


Accelerometers · Acoustics · Pressure sensors · Signal conditioners · Electronics · Calibration · LVDTs · Cables

# Test and measurement product catalog

MEGGiTT
smart engineering for
extreme environments

# Meggitt PLC

The Meggitt group, comprising a 10,000-plus workforce over 40 operating sites worldwide, specializes in smart engineering for extreme environments—high performance components and sub-systems for aerospace, defence and energy markets. Its sensing and control technologies are also deployed in land and marine-based gas turbines, oil and gas applications and the medical, mainstream industrial, test engineering and transportation sectors. The group is managed via five divisions.

**Meggitt Aircraft Braking Systems** is the number one producer of wheels, brakes and brake control systems for regional, commercial transports and business jets and military aircraft, with products on an active fleet of over 30,000. Its capabilities include helicopter rotor brakes and brake temperature monitoring.

**Meggitt Control Systems** is a leading supplier of aerospace valves, heat exchangers, environmental control systems, high performance electro-mechanical fans, motors, compressors, controllers and specialist pumps and industrial fuel and bleed air control valves and ground fuelling products.

**Meggitt Polymers & Composites** designs and develops aircraft seals, flexible fuel tanks and coatings, complex composite structures, smart ice protection systems and sub-assemblies and interior panels and accessories.

**Meggitt Sensing Systems** excels in high performance sensing and monitoring systems for applications in aerospace, energy, industrial and laboratory test.

The **Meggitt Equipment Group** was created to enable a set of smaller capabilities market their offerings to specialist customers, while benefiting from the wider Meggitt group's investment in shared services and common processes. Its capabilities include training systems (live and virtual fire) and combat support (ammunition-handling, military electronics cooling and countermeasure launch and recovery systems), avionics, automotive and industrial control electronics, unique heat transfer equipment for hydrocarbon processing and aircraft fire protection and control.

In April 2011, Pacific Scientific Aerospace joined the Meggitt Equipment Group, creating a comprehensive ATA 26 fire protection system in-house and expanding its capability in more electric technologies (motion control, power conversion, high-density magnetics, power sensors, interconnects and harnesses and next generation lithium batteries), electro-mechanical linear motion control and the latest in aircraft security tools.

www.meggitt.com



# Meggitt Sensing Systems

Meggitt Sensing Systems is the Meggitt division specializing in sensing and monitoring systems. We measure physical parameters in the extreme environments of aircraft, space vehicles, power generators, nuclear, oil and gas installations and test laboratories.

## Our primary markets

| Aerospace | Energy | Measurement |
|---|---|---|
| › Engine sensing | › Vibration sensing | › Acceleration, pressure, inertial, shock and vibration sensing |
| › Fluid sensing | › Fire and flame detection | › Automotive crash test |
| › Inertial systems | › Ignition systems | › Cardiac rhythm monitoring |
| › Ignition systems | › Combustion monitoring | › Laboratory and airborne test instrumentation |
| › Engine monitoring | › Blade health monitoring | › Calibration systems |
| › Landing gear monitoring | › Condition monitoring systems | |

Meggitt Sensing Systems, a Meggitt group division, has operated through its antecedents since 1927 under the names of Endevco®, Wilcoxon Research, Sensorex, ECET, Vibro-Meter, Lodge Ignition and Ferroperm Piezoceramics, aligning some of the world's notable companies in the sensing industry with related products, services and applications.

Today, the capabilities and facilities of Meggitt Sensing Systems are integrated under one business unit. Headquartered in Switzerland and providing complete systems with these renowned product brands, from a single supply base.

Our unique yet wide portfolio includes high technology products and systems for civil and military aerospace applications. We are leaders in the energy, power generation, nuclear, oil and gas, industrial, laboratory measurement, automotive and space markets. Meggitt Sensing Systems deploys a wide array of technologies, including piezoelectric, piezoresistive, variable capacitance, inertial, capacitive, resistive, inductive, magnetic, microwave and optical, to address its key customer challenges in high-temperature, high shock, limited space and weight, biocompatibility and communications.

## Leading the way in measurement

With our eight development and manufacturing sites located in Switzerland, France, United Kingdom, Denmark and the United States, we have unmatched capabilities to deliver more critical sensing solutions. An extensive sales and support network extends across Europe, Asia and the Americas to serve our customers worldwide.

**Sensing solutions for challenging measurement applications**
Our facility in San Juan Capistrano, California, formerly known as Endevco® (www.endevco.com), specializes in mission-critical measurement in the aerospace, defence, automotive, industrial and medical sectors. Products include piezoelectric, piezoresistive and variable capacitance accelerometers; pressure transducers; microphones; laboratory and airborne; signal conditioning; electronics and systems calibration equipment.

**Industrial sensing and simplified condition-based maintenance**
Our facility in Germantown, Maryland, formerly known as Wilcoxon Research (www.wilcoxon.com), specializes in highly reliable industrial vibration sensors and condition-based monitoring and predictive maintenance applications. The facility produces a wide range of vibration sensors for industrial, process control, military and test measurement. Its laboratories focus on state-of-the-art basic and applied research for military and government agencies.

**Displacement sensors and inertial systems**
Our facility in Archamps, France, formerly known as Sensorex (www.sensorex.fr), specializes in linear and rotary displacements, inertial sensors and systems, hybrids and (micro)electronics for aerospace and industrial markets.

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# Product technology introductions

## Accelerometers Isotron®

Isotron® accelerometers feature an integral electronic impedance converter, eliminating the need for an external charge amplifier. They can drive signals across long cables with minimal distortion and noise pick-up. Isotron® electronics are compatible with the industry standard IEPE current sources that are built into many FFT analyzers and data acquisition systems (current sources and amplifiers are also available from Meggitt). These accelerometers are available in a wide selection of sensitivities, ranges, sizes and shapes. Specialty Endevco® accelerometers pioneered by Meggitt include lightweight versions with a 30 kHz bandwidth, high sensitivity units for seismic measurements, and sensors designed for higher temperature environments.

## Accelerometers Piezoelectric

Piezoelectric accelerometers are high-impedance charge mode sensors, known for having a high mean time between failures (MTBF) and greater temperature survivability. They are used with either a charge amplifier or in-line charge converter, the Endevco® model 133 three-channel signal conditioner or model 2771 series of remote charge converters (RCC). Piezoelectric charge mode designs are ideal for use in extreme environments or in applications in which the actual acceleration range to be measured is unknown. Endevco® accelerometers are offered in a variety of sizes and configurations to meet your testing needs. Special purpose units are also available for onboard flight, spacecraft and satellites; cryogenic and extreme high temperatures; and radiation environments.

## Accelerometers Piezoresistive

Available in both damped and undamped versions, Endevco® piezoresistive accelerometers are DC responding and ideal for measuring long duration transient events. Applications include automotive crash testing, high g shock and biomedical applications. Just as with our VC accelerometers, Endevco® piezoresistive sensing elements are also machined in-house at Meggitt's own ISO 9001 certified MEMS facility in Sunnyvale. Units are available in surface mount packages, general use configurations and application specific packaging. They are also shipped in special electrostatic discharge (ESD) packaging for added protection during shipment and handling.

## Accelerometers Variable capacitance (VC)

VC accelerometers are DC responding sensors for measuring motion, long duration events and low-frequency vibration. They provide high sensitivities at very low frequencies and outstanding temperature stability. Endevco® accelerometers are known for their high-shock survivability and fast recovery time, while providing years of accurate measurements. Endevco® VC accelerometers operate from DC power supplies and require no special signal conditioning. All sensing elements are machined in-house at Meggitt's own ISO 9001 certified MEMS facility in Sunnyvale, California, USA.

## Cables

Meggitt designs and manufactures its own cables and connectors for optimal performance in extreme environments. In-house expertise extends to both standard and custom designs, including low-noise (noise treated), high-temperature and multi-conductor models. All cables and connectors are subjected to rigorous quality assurance testing, ensuring their reliability within the intended application environment.

## Electronics Signal conditioners and amplifiers

Meggitt offers a comprehensive family of high-performance electronic instruments, ranging from simple battery operated signal conditioners to computer-controlled laboratory quality instruments that measure vibration, shock and pressure. These high-precision electronic instruments support both Endevco® and other industry piezoelectric (charge mode), VC, Isotron® (IEPE-type) and piezoresistive sensors.

## Linear Variable Differential Transformer (LVDT)

Meggitt's Sensorex LVDTs are designed for high-precision displacement measurements within a variety of embedded automotive, factory control and automation applications, including production line assembly, control and welding; and laboratory test bench linear displacement and force and traction applications. LVDTs are designed without wearable parts for friction-free operation, while offering infinite resolution, long mean time before failure (MTBF), extended useful service life and high measurement repeatability. Units are highly resistant to shock and vibration, impervious to external magnetic fields and are designed to be compatible for use with all industry standard LVDT signal conditioners.

## Microphones Piezoelectric

Meggitt's Endevco® piezoelectric microphones measure high-intensity acoustic noise parameters and very low-pressure fluctuations over a frequency range of 1 Hz to 10 kHz over a measurement range of 100 to ›180 dB SPL. These hermetically sealed microphones are designed for operation in harsh environments over an operating temperature range of -55°C to +260°C (-67°F to +500°F). Units are also insensitive to altitude changes and ambient vibration.

## Microphones Piezoresistive

Endevco® piezoresistive microphones are used for measuring high-intensity sound over a wide frequency range with a 200 mV full-scale output, over a measurement range of 95 to 190 dB SPL, depending upon selected model. They are available with convenient 10-32 mounting threads, or a smaller version can be mounted using adhesives for flush mounting on flat or contoured surfaces. A full bridge sensor provides a convenient interface to standard bridge signal conditioning equipment. Applications include flight testing, wind tunnel and other aerodynamic studies, and engine inlet acoustic studies.

## Microphones Prepolarized condenser

Endevco® prepolarized condenser measurement microphones, available in ⅛", ¼", and ½" diameters, are offered in free-field, pressure, low-cost array and random incidence types and can be used to meet IEC and ANSI standards. All prepolarized condenser microphones are constructed with a stainless steel protective grid case and housing, as well as a special stainless steel alloy diaphragm, for high-reliability in a variety of environments. Models may be purchased either as stand-alone units or in a microphone and low-noise preamplifier combination with iTEDS (per IEEE 1451.4) for simplified test setups within larger channel count applications.

## Pressure sensors Piezoelectric

Meggitt offers Endevco® high-temperature piezoelectric dynamic pressure sensors for harsh environments. Applications include combustion monitoring, engine test cells, propulsion systems, or any other measurement that requires dynamic monitoring in high-temperature (+538°C/+1000°F) environments. These pressure sensors are offered in both single-ended and differential types to meet a variety of application requirements. Units also feature all-welded Inconel® housings for maximum temperature durability and are available with hardline cable assemblies.

## Pressure sensors Piezoresitive

Meggitt's Endevco® high sensitivity miniature pressure sensors measure both dynamic and static pressure. These sensors feature a four-arm strain gage bridge design, implanted into a sculpted diaphragm, for wideband frequency response and twice the sensitivity of traditional flat diaphragms for improved resolution. The MEMS design provides an extremely high output signal and high resonance frequency with exceptional linearity and hysteresis performance. All sensors are temperature compensated between 0 and +200°F (-18 to +93°C), with the option of selecting the compensation range on special order. Absolute sensors are available in ranges as low as 0 to +15 and as high as 0 to +2000 psia. Gage/differential sensors are available in ranges as low as 0 to +1 psig and as high as 0 to +20,000 psig. Select models also offer operating temperatures up to +260°C (+500°F). All units are shipped in special electrostatic discharge (ESD) packaging for added protection during shipment and handling. Typical applications include process control, blast testing, automotive airbag testing, rocket motor analysis, jet engine inlet pressure measurements, transmission testing and hydraulics measurements.

## Shakers Electrodynamic and piezoelectric

Wilcoxon Research vibration generators, or "shakers", are designed to generate vibration for structural research and modal testing requirements. The shaker produces a dynamic force operating on the mass reaction principle. Basically, a heavy mechanical component of the shaker is caused to oscillate by the drive signal from a power amplifier. A reaction force is generated, which excites the structure under test. Meggitt offers both low-frequency electromagnetic shakers and high-frequency piezoelectric shakers under the Wilcoxon Research brand, as well as the associated power amplifiers and impedance matching networks necessary for operation.

# Variable capacitance accelerometers

## Typical applications

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

Variable capacitance (VC) accelerometers are expressly designed to measure motion, long duration transient events and low-frequency vibration. They provide high sensitivities at very low frequencies, down to DC, with outstanding temperature stability.

Meggitt's Endevco® VC accelerometers are known for exceptionally high measurement accuracy, shock survivability and fast recovery times over years of use. With internal MEMS sensing elements manufactured at Meggitt's own US facility, all aspects of quality control are carefully monitored throughout the process. The sensors operate from an unregulated DC power source and require no special signal conditioning for operation.

## Endevco® model 7290E series for flight test

The Endevco® model 7290E, a high-precision VC accelerometer series with integral digital temperature compensation, is recommended for flight test applications such as aircraft flutter, engine load cycle, control surfaces and landing gear response assessments. Available in seven models ranging from 2 g to 150 g, the series incorporates a VC sensing element with gas damping and internal overrange stops, enabling the transducer to withstand high shock and acceleration loads. Sensors feature +0.2% FSO typical non-linearity and hysteresis for most ranges and superior frequency response. The extended temperature range of the model 7290E allows for use of the same accelerometer at all aircraft measurement points, with a combined thermal zero and sensitivity shift of 2% over the temperature range of -40°C to +100°C (-40°F to +212°F). 7290E will operate accurately while exposed to cold temperatures at altitudes up to 13,000 meters (43,000 feet), as well as tolerate heat from the engine fan case and the brakes on the landing gear. As a result of these unique attributes, this VC accelerometer is able to measure low-frequency aircraft vibration events, with best-in-class thermal zero shift and sensitivity shift performance, while withstanding high g shock and acceleration loads.

- Seven available ranges from ± 2g to ± 150g
- Broad frequency response
- Digital temperature compensation
- Differential or single ended output
- Low cost, premium performance


| Endevco® model number | 7290A | 7290D | 7290E | 40366 |
|---|---|---|---|---|
| **Description** | Flight test standard<br>DC response<br>Gas damped | High accuracy<br>DC response with iTEDS<br>Extreme temperatures | Wide bandwidth<br>DC response<br>Digital compensation | MEMS die<br>Surface mount<br>pF output |
| **Linear range** g | ± 2 / ± 10 / ± 30 / ± 50 / ± 100 / ± 150 | ± 2 / ± 10 / ± 30 / ± 50 / ± 100 | ± 2 / ± 5 / ± 10 / ± 30 / ± 50 / ± 100 / ± 150 | ± 2 |
| **Sensitivity** mV/g typical | 1000 / 200 / 66 / 40 / 20 / 13.2 | 1000 / 200 / 66 / 40 / 20 | 1000 / 400 / 200 / 66 / 40 / 20 / 13.2 | 0.25 pF/g |
| **Frequency response** ± 5% | 0–15 / 0–500 / 0–800 / 0–1000 / 0–1000 | 0–15 / 0–500 / 0–800 / 0–1000 / 0–1000 | 0–15 / 0–30 / 0–500 / 0–1000 / 0–2000 / 0–2000 / 0–2000 | TBD based on electronics |
| **Non linearity** % FSO typical | 0.2 / 1.0 (100 g / 150 g) | 0.2 / 1.0 (100 g) | 0.2 / 1.0 (100 g / 150 g) | less than 1% |
| **Shock limit** g | 5000 (2 g / 10 g) / 10,000 | 5000 (2 g / 10 g) / 10,000 | 5000 (2 g / 5 g / 10 g) / 10,000 | 5000 |
| **Operating temperature** °C (°F) | -55 to +121 (-67 to +250) | -55 to +125 (-67 to +257) | -55 to +121 (-67 to +250) | -40 to +100 (-40 to +212) |
| **Dimensions** mm (in) | 25.4 x 21.6 x 7.6<br>(1.00 x 0.85 x 0.30) | 25.4 x 21.6 x 9.1<br>(1.00 x 0.85 x 0.36) | 25.4 x 21.6 x 7.6<br>(1.00 x 0.85 x 0.30) | 2.90 x 2.05 x 0.79<br>(0.11 x 0.08 x 0.03) |
| **Weight** grams | 12 | 15 | 10 | 0.01 |
| **Excitation voltage** Vdc | 9.5 to 18 | 8.0 to 30 | 9.5 to 36 | 5 |
| **Mounting method** | Screw 4-40 | Screw 4-40 | Screw 4-40 | SMT or Wirebond |

# Piezoresistive accelerometers

## Typical applications

- Frontal, rear and side impact
- Low-frequency crash event detection
- Vehicle crush zones, crash sleds and rollover
- Global regulatory compliance testing
- Anthropomorphic test devices (ATD)

Since the earliest days of vehicle safety testing, Meggitt has worked with OEMs, test laboratories, ATD manufacturers and their associated design and test personnel to ensure accurate measurements of front, side and rear impact; crush zones; and 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 high-impact shock and vibration, rotational acceleration, long duration transient motion, and low-frequency measurement capabilities are also particularly ideal. Most models are undamped to minimize phase shift.

## Endevco® model 7268C

The Endevco® model 7268C is a miniature, high output triaxial piezoresistive accelerometer, designed for crash testing and other applications that require minimal mass loading and a broad frequency response. This accelerometer facilitates simultaneous high-shock measurements across three orthogonal axes within a single, compact package, with two fixed resistors to enable shunt calibration on each axis. Both models are world SID-dummy approved, including Euro SID-1 and Euro SID-2, with specifications that meet EuroNCAP, SAEJ211 and SAEJ2570 standards.

- Triaxial, small size
- Mechanical overtravel stops
- Broad frequency response
- Available in choice of two full-scale ranges of 500 g and 2000 g

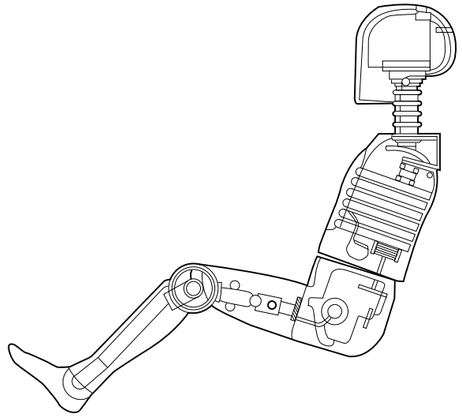



| Endevco® model number | 2262A | 7265A / A-HS | 7268C | 7269 |
|---|---|---|---|---|
| **Description** | Rugged<br>Critically damped<br>High sensitivity | Low mass<br>Critically damped<br>High sensitivity | Triaxial<br>Undamped<br>Broad frequency response | Miniature triaxial<br>Undamped<br>Surface mount |
| **Linear range** g | ± 1000 / ± 2000 | ± 100 / ± 20 | ± 500 / ± 2000 | ± 500 / ± 2000 |
| **Sensitivity** mV/g typical | 0.5 / 0.25 | 5 / 25 | 0.80 / 0.20 | 0.80 / 0.20 |
| **Frequency response** ± 5%, Hz | 1500 / 3000 | 0 to 800 / 0 to 500 (±5%)<br>[± 1dB Hz] | 3000 (Z) / 1500 (X&Y) | 3000 / 4000 |
| **Shock limit** g | 2500 / 5000 | 2000 | 5000 / 10,000 | 5000 / 10,000 |
| **Operating temperature** °C (°F) | -18 to +93 (0 to +200) | -18 to +66 (0 to +150) | -18 to +66 (0 to +150) | -18 to +66 (0 to +150) |
| **Dimensions** mm (in) | 15.9 x 25.4<br>(5/8 Hex x 1.00) | 11.94 x 16 x 7.75<br>(0.470 x 0.630 x 0.305) | 12.7 x 13.84 x 10.67<br>(0.500 x 0.545 x 0.420) | 10.16 x 7.1<br>(0.400 x 0.280) |
| **Weight** gram | 28 | 5 / 5.9 | 8 | 0.4 |
| **Mounting method** | 10-32 detachable stud | Screw | Screw | Adhesive |

# Endevco® model 7264C series

**Crash industry standard**

The Endevco® model 7264C is a global crash test industry standard, offering 10,000 g shock survivability. Its MEMS-based monolithic, undamped, full-bridge circuit design with integral mechanical stops produces virtually no phase shift over the useful frequency range with a broad frequency response. A wide range of excitation voltages, from 2 to 10 Volts, is also available to ensure compatibility with user data acquisition systems. The 7264C is also optionally available with <1% transverse sensitivity and ‹ ± 25 mV zero measurand output to support stringent requirements, with fixed resistors to facilitate shunt calibration. With a frequency response extending down to DC (steady state), the accelerometer can reliably measure the long duration transient shocks typically found within vehicle front, rear and side impact events and ATDs, in applications where the source and location of impact can be identified.



| Endevco® model number | 7264 | 7264C | 7264D | 7264G |
|---|---|---|---|---|
| **Description** | Lightweight<br>Undamped<br>High sensitivity | Crash test standard<br>Undamped<br>Meets SAE J211 / J2570 | High resonance<br>Undamped<br>Meets SAE J211 / J2570 | Extremely rugged<br>Damped<br>Meets SAE J211 / J2570 |
| **Linear range** g | ± 200 | ± 500 / ± 2000 | ± 2000 | ± 2000 |
| **Sensitivity** mV/g typical | 2.5 | 0.80 / 0.20 | 0.20 | 0.20 |
| **Frequency response** ± 5%, Hz | 1000 | 3000 / 5000 | 6000 | 2000 / 4000 |
| **Shock limit** g | 2000 | 5000 / 10,000 | 10,000 | 10,000 |
| **Operating temperature** °C (°F) | -18 to +66 (0 to +150) | -18 to +66 (0 to +150) | -18 to +66 (0 to +150) | -18 to +66 (0 to +150) |
| **Dimensions** mm (in) | 10.16 x 10.16 x 5.08<br>(0.400 x 0.400 x 0.200) | 10.16 x 10.16 x 5.13<br>(0.400 x 0.400 x 0.202) | 10.16 x 10.16 x 5.08<br>(0.400 x 0.400 x 0.200) | 10.16 x 10.16 x 5.13<br>(0.400 x 0.400 x 0.202) |
| **Weight** gram | 1 | 1.4 | 1.4 | 1.4 |
| **Mounting method** | Screw | Screw | Screw | Screw |

| Endevco® model number | 7231C | 7286 / 7287 | 7302BM4 |
|---|---|---|---|
| **Description** | ATD standard<br>Undamped<br>Optional cable | Lightweight<br>Low cost<br>Undamped<br>Optional cable | ATD standard<br>Angular<br>Rotational<br>Undamped |
| **Linear range** g | ± 750 | ± 2000 | 50,000 rad/sec$^2$ |
| **Sensitivity** mV/g typical | 0.20 | 0.003 / 0.2 | 5 mV/krad/sec$^2$ |
| **Frequency response** ± 5%, Hz | 2000 | 4000 | 3 to 1600 |
| **Shock limit** g | 2500 | 10,000 | 2500 |
| **Operating temperature** °C (°F) | -73 to +149 (-100 to +300) | 10 to +30 (50 to +86) | -18 to +121 (0 to +250) |
| **Dimensions** mm (in) | 12.7 x 19.05 x 22.9<br>(0.500 x 0.750 x 0.900) | 11.8 x 17.8<br>(0.47 x 0.7) | 15.9 x 29.97<br>(0.625 dia x 1.18) |
| **Weight** gram | 24 | less than 1 | 35 |
| **Mounting method** | 10-32 detachable stud | Adhesive or screw | Screw |

# High g piezoresistive shock accelerometers

Endevco® extreme environment high g piezoresistive shock accelerometers feature a patented, monolithic, four-active arm bridge circuit design, incorporating the use of Meggitt's own proprietary MEMS sensing element. The low mass, small size and unique construction of these sensors allows for high resonance frequency, low output impedance and zero damping for minimal phase shift over their useful frequency range. High resonance frequencies also permits their survival in the presence of high-frequency components, in a shock pulse that could otherwise shatter the seismic system of accelerometers having lower resonance frequencies. In addition, these undamped accelerometer models can also accurately respond to fast rise times and short duration shock motion. With a frequency response extending down to DC (steady state), the sensors are ideal for measuring long duration transient high g shocks while integrating critical acceleration data for velocity and displacement.

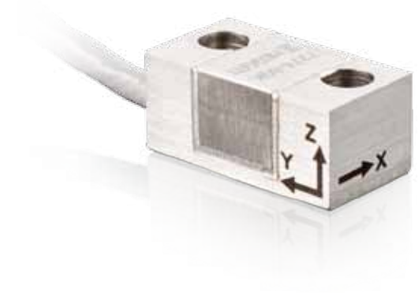
- Weapons and rocket testing
- High-shock data recorders
- Shock wave monitoring
- Drop and impact testing
- Portable electronic device testing
- Near-field pyroshock testing
- Fuze/safe and arm
- Pyrotechnic and penetration

| Endevco® model number | 7270A | 7270AM4 | 7270AM6 | 7274 |
|---|---|---|---|---|
| **Description** | High resonance<br>Undamped<br>Shock standard | High resonance<br>Undamped<br>Stud mount | Rugged<br>Mechanical filter<br>Stud mount | Triaxial<br>Undamped<br>High resonance |
| **Linear range** g | ± 2000 / 6000 / 20,000 / 60,000 / 200,000 | ± 2000 / 6000 / 20,000 / 60,000 / 200,000 | ± 2000 / 6000 / 20,000 / 60,000 | ± 2000 / 6000 / 20,000 / 60,000 |
| **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 |
| **Operating temperature** °C (°F) | -55 to +121 (-67 to +250) | -55 to +66 (-67 to +150) | -34 to +66 (-30 to +150) | -55 to +66 (-67 to +150) |
| **Weight** gram | 1.5 | 1.5 | 8.4 | 2.9 |
| **Mounting method** | Screw | 1/4-28 integral stud | 1/4-28 integral stud | Screw |

Certain models detailed here are subject to International Traffic in Arms Regulations (ITAR), and as such a license is required for shipments outside the U.S. and other restrictions may apply.



# Endevco® model 7274 triaxial high g piezoresistive shock accelerometer series




The Endevco® model 7274 series is a family of rugged, undamped, high g triaxial piezoresistive shock accelerometers, designed for high-acceleration shock measurements across three mutually perpendicular axes. It is the triaxial version of the popular single-axis 7270A series, sharing the same footprint, bolt pattern and highly efficient sensing system, with 20 years of field-proven pedigree across thousands of installations.

Available in four unique ranges of up to 60,000 g, the series incorporates three sensors mounted in a triaxial arrangement within a single housing. Selectable ranges per axis are available by special request. For each axis, the MEMS sensor is sculptured from a single chip of silicon, which includes the inertial mass and strain gages arranged in a patented four-active-arm Wheatstone bridge circuit configuration. This unique construction allows for a sensor with high resonance frequency, low output impedance, ruggedness 3x to over-range, and zero damping for minimal phase shift over its useful frequency range. Because units are undamped, they can also accurately respond to fast rise times and short duration shock motion. With a frequency response extending down to DC (steady state), the 7274 series is also ideal for measuring long duration transient shocks while integrating critical acceleration data for velocity and displacement.


| Endevco® model number | 71M | 72 | 73 / 73FC |
|---|---|---|---|
| **Description** | Surface mount<br>Undamped<br>Low mass | Lightly damped<br>Rugged<br>ESD protection | Triaxial<br>Undamped<br>Mounting options |
| **Linear range** g | ± 2000 / 6000 / 20,000 / 60,000 | ± 20,000 / 60,000 | ± 2000 / 6000 / 20,000 / 60,000 |
| **Shock limit** g | 10,000 / 18,000 / 60,000 / 120,000 | 80,000 / 240,000 | 10,000 / 18,000 / 60,000 / 120,000 |
| **Operating temperature** °C (°F) | -54 to +66 (-65 to +150) | -54 to +66 (-65 to +150) | -54 to +66 (-65 to +150) |
| **Weight** gram | 0.06 | 0.16 | 0.92 |
| **Mounting method** | Adhesive | SMT | Adhesive or solder |

Certain models detailed here are subject to International Traffic in Arms Regulations (ITAR), and as such a license is required for shipments outside the U.S. and other restrictions may apply.


# Piezoresistive pressure transducers

## Typical applications

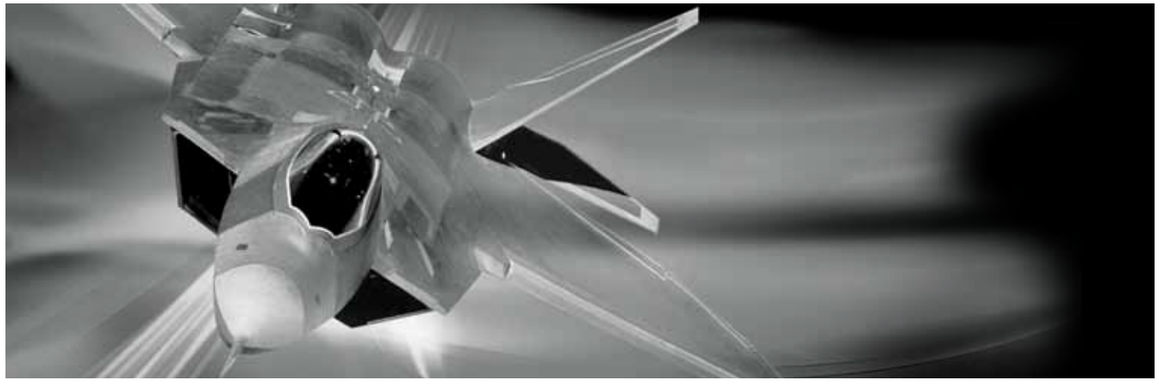
- Jet airflow fields and inlet pressure
- Hypersonic, transonic and "quiet flow" wind tunnel testing
- Turbulent airflow measurements
- Process control
- Blast testing
- Automotive airbag inflation testing
- Rocket motor analysis
- Vehicle transmission testing
- Hydraulics measurements

Endevco® miniature piezoresistive pressure transducers from Meggitt Sensing Systems are designed to measure both dynamic and static pressure to a high degree of accuracy. They feature a state-of-the art diaphragm design and incorporation of MEMS sensing elements, manufactured at Meggitt's own 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.

Select models feature user-selectable temperature compensation and high temperature operation to +260°C (+500°F). In addition, the Endevco® range of absolute pressure sensors is available in ranges as low as 0–15 psia and as high as 0–2000 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.

| Endevco® model number | 8507C | 8510B | 8510C | 8511A |
|---|---|---|---|---|
| **Description** | Gage<br>High sensitivity<br>Temp compensation | Gage<br>Vent tube<br>Temp compensation | Gage<br>High resonance<br>Temp compensation | Rugged<br>Gage<br>High pressure<br>Temp compensation |
| **Full scale pressure** psig | 1 / 2 / 5 / 15 | 1 / 2 / 5 / 200 / 500 / 2000 | 15 / 50 / 100 | 5000 / 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 | less than 1000 |
| **Non linearity** (typ) %FSO | 1.5 / 1.0 / 0.5 / 0.2 | 1.0 / 1.0 / 0.5 / 0.25 / 0.25 / 0.25 | 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 / 2500 / 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** gram | 0.3 | 2.3 | 2.3 | 11 |
| **Mounting method** | RTV bond | 10-32 UNF-2A | 10-32 UNF-2A | 3/8-24 UNF-2A |

| Endevco® model number | 8515C | 8530B | 8530BM37 | 8530C | 8540 |
|---|---|---|---|---|---|
| **Description** | 0.03 inch thin<br>Surface mount<br>High sensitivity | Absolute<br>High resonance<br>Temp compensation | Absolute<br>Detachable cable<br>ABS braking studies | Absolute<br>High sensitivity<br>Temp compensation | Absolute<br>High temperature<br>Temp compensation |
| **Full scale pressure** psia | 15 / 50 | 200 / 500 / 1000 | 200 / 500 / 1000 / 2000 | 15 / 50 / 100 | 15 / 50 / 100 / 200 / 500 |
| **Sensitivity** mV/psi | 13.3 / 4.0 | 1.5 / 0.6 / 0.3 | 1.5 / 0.6 / 0.3 / 0.3 | 15 / 4.5 / 2.25 | 20 / 6 / 3 / 1.5 / 0.6 |
| **Resonance frequency** kHz | 180 / 320 | 750 / 1000 / ›1000 | 750 / 1000 / ›1000 / ›1000 | 180 / 320 / 500 | 140 / 240 / 350 / 450 / 900 |
| **Non linearity** (typ) %FSO | 0.2 | 0.2 | 0.2 | 0.15 / 0.1 / 0.1 | 0.25 / 0.25 / 0.25 / 0.4 / 0.4 |
| **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) | -54 to +260 (-65 to +500) |
| **Burst pressure** psi | 75 / 250 | 800 / 2000 / 4000 | 800 / 2000 / 4000 / 4000 | 75 / 250 / 400 | 30 / 100 / 200 / 400 / 1000 |
| **Face diameter** mm (in) | 6.35 (0.25) | 3.86 (0.152) | 3.86 (0.152) | 3.86 (0.152) | 3.86 (0.152) |
| **Weight** gram | 0.08 | 2.3 | 2.3 | 2.3 | 8.5 |
| **Mounting method** | RTV bond | 10-32 UNF-2A | 10-32 UNF-2A | 10-32 UNF-2A | 10-32 UNF-2A |



# Piezoelectric accelerometers

## Typical applications

- Aircraft flight testing
- Ground vibration testing
- Automotive ride quality testing
- Product testing
- Quality assurance
- Research and development
- Test and measurement
- Turbine maintenance
- Engine testing
- Medical devices (non-critical)
- OEM design and test applications

Meggitt piezoelectric accelerometers are charge mode accelerometers that require use of an external charge amplifier, allowing for reliable operation over wider temperature and amplitude ranges. Piezoelectric accelerometers are popular choices for acceleration, shock and vibration measurements, due to their wide frequency ranges, easy installation, and availability in multiple shapes, weights, sizes and sensitivities. Special purpose piezoelectric accelerometers are also available for flight test, extreme low- and high-temperatures and radiation environments.

## Endevco® model 12M family

**Piezoelectric accelerometer**
**Structural monitoring**

Smart Structures, a leader in wireless advanced systems that test and monitor the health of highways, bridges, peers, high-rise buildings, and power-plants chose to use Endevco®'s 12M family of accelerometers due to their combination of small form factor, broad frequency response, high shock limit, and high charge output. "We worked very closely with Endevco® for two years as we refined our system design and manufacturing process," stated Tom Chiarella, President of Smart Structures, Inc. "Their technical expertise and dedication to helping us succeed were critical elements in advancing key functionality in our product."

**12M1B features**

- Surface mount piezoelectric accelerometer
- 1.9 pC/g sensitivity
- 1 Hz to 2000 Hz frequency response
- OEM / medical applications

| Endevco® model number | 12M1B | 22 | 23 | 2220E |
|---|---|---|---|---|
| **Description** | Surface mount<br>OEM<br>Medical device | Micro-miniature<br>teardrop | Micro-miniature<br>triaxial | Thru-hole mount<br>Lightweight |
| **Sensitivity** pC/g typical | 1.9 | 0.4 | 0.4 | 3.0 |
| **Sinusoidal limit** g | 500 | 2500 | 1000 | 1000 |
| **Shock limit** g | 1000 | 10,000 | 10,000 | 5000 |
| **Frequency response** ±1 dB Hz | 1 to 2000 | 3 to 12,000 | 3 to 10,000 (X&Y) /<br>3 to 12,000 (Z) | 1 to 12,000 |
| **Min temperature** °C (°F) | -65 (-85) | -73 (-100) | -73 (-100) | -55 (-67) |
| **Max temperature** °C (°F) | +150 (+302) | +150 (+300) | +149 (+300) | +260 (+500) |
| **Signal/ground isolation** | No | Yes | Yes | Yes |
| **Hermetic seal** | No | No | No | Yes |
| **Weight** gram (without cable) | 0.12 | 0.14 | 0.8 | 3.1 |
| **Dimensions** mm (in) | 4.57 x 3.81 x 1.4<br>[0.180 x 0.150 x 0.055] | Ø 3.58 x 2.79<br>[Ø 0.141 x 0.110] | 7.62 x 6.35 x 5.08<br>[0.30 x 0.25 x 0.20] | Ø 9.53 x 5.8<br>[Ø 0.375 x 0.23] |
| **Mounting method** | SMT | Adhesive | Adhesive | Screw |
| **Cable included** | No | 3095A-120 | 3095A-120 | 3053V-120 |

# Endevco® model 2220E

The Endevco® model 2220E is a lightweight, miniature high-temperature piezoelectric accelerometer to +260°C (+500°F), ideal for the high-reliability vibration testing of aircraft APUs, hydraulic systems and jet and turboprop aircraft engines. The centrally located thru-bolt mounting of this hermetically sealed transducer provides 360° cable and connector orientation for a consistently flat mounting surface.

- 3.0 pC/g sensitivity
- 1 Hz to 12,000 Hz frequency response
- High temperature (+260°C)
- Hermetically sealed
- Lightweight (3.1 grams)
- 360° cable orientation

| Endevco® model number | 2221F | 2222C | 2222D | 2224C | 2225 / 2225M5A |
|---|---|---|---|---|---|
| **Description** | Thru-hole mount 360° cable orientation | Miniature teardrop | Miniature teardrop Hermetic | General purpose | High g shock |
| **Sensitivity** pC/g typical | 10 | 1.4 | 1.1 | 12 | 0.75 / 0.025 |
| **Sinusoidal limit** g | 1000 | 1000 | 1000 | 1000 | 10,000 / 10,000 |
| **Shock limit** g | 3000 | 10,000 | 10,000 | 2000 | 20,000 / 100,000 |
| **Frequency response** ±1 dB Hz | 0.1–12,000 | 1–10,000 | 0.1–12,000 | 0.1–10,000 | 1–10,000 |
| **Min temperature** °C (°F) | -55 (-67) | -73 (-100) | -55 (-67) | -55 (-67) | -55 (-67) / -18 (0) |
| **Max temperature** °C (°F) | +260 (+500) | +177 (+350) | +175 (+347) | +177 (+350) | +177 (+350) / +66 (+150) |
| **Signal/ground isolation** | Yes | Yes | No | No | No |
| **Hermetic seal** | Yes | No | Yes | No | No |
| **Weight** gram (without cable) | 11 | 0.5 | 1.0 | 16 | 13 |
| **Dimensions** mm (in) | Ø 15.24 x 8.9 [Ø 0.60 x 0.35] | Ø 6.35 x 3.3 [Ø 0.25 x 0.13] | Ø 6.35 x 4.1 [Ø 0.25 x 0.16] | 14.2 hex x 13.7 [0.56 hex x 0.54] | 14.2 hex x 13.7 [0.56 hex x 0.54] |
| **Mounting method** | Screw | Adhesive | Adhesive | Stud | Stud |
| **Cable included** | 3090C-120 | 3090C-120 | 3053V-120 | 3090C-120 | 3090C-120 / 3060D-120 |

| Endevco® model number | 2226C | 2228C | 2230EM1 | 2248M1 | 2270 |
|---|---|---|---|---|---|
| **Description** | Lightweight Miniature | Triaxial Ground isolated | Triaxial High temperature | Radiation tested High temperature Lightweight | Back-to-back calibration |
| **Sensitivity** pC/g typical | 2.8 | 2.8 | 3 | 3.0 | 2.2 |
| **Sinusoidal limit** g | 1000 | 1000 | 1000 | 500 | 1000 |
| **Shock limit** g | 2000 | 2000 | 2000 | 3000 | 15,000 |
| **Frequency response** ±1 dB Hz | 0.1–7000 | 0.1–6000 | 1-10,000 | 1–8000 | 2–20,000 (for accelerometers up to 35 grams) |
| **Min temperature** °C (°F) | -55 (-67) | -55 (-67) | -55 (-67) | -54 (-65) | -54 (-65) |
| **Max temperature** °C (°F) | +177 (+350) | +177 (+350) | +260 (+500) | +482 (+900) | +177 (+350) |
| **Signal/ground isolation** | No | Yes | No | No | Yes |
| **Hermetic seal** | No | No | Yes | Yes | No |
| **Weight** gram (without cable) | 2.8 | 15 | 22.5 | 13 | 40 |
| **Dimensions** mm (in) | 9.53 hex x 5.8 [0.375 hex x 0.19] | 18.72 x 18.72 x 11.68 [0.737 x 0.737 x 0.460] | 17.14 x 11.68 x 15.24 [0.675 x 0.460 x 0.60] | 11.09 x 11.09 x 16.51 [0.437 x 0.437 x 0.650] | 15.88 hex x 28.4 [0.625 hex x 1.12] |
| **Mounting method** | Adhesive | Screw | Screw | Stud | Stud |
| **Cable included** | 3060D-120 | 3060D-120 | 3053V-120 | 3075M6-120 | 3090C-120 |

# Endevco® model 6233C

The Endevco® model 6233C is a rugged, very high-temperature piezoelectric charge mode accelerometer, designed for continuous operation to +485°C (+900°F) with long Mean Time Between Failures (MTBF). It is ideal for the high-precision vibration monitoring of high-temperature jet and turboprop engines, helicopter and rotorcraft HUMs, gas turbines and nuclear power plant machinery and equipment. As a self-generating device, the accelerometer requires no external power source for operation. At such high temperatures, however, use of a charge amplifier or remote charge converter than can accept a 100 kΩ source resistance is required.

- 10, 50 and 100 pC/g sensitivities available
- Balanced differential output
- Ground isolated
- Hermetically sealed
- Industry standard three-point ARINC mounting
- Rugged 2-pin 7/16-24 UNS 2A threaded receptacle

| Endevco® model number | 2271A | 2271AM20 | 2273AM1 | 2273AM20 |
|---|---|---|---|---|
| **Description** | Cryogenic | Cryogenic | Radiation tested<br>10-32 side connector | Radiation tested<br>10-32 top connector |
| **Sensitivity** pC/g typical | 11.5 | 11.5 | 10 | 10 |
| **Sinusoidal limit** g | 1000 | 1000 | 500 | 500 |
| **Shock limit** g | 10,000 | 10,000 | 3000 | 3000 |
| **Frequency response** ±1 dB Hz | 1–8000 | 1-8000 | 1-7000 | 1-7000 |
| **Min temperature** °C (°F) | -269 (-452) | -269 (-452) | -55 (-67) | -55 (-67) |
| **Max temperature** °C (°F) | +260 (+500) | +260 (+500) | +399 (+750) | +399 (+750) |
| **Signal/ground isolation** | Yes | Yes | Yes | Yes |
| **Hermetic seal** | Yes | Yes | Yes | Yes |
| **Weight** gram (without cable) | 27 | 27 | 32 | 34 |
| **Dimensions** mm (in) | 15.9 hex x 19.8<br>[0.625 hex x 0.78] | 15.9 hex x 24.9<br>[0.625 hex x 0.98] | 15.9 hex x 26.9<br>[0.625 hex x 1.06] | 15.9 hex x 34.5<br>[0.625 hex x 1.36] |
| **Mounting method** | Stud | Stud | Stud | Stud |
| **Cable included** | 3090DV-120 | 3090C-120 | 3075M6-120 | 3075M6-120 |

| Endevco® model number | 2276 | 6222S | 6233C | 6237M70 |
|---|---|---|---|---|
| **Description** | Radiation tested<br>High temp | ARINC mount<br>Differential output | ARINC mount<br>High temp<br>Differential output | Very high temperature |
| **Sensitivity** pC/g typical | 10 | 20 / 50 / 100 | 10 / 50 / 100 | 10 |
| **Sinusoidal limit** g | 500 | 2000 / 1000 / 500 | 1000 / 1000 / 500 | 500 |
| **Shock limit** g | 3000 | 4000 / 2000 / 1000 | 2000 / 2000 / 1000 | 2000 |
| **Frequency response** ±1 dB Hz | 1–7000 | 1–12,000 / 1–9000 / 1–9000 | 1–8000 / 0.1–5000 / 0.1–3000 | 1–5000 |
| **Min temperature** °C (°F) | -55 (-67) | -54 (-65) | -55 (-67) | -55 (-67) |
| **Max temperature** °C (°F) | +482 (+900) | +260 (+500) | +482 (+900) | +650 (+1200) |
| **Signal/ground isolation** | No | Yes | Yes | Yes |
| **Hermetic seal** | Yes | Yes | Yes | No |
| **Weight** gram (without cable) | 30 | 91 | 75 / 110 / 110 | 30 |
| **Dimensions** mm (in) | 15.9 hex x 25.4<br>[0.625 hex x 1.00] | 41.4 x 30.2 x 20.3<br>[1.63 x 1.19 x 0.80] | 41.6 x 30.2 x 25.4 / 81.8 / 38.1<br>[1.64 x 1.19 x 1.00 / 1.25 / 1.50] | 24.4 x 14.2 x 14.2<br>[0.96 x 0.56 x 0.56] |
| **Mounting method** | Stud | Screw | Screw | Screw |
| **Cable included** | 3075M6-120 | No | No | Integral |

## Endevco® model 7703A

The Endevco® model 7703A series is a high-temperature radiation tested piezoelectric accelerometer family, designed for general vibration measurements on structures and objects, particularly within nuclear environments. The model is available in multiple sensitivities. It features a 10-32 side connector and highly stable shear mode construction, offering low base strain sensitivity, high resonance frequency, insensitivity to thermal transients and excellent output stability over time. A 10-foot cable assembly and 10-32 mounting stud are supplied for easy installation and error-free operation.

Both 50 and 100 pC/g series ranges are well-suited for nuclear environments because of their high sensitivity and $10^8$ Rad Integrated Gamma Flux radiation rating (Integrated Neutron Flux of up to $10^{10}$ N/cm$^2$), with triaxial mounting capabilities for vibration measurements across three orthogonal axes (via optional triaxial mounting block model 2950A). The 1000 pC/g version is ideal for high-sensitivity, high-output applications where vibration inputs are low. Additional applications include modal measurements on larger structures and objects, engine testing, oil and gas pipeline monitoring, nuclear power plant pipeline and valve vibration monitoring, as well as aerospace metallurgy and automotive metrology.

- 50, 100, 200, 300 and 1000 pC/g sensitivities available
- High temperature (+288°C)
- Tested for radiation environments up to $10^8$ rad
- Ground isolated
- Hermetically sealed

| Endevco® model number | 7240C | 7703A | 7704A |
|---|---|---|---|
| **Description** | Very high frequency | General purpose<br>Radiation tested | General purpose<br>Radiation tested |
| **Sensitivity** pC/g, typical | 3.0 | 50 / 100 / 200 / 300 / 1000 | 50 / 100 |
| **Sinusoidal limit** g | 1000 | 2000 / 1000 / 850 / 675 / 500 | 2000 / 1000 |
| **Shock limit** g | 5000 | 10,000 / 5000 / 2000 / 1600 / 1000 | 10,000 / 5000 |
| **Frequency response** ±1 dB Hz | 1–20,000 | 1–9000 / 1–8000 / 1-6000 / 1-5000 / 1-3000 | 1–9000 / 1–8000 |
| **Min temperature** °C (°F) | -55 (-67) | -55 (-67) | -55 (-67) |
| **Max temperature** °C (°F) | +260 (+500) | +288 (+550) | +288 (+550) |
| **Signal/ground isolation** | No | Yes | Yes |
| **Hermetic seal** | Yes | Yes | Yes |
| **Weight** gram (without cable) | 4.8 | 25 / 29 / 62 / 70 / 120 | 25 / 29 |
| **Dimensions** mm (in) | 9.53 hex x 11.68<br>[0.375 hex x 0.46] | for -50 / -100<br>16.0 hex x 19.8 [0.63 hex x 0.78]<br>for -200 / -300 / -400<br>25.4 hex x 23.1 [1.0 x 0.91] | 16.0 hex x 21.1<br>[0.63 hex x 0.83] |
| **Mounting method** | Stud | Stud | Stud |
| **Cable included** | 3053V-120 | 3090C-120 | 3090C-120 |



## Piezoelectric pressure sensors

The Endevco® model 522M series is a family of piezoelectric pressure transducers, expressly designed for the high-reliability dynamic measurement of pressure fluctuations, even in extreme temperatures of up to +1000°F (continuous) and up to +1200°F intermittent and within high static pressure environments.

Featuring an all-welded Inconel® construction for maximum temperature survivability, the Endevco® model 522M series features an integral metal-sheathed hardline cable of triaxial construction, with 10-32 coaxial receptacle that offers output signal-to-case isolation. The electrical design of these sensors is fully optimized for use with both single-ended and differential amplifiers. Typical applications include combustion monitoring, high pressure steam, propulsion systems testing, test cell environmental pressures, and gas turbine testing. ATEX approved models are also available.

| Endevco® model number | 522M17 | 522M25A |
|---|---|---|
| **Description** | High temperature<br>Use with single-ended charge amplifiers | Differential output<br>24 inch length |
| **Sensitivity** pC/psi, typical | 12 | 17 |
| **Resonant frequency** kHz | 45 | 20 |
| **Vibration sensitivity** pC/g | 0.05 | 0.05 |
| **Max temperature sensor** °C (°F) | +538 (+1000) | +530 (+986) |
| **Max temperature connector** °C (°F) | +177 (+351) | +260 (+500) |
| **Operating static pressure** psi | 2500 | 400 |
| **Dynamic range** psi | 500 | 20 |
| **Weight** gram (without cable) | 25 | 250 (including cable) |
| **Exit type/connector** | 10-32 | EN2997 3-pin |

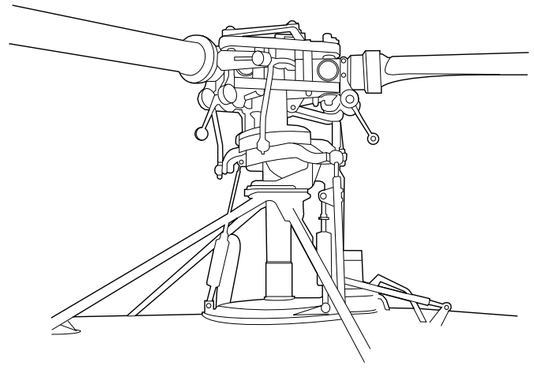
# Isotron® accelerometers

## Typical applications

- Aircraft flight testing
- Ground vibration testing
- Automotive ride quality testing
- Product testing
- Quality assurance
- Research and development
- Test and measurement
- Heavy machinery maintenance
- Engine testing
- OEM design and test applications

Endevco® Isotron® accelerometers, also known as IEPE-type or voltage mode, feature an integral electronic impedance converter, eliminating the need for an external charge amplifier. They can drive long cables with minimal distortion and noise pick-up. Isotron® electronics are compatible with industry standard IEPE current sources built into most industry standard data acquisition systems.

These accelerometers are available with a wide selection of ranges, sizes and shapes. Some units are also available with iTEDS onboard memory storage (per IEEE 1451.4-2004), facilitating their use within larger channel count applications. Special version Isotron® accelerometers, also pioneered by Endevco®, include lightweight versions with a 30 kHz bandwidth, high sensitivity units for seismic measurements, and ultra low-noise accelerometers for measuring whole body motion.



## Helicopter health and usage monitoring systems

Meggitt Sensing Systems has played a major role in the successful incorporation of piezoelectric accelerometers into health and usage monitoring systems (HUMS) and their associated helicopter and rotor craft structural monitoring programs, as part of a cost-effective predictive maintenance strategy. High-output, ground isolated, low-noise Endevco® piezoelectric HUMS accelerometers are often specified to effectively measure the low-frequency phase and vibration levels found within rotor-track and balance (RTB) applications. In addition, high resonance frequency models offer linear response to 10 kHz for rotating part diagnostics, gearbox bearing assessments and shaft monitoring. All Endevco® piezoelectric HUMS accelerometers feature low base strain sensitivity, a reliable hermetic connector and integral cable, all essential for use in harsh environments, with thru-bolt designs for easy installation within space constrained areas.

| Endevco® model number | 25A | 25B | 27A11 / A12 | 27AM1 |
|---|---|---|---|---|
| **Description** | World's smallest Isotron® | World's smallest Isotron® | Lightweight teardrop iTEDS | Lightweight teardrop |
| **Sensitivity** mV/g typical | 5 | 5 | 10 / 100 | 10 / 100 |
| **Range** g | ± 740 | ± 740 | ± 500 / ± 50 | ± 500 / ± 50 |
| **Shock limit** g | 2000 | 2000 | 5000 | 5000 |
| **Frequency response** ±1 dB Hz | 1–12,000 | 1–12,000 | 2–10,000 / 3–10,000 | 2–10,000 / 3–10,000 |
| **Broadband noise** (µg rms) | 7000 | 7000 | 2000 / 400 | 2000 / 400 |
| **Min temperature** °C (°F) | -55 (-67) | -55 (-67) | -55 (-67) | -55 (-67) |
| **Max temperature** °C (°F) | +125 (+257) | +125 (+257) | +125 (+257) | +125 (+257) |
| **Signal/ground isolation** | Yes | Yes | No | No |
| **Hermetic seal** | No | No | Yes | Yes |
| **Weight** gram (without cable) | 0.2 | 0.2 | 0.8 / 1.0 | 0.8 / 1.0 |
| **Dimensions** mm (in) | Ø 0.381 x 2.54 [Ø 0.15 x 0.10] | Ø 0.381 x 2.74 [Ø 0.15 x 0.108] | Ø 6.35 x 6.6 [Ø 0.25 x 0.26] | Ø 6.35 x 4.8 [Ø 0.25 x 0.19] |
| **Mounting method** | Adhesive | Adhesive | Adhesive | Adhesive |
| **Cable included** | 3024-120 | 3006-120 (attached to accelerometer) | 3053VM1-120 | 3053VM1-120 |

# Endevco® model 35A

**Miniature triaxial Isotron® accelerometer**
**Vibration analysis**

Researchers throughout the world have called upon Endevco® to solve their most basic and most challenging measurement needs. At Claremont McKenna College in Claremont, California researcher Tyler Benner selected Endevco®'s model 35A to study the induced vibrations in an olympic recurve bow to optimize the tiller setting. In the study Tyler noted "The 35A's 5 mv/g output and scant 1.1 gram weight was the perfect accelerometer for this study." The miniature size of the 35A also allowed them to study the natural frequencies of the bow materials and how this could impact both material selection and design.

- Ultra-miniature triaxial accelerometer
- 5 mV/g sensitivity, ±1000 g range
- 1 Hz to 12,000 Hz frequency response
- Very lightweight (1.1 grams)

# Endevco® model 65HT

The Endevco® model 65HT triaxial accelerometer is a miniature, high-temperature device packaged in a 10-mm cube of welded titanium construction and weighs only five grams. Using the latest technology in high-temperature components and processes, its micro-electronic circuits are designed and built specifically to operate up to +175°C. It is the ideal sensor for vehicle testing, aircraft and automotive engine testing, and high temperature product testing.

- Triaxial, low impedance output
- 0.5, 1.0 and 10.0 mV/g sensitivities available
- High temperature (+175°C)
- High shock limit, overload-protected
- Small size (10 mm cube)
- Lightweight (5 grams)

| Endevco® model number | 35A | 61C12 / C13 | 65 | 65HT |
|---|---|---|---|---|
| **Description** | Smallest triaxial Isotron® | EZ mount<br>iTEDS | Triaxial<br>Miniature | Triaxial<br>High temperature |
| **Sensitivity** mV/g, typical | 5 | 100 / 1000 | 10 / 100 | 0.5 / 1 / 10 |
| **Linear range** g | ± 1000 | ± 50 / ± 5 | ± 500 / ± 50 | ± 10,000 / ± 5000 / ± 500 |
| **Shock limit** g | 2000 | 5000 | 10,000 | 15,000 / 10,000 / 10,000 |
| **Frequency response** ±1 dB Hz | 1–12,000 | 1–8000 (adhesive) | 0.4–10,000 / 1.5–6000 | 3–8000 |
| **Broadband noise** (µg rms) | 7000 | 150 / 50 | 800 / 400 | 8000 / 4000 / 1400 |
| **Min temperature** °C (°F) | -55 (-67) | -20 (-4) | -55 (-67) | -55 (-67) |
| **Max temperature** °C (°F) | +125 (+257) | +85 (+185) | +125 (+257) | +175 (+347) |
| **Signal/ground isolation** | No | Yes | No | No |
| **Hermetic seal** | No | Yes | Yes | Yes |
| **Weight** gram (without cable) | 1.1 | 13 | 5 | 5 |
| **Dimensions** mm (in) | 6.35 x 6.35 x 7.62<br>[0.25 x 0.25 x 0.30] | 14.2 cube<br>[0.56 cube] | 10 cube<br>[0.39 cube] | 10 cube<br>[0.39 cube] |
| **Mounting method** | Adhesive | Adhesive & EZ mount | Stud | Stud |
| **Cable included** | 3027AM5-120 | 3061A-120 | 3027AM3-120 | 3027AVM13-84<br>3027AM3-36 |

| Endevco® model number | 66A50 / A11 / A12 | 67 | 86 | 87 |
|---|---|---|---|---|
| **Description** | Triaxial<br>iTEDS | Triaxial<br>High temperature<br>High sensitivity | Ultra low frequency seismic measurements | Very low frequency seismic measurements |
| **Sensitivity** mV/g, typical | 5 / 10 / 100 | 10 / 100 | 10,000 | 1000 / 10,000 |
| **Linear range** g | ± 1000 / ± 500 / ± 50 | ± 500 / ± 50 | ± 0.5 | ± 5 / ± 0.5 |
| **Shock limit** g | 10,000 | 5000 | 250 | 400 |
| **Frequency response** ±1 dB Hz | 0.4–14,000 / 0.4–14,000 /<br>1.5–10,000 | 0.15–8000 / 0.5–8000 | 0.005–100 | 0.015–380 / 0.05–380 |
| **Broadband noise** (µg rms) | 6000 / 800 / 400 | 1400 / 450 | 0.1 | 1.5 / 0.4 |
| **Min temperature** °C (°F) | -55 (-67) | -55 (-67) | -20 (-4) | -20 (-4) |
| **Max temperature** °C (°F) | +125 (+257) | +175 (+347) | +100 (+212) | +100 (+212) |
| **Signal/ground isolation** | No | No | Yes | Yes |
| **Hermetic seal** | Yes | Yes | Yes | Yes |
| **Weight** gram (without cable) | 5 | 14 | 771 | 170 |
| **Dimensions** mm (in) | 10 x 10 x 13<br>[0.39 x 0.39 x 0.52] | 14 cube<br>[0.58 cube] | Ø 64.8 x 55.5<br>[Ø 2.55 x 2.18] | Ø 28.6 x 37.3<br>[Ø 1.125 x 1.47] |
| **Mounting method** | Stud | Stud | Stud | Stud |
| **Cable included** | 3027AM3-120 | 3027AVM13-84<br>3027AM3-36 | 6923M9-120 | No |


# Endevco® model 5220B

The Endevco® model 5220B-100 is an industrial accelerometer designed specifically for vibration measurement in the rugged environments of plant machinery. The 5220B-100 has a top integral two-pin receptacle MS3102-10SL-4P. The system transmits its low impedance voltage output through the same pin or twisted pair cable that supplies the required constant current power.

- Industrial general purpose accelerometer
- 100 mV/g sensitivity
- Hermetically sealed
- Ground isolated
- Isolated Faraday shield


| Endevco® model number | 256 | 256HX | 752A12 / A13 | 2250A | 2250AM1 |
|---|---|---|---|---|---|
| **Description** | Lightweight<br>General purpose | Lightweight<br>General purpose | Compact<br>iTEDS | Small teardrop<br>Wide bandwidth<br>Removable cable | Small teardrop<br>Wide bandwidth<br>Solder pins |
| **Sensitivity** mV/g, typical | 10 / 100 | 10 / 100 | 100 / 1000 | 10 | 10 |
| **Range** g | ± 500 / ± 50 | ± 500 / ± 50 | ± 50 / ± 5 | ± 500 | ± 500 |
| **Shock limit** g | 2000 | 2000 | 5000 | 2000 | 2000 |
| **Frequency response** ±1 dB Hz | 1–9000 | 1–10,000 | 0.05–10,000 / 0.3–10,000 | 2–15,000 | 2–15,000 |
| **Broadband noise** (µg rms) | 1000 / 300 | 1000 / 300 | 150 / 50 | 1500 | 1500 |
| **Min temperature** °C (°F) | -55 (-67) | -55 (-67) | -20 (-4) | -55 (-67) | -55 (-67) |
| **Max temperature** °C (°F) | +125 (+257) | +125 (+257) | +85 (+185) | +125 (+257) | +125 (+257) |
| **Signal/ground isolation** | Yes | Yes | Yes | Yes | Yes |
| **Hermetic seal** | Yes | Yes | Yes | No | No |
| **Weight** gram (without cable) | 3.5 | 4.0 | 13 | 0.4 | 0.4 |
| **Dimensions** mm (in) | Ø 11.2 x 6.8<br>[Ø 0.44 x 0.27] | 11.2 hex x 9.4<br>[0.44 hex x 0.37] | 14.4 hex x 17.3<br>[0.57 hex x 0.68] | Ø 5.84 x 4.06<br>[Ø 0.23 x 0.16] | Ø 5.84 x 4.06<br>[Ø 0.23 x 0.16] |
| **Mounting method** | Adhesive | Stud | Stud | Adhesive | Adhesive |
| **Cable included** | 3061A-120 | 3061A-120 | 3061A-120 | 3006-120 | 3024-120 |


| Endevco® model number | 2255B | 2258A | 5220B-100 | 7250A |
|---|---|---|---|---|
| **Description** | High g shock<br>Far field | Triaxial<br>Three 10-32 connectors | Industrial general purpose<br>Isolated Faraday shield | Thru-hole mount<br>Lightweight<br>Wide bandwidth |
| **Sensitivity** mV/g, typical | 0.1 / 1 | 10 / 100 | 100 | 2 / 10 |
| **Range** g | ± 50,000 / ± 5000 | ± 500 / ± 50 | ± 80 | ± 2500 / ± 500 |
| **Shock limit** g | 50,000 | 2000 | 5000 | 10,000 |
| **Frequency response** ±1 dB Hz | 2–20,000 / 0.5–20,000 | 1–7000 | 1–9000 | 3–20,000 / 4–20,000 |
| **Broadband noise** (µg rms) | 0.5 / 0.05 | 1000 / 300 | 700 | 10,000 / 2000 |
| **Min temperature** °C (°F) | -55 (-67) | -55 (-67) | -50 (-58) | -55 (-67) |
| **Max temperature** °C (°F) | +125 (+257) | +125 (+257) | +120 (+248) | +125 (+257) |
| **Signal/ground isolation** | Yes | Yes | Yes | Yes |
| **Hermetic seal** | No | Yes | Yes | Yes |
| **Weight** gram (without cable) | 2 | 15 | 90 | 1.8 |
| **Dimensions** mm (in) | 7.92 hex x 13.0<br>[0.312 hex x 0.51] | 18.7 x 18.7 x 11.7<br>[0.74 x 0.74 x 0.46] | 22.2 hex x 53.3<br>[0.875 hex x 0.75] | Ø 9.78 x 5.8<br>[Ø 0.385 x 0.23] |
| **Mounting method** | Stud | Screw | Stud | Screw |
| **Cable included** | 3024-120 | 3061A-120 | No | 3091F-120 |

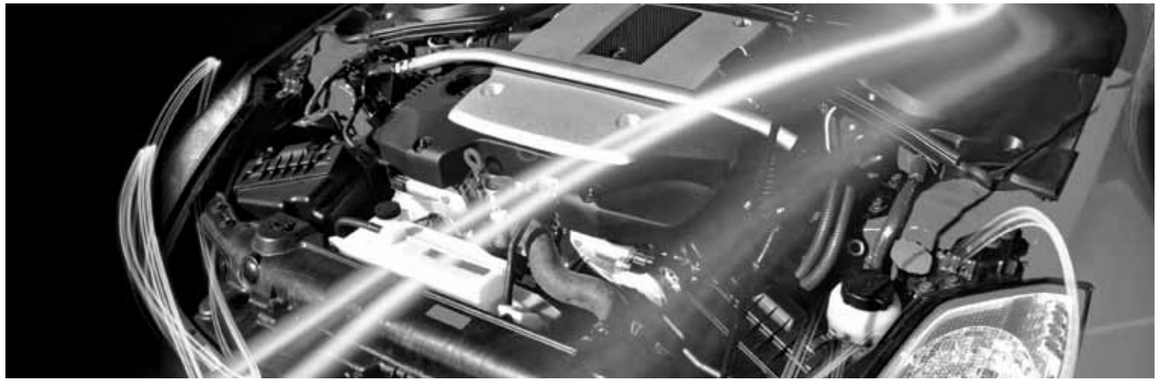
# Endevco® model 7251A

The Endevco® model 7251A series is a family of small, lightweight, hermetically sealed piezoelectric accelerometers with integral electronics. The centrally located thru-bolt mounting hole of this series provides both 360° cable and connector orientation, allowing for a flat mounting surface, even when the sensor is not fully perpendicular, for ease of use in a variety of applications.

- 10, 100, and 500 mV/g sensitivities available on standard model
- High temperature up to +150°C option available
- TEDS option available
- Ground isolated
- Hermetically sealed
- Lightweight (10.5 grams standard model)
- 360° cable orientation

| Endevco® model number | 7250AM1 | 7251A | 7253C |
|---|---|---|---|
| **Description** | Thru-hole mount<br>Wide bandwidth<br>Solder pins | Thru-hole mount<br>General purpose | Triaxial<br>Wide bandwidth<br>Lightweight |
| **Sensitivity** mV/g, typical | 2 / 10 | 10 / 100 / 500 | 10 |
| **Linear range** g | ± 2500 / ± 500 | ± 500 / ± 50 / ± 10 | ± 500 |
| **Shock limit** g | 10,000 | 5000 | 2000 |
| **Frequency response** ± 1dB Hz | 3–20,000 / 4–20,000 | 2–10,000 | 2–15,000 |
| **Broadband noise** (µg rms) | 10,000 / 20,000 | 1000 / 250 / 150 | 2000 |
| **Min temperature** °C (°F) | -55 (-67) | -55 (-67) | -55 (-67) |
| **Max temperature** °C (°F) | +125 (+257) | +125 (+257) | +125 (+257) |
| **Signal/ground isolation** | Yes | Yes | Yes |
| **Hermetic seal** | Yes | Yes | No |
| **Weight** gram (without cable) | 1.8 | 10.5 | 3.6 |
| **Dimensions** mm (in) | Ø 9.78 x 5.8<br>[Ø 0.385 x 0.23] | Ø 15.2 x 8.9<br>[Ø 0.60 x 0.35] | 15.2 x 15.2 x 7.1<br>[0.60 x 0.60 x 0.28] |
| **Mounting method** | Screw | Screw | Screw |
| **Cable included** | 3091F-120 | 3061A-120 | 3027AM3-120 |

| Endevco® model number | 7255A | 7259B |
|---|---|---|
| **Description** | Near-field<br>High shock<br>Built in mech filter<br>Solder terminals | Very high frequency<br>Lightweight |
| **Sensitivity** mV/g, typical | 0.1 / 1 | 10 / 25 / 100 |
| **Linear range** g | ± 50,000 / ± 5000 | ± 500 / ± 200 / ± 50 |
| **Shock limit** g | 300,000 / 25,000 | 10,000 / 5000 / 2000 |
| **Frequency response** ±1 dB Hz | 3–10,000 (± 3 dB) | 5–10,000 |
| **Broadband noise** (µg rms) | 0.5 / 0.05 | 1500 / 1500 / 200 |
| **Min temperature** °C (°F) | -18 (0) | -55 (-67) |
| **Max temperature** °C (°F) | +66 (+150) | +125 (+257) |
| **Signal/ground isolation** | Yes | Yes (with isolator) |
| **Hermetic seal** | Yes | Yes |
| **Weight** gram (without cable) | 5.0 | 4.4 |
| **Dimensions** mm (in) | 9.52 hex x 21.3<br>[0.375 hex x 0.84] | 9.53 hex x 11.68<br>[0.375 hex x 0.46] |
| **Mounting method** | Stud | Stud |
| **Cable included** | 3024-120 | 3053VM1-120 |



# Microphones

## Typical applications

- NVH testing
- Cabin noise analysis
- Pass-by noise testing
- Environmental noise analysis
- Building noise studies
- Acoustic chamber testing
- Appliance noise evaluation
- Wind tunnel and aerodynamics testing

Endevco®'s 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.

Endevco® prepolarized condenser measurement microphones, available in ⅛", ¼", and ½" diameters, are offered in free-field, pressure, low-cost array and random incidence types and may be used to meet IEC and ANSI standards. Array microphones offer a lower overall per channel measurement cost and are directly compatible with Isotron® (IEPE-type) signal conditioning. They may be used as drop-in replacements within existing accelerometer test system set-ups for as-needed precision noise measurements. Models may be purchased as stand-alone units, or in a pre-calibrated microphone and low-noise preamplifier combination with iTEDS on-board memory storage capabilities (per IEEE 1451.4-2004), facilitating their use within larger channel count applications.

| Endevco® model number | 2510 | 2510M4A | EM40AD | EM40AO | EM40BD |
|---|---|---|---|---|---|
| **Description** | High intensity sound<br>High temperature<br>Vibration compensated | High intensity sound<br>High temperature<br>Vibration compensated | 1/2"<br>Prepolarized<br>Condenser | 1/2"<br>Wide frequency<br>Condenser | 1/4"<br>Prepolarized<br>Condenser |
| **Type** | Pressure | Pressure | Pressure | Pressure | Pressure |
| **Sensitivity** mV/Pa ± 3 dB @ 250 Hz | 0.16 pC/pascal | 0.16 pC/pascal | 50 | 12.5 | 1.6 |
| **Frequency range** Hz | 2–4000 | 2–4000 | 6.3–10,000 | 3.15–20,000 | 10–70,000 |
| **Temperature range** °C (°F) | -55 to +260<br>(-67 to +500) | -55 to +260<br>(-67 to +500) | -40 to +120<br>(-40 to +248) | -40 to +150<br>(-40 to +302) | -40 to +120<br>(-40 to +248) |
| **Dynamic range** dB | 100–180 | 100–180 | 17–146 | 27–160 | 45–174 |
| **Diameter** mm (in) | 20.70 (0.815) | 20.70 (0.815) | 12.7 (1/2) | 12.7 (1/2) | 6.35 (1/4) |
| **Cable included** | 3090C-120 | 3090C-120 | No | No | No |

| Endevco® model number | EM40DD | EM40AE | EM40AM | EM40BE | EM40AQ |
|---|---|---|---|---|---|
| **Description** | 1/8"<br>Prepolarized<br>Condenser | 1/2"<br>Prepolarized<br>Condenser | 1/2"<br>Wide frequency<br>Condenser | 1/4"<br>Prepolarized<br>Condenser | 1/2"<br>Prepolarized<br>Condenser |
| **Type** | Pressure | Free-field | Free-field | Free-field | Random incidence |
| **Sensitivity** mV/Pa ± 3 dB @ 250 Hz | 0.7 | 50 | 12.5 | 4 | 50 |
| **Frequency range** Hz | 6.5–140,000 | 3.15–20,000 | 3.15–40,000 | 10–100,000 | 3.16–16,000 |
| **Temperature range** °C (°F) | -40 to +120<br>(-40 to +248) | -40 to +150<br>(-40 to +302) | -10 to +50<br>(14 to +122) | -40 to +150<br>(-40 to +302) | -40 to +150<br>(-40 to +302) |
| **Dynamic range** dB | 50–184 | 15–146 | 20–160 | 40–168 | 17–146 |
| **Diameter** mm (in) | 3.16 (1/8) | 12.7 (1/2) | 12.7 (1/2) | 6.35 (1/4) | 12.7 (1/2) |
| **Cable included** | No | No | No | No | No |

# Microphone sets

Endevco® EM46 series is a family of microphones and preamplifiers, pre-assembled and calibrated as a single unit, with the incorporation of iTEDS. These combination units have been carefully selected to obtain the best possible properties and reliability, thus optimizing workflow for the user and minimizing typical handling errors. The units are assembled in a dust-free environment to avoid contamination of the interface between the microphone and preamplifier and have been sealed with a label. The label can be removed and the kit dismantled, if desired by the user.

For measurement platforms that support intelligent transducers, according to IEEE 1451.4 (iTEDS), microphones may be simply plugged in, in order to identify their specific properties, types and calibration data—a feature especially appreciated by multi-channel users. All EM46 series units are delivered with calibration charts including sensitivity values and frequency response curves for the complete kit. The sensitivity value can therefore be used directly within the system setup.

- Preassembled kit, consisting of a high-precision microphone cartridge and iTEDS-enabled preamplifier
- Constructed of highly durable stainless steel
- Calibrated as a complete system
- Repairable diaphragm

| Endevco® model number | EM46AE | EM46BE | EM46AQ |
|---|---|---|---|
| **Description** | EM40AE microphone & EM26CA preamp with iTEDS | EM40BE microphone & EM26CB preamp with iTEDS | EM40AQ microphone & EM26CA preamp with iTEDS |
| **Type** | Free-field | Free-field | Random incidence |
| **Sensitivity** mV/Pa ± 3 dB @ 250 Hz | 50 | 4 | 50 |
| **Frequency range** Hz | 3.15–20,000 | 10–100,000 | 3.15–12,500 |
| **Min temperature** °C (°F) | -30 (-22) | -30 (-22) | -30 (-22) |
| **Max temperature** °C (°F) | +70 (+158) | +70 (+158) | +70 (+158) |
| **Dynamic range** dbA to dB | 17–134 | 40–168 | 16–138 |
| **Length** mm (in) | 84 (3.31) | 53 (2.09) | 84 (3.31) |
| **Weight** oz (g) | 1.16 (33) | 0.28 (8) | 1.23 (35) |
| **Diameter** mm (in) | 12.7 (1/2) | 6.35 (1/4) | 12.7 (1/2) |
| **Connector** | BNC | 10-32 | BNC |



# Environmental noise analysis

Measurement microphones are used in environmental noise analysis to study sounds from sources such as airports, highways and construction zones. This analysis can give a better understanding of the sound levels experienced in these areas, allowing for the necessary adjustments to be made to comply with existing regulations and legislation.

| Endevco® model number | EM46AD | EM46A0 | EM46BD |
|---|---|---|---|
| **Description** | EM40AD microphone & EM26CA preamp with iTEDS | EM40A0 microphone & EM26CA preamp with iTEDS | EM40BD microphone & EM26CB preamp with iTEDS |
| **Type** | Pressure | Pressure | Pressure |
| **Sensitivity** mV/Pa ± 3 dB @ 250 Hz | 50 | 12.5 | 1.6 |
| **Frequency range** Hz | 3.15–10,000 | 3.15–20,000 | 10–70,000 |
| **Min temperature** °C (°F) | -30 (-22) | -30 (-22) | -30 (-22) |
| **Max temperature** °C (°F) | +70 (+158) | +70 (+158) | +70 (+158) |
| **Dynamic range** dbA to dB | 16–138 | 27–147 | 45–174 |
| **Length** mm (in) | 84 (3.31) | 80.3 (3.16) | 53 (2.09) |
| **Weight** oz (g) | 1.23 (35) | 1.16 (33) | 0.28 (8) |
| **Diameter** mm (in) | 12.7 (1/2) | 12.7 (1/2) | 6.35 (1/4) |
| **Connector** | BNC | BNC | 10-32 |

## Isotron® preamplifiers for prepolarized microphones

Optimized for use with prepolarized condenser microphones, Endevco® preamplifiers are delivered with a built-in iTEDS chip, and can be programmed as a single unit, pre-fitted with a microphone. All preamplifiers have a stainless steel casing for maximum strength and durability.

| Endevco® model number | EM26CA | EM26CF | EM26CB | EM26CS |
|---|---|---|---|---|
| **Description** | 1/2" microphone preamplifier | 1/2" microphone preamplifier with gain and filter settings | 1/4" microphone preamplifier | 1/4" microphone preamplifier Small size |
| **Power supply** mA | 2–20 | 4–20 | 2–20 | 2–20 |
| **Noise A-weighted** µV rms | ‹ 2.5 | 10, typical | ‹ 2.5 | ‹ 2.5 |
| **Frequency range** Hz | 2–200,000 | 2.5–100,000 | 2–200,000 | 2–200,000 |
| **Min temperature** °C (°F) | -30 (-22) | -30 (-22) | -30 (-22) | -30 (-22) |
| **Max temperature** °C (°F) | +70 (+158) | +70 (+158) | +70 (+158) | +70 (+158) |
| **Output voltage maximum** V | ± 8 | ± 5 | ± 8 | ± 8 |
| **Input impedance** GΩ | 20 | 20 | 20 | 20 |
| **Output impedance** Ω | ‹ 50 | ‹ 50 | ‹ 50 | ‹ 50 |
| **Gain, typical** dB | -0.25 | -0.25 | -0.25 | -0.45 |
| **Length** mm (in) | 73 (2.87) | 93 (3.66) | 50 (1.97) | 29.5 (1.16) |
| **Weight** oz (g) | 0.92 (26) | 1.06 (30) | 0.28 (8) | 0.12 (3.5) |
| **Diameter** mm (in) | 12.7 (1/2) | 12.7 (1/2) | 6.35 (1/4) | 6.35 (1/4) |
| **Connector** | BNC | BNC | Microdot 10-32 | Microdot 10-32 |

## Low-cost array and low-profile surface microphones

Special microphones are often required for testing conditions in which there are particular requirements surrounding the methods of measurements and configurations. Surface microphones are used for measurements on planar and curved surfaces. A typical application includes measurements of wind-induced noise on ground and airborne vehicles. Array microphones are used in applications where concurrent measurements are required at several points in an array. Typical applications include sound field analysis and sound power analysis.

- Low-cost pre-polarized array microphones designed for multi-channel acoustic measurements
- Low-profile surface microphone, ideal for measuring wind-induced noise on ground and airborne vehicles
- Build in iTEDS capability

| Endevco® model number | EM40PH | EM40PL | EM40PS |
|---|---|---|---|
| **Description** | Low-cost general purpose microphone with integral Isotron® amplifier and iTEDS | Low-cost general purpose microphone with integral Isotron® amplifier and iTEDS | Low-profile Surface microphone |
| **Power supply** mA | 2–20 | 2–20 | 2–10 |
| **Type** | Array | Array | Surface |
| **Sensitivity** mV/Pa ± 3 dB @ 250 Hz | 50 | 10 | 5 |
| **Frequency range** Hz | 10–20,000 | 10–20,000 | 20–20,000 |
| **Min temperature** °C (°F) | -10 (+14) | -10 (+14) | -20 (-4) |
| **Max temperature** °C (°F) | +50 (+122) | +50 (+122) | +80 (+176) |
| **Dynamic range** dbA to dB | ‹ 32 to 135 | ‹ 32 to 150 | ‹ 32 to 136 |
| **Output impedance** Ω | ‹ 50 | ‹ 50 | ‹ 50 |
| **Diameter** mm (in) | 7 (0.28) | 7 (0.28) | 13.2 (0.52) w/o fairing |
| **Connector** | SMB | SMB | 10-32 |

# Electronics

## Typical applications

- Aerospace and defense
- Automotive and off-highway
- Product testing
- Quality assurance
- Research and development
- Test and measurement

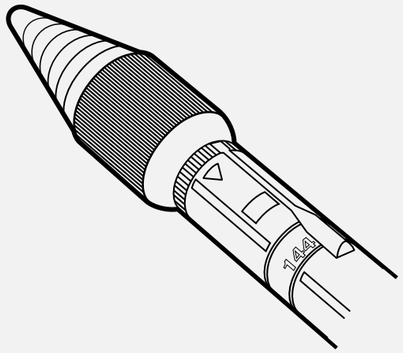
Endevco® offers a comprehensive family of high performance electronic instruments from simple battery operated signal conditioners to computer controlled laboratory quality instruments that measure vibration, shock and pressure. Endevco® electronic instruments support piezoelectric (charge-mode), variable capacitance, Isotron® (voltage-mode) and piezoresistive sensors. The models 133, 136 and 2775B feature an RS-232 interface and can be controlled by Endevco®'s optional software (35933A).

| Endevco® model number | 2680MX | 2685MX | 2771C | 2777A |
|---|---|---|---|---|
| **Description** | PE charge amp for airborne applications | Isotron® signal conditioner for airborne applications | Ultra low noise remote charge convertor | Differential remote charge convertor<br>Low noise<br>Ruggedized |
| **Input** | PE | Isotron® | PE | DIFF PE |
| **Channels** | 1 | 1 | 1 | 1 |
| **Gain** | 0.1–100 | 0.1–100 | 0.1 / 1 / 10 | 2 / 10 mV/Pc |
| **Broadband noise** rms | 1.5 | 1.5 | 5 / 30 / 50 µV | 1 / 5 (RTO) |
| **Lower cutoff freq** -3 dB Hz | 3 | 0.7 | 0.4 / 0.4 / 2 | 5.73 |
| **Upper cutoff freq** -3 dB Hz | Selectable | Selectable | 8 / 30 / 50,000 (± 5%) | 17,500 |
| **Power** | 20-32 VDC | 20-32 VDC | Constant current | 22–31 VDC |

| Endevco® model number | 2775B | 6634C | 4430A | 4416B | 4830A |
|---|---|---|---|---|---|
| **Description** | PE / Isotron® signal conditioner<br>AC / DC / Servo outputs | Rotating machinery Vibration amplifier<br>Single ended, filters, alarm relays | Ultra low noise PE / Isotron® / bridge signal conditioner | Portable Isotron® power supply and signal conditioner | Handheld accelerometer simulator |
| **Input** | PE / Isotron® / RCC | PE / Isotron® / Velocity coil | PE / Isotron® | Isotron® | Output only |
| **Channels** | 1 or 6 / Rack | 1 or 6 / Rack | 1 or 10 / Rack | 1 | 1 |
| **Gain** | 0.0025–10,000 | Selectable | 1–1000 | 1 / 10 | N/A |
| **Display** | Meter | DPM | DPM | N/A | LCD |
| **Broadband noise** rms | 1 (RTO) | 1 | 1 | 100 µV RMS (RTO) | 2 |
| **Lower cutoff freq** -3 dB Hz | 0.16 | 2 | 0 | 0.3 | 1 |
| **Upper cutoff freq** -3 dB Hz | 120,000 | 20,000 | 100,000 | 40,000 | 10,000 |
| **Power** | 100–240 VAC | 90–240 VAC | From 4961 / 4960A | Battery / AC | Battery / AC |
| **Type of control** | Manual / RS-232 | Manual / RS-232 | Manual / GPIB | Manual | Manual |

## Engine vibration monitoring

Meggitt Sensing Systems precision signal conditioners have been used extensively for supporting accelerometer measurements on space probes and launch vehicles within the US, Europe and Japan, as well as in the laboratory vibration testing of flight components during the qualification process. Our signal conditioners offer exceptional compatibility with existing control systems and support of multiple accelerometer types.



## Multi-channel signal conditioners




| Endevco® model number | 133 | 126 | 136 | 2793 |
|---|---|---|---|---|
| **Description** | General purpose PE / Isotron® signal conditioner | Low cost bridge amplifier Auto zero | General purpose differential voltage amplifier Auto zero | Standard rack mount PE / Isotron® signal conditioner with status indicators |
| **Input** | PE / Isotron® | PR / VC | PR / VC | PE / Isotron® / RCC |
| **Channels** | 3 or 9 / Rack | 3 | 3 or 9 / Rack | 16 |
| **Gain** | 1–1000 | 0.00-999.9 | 1–1000 | 1 / 10 |
| **Display** | DPM | N/A | DPM | N/A |
| **Broadband noise** rms | 1 (RTO) | 1 (RTO) | 1 (RTO) | 0.4 |
| **Lower cutoff freq** -3 dB Hz | 10 | DC | DC | 1 |
| **Upper cutoff freq** -3 dB Hz | 10,000 | 10,000 | 10,000 | 30,000 |
| **Power** | AC / DC | AC / DC | AC / DC | 100–240 VAC |
| **Type of control** | Manual / RS-232 | Manual | Manual / RS-232 | Manual |



## Endevco® model 4990A

The Endevco® model 4990A (OASIS) is a multi-rack based system that interfaces with multiple sensor types by using the 400 series family (below) of modular signal conditioning cards. The modular cards can be used in any combination, giving maximum flexibility to customize any system configuration. The system is ideal for applications requiring anywhere from a few channels to thousands.

Using the OASIS application software, the system can be configured via serial or Ethernet communication. The ability to save and recall previous configurations results in tremendous savings in system setup time.

## Modular signal conditioning cards for 4990A (OASIS)




| Endevco® model number | 433 | 436 | 482B | 428 |
|---|---|---|---|---|
| **Description** | PE / Isotron® signal conditioner Rack mounted card | DC differential voltage amplifier Rack mounted card | Isotron® signal conditioner iTEDS capabilities Rack mounted card | PE / Isotron® signal conditioner Isolated front end Rack mounted card |
| **Input** | PE / Isotron® | PR / VC | Isotron® / RCC | PE / Isotron® |
| **Channels** | 3 or 48 / Rack | 3 or 48 / Rack | 8 or 128 / Rack | 2 or 32 / Rack |
| **Gain** | 0–1000 | 10–1000 | 0–100 | 0–10,000 |
| **Broadband noise** rms | 0.4 | 5 | 15 | 0.01 |
| **Lower cutoff freq** -3 dB Hz | 0.1 | DC | 12 | 0.5 |
| **Upper cutoff freq** -3 dB Hz | 100,000 | 100,000 | 100,000 | 120,000 |
| **Power** | DC | DC | DC | DC |
| **Type of control** | RS-232 / Ethernet | RS-232 / Ethernet | RS-232 / Ethernet | RS-232 / Ethernet |

# Calibration equipment

Meggitt Sensing Systems recommends the periodic calibration of sensors and instrumentation to ensure continued performance according to published specifications. For sensors used in severe environments, more frequent calibrations are recommended. Endevco® calibration systems provide an expedited means of performing necessary verifications and are particularly ideal for use in test laboratories where higher quantities of sensors are in use, or where sensors need to be calibrated at the ready.

## Commercial Automated Accelerometer Calibration System (CAACS)

- Vibration calibration 0.5 Hz to 40 kHz
- Shock calibration 20 g to 10,000 g
- Calibration of different type of transducers, PE, IEPE, PR, VC, Servo, Velocity
- Calibration certificates may be customized by user
- Electrical self-calibration
- Compliance with ANSI/NCSL Z540-1-1994 and ISO 9000
- All calibrations performed are traceable to the National Institute of Standards and Technology (NIST)
- Calibration in accordance with ISO/IEC 17025-2005
- Controls up  to four excitation sources

## CAACS service plans

Meggitt Sensing Systems offers multiple CAACS service plans, for continued support after initial product warranty expiration. With loaner equipment options and special access to the CAACS technical support team, the plans offer a known cost of ownership and a means of accurately budgeting support requirements, ensuring that any technical issues with the system can receive immediate troubleshooting, and be back up and running with minimal downtime.

## Available exciters

| Endevco® model number | 2911 | 2925 | 2924A |
|---|---|---|---|
| **Description** | High frequency shaker<br>Built in reference accelerometer | POP (Pneumatically Operated Projectile) shock calibrator | Long stroke shaker<br>Six-inch<br>Pk-to-pk displacement |
| **Frequency range** Hz | 2–40,000 | N/A | 0–200 |
| **Acceleration level** g | 40 | 20–10,000 | 6 max |
| **Inputs** | N/A | N/A | N/A |
| **Control** | Computer controlled or manual | Computer controlled or manual | Computer controlled or manual |

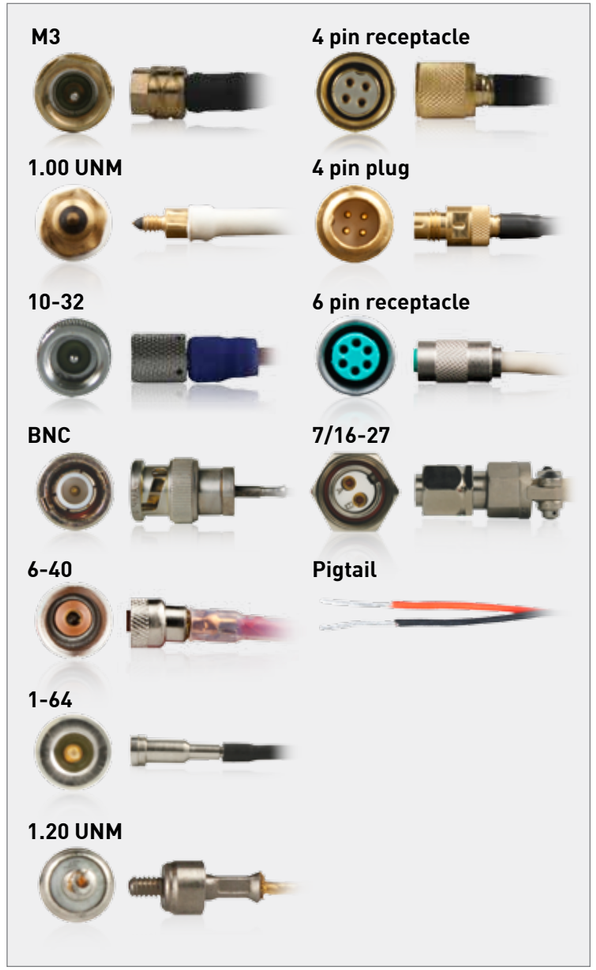
## Portable calibrators

| Endevco® model number | 28959F / FV | EM42AA |
|---|---|---|
| **Description** | Portable calibration unit | Handheld acoustic calibrator |
| **Frequency range** Hz | 10–10,000 | 250 ± 0.05% |
| **Acceleration level** g | 10 max | N/A |
| **Inputs** | PE / Isotron® / PR / Velocity | Endevco® microphones |
| **Control** | Manual | Manual |

# Cables

Endevco® designs and manufactures its own cables and connectors specifically 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 schooled 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 just don't compare.

Endevco® also specializes in custom cables, cable lengths, and connectors. Please contact your local Endevco® representative or contact the factory directly to discuss your custom requirements.




| Endevco® model number | 3003C | 3006 | 3024 | 3027A | 3027AM3 | 3027AVM13 |
|---|---|---|---|---|---|---|
| **Connector 1** | 1.00 UNM | 1.20 UNM | 10-32 | 4-pin receptacle | 4-pin receptacle | 4-pin plug |
| **Connector 2** | 1-64 UNC-2A | 10-32 | Pigtail | Pigtail | 3x BNC | 4-pin receptacle |
| **Capacitance** pF/ft | 25 | 42 | N/A | 16 | 30 | 16 |
| **Center conductor resistance** Ω/ft max | 42 | 16 | 0.066 | 0.3 | 0.2 | 0.3 |
| **Conductor size** AWG | 40 | 36 | 28 | 32 | 28 | 28 |
| **Jacket material** | Teflon® | Fluorocarbon | N/A | Silicone | PVC | Teflon® |
| **Overall diameter** in | 0.024 | 0.035 | 0.055 | 0.108 | 0.105 | 0.105 |
| **Bend radius** in | 0.1 | 0.120 | 0.75 | 0.50 | 0.850 | N/A |
| **Temperature range** °C (°F) | -73 to +177 (-100 to +350) | -50 to +125 (-58 to +257) | -184 to +176 (-300 to +350) | -100 to +125 (-148 to +257) | -55 to +85 (-67 to +185) | -100 to +200 (-148 to +392) |
| **Low noise** | Yes | No | No | No | No | Yes |

| Endevco® model number | 3053V | 3053VM1 | 3060D | 3061 | 3075M6 | 3090C |
|---|---|---|---|---|---|---|
| **Connector 1** | M3 | M3 | 10-32 | 10-32 | 10-32 | 10-32 |
| **Connector 2** | 10-32 | BNC | 10-32 | BNC | 10-32 | 10-32 |
| **Capacitance** pF/ft | 32 | 32 | 50 | 28 | 63 | 36 |
| **Center conductor resistance** Ω/ft max | 0.5 | 0.5 | 0.2 | 0.5 | 0.4 | 0.5 |
| **Conductor size** AWG | 33 | 33 | 28 | 30 | 0.01 in O.D. | 30 |
| **Jacket material** | Extruded Teflon® | Extruded PFA | Silicone | Teflon® | 304LSS | Teflon® |
| **Overall diameter** in | 0.054 | 0.054 | 0.092 | 0.080 | 0.070 | 0.080 |
| **Bend radius** in | 0.5 | 0.50 | 0.950 | 0.85 | 0.75 | 0.850 |
| **Temperature range** °C (°F) | -258 to +260 (-432 to +500) | -55 to +200 (-67 to +392) | -73 to +260 (-100 to +500) | -100 to +260 (-148 to +500) | -184 to +482 (-300 to +900) | -258 to +260 (-432 to +500) |
| **Low noise** | Yes | Yes | Yes | No | No | Yes |

| Endevco® model number | 3090CM12 | 3090DV | 3091F | 3095A | 6917B/D | 6918M30 |
|---|---|---|---|---|---|---|
| **Connector 1** | 10-32 | 10-32 | 6-40 UNF-2B | 1-64 | 7/16-27 | 7/16-27 |
| **Connector 2** | BNC | 10-32 | 10-32 | 10-32 | Pigtail | 7/16-27 |
| **Capacitance** pF/ft | 32 | 32 | 40 | 30 | 80 | 80 |
| **Center conductor resistance** Ω/ft max | 0.5 | 0.5 | 0.6 | 0.6 | 0.2 | N/A |
| **Conductor size** AWG | 30 | 30 | 33 | 33 | 20 | N/A |
| **Jacket material** | Teflon® | Teflon® | Teflon® | Teflon® | Teflon® | SS |
| **Overall diameter** in | 0.080 | 0.081 | 0.060 | 0.060 | 0.19 | 0.25 |
| **Bend radius** in | 0.85 | 0.75 | 0.12 | N/A | 0.60 | 0.8 |
| **Temperature range** °C (°F) | -254 to +260 (-423 to +500 | -258 to +260 (-432 to +500) | -184 to +260 (-300 to +500) | -184 to +177 (-300 to +350) | -54 to +260 (-65 to +500) | -54 to +482 (-65 to +900) |
| **Low noise** | Yes | Yes | Yes | Yes | Yes | Yes |

# Servo inclinometers

## Typical applications

- Rail-track gauging-monitoring
- Platform/antenna leveling
- Automatic stacking cranes
- Railway maintenance vehicles
- Continuous casting angle monitoring
- LNG ship trim and list control

The Sensorex range of high-precision tilt sensors from Meggitt Sensing Systems is ideal for pipeline leveling, structural testing, rail monitoring, and general angular measurements. They feature oil immersed sensing elements, for high resistance to external shock and vibration inputs, with IP65 to IP68 sealed housings for enhanced protection, and optional ATEX certification for explosive environment applications.

Gravity-referenced servo inclinometers incorporate the earth's gravitational field (±1 g) as their primary measurement reference point. They are most commonly used in civil engineering, industrial production (robotics and automation), rail and general laboratory environments (test benches and prototyping). High-performance MEMS inclinometers are typically used within space constrained environments, and offer precision tilt measurement capabilities within a compact and robust package size. They are used for pitch and roll measurements; satellite and antennae dish monitoring, as well as machinery monitoring and control applications.

| Sensorex series number | SX41100 | SX41200 | SX41400 |
|---|---|---|---|
| **Description** | Digital servo-inclinometer<br>High performance | Servo-inclinometer / accelerometer<br>High performance | Dual axis servo-inclinometer<br>High performance |
| **Linearity** % FS | ‹ ± 0.02 | ‹ ± 0.05 | ‹ ± 0.05 |
| **Thermal sensitivity drift** | 100 ppm of reading / °C | ‹ 100 ppm of reading / °C | ‹ 100 ppm of reading / °C |
| **Zero drift** | 50 ppm of FS / °C | ‹ 100 ppm FSO / °C | ‹ 100 ppm FSO / °C |
| **Operating temperature** °C (°F) | -40 to +85 (-40 to +185) | -40 to +80 (-40 to +176) | -40 to +80 (-40 to +176) |
| **Range** | ± 1 to ± 70° | ± 3 to ± 90° | ± 3 to ± 90° |
| **Power supply** V | 9 to 30 | 10 to 30 | 10 to 30 |
| **Output** | ± 5 V, 4–20 mA, RS485 | ± 5 V, 4–20 mA | ± 5 V, 4–20 mA |
| **Bandwidth** Hz (-3 dB) | 0.1 to 10 (adjustable) | 3 to 15 (according to range) | 3 to 10 (according to range) |
| **Dimensions** mm | 65 x 55 x 36 | 67 x 35 x 51 | 76 x 70 x 51 |
| **IP rating** | 65 | 65 | 65 |

For each Sensorex series, refer to data sheet for part number configuration.

| Sensorex series number | SX41600 | SX46110 | SX46120 |
|---|---|---|---|
| **Description** | ATEX Dual axis servo-inclinometer<br>High performance | Single axis MEMS inclinometer | Dual axis MEMS inclinometer |
| **Linearity** % FS | ‹ 0.05 | ‹ ± 0.7 | ‹ ± 0.7 |
| **Thermal sensitivity drift** | ‹ 100 ppm of reading / °C | 100 ppm of reading / °C | 100 ppm of reading / °C |
| **Zero drift** | ‹ 100 ppm FSO / °C | 100 ppm of FS / °C | 100 ppm of FS / °C |
| **Operating temperature** °C (°F) | -40 to +85 (-40 to +185) | -40 to +125 (-40 to +257) | -40 to +125 (-40 to +257) |
| **Range** | ± 1 to ± 90° | ± 5 to ± 90° | ± 5 to ± 90° |
| **Power supply** V | 24 ± 4V | 9 to 36 | 9 to 36 |
| **Output** | 4–20 mA | 0–5 V, 4–20 mA | 0–5 V, 4–20 mA |
| **Bandwidth** Hz (-3 dB) | 3 to 10 (according to range) | 10 | 10 |
| **Dimensions** mm | 133 x 52 x 60 | 27 x 22 x 35 | 38 x 30 x 35 |
| **IP rating** | 67 | 65 | 65 |

For each Sensorex series, refer to data sheet for part number configuration.

# Inertial systems/servo accelerometers

## Typical applications

- Automatic Train Control (ATC/ATP)
- Road car test
- Flight test characterization
- Seismic surveying
- Telemetry
- Rail vehicle test

The Sensorex range of inertial measurement units (IMUs) incorporates MEMS sensors with no moving parts, ensuring their high-reliability performance in severe environments. Sensorex IMUs are used to measure the real-time angular speed and acceleration on three axes with high accuracy. The “REDs” digital model is fully compensated for the efforts of non-linearity and temperature drift, as well as for bias and misalignment errors. Rugged, lightweight and compact, Sensorex IMUs are ideal for use in onboard flight testing, road and rail study, telemetry. In addition Meggitt Sensing Systems offers a range of Sensorex MEMS-packaged gyrometers, designed to measure angular velocity to a high degree of accuracy.


| Sensorex series number | SX43030 | SX43040 | SX43690 |
|---|---|---|---|
| **Description** | Rugged MEMS inertial measurement unit | High performance MEMS inertial measurement unit | MEMS packaged gyrometer |
| **Linearity** | Acc. ‹ ± 0.9% FS ;<br>Gyro. ‹ ± 1% FS | Acc. ‹ ± 0.9% FS ;<br>Gyro. ‹ ± 0.1% FS | ‹ ± 1% FS |
| **Scale factor drift** | ± 3% OTR | ± 0.3% OTR | ± 3% OTR |
| **Bias drift** | ± 3°/s OTR | ± 0.4°/s OTR | ± 3°/s OTR |
| **Operating temperature** °C (°F) | -40 to +75 (-40 to +167) | -40 to +75 (-40 to +167) | -40 to +60 (-40 to +140) |
| **Range** | Acc. ± 2 to ± 10 g<br>Gyro. ± 50 to ± 110°/s | Acc. ± 2 to ± 10 g<br>Gyro. ± 50 to ± 110°/s | ± 50 to 200°/s |
| **Power supply** V | 9 to 36 | 10 to 36 | 9 to 36 |
| **Output** | ± 5 V | ± 5 V, RS485 Modbus | ± 5 V |
| **Bandwidth** Hz (-3 dB) | 50 | 0.1 to 100 (adjustable) | 30 to 80 (according to range) |
| **Dimensions** mm | Diam. 90 x 91.5 | Diam. 90 x 91.5 | 113.9 x 35.3 x 32.5 |
| **IP rating** | 65 | 65 | 65 |

For each Sensorex series, refer to data sheet for part number configuration.


| Sensorex series number | SX41800 |
|---|---|
| **Description** | Digital servo-accelerometer |
| **Linearity** | ‹ ± 0.02% FS |
| **Thermal sensitivity drift** | 100 ppm of reading / °C |
| **Zero drift** | 50 ppm of FS / °C |
| **Operating temperature** °C (°F) | -40 to +85 (-40 to +185) |
| **Range** g | ± 0.1 / ± 0.25 / ± 0.5 / ± 1.0 |
| **Power supply** V | 9 to 30 |
| **Output** | ± 5 V, 4–20 mA, RS485 Modbus |
| **Bandwidth** Hz (-3 dB) | 0.1 to 10 |
| **Dimensions** mm | 65 x 55 x 36 |
| **IP rating** | 65 |

For each Sensorex series, refer to data sheet for part number configuration.

# LVDT and RVDT

## Typical applications

- Structure monitoring
- Servo-actuator feed-back
- Test bench instrumentation
- Metrology/dimensional controls
- Servo-valve feed-back
- Race car clutch/steering control

Linear position and displacement sensors are designed to produce an electrical output, proportional to the displacement of a free moving core, to assess critical parameters such as dimensional control and actuator position feedback within hydraulic cylinders and other servo-control applications.

The Sensorex range of standard and custom high-performance linear variable differential transformers (LVDTs), available in wire, cable and connector styles, offers friction-free operation, small size, infinite resolution, long service life and measurement repeatability within civil engineering, industrial automation, robotics, safety systems, test benches and prototyping applications. These compact sensors offer multi-step windings with extremely favorable size-to-stroke ratios, as well as ATEX-certified intrinsically safe versions for use in nuclear and other hazardous environments. In addition, Meggitt Sensing Systems offers a range of DC-DC LVDTs, incorporating Sensorex hybrid technologies and eliminating the need for signal conditioning and power supplies.

| Sensorex series number | SX12K | SX12V | SX12W | SX CER |
|---|---|---|---|---|
| **Description** | LVDT<br>Cable output | LVDT for servo-actuator | LVDT<br>Wires output | LVDT with guide and swivel joints |
| **Linearity** % FS | ‹ ± 0.15 | ‹ ± 0.3 | ‹ ± 0.15 | ‹ 0.3 |
| **Thermal sensitivity drift** | ‹ 150 ppm of reading / °C | ‹ 500 ppm of reading / °C | ‹ 150 ppm of reading / °C | ‹ 500 ppm of reading / °C |
| **Zero drift** ppm FS / °C | 50 | 50 | 50 | ‹ 50 |
| **Operating temperature** °C (°F) | -40 to +200 (-40 to +392) | -40 to +125 (-40 to +257) | -40 to +200 (-40 to +392) | -40 to +80 (-40 to +176) |
| **Power supply/output** | AC / AC | AC / AC | AC / AC | AC / AC |
| **Stroke** mm | ± 3 to ± 150 | ± 12.5 to ± 150 | ± 3 to ± 150 | ± 3 to ± 150 |
| **Size diameter** mm | 12 | 12 | 12 | 20 |
| **Options** | HT 200°C | High pressure: 350 Bar | HT 200°C or<br>HP: 350 Bar | Intrinsically safe version available |
| **IP rating** | 66 | 65 | 66 | 67 |

For each Sensorex series, refer to data sheet for part number configuration.

| Sensorex series number | SX20MD | SX20MER | SX20MEC2R | SX36RV |
|---|---|---|---|---|
| **Description** | Digital LVDT M12 connector | DC / DC LVDT<br>Cable output | DC / DC LVDT<br>Connector output | Intrinsically safe RVDT |
| **Linearity** % FS | ‹ ± 0.05 | ‹ ± 0.25 | ‹ ± 0.25 | ‹ 0.25 |
| **Thermal sensitivity drift** | 50 ppm of reading / °C | ‹ 300 ppm of reading / °C | ‹ 300 ppm of reading / °C | ‹ 800 ppm of reading / °C |
| **Zero drift** ppm FS / °C | 30 | ‹ 80 | ‹ 80 | NC |
| **Operating temperature** °C (°F) | -40 to +85 (-40 to +185) | -40 to +85 (-40 to +185) | -40 to +85 (-40 to +185) | -40 to +100 (-40 to +212) |
| **Power supply/output** | 12 to 30 VDC | 24 VDC ± 10 | 24 VDC ± 10 | AC / AC |
| **Stroke** mm | ± 2.5 to ± 150 | ± 2.5 to ± 150 | ± 2.5 to ± 150 | ± 10° to ± 60° |
| **Size diameter** mm | 20 | 20 | 20 | 36 |
| **Options** | No | Gauge head /<br>shrivel joints | No | No |
| **IP rating** | 66 | 66 | 67 | 54 |

For each Sensorex series, refer to data sheet for part number configuration.

# LVDT/RVDT signal conditioners

## Typical applications

- LVDT-RVDT power supply
- LVDT-RVDT signal conditioning
- Rackable cards and displays
- DIN rail mounting
- Strain gauge signal conditioning
- ATEX certified conditioners

As a complement to the precision LVDT and RVDT sensors highlighted in this catalog, Meggitt Sensing Systems offers a complete range of Sensorex conditioning instrumentation, including display signal conditioners, signal conditioning cards, boards and racks. When used with Sensorex LVDTs and RVDTs, the conditioners convert a transducer's mechanical position into a corresponding electrical output, with a high degree of accuracy and repeatability. Sensorex conditioners are ideal for use in test laboratory environments and general testing applications in the process industries, where minimal maintenance and easy-fit configurations are needed to reduce downtime and costs.




| Sensorex series number | SX3120 | SX3310 | SX3320 | SX690210279 |
|---|---|---|---|---|
| **Description** | LVDT conditioner | Strain gauge conditioner | Strain gauge conditioner with threshold | Intrinsically safe LVDT / RVDT conditioner |
| **Operating temperature** °C (°F) | 0 to +70 (+32 to +158) | 0 to +70 (+32 to +158) | 0 to +70 (+32 to +158) | -40 to +85 (-40 to +185) |
| **Power supply** | 24 VDC | 24 ± 4 VDC | 24 ± 8 VDC | 15 to 28 V |
| **Output** | ± 10 V,<br>0–10 V,<br>4–20 mA | ± 10 V,<br>0–10 V,<br>4–20 mA | ± 10 V,<br>0–10 V,<br>4–20 mA | 4–20 mA |
| **Dimensions** | Din | Din | Din | 214 x 125 x 55 |
| **Channel** | 1 | 1 | 1 | 1 |
| **Options** | No | No | No | No |

For each Sensorex series, refer to data sheet for part number configuration.



| Sensorex series number | Rack 9000 | SX9130 | SX9131 |
|---|---|---|---|
| **Description** | LVDT conditioner rack | LVDT conditioning card | Digital LVDT conditioning card |
| **Operating temperature** °C (°F) | 0 to +60 (+32 to +140) | 0 to +70 (+32 to +158) | 0 to +70 (+32 to +158) |
| **Power supply** | 220 VAC or ± 15 V | ± 15 VDC | ± 15 VDC |
| **Output** | 0–10 V,<br>4–20 mA | ± 10 V or 0–10 V,<br>4–20 mA | ± 10 V or 0–10 V,<br>4–20 mA,<br>RS485 MODBUS |
| **Dimensions** | 19" or 1/2 19" | Euro | Euro |
| **Channel** | 3 or 10 / Rack | 1 | 1 |
| **Options** | Racks available for 3 units or<br>10 units RS232, RS485 outputs | No | No |

For each Sensorex series, refer to data sheet for part number configuration.

# Shakers

## Typical applications

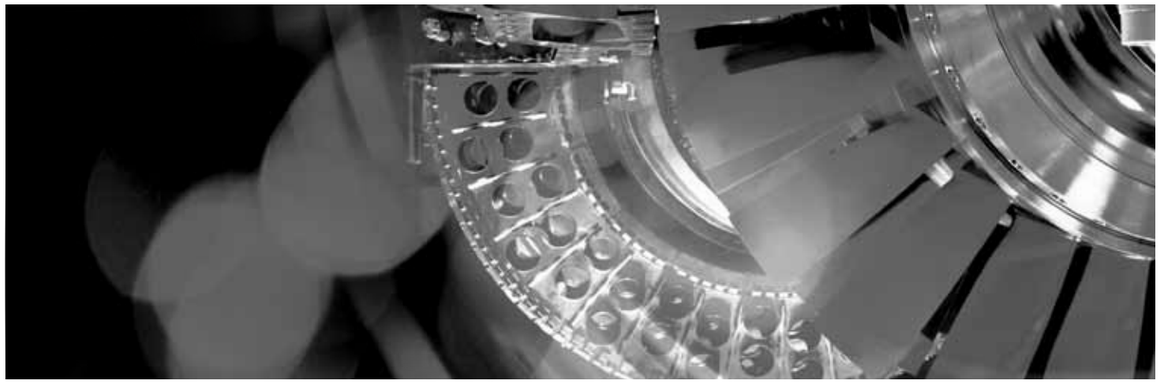
- Structural testing
- Material studies
- Product testing
- Quality assurance
- Research and development
- Modal testing

Wilcoxon Research piezoelectric and electromagnetic shakers are used to provide reliable structural excitation of a test article within a controlled, localized environment. By simulating such dynamic forces and natural frequencies, shakers can be used along with sensors and other vibration monitoring devices to reveal cracks, defects, weaknesses or other abnormalities, allowing an engineer or test technician to better predict structural behavior over time. Electromagnetic shakers excite primarily at low frequencies to measure components, such as first bending mode of airframes and ship hulls. Piezoelectric shakers excite at higher frequencies, typically above the acoustic range, where materials such as semiconductor components and high-strength metals begin to break apart.

| Wilcoxon Research model number | F3 / Z602WA | F4 / Z820WA | F5B / Z11 | F10 / Z820WA |
|---|---|---|---|---|
| **Description** | Electromagnetic shaker system | Electromagnetic shaker system | Electromagnetic shaker system | Electromagnetic shaker system |
| **Compatible impedance head** | Included, available without Z602WA | Included, available without Z8280WA | Included, available without Z11 | Included, available without Z8280WA |
| **Frequency range** Hz | 25–10,000 | 10–7500 | 10–10,000 | 5–2000 |
| **Nominal force output** lb (kg) | 1 (0.45) | 10 (4.5) | 0.4 (0.2) | 20 (9.1) |
| **Diameter** in (cm) | 2.26 (5.74) | 5.10 (12.95) | 1.35 (3.43) | 8.25 (20.96) |
| **Weight** lbs (kg) | 0.83 (0.38) | 6.8 (3.1) | 0.376 (0.17) | 28 (12.7) |

| Wilcoxon Research model number | F7 | F7-1 | F4 / F7 |
|---|---|---|---|
| **Description** | Piezoelectric shaker | Piezoelectric shaker | Electromagnetic / piezoelectric dual vibration shaker system |
| **Compatible impedance head** | Included | N/A | Included |
| **Frequency range** Hz | 500–20,000 | 1–80,000 | 10–20,000 |
| **Nominal force output** lb (kg) | 100 (45.4) | 10 (4.5) | 10 (4.5) |
| **Diameter** in (cm) | 2.20 (5.59) | 2.20 (5.59) | 5.10 (12.95) |
| **Weight** lbs (kg) | 2.5 (1.1) | 2.8 (1.3) | 8.2 (3.7) |
| **Matching network recommended** | N7FS | N8HFS | N7FS |


| Wilcoxon Research model number | D60H | D60L | D125L |
|---|---|---|---|
| **Description** | Piezoelectric shaker tables | Piezoelectric shaker tables | Piezoelectric shaker tables |
| **Compatible impedance head** | N/A | N/A | N/A |
| **Frequency range** Hz | 3000–50,000 | 2000–20,000 | 2000–20,000 |
| **Max acceleration** g | 1500 | 1500 | 1800 |
| **Diameter** in (cm) | 3.0 (7.62) | 4.0 (10.16) | 7.5 (19.05) |
| **Weight** lbs (kg) | 8.8 (4.0) | 13.0 (6.0) | 99 (45) |
| **Matching network recommended** | N8FS | N8FS | N8FS |



# Dynamic pressure sensors

## Typical applications

- Combustion instability monitoring
- High-pressure steam
- Propulsion systems testing
- Gas turbine testing
- Extreme high-temperature in-laboratory dynamic pressure measurements

Vibro-Meter high-precision piezoelectric pressure sensors are designed for long-term dynamic pressure monitoring or development testing. The transducers are specially designed to ensure dynamic pressure fluctuation measurement accuracy of up to 5076 psi, with continuous reliable operation in temperatures exceeding +777°C (+1431°F), as well as within high static pressure environments. The use of Meggitt's own proprietary single crystal material, operating in compression mode, makes it an extremely stable and reliable dynamic pressure transducer at such extreme temperatures. Sensors are fitted with an integral mineral insulated cable (twin-conductor), terminating in either a LEMO or special high-temperature connector. Models are also available with all-welded high-temperature Inconel housings, integral hardline cables, differential output and output signal-to-case isolation. ATEX certified versions are also available for use in explosive environments.

| Vibro-Meter model number | CP211 |
|---|---|
| **Description** | Extreme temperature<br>High pressure<br>Combustion monitoring |
| **Sensitivity** pC/bar | 25 |
| **Resonant frequency** kHz | › 80 |
| **Vibration sensitivity** pC/g (bar/g) | ≤ 0.0625 (≤ 0.0025) |
| **Max temperature sensor** °C (°F) | +777 (+1431) |
| **Max temperature connector** °C (°F) | +777 (+1431) |
| **Operating static pressure** psi | N/A |
| **Dynamic range** psi | 5076 |
| **Weight** gram (without cable) | 12 |
| **Exit type/connector** | Twin core MI-cable / VM-LEMO connector |

# Accessories

To ensure high-reliability sensor performance and repeatable results, the use of appropriately selected mounting studs, blocks, bases, adapters and other accessories is highly recommended. These tools are used to properly affix a sensor to the test structure or mounting surface with a minimum of additional mechanical stress and to optimize the frequency response. Meggitt Sensing Systems manufactures a complete range of accessories, designed and fully tested to be directly compatible with our sensors, transducers and related instrumentation. 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. For questions regarding the appropriateness of various sensor mounting techniques or selection of proper accessories, please contact any member of the Meggitt Sensing Systems sales and applications engineering team.



| | 4948 | 4948A | 31979 |
|---|---|---|---|
| **Category** | Electronics | Electronics | Electronics |
| **Description** | 19 inch rack mount kit, holds six units | 19 inch rack mount kit, holds six units | 19 inch rack mount kit, holds 3 units |
| **Compatibility** | 6634C | 2775B | 133, 136 |
| **Brand** | Endevco® | Endevco® | Endevco® |





| | 35818-XXX | 35918-4 | EJ21 | EJ34 | EJ807 |
|---|---|---|---|---|---|
| **Category** | Electronics | Electronics | Adapters | Adapters | Adapters |
| **Description** | Filter/integrator, provides capability for single or double integration | Charge converter plug-in module | 10-32 to BNC adapter | 10-32 to 10-32 | Serial to RJ-11 adapter |
| **Compatibility** | 2775B | 4430A | 133, 6634C, 2775B | 10-32 cables | 133, 136, 2775B |
| **Brand** | Endevco® | Endevco® | Endevco® | Endevco® | Endevco® |




| | EMAL0012 | EMAL0013 |
|---|---|---|
| **Description** | Tripod adapter for ½" microphones / preamplifiers | Tripod adapter for ¼" microphones / preamplifiers |
| **Brand** | Endevco® | Endevco® |



| | EMRA0020 | EMRA0022 | EMRA0063 |
|---|---|---|---|
| **Description** | ½" nose cone for replacing the standard protection grid of a ½" microphone when making acoustic measurements in laminar airflow. | ¼" nose cone for replacing the standard protection grid of a ¼" microphone when making acoustic measurements in laminar airflow. | Adapter for using a 1/8" microphone with a ¼" preamplifier. It can be used with any standard 1/8" microphone and ¼" preamplifier such as the model EM26CB. |
| **Brand** | Endevco® | Endevco® | Endevco® |



| | EMAM0069 | EMAM0071 | EMAM0364 |
|---|---|---|---|
| **Description** | Spherical set of five open-cell-structure foam windscreens for mounting on ½" microphones with standard protection grids when making acoustic measurements in windy or other airflow conditions. 90 mm in diameter. | Spherical set of five open-cell-structure foam windscreens for mounting on ¼" microphones with standard protection grids when making acoustic measurements in windy or other airflow conditions. 90 mm in diameter. | Set of six open-cell-structure foam windscreens for mounting on array microphones when making acoustic measurements in windy or other airflow conditions. 40 mm in diameter. |
| **Brand** | Endevco® | Endevco® | Endevco® |





| | 2950 | 2950M3 | 2950M16 | 2950M28 | 2961 |
|---|---|---|---|---|---|
| **Category** | Mounting | Mounting | Mounting | Mounting | Mounting |
| **Description** | Triaxial mounting block, 10-32 threaded holes, 4-40 screw mount block (provided) | Triaxial mounting block, 6-32 threaded holes, 4-40 screw mount block (provided) | Triaxial mounting block, adhesive mount block | Triaxial mounting block, 8-32 threaded holes, 6-32 screw mount block (provided) | Mounting block, 0-80 screw mount (provided) or 10-32 stud mount block (provided) |
| **Material** | Aluminum alloy | Aluminum alloy | Aluminum alloy | Aluminum alloy | Aluminum alloy |
| **Compatibility** | Accelerometers with 10-32 stud | 2221D, 2221F, 7221A, 7251A | 25A, 25B | 7257AT | 2222C, 2222D |
| **Brand** | Endevco® | Endevco® | Endevco® | Endevco® | Endevco® |





| | 2967B | 2981-12 | 2985 | 2985M5 | 2986M3 |
|---|---|---|---|---|---|
| **Category** | Mounting | Mounting | Mounting | Mounting | Mounting |
| **Description** | Triaxial mounting block, 1/4-28 threaded holes, 10-32 screw mount block (provided) | Mounting Stud, 10-32, Hex I.D. | Insulated mounting stud, 10-32 integral studs both ends, 7.5 grams | Insulated mounting stud, 10-32 integral stud for accelerometer, 1/4-28 integral stud for mounting | Mounting base, 1/4-28 integral stud, adhesive mount block, 13/16" hex |
| **Material** | Titanium | 17-4PH stainless steel condition H900 | Stainless steel | Stainless steel | Stainless steel |
| **Compatibility** | 7255A, 2255B | Accelerometers with 10-32 threaded hole | Accelerometers with 10-32 threaded hole | Accelerometers with 10-32 threaded hole | Accelerometers with 1/4-28 threaded hole |
| **Brand** | Endevco® | Endevco® | Endevco® | Endevco® | Endevco® |





| | 2988M4 | 7953A | 7964B | 7970 | 7990 |
|---|---|---|---|---|---|
| **Category** | Mounting | Mounting | Mounting | Mounting | Mounting |
| **Description** | Mounting base, 1/4-28 integral stud, adhesive mount block, 13/16" hex | Triaxial mounting block, 0-80 threaded holes, 2-56 screw mount (provided) | Triaxial mounting block, 0-80 threaded holes, 2-56 screw mount (provided) | Triaxial mounting block, 4-40 threaded holes, 6-32 screw mount (provided) | Triaxial mounting block, 4-40 threaded holes |
| **Material** | Stainless steel | Magnesium alloy | Aluminum | Titanium | Aluminum alloy |
| **Compatibility** | Accelerometers with 1/4-28 threaded hole | 7264-2000, 7264C, 7264D, 7264G | 7264B | 7270A | 7290A, 7290D, 7290E |
| **Brand** | Endevco® | Endevco® | Endevco® | Endevco® | Endevco® |






| | 41013 | B1A | B12 | B2A | B4 |
|---|---|---|---|---|---|
| **Category** | Mounting | Mounting | Mounting | Mounting | Mounting |
| **Description** | Charge converter plug-in card for PE transducers | Rare earth magnetic mounting base, 10-32 stud, isolated, 0.95" diameter, 40 lbs force. Electrically isolates the sensor from ground to prevent ground loops | Rare earth magnetic mounting two-pole magnet base, ¼-28 threaded hole, 0.88" diameter, 20 lbs force | Rare earth magnetic mounting base, 10-32 stud, nonisolated, 0.95" diameter, 40 lbs. force | Rare earth magnetic mounting base, 10-32 stud, nonisolated, 0.68" diameter, 40 lbs. force |
| **Material** | Beryllium copper | Rare earth | Rare earth | Rare earth | Rare earth |
| **Compatibility** | 65, 65HT | Accelerometers with 10-32 threaded hole | Accelerometers with 1/4-28 stud | Accelerometers with 10-32 threaded hole | Accelerometers with 10-32 threaded hole |
| **Brand** | Endevco® | Wilcoxon Research | Wilcoxon Research | Wilcoxon Research | Wilcoxon Research |




| | SF4 | SF5 | TC1 | TC2 |
|---|---|---|---|---|
| **Category** | Mounting | Mounting | Mounting | Mounting |
| **Description** | Mounting stud, 10-32 UNF both ends, isolated, stainless steel with non-conductive layer of epoxy to prevent ground loops, recommended mounting torque 18 in-lbs | Epoxy mounting stud, 10-32 thread, 0.50" hex, recommended mounting torque 18 in-lbs | One inch triaxial mounting cube, 10-32 threaded holes, anodized aluminum, non-conductive coating prevents ground loops. Weight 1.27 oz (36 grams) | Triaxial mounting cube for 731A, 3/8-16 threaded holes, anodized aluminum, non-conductive coating prevents ground loops. Weight 17.6 oz (500 grams) |
| **Material** | Stainless steel | Anodized aluminum | Anodized aluminum | Anodized aluminum |
| **Compatibility** | Accelerometers with 10-32 threaded holes | Accelerometers with 10-32 threaded holes | Accelerometers with 10-32 stud | Accelerometers with 3/8-16 stud |
| **Brand** | Wilcoxon Research | Wilcoxon Research | Wilcoxon Research | Wilcoxon Research |

The TC1 has a cube size of 1". The TC2 cube size is 2.63" (2.63" x 2.63" x 2.63")

# Product selection guide—application index

## Absolute pressure products



## Automotive crash test products



## Electronics products



## Extreme temperature products



## Gage and differential pressure products



## Gas turbines



## High g shock



## Industrial machine monitoring



## Lightweight products

# Product selection guide—application index

## Low frequency and low level accelerometers



## Multi purpose accelerometers



## Medical/SMT



## Microphones



## Nuclear applications



## Products for testing movement



## Space and flight products



## Specialized application products

# Selecting accelerometers for test applications

Meggitt Sensing Systems designs and manufactures a variety of accelerometers for high-reliability measurements of vibration, shock and inertial motion.

An accelerometer senses motion and produces an electrical output proportional to the magnitude, frequency and amplitude of input. 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 article is intended as a helpful general overview of accelerometer technology types and their application considerations. For technical assistance, please contact any member of our applications engineering team or your local authorized sales representative. A list of worldwide contacts may be found on the back page of this catalogue.

## Piezoelectric (PE) accelerometer

The piezoelectric (PE) accelerometer uses a simple spring-mass principle, in which a force is generated that relates to amplitude and frequency. This force is applied to the PE element, which develops an electrical charge proportional to mechanical motion. Different configurations of PE accelerometer elements are used to support specific applications.

**Advantages of PE sensors**

› The single-ended compression type is optimum for low-level measurements because of the high sensitivity that can be achieved by stacking multiple crystals and connecting them in parallel.

› A shear mode design allows for the construction of small, 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.

› PE accelerometers are often specified where the use of an extremely rugged high-temperature device is required. These sensors can measure a wide range of temperatures, from cryogenics to the extreme heat environments of gas turbine engines.

› Gain also may be optimized within PE accelerometers to allow for substitution of a smaller accelerometer within a given application. The upper end of the frequency response can be tailored with electronic filtering to match the anticipated measurement range and suppress natural mechanical resonances. The low-frequency response typically is set at 1 Hz for PE accelerometers and can be pushed close to 50 kHz.

› PE accelerometers are available in a wide range of shapes and sizes, from micro-miniature for PC circuit board or small electronic device testing to larger sizes used in seismic or turbofan applications.

## Isotron® accelerometer

The trade name Isotron® refers to a type of piezoelectric (PE) accelerometer with internal electronics (IEPE) that allows it to convert charge to a low-impedance voltage output. Its temperature response is somewhat limited due to its onboard electronics. These internal electronics can further increase susceptibility to electrostatic discharge (ESD). 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.

## Piezoresistive (PR) accelerometer

More recent PR strain gauge accelerometer designs consist of a rugged monolithic assembly with solid-state MEMS resistors that change in resistance in proportion to applied mechanical stress.

**Advantages of PR sensors**

› The monolithic MEMS sensor exhibits high sensitivity with an excellent signal-to-noise ratio and a typical temperature range of -20°C to +120°C (-4°F to +248°F).

› PR accelerometers feature DC response characteristics make it useful for measuring long duration pulses such as those experienced during automotive crash events and munitions blast testing.

## Variable capacitance (VC) accelerometer

VC accelerometers feature a MEMS sensing element sandwiched between a lid and a base and electrostatically bonded to form a parallel-plate capacitor. This accelerometer features DC response, stable damping for good frequency coverage and rugged construction. Integral electronics with DC excitation provides a high-level, low-impedance output signal that is stable from -20°C to +120°C (-4°F to +248°F). This sensor is designed for low-g measurement, yet can also withstand higher g shocks. It is suitable for trajectory monitoring, structural evaluation, flutter testing, and vehicle dynamics testing of automotive suspensions and brakes.

**Sensors with on-board memory**

Commonly referred to as smart sensors, provide an inherently improved signal-to-noise ratio. Their key feature is conformance to the IEEE 1451.4 Transducer Electronic Data Sheet (TEDS) specification, which allows for onboard storage of accelerometer serial number and calibration data, for simplified test setups with reduced errors.

**Accelerometer performance characteristics**

To obtain meaningful acceleration data, one must fully understand the performance characteristics of the accelerometers under consideration. There are several types of accelerometers and many designs within each category. The most critical trade-offs relate to sensitivity, weight and frequency response, and include:

› Sensitivity—Higher sensitivity 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 resonant frequency.

› Mass loading—Motion of the equipment under test will be attenuated if the dynamic mass of the accelerometer approaches the dynamic mass of the structure on which it is mounted. Consequently, a lightweight sensor must be used for the accurate evaluation of low-mass test articles.

› Low-frequency response—With a PE accelerometer, the low-frequency cutoff often is set at 1 to 5 Hz to reject any pyroelectric output. Some models, however, extend the cutoff to near DC. PR and VC accelerometers offer such DC response characteristics.

› 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—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. PR and VC sensors are extremely linear and specified for their combined nonlinearity, hysteresis, and non-repeatability specifications.

› 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.

› Transient temperature effects—Compression mode PE and Isotron® accelerometers can produce an output with temperature changes. This problem has been virtually eliminated with the advent of shear mode accelerometers (most Endevco® accelerometers are shear mode types). Thermal transient errors tend to occur at very low frequencies and often go undetected. PR and VC devices have no significant response to temperature changes.

› 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. Isolation may be improved by using insulated studs or adhesive mounting adapters. Shear accelerometers are much less sensitive to such errors than conventional compression types.

› Dirty environments—Every component in the measurement chain must be kept clean and dry to achieve optimum performance. PE accelerometers require more care because they are very sensitive to external contamination due to their high output impedance.

# Endevco® incentive programs

For more than 60 years, the Endevco® brand has been synonymous with an impeccable global reputation for top-quality precision sensors and instrumentation, successfully implemented in a variety of extreme environments. Our products can be consistently counted on to reliably perform according to published specifications, over an extended period of time, providing a lower total cost of ownership and enhanced value.

To make it even easier to do business with us, Meggitt offers a number of Endevco® customer incentive programs, ranging from comprehensive 5-year product line warranties, to stocking and availability guarantees, to competitor trade-in allowances and test fixture upgrade discounts. All are designed to provide even greater confidence, reliability and performance when choosing Endevco® sensors and instrumentation for your application requirements.

## Five-year product line warranty

In early 2009, Meggitt was the first in the industry to offer a true 5-year product warranty across all of its Endevco® transducer and electronic instrumentation lines, worldwide. This warranty is without hidden loopholes or "fine print." It is simply the confidence we have placed in our own product performance, and in turn, the same trust we invite our customers to place in us. As this warranty accompanies each of our products, it is simply another value added reason for choosing Endevco® products. For full warranty details visit www.endevco.com

## Guaranteed In Stock™

When selecting from among Endevco® Guaranteed In Stock sensors, instrumentation, cable assemblies and accessories, be assured that products are guaranteed to be available and in stock at the time of order, or you'll receive a 5% model discount at the time of purchase.

## US General Services Administration (GSA) pricing

If you are a US government customer or a subcontractor authorized to buy against GSA contracts to fulfill your government purchasing requirements, we help to simplify your acquisition activity by providing a wide variety of products through Meggitt's Endevco® GSA contract, GS-24F-1088B. Endevco® brand pressure transducers can be purchased through GenTek Corporation's GSA contract, GS-07F-0055V. To view all Endevco® brand products offered through GSA, visit www.gsaadvantage.gov. For a listing of Endevco® pressure transducers offered through GSA, search GenTek at www.gsaadvantage.gov

## -R Replacement sensors program

Introducing a new, cost-effective way to upgrade existing test fixtures, without sacrificing quality or performance! The Endevco® -R Replacement sensors program allows customers to choose from among dozens of our most popular Isotron® (IEPE-type) and charge output piezoelectric accelerometers, at specially discounted prices.

## Competitive Trade-in program (CTi)

Get added reliability and value for your application by making the switch to Endevco® brand sensors and instrumentation! Send us your working or non-working competitive product, let us help you to find the best Endevco® standard product replacement for your application, and receive a 15% trade-in discount, issued simultaneously with your product purchase. It's as easy as that. Our trade-in allowance is applicable across all Endevco® standard product offerings. Purchases under the CTi program are also still covered by Endevco®'s 5-year product warranty. Contact Customer Service for more details.

## University discount

Meggitt offers a 15% Endevco® product discount to university customers. To qualify, "university" must be in the name of the ordering account.

# Contacts

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Sensorex distributors should only be used by European customers purchasing Sensorex products only.

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