1	6222S
Description	Thru-hole mount 360° cable orientation Lightweight	Thru-hole mount 360° cable orientation	Triaxial Adhesive mount	Triaxial Flange mount	ARINC mount Differential output
Sensitivity pC/g typical	3.0	10	3	3	20 / 50 / 100
Sinusoidal limit g	1,000	1,000	1,000	1,000	2,000 / 1,000 / 500
Shock limit g	5,000	3,000	2,000	2,000	4,000 / 2,000 / 1,000
Frequency response ±1 dB Hz	1 to 12,000	0.1-12,000	1-10,000	1-10,000	1-12,000 / 1-9,000 / 1-9,000
Operating temperature °C (°F)	-55 to +260 [-67 to +500]	-55 to +260 [-67 to +500]	-55 to +260 [-67 to +500]	-55 to +260 [-67 to +500]	-54 to +260 [-65 to +500]
Signal/ground isolation	Yes	Yes	No	No	Yes
Hermetic seal	Yes	Yes	Yes	Yes	Yes
Weight grams (without cable)	3.1	11	17	22.5	91
Dimensions mm (in)	Ø 9.53 x 5.8 (Ø 0.375 x 0.23)	Ø 15.24 x 8.9 (Ø 0.60 x 0.35)	17.15 x 11.68 x 15.24 (0.675 x 0.46 x 0.60)	17.15 x 11.68 x 15.24 (0.675 x 0.460 x 0.60)	41.4 x 30.2 x 20.3 (1.63 x 1.19 x 0.80)
Mounting method	Screw	Screw	Adhesive	Screw	Screw
Cable included	3053V/120	3090C/120	3053V/120 (3)	3053V/120 (3)	No

+260°C/+288°C
(+500°F/+550°F)

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Model number	7240C	7201	7703A	7704A
Description	Very high frequency	General purpose	General purpose Radiation tested	General purpose Radiation tested
Sensitivity pC/g typical	3.0	10 / 50 / 100	50 / 100 / 200 / 300 / 1,000	50 / 100
Sinusoidal limit g	1,000	2,000	2,000 / 1,000 / 850 / 675 / 500	2,000 / 1,000
Shock limit g	5000	20,000 / 10,000 / 5000	10,000/5,000/2,000/1,600/1,000	10,000 / 5,000
Frequency response ±1 dB Hz	1–20,000	1–15,000 / 1–10,000 / 1–8000	1–9,000 / 1–8,000 / 1–6,000 / 1–5,000 / 1–3,000	1–9,000 / 1–8,000
Operating temperature °C (°F)	-55 to +260 (-67 to +500)	-73 to +260 (-100 to +500)	-55 to +288 (-67 to +550)	-55 to +288 (-67 to +550)
Signal/ground isolation	No	No	Yes	Yes
Hermetic seal	Yes	Yes	Yes	Yes
Weight grams (without cable)	4.8	18 / 20 / 25	25 / 29 / 62 / 70 / 120	25 / 29
Dimensions mm (in)	9.53 hex x 11.68 (3/8 hex x 0.46)	15.88 hex x 19.8 (5/8 hex x 0.78)	for -50 / -100: 16.0 hex x 19.8 (5/8 hex x 0.78) for -200 / -300 / -1000: 25.4 hex x 23.1 (1.0 hex x 0.91)	16.0 hex x 21.1 (5/8 hex x 0.83)
Mounting method	Stud	Stud	Stud	Stud
Cable included	3053V/120	3090C/120	3090C/120	3090C/120

IEPE accelerometers

Applications

- Aircraft flight testing
- Ground vibration testing
- Modal analysis
- Quality assurance
- Product R & D
- Heavy machinery maintenance
- Powertrain development
- OEM design and test applications



Integrated electronics piezoelectric (IEPE) accelerometers

The acronym IEPE refers to a type of piezoelectric (PE) accelerometer with internal electronics (IE) that allows it to convert charge to a low-impedance voltage output. Its temperature response is somewhat limited due to its onboard electronics. This type of accelerometer is primarily specified for applications in which environmental conditions permit its use, including HALT/HASS/ESS testing, industrial vibration monitoring and general purpose vibration and shock testing.

Since both PE and IEPE types are AC-coupled designs, the acceleration output of these accelerometers cannot be used to yield correct velocity and displacement information by numerical integration.

Advantages of IEPE sensors

- Less operator attention, training and installation expertise required.
- Uses standard coaxial cable.
- Drives long cables without noise increase or loss of resolution.
- Operates directly into many data collectors with built-in constant current input.

IEPE accelerometers

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Small single axis

Model number	2256B-R	256HX-R	7250B	7251A-R
Description	Lightweight General purpose	Lightweight General purpose	Ultra wide bandwidth Thru-hole mount	Thru-hole mount
Sensitivity mV/g, typical	10 / 100	10 / 100	2 / 10	10 / 100
Linear range g	±500 / ±50	±500 / ±50	±2,500 / ±500	±500 / ±50
Shock limit g	2,000	2,000	10,000	5,000
Frequency response ± 1dB Hz	1-10,000 (±10%)	1-10,000 (±10%)	1 to 40,000 (±3 dB)	2-10,000 (±10%)
Broadband noise (µg rms)	1,000 / 300	1,000 / 300	3,500 / 1,000	1,000 / 250
Operating temperature °C (°F)	-55 to +125 (-67 to +257)	-55 to +125 (-67 to +257)	-55 to +125 (-67 to +257)	-55 to +125 (-67 to +257)
Signal/ground isolation	Yes	Yes	Yes	Yes
Hermetic seal	Yes	Yes	Yes	Yes
Weight grams (without cable)	4	4	1.9	10.5
Dimensions mm (in)	11.2 hex x 7.4 (0.44 hex x 0.29)	11.2 hex x 9.4 (0.44 hex x 0.37)	Ø 9.65 x 6.2 (Ø 0.381x 0.25)	Ø 15.2 x 8.9 (Ø 0.60 x 0.35)
Mounting method	Adhesive	Stud	Screw	Screw
Cable included	None	None	3091F/120	None

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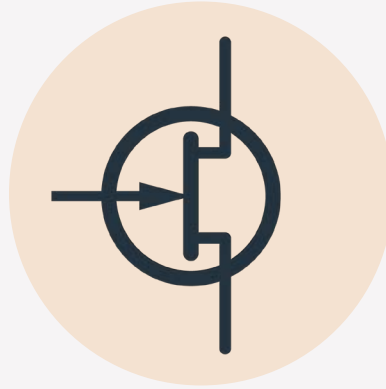
Small triax

Model number	65 / 65M1	65HT / 65HTM1	65HTLPF / 65HTLPFM1
Description	Industry standard	Triaxial High temperature	Triaxial High temperature Integrated low-pass filter
Sensitivity mV/g, typical	10 / 100	10	10
Linear range g	±500 / ±50	±500	±500
Shock limit g	10,000	10,000	10,000
Frequency response ± 1dB Hz	0.4-10,000 / 1.5-6,000	0.5-8,000	0.5-1,400 (2 kHz filter)
Broadband noise (µg rms)	800 / 400	600	4,000
Operating temperature °C (°F)	-55 to +125 (-67 to +257)	-55 to +175 (-67 to +347)	-55 to +175 (-67 to +347)
Signal/ground isolation	65: No / 65M1: Yes	65HT: No / 65HTM1: Yes	No
Hermetic seal	Yes	Yes	Yes
Weight grams (without cable)	5	65HT: 5 / 65HTM1: 6	5
Dimensions mm (in)	65: 10 cube (0.39 cube) 65M1: 11.2 cube (0.44 cube)	65HT: 10 cube (0.39 cube) 65HTM1: 11.2 cube (0.44 cube)	10 cube (0.39 cube)
Mounting method	Stud / adhesive	65HT: Stud 65HTM1: Adhesive	Stud
Cable included	3027AM3/120	3027AVM13/84 / 3027AM3/36	3027AVM13/84 / 3027AM3/36

Signal conditioners

Configurations

- Bench top
- Rack mounted
- In-line, remote
- Airborne installation
- Battery operated



Endevco offers a comprehensive family of high performance electronic instruments from simple battery operated signal conditioners to computer controlled laboratory quality instruments that measure vibration, shock and pressure. Endevco electronic instruments support piezoelectric (charge-mode), variable capacitance, IEPE (voltage-mode) and piezoresistive sensors.

Single channel in-line signal conditioners



Model number	2680MX	2685MX	2777A	2771C	2771CM2
Features	Airborne applications Small, lightweight	Airborne applications Small, lightweight	2 gain options Airborne applications Acceleration and velocity outputs	4 gain options Supports TEDS	Designed for use with extreme high temp sensors, 1200°F (650°C)
Input	PE	IEPE	DIFF PE	PE	PE
Channels	1	1	1	1	1
Gain	0.1–100 mV/pC	0.1–100 mV/mV	2 / 10 mV/pC	0.1 / 1 / 5 / 10 mV/pC	1 mV/pC
Broadband noise rms	1.5 mV	1.5 mV	1/5 mV (RTO)	5 / 30 / 50 / 50 µV	10 µV
Lower cutoff freq Hz (-3 dB)	3	0.7	5.73 / 8.59 / 11.5 / 14.3 / 113	0.4 / 0.4 / 2 / 2	2
Upper cutoff freq Hz (-3 dB)	Selectable	Selectable	17,500	8 / 30,000 / 50,000 / 50,000 (±5%)	30
Power requirements VDC	20-32	20-32	22–31	24-30	24-30
Operating temperature °C (°F)	-67 to +212 (-55 to 100)	-67 to +212 (-55 to 100)	-5 to +185 (-15 to 85)	-40 to +257 (-40 to 125)	-40 to +257 (-40 to +125)
Weight grams	34	34	227	57	57

Single channel programmable signal conditioners



Model number	4416C	4418
Features	IEPE power supply Portable and compact Rechargeable battery	Bridge signal conditioner Portable and compact ZMO adjustment
Input	IEPE	PR, VC
Channels	1	1
Gain	1, 10, 100 selectable	1, 10, 100 selectable
Broadband noise rms	< 20 µV	<20 uV
Lower cutoff freq Hz (-3 dB)	0.1	DC
Upper cutoff freq Hz (-3 dB)	100,000	10,000
Power requirements	Battery powered, rechargeable	Battery powered, rechargeable
Type of control	Manual	Manual
Rack mount	N/A	N/A

High intensity microphones

Piezoelectric microphones measure high intensity acoustic noise and very low pressure fluctuations over a frequency range of 1 Hz to 10 kHz with a measurement range of 100 to >180 dB SPL. These hermetically sealed microphones are designed for operation in harsh environments and operate over a temperature range of -55°C to +260°C (-67°F to +500°F). Other outstanding features include insensitivity to altitude changes and ambient vibration.



CE



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Model number	2510	2510M4A
Description	High intensity sound High temperature Vibration compensated	High intensity sound High temperature Vibration compensated
Type	Pressure	Pressure
Sensitivity pC rms@140 dB SPL	31	31
Frequency range ± 1 dB Hz	2-4,000	2-4,000
Temperature range °C (°F)	-55 to +260 (-67 to +500)	-55 to +260 (-67 to +500)
Dynamic range dB	100-180	100-180
Diameter mm (in)	20.70 (0.815)	20.70 (0.815)
Cable included	3090C/120	3090C/120

Cable assemblies

Endevco designs and manufactures many of its own cables and connectors, specializing in custom cables, lengths, and connectors for dynamic testing. In these tough and challenging environments, accuracy depends as much on cables and connectors as it does on transducers. Our engineers are well versed in all the critical parameters in cable and connector designs that can affect signal transmission. As a result, these parameters are carefully optimized in our products to ensure data quality and reliability. When it comes to this kind of in-house custom capability, ordinary commercial cable and transducer companies don't compare.



Cable assemblies

Miniature

	CE	CE	CE	CE
Model number	3003C	3006	3053V	3053VM1
Connector 1	1.00 UNM jack	1.20 UNM jack	M3 male plug, hex end	M3 male plug, hex end
Connector 2	1-64 UNC-2A, female plug	10-32 male plug	10-32 male plug, hex end	BNC male plug
Cable type	Coaxial	Coaxial	Coaxial, shielded	Coaxial, shielded
Capacitance pF/ft, max	25	43	32	32
Conductor size AWG	Solid, 40	Stranded, 36	Solid, 33	Solid, 33
Jacket material	ETFE	PTFE	Extruded ETFE, TPE	Extruded ETFE, TPE
Overall diameter in, max	0.024	0.040	0.054	0.054
Bend radius in, min	0.1	0.12	0.5	0.5
Temperature range °C (°F)	-73 to +177 [-100 to +350]	-50 to 125 [-58 to 257]	-254 to +260 [-432 to +500]	-55 to +200 [-67 to +392]
Low noise treated	No	No	Yes	Yes

	CE	CE	CE
Model number	3091F	3093M10	3095A
Connector 1	6-40 UNF-2B female plug	10-32 female socket	1-64 UNC
Connector 2	10-32 male plug	1-64 UNC	10-32 male plug
Cable type	Coaxial, shielded	Coaxial, shielded	Coaxial, shielded
Capacitance pF/ft, max	40	30	30
Conductor size AWG	Solid, 33	Solid, 33	Solid, 33
Jacket material	Wrapped ETFE	Wrapped ETFE	Wrapped ETFE
Overall diameter in, max	0.06	0.06	0.06
Bend radius in, min	0.12	0.12	0.12
Temperature range °C (°F)	-184 to +260 [-300 to +500]	-73 to +177 [-100 to +350]	-184 to +177 [-300 to +350]
Low noise treated	Yes	Yes	Yes

Standard coaxial

CE

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Model number	3090C	3090CM12	3090CM67	3060D
Connector 1	10-32 male plug	10-32 male plug	10-32 male plug, hex	10-32 male plug
Connector 2	10-32 male plug	BNC male plug	10-32 male plug, hex	10-32 male plug
Cable type	Coaxial, shielded	Coaxial, shielded	Coaxial, shielded	Coaxial, shielded
Capacitance pF/ft, max	40	32	35	50
Conductor size AWG	Stranded, 30	Stranded, 30	Stranded, 30	Solid, 28
Jacket material	Wrapped ETFE	Wrapped ETFE	Wrapped ETFE with Heat-resistant para-aramid synthetic fiber reinforcement and protective metal overbraid	Extruded silicon
Overall diameter in, max	0.08	0.08	0.12	0.092
Bend radius in, min	0.85	0.85	0.85	0.95
Temperature range °C (°F)	-269 to +260 (-452 to +500)	-185 to +260 (-300 to +500)	-55 to +260 (-67 to +500)	-73 to +260 (-100 to +500)
Low noise treated	Yes	Yes	Yes	Yes

CE

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Model number	3061	3096
Connector 1	10-32 male plug	10-32 male plug, hex
Connector 2	BNC male plug	10-32 male plug, hex
Cable type	Coaxial, shielded	Coaxial, shielded
Capacitance pF/ft, max	28	35
Conductor size AWG	Stranded, 30	Stranded, 30
Jacket material	Extruded ETFE	Wrapped Teflon with Heat-resistant para-aramid synthetic fiber reinforcement
Overall diameter in, max	0.08	0.115
Bend radius in, min	0.85	0.85
Temperature range °C (°F)	-100 to +260 (-148 to +500)	-55 to +260 (-67 to +500)
Low noise treated	No	Yes

Multi conductor

CE

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Model number	6917B	6917D	3024	3027M8	3024M1
Connector 1	7/16-27 female plug (2 socket)	7/16-27 female plug w/Viton boot (2 socket)	10-32 male plug	10-32 male hex plug	10-32 male plug
Connector 2	Pigtail	Pigtail	Pigtail	Pigtail	Pigtail
Cable type	Twisted pair, shielded	Twisted pair, shielded	Twisted pair	Twisted pair	Twisted pair, shielded
Capacitance pF/ft, max	80	80	N/A	N/A	N/A
Conductor size AWG	Stranded, 20	Stranded, 20	Stranded, 28	Stranded, 26	Stranded, 28
Jacket material	Wrapped ETFE	Wrapped ETFE	No overall jacket	Tefzel	Extruded ETFE
Overall diameter in, max	0.21	0.21	0.055	0.086	0.094
Bend radius in, min	0.6	0.6	0.75	0.75	0.75
Temperature range °C (°F)	-54 to +260 (-65 to +500)	-54 to +288 (-65 to +550)	-184 to +176 (-300 to +350)	-184 to +176 (-300 to +350)	-184 to +176 (-300 to +350)
Low noise treated	Yes	Yes	No	No	No

CE

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Model number	3027B	3027AM3	3027AVM13	3915
Connector 1	4 socket plug	4 socket plug	4 socket plug	4-socket plug
Connector 2	Pigtail	3x BNC male plug	4 pin receptacle	Pigtail
Cable type	4 conductor, shielded	4 conductor, shielded	4 conductor, shielded	4-conductor, shielded
Capacitance pF/ft, max	16	30	16	-
Conductor size AWG	Stranded, 32	Stranded, 28	Stranded, 28	Stranded, 28
Jacket material	Extruded silicone	Extruded PVC	Extruded ETFE, TPE	Silicone rubber
Overall diameter in, max	0.108	0.105	0.105	0.097
Bend radius in, min	0.5	N/A	N/A	1.0
Temperature range °C (°F)	-100 to +125 (-148 to +257)	-55 to +85 (-67 to +185)	-100 to +200 (-148 to +392)	-60 to +121 (-76 to +250)
Low noise treated	No	No	No	Yes

Accessories

Endevco manufactures a complete range of accessories designed and fully tested to be directly compatible with our sensors, transducers and related instrumentation. To ensure high-reliability sensor performance and repeatable results, appropriately selected mounting studs, blocks, bases, adapters and other accessories are highly recommended. These tools are used to properly affix a sensor to the test structure or mounting surface with minimum additional mechanical stress and optimize the frequency response. When selecting an accessory for a given measurement requirement, it is important to note that selection of and adherence to proper sensor mounting techniques, as well as preparation of the mounting surface, is absolutely critical.

Mounting accessories

Mounting blocks



Model number	2950	2950M3	2950M18
Description	Triaxial mounting block 10-32 threaded holes 4-40 screw mount provided	Triaxial mounting block 6-32 threaded holes 4-40 Screw mount provided	Triaxial mounting block 2-56 threaded holes 4-40 mounting screw provided
Material	Anodized aluminum	Anodized aluminum	Anodized aluminum
Compatibility	Accelerometers with 10-32 stud	2221F, 7221A, 7251A	2220E, 7250A, 7250AM1
Dimensions mm (in)	25.4 x 25.4 x 17.0 (1.0 x 1.0 x 0.67)	22.22 x 22.22 x 15.88 (0.875 x 0.875 x 0.625)	12.7 x 12.7 x 10.16 (0.50 x 0.50 x 0.40)
Weight grams	20.5	20.5	3.7

Mounting blocks



Model number	7930	7953A	7964B
Description	Triaxial and 6DOF Block 2-56 screws for mounting 0-80 threaded holes	Triaxial mounting block 2-56 screws for mounting 0-80 threaded holes	Triaxial mounting block 2-56 screws for mounting 0-80 threaded holes
Material	Aluminum alloy	Magnesium alloy	Aluminum alloy
Compatibility	7310 (rate), 7264C, 7264H, 726C (accels)	7264C, 7264D, 7264H, 726C, 757F	7264B
Dimensions mm (in)	21.72 x 21.72 x 11.56 (0.855 x 0.855 x 0.455)	16.51 x 16.51 x 10.92 (0.650 x 0.650 x 0.430)	16.51 x 16.51 x 10.92 (0.650 x 0.650 x 0.430)
Weight grams	9.7	5.1	7.9



Mounting blocks

Model number	7980	7970	7990
Description	Triaxial mounting block 6-32 screws for mounting 4-40 threaded holes	Triaxial mounting block 6-32 screws for mounting 4-40 threaded holes	Triaxial mounting block 6-32 screws for mounting 4-40 threaded holes
Material	Titanium	Titanium	Aluminum alloy
Compatibility	7270AM7, 7280AM7	7270A, 7280A	7290D
Dimensions mm (in)	27.94 x 15.24 x 10.16 (1.100 x 0.600 x 0.400)	20.32 x 15.24 x 10.39 (0.800 x 0.6.00 x 0.409)	26.04 x 25.40 x 25.40 (1.025 x 1.0 x 1.0)
Weight grams	21	10.6	40



Adapters

Model number	2980M4	2980M12	2985	2986B	2986M3
Description	Isolated mounting adapter 10-32 stud .495 inch diameter	Isolated mounting adapter 10-32 stud to 10-32 stud 3/8 inch hex	Isolated mounting adapter 10-32 stud to 10-32 stud 5/8 inch hex	Isolated mounting adapter 10-32 stud to 10-32 stud 5/8 inch hex	Isolated mounting adapter 10-32 stud to M5 stud 14 mm hex
Material	Stainless steel	Anodized aluminum	Stainless steel	Stainless steel	Stainless steel
Compatibility	10-32 threaded hole accelerometers	10-32 threaded hole accelerometers	10-32 threaded hole accelerometers	10-32 threaded hole accelerometers	10-32 threaded hole accelerometers

Accessories



Mounting bases

Model number	2988	30042
Description	Adhesive mounting base to 10-32 stud 1/2 inch hex	Aerodynamic mounting pad
Material	Anodized aluminum	Urethane
Compatibility	10-32 threaded hole accelerometers	8515C
Dimensions mm (in)	12.7 hex (0.5 hex)	111.76 OD; 0.79 thick (4.400 OD; 0.03 thick)



Mounting studs

Model number	2981-3	2981-4	2981-12
Description	Mounting stud 10-32 stud to 10-32 stud Slotted head	Mounting stud 10-32 stud to M5 stud Slotted head	Mounting stud 10-32 stud Hex socket head
Material	Stainless steel	Stainless steel	Stainless steel
Compatibility	10-32 threaded hole accelerometers	10-32 threaded hole accelerometers	10-32 threaded hole accelerometers

Miscellaneous accessories

Model	Description
EDV21997	Plug accessory kit for 2680 and 2685
26574	Plug assembly for 6917B cable
EDV30279	PR/VC mounting fixture
EDVEHM2107	Power adaptor, 12VDC, for 4416C
EDVEJ1085	4 socket plug, used on 3027A series cable assemblies
EDVEJ1183	10-32 Microdot to BNC adaptor
EJ34	10-32 to 10-32 in-line adaptor

Model	Description
EDVEJ600	25 pin D connector
EJ66	Feed-thru bulkhead microdot connector
EDVEJ720	Input connector, Bendix 2 pin straight plug for 2777A
EDVEJ721	Output connector, Bendix 6 pin socket plug for 2777A
EDVEJ724-U	9 Pin D-sub connector for 126
EP171	Adaptor, 10-32 to female BNC
EDVEP31	Potting sleeve for 2680 and 2685
EP310	Adaptor, 10-32 plug to 10-32 receptacle, right angle
EDVEP316	Twinax BNC Plug
EDVEP35	Connector hood for 2680 and 2685
EDVEP38	Mating plug for 2680 and 2685
EDVEP685	10-32 plug
EDVEP686	BNC plug
EDVEP695	10-32 to BNC adaptor for 4830B
EDVEW1196	D-sub cable, DB25 male / female, 2.5 ft
EDVEW1400	USB cable for 4830B

Reference accelerometers

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Model number	2270	2270M8
Description	Back-to-back calibration	Transfer standard accelerometer
Sensitivity pC/g typical	2.2	2.2
Sinusoidal limit g	1,000	1,000
Shock limit g	15,000	15,000
Frequency response ± 1 dB Hz	2–20,000 (for accelerometers up to 35 grams)	2 – 10,000 (+/-5%)
Operating temperature °C (°F)	-55 to +177 (-67 to +350)	-54 to +177 (-65 to +350)
Signal/ground isolation	Switchable	Yes
Hermetic seal	No	Yes
Weight grams (without cable)	40	16.5
Dimensions mm (in)	15.88 hex x 28.4 (5/8 hex x 1.12)	15.88 hex x 17.8 (5/8 hex x 0.7)
Mounting method	Stud	Stud
Cable included	3090C/120	3090C/120

CE



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Portable system verification instruments

Model number	4330B
Description	Handheld accelerometer simulator
Outputs	Single-ended charge Differential charge Single-ended voltage Tachometer IEPE
Frequency range Hz	1-20,000, resolution 0.5
Amplitude	Adjustable up to 10,000 pC or mV pk
Amplitude accuracy	$\pm 1\%$
Broadband noise	< 2 mV or 2 pc
Battery	Rechargeable battery
Features	<ul style="list-style-type: none"> • FFT input function • User defined simulation profiles • Utility software for profile setup • Front panel calibration • USB interface

Model number	394C06
Description	Handheld shaker
Operating frequency Hz	($\pm 1\%$) 159.2
Acceleration output g	($\pm 3\%$) 1.00 g rms (9.81 m/s ² rms)
Distortion	(0 to 99 grams load) =2 % (100 to 149 grams load) =5 % (150 to 210 grams load) =9 %
Load grams	2 - 210
Power	Internal 4 AA batteries Accepts external DC power supply
Dimensions	2.2" (56 mm) Dia. x 7.8" (200 mm) H
Mounting thread	10-32 female
Provided by	PCB Piezotronics

Calibration services

Features

- Full range of sensor calibration services available
- Comprehensive calibration reports
- A2LA accredited, National Metrology Institute traceable
- Custom calibration services available
- Fast turnaround



Endevco offers complete calibration services to regularly calibrate sensors and maintain a high level of precision and accuracy. Many types of calibrations are available, including absolute vibration calibration for the lowest uncertainty, as well as comparison techniques for shock and vibration. Endevco can also perform customized calibrations including environmental calibrations to verify amplitude linearity or frequency, or high shock impact testing. Our calibration team is committed to providing the most accurate calibrations available with conformance to the National Metrology Institute (NMI: NIST, PTB, etc.). All calibration services are A2LA accredited.

What we calibrate

- Piezoelectric accelerometers (PE and IEPE)
- Piezoresistive accelerometers
- Variable capacitance accelerometers
- Pressure transducers
- Both Endevco and non-Endevco transducers
- System calibration (sensor + amplifier/signal conditioner)

Annual calibration is recommended for accelerometers and their associated instrumentation to ensure the continued accuracy of your dynamic measurements. Accelerometer calibration is available from the same people who design, build, and calibrate hundreds of accelerometers on a daily basis. Calibration is conducted by qualified technicians who are under the supervision of our experienced Engineering staff. Endevco offers a wide selection of calibration services to meet your needs. These include simple back-to-back calibrations and highly accurate absolute calibrations.

For those that require the highest levels of reporting, services are available with comprehensive reports that include a description of methods used, the reference standards used and their current calibration dates, report numbers and traceability to the National Metrology Institute (NMI: NIST, PTB, etc.), the estimated uncertainty of the calibrations, the temperature and humidity during the calibrations. The report also includes measurement data points and a graphical display of output data. Additionally, fast turnaround services are available that supply a standard one page calibration certificate.

For vibration services, Endevco uses precision, low noise air bearing shakers with a beryllium armature to ensure the highest accuracy with high frequency capabilities. We can also perform a resonance search to further determine the condition of the sensor. Endevco designed equipment is used to test cross-axis sensitivity, another important test of the accelerometers performance. For shock services, Endevco equipment is used for testing up to 100,000 gs.

What we do

When we receive your sensor, it will be fully inspected and tested. Once your sensor is determined to be operating properly, we will proceed with the requested calibration. If during inspection and testing we determine that the unit is defective, we will advise you regarding the repair or replacement alternatives. In the event we are unable to make the necessary repairs, we can offer an attractive trade-in on a new Endevco product. Contact your local Representative to discuss other options or alternatives.

Traceability and accreditation

Accelerometer calibrations are conducted in our A2LA accredited laboratory. The methods used are in accordance with

ANSI/NCSL Z540-1-1994 and ISO/IEC 17025-2005. Traceability to the National Metrology Institute (NMI: NIST, PTB, etc.) is shown as required by military quality control standards.

Calibration services

Primary calibration with frequency sweep

Primary Calibration by Laser Interferometer. Includes frequency sweep in the specified range below.

Calibration service number	CS120A	CS120AH	CS120AL	CS120ALH	CS120AS	CS120ALH-S	CS120ALS
Frequency range	20 Hz to 10 kHz	20 Hz to 20 kHz	1 Hz to 10 kHz	1 Hz to 20 kHz	20 Hz to 10 kHz	1 Hz to 20 kHz	1 Hz to 10 kHz
System cal ³	No	No	No	No	Yes	Yes	Yes
Transverse sensitivity	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Report/certificate ¹	Full report	Full report	Full report	Full report	Full report	Full report	Full report
Capacitance Measurement	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Primary calibration, single point

Primary Calibration by Laser Interferometer. Measurement taken at a single frequency, customer defined.

Calibration service number	CS120B
Frequency range	Single Frequency
System cal ³	No
Transverse sensitivity	Yes
Report/certificate ¹	Full report
Capacitance Measurement	Yes

Comparison calibration

Secondary calibration by comparison provides a measurement uncertainty of $\pm 1.2\%$ (100 Hz), $\pm 1.5\%$ (20 Hz to 2500 Hz), $\pm 2.5\%$ (>2500 Hz to 10,000 Hz), and 5% (>10,000 Hz to 20,000 Hz).

Calibration service number	CS130	CS130H	CS130L	CS130LH	CS130S	CS130LH-S
Frequency range	20 Hz to 10 kHz	20 Hz to 20 kHz	1 Hz to 10 kHz	1 Hz to 20 kHz	20 Hz to 10 kHz	1 Hz to 20 kHz
System cal ³	No	No	No	No	Yes	Yes
Transverse sensitivity	Yes	Yes	Yes	Yes	Yes	Yes
Report/certificate ¹	Full report	Full report	Full report	Full report	Full report	Full report
Sensor manufacturer	Endevco	Endevco	Endevco	Endevco	Endevco/ Non-Endevco	Endevco
Resonance search ²	Yes	Yes	Yes	Yes	Yes	Yes

Calibration service number	CS130LS	CS130T ⁴	CS135	CS135L	CS135LH	CS410
Frequency range	1 Hz to 10 kHz	20 Hz to 10 kHz	20 Hz to 10 kHz	1 Hz to 10 kHz	1 Hz to 20 kHz	20 Hz to 10 kHz
System cal ³	Yes	No	No	No	No	No
Transverse sensitivity	Yes	Yes	No	No	No	Yes
Report/certificate ¹	Full report	Full report	Full report	Full report	Full report	Standard cert
Sensor manufacturer	Endevco	Endevco	Endevco	Endevco	Endevco	Endevco
Resonance search ²	Yes	Yes	Yes	Yes	Yes	Yes

Calibration service number	CS415	CS410TEDS ⁵	CS420	CS425	CS420L	CS210 ⁶
Frequency range	20 Hz to 10 kHz	20 Hz to 10 kHz	20 Hz to 10 kHz	20 Hz to 10 kHz	1 Hz to 10 kHz	20 Hz to 10 kHz
System cal ³	No	No	No	No	No	No
Transverse sensitivity	No	Yes	Yes	No	Yes	Yes
Report/certificate ¹	Standard cert	Standard cert	Standard cert	Standard cert	Standard cert	Standard cert
Sensor manufacturer	Endevco	Endevco	Non-Endevco	Non-Endevco	Non-Endevco	Endevco
Resonance search ²	Yes	Yes	Yes	Yes	Yes	Yes

Calibration services

Shock calibration

Half-sine shock calibration by comparison provides a measurement uncertainty of $\pm 1.9\%$ (20 to 2000 g) and 2.7% (2000 to 10,000 g).

Calibration service number	CS110	CS110S	CS220	CS220S	CS111	CS115
Shock range	20 g to 10 Kg, 5 levels	20 g to 10 Kg, 5 levels	20 g to 10 Kg, 5 levels	20 g to 10 Kg, 5 levels	10 Kg to 100 Kg, 5 levels	10 Kg to 100 Kg, 5 levels
Frequency range ⁷	20 Hz to 10 kHz	20 Hz to 10 kHz	NA	NA	NA	NA
System cal ²	No	Yes	No	Yes	No	No
Transverse sensitivity	Yes	Yes	Yes	Yes	Yes	No

Environmental calibration

Sensitivity calibration at temperature.

Calibration service number	CS310	CS315	CS330
Description	Sensitivity measurement at single frequency, at customer specified temperature	Sensitivity measurement at single frequency, at customer specified temperature	Sensitivity measurement at single frequency, at customer specified temperature
Temperature range °C (°F)	-55 to +175 [-67 to +345]	-55 to +175 [-67 to +345]	-173 to +760 [-280 to +1400]
Transverse sensitivity	No	Yes	Customer specified

1. Full report includes a 5+ page comprehensive report. Standard Cert includes a 1 page calibration certificate
2. Resonance search is performed up to 50,000 Hz or the sensor's highest specification frequency
3. System cal performs the calibration procedure on the measurement system including a transducer and its associated cable and signal conditioning
4. For triaxial accelerometers
5. Includes TEDS (Transducer Electronic Data Sheet) verification and update
6. Amplitude linearity (5 g levels from 1 g to 100 g, specified by customer)
7. Includes standard frequency sweep

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10869 NC Highway 903, Halifax, NC 27839 USA

endevco.com | sales@endevco.com | 866 363 3826

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