

KISTLER

measure. analyze. innovate.

# Accelerometers

**Providing Quick, Accurate and Reliable Motion Data**



# Kistler Has a Wide Acceleration Product Offering

This catalog provides comprehensive information on all Kistler products for the measurement of acceleration.

The overview of the Kistler range is followed by detailed information on our products in tabular form and a presentation of the company as a whole.

Detailed catalogs are also available on the full range of Kistler products for the measurement of force and pressure.

As Kistler measuring instruments are used in a great variety of fields, separate brochures are also available for the following application:

- Engines
- Vehicles
- Manufacturing
- Plastics Processing
- Biomechanics

The aim of this series of brochures is to help you make the right choice from our wide range of products and to suggest ways of optimizing their application.

Please contact us for any brochures you require. You will find the address of your nearest Kistler branch on the back page of the catalog. Alternatively, you can email us at info@kistler.com.

We wish you every success with Kistler measurement instruments and thank you for your confidence and interest.



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# Kistler Measures Acceleration

**Accelerometers are used in every avenue of the dynamic test environment and Kistler has developed families of products covering this expansive range of application. From ultra low motions encountered in wafer fabrication technology to shock spectra reconstruction experienced in pyrotechnic separation event studies, and everywhere between, an optimal sensor solution is available. Static events are captured with the K-Beam® static and low frequency product offerings. Very high frequency activity is routinely measured using any of several miniature piezoelectric single axis or triaxial types. Many sensing technologies including piezoceramic, natural quartz and variable capacitance approaches have been extensively explored and are employed as needed to accommodate the demands of the application.**

**Some application include:**

## Structural Testing

Mechanical devices, assemblies, and constructions of all types are investigated using accelerometers to measure their dynamic response when subjected to a known input. The deformation pattern, when the specimen experiences resonance, can be computed from the measured data.

Known as Experimental Modal Analysis (EMA), this field of study often uses a member of the PiezoBeam® family or Ceramic Shear family where their general characteristics have been adapted to accommodate most requirements of common tests. Typical highlight features include high output from a low weight sensor, ground isolated, and an inexpensive package providing an economical solution for large channel count application.

## Aerospace and Military

Very demanding application are encountered in the military and aerospace industry where any error may present a life-threatening situation. This category also covers a tremendous range of application and nearly all accelerometer product offerings have been used in these important investigations.
Flutter testing, rocket launch pad dynamics, aircraft EMA, ammunition investigations, helicopter rotor reactions, etc.
are a few of the common measurements performed.






## Automotive/Transportation

Ride quality has been receiving tremendous attention in recent years. New vehicle designs are presenting less noise to the occupants and the subtle details of the intricacies of road/tyre interaction, bump & jar response, and the overall feel of the ride are important to even the common customer. The K-Beam® family covers the low to mid frequency range of many investigations and the many piezoelectric offerings extend into the higher frequency areas of interest.

## Civil Engineering

Very low frequency activity is of interest when studying extremely large structures such as bridges, buildings or dams. These specimens require DC capable accelerometers since most dynamic activity is in the very low frequency realm often in the range of a few hertz. The K-Beam product family is commonly used to measure vibration and acceleration in this arena.

## Environmental Stress Screening

Computer components, automotive electronics, and miniature mechanical assemblies are often exposed to an aggressive life test or actual functional tests under extreme environmental conditions. This may involve multiple impact drop testing or wide range thermal cycling and many of the K-Shear® product offerings have been tailored to survive and perform extremely well even under incredibly abusive conditions. The M5- and M8-suffixes provide extreme high and low temperature capabilities respectively and the shear shock Type 8742 and 8743 survive after many exposures to high-level cyclic inputs.

### Kistler Measures Acceleration



Remarkable lifetime under any condition



Precise, ultralow frequency, measurements are common using a K-Beam® solution



Modal studies easily accomplished using an array of inexpensive accelerometers



Tilt and comfort controlled using K-Beam® feedback



Space quality measurements are routine



Flight safety issues measured accurately with K-Beam® family



Harsh environments present negligible concern when using K-Shear® accelerometers



On site or factory calibration solutions available

# Design and Use of Piezoelectric Accelerometers

## Measuring Acceleration

Piezoelectric accelerometers consist essentially of three basic elements: the sensor body, the piezoelectric sensing element and the seismic mass. Initially piezoelectric accelerometers incorporated a compression design whereby the compression cut, quartz crystal sensing element is preloaded between the base plate and seismic mass. Because of the constant seismic mass, the force acting on the measuring element is proportional to the acceleration in accordance with Newton's first law: $F = m \cdot a$. An electrical charge is generated proportional to the force (and hence the acceleration). Because they are basically AC coupled devices, piezoelectric accelerometers are not suitable for measuring constant (DC) accelerations like those generated in a centrifuge.
For "true" DC acceleration measurement, refer to Kistler K-Beam accelerometers with variable capacitance sensing elements.

Although the compression cut quartz design was widely accepted with it's inherent characteristics of long term stability, low mass, high rigidity and subsequent high resonant frequency, Kistler has focused on accelerometers which utilize a shear mode quartz element that is sensitive to imposed shearing forces and unaffected by other orthogonal force components. In addition, the primary charge sensitivity of shear mode quartz is twice that for compression mode quartz. This results in a smaller seismic system design in shear mode units and thereby reduces their overall size and mass. As in the compression design, the force acting on the element is proportional to the acceleration in accordance with Newton's first law:
$F = m \cdot a$ and an electrical charge is generated proportional to the acceleration.



Kistler incorporates several other design features into their K-Shear units which provide combined features uncommon and superior to conventional compression designs.

Conventional compression type accelerometers can be designed to be insensitive to stresses resulting from imposed base strain simply by making the base extremely large.

The advantages of the shear design are realized by efficiently packaging the seismic system in a manner which isolates it from mechanically induced stresses such as base or case strain. With the K-Shear construction the imposed base/case strain is isolated from the quartz and is essentially negligible at the root of the seismic support.

Output resulting from thermally induced stress is also negligible in K-Shear accelerometers. On compression type accelerometers, stresses caused by expansion or contraction of internal elements act directly on the preload mechanism which results in a charge output from the quartz. Similar expansion or contraction of the preload screw in K-Shear accelerometers results in stresses which act in an insensitive crystal direction. The optimized K-Shear design further reduces thermal effects by producing a nearly uniform, self-cancelling thermal stress.

Piezotron and Picotron accelerometers are low impedance types which incorporate a miniature, built-in impedance converter for the charge-to-voltage conversion. Picotron units are distinguished from Piezotron by virtue of their very small (pico) size. Ceramic Shear is a new family of accelerometers designed for OEM and multichannel application (i.e. modal analysis). They feature high output, low noise and extended temperature range in a low or high impedance package. PiezoBeam accelerometers incorporate a bimorph ceramic sensing element and a miniaturized, hybrid charge amplifier for the charge-to-voltage conversion. These units feature very high output (up to 1 000 mV/g) in a very small (down to 5 g), rugged package. For use in thermally stable environments.

In addition to incorporating either compressive or K-Shear designs, most Kistler piezoelectric accelerometers utilize built-in charge-to-voltage converters for low impedance, voltage output. The low end frequency response is usually limited to 0,5 Hz, which is adequate for most shock and vibration application. Low impendance output also allows the usage of general purpose sensor cable in environments where moisture or contamination would be detrimental to the high insulation resistance for high impedance accelerometers. The low impedance design also provides immunity to RF/EMI.

## Cutaways



K-Shear®



Annular Shear



PiezoBeam®



K-Beam®

# Capacitive Accelerometers

## Design and Use of Variable Capacitance Accelerometers

Measurement of low frequency events including static or DC capability is accomplished using various designs based on the variable "capacitance" sensor principle. In a typical design, a diaphragm centered between two electrodes forms the seismic mass of the spring mass systems. The gap between each electrode and the central mass creates a repeatable electrical capacitance. When the mass is forced off center by an imposed acceleration, a differential capacitance exists between the two initially equal "capacitors".

This differential capacitance is linearly proportional to the applied acceleration within the specified amplitude range of the accelerometer. An electrical "bridge" type circuit is used to achieve an appropriate voltage output. Using a differential approach creates immunity or common mode rejection to environmental influences since both "capacitors" react similarly and the difference is usually negligible.

MEMS (Micro Electro Mechanical Sensor) technology is used in several designs since it offers very low seismic weight and a relatively stiff siliconsupporting structure. The bulk micro-machining processes now produce very high accuracy and repeatable elements that are required for high precision sensor designs.

Advanced designs include a servo or feedback loop to restore the central mass to its origin by presenting an electrostatic restoring force to the appropriate electrode. Thus a "null" type sensor is achieved yielding the best noise characteristics available in the industry. It's also entirely non-magnetic and therefore insensitive to magnetic fields.



Overload protection is incorporated in all designs with the surrounding electrodes limiting displacement of the seismic mass. Also, damping is achieved in some designs resulting from the compressed cavity gas reducing transient stresses. The relatively rugged construction compares well against competitive strain gage type accelerometers. Power requirements are simple where often a single nine-volt battery connection is all that is required in addition to the output lead. The ease of installation combined with a robust, reliable sensor has guided these accelerometers into many application formally outfitted with piezoresistive or expensive servo type accelerometers.

Ride quality studies in many areas of transportation such as automobiles, trains, aircraft and marine vehicles have utilized the variable capacitance products where the frequencies of interest and ease of use made their selection obvious. The operation and refinement of wafer fabrication equipment has been extensively investigated using K-Beam accelerometers that are well adapted to measure the low level, low frequency events common to the processes. Dynamic studies on large structures require great accuracy at very low frequencies and again are an ideal fit to the variable capacitance product range.

## Low Frequency Application



Ground motion effects accurately recorded

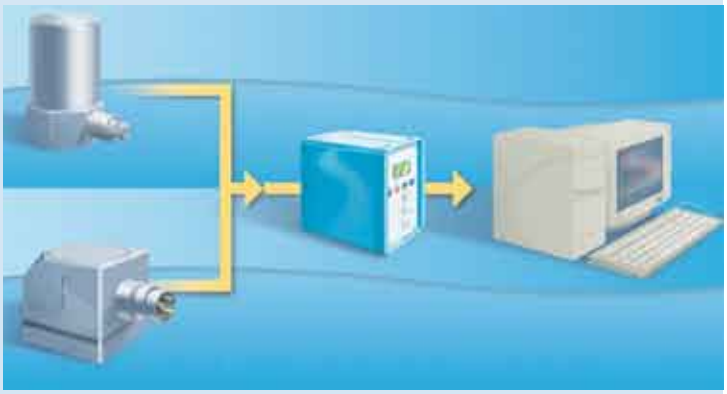


Smallest vibrations easily captured

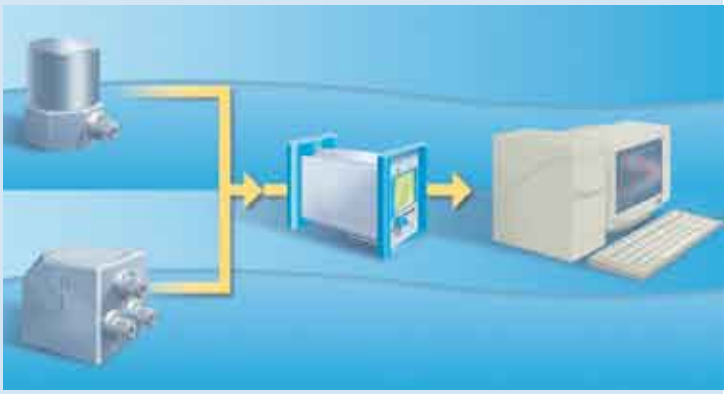


# Acceleration Measuring Systems

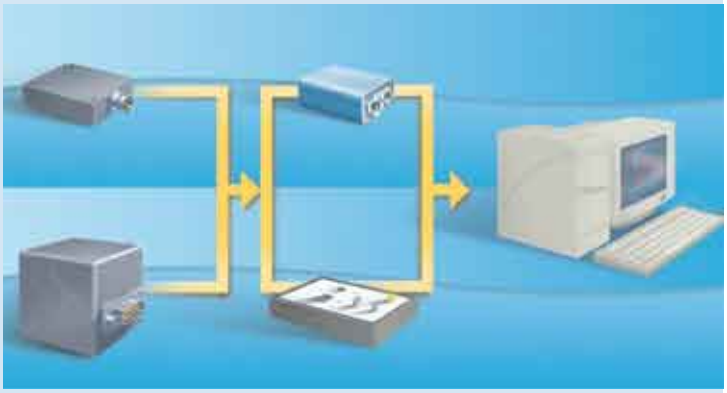
## Acceleration Measuring Systems



Economical measurement solutions offered by the low impedance approach



Versatile system configurations provided through charge amplifier functionality



DC acceleration system easily configured

**Low impedance piezoelectric system**

- Low output impedance, <100 Ω
- Low Noise output signal
- Fixed accelerometer range and voltage sensitivity
- Simple two-wire system for power and signal with no special cable conductor requirements
- Lower cost per channel
- Simple and inexpensive signal conditioning; power supply/coupler and standard cables
- Coupler for setting of gain, range, filtering and time constant
- Frequency response from 0,5 ... 20 000 Hz
- Operating temperature range –196 … 165 °C

**Systems with charge amplifier**

- Wide measuring range
- One accelerometer can be used over its entire measuring range by selecting an appropriate charge amplifier range
- Push-button, electronic or computer-controlled resetting of charge amplifier
- Sensors having operational temperature range up to 250 °C and above
- Charge amplifier for setting of range, filtering and time constant
- Frequency response from 0,5 ... 20 000 Hz

**Silicon micro-machined variable capacitance system**

- True static and dynamic measuring
- Frequency response from 0 ... 300 Hz
- Both acceleration and inclination information possible using AC or DC coupled output
- Output signals can be either single-ended, bipolar, differential, voltages or current
- Operating temperature range –40 … 85 °C

*See Piezoelectric Accelerometer theory on page 88 for further information.*

# Accelerometer Mounting

**For an accelerometer to accurately sense and generate useful data, it must be properly coupled to the test object. This requires that the accelerometer mounting be rigid over the frequency range of interest. The methods for mounting an accelerometer usually depend on the accelerometer and the test structure. A selection of studs, isolated mounting pads, wax, magnets, and triaxial cubes are available from Kistler to solve virtually any mounting/installation problem. Some accelerometers have an electrically isolated mounting surface which provides electrical (ground) isolated between the sensor signal ground and the mounting surface.**

## Stud Mounting

The best method for mounting an accelerometer is with a threaded stud. Most Kistler mounting studs are machined from Beryllium Copper for high strength and low modulus of elasticity, coupled with high elastic limits. These studs provide excellent coupling between the accelerometer's mounting surface and the test object.

Care should be taken to ensure that the two mounting surfaces mate evenly. The mounting threads must be perpendicular to the surface and free of any burrs. The surface must also be flat to ensure good coupling. Adding a slight amount of grease or oil between the mounting surfaces improves the coupling, especially at higher frequencies.

A designated mounting torque provides the proper coupling force between the accelerometer and the test object without overstressing and distorting the accelerometer mounting base. Always use the proper sockets and torque for each Kistler accelerometer as listed on the individually supplied calibration certificates.

## Adhesive Mounting

This simple method is ideal for mounting where drilling holes is not practical or where the mounting surface is not flat.

**Direct adhesive mounting**
Many lightweight accelerometers are designed strictly for adhesive mounting. When properly mounted, these units will provide accurate data within the specified frequency range. This method is ideal for modal and structural analysis where the test structure cannot be modified for mounting the accelerometers. For measurements up to 5 kHz, wax mounting is a suitable adhesive.

**Isolated, adhesive pad mounting**
Hard anodized aluminum mounting pads offer several advantages when the accelerometer must be mounted to irregular surfaces or when ground isolated is required. These pads are adhesively mounted to the test structure providing a flat mounting surface and a high quality mounting thread. The hard anodized surface provides ground isolated between the sensor and the mounting surface. This is particularly useful in preventing ground loops.

### Accelerometer Mounting

Top-mounted connector – tape or clamp to relieve stress on connector



Side-mounted connector – tape or clamp to relieve stress on connector (about 2½ ... 3 inches from connector)



## Strain Relieving Cables

Accelerometer cables should be taped or clamped to the same surface on which the accelerometer is attached to avoid motion between the vibration surface and the tie down point. These techniques will prevent flexing of the cable near the connector and thereby minimize any resultant frequency response errors.

# Accelerometer Mounting

## Magnetic Mounting

For special application where the accelerometer needs to be mounted to ferromagnetic structures for a quick test, one of several Kistler magnetic mounts can be used.

The accelerometer is first mounted to the magnet. These mounts can then be moved quickly to measure vibrations at several different locations. Due to the higher mass, magnets are only recommended for measurements of vibrations with frequencies up to 1 000 Hz. Further, the added mass may affect the measurement of very light structures due to mass loading.

## Triaxial Mounting

Several triaxial mounting cubes are available from Kistler which allow mounting of up to three individual accelerometers in orthogonal directions. The cube's added mass and size must be considered and may affect the overall system frequency response. Kistler also offers integral triaxial units for those application where mass and size profile are critical. The optimized integral package often provides the best measurement solution.

*Refer to pages 76 ... 79 for details on mounting accessories for Kistler accelerometers.*

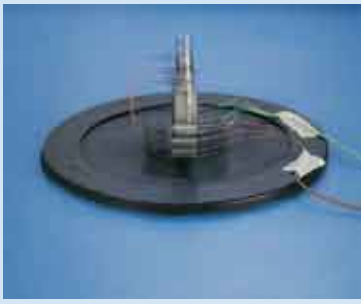
## Kistler Calibration

Kistler accelerometers are calibrated in the factory and delivered with a calibration certificate. The reference sensors are cross-referenced to national standards. Kistler operates a NIST traceable calibration center and the calibration laboratory No. 049 of the Swiss Calibration Service for the measurands: force, pressure, acceleration and electric charge. Kistler and some of its group companies offer a recalibration service and the company records in its archives the details of when and how often a particular sensor was calibrated.

Kistler offers an on-site service for recalibrating built-in sensors, thereby helping to keep downtimes to a minimum. In addition, Kistler offers a whole range of instruments for use in calibration laboratories.

Our calibration service receives the highest marks. The calibration of your instruments, manufactured by Kistler or someone else, is performed with the most care and precision. Our standard prompt service is exceptional.
The Kistler Calibration Laboratory accredited to ISO/IEC 17025.

### Calibration



On site, traceable, calibration systems



National referenced calibration services available



# Product Information

The selection process to identify the best accelerometer for a specific application is complicated and often difficult when detailed data sheets are reviewed independently. The following pages group the accelerometer product offerings by category and specification.

This valuable table should be used as a general guide to refine the selection options to a few choices where more specific detail is available on the page identified in the table. The data sheet containing all relevant information is readily available on the internet at www.kistler.com.



# Product Overview

## Low Frequency Measurements (0 … 250 Hz), Single Axis — Capacitive Sensors

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $\mu g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8305B2 | ±2 | 500 | 0 … 200 | –40 … 85 | 200 | 6,5 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B2M2 | ±2 | 1 000 | 0 … 200 | –40 … 85 | 200 | 6,5 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B2M4 | ±2 | 500 | 0 … 200 | –40 … 85 | 200 | 6,5 | yes | 4 pin pos., integral cable I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B2M7 | ±2 | 500 | 0 … 200 | –40 … 85 | 200 | 6,5 | yes | 4 pin neg., integral cable I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8310B2 | ±2 | 1 000 | 0 … 250 | –40 … 85 | 540 | 17 | yes | 4 pin pos. I side | | | ✓ | ✓ | | ✓ | | ✓ | | 31 |
| 8310B2M11sp | ±2 | 1 000 | 0 … 250 | –40 … 85 | 540 | 17 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 31 |
| 8312B2 | ±2 | 1 000 | 0 … 250 | –40 … 85 | 540 | 12 | yes | 4 pin pos. I side | | | ✓ | ✓ | | ✓ | | ✓ | | 32 |
| 8330A3 | ±3 | 1 200 | 0 … 500 | –40 … 125 | <1,3 | 28,5 | yes | 4 pin pos. I side | | | ✓ | ✓ | | ✓ | | ✓ | | 32 |
| 8305B10 | ±10 | 100 | 0 … 180 | –40 … 85 | 1 000 | 6,5 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B10M2 | ±10 | 200 | 0 … 180 | –40 … 85 | 1 000 | 6,5 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B10M4 | ±10 | 100 | 0 … 180 | –40 … 85 | 1 000 | 6,5 | yes | 4 pin pos., integral cable I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B10M7 | ±10 | 100 | 0 … 180 | –40 … 85 | 1 000 | 6,5 | yes | 4 pin neg., integral cable I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8310B10 | ±10 | 200 | 0 … 180 | –40 … 85 | 2 830 | 17 | yes | 4 pin pos. I side | | | ✓ | ✓ | | ✓ | | ✓ | | 31 |
| 8310B10M11sp | ±10 | 200 | 0 … 180 | –40 … 85 | 2 830 | 17 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 31 |
| 8312B10 | ±10 | 200 | 0 … 180 | –40 … 85 | 2 830 | 12 | yes | 4 pin pos. I side | | | ✓ | ✓ | | ✓ | | ✓ | | 32 |
| 8305B25 | ±25 | 80 | 0 … 300 | –40 … 85 | 1 760 | 6,5 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B25M2 | ±25 | 160 | 0 … 300 | –40 … 85 | 1 760 | 6,5 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B25M4 | ±25 | 80 | 0 … 300 | –40 … 85 | 1 760 | 6,5 | yes | 4 pin pos., integral cable I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B25M7 | ±25 | 80 | 0 … 300 | –40 … 85 | 1 760 | 6,5 | yes | 4 pin neg., integral cable I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8310B25 | ±25 | 80 | 0 … 300 | –40 … 85 | 2 940 | 17 | yes | 4 pin pos. I side | | | ✓ | ✓ | | ✓ | | ✓ | | 31 |
| 8310B25M11sp | ±25 | 80 | 0 … 300 | –40 … 85 | 2 940 | 17 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 31 |
| 8305B50 | ±50 | 40 | 0 … 500 | –40 … 85 | 3 620 | 6,5 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B50M2 | ±50 | 80 | 0 … 500 | –40 … 85 | 3 620 | 6,5 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B50M4 | ±50 | 40 | 0 … 500 | –40 … 85 | 3 620 | 6,5 | yes | 4 pin pos., integral cable I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B50M7 | ±50 | 40 | 0 … 500 | –40 … 85 | 3 620 | 6,5 | yes | 4 pin neg., integral cable I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8310B50 | ±50 | 40 | 0 … 500 | –40 … 85 | 5 700 | 17 | yes | 4 pin pos. I side | | | ✓ | ✓ | | ✓ | | ✓ | | 31 |
| 8310B50M11sp | ±50 | 40 | 0 … 500 | –40 … 85 | 5 700 | 17 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 31 |
| 8305B100 | ±100 | 20 | 0 … 500 | –40 … 85 | 3 910 | 6,5 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B100M2 | ±100 | 40 | 0 … 500 | –40 … 85 | 3 910 | 6,5 | yes | integral cable pigtails I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B100M4 | ±100 | 20 | 0 … 500 | –40 … 85 | 3 910 | 6,5 | yes | 4 pin pos., integral cable I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |
| 8305B100M7 | ±100 | 20 | 0 … 500 | –40 … 85 | 3 910 | 6,5 | yes | 4 pin neg., integral cable I side | | | ✓ | ✓ | | ✓ | | ✓ | | 30 |

# Product Overview

## Low Amplitude, Low Frequency Measurements (0 ... 300 Hz), Single Axis — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $\mu g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8393B2 | ±2 | 1 000 | 0 … 250 | –40 … 85 | 540 | 60 | yes | 9 pin micro-D pos. I side | | | ✓ | ✓ | | | | ✓ | | 54 |
| 8393B10 | ±10 | 200 | 0 … 180 | –40 … 85 | 2 830 | 60 | yes | 9 pin micro-D pos. I side | | | ✓ | ✓ | | | | ✓ | | 54 |

## Calibration — Charge Output

| Type | Range g | Sensitivity pC/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8002K | ±1 000 | –1 | 0 … 6 000 (–1, 5 %) | –70 … 120 | * | 20 | no | 10-32 neg. I top | ✓ | | | | | | | | | 85 |
| 8076K | ±1 000 | –1 | 0,5 … 5 000 (±4 %) | –20 … 65 | * | 80 | yes | 10-32 neg. I side | | ✓ | | | | | | | | 85 |

## General Purpose Vibration Measurement, Triaxial — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8762A5 | ±5 | 1 000 | 0,5 … 6 000 | –55 … 80 | 0,0003 | 23 | yes | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8762A10 | ±10 | 500 | 0,5 … 6 000 | –55 … 80 | 0,00035 | 23 | yes | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8792A25 | ±25 | 200 | 1 … 5 000 | –55 … 100 | 0,002 | 29 | yes | 4 pin pos. I side | | | ✓ | | | | ✓ | | ✓ | 59 |
| 8762A50 | ±50 | 100 | 0,5 … 6 000 | –55 … 80 | 0,0012 | 23 | yes | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8792A50 | ±50 | 100 | 0,5 … 5 000 | –55 … 100 | 0,004 | 29 | yes | 4 pin pos. I side | | | ✓ | | | | ✓ | | ✓ | 59 |
| 8792A100 | ±100 | 50 | 0,5 … 5 000 | –55 … 100 | 0,006 | 29 | yes | 4 pin pos. I side | | | ✓ | | | | ✓ | | ✓ | 59 |
| 8792A500 | ±500 | 10 | 1 … 5 000 (–5, 10 %) | –55 … 120 | 0,01 | 27 | yes | 4 pin pos. I side | | | ✓ | | | | ✓ | | ✓ | 59 |
| 8793A500 | ±500 | 10 | 2,5 … 10 000 | –55 … 120 | 0,002 | 11 | with adapt. | 4 pin pos. I side | | | ✓ | ✓ | | | | ✓ | | 60 |
| 8794A500 | ±500 | 10 | 2,5 … 10 000 | –75 … 120 | 0,002 | 7,6 | with adapt. | 4 pin pos. integral cable I side | | | ✓ | ✓ | | | | ✓ | | 61 |

* Threshold for accelerometers with charge output depends upon charge amplifier settings.

# Product Overview

## General Purpose Vibration Measurement, Single Axis — Charge Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8712A5M1 | ±5 | 1 000 | 0,5 … 8 000 | –55 … 100 | 0,0004 | 51 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 41 |
| 8784A5 | ±5 | 1 000 | 1 … 6 000 | –55 … 80 | 0,0004 | 21 | with adapt. | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 49 |
| 8786A5 | ±5 | 1 000 | 1 … 6 000 | –55 … 80 | 0,0004 | 21 | with adapt. | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 49 |
| 8702B25 | ±25 | 200 | 1 … 8 000 | –55 … 100 | 0,002 | 8,7 | with adapt. | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B25M1 | ±25 | 200 | 1 … 8 000 | –55 … 100 | 0,002 | 9,7 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B25 | ±25 | 200 | 1 … 8 000 | –55 … 100 | 0,002 | 7,5 | with adapt. | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B25M1 | ±25 | 200 | 1 … 8 000 | –55 … 100 | 0,002 | 8 | yes | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B50 | ±50 | 100 | 0,5 … 10 000 | –55 … 100 | 0,004 | 8,7 | with adapt. | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B50M1 | ±50 | 100 | 0,5 … 10 000 | –55 … 100 | 0,004 | 9,7 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B50 | ±50 | 100 | 0,5 … 10 000 | –55 … 100 | 0,004 | 7,5 | with adapt. | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B50M1 | ±50 | 100 | 0,5 … 10 000 | –55 … 100 | 0,004 | 8 | yes | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8752A50 | ±50 | 100 | 0,5 … 5 000 | –55 … 120 | 0,002 | 115 | case isol. | MIL-C-5015 I top | ✓ | | ✓ | | | | ✓ | | | 46 |
| 8774A50 | ±50 | 100 | 1 … 10 000 | –55 … 120 | 0,0025 | 4 | with adapt. | 10-32 neg. I top | ✓ | ✓ | ✓ | | | ✓ | ✓ | | | 47 |
| 8776A50M6 | ±50 | 100 | 1 … 10 000 | –55 … 120 | 0,0025 | 4,5 | with adapt. | 10-32 neg. I side | ✓ | ✓ | ✓ | | | ✓ | ✓ | | | 47 |
| 8141B | ±50 | 100 | 0,5 … 8 000 (±10 %) | –55 … 90 | 0,0002 | 30 | case isol. | integral cable pigtails I side | | | | | | | ✓ | | ✓ | 37 |
| 8702B100 | ±100 | 50 | 0,5 … 10 000 | –55 … 100 | 0,006 | 8,7 | with adapt. | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B100M1 | ±100 | 50 | 0,5 … 10 000 | –55 … 100 | 0,006 | 9,7 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B100 | ±100 | 50 | 0,5 … 10 000 | –55 … 100 | 0,006 | 7,5 | with adapt. | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B100M1 | ±100 | 50 | 0,5 … 10 000 | –55 … 100 | 0,006 | 8 | yes | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B500 | ±500 | 10 | 1 … 10 000 | –55 … 120 | 0,01 | 8,2 | with adapt. | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B500M1 | ±500 | 10 | 1 … 10 000 | –55 … 120 | 0,01 | 9,2 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B500M3 | ±500 | 10 | 0,5 … 10 000 | –55 … 120 | 0,01 | 9,2 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B500 | ±500 | 10 | 1 … 10 000 | –55 … 120 | 0,01 | 7,1 | with adapt. | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B500M1 | ±500 | 10 | 1 … 10 000 | –55 … 120 | 0,01 | 7,6 | yes | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B500M3 | ±500 | 10 | 0,5 … 10 000 | –55 … 120 | 0,01 | 7,6 | yes | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8720A500 | ±500 | 10 | 1 … 10 000 (–5, 10 %) | –55 … 120 | 0,01 | 4,9 | yes | 10-32 neg. I side | | | ✓ | ✓ | | | | | | 42 |

# Product Overview

## General Purpose Vibration Measurement, Single Axis — Charge Output

| Type | Range g | Sensitivity pC/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8203A50 | ±1 000 | –50 | 5 … 4 000 | –70 … 250 | * | 44,5 | with adapt. | 10-32 neg. | side | ✓ | | ✓ | | | ✓ | ✓ | | | 35 |
| 8202A10 | ±2 000 | –10 | 5 … 10 000 | –70 … 250 | * | 14,5 | with adapt. | 10-32 neg. | side | ✓ | | ✓ | | | ✓ | ✓ | | | 34 |

## Shock/Impact/Impulse Measurement, Single Axis — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8704B5000 | ±5 000 | 1 | 1 … 10 000 (±5 %) | –55 … 120 | 0,13 | 7,1 | with adapt. | 10-32 neg. | top | ✓ | | ✓ | ✓ | | ✓ | | | | 40 |
| 8742A5 | ±5 000 | 1 | 1 … 10 000 | –55 … 120 | 0,13 | 4,5 | no | 10-32 neg. | top | | ✓ | | | | ✓ | | | | 44 |
| 8742A5M1 | ±5 000 | 1 | 1 … 10 000 | –55 … 120 | 0,13 | 8,2 | yes | 10-32 neg. | top | | ✓ | | | | ✓ | | | | 44 |
| 8742A10 | ±10 000 | 0,5 | 1 … 10 000 | –55 … 120 | 0,25 | 4,5 | no | 10-32 neg. | top | | ✓ | | | | ✓ | | | | 44 |
| 8742A10M1 | ±10 000 | 0,5 | 1 … 10 000 | –55 … 120 | 0,25 | 8,2 | yes | 10-32 neg. | top | | ✓ | | | | ✓ | | | | 44 |
| 8742A20 | ±20 000 | 0,25 | 1 … 10 000 | –55 … 120 | 0,5 | 4,5 | no | 10-32 neg. | top | | ✓ | | | | ✓ | | | | 44 |
| 8742A20M1 | ±20 000 | 0,25 | 1 … 10 000 | –55 … 120 | 0,5 | 8,2 | yes | 10-32 neg. | top | | ✓ | | | | ✓ | | | | 44 |
| 8742A50 | ±50 000 | 0,1 | 1 … 10 000 | –55 … 120 | 1,3 | 4,5 | no | 10-32 neg. | top | | ✓ | | | | ✓ | | | | 44 |
| 8742A50M1 | ±50 000 | 0,1 | 1 … 10 000 | –55 … 120 | 1,3 | 8,2 | yes | 10-32 neg. | top | | ✓ | | | | ✓ | | | | 44 |
| 8743A100 | ±100 000 | 0,05 | 0,5 … 10 000 | –55 … 120 | 2,6 | 4,5 | no | 10-32 neg. integral cable | side | | ✓ | | | | ✓ | | | | 45 |
| 8743A100M1 | ±100 000 | 0,05 | 0,5 … 10 000 | –55 … 120 | 2,6 | 9 | yes | 10-32 neg. integral cable | side | | ✓ | | | | ✓ | | | | 45 |

## Shock/Impact/Impulse Measurement, Single Axis — Charge Output

| Type | Range g | Sensitivity pC/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8044 | –20 … 30 k | –0,3 | 0 … 8 000 | –195 … 200 | * | 7 | no | 10-32 neg. | top | ✓ | | | | | | | | | 34 |

* Threshold for accelerometers with charge output depends upon charge amplifier settings.

# Product Overview

## Modal Analysis and Structural Testing, Single Axis — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8632C5 | ±5 | 1 000 | 1 … 3 000 | 0 … 65 | 0,00012 | 6 | yes | 10-32 neg. I side | | | ✓ | ✓ | ✓ | | | | | 38 |
| 8636C5 | ±5 | 1 000 | 1 … 3 000 | 0 … 65 | 0,00012 | 5 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 38 |
| 8772A5 | ±5 | 1 000 | 1 … 5 000 | 0 … 65 | 0,0004 | 8 | yes | 10-32 neg. I side | | | ✓ | ✓ | ✓ | | | | | 46 |
| 8632C10 | ±10 | 500 | 1 … 5 000 | 0 … 65 | 0,00028 | 6 | yes | 10-32 neg. I side | | | ✓ | ✓ | ✓ | | | | | 38 |
| 8636C10 | ±10 | 500 | 1 … 5 000 | 0 … 65 | 0,00028 | 5 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 38 |
| 8772A10 | ±10 | 500 | 1 … 5 000 | 0 … 65 | 0,0005 | 8 | yes | 10-32 neg. I side | | | ✓ | ✓ | ✓ | | | | | 46 |
| 8632C50 | ±50 | 100 | 1 … 6 000 | 0 … 65 | 0,001 | 6 | yes | 10-32 neg. I side | | | ✓ | ✓ | ✓ | | | | | 38 |
| 8636C50 | ±50 | 100 | 1 … 6 000 | 0 … 65 | 0,001 | 5 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 38 |
| 8772A50 | ±50 | 100 | 1 … 5 000 | 0 … 65 | 0,002 | 8 | yes | 10-32 neg. I side | | | ✓ | ✓ | ✓ | | | | | 46 |
| 8774A50 | ±50 | 100 | 1 … 10 000 | –55 … 120 | 0,0025 | 4 | no | 10-32 neg. I top | ✓ | ✓ | ✓ | | | ✓ | ✓ | | | 47 |
| 8776A50 | ±50 | 100 | 1 … 7 000 | –55 … 120 | 0,0025 | 4 | no | 10-32 neg. I side | | | ✓ | ✓ | | | | | | 47 |
| 8776A50M1 | ±50 | 100 | 1 … 7 000 | –55 … 120 | 0,0025 | 4,3 | yes | 10-32 neg. I side | | | ✓ | ✓ | | | | | | 47 |
| 8776A50M3 | ±50 | 100 | 0,5 … 4 000 | –55 … 120 | 0,0025 | 4,3 | yes | 10-32 neg. I side | | | ✓ | ✓ | | | | | | 47 |
| 8776A50M6 | ±50 | 100 | 1 … 10 000 | –55 … 120 | 0,0025 | 4,3 | no | 10-32 neg. I side | | ✓ | ✓ | ✓ | | ✓ | ✓ | | | 48 |

## Modal Analysis and Structural Testing, Triaxial — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8690C5 | ±5 | 1 000 | 1 … 3 000 | 0 … 65 | 0,00012 | 11,2 | yes | 4 pin pos. I side | | | ✓ | ✓ | ✓ | | ✓ | | | 55 |
| 8692C5 | ±5 | 1 000 | 1 … 3 000 | 0 … 65 | 0,00012 | 16 | yes | 4 pin pos. I side | | | ✓ | ✓ | | | ✓ | | | 55 |
| 8692C5M1 | ±5 | 1 000 | 1 … 3 000 | 0 … 65 | 0,00012 | 16 | yes | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 56 |
| 8690C10 | ±10 | 500 | 1 … 5 000 | 0 … 65 | 0,00028 | 11,2 | yes | 4 pin pos. I side | | | ✓ | ✓ | ✓ | | | | | 55 |
| 8692C10 | ±10 | 500 | 1 … 5 000 | 0 … 65 | 0,00028 | 16 | yes | 4 pin pos. I side | | | ✓ | ✓ | | | ✓ | | | 55 |
| 8692C10M1 | ±10 | 500 | 1 … 5 000 | 0 … 65 | 0,00028 | 16 | yes | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 56 |
| 8690C50 | ±50 | 100 | 1 … 6 000 | 0 … 65 | 0,001 | 11,2 | yes | 4 pin pos. I side | | | ✓ | ✓ | ✓ | | | | | 55 |
| 8692C50 | ±50 | 100 | 1 … 6 000 | 0 … 65 | 0,001 | 16 | yes | 4 pin pos. I side | | | ✓ | ✓ | | | ✓ | | | 55 |
| 8692C50M1 | ±50 | 100 | 1 … 6 000 | 0 … 65 | 0,001 | 16 | yes | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 56 |

# Product Overview

## Miniature, Ultra Light Mass, Single Axis — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8614A500M1 | ±500 | 4 | 10 … 25 000 | –55 … 135 | 0,025 | 0,7 | with adapt. | 10-32 neg., integral cable l side | | | ✓ | ✓ | | | | | | 37 |
| 8728A500 | ±500 | 10 | 2 … 10 000 | –55 … 120 | 0,02 | 1,6 | no | 10-32 neg., integral cable l side | | | ✓ | ✓ | | | | | | 43 |
| 8730A500 | ±500 | 10 | 2 … 10 000 | –55 … 120 | 0,01 | 1,9 | with adapt. | 10-32 neg. l top | ✓ | | | | | ✓ | ✓ | | | 43 |
| 8730A500M1 | ±500 | 10 | 2 … 7 000 | –55 … 120 | 0,02 | 2,5 | yes | 10-32 neg. l top | ✓ | | | | | ✓ | ✓ | | | 43 |
| 8730AE500 | ±500 | 10 | 2 … 10 000 | –55 … 120 | 0,02 | 1,9 | no | 10-32 neg. l top | ✓ | | | | | | | | | 43 |
| 8732A500 | ±500 | 10 | 2 … 10 000 (–5, 12 %) | –55 … 120 | 0,01 | 1,1 | yes | 10-32 neg., integral cable l side | | | ✓ | ✓ | | | | | | 44 |
| 8734A500 | ±500 | 10 | 2 … 10 000 (–5, 12 %) | –55 … 120 | 0,01 | 1,1 | yes | 10-32 neg., integral cable l side | | | ✓ | ✓ | | | | ✓ | | 44 |
| 8778A500 | ±500 | 10 | 2 … 9 000 | –55 … 120 | 0,01 | 0,4 | yes | 10-32 neg., int. coax l side | | | ✓ | ✓ | | | | | | 48 |
| 8778A500M14 | ±500 | 10 | 2 … 9 000 | –55 … 120 | 0,01 | 0,4 | yes | 10-32 neg., int. pair l side | | | ✓ | ✓ | | | | | | 48 |
| 8614A1000M1 | ±1 000 | 2,5 | 10 … 25 000 | –55 … 120 | 0,04 | 0,7 | with adapt. | 10-32 neg,, integral cable l side | | | ✓ | ✓ | | | | | | 37 |

## Miniature, Ultra Light Mass, Triaxial — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8763A50 | ±50 | 100 | 0,5 … 7 000 | –55 … 120 | 0,0003 | 4,5 | with adapt. | mini 4 pin pos. l side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8694M1 | ±500 | 4 | 10 … 20 000 | –55 … 135 | 0,025 | 2,5 | with adapt. | 4 pin neg, integral cable l side | | | ✓ | ✓ | | | | | | 56 |
| 8763A500 | ±500 | 10 | 1 … 12 000 | –55 … 120 | 0,01 | 3,3 | with adapt. | mini 4 pin pos. l side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8763A1000 | ±1 000 | 5 | 1 … 10 000 | –55 … 120 | 0,02 | 3 | with adapt. | mini 4 pin pos. l side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |

# Product Overview

## Miniature, Ultra Light Mass, Single Axix — Charge Output

| Type | Range g | Sensitivity pC/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8278A500 | ±500 | –1,3 | 1 … 10 000 | –70 … 180 | * | 0,7 | yes | 10-32 neg., integral cable I side | | | ✓ | ✓ | | | | | | 36 |
| 8274A5 | ±2 000 | –5,5 | 1 … 12 000 (±7 %) | –55 … 165 | * | 4 | with adapt. | 10-32 neg. I top | | ✓ | ✓ | | | ✓ | ✓ | | | 35 |
| 8276A5 | ±2 000 | –5,5 | 1 … 7 000 | –55 … 165 | * | 4 | no | 10-32 neg. I side | | | ✓ | ✓ | | ✓ | | | | 36 |

## High Temperature Vibration Measurement, Single Axis — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8752A50M5 | ±50 | 100 | 1 … 5 000 | –55 … 165 | 0,002 | 115 | case Iso. | MIL-C-5015 I top | ✓ | | ✓ | | | | ✓ | | | 46 |
| 8714B100M5 | ±100 | 50 | 1 … 10 000 | –55 … 165 | 0,002 | 5 | yes | 10-32 neg. I side | | | ✓ | ✓ | | | ✓ | | ✓ | 41 |
| 8702B500M5 | ±500 | 10 | 2 … 7 000 | –55 … 165 | 0,01 | 9,2 | with adapt. | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8714B500M5 | ±500 | 10 | 1 … 10 000 | –55 … 165 | 0,003 | 4,2 | yes | 10-32 neg. I side | | | ✓ | ✓ | | | ✓ | | ✓ | 41 |
| 8715A5000M5 | ±5 000 | 1 | 2 … 10 000 | –55 … 165 | 0,04 | 2,1 | no | 5-44 neg. I side | | | ✓ | ✓ | | | ✓ | | ✓ | 42 |

## High Temperature Vibration Measurement, Single Axis — Charge Output

| Type | Range g | Sensitivity pC/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8290A25M5 | ±1 000 | –25 | 5 … 4 000 | –70 … 250 | * | 53 | no | (3) 10-32 neg. I side | ✓ | | ✓ | | | | | | | 54 |

* Threshold for accelerometers with charge output depends upon charge amplifier settings.

# Product Overview

## High Temperature Vibration Measurement, Single Axis — Charge Output

| Type | Range g | Sensitivity pC/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8278A500 | ±500 | –1,3 | 1 … 10 000 | –70 … 180 | * | 0,7 | yes | 10-32 neg., integral cable l side | | | ✓ | ✓ | | | | | | 36 |
| 8203A50 | ±1 000 | –50 | 5 … 4 000 | –70 … 250 | * | 44,5 | with adapt. | 10-32 neg. l side | ✓ | | ✓ | | | ✓ | ✓ | | | 35 |
| 8202A10 | ±2 000 | –10 | 5 … 10 000 | –70 … 250 | * | 14,5 | with adapt. | 10-32 neg. l side | ✓ | | ✓ | | | ✓ | ✓ | | | 34 |
| 8274A5 | ±2 000 | –5,5 | 1 … 12 000 (±7 %) | –55 … 165 | * | 4 | with adapt. | 10-32 neg. l side | | ✓ | ✓ | | | ✓ | ✓ | | | 35 |
| 8276A5 | ±2 000 | –5,5 | 1 … 7 000 | –55 … 165 | * | 4 | no | 10-32 neg. l side | | | ✓ | ✓ | | ✓ | | | | 36 |

## High Temperature Vibration Measurement, Triaxial — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8763A500M5 | ±500 | 10 | 1 … 12 000 | –55 … 165 | 0,01 | 3,3 | with adapt. | mini 4 pin pos. l side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8793A500M5 | ±500 | 10 | 2,5 … 10 000 | –55 … 165 | 0,002 | 11 | with adapt. | 4 pin pos. l side | | | ✓ | ✓ | | | | ✓ | | 60 |
| 8794A500M5 | ±500 | 10 | 2,5 … 10 000 | –55 … 165 | 0,002 | 7,6 | with adapt. | 4 pin pos., integral cable l side | | | ✓ | ✓ | | | | ✓ | | 61 |
| 8763A1000M5 | ±1 000 | 5 | 1 … 10 000 | –55 … 165 | 0,02 | 3 | with adapt. | mini 4 pin pos. l side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |

## High Temperature Vibration Measurement, Single Axis — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8702B500M8 | ±500 | 10 | 2 … 7 000 | –196 … 120 | 0,01 | 9,2 | no | 10-32 neg. l side | ✓ | | ✓ | | | ✓ | ✓ | | | 39 |
| 8730A500M8 | ±500 | 10 | 2 … 10 000 | –196 … 120 | 0,02 | 1,9 | with adapt. | 10-32 neg. l top | | ✓ | | | | ✓ | ✓ | | | 43 |

* Threshold for accelerometers with charge output depends upon charge amplifier settings.

# Product Overview

## High Temperature Vibration Measurement, Triaxial — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integ. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8795A50M8 | ±50 | 100 | 1 … 4 000 | –196 … 120 | 0,001 | 32 | with adapt. | 4 pin pos. I side | ✓ | | ✓ | | | | ✓ | | | 61 |
| 8793A500M8 | ±500 | 10 | 2,5 … 10 000 | –196 … 120 | 0,002 | 11 | with adapt. | 4 pin pos. I side | | | ✓ | ✓ | | | | ✓ | | 60 |

## High Temperature Vibration Measurement, PiezoStar®, Single Axis — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integ. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8703A50M1 | ±50 | 100 | 0,5 … 10 000 | –55 … 165 | 0,0012 | 10 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 40 |
| 8703A50M5 | ±50 | 100 | 0,5 … 10 000 | –55 … 165 | 0,0012 | 8,8 | with adapt. | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 40 |
| 8705A50M1 | ±50 | 100 | 0,5 … 10 000 | –55 … 165 | 0,0012 | 8,4 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 40 |
| 8705A50M5 | ±50 | 100 | 0,5 … 10 000 | –55 … 165 | 0,0012 | 7,6 | with adapt. | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 40 |
| 8703A250M1 | ±250 | 20 | 0,5 … 10 000 | –55 … 165 | 0,006 | 8,1 | yes | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 40 |
| 8703A250M5 | ±250 | 20 | 0,5 … 10 000 | –55 … 165 | 0,006 | 6,9 | with adapt. | 10-32 neg. I side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 40 |
| 8705A250M1 | ±250 | 20 | 0,5 … 10 000 | –55 … 165 | 0,006 | 6,4 | yes | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 40 |
| 8705A250M5 | ±250 | 20 | 0,5 … 10 000 | –55 … 165 | 0,006 | 6,7 | with adapt. | 10-32 neg. I top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 40 |
| 8715A5000M5 | ±5 000 | 1 | 2 … 10 000 | –55 … 165 | 0,04 | 2,1 | yes | 5-44 neg. I side | | | ✓ | ✓ | | | | | ✓ | 42 |

## High Temperature Vibration Measurement, PiezoStar®, Triaxial — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integ. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8766A50M5 | ±50 | 100 | 0,5 … 5 000 | –55 … 165 | 0,001 | 16 | with adapt. | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 58 |
| 8765A250M5 | ±250 | 20 | 1 … 9 000 | –55 … 165 | 0,002 | 6,4 | yes | mini 4 pin pos. I side | | | ✓ | ✓ | | | | | ✓ | 58 |

Note: Adhesive mounting pads made of aluminum with a hard anodized shell provide ground isolation; see data sheet 8434_000-281.

# Product Overview

| Suffix | TEDS Template | Suffix | TEDS Template | Suffix | TEDS Template | Suffix | TEDS-Template |
|---|---|---|---|---|---|---|---|
| **T** | TEDS, default, IEEE 1451.4 V0.9 template 0 (UTID 1) | **T02** | TEDS, LMS template 117, free form at point ID | **T04** | TEDS, LMS template 118, aerospace format (Field 14 geometry = 1) | **T06** | TEDS, P1451.4 V1.0 template 25 – transfer function enabled |
| **T01** | TEDS, IEEE 1451.4 V0.9 template 24 (UTID 116225) | **T03** | TEDS, LMS template 118, automotive format (Field 14 geometry = 0) | **T05** | TEDS, P1451.4 V1.0 template 25 – transfer function disabled | | |

## TEDS – Accelerometers, Single Axis — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8632C5T | ±5 | 1 000 | 1 … 3 000 | 0 … 65 | 0,00012 | 6 | yes | 10-32 neg. l side | | | ✓ | ✓ | ✓ | | | | | 38 |
| 8772A5T | ±5 | 1 000 | 1 … 5 000 | 0 … 65 | 0,0004 | 8 | yes | 10-32 neg. l side | | | ✓ | ✓ | ✓ | | | | | 46 |
| 8632C10T | ±10 | 500 | 1 … 5 000 | 0 … 65 | 0,00028 | 6 | yes | 10-32 neg. l side | | | ✓ | ✓ | ✓ | | | | | 38 |
| 8772A10T | ±10 | 500 | 1 … 5 000 | 0 … 65 | 0,0005 | 8 | yes | 10-32 neg. l side | | | ✓ | ✓ | ✓ | | | | | 46 |
| 8702B25M1T | ±25 | 200 | 1 … 8 000 | –55 … 100 | 0,002 | 9,7 | yes | 10-32 neg. l side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B25T | ±25 | 200 | 1 … 8 000 | –55 … 100 | 0,002 | 8,7 | with adapt. | 10-32 neg. l side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B25M1T | ±25 | 200 | 1 … 8 000 | –55 … 100 | 0,002 | 8 | yes | 10-32 neg. l top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B25T | ±25 | 200 | 1 … 8 000 | –55 … 100 | 0,002 | 7,5 | with adapt. | 10-32 neg. l top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8632C50T | ±50 | 100 | 1 … 6 000 | 0 … 65 | 0,001 | 6 | yes | 10-32 neg. l side | | | ✓ | ✓ | ✓ | | | | | 38 |
| 8702B50M1T | ±50 | 100 | 0,5 … 10 000 | –55 … 100 | 0,004 | 9,7 | yes | 10-32 neg. l side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B50T | ±50 | 100 | 0,5 … 10 000 | –55 … 100 | 0,004 | 8,7 | with adapt. | 10-32 neg. l side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B50M1T | ±50 | 100 | 0,5 … 10 000 | –55 … 100 | 0,004 | 8 | yes | 10-32 neg. l top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B50T | ±50 | 100 | 0,5 … 10 000 | –55 … 100 | 0,004 | 7,5 | with adapt. | 10-32 neg. l top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8772A50T | ±50 | 100 | 1 … 5 000 | 0 … 65 | 0,002 | 8 | yes | 10-32 neg. l side | | | ✓ | ✓ | ✓ | | | | | 46 |
| 8702B100M1T | ±100 | 50 | 0,5 … 10 000 | –55 … 100 | 0,006 | 9,7 | yes | 10-32 neg. l side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B100T | ±100 | 50 | 0,5 … 10 000 | –55 … 100 | 0,006 | 8,7 | with adapt. | 10-32 neg. l side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B100M1T | ±100 | 50 | 0,5 … 10 000 | –55 … 100 | 0,006 | 8 | yes | 10-32 neg. l top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B100T | ±100 | 50 | 0,5 … 10 000 | –55 … 100 | 0,006 | 7,5 | with adapt. | 10-32 neg. l top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8714B100T | ±100 | 50 | 1 … 10 000 | –55 … 80 | 0,002 | 5 | yes | 10-32 neg. l side | | | ✓ | ✓ | | ✓ | | ✓ | | 41 |
| 8702B500M1T | ±500 | 10 | 1 … 10 000 | –55 … 100 | 0,01 | 9,2 | yes | 10-32 neg. l side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8702B500T | ±500 | 10 | 1 … 10 000 | –55 … 100 | 0,01 | 8,2 | with adapt. | 10-32 neg. l side | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B500M1T | ±500 | 10 | 1 … 10 000 | –55 … 120* | 0,01 | 7,6 | yes | 10-32 neg. l top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8704B500T | ±500 | 10 | 1 … 10 000 | –55 … 100 | 0,01 | 7,1 | with adapt. | 10-32 neg. l top | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 39 |
| 8714B500T | ±500 | 10 | 1 … 10 000 | –55 … 80 | 0,003 | 4,2 | yes | 10-32 neg. l side | | | ✓ | ✓ | | ✓ | | ✓ | | 41 |

* For TEDS sensors, TEDS data retention and data communications may be degraded for temperatures exceeding –40 … 110 °C. Analog operation over the operating temperature is unaffected.
Note: Adhesive mounting pads made of aluminum with a hard anodized shell provide ground isolation; see data sheet 8434_000-281.

# Product Overview

## TEDS – Accelerometers, Triaxial — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integ. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8690C5T | ±5 | 1 000 | 1 … 3 000 | 0 … 65 | 0,00012 | 11,2 | yes | 4 pin pos. I side | | | ✓ | ✓ | ✓ | | | | | 55 |
| 8762A5T | ±5 | 1 000 | 0,5 … 6 000 | –40 … 80 | 0,0003 | 23 | yes | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8690C10T | ±10 | 500 | 1 … 5 000 | 0 … 65 | 0,00028 | 11,2 | yes | 4 pin pos. I side | | | ✓ | ✓ | ✓ | | | | | 55 |
| 8762A10T | ±10 | 500 | 0,5 … 6 000 | –40 … 80 | 0,00035 | 23 | yes | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8792A25T | ±25 | 200 | 1 … 5 000 | –55 … 100* | 0,002 | 29 | yes | 4 pin pos. I side | | | ✓ | | | | ✓ | | ✓ | 59 |
| 8690C50T | ±50 | 100 | 1 … 6 000 | 0 … 65 | 0,001 | 11,2 | yes | 4 pin pos. I side | | | ✓ | ✓ | ✓ | | | | | 55 |
| 8762A50T | ±50 | 100 | 0,5 … 6 000 | –40 … 80 | 0,0012 | 23 | yes | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8763A50T | ±50 | 100 | 0,5 … 7 000 | –55 … 120 | 0,0003 | 4,5 | with adapt. | mini 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8792A50T | ±50 | 100 | 0,5 … 5 000 | –55 … 100* | 0,004 | 29 | yes | 4 pin pos. I side | | | ✓ | | | | ✓ | | ✓ | 59 |
| 8792A100T | ±100 | 50 | 0,5 … 5 000 | –55 … 100* | 0,006 | 29 | yes | 4 pin pos. I side | | | ✓ | | | | ✓ | | ✓ | 59 |
| 8763A500T | ±500 | 10 | 1 … 12 000 | –55 … 120 | 0,01 | 3,3 | with adapt. | mini 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |
| 8792A500T | ±500 | 10 | 1 … 5 000 (–5, 10 %) | –55 … 120* | 0,01 | 27 | yes | 4 pin Pos. I side | | | ✓ | | | | ✓ | | ✓ | 59 |
| 8793A500T | ±500 | 10 | 2,5 … 10 000 | –40 … 120 | 0,002 | 11 | with adapt. | 4 pin Pos. I side | | | ✓ | ✓ | | | | ✓ | | 60 |
| 8763A1000T | ±1 000 | 5 | 1 … 10 000 | –55 … 120 | 0,02 | 3 | with adapt. | mini 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 57 |

## TEDS – Accelerometers, PiezoStar®, Single Axis — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integ. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8715A5000T | ±5 000 | 1 | 2 … 10 000 | –40 … 120* | 0,04 | 2,1 | yes | 5-44 neg. I side | | | ✓ | ✓ | | | | | ✓ | 42 |

## TEDS – Accelerometers, PiezoStar®, Single Axis — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Threshold $g_{rms}$ | Mass g | Ground isolated | Connector | Mounting: mounting stud | integ. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8766A50T | ±50 | 100 | 0,5 … 5 000 | –55 … 120* | 0,001 | 16 | with adapt. | 4 pin pos. I side | ✓ | | ✓ | ✓ | | | ✓ | | | 59 |

* For TEDS sensors, TEDS data retention and data communications may be degraded for temperatures exceeding –40 … 110 °C. Analog operation over the operating temperature is unaffected.
Note: Adhesive mounting pads made of aluminum with a hard anodized shell provide ground isolation; see data sheet 8434_000-281.

# Product Overview

## Impedance Heads — Voltage Output

| Type | Vib.-Range g | Sensitivity mV/g | Kraftbereich N | Sensitivity mV/N | Temp. range °C | Threshold $g_{ms}$/N | Mass g | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8770A5 | 5 | 1 000 | ±22,2 | 226 | –55 … 80 | 0,0004/0,001 | 34 | 10-32 neg. | side | ✓ | | | | | | | | 63 |
| 8770A50 | 50 | 100 | ±222,4 | 22,6 | –55 … 120 | 0,001/0,006 | 34 | 10-32 neg. | side | ✓ | | | | | | | | 63 |

## Impact Hammers — Voltage Output

| Type | Range g | Sensitivity mV/g | Frequency response Hz (±5 %) | Temp. range °C | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9722A500 | 500 | 10 | 8 200 | –20 … 70 | BNC neg. \| bottom | | | | | | | | | 65 | |
| 9722A2000 | 2 000 | 2 | 9 300 | –20 … 70 | BNC neg. \| bottom | | | | | | | | | | 65 |
| 9724A2000 | 2 000 | 2 | 6 600 | –20 … 70 | BNC neg. \| bottom | | | | | | | | | | 65 |
| 9724A5000 | 5 000 | 1 | 6 900 | –20 … 70 | BNC neg. \| bottom | | | | | | | | | | 66 |
| 9726A5000 | 5 000 | 1 | 5 000 | –20 … 70 | BNC neg. \| bottom | | | | | | | | | | 66 |
| 9726A20000 | 20 000 | 0,2 | 5 400 | –20 … 70 | BNC neg. \| bottom | | | | | | | | | | 66 |
| 9728A20000 | 20 000 | 0,2 | 1 000 | –20 … 70 | BNC neg. \| bottom | | | | | | | | | | 66 |

# Product Overview

## Force Sensors — Charge Output

| Type | Range Compression N | Range Tension N | Sensitivity pC/N | Temp. range °C | Threshold N | Mass g | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9212 | +22 240 | –2 224 | –11 | –195 … 150 | * | 19 | 10-32 neg. l side | ✓ | | | | | | | | | 63 |
| 9222 | +22 240 | –2 224 | –4 | –195 … 150 | * | 19 | 10-32 neg. l side | ✓ | | | | | | | | | 63 |

## Force Sensors — Voltage Output

| Type | Range Compression N | Range Tension N | Sensitivity mV/N | Temp. range °C | Threshold N | Mass g | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9712B5 | +22 | –22 | 181,8 | –50 … 120 | 0,0001 | 19 | 10-32, neg l side | ✓ | | | | | | | | | 64 |
| 9712B50 | +220 | –220 | 22,6 | –50 … 120 | 0,001 | 19 | 10-32, neg l side | ✓ | | | | | | | | | 64 |
| 9712B5250 | +1 112 | –1 112 | 4,5 | –50 … 120 | 0,005 | 19 | 10-32, neg l side | ✓ | | | | | | | | | 64 |
| 9712B500 | +2 224 | –2 224 | 2,2 | –50 … 120 | 0,01 | 19 | 10-32, neg l side | ✓ | | | | | | | | | 64 |
| 9712B5000 | +22 240 | –22 240 | 0,2 | –50 … 120 | 0,1 | 19 | 10-32, neg l side | ✓ | | | | | | | | | 64 |

* For TEDS sensors, TEDS data retention and data communications may be degraded for temperatures exceeding –40 … 110 °C. Analog operation over the operating temperature is unaffected.
Note: Adhesive mounting pads made of aluminum with a hard anodized shell provide ground isolation; see data sheet 8434_000-281.

# Product Overview

## Axial Rotational Accelerometer, Single Axis — Voltage Output

| Type | Range krads/s² | Sensitivity µV/rad/s² | Frequency response Hz (±5 %) | Temp. range °C | Threshold rads/s² | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8838 | ±150 | 34 | 1 … 2 000 | –55 … 120 | 4 | 18,5 | yes | 4 pin pos. I side | | | | | | | | | ✓ | 49 |

## Lateral Rotational Accelerometer, Single Axis — Voltage Output

| Type | Range krads/s² | Sensitivity µV/rad/s² | Frequency response Hz (±5 %) | Temp. range °C | Threshold rads/s² | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8840 | ±150 | 34 | 1 … 2 000 | –55 … 120 | 4 | 18,5 | | 4 pin pos. I side | | | | | | | | | ✓ | 50 |

## Acoustic Emission, Single Axis — Voltage Output

| Type | Sensitivity dB ref 1V / (m/s) | Frequency response Hz (±5 %) | Temp. range °C | Mass g | Ground isolated | Connector | Mounting: mounting stud | integr. stud | adhesive/pad | wax | mounting clip | triaxial cube | magnetic | screw | centering screw | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8152B211/221 | 48 | 100 k … 900 k | –40 … 60 | 29 | yes | integral cable pigtails I side | | | | | | | | | ✓ | 52 |
| 8152B111/121 | 57 | 50 k … 400 k | –40 … 60 | 29 | yes | integral cable pigtails I side | | | | | | | | | ✓ | 52 |

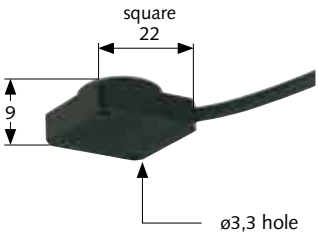
# Low Frequency Acceleration

Single axis static/low frequency accelerometer options include integral cable, environmentally sealed and hermetic configurations. Case or base isolated is provided by a durable, hard anodized aluminium construction. Some types operate symmetrically about a 2,5 VDC voltage and others provide an output symmetric about a zero volt baseline. Integral cable types provide the necessary measurement performance characteristics in an economical package while the four pin connector types provide an improved seal, replaceable cable and some advanced signal conditioning. Type 8310B... offer an internal temperature sensor thereby providing a means of subsequent temperature compensation.



# Low Frequency Acceleration: Capacitive Accelerometers

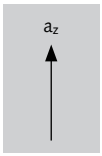
## K-Beam® Capacitive Accelerometer




| Technical data | | Type 8305B2 | Type 8305B10 | Type 8305B25 |
|---|---|---|---|---|
| Range | g | ±2 | ±10 | ±25 |
| Sensitivity, ±5 % | mV/g | 500 | 100 | 80 |
| Output at zero g, ±5 % | V | 2,5 | 2,5 | 2,5 |
| Frequency response, +5 % | Hz | 0 … 180 | 0 … 300 | 0 … 300 |
| Non-linearity | %FSO | 0,4 | 0,4 | 1 |
| Resolution/threshold | $\mu g_{rms}$ | 200 | 1 000 | 1 760 |
| Transverse sensitivity typ. | % | ±1 | ±1 | ±1 |
| Shock, half sine, 200 µs | $g_{pk}$ | 3 000 | 3 000 | 3 000 |
| Temp. coeff.: Bias | mg/°C | 0,2 | 1 | 5 |
| Temp. coeff.: Sensitivity | %/°C | 0,02 | 0,02 | 0,02 |
| Operating temperature range | °C | –40 … 85 | –40 … 85 | –40 … 85 |
| Phase shift max. @ 100 Hz | ° | 10 | 10 | 5 |
| Current nom. | mA | 0,7 | 0,7 | 12 |
| Supply | VDC | 7 … 32 | 7 … 32 | 7 … 32 |
| Housing/base | material | Al hard anodized | Al hard anodized | Al hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 | IP66 |
| Mass | grams | 6,5 | 6,5 | 6,5 |

Type 8305B...M2 versions, operate from a single polarity supply providing a differential output (0 V = 0 g) and double the sensitivity.

**Measuring direction**




**Connection**
Std.: pigtails
M2: pigtails
M4: 4 pin pos.
M7: 4 pin neg.

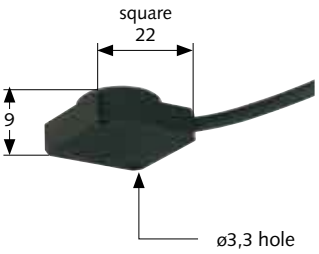
**Characteristics**
Small, lightweight variable capacitance sensing element, CE compliant, 0,5 m integral cable, custom lengths available.

**Application**
Low frequency vibration measurements for automotive ride quality and aerospace structural testing.

**Accessories**
Power supply Type 5210
Mounting cube Type 8516

**Data sheet** 8305B_000-565

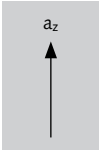
## K-Beam® Capacitive Accelerometer




| Technical data | | Type 8305B50 | Type 8305B100 |
|---|---|---|---|
| Range | g | ±50 | ±100 |
| Sensitivity, ±5 % | mV/g | 40 | 20 |
| Output at zero g, ±5 % | V | 2,5 | 2,5 |
| Frequency response, ±5 % | Hz | 0 … 500 | 0 … 500 |
| Non-linearity | %FSO | 1 | 1 |
| Resolution/threshold | $\mu g_{rms}$ | 3 620 | 3 910 |
| Transverse sensitivity typ. | % | ±1 | ±1 |
| Shock, half sine, 200 µs | $g_{pk}$ | 3 000 | 3 000 |
| Temp. coeff.: Bias | mg/°C | 5 | 10 |
| Temp. coeff.: Sensitivity | %/°C | 0,02 | 0,02 |
| Operating temperature range | °C | –40 … 85 | –40 … 85 |
| Phase shift max. @ 100 Hz | ° | 5 | 5 |
| Current nom. | mA | 12 | 12 |
| Supply | VDC | 7 … 32 | 7 … 32 |
| Housing/base | material | Al hard anodized | Al hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 |
| Mass | grams | 6,5 | 6,5 |

Type 8305B...M2 versions, operate from a single polarity supply providing a differential output (0 V = 0 g) and double the sensitivity.

**Measuring direction**




**Connection**
Std.: pigtails
M2: pigtails
M4: 4 pin pos.
M7: 4 pin neg.

**Characteristics**
Small, lightweight variable capacitance sensing element, CE compliant, 0,5 m integral cable, custom lengths available.

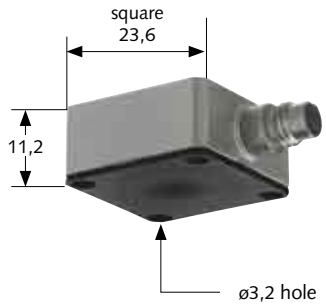
**Application**
Low frequency vibration measurements for automotive ride quality and aerospace structural testing.

**Accessories**
Power supply Type 5210
Mounting cube Type 8516

**Data sheet** 8305B_000-565

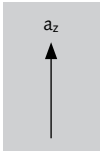
# Low Frequency Acceleration: Capacitive Accelerometers

## K-Beam® Capacitive Accelerometer




| Technical data | | Type 8310B2 | Type 8310B10 |
|---|---|---|---|
| Range | g | ±2 | ±10 |
| Sensitivity, ±5 % | mV/g | 1 000 | 200 |
| Output at zero g | mV | 0 ±30 | 0 ±30 |
| Frequency response, ±5 % | Hz | 0 … 250 | 0 … 180 |
| Non-linearity | %FSO | ±0,8 | ±0,8 |
| Resolution/threshold | $\mu g_{rms}$ | 540 | 2 830 |
| Transverse sensitivity typ. | % | ±1 | ±1 |
| Shock, half sine, 700 µs | $g_{pk}$ | 6 000 | 6 000 |
| Temp. coeff.: Bias | mg/°C | 0,2 | 1 |
| Temp. coeff.: Sensitivity | %/°C | 0,02 | 0,02 |
| Operating temperature range | °C | –40 … 85 | –40 … 85 |
| Phase shift max. @ 100 Hz | ° | 20 | 20 |
| Current nom. | mA | 1,3 | 1,3 |
| Power supply | VDC | 3,8 … 32 | 3,8 … 32 |
| Housing/base | material | Ti./Al hard anod. | Ti./Al hard anod. |
| Degree of protection (EN60529) | | IP68 | IP68 |
| Mass | grams | 17 | 17 |

**Measuring diretion**




**Connection**
Std: 4 pin pos. M11: pigtails

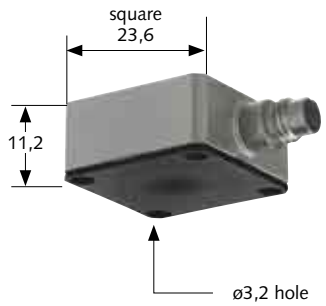
**Characteristics**
Bipolar output, 2 V FS, zero volt output at zero g, CE compliant, temperature output provided. Type 8310B…M11: pigtail integral cable version.

**Application**
Vehicle ride quality, structural analysis, building & bridge vibration.

**Accessories**
Cables Type 1592A..., 1592M1..., 1786C...
Power supply Type 5210
Mounting cube Type 8518A

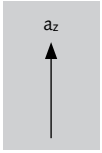
**Data sheet** 8310B_000-566

## K-Beam® Capacitive Accelerometer




| Technical data | | Type 8310B25 | Type 8310B50 |
|---|---|---|---|
| Range | g | ±25 | ±50 |
| Sensitivity, ±5 % | mV/g | 80 | 40 |
| Output at zero g | mV | 0 ±40 | 0 ±40 |
| Frequency response, ±5 % | Hz | 0 … 300 | 0 … 500 |
| Non-linearity | %FSO | ±1 | ±1 |
| Resolution/threshold | $\mu g_{rms}$ | 2 940 | 5 700 |
| Transverse sensitivity typ. | % | 2 | 2 |
| Shock, half sine, 700 µs | $g_{pk}$ | 3 000 | 3 000 |
| Temp. coeff.: Bias | mg/°C | 3 | 5 |
| Temp. coeff.: Sensitivity | %/°C | 0,02 | 0,02 |
| Operating temperature range | °C | –40 … 85 | –40 … 85 |
| Phase shift max. @ 100 Hz | ° | 20 | 20 |
| Current nom. | mA | 13 | 13 |
| Supply | VDC | 6 … 32 | 6 … 32 |
| Housing/base | material | Ti./Al hard anod. | Ti./Al hard anod. |
| Degree of protection (EN60529) | | IP68 | IP68 |
| Mass | grams | 17 | 17 |

**Measuring direction**




**Connection**
Std: 4 pin pos. M11: pigtails

**Characteristics**
Bipolar output, 2 V FS, zero volt output at zero g, CE compliant, temperature output provided. Type 8310B…M11: pigtail integral cable version.

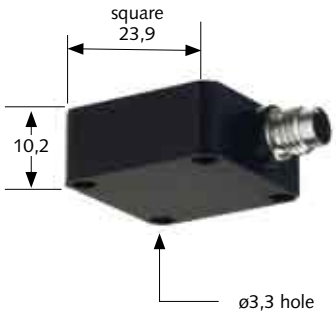
**Application**
Vehicle ride quality, structural analysis, building & bridge vibration.

**Accessories**
Cables Type 1592A..., 1592M1..., 1786C...
Power supply Type 5210
Mounting cube Type 8518A

**Data sheet** 8310B_000-566

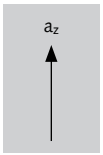
# Low Frequency Acceleration: Capacitive Accelerometers

## K-Beam® Capacitive Accelerometer




| Technical data | | Type 8312B2 | Type 8312B10 |
|---|---|---|---|
| Range | g | ±2 | ±10 |
| Sensitivity, ±5 % | mV/g | 1 000 | 2 00 |
| Output at zero g | mV | 0 ±30 | 0 ±30 |
| Frequency response, ±5 % | Hz | 0 … 250 | 0 … 180 |
| Non-linearity | %FSO | ±0,8 | ±0,8 |
| Resolution/threshold | $\mu g_{rms}$ | 540 | 2 830 |
| Transverse sensitivity typ. | % | 1 | 1 |
| Shock, half sine, 500 µs | $g_{pk}$ | 6 000 | 6 000 |
| Temp. coeff.: Bias | mg/°C | 0,2 | 1 |
| Temp. coeff.: Sensitivity | %/°C | 0,02 | 0,02 |
| Operating temperature range | °C | –40 … 85 | –40 … 85 |
| Phase shift max. @ 100 Hz | ° | 20 | 20 |
| Current nom. | mA | 1,3 | 1,3 |
| Power supply | VDC | 3,8 … 32 | 3,8 … 32 |
| Housing/base | material | Al hard anodized | Al hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 |
| Mass | grams | 12 | 12 |

**Measuring direction**




**Connection**
4 pin pos.

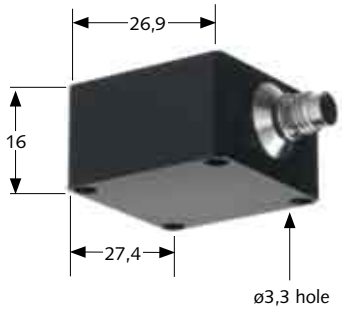
**Characteristics**
Bipolar output: ±2 V FS, zero volt output at zero g, CE compliant.

**Application**
Vehicle ride quality, structural analysis, building & bridge vibration.

**Accessories**
Cables Type 1592A..., 1592M1..., 1786C...
Power supply Type 5210
Mounting cube Type 8518

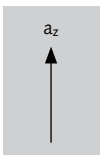
**Data sheet** 8312B_000-567

## ServoK-Beam™ Capacitive Accelerometer




| Technical data | | Type 8330A3 |
|---|---|---|
| Range | g | ±3 |
| Sensitivity, ±5 % | mV/g | 1 200 |
| Output at zero g | mV | 0 ±260 |
| Frequency response, ±5 % | Hz | 0 … 500 |
| Non-linearity | %FSO | ±0,1 |
| Resolution/threshold | $\mu g_{rms}$ | <1,3 |
| Transverse sensitivity typ. | % | 0,4 |
| Shock, half sine, 500 µs | $g_{pk}$ | 1 500 |
| Temp. coeff.: Bias | mg/°C | 0,1 |
| Temp. coeff.: Sensitivity | %/°C | 0,005 |
| Operating temperature range | °C | –40 … 125 |
| Phase shift max. @ 100 Hz | ° | –0,25 |
| Current nom. | mA | 8,5 |
| Power supply | VDC | ±6 … 15 |
| Housing/base | material | Al hard anodized |
| Degree of protection (EN60529) | | IP66 |
| Mass | grams | 28,5 |

**Measuring direction**




**Connection**
4 pin pos.

**Characteristics**
Closed loop accelerometer, zero volt output at zero g, ultra low noise.

**Application**
Low frequency, low amplitude vibration measurements such as background vibration and seismic measurements.

**Accessories**
Cables Type 1592M1…, 1788A…
Mounting cube Type 8530

**Data sheet** 8330A3_000-542

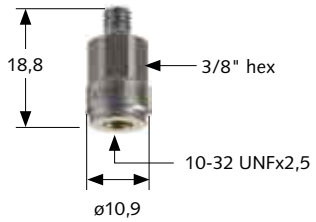
# Vibration

Single axis accelerometers are available in many configurations to accommodate widely varying test conditions. Critical constraints often include size, weight, sensitivity, frequency response, etc. These variables are interrelated, therefore a compromise must be established during the selection process. Accelerometer families have been created with an optimized set of parameters intended for a particular field of testing. Dynamic accelerometer families include PiezoStar®, PiezoBeam®, Ceramic Shear, and the K-Shear® constructions. Typically the PiezoBeam® family provides high output in an economical, lightweight package tuned for a Modal Analysis environment. Ceramic Shear types provide improved thermal transient characteristics. PiezoStar and K-Shear offers high quality, general-purpose capability covering the widest range of application. Further classification provides focus to important criteria such as miniature size or high temperature capability.



# Vibration: Charge Output

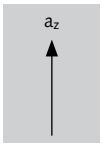
## Quartz Shock Accelerometer




| Technical data | | Type 8044 |
|---|---|---|
| Range | g | –20 000 … 30 000 |
| Sensitivity, ±5 % | pC/g | –0,3 |
| Frequency response, ±5 % | Hz | 0 … 8 000 |
| Threshold nom. | $g_{rms}$ | * |
| Transverse sensitivity typ. | % | ≤5 |
| Non-linearity | %FSO | ±1 |
| Temp. coeff. sensitivity typ. | %/°C | –0,02 |
| Operating temperature range | °C | –195 … 200 |
| Housing/base | material | stainless steel |
| Degree of protection (EN60529) | | IP67 |
| Mass | grams | 7 |
| Ground isolated | | no |

* Threshold for high impedance accelerometers depend upon charge amplifier settings, call Kistler for details.

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
High impedance charge mode, wide measuring range, stable quartz element, lightweight, miniature package.

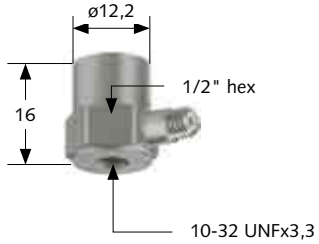
**Application**
Measuring and analyzing shock and vibration with very high amplitudes of acceleration.

**Accessories**
Cable Type 1631C...
Charge amplifier Type 5000 series

**Data sheet** 8044_000-209

# Charge Output, Extreme Temperature

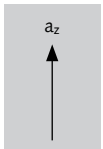
## Ceramic Shear Accelerometer




| Technical data | | Type 8202A10 |
|---|---|---|
| Range | g | ±2 000 |
| Sensitivity, ±5 % | pC/g | –10 |
| Frequency response, ±5 % | Hz | 5 … 10 000 |
| Threshold nom. | $g_{rms}$ | * |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Temp. coeff. sensitivity typ. | %/°C | 0,13 |
| Operating temperature range | °C | –70 … 250 |
| Housing/base | material | stainless steel |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 14,5 |
| Ground isolated | | with adapter |

* Threshold for high impedance accelerometers depend upon charge amplifier settings, call Kistler for details.

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
High impedance, charge mode, high temp. (250 °C), ceramic shear sensing element, low transverse sensitivity.

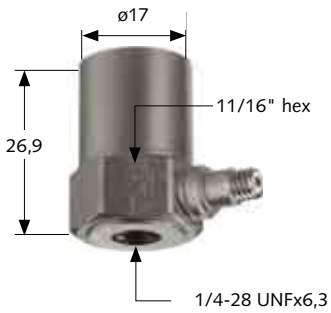
**Application**
Automotive, aerospace and environmental testing where low impedance sensors are limited by temperature range.

**Accessories**
Cable Type 1631C…
Charge converter Type 5050A...
Coupler Type 5100 series
Adh. mounting pad Type 8436

**Data sheet** 8202A_000-212

## Vibration: Charge Output, Extreme Temperature

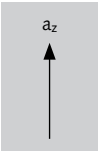
### Ceramic Shear Accelerometer




| Technical data | | Type 8203A50 |
|---|---|---|
| Range | g | ±1 000 |
| Sensitivity, ±15 % | pC/g | –50 |
| Frequency response, ±5 % | Hz | 5 … 4 000 |
| Threshold, nom. | $g_{rms}$ | * |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Temp. coeff. sensitivity typ. | %/°C | 0,13 |
| Operating temperature range | °C | –70 … 250 |
| Housing/base | material | stainless steel |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 44,5 |
| Ground isolated | | with adapter |

* Threshold for high impedance accelerometers depend upon charge amplifier settings, call Kistler for details.

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
High impedance, charge mode, high temp. (250 °C), ceramic shear sensing element, low transverse sensitivity.

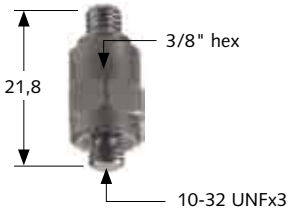
**Application**
Automotive, aerospace and environmental testing where low impedance sensors are limited by temperature range.

**Accessories**
Cable Type 1631C…
Charge converter Type 5050A…
Coupler Type 5100 series
Adh. mounting pad Type 8438

**Data sheet** 8202A_000-212

## Charge Output

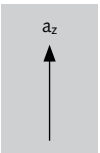
### Ceramic Shear Accelerometer




| Technical data | | Type 8274A5 |
|---|---|---|
| Range | g | ±2 000 |
| Sensitivity | pC/g | –5,5 |
| Frequency response, ±7 % | Hz | 1 … 12 000 |
| Threshold nom. | $g_{rms}$ | * |
| Transverse sensitivity typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Temp. coeff. sensitivity typ. | %/°C | 0,1 |
| Operating temperature range | °C | –55 … 165 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 4 |
| Ground isolated | | with adapter |

* Threshold for high impedance accelerometers depend upon charge amplifier settings, call Kistler for details.

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
High impedance, ceramic shear sensing element, wide frequency response, low transverse sensitivity, lightweight, rugged connector, ideal for OEM application.

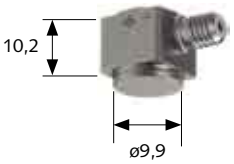
**Application**
Impact and vibration related application including condition monitoring and vehicle testing.

**Accessories**
Cable Type 1631C…
Charge converter Type 5050A...
Coupler Type 5100 series
Adh. mounting pad Type 8436
Mounting magnet Type 8452A
Mounting cube Type 8524

**Data sheet** 8274A_000-213

# Vibration: Charge Output

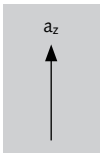
## Ceramic Shear Accelerometer




| Technical data | | Type 8276A5 |
|---|---|---|
| Range | g | ±2 000 |
| Sensitivity | pC/g | –5,5 |
| Frequency response, ±5 % | Hz | 1 … 7 000 |
| Threshold nom. | $g_{rms}$ | * |
| Transverse sensitivity typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Temp. coeff. sensitivity typ. | %/°C | 0,1 |
| Operating temperature range | °C | –55 … 165 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 4 |
| Ground isolated | | no |

* Threshold for high impedance accelerometers depend upon charge amplifier settings, call Kistler for details.

**Measuring direction**




**Connection**
10-32 neg.

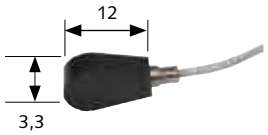
**Characteristics**
High impedance, ceramic shear sensing element, wide frequency response, low transverse sensitivity, lightweight, rugged connector, priced for OEM application.

**Application**
Impact and vibration related application including condition monitoring and vehicle testing.

**Accessories**
Cable Type 1631C...
Charge converter Type 5000 series
Coupler Type 5100 series
Adh. mounting pad Type 8436
Mounting magnet Type 8452A
Mounting cube Type 8524
Mounting cube Type 8526

**Data sheet** 8274A_000-213

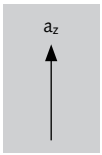
## Ceramic Shear Miniature Accelerometer




| Technical data | | Type 8278A500 |
|---|---|---|
| Range | g | ±500 |
| Sensitivity, ±5 % | pC/g | –1,3 |
| Frequency response, ±5 % | Hz | 1 … 10 000 |
| Threshold nom. | $g_{rms}$ | * |
| Transverse sensitivity, typ. | % | 3 |
| Non-linearity | %FSO | ±1 |
| Temp. coeff. sensitivity typ. | %/°C | 0,18 |
| Operating temperature range | °C | –70 … 180 |
| Housing/base | material | Al hard anodized |
| Degree of protection (EN60529) | | IP66 |
| Mass | grams | 0,7 |
| Ground isolated | | yes |

* Threshold for high impedance accelerometers depend upon charge amplifier settings, call Kistler for details.

**Measuring direction**




**Connection**
10-32 pos.

**Characteristics**
High impedance charge mode, ultra low base strain, wide frequency response, ground isolated, high sensitivity, –1,3 pC/g, integral cable (user specified length), high temperature.

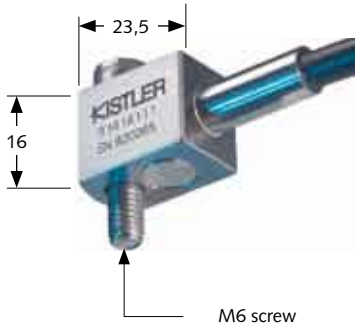
**Application**
Precision vibration measurements; modal analysis on small, thin walled structures or where space is limited and mass loading is of primary concern.

**Accessories**
Extension cable Type 1631C…
Charge converter Type 5050 series
Coupler Type 5100 series

**Data sheet** 8278A_000-611

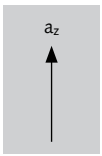
# Vibration: Voltage Output

## Piezotron® Ceramic Shear Accelerometer




| Technical data | | Type 8141B... |
|---|---|---|
| Range | g | ±50 |
| Sensitivity | mV/g | 100 |
| Frequency response, ±5 % | Hz | 0,5 … 8 000 |
| Threshold | $g_{rms}$ | 0,0002 |
| Transverse sensitivity typ. | % | ≤5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | 0,05 |
| Operating temperature range | °C | –55 … 90 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 |
| Housing/base | material | stainless steel |
| Degree of protection (EN60529) | | IP65 (Type 8141B1…)/IP67 (Type 8141B2…) |
| Mass | grams | 30 |
| Ground isolated | | yes |

**Measuring direction**




**Connection**
pigtails

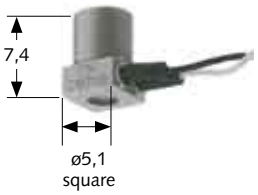
**Characteristics**
Charge output, rugged, hermetically sealed construction with durable integral cable. Piezoceramic shear sensing elements. CE compliant.

**Application**
Measurement of vibration on machine structures, bearing monitoring, machine tools or as a built-in integral component of a machine diagnostic system.

**Accessories**
Ext. cable Type 1761B...40
Coupler Type 5127B

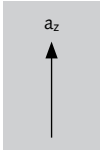
**Data sheet** 8141B_000-616

## Picotron® Miniature Accelerometer




| Technical data | | Type 8614A500M1 | Type 8614A1000M1 |
|---|---|---|---|
| Range | g | ±500 | ±1 000 |
| Sensitivity, ±5 % | mV/g | 4 | 2,5 |
| Frequency response, ±5 % | Hz | 10 … 25 000 | 10 … 25 000 |
| Threshold | $g_{rms}$ | 0,025 | 0,04 |
| Transverse sensitivity typ. | % | <5 | <5 |
| Non-linearity | %FSO | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | –500 … 1 000 | ±2 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 | –0,06 |
| Operating temperature range | °C | –55 … 135 | –55 … 120 |
| Power supply | mA<br>VDC | 4<br>12 … 30 | 4<br>20 … 30 |
| Housing/base | material | Titanium | Titanium |
| Degree of protection (EN60529) | | IP66 | IP66 |
| Mass | grams | 0,7 | 0,7 |
| Ground isolated | | with adapt. | with adapt. |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Low impedance voltage mode, small and lightweight, very high natural frequency, integral cable CE compliant.

**Application**
P.C. board component shock and vibration testing, monitoring missile and aircraft vibration; high speed rotating component equipment performance and wear signature; and vibration responses of thin-walled structures.

**Accessories**
Ext. cable Type 1761B...
Coupler Type 5100 series
Adh. mounting pad Type 8439

**Data sheet** 8614A_000-225

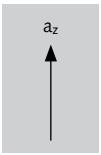
# Vibration: Voltage Output

## PiezoBeam® Cube Accelerometer




| Technical data | | Type 8632C5 | Type 8632C10 | Type 8632C50 |
|---|---|---|---|---|
| Range | g | ±5 | ±10 | ±50 |
| Sensitivity, ±5 % | mV/g | 1 000 | 500 | 100 |
| Frequency response, ±5 % | Hz | 1 … 3 000 | 1 … 5 000 | 1 … 6 000 |
| Threshold | $g_{rms}$ | 0,00012 | 0,00028 | 0,001 |
| Transverse sensitivity, typ. | % | <1 | <1 | <1 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (0,2 ms pulse) | $g_{pk}$ | 7 000 | 10 000 | 10 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,04 | 0,08 | 0,08 |
| Operating temperature range | °C | 0 … 65 | 0 … 65 | 0 … 65 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | Al. hard anodized | Al. hard anodized | Al. hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 | IP66 |
| Mass | grams | 6 | 6 | 6 |
| Ground isolated | | yes | yes | yes |

**Measuring direction**




**Connection**
10-32 neg.

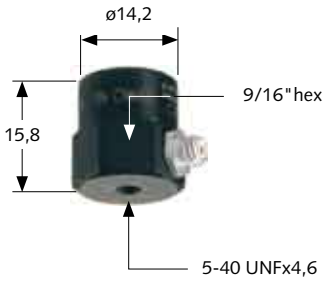
**Characteristics**
Low impedance voltage mode, high sensitivity, lightweight cubic design, low transverse sensitivity, ground isolated, CE compliant.
Type 8632C...T: TEDS version.

**Application**
Modal analysis, structural investigations in thermally stable environments (laboratory).

**Accessories**
Cable Type 1761B...
Coupler Type 5100 series
Mount. clip Type 8478

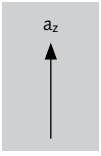
**Data sheet** 8632C_000-229

## PiezoBeam® Accelerometer




| Technical data | | Type 8636C5 | Type 8636C10 | Type 8636C50 |
|---|---|---|---|---|
| Range | g | ±5 | ±10 | ±50 |
| Sensitivity, ±5 % | mV/g | 1 000 | 500 | 100 |
| Frequency response, ±5 % | Hz | 1 … 3 000 | 1 … 5 000 | 1 … 6 000 |
| Threshold | $g_{rms}$ | 0,00012 | 0,00028 | 0,001 |
| Transverse sensitivity, typ. | % | <1 | <1 | <1 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (0,2 ms pulse) | $g_{pk}$ | 7 000 | 10 000 | 10 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,04 | 0,08 | 0,08 |
| Operating temperature range | °C | 0 … 65 | 0 … 65 | 0 … 65 |
| Power supply | mA<br>VDC | 3 … 18<br>20 … 30 | 3 … 18<br>20 … 30 | 3 … 18<br>20 … 30 |
| Housing/base | Type | Al. hard anodized | Al. hard anodized | Al. hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 | IP66 |
| Mass | grams | 5 | 5 | 5 |
| Ground isolated | | yes | yes | yes |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Low impedance voltage mode, high sensitivity, very low noise, low transverse sensitivity, ground isolated, CE compliant.

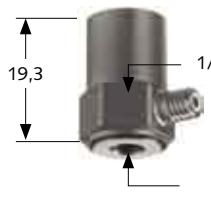
**Application**
Low frequency measurements, vibrations & oscillations in mechanical structures and for modal analysis in thermally stable environments.

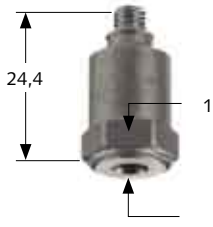
**Accessories**
Cable Type 1761B...
Coupler Type 5100 series
Adh. mounting pad Type 8434
Mounting magnet Type 8450A

**Data sheet** 8636C_000-227

# Vibration: Voltage Output

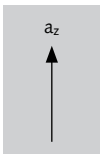
## K-Shear® Accelerometer




| Technical data | | Type 8702/04B25 | Type 8702/04B50 | Type 8702/04B100 |
|---|---|---|---|---|
| Range | g | ±25 | ±50 | ±100 |
| Sensitivity, ±5 % | mV/g | 200 | 100 | 50 |
| Frequency response, ±5 % | Hz | 1 … 8 000 | 0,5 … 10 000 | 0,5 … 10 000 |
| Threshold | $g_{rms}$ | 0,002 | 0,004 | 0,006 |
| Transverse sensitivity typ. | % | 1,5 | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 2 000 | 2 000 | 2 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 | –0,06 | –0,06 |
| Operating temperature range | °C | –55 … 100 | –55 … 100 | –55 … 100 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 | 2 … 20<br>20 … 30 | 2 … 20<br>20 … 30 |
| Housing/base | material | Titanium | Titanium | Titanium |
| Degree of protection (EN60529) | | IP68 | IP68 | IP68 |
| Mass | grams | 8,7/7,5 | 8,7/7,5 | 8,7/7,5 |
| Ground isolated | | with adapt./yes (M1) | with adapt./yes (M1) | with adapt./yes (M1) |

**Measuring direction**




**Connection**
10-32 neg.
Type 8702: side
Type 8704: top

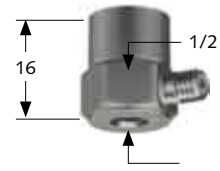
**Characteristics**
Low impedance voltage mode, ultra low base strain, low thermal transient response, quartz-shear sensing elements, CE compliant
Type 8702/4B…M1: ground isolated
Type 8702/4B…T: TEDS option.

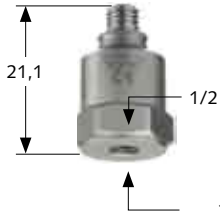
**Application**
General purpose vibration measurement, vehicle or environmental testing, ESS and modal analysis.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series
Adh. mounting pad Type 8436

**Data sheet** 8702B_000-239

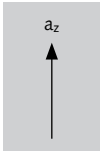
## K-Shear® Accelerometer




| Technical data | | Type 8702B500 | Type 8704B500 |
|---|---|---|---|
| Range | g | ±500 | ±500 |
| Sensitivity, ±5 % | mV/g | 10 | 10 |
| Frequency response, ±5 % | Hz | 1 … 10 000 | 1 … 10 000 |
| Threshold | $g_{rms}$ | 0,01 | 0,01 |
| Transverse sensitivity typ. | % | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 | –0,06 |
| Operating temperature range | °C | –55 … 120 | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 | 2 … 20<br>20 … 30 |
| Housing/base | material | Titanium | Titanium |
| Degree of protection (EN60529) | | IP68 | IP68 |
| Mass | grams | 8,2 | 7,1 |
| Ground isolated | | with adapt./yes (M1) | with adapt./yes (M1) |

**Measuring direction**




**Connection**
10-32 neg.
Type 8702: side
Type 8704: top

**Characteristics**
Low impedance voltage mode, ultra low base strain, low thermal transient response, quartz-shear sensing elements, CE compliant.
Type 8702/4B…M1: ground isolated
Type 8702B…M5: high temp. (165 °C)
Type 8702B…M8: low temp. (–195 °C)
Type 8702/4B…T: TEDS option.

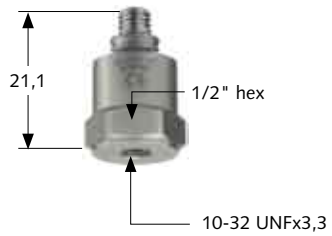
**Application**
General purpose vibration measurement, vehicle or environmental testing, ESS and modal analysis.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series
Adh. mounting pad Type 8436

**Data sheet** 8702B_000-238

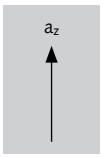
# Vibration: Voltage Output

## K-Shear® Shock Accelerometer




| Technical data | | Type 8704B5000 |
|---|---|---|
| Range | g | ±5 000 |
| Sensitivity, ±5 % | mV/g | 1 |
| Frequency response, ±5 % | Hz | 1 … 10 000 |
| Threshold | $g_{rms}$ | 0,13 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 10 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 |
| Operating temperature range | °C | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 7,1 |
| Ground isolated | | with adapt. |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Low impedance voltage mode, quartz-shear sensing elements, ultra low base strain, ultra low thermal transient response, CE compliant.

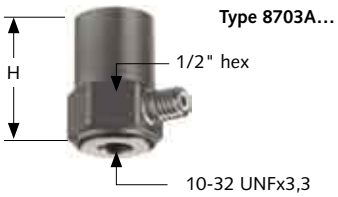
**Application**
Measurement and control during mechanical shock testing.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series
Adh. mounting pad Type 8436

**Data sheet** 8704B_000-240

## PiezoStar® Accelerometer

**Type 8703A…**

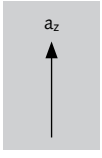



**Type 8705A…**




| Technical data | | Type 8703/05A50M5 | Type 8703/05A250M5 |
|---|---|---|---|
| Range | g | ±50 | ±250 |
| Sensitivity, ±5 % | mV/g | 100 | 20 |
| Frequency response, ±5 % | Hz | 0,5 … 10 000 | 0,5 … 10 000 |
| Threshold, nom. | $g_{rms}$ | 0,0012 | 0,006 |
| Transverse sensitivity, typ. | % | 3 | 3 |
| Non-linearity | %FSO | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 2 000 | 2 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,004 | –0,004 |
| Operating temperature range | °C | –55 … 165 | –55 … 165 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 | 2 … 20<br>20 … 30 |
| Housing/base | material | Titanium | Titanium |
| Degree of protection (EN60529) | | IP68 | IP68 |
| Mass | grams | 8,8/7,6 | 6,9/6,7 |
| Ground isolated | | with adapt./<br>M1 Option | with adapt./<br>M1 Option |
| Size (H) | mm | 19,3/24,4 | 16/20,8 |

**Measuring direction**




**Connection**
10-32 neg.
Type 8703: side
Type 8705: top

**Characteristics**
Low impedance voltage output, ultra low base strain, ultra low temp. coefficient of sensitivity with PiezoStar, CE compliant, Type 8703/5A…M1: ground isolated.

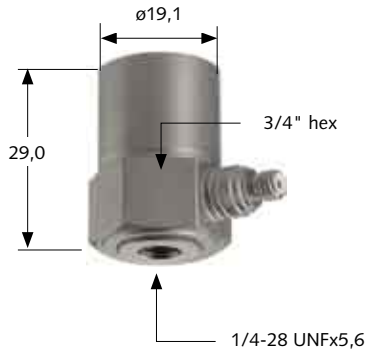
**Application**
Dynamic temperature environments. General purpose vibration measurement, vehicle or environmental testing, ESS and modal analysis.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series
Adh. mounting pad Type 8436

**Data sheet** 8703A_000-557

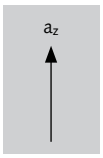
# Vibration: Voltage Output

## K-Shear® High Sensitivity Accelerometer




| Technical data | | Type 8712A5M1 |
|---|---|---|
| Range | g | ±5 |
| Sensitivity, ±5 % | mV/g | 1 000 |
| Frequency response, ±5 % | Hz | 0,5 … 8 000 |
| Threshold | $g_{rms}$ | 0,0004 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 1 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 |
| Operating temperature range | °C | –55 … 100 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 |
| Housing/base | material | stainless steel |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 51 |
| Ground isolated | | yes |

**Measuring direction**




**Connection**
10-32 neg.

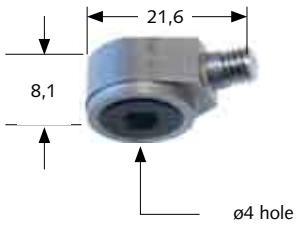
**Characteristics**
Low impedance voltage mode, very high sensitivity, quartz shear accuracy and stability, ultra low thermal transient response, sealed according to protection class IP68, ground isolated, CE compliant.

**Application**
Testing application where a rugged accelerometer with a wide frequency range is required: Precision automotive testings, ESS and industrial application.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series

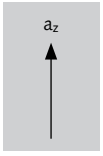
**Data sheet** 8712A_000-244

## Ceramic Shear Accelerometer




| Technical data | | Type 8714B100M5 | Type 8714B500M5 |
|---|---|---|---|
| Range | g | ±100 | ±500 |
| Sensitivity, ±10 % | mV/g | 50 | 10 |
| Frequency response, ±5 % | Hz | 1 … 10 000 | 1 … 10 000 |
| Threshold | $g_{rms}$ | 0,002 | 0,003 |
| Transverse sensitivity, typ. | % | 3 | 3 |
| Non-linearity | %FSO | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,14 | –0,16 |
| Operating temperature range | °C | –55 … 165 | –55 … 165 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 | 2 … 18<br>18 … 30 |
| Housing/base | material | Titanium/Al. | Titanium/Al. |
| Degree of protection (EN60529) | | IP68 | IP68 |
| Mass | grams | 5 | 4,2 |
| Ground isolated | | yes | yes |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Low impedance voltage mode, low profile, high temperature ceramic annular shear accelerometer, CE compliant.
Type 8714B…T: TEDS option.

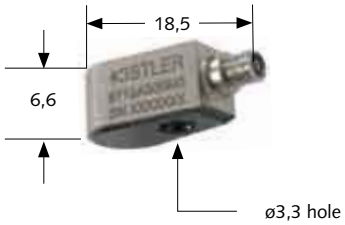
**Application**
Provides measurement solutions in hard-to-mount locations when cable orientation is important or height restrictions apply.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series

**Data sheet** 8714B_000-602

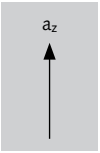
# Vibration: Voltage Output

## PiezoStar® Accelerometer




| Technical data | | Type 8715A5000M5 |
|---|---|---|
| Range | g | ±5 000 |
| Sensitivity, ±10 % | mV/g | 1 |
| Frequency response, ±5 % | Hz | 2 … 10 000 |
| Threshold, nom. | $g_{rms}$ | 0,04 |
| Transverse sensitivity, typ. | % | 3 |
| Non-linearity | %FSO | ±1 |
| Shock (0,2 ms pulse) | $g_{pk}$ | 8 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,01 |
| Operating temperature range | °C | –55 … 165 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 2,1 |
| Ground isolated | | yes |

**Measuring direction**




**Connection**
5-44 neg.

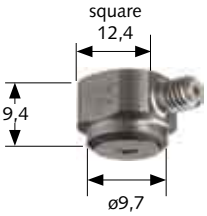
**Characteristics**
Low impedance voltage mode, unique PiezoStar element, ultra-low temperature sensitivity, ground isolated, lightweight, hermetically sealed, CE compliant.
Type 8715A…T: TEDS option.

**Application**
Shock and vibration measuring in dynamic temperature conditions. General application include: Environmental Testing (ESS) Product Acceptance/Qualification, and aviation testing.

**Accessories**
Cable Type 1766A…
Coupler Type 5100 series

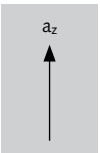
**Data sheet** 8715A_000-603

## K-Shear® Accelerometer




| Technical data | | Type 8720A500 |
|---|---|---|
| Range | g | ±500 |
| Sensitivity, ±5 % | mV/g | 10 |
| Frequency response, ±5 % | Hz | 1 … 10 000 |
| Threshold | $g_{rms}$ | 0,01 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 |
| Operating temperature range | °C | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 4,9 |
| Ground isolated | | yes |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Low impedance, voltage mode, quartz-shear sensing element, ultra low base strain sensitivity, ultra low thermal transients, lightweight, small size, ground isolated,
CE compliant.

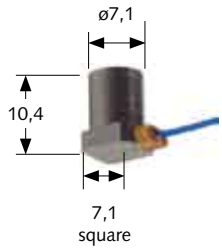
**Application**
Shock and vibration measuring on light structures. The small size allows for installation on items with limited mounting space.

**Accessories**
Cable Type 1761B...
Coupler Type 5100 series

Data sheet 8720A_000-246

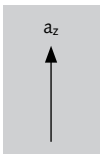
# Vibration: Voltage Output

## K-Shear® Miniature Accelerometer




| Technical data | | Type 8728A500 |
|---|---|---|
| Range | g | ±500 |
| Sensitivity, ±5 % | mV/g | 10 |
| Frequency response, ±5 % | Hz | 2 … 10 000 |
| Threshold | $g_{rms}$ | 0,02 |
| Transverse sensitivity typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 |
| Operating temperature range | °C | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP67 |
| Mass | grams | 1,6 |
| Ground isolated | | no |

**Measuring direction**




**Connection**
10-32 neg.

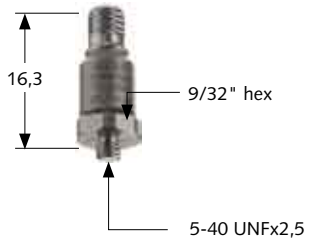
**Characteristics**
Low impedance voltage mode, small, lightweight. integral cable (2 m), quartz-shear stability and precision, CE compliant.

**Application**
Precision measurements on small, thin-walled structures or where space is limited. Ideal for high frequency vibration measurements.

**Accessories**
Ext. cable Type 1761B...
Coupler Type 5100 series

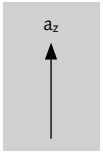
**Data sheet** 8728A_000-247

## K-Shear® Miniature Accelerometer




| Technical data | | Type 8730A500 | Type 8730A500M1 | Type 8730A500M8 |
|---|---|---|---|---|
| Range | g | ±500 | ±500 | ±500 |
| Sensitivity, ±10 % | mV/g | 10 | 10 | 10 |
| Frequency response, ±5 % | Hz | 2 … 10 000 | 2 … 7 000 | 2 … 10 000 |
| Threshold | $g_{rms}$ | 0,01 | 0,02 | 0,02 |
| Transverse sensitivity typ. | % | 1,5 | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 | 5 000 | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 | –0,06 | –0,06 |
| Operating temperature range | °C | –55 … 120 | –55 … 120 | –195 … 120 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | Titanium | Titanium | Titanium |
| Degree of protection (EN60529) | | IP68 | IP68 | IP68 |
| Mass | grams | 1,9 | 2,5 | 1,9 |
| Ground isolated | | with adapt. | yes | with adapt. |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Quartz-shear sensing element, low impedance output, ultra low base strain sensitivity, CE compliant.
Type 8730AE metric thread (M3x0,5, 8 mm hex) available (AE).

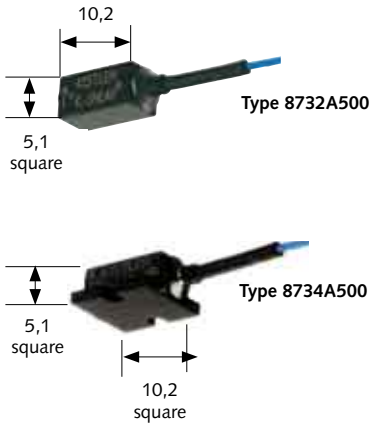
**Application**
Precision measurements on small, thin-walled structures and environmental testing.

**Accessories**
Cable Type 1761B...
Coupler Type 5100 series
Adh. mounting pad Type 8434

**Data sheet** 8730A_000-248

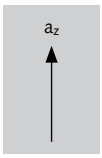
# Vibration: Voltage Output

## K-Shear® Accelerometer




| Technical data | | Type 8732A500 | Type 8734A500 |
|---|---|---|---|
| Range | g | ±500 | ±500 |
| Sensitivity, ±5 % | mV/g | 10 | 10 |
| Frequency response, ±5 % | Hz | 2 … 10 000 | 2 … 10 000 |
| Threshold | $g_{rms}$ | 0,01 | 0,01 |
| Transverse sensitivity, typ. | % | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 | –0,06 |
| Operating temperature range | °C | –55 … 120 | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | Al./Titanium | Al./Titanium |
| Degree of protection (EN60529) | | IP67 | IP67 |
| Mass | grams | 1,1 | 1,1 |
| Ground isolated | | yes | yes |

**Measuring direction**




**Connection**
10-32 neg.

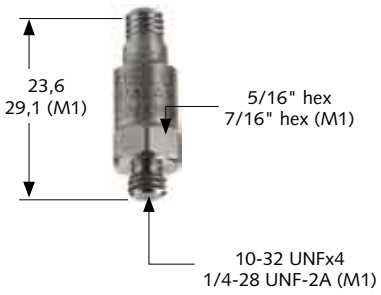
**Characteristics**
Low impedance voltage mode, quartz-shear sensing element, low profile and lightweight, standard automotive footprint and mounting, CE compliant, integral cable (2 m).

**Application**
Precision vibration measurement or modal analysis on small, thin-walled structures where space is limited.

**Accessories**
Ext. cable Type 1761B...
Coupler Type 5100 series

**Data sheet** 8732A_000-249

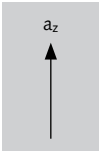
## K-Shear® Shock Accelerometer




Type 8742A… (Standard)
Type 8742A…M1 (Ground isolated)

| Technical data | | Type 8742A5 | Type 8742A10 | Type 8742A20 |
|---|---|---|---|---|
| Range | g | ±5 000 | ±10 000 | ±20 000 |
| Sensitivity, ±5 % | mV/g | 1 | 0,5 | 0,25 |
| Frequency response, ±10 % | Hz | 1 … 10 000 | 1 … 10 000 | 1 … 10 000 |
| Threshold, nom. | $g_{rms}$ | 0,13 | 0,25 | 0,5 |
| Transverse sensitivity, typ. | % | 1,5 | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock | $g_{pk}$ | 50 000 | 50 000 | 100 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 | –0,06 | –0,06 |
| Operating temperature range | °C | –55 … 120 | –55 … 120 | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 | 2 … 20<br>18 … 30 | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium/stainless steel | Titanium/stainless steel | Titanium/stainless steel |
| Degree of protection (EN60529) | | IP68 | IP68 | IP68 |
| Mass | grams | 4,5/8,2 (M1) | 4,5/8,2 (M1) | 4,5/8,2 (M1) |
| Ground isolated | | no/yes (M1) | no/yes (M1) | no/yes (M1) |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Low impedance voltage mode, unique quartz-shear sensing element, low transverse sensitivity, high resonant frequency, CE compliant, Type 8742A… (std): ground isolated (4,5 grams).

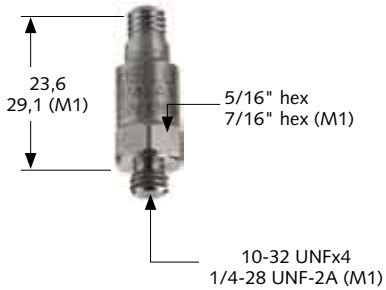
**Application**
Impact and vibration related application including shock and vehicle testing.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series

**Data sheet** 8742A_000-250

# Vibration: Voltage Output

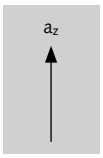
## K-Shear® Shock Accelerometer




Type 8742A… (Standard)
Type 8742A…M1 (Ground isolated)

| Technical data | | Type 8742A50 |
|---|---|---|
| Range | g | ±50 000 |
| Sensitivity, ±5 % | mV/g | 0,1 |
| Frequency response, ±10 % | Hz | 1 … 10 000 |
| Threshold | $g_{rms}$ | 1,3 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 100 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 |
| Operating temperature range | °C | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium/stainless steel |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 4,5/8,2 (M1) |
| Ground isolated | | no/yes (M1) |

**Measuring direction**




**Connection**
10-32 neg.

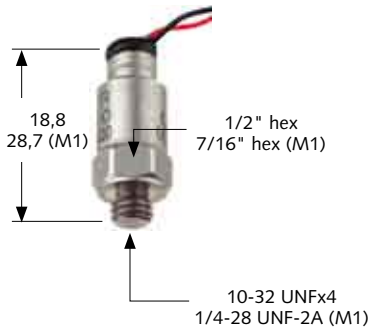
**Characteristics**
Low impedance voltage mode, unique quartz-shear sensing element, low transverse sensitivity, wide bandwidth, high resonant frequency, CE compliant,
Type 8742A… (std): ground isolated (4,5 grams).

**Application**
Impact and vibration related application including shock and vehicle testing.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series

**Data sheet** 8742A_000-250

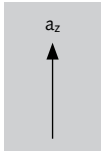
## K-Shear® Shock Accelerometer




Type 8743A… (Standard)
Type 8743A…M1 (Ground isolated)

| Technical data | | Type 8743A100 |
|---|---|---|
| Range | g | ±100 000 |
| Sensitivity, ±5 % | mV/g | 0,05 |
| Frequency response, ±7 % | Hz | 0,5 … 10 000 |
| Threshold | $g_{rms}$ | 2,6 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 120 000/150 000 (M1) |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 |
| Operating temperature range | °C | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium/stainless steel |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 4,5/9 (M1) |
| Ground isolated | | no/yes (M1) |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Low impedance, voltage mode, unique quartz sensing element, low transverse sensitivity, wide bandwidth, high resonant frequency, CE compliant.
Type 8743A... (std.): ground isolated option (4,5 grams), 1 m integral cable.

**Application**
Impact and vibration related application including shock and vehicle testing.

**Accessories**
Ext. cable Type 1761B...
Coupler Type 5100 series

**Data sheet** 8743A_000-564

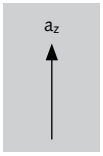
# Vibration: Voltage Output

## K-Shear® Industrial Accelerometer




| Technical data | | Type 8752A50 | Type 8752A50M5 |
|---|---|---|---|
| Range | g | ±50 | ±50 |
| Sensitivity | mV/g | 100 (±5) | 100 (±10) |
| Frequency response | Hz | 0,5 … 5 000 | 1 … 5 000 |
| Threshold (noise $\mu V_{rms}$) | $g_{rms}$ | 0,002 | 0,002 |
| Transverse sensitivity typ. | % | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 2 000 | 2 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,03 | –0,03 |
| Operating temperature range | °C | –55 … 120 | –55 … 165 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | stainless steel | stainless steel |
| Degree of protection (EN60529) | | IP68 | IP68 |
| Mass | grams | 115 | 115 |
| Ground isolated | | yes | yes |

**Measuring direction**




**Connection**
2 pin
MIL-C-5015/s

**Characteristics**
Low impedance voltage mode, quartz-shear stability & precision, insensitive to thermal transients, case and ground isolated, CE compliant.

**Application**
Industrial application for machinery monitoring, pre-dictive maintenance and analysis of gears and anti-friction bearings.

**Accessories**
Cables Type 1770A..., 1772A..., 1776A..., 1778A...
Coupler Type 5100 series

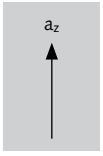
**Data sheet** 8752A_000-251

## Ceramic Shear Accelerometer




| Technical data | | Type 8772A5 | Type 8772A10 | Type 8772A50 |
|---|---|---|---|---|
| Range | g | ±5 | ±10 | ±50 |
| Sensitivity, ±5 % | mV/g | 1 000 | 500 | 100 |
| Frequency response, ±5 % | Hz | 1 … 5 000 | 1 … 5 000 | 1 … 5 000 |
| Threshold | $g_{rms}$ | 0,0004 | 0,0005 | 0,002 |
| Transverse sensitivity, typ. | % | <5 | <5 | <5 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (0,2 ms pulse) | $g_{pk}$ | 5 000 | 7 000 | 7 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,15 | –0,1 | –0,1 |
| Operating temperature range | °C | 0 … 65 | 0 … 65 | 0 … 65 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | Al. hard anodized | Al. hard anodized | Al. hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 | IP66 |
| Mass | grams | 8 | 8 | 8 |
| Ground isolated | | yes | yes | yes |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Low impedance voltage mode, lightweight, ceramic shear sensing element, cube shaped for mounting flexibility, CE compliant.
Type 8772A...T: TEDS option.

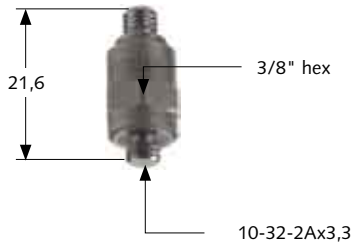
**Application**
Modal analysis application exposed to environmental factors.

**Accessories**
Cable Type 1761B...
Coupler Type 5100 series
Mounting clip Type 8474

**Data sheet** 8772A_000-253

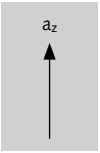
# Vibration: Voltage Output

## Ceramic Shear Accelerometer




| Technical data | | Type 8774A50 |
|---|---|---|
| Range | g | ±50 |
| Sensitivity, ±5 % | mV/g | 100 |
| Frequency response, ±5 % | Hz | 1 … 10 000 |
| Threshold, nom. | $g_{rms}$ | 0,0025 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±0,5 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,14 |
| Operating temperature range | °C | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 4 |
| Ground isolated | | with adapt. |

**Measuring direction**




**Connection**
10-32 neg.

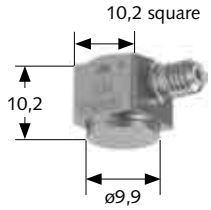
**Properties**
Low impedance voltage mode, high sensitivity, high resolution ceramic shear sensing element, priced for OEM application, CE compliant.

**Areas of application**
General purpose vibration measurement.

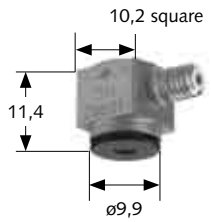
**Accessories**
Cable Type 1761B…
Coupler Type 5100 series
Adh. mounting pad Type 8436
Mnt. cube Type 8524

**Data sheet** 8774A_000-255

## Ceramic Shear Accelerometer



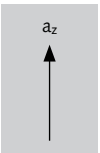

**Type 8776A…**




**Type 8776A…M1**
**Type 8776A…M3**

| Technical data | | Type 8776A50 | Type 8776A50M1 | Type 8776A50M3 |
|---|---|---|---|---|
| Range | g | ±50 | ±50 | ±50 |
| Sensitivity, ±15 % | mV/g | 100 | 100 | 100 |
| Frequency response, ±5 % | Hz | 1 … 7 000 | 1 … 7 000 | 0,5 … 4 000 |
| Threshold, nom. | $g_{rms}$ | 0,0025 | 0,0025 | 0,003 |
| Transverse sensitivity, typ. | % | 1,5 | 1,5 | 3 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 | 5 000 | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,14 | –0,14 | –0,14 |
| Operating temperature range | °C | –55 … 120 | –55 … 120 | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 | 2 … 20<br>18 … 30 | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium | Titanium | Titanium |
| Degree of protection (EN60529) | | IP68 | IP68 | IP68 |
| Mass | grams | 4,0 | 4,0 | 4,3 |
| Ground isolated | | no | yes | yes |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
High sensitivity, high resolution ceramic shear sensing element, CE compliant.
Type 8776A…M1: ground isolated
Type 8776A…M3: extended low, frequency and ground isolated.

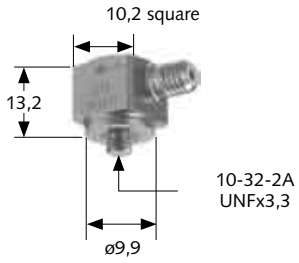
**Application**
Modal/structural analysis.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series
Mnt. cube: Type 8526

**Data sheet** 8774A_000-255

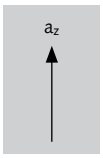
# Vibration: Voltage Output

## Ceramic Shear Accelerometer




| Technical data | | Type 8776A50M6 |
|---|---|---|
| Range | g | ±50 |
| Sensitivity, ±15 % | mV/g | 100 |
| Frequency response, ±5 % | Hz | 1 … 10 000 |
| Threshold, nom. | $g_{rms}$ | 0,0025 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,14 |
| Operating temperature range | °C | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 4,5 |
| Ground isolated | | with adapt. |

**Measuring direction**




**Connection**
10-32 neg.

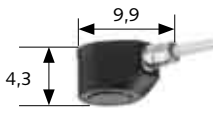
**Characteristics**
Low impedance voltage mode, high sensitivity, high resolution ceramic shear sensing element, CE compliant.

**Application**
General purpose vibration measurement.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series
Adh. mounting pad Type 8436

**Data sheet** 8774A_000-255

## Ceramic Shear Miniature Accelerometer



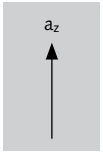

**Type 8778A…**
coaxial,
10-32 neg.




**Type 8778A…M14**
twisted pair,
10-32 neg.

| Technical data | | Type 8778A500 | Type 8778A500M14 |
|---|---|---|---|
| Range | g | ±500 | ±500 |
| Sensitivity, ±5 % | mV/g | 10 | 10 |
| Frequency response, ±5 % | Hz | 2 … 9 000 | 2 … 9 000 |
| Threshold, nom. | $g_{rms}$ | 0,01 | 0,01 |
| Transverse sensitivity, typ | % | 3 | 3 |
| Non-linearity | %FSO | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,14 | –0,14 |
| Operating temperature range | °C | –55 … 120 | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 | 2 … 20<br>18 … 30 |
| Housing/base | material | Al./Titanium | Al./Titanium |
| Degree of protection (EN60529) | | IP66 | IP66 |
| Mass | grams | 0,4 | 0,4 |
| Ground isolated | | yes | yes |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Low impedance voltage mode, ultra low base strain, low mass, ground isolated, CE compliant, integral cable (user specified length).

**Application**
Environmental/product testing on small, thin walled structures or where space is limited and mass loading is of primary concern.

**Accessories**
Extension cable Type 1761B…
Coupler Type 5100 series
Removal tool Type 1378

**Data sheet** 8778A_000-256

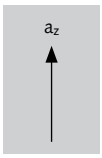
# Vibration: Voltage Output

## Ceramic Shear Accelerometer




| Technical data | | Type 8784A5 | Type 8786A5 |
|---|---|---|---|
| Range | g | ±5 | ±5 |
| Sensitivity, ±10 % | mV/g | 1 000 | 1 000 |
| Frequency response, ±5 % | Hz | 1 … 6 000 | 1 … 6 000 |
| Threshold, nom. | $g_{rms}$ | 0,0004 | 0,0004 |
| Transverse sensitivity, typ. | % | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 2 500 | 2 500 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 | –0,06 |
| Operating temperature range | °C | –55 … 80 | –55 … 80 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium | Titanium |
| Degree of protection (EN60529) | | IP68 | IP68 |
| Mass | grams | 21 | 21 |
| Ground isolated | | with adapt. | with adapt. |

**Measuring direction**




**Connection**
10-32 neg.
Type 8784A5:...
Type 8786A5:...

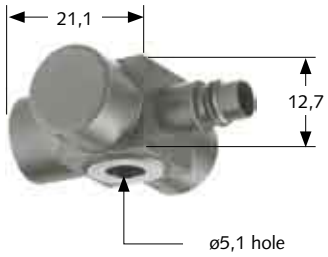
**Characteristics**
Low impedance voltage mode, ceramic shear sensing element, high sensitivity, high resolution, CE compliant.

**Application**
Low level vibration and impact testing for application including condition monitoring and vehicle testing.

**Accessories**
Cable Type 1761B…
Coupler Type 5100 series
Adh. mounting pad Type 8436

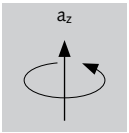
**Data sheet** 8784A_000-257

## K-Shear® Axial Rotational Accelerometer




| Technical data | | Type 8838 |
|---|---|---|
| Range | krads/s² | ±150 |
| Sensitivity | µV/rad/s² | 34 ±2 |
| Frequency response | Hz | 1 … 2 000 |
| Threshold, nom. | rads/s² | 4 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | g | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 |
| Operating temperature range | °C | –55 … 120 |
| Power supply | mA<br>VDC | 4<br>20 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 18,5 |
| Ground isolated | | yes |

**Measuring direction**




**Connection**
4 pin pos.

**Characteristics**
Low impedance voltage mode, shear quartz piezoelectric principal, axial or lateral oscillations, hermetic construction, lightweight and convenient thru hole mount, CE compliant.

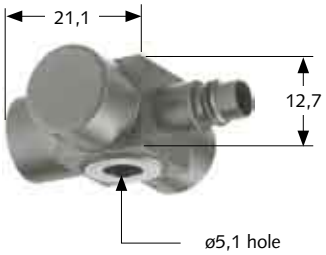
**Application**
Axial or shaft type measurements on an oscillating but non-rotating specimen.

**Accessories**
Cables Type 1592M1..., 1578A, 1786C...

**Data sheet** 8838_000-271

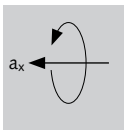
# Vibration: Voltage Output

## K-Shear® Lateral Rotational Accelerometer




| Technical data | | Type 8840 |
|---|---|---|
| Range | krads/s² | ±150 |
| Sensitivity | µV/rad/s² | 34 ±2 |
| Frequency response | Hz | 1 … 2 000 |
| Threshold, nom. | rads/s² | 4 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | g | 5 000 |
| Temp. coeff. sensitivity typ. | %/°C | –0,06 |
| Operating temperature range | °C | –55 … 120 |
| Power supply | mA<br>VDC | 4<br>20 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 18,5 |
| Ground isolated | | yes |

**Measuring direction**




side rotation

**Connection**
4 pin pos.

**Characteristics**
Voltage output, shear quartz piezoelectric, lateral oscillations, hermetic construction, lightweight and convenient thru hole mount, CE compliant.

**Application**
Axial or shaft type measurements on plate or lateral rotational acceleration measurements.

**Accessories**
Cables Type 1592M1…, 1578A, 1786C…

**Data sheet** 8838_000-271

# Acoustic Emission

Acoustic Emission (AE) are transient elastic waves during the rapid release of energy from localized sources within a material. AE waves range in frequency from a few kHz to several MHz.

The source of these emissions in metals is closely associated with the dislocation movements accompanying plastic deformation and the initiation and extension of cracks in a structure under stress. Sources of AE include melting, phase transformation, thermal stresses, cool down cracking, friction mechanisms and stress build up.

The AE sensor can be used to monitor processes such as:

- Stamping
- Deep drawing
- Cutting tool breakage
- Fracture of metal or composite pressure vessels
- Fracture of stressed structures/bridges
- Detecting loose parts in an electronic assembly
- Detecting, locating and evaluating flaws in materials
- Insect activity in wood
- Steam valve leaks
- Partial discharge in transformers

AE sensors can warn of faults when they are occuring, not just whether or not they exist like traditional non-destructive text methods, i.e. x-ray, dye penetrants, eddy current, ultrasonic transmission or microscopic inspection. Detectable AE signals are emitted before visual signs of fracture or cracking appear.



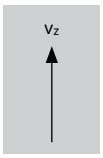
# Acoustic Emission: Voltage Output, Acoustic Emission Sensor

## Piezotron® Ceramic Shear Acoustic Emission Sensor




| Technical data | | Type 8152B1 | Type 8152B2 |
|---|---|---|---|
| Frequency response, ±10 dB | kHz | 50 … 400 | 100 … 900 |
| Sensitivity (nom.) | dBref $_{1V (m/s)}$ | 57 | 48 |
| Overload shock 0,5 ms pulse | g | 2 000 | 2 000 |
| Operating temperature range | °C | –40 … 60 | –40 … 60 |
| Supply: Constant current | mA | 3 … 6 | |
| Supply: Voltage (coupler) | VDC | 5 … 36 | 5 … 36 |
| Output voltage (FSO) | V | ±2 | ±2 |
| Output bias | VDC | 2,2 | 2,5 |
| Mass | grams | 29 | 29 |
| Housing | material | stainless steel | stainless steel |
| Degree of protection (EN60529) | | PUR IP65<br>Viton® IP67 | PUR IP65<br>Viton® IP67 |
| Ground isolation | | yes | yes |

**Measuring direction**




**Connection**
pigtails

**Characteristics**
Voltage output, high sensitivity and wide frequency range, inherent highpass characteristic, robust, suitable for industrial use (degree of protection I65 resp. I67), ground isolated, CE compliant, integral cable. Other cable length available.
Type 8152B:...1: PUR cable
Type 8152B:...2: Viton® cable

**Application**
Measurement of very high frequency phenomena particularly on machine structures. Crack formation investigations, fatigue studies and machine tool diagnostics.

**Accessories**
Magnetic clamp Type 8443B
AE Coupler Type 5125B...

**Data sheet** 8152B_000-204

## Acoustic Emission (AE) Coupler



| Technical data | | Type 5125B |
|---|---|---|
| Sensor excitation current | mA | 4 |
| Sensor signal voltage | $V_{pp}$ | 1,6 |
| Frequency response, –5 % | kHz | 15 … 1 000 |
| Output voltage | V | 0 … ±5 |
| Gain | | 10, 100 |
| Power | mA<br>VDC | <70<br>15 … 36 |
| Operating temperature range | °C | 0 … 60 |
| Housing | material | Aluminum |
| Dimensions (WxHxD) | mm | 115x35x64 |
| Mass | kg | 0,27 |

**Connection**
Input: BNC neg. or cable strain relief

Output: 8 pin round connector DIN 45326

**Characteristics**
Built-in RMS converter and limit monitor, plug-in filter elements, rugged case, vibration-proof construction, CE compliant.

**Application**
Acoustic emission (AE) sensors.

**Accessories**
8 pin round connector Type 1500A57
Low/high pass filters

**Specify version**
Request data sheet order options

**Data sheet** 5125B_000-322

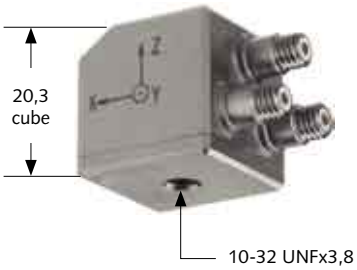
# Triaxial

The PiezoBeam, Ceramic Shear, K-Shear® and K-Beam® technologies have been packaged into triaxial assemblies providing a convenient means to obtain three orthogonal data sets from a single sensor. The integral package is less cost than three separate accelerometers mounted to a common center and typically easier to set-up and operate due to mounting and cabling considerations.



## Triaxial: Charge Output, High Temperature

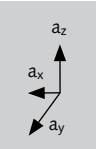
### Ceramic Shear Triaxial Accelerometer




| Technical data | | Type 8290A25M5 |
|---|---|---|
| Range | g | ±1 000 |
| Sensitivity, ±15 % | pC/g | –25 |
| Frequency response, ±10 % | Hz | 5 … 4 000 |
| Threshold, nom. | $g_{rms}$ | * |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Temp. coeff.: Sensitivity | %/°C | 0,13 |
| Operating temperature range | °C | –70 … 250 |
| Housing/base | material | stainless steel |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 53 |
| Ground Isolated | | no |

* Threshold for high impedance accelerometers depend upon charge amplifier settings, call Kistler for details.

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
High impedance, charge mode Ceramic Shear sensing element, low transverse sensitivity, long-term stability at extended temperatures.

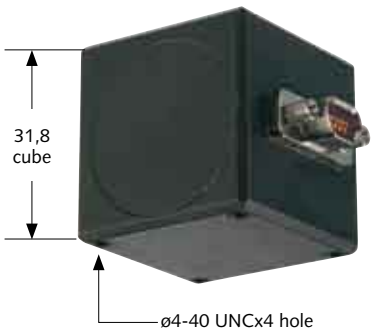
**Application**
General vibration measurements with varying test conditions, vehicle vibration and NVH testing, general laboratory and ESS.

**Accessories**
Cable Type 1631C…
Charge converter Type 5050A…
Coupler Type 5100 series
Mounting studs Type 8402, 8411

**Data sheet** 8290A_000-215

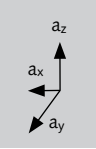
## Capacitance Accelerometer

### K-Beam® Capacitive Triaxial Accelerometer




| Technical data | | Type 8393B2 | Type 8393B10 |
|---|---|---|---|
| Range | g | ±2 | ±10 |
| Sensitivity, ±5 % | mV/g | 1 000 | 200 |
| Output at zero g | mV | 0 ±30 | 0 ±30 |
| Frequency response, ±5 % | Hz | 0 … 250 | 0 … 180 |
| Non-linearity | %FSO | ±0,8 | ±0,8 |
| Resolution/threshold | $g_{rms}$ | 540 | 2 830 |
| Transverse sensitivity, typ. | % | 1 | 1 |
| Shock (700 µs half sine) | $g_{pk}$ | 6 000 | 6 000 |
| Temp. coeff.: Bias | mg/°C | 0,2 | 1 |
| Temp. coeff.: Sensitivity | %/°C | 0,02 | 0,02 |
| Phase shift max. @ 100 Hz | ° | 20 | 20 |
| Operating temperature range | °C | –40 … 85 | –40 … 85 |
| Current nom. | mA | 4 | 4 |
| Voltage | VDC | 3,8 … 32 | 3,8 … 32 |
| Housing/base | material | Al. hard anodized | Al. hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 |
| Mass | grams | 60 | 60 |

**Measuring direction**




**Connection**
9 pin micro D pos.

**Characteristics**
Bipolar output, 2 V FS, zero volt output at zero g, ground isolated, low noise, operating from voltage supply 3,8 ... 32 VDC, CE compliant.

**Application**
Structural dynamics for bridges and buildings; transportation, robotics, human motion and seismic ground measurements.

**Accessories**
Cable Type 1790A2
Cap screw 4-40 UNC x 4,8 mm

**Data sheet** 8393B_000-568

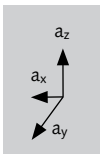
# Triaxial: Voltage Output

## PiezoBeam® Triaxial Accelerometer




| Technical data | | Type 8690C5 | Type 8690C10 | Type 8690C50 |
|---|---|---|---|---|
| Range | g | ±5 | ±10 | ±50 |
| Sensitivity, ±5 % | mV/g | 1 000 | 500 | 100 |
| Frequency response, ±5 % | Hz | 1 … 3 000 | 1 … 5 000 | 1 … 6 000 |
| Threshold, nom. | $g_{rms}$ | 0,00012 | 0,00028 | 0,001 |
| Transverse sensitivity, typ. | % | <1 | <1 | <1 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (0,2 ms pulse) | $g_{pk}$ | 5 000 | 10 000 | 10 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,04 | 0,08 | 0,08 |
| Operating temperature range | °C | 0 … 65 | 0 … 65 | 0 … 65 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | Al. hard anodized | Al. hard anodized | Al. hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 | IP66 |
| Mass | grams | 11,2 | 11,2 | 11,2 |
| Ground isolated | | yes | yes | yes |

**Measuring direction**




**Connection**
4 pin pos.

**Characteristics**
Low impedance voltage mode, high sensitivity low mass, ground isolated CE compliant.
Type 8690C...T: TEDS version.

**Application**
Modal analysis or structural testing.

**Accessories**
Cable Type 1756B...,
Extension cable Type 1578A...
Coupler Type 5100 series
Mounting clip Type 8476

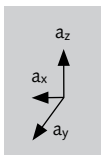
**Data sheet** 8690C_000-234

## PiezoBeam® Triaxial Accelerometer




| Technical data | | Type 8692C5 | Type 8692C10 | Type 8692C50 |
|---|---|---|---|---|
| Range | g | ±5 | ±10 | ±50 |
| Sensitivity, ±5 % | mV/g | 1 000 | 500 | 100 |
| Frequency response, ±5 % | Hz | 1 … 3 000 | 1 … 5 000 | 1 … 6 000 |
| Threshold, nom. | $g_{rms}$ | 0,00012 | 0,00028 | 0,001 |
| Transverse sensitivity, typ. | % | <1 | <1 | <1 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (0,2 ms pulse) | $g_{pk}$ | 5 000 | 10 000 | 10 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,04 | 0,08 | 0,08 |
| Operating temperature range | °C | 0 … 65 | 0 … 65 | 0 … 65 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | Al. hard anodized | Al. hard anodized | Al. hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 | IP66 |
| Mass | grams | 16 | 16 | 16 |
| Ground isolated | | yes | yes | yes |

**Measuring direction**




**Connection**
4 pin pos.

**Characteristics**
Low impedance voltage mode, high sensitivity, thermal stability, CE compliant.

**Application**
Modal analysis or structural testing.

**Accessories**
Cable Type 1756B...
Extension cable Type 1578A...
Coupler Type 5100 series

**Data sheet** 8692C_000-236

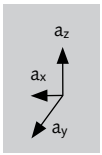
# Triaxial: Voltage Output

## PiezoBeam® Triaxial Accelerometer




| Technical data | | Type 8692C5M1 | Type 8692C10M1 | Type 8692C50M1 |
|---|---|---|---|---|
| Range | g | ±5 | ±10 | ±50 |
| Sensitivity, ±5 % | mV/g | 1 000 | 500 | 100 |
| Frequency response, ±5 % | Hz | 1 … 3 000 | 1 … 5 000 | 1 … 6 000 |
| Threshold, nom. | $g_{rms}$ | 0,00012 | 0,00028 | 0,001 |
| Transverse sensitivity, typ. | % | <1 | <1 | <1 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (0,2 ms pulse) | $g_{pk}$ | 5 000 | 10 000 | 10 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,04 | 0,08 | 0,08 |
| Operating temperature range | °C | 0 … 65 | 0 … 65 | 0 … 65 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | Al. hard anodized | Al. hard anodized | Al. hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 | IP66 |
| Mass | grams | 16 | 16 | 16 |
| Ground isolated | | yes | yes | yes |

**Measuring direction**




**Connection**
4 pin pos.

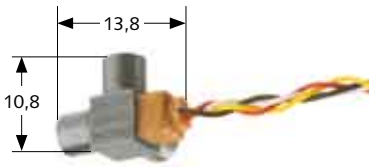
**Characteristics**
Low impedance voltage mode, high sensitivity, thermal stability, CE compliant.

**Application**
Modal analysis or structural testing.

**Accessories**
Cable Type 1756B...
Extension cable Type 1578A...
Coupler Type 5100 series

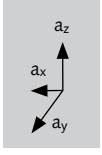
**Data sheet** 8692C_000-236

## Piezotron® Miniature Quartz Compression Accelerometer




| Technical data | | Type 8694M1 |
|---|---|---|
| Range | g | ±500 |
| Sensitivity, ±5 % | mV/g | 4 |
| Frequency response, ±5 % | Hz | 10 … 20 000 |
| Threshold, nom. | $g_{rms}$ | 0,025 |
| Temp. coeff.: Sensitivity | % | <5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse width) | $g_{pk}$ | 2 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,05 |
| Operating temperature range | °C | –196 … 135 |
| Power supply | mA<br>VDC | 2 … 18<br>12 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP66 |
| Mass | grams | 2,5 |
| Ground isolated | | with adapt. |

**Measuring direction**




**Connection**
4 pin neg.

**Characteristics**
Low impedance voltage mode, small size and lightweight, very high resonant frequency, CE compliant. Integral cable (user-specific length).

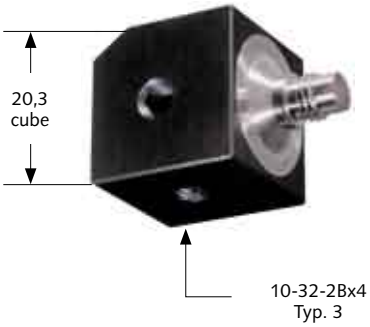
**Application**
Dynamic characteristics of very light test objects, measuring of vibrations on thin-walled structures, modal testing.

**Accessories**
Anodized adapter Types 8439, 8440 for ground isolation
Extension cable Types 1578A..., 1576
Coupler Type 5100 series
Pad Type 8440

**Data sheet** 8694M_000-237

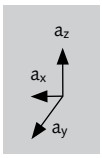
# Triaxial: Voltage Output

## Annular Ceramic Shear Triaxial Accelerometer




| Technical data | | Type 8762A5 | Type 8762A10 | Type 8762A50 |
|---|---|---|---|---|
| Range | g | ±5 | ±10 | ±50 |
| Sensitivity, ±5 % | mV/g | 1 000 | 500 | 100 |
| Frequency response, ±5 % | Hz | 0,5 … 6 000 | 0,5 … 6 000 | 0,5 … 6 000 |
| Threshold, nom. | $g_{rms}$ | 0,0003 | 0,00035 | 0,0012 |
| Transverse sensitivity typ. | % | <5 | <5 | <5 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (0,2 ms pulse) | $g_{pk}$ | 5 000 | 7 000 | 7 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,06 | –0,02 | –0,02 |
| Operating temperature range | °C | –55 … 80 | –55 … 80 | –55 … 80 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | | Al. hard anodized | Al. hard anodized | Al. hard anodized |
| Degree of protection (EN60529) | | IP66 | IP66 | IP66 |
| Mass | grams | 23 | 23 | 23 |
| Ground isolated | | yes | yes | yes |

**Measuring direction**




**Connection**
4 pin pos.

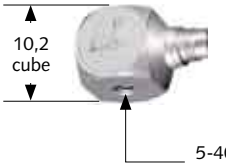
**Characteristics**
Voltage output, high sensitivity, low noise, cube shaped, ground isolated, 3 threaded holes, 10-32UNF, CE compliant.

**Application**
Modal analysis, automotive bodies and aircraft structures, general vibrations.

**Accessories**
Cable Type 1756B...
Extension Cable Type 1578A
Coupler Type 5100 series

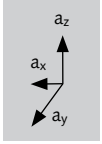
**Data sheet** 8762A_000-456

## Ceramic Shear Triaxial Accelerometer




| Technical data | | Type 8763A50 | Type 8763A500 | Type 8763A1000 |
|---|---|---|---|---|
| Range | g | ±50 | ±500 | ±1 000 |
| Sensitivity, ±10 % | mV/g | 100 | 10 | 5 |
| Frequency response, ±5 % | Hz | 0,5 … 7 000 | 1 … 12 000 | 1 … 10 000 |
| Threshold, nom. | $g_{rms}$ | 0,0003 | 0,01 | 0,02 |
| Transverse sensitivity, typ. | % | 2,5 | 2,5 | 3,5 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (1 ms pulse width) | $g_{pk}$ | 500 | 5 000 | 5 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,06 | –0,15 | –0,15 |
| Operating temperature range<br>Type 8763A…M5 | °C<br>°C | –55 … 90<br>not available | –55 … 120<br>–55 … 165 | –55 … 120<br>–55 … 165 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 | 2 … 20<br>18 … 30 | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium | Titanium | Titanium |
| Degree of protection (EN60529) | | IP68 | IP68 | IP68 |
| Mass | grams | 4,5 | 3,3 | 3 |
| Ground isolated | | with adapt. | with adapt. | with adapt. |

**Measuring direction**




**Connection**
Mini 4 pin pos.

**Characteristics**
Voltage output, cube shaped, miniature, low mass, 3 5-40 threaded holes, mini 4 pin connector, low base strain sensitivity, CE compliant
Type 8763A...M5: high temperature (500/1 000 g only)
Type 8763A...T: TEDS option.

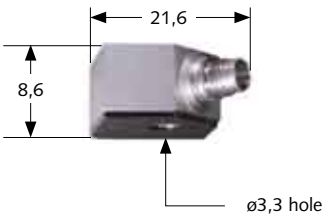
**Application**
Dynamic vibration, shock measurement, light weight structures.

**Accessories**
Cable Type 1784AK03
Coupler Type 5100 series
Pad Type 8434

**Data sheet** 8763A_000-474

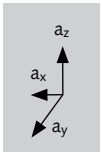
# Triaxial: Voltage Output

## PiezoStar® Miniature Triaxial Shear Accelerometer




| Technical data | | Type 8765A250M5 |
|---|---|---|
| Range | g | ±250 |
| Sensitivity, ±10 % | mV/g | 20 |
| Frequency response, ±5 % | Hz | 1 … 9 000 |
| Threshold, nom. | $g_{rms}$ | 0,002 |
| Transverse sensitivity, typ. | % | 2,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse width) max. | $g_{pk}$ | 5 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,004 |
| Operating temperature range | °C | –55 … 165 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 6,4 |
| Ground isolated | | yes |

**Measuring direction**




**Connection**
Mini 4 pin pos.

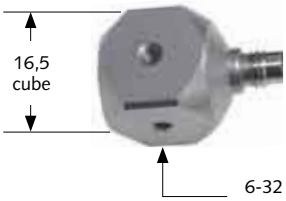
**Characteristics**
Voltage output, ultra low thermal sensitivity variation with PiezoStar, ground isolated, mini 4 pin connector, CE compliant

**Application**
Modal analysis, automotive bodies and aircraft structures, general vibrations.

**Accessories**
Insulated mounting screw 4-40x1/2
Cable Type 1784AK03
Coupler Type 5100 series

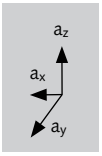
**Data sheet** 8765A_000-472

## PiezoStar® Triaxial Accelerometer




| Technical data | | Type 8766A50 | Type 8766A50M5 |
|---|---|---|---|
| Range | g | ±50 | ±50 |
| Sensitivity, ±10 % | mV/g | 100 | 100 |
| Frequency response, ±5 % | Hz | 0,5 … 5 000 | 0,5 … 5 000 |
| Threshold, nom. | $g_{rms}$ | 0,001 | 0,001 |
| Transverse sensitivity, typ. | % | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 | 5 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,004 | –0,004 |
| Operating temperature range | °C | –55 … 120 | –55 … 165 |
| Power supply | mA<br>VDC | 2 … 18<br>18 … 30 | 2 … 18<br>18 … 30 |
| Housing/base | material | Titanium | Titanium |
| Degree of protection (EN60529) | | IP68 | IP68 |
| Mass | grams | 16 | 16 |
| Ground isolated | | with adapt. | with adapt. |

**Measuring direction**




**Connection**
4 pin pos.

**Characteristics**
PiezoStar element, +165 °C operation, TEDS, hermetic, titanium construction, low temperature and base strain sensitivity, low impedance voltage output, CE compliant.
Type 8766A…T: TEDS version.

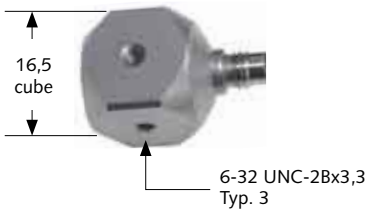
**Application**
Application include automotive under the hood and under the vehicle testing as well as subsystem vibration testing for aerospace application.

**Accessories**
Cable Type 1756B…
Coupler Type 5100 series
Adh. mounting pad Type 8436 (w/ Type 8430K03 stud 10-32 ... 6-32)

**Data sheet** 8766A_000-607

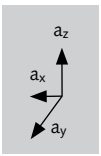
# Triaxial: Voltage Output

## PiezoStar® TEDS Triaxial Accelerometer




| Technical data | | Type 8766A50T |
|---|---|---|
| Range | g | ±50 |
| Sensitivity, ±10 % | mV/g | 100 |
| Frequency response, ±5 % | Hz | 0,5 … 5 000 |
| Threshold ,nom. | $g_{rms}$ | 0,001 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms Puls) | $g_{pk}$ | 5 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,004 |
| Operating temperature range | °C | –40 … 120 |
| Power supply | mA<br>VDC | 2 … 20<br>18 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 16 |
| Ground isolated | | with adapt. |

**Measuring direction**




**Connection**
4 pin pos.

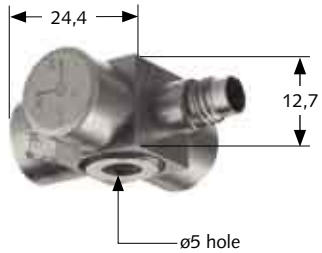
**Characteristics**
Voltage output, PiezoStar element, 165°C operation, hermetic titanium construction, low temperature and base strain sensitivity, CE compliant. Type 8766A...T: TEDS option.

**Application**
Application include automotive under the hood and under the vehicle testing as well as subsystem vibration testing for aerospace application.

**Accessories**
Cable Type 1756B…
Coupler Type 5100 series
Adh. mounting pad Type 8436 (w/ Type 8430K03 stud 10-32 ... 6-32)

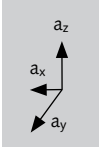
**Data sheet** 8766A_000-607

## K-Shear® Triaxial Accelerometer




| Technical data | | Type 8792A25 | Type 8792A50 | Type 8792A100 |
|---|---|---|---|---|
| Range | g | ±25 | ±50 | ±100 |
| Sensitivity, ±5 % | mV/g | 200 | 100 | 50 |
| Frequency response, ±5 % | Hz | 1 … 5 000 | 0,5 … 5 000 | 0,5 … 5 000 |
| Threshold, nom. | $g_{rms}$ | 0,002 | 0,004 | 0,006 |
| Transverse sensitivity, typ. | % | 1,5 | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 2 000 | 2 000 | 2 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,06 | –0,06 | –0,06 |
| Operating temperature range | °C | –55 … 100 | –55 … 100 | –55 … 100 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | stainless steel | stainless steel | stainless steel |
| Degree of protection (EN60529) | | IP68 | IP68 | IP68 |
| Mass | grams | 29 | 29 | 29 |
| Ground isolated | | yes | yes | yes |

**Measuring direction**




**Connection**
4 pin pos.

**Characteristics**
Center hole quartz shear triaxial, low base strain sensitivity, wide frequency range, ground isolated, low profile, CE compliant.
Type 8792A…T: TEDS version.

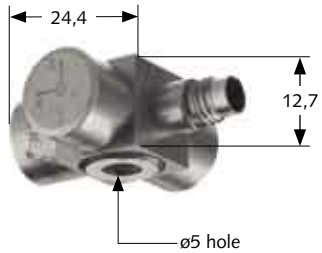
**Application**
Center hole mounting capability allows orientation of exit cable or axis alignment. The low profile package accommodates restricted space environments.

**Accessories**
Socket cap screw 10-32x0,75, M5x20
Cables Type 1578A…, 1756B…
Coupler Type 5100 series

**Data sheet** 8792A_000-260

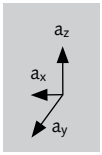
# Triaxial: Voltage Output

## K-Shear® Triaxial Accelerometer




| Technical data | | Type 8792A500 |
|---|---|---|
| Range | g | ±500 |
| Sensitivity, ±5 % | mV/g | 10 |
| Frequency response, ±5 % | Hz | 1 … 5 000 |
| Threshold, nom. | $g_{rms}$ | 0,01 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,06 |
| Operating temperature range | °C | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 |
| Housing/base | material | stainless steel |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 27 |
| Ground isolated | | yes |

**Measuring direction**




**Connection**
4 pin pos.

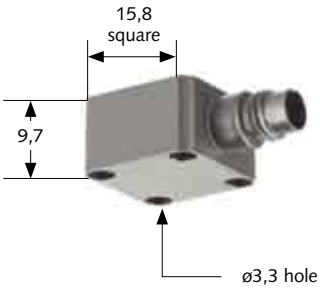
**Characteristics**
Center hole quartz shear triaxial, low base strain sensitivity, wide frequency range, ground isolated, low profile, CE compliant.
Type 8792A…T: TEDS version.

**Application**
Center hole mounting capability allows orientation of exit cable or axis alignment. The low profile package accommodates restricted space environments.

**Accessories**
Socket cap screw 10-32x0,75, M5x20
Cables Type 1578A…, 1756B…
Coupler Type 5100 series

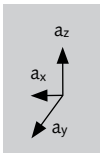
**Data sheet** 8792A_000-260

## K-Shear® Triaxial Accelerometer




| Technical data | | Type 8793A500 | Type 8793A500M5 | Type 8793A500M8 |
|---|---|---|---|---|
| Range | g | ±500 | ±500 | ±500 |
| Sensitivity ±5 % | mV/g | 10 | 10 | 10 |
| Frequency response, ±5 % | Hz | 2,5 … 10 000 | 2,5 … 10 000 | 2,5 … 10 000 |
| Threshold, nom. | $g_{rms}$ | 0,002 | 0,002 | 0,002 |
| Transverse sensitivity, typ. | % | 1,5 | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Shock (1 ms pulse) | $g_{pk}$ | 5 000 | 5 000 | 5 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,03 | –0,03 | –0,03 |
| Operating temperature range | °C | –55 … 120 | –55 … 165 | –195 … 120 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | stainless steel | stainless steel | stainless steel |
| Degree of protection (EN60529) | | IP68 | IP68 | IP68 |
| Mass | grams | 11 | 11 | 11 |
| Ground isolated | | with adapt. | with adapt. | with adapt. |

**Measuring direction**




**Connection**
4 pin pos.

**Characteristics**
Low impedance voltage mode, low profile design, quartz shear accuracy and stability, hermetically sealed, CE compliant.
Type 8793A...T: TEDS version.

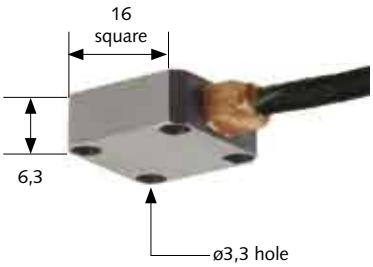
**Application**
Useful for measuring vibration and shock on small and lightweight structures, extreme temperature applications.

**Accessories**
Cap screws 4-40x0,5" and M2,5x12 mm
Cable Type 1756B...
Coupler Type 5100 series
Adh. mount. pad Type 800M144

**Data sheet** 8793A_000-261

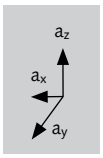
# Triaxial: Voltage Output

## K-Shear® Triaxial Accelerometer




| Technical data | | Type 8794A500 | Type 8794A500M5 |
|---|---|---|---|
| Range | g | ±500 | ±500 |
| Sensitivity, ±5 % | mV/g | 10 | 10 |
| Frequency response, ±5 % | Hz | 2,5 … 10 000 | 2,5 … 10 000 |
| Threshold, nom. | $g_{rms}$ | 0,002 | 0,002 |
| Transverse sensitivity, typ. | % | 1,5 | 1,5 |
| Non-linearity | %FSO | ±1 | ±1 |
| Shock (1 ms Puls) | $g_{pk}$ | 5 000 | 5 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,03 | –0,03 |
| Operating temperature range | °C | –75 … 120 | –55 … 165 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | stainless steel | stainless steell |
| Degree of protection (EN60529) | | IP67 | IP67 |
| Mass | grams | 7,6 | 7,6 |
| Ground isolated | | with adapt. | with adapt. |

**Measuring direction**




**Connection**
4 pin pos.

**Characteristics**
Low impedance voltage mode, low profile design, quartz shear stability, CE compliant, 2 m integral cable.

**Application**
The low profile design provides an aerodynamic advantage for in-flight flutter testing as well as general shock and vibration.

**Accessories**
Mounting screw 4-40x3/8 and M2,5x10 mm
Cable Type 1756B…
Extension cable Type 1578A…
Coupler Type 5100 series
Adh. mount. pad Type 800M144

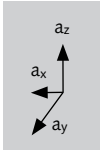
**Data sheet** 8794A_000-263

## K-Shear® Low Temperature Triaxial Cube Accelerometer Hermetically Sealed




| Technical data | | Type 8795A50M8 |
|---|---|---|
| Range | g | ±50 |
| Sensitivity, ±10 % | mV/g | 100 |
| Frequency response, ±5 % | Hz | 1 … 4 000 |
| Threshold, nom. | $g_{rms}$ | 0,001 |
| Transverse sensitivity, typ. | % | 1,5 |
| Non-linearity | %FSO | ±1 |
| Shock (1 ms Puls) | $g_{pk}$ | 5 000 |
| Temp. coeff.: Sensitivity | %/°C | –0,03 |
| Operating temperature range | °C | –196 … 120 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 |
| Housing/base | material | Titanium |
| Degree of protection (EN60529) | | IP68 |
| Mass | grams | 32 |
| Ground isolated | | with adapt. |

**Measuring direction**




**Connection**
4 pin pos.

**Characteristics**
Low impedance voltage mode, triaxial quartz sensor, hermetically sealed, CE compliant.

**Application**
Vehicle vibration and noise harshness (NVH) testing, general laboratory and modal testing, extreme temperature applications.

**Accessories**
Mounting studs
Type 8402, 8411
CableType 1756B...
Extension cable Type 1578A...
Coupler Type 5100 series
Adh. mount. pad Type 8436

**Data sheet** 8795A_000-264

# Impulse

A selection of impulse hammers is available covering ranges of application from small to very large mechanical structures. The force-instrumented hammer contains a load cell at the impact end where a variety of tips can be attached. The input power spectrum provided to a test structure can be controlled by appropriate selection of hammer and contact tip. The hammer designs are rugged with the cabling conveniently exiting the rear of the handle. Hammer mass and tip interchanges are accommodated by simple threaded engagement to the hammerhead.



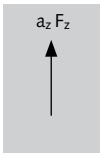
## Impulse: Voltage Output, Impedance Head

### Piezotron® Impedance Head




| Technical data | | Type 8770A5 | Type 8770A50 |
|---|---|---|---|
| **ACCELERATION** | | | |
| Range | g | ±5 | ±50 |
| Sensitivity, ±10 % | mV/g | 1 000 | 100 |
| Frequency response, ±5 % | Hz | 1 … 4 000 | 1 … 4 000 |
| Threshold | $g_{rms}$ | 0,0004 | 0,001 |
| Transverse sensitivity, typ. | % | 1,5 | 1,5 |
| Temp. coeff.: Sensitivity | %/°C | 0,14 | 0,14 |
| **FORCE** | | | |
| Range | N | ±22 | ±222 |
| Sensitivity, ±10 % | mV/N | 227 | 23 |
| Threshold | N | 0,0006 | 0,006 |
| Temp. coeff.: Sensitivity | %/°C | 0,05 | 0,05 |
| Operating temperature range | °C | –55 … 80 | –55 … 120 |
| Power supply | mA<br>VDC | 2 … 18<br>20 … 30 | 2 … 18<br>20 … 30 |
| Housing/base | material | Titanium | Titanium |
| Degree of protection (EN60529) | | IP68 | IP68 |
| Mass | grams | 34 | 34 |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Sensitivity unaffected by mounting torque, wide frequency range, CE compliant.

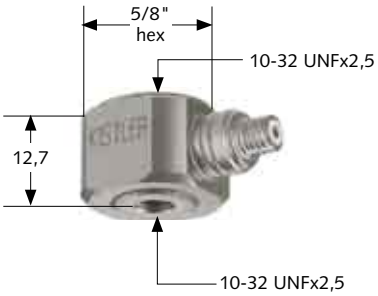
**Application**
Modal analysis, typically installed on a test article and connected by a threaded stinger to a shaker. Measures input force and acceleration simultaneously.

**Accessories**
Cable Type 1761B...
Coupler Type 5100 series

**Data sheet** 8770A_000-252

## Charge Output Force Sensor

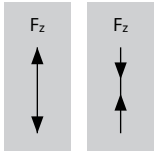
### Quartz Force Sensor




| Technical data | | Type 9212 | Type 9222 |
|---|---|---|---|
| Range compression | N | +22 240 | +22 240 |
| Range tension | N | –2 224 | –2 224 |
| Threshold | N | * | * |
| Sensitivity, nom. | pC/N | –11 | –4 |
| Non-linearity | %FSO | ±0,5 | ±0,5 |
| Rigidity | kN/µm | 0,8 | 0,8 |
| Temp. coeff.: Sensitivity | %/°C | 0,02 | 0,04 |
| Operating temperature range | °C | –240 … 150 | –195 … 150 |
| Insulation resistance | Ω | $10^{13}$ | $10^{13}$ |
| Capacitance | pF | 58 | 23 |
| Housing/base | material | stainless steel | stainless steel |
| Degree of protection (EN60529) | | IP67 | IP67 |
| Mass | grams | 18 | 19 |

* Threshold for high impedance accelerometers depend upon charge amplifier settings, call Kistler for details.

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
High impedance charge mode output, rugged quartz sensor, wide measuring ranges for compression and tension, quasi-static response.

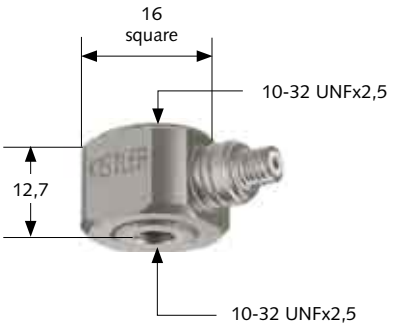
**Application**
Force application such as press fit assembly, crimping and impact force testing; can be used with shakers for modal analysis, machine tool measurements or various automotive, aerospace and robotic testing.

**Accessories**
Cables Type 1631A..., 1631C...
Charge amplifier Type 5000 series
Impact pad Type 900A1

**Data sheet** 9212_000-418

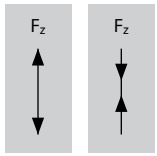
# Impulse: Charge Output Force Sensor

## Quartz Piezotron® Force Sensor




| Technical data | | Type 9712B5 | Type 9712B50 | Type 9712B250 |
|---|---|---|---|---|
| Range compression | N | +22 | +220 | +1 112 |
| Range tension | N | –22 | –220 | –1 112 |
| Threshold | N | 0,0005 | 0,005 | 0,022 |
| Sensitivity, nom. | mV/N | 181,8 | 22,6 | 4,5 |
| Non-linearity | %FSO | ±1 | ±1 | ±1 |
| Rigidity | kN/µm | 0,8 | 0,8 | 0,8 |
| Temp. coeff.: Sensitivity | %/°C | 0,04 | 0,04 | 0,04 |
| Operating temperature range | °C | –50 … 120 | –50 … 120 | –50 … 120 |
| Power supply | mA<br>VDC | 4<br>20 … 32 | 4<br>20 … 32 | 4<br>20 … 32 |
| Housing/base | material | stainless steel | stainless steel | stainless steel |
| Degree of protection (EN60529) | | IP68 | IP68 | IP68 |
| Mass | grams | 19 | 19 | 19 |

**Measuring direction**




**Connection**
10-32 neg.

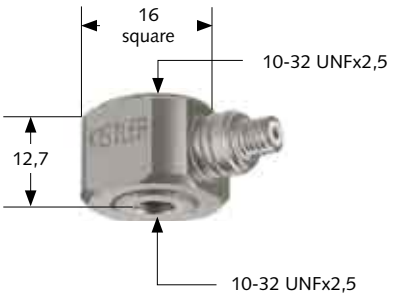
**Characteristics**
Low impedance voltage mode, rugged quartz sensor, wide measuring range, uses standard low cost cables, CE compliant.

**Application**
Force application where high sensitivity, high rigidity and fast responses are required.

**Accessories**
Cable Type 1761B...
Charge amplifier Type 5100 series
Impact pad Type 900A1

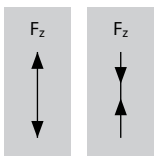
**Data sheet** 9712_000-417

## Quarz Piezotron® Force Sensor




| Technical data | | Type 9712B500 | Type 9712B5000 |
|---|---|---|---|
| Range compression | N | +2 224 | +22 240 |
| Range tension | N | –2 224 | –2 224 |
| Threshold | N | 0,044 | 0,445 |
| Sensitivity, nom. | mV/N | 2,2 | 0,2 |
| Non-linearity | %FSO | ±1 | ±1 |
| Rigidity | kN/µm | 0,8 | 0,8 |
| Temp. coeff.: Sensitivity | %/°C | 0,04 | 0,04 |
| Operating temperature range | °C | –50 … 120 | –50 … 120 |
| Power supply | mA<br>VDC | 4<br>20 … 32 | 4<br>20 … 32 |
| Housing/base | material | stainless steel | stainless steel |
| Degree of protection (EN60529) | | IP68 | IP68 |
| Mass | grams | 19 | 19 |

**Measuring direction**




**Connection**
10-32 neg.

**Characteristics**
Low impedance voltage mode, rugged quartz sensor, wide measuring ranges, uses standard low cost cables, CE compliant.

**Application**
Force application where high sensitivity, high rigidity and fast responses are required.

**Accessories**
Cable Type 1761B...
Coupler Type 5100 series
Impact pad Type 900A1

**Data sheet** 9712_000-417

# Impulse: Voltage Output Force Hammer

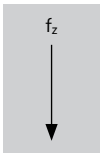
## Impulse Force Hammer



| Technical data | | Type 9722A500 | Type 9722A2000 |
|---|---|---|---|
| Force range | N | 0 … 500 | 0 … 2 000 |
| Frequency range, –10 dB | Hz | 8 200* | 9 300* |
| Resonant frequency | kHz | 27 | 27 |
| Sensitivity, nom. | mV/N | 10 | 2 |
| Rigidity | kN/µm | 0,8 | 0,8 |
| Time constant | s | 500 | 500 |
| Operating temperature range | °C | –20 … 70 | –20 … 70 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 | 2 … 20<br>20 … 30 |
| Length of handle | mm | 188 | 188 |
| Hammer head dimensions: | | | |
| Diameter | mm | 17,5 | 17,5 |
| Length | mm | 61 | 61 |
| Mass | grams | 100 | 100 |

* Low frequency point depends upon the time constant and tip in use, call Kistler for details.

**Measuring direction**




**Connection**
BNC neg.

**Characteristics**
Low impedance voltage mode, quartz force sensing element, sensor cable integrated to hammer handle, CE compliant.

**Application**
Analyze the dynamic behavior of mechanical structures.

**Accessories**
Cable Type 1601B...
Coupler Type 5100 series

**Data sheet** 9722A_000-272

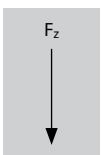
## Impulse Force Hammer



| Technical data | | Type 9724A2000 | Type 9724A5000 |
|---|---|---|---|
| Force range | N | 0 … 2 000 | 0 … 5 000 |
| Frequency range, –10 dB | Hz | 6 600* | 6 900* |
| Resonant frequency | kHz | 27 | 27 |
| Sensitivity, nom. | mV/N | 2 | 1 |
| Rigidity | kN/µm | 0,8 | 0,8 |
| Time constant | s | 500 | 500 |
| Operating temperature range | °C | –20 … 70 | –20 … 70 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 | 2 … 20<br>20 … 30 |
| Length of handle | mm | 231 | 231 |
| Hammer head dimensions: | | | |
| Diameter | mm | 23 | 23 |
| Length | mm | 89 | 89 |
| Mass | grams | 250 | 250 |

* Low frequency point depends upon the time constant and tip in use, call Kistler for details.

**Measuring direction**




**Connection**
BNC neg.

**Characteristics**
Low impedance voltage mode, quartz force sensing element, sensor cable integrated to handle of hammer, CE compliant.

**Application**
Analyze the dynamic behavior of mechanical structures.

**Accessories**
Cable Type 1601B...
Coupler Type 5100 series

**Data sheet** 9724A_000-273

# Impulse: Voltage Output Force Hammer

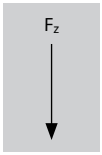
## Impulse Force Hammer



| Technical data | | Type 9726A5000 | Type 9726A20000 |
|---|---|---|---|
| Force range | N | 0 … 5 000 | 0 … 20 000 |
| Frequency range, –10 dB | Hz | 5 000* | 5 400* |
| Resonant frequency | kHz | 27 | 27 |
| Sensitivity, nom. | mV/N | 1 | 0,2 |
| Rigidity | kN/µm | 0,8 | 0,8 |
| Time constant | s | 500 | 500 |
| Operating temperature range | °C | –20 … 70 | –20 … 70 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 | 2 … 20<br>20 … 30 |
| Length of handle | mm | 236 | 236 |
| Hammer head dimensions: | | | |
| Diameter | mm | 32 | 32 |
| Length | mm | 94 | 94 |
| Mass | grams | 500 | 500 |

* Low frequency point depends upon the time constant and tip in use, call Kistler for details.

**Measuring direcion**




**Connection**
BNC neg.

**Characteristics**
Low impedance voltage mode, quartz force sensing element, sensor cable integrated to hammer handle, CE compliant.

**Application**
Analyze the dynamic behavior of mechanical structures.

**Accessories**
Cable Type 1601B...
Coupler Type 5100 series

**Data sheet** 9726A_000-274

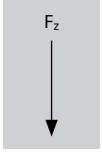
## Impulse Force Hammer



| Technical data | | Type 9728A20000 |
|---|---|---|
| Force range | N | 0 … 20 000 |
| Frequency range, –10 dB | Hz | 1 000 |
| Resonant frequency | kHz | 20 |
| Sensitivity, nom. | mV/N | 0,2 |
| Rigidity | kN/µm | 2,7 |
| Time constant | s | 500 |
| Operating temperature range | °C | –20 … 70 |
| Power supply | mA<br>VDC | 2 … 20<br>20 … 30 |
| Length of handle | mm | 343 |
| Hammer head dimensions: | | |
| Diameter | mm | 51 |
| Length | mm | 155 |
| Mass | grams | 1 500 |

* Low frequency point depends upon the time constant and tip in use, call Kistler for details.

**Measuring direction**




**Connection**
BNC neg.

**Characteristics**
Low impedance voltage mode, quartz force sensing element, sensor cable integrated to handle of hammer, CE compliant.

**Application**
Analyze the dynamic behavior of mechanical structures.

**Accessories**
Cable Type 1601B...
Coupler Type 5100 series

**Data sheet** 9728A_000-275

# Electronics & Software

Powering, conditioning and computer interface solutions are available from a suite of electronic equipment tailored to provide measurement flexibility with utmost quality and integrity. Couplers from inexpensive single channel to large, modular, multi-channel platforms can be selected. Charge amplifiers with dual mode (low and high impedance) capability offer adaptability to a variety of sensor configurations. Gain, filtering, and conditioning aspects of the measurement chain are contained in this section of the catalog.



# Signal Conditioner

## In-line Charge Converter Module



| Technical data | | Type 5050A0,1 | Type 5050A1 | Type 5050A10 |
|---|---|---|---|---|
| Voltage | $V_{pp}$ | 10 | 10 | 10 |
| Gain | mV/pC | 0,1 | 1 | 10 |
| Noise (1 … 10 kHz) | $\mu V_{rms}$ | 5 | 10 | 70 |
| Input resistance min. | Ω | 100 | 100 | 100 |
| Input capacitance | nF | 30 | 30 | 30 |
| Frequency response, –5 % | Hz | 1 … 20 000 | 1 … 20 000 | 1 … 20 000 |
| Constant current | mA | 2 … 18 | 2 … 18 | 2 … 18 |
| Compliance voltage | VDC | 20 … 30 | 20 … 30 | 20 … 30 |
| Operating temperature range | °C | –40 … 80 | –40 … 80 | –40 … 80 |
| Signal polarity | | inverted | inverted | inverted |
| Degree of protection (EN60529) | | IP67 | IP67 | IP67 |
| Housing | material | stainless steel | stainless steel | stainless steel |
| Input connector | Type | KIAG 10-32 neg. | KIAG 10-32 neg. | KIAG 10-32 neg. |
| Output connector | Type | BNC neg. | BNC neg. | BNC neg. |
| Dimensions (WxDia.) | mm | 70,9xø15,9 | 70,9xø15,9 | 70,9xø15,9 |
| Mass | grams | 28 | 28 | 28 |

**Connection**
Input:
10-32 neg.
Output:
BNC neg.

**Characteristics**
Two wire, single ended device, rugged, stainless steel case, wide frequency response, three gain versions, CE conform. Ideal for ceramic high impedance accelerometers.

**Application**
In line charge converter for high impedance ceramic accelerometers. Ideal for remote signal conditioning for high temperature vibration measurements.

**Accessories**
Cable Type 1635C...
Coupler Type 5100 series

**Data sheet** 5050A_000-452

## Piezotron® Low Impedance Coupler



| Technical data | | Type 5108A |
|---|---|---|
| Sensor signal voltage | $V_{pp}$ | 20 |
| Sensor supply current | mA | 4 |
| Frequency response | Hz | 0,02 … 87 000 (at 5 $V_{pp}$ and 2 m cable) |
| Output voltage | $V_{pp}$ | 20 |
| Gain | | 1 |
| Power | VDC | 22 … 30 |
| Operating temperature range | °C | 0 … 50 |
| Power | Type | Banana jacks |
| Housing | material | Aluminum |
| Dimensions (WxHxD) | mm | 57,2x22,2x22,2 |
| Mass | grams | 65 |

**Connection**
Input: BNC neg.
Output: BNC pos.
Power: banana jacks, polarity
(+ red, - black)

**Characteristics**
Simple to operate, AC coupled, reverse polarity protection, CE compliant.

**Application**
Use with low impedance Piezotron sensors with built-in electronics.

**Accessories**
Cable Type 1761B...

**Data sheet** 5108A_000-328

# Signal Conditioner

## Multimeter Coupler




| Technical data | | Type 5110 |
|---|---|---|
| Input: No load voltage | VDC | 20 |
| Input: Excitation current, ±10 % | mA | 2 |
| Output voltage swing | $V_{pp}$ | 18 |
| Output voltage gain | | 1 |
| Output to BNC connector: | | |
| Frequency response, ±5 %, 5 $V_{pp}$ | Hz | 0,07 … 60 000 |
| Output to multimeter: | | |
| Frequency response, ±5 %, 5 $V_{pp}$ | Hz | 0 … 60 000 |
| Time constant (±10 %) | s | 10 |
| Internal battery | Type | 9 V alkaline (IEC 6LR61) |
| Connector: Sensor, output | Type | BNC neg. |
| Connector: Multimeter | Type | Banana |
| Operating temperature range | °C | –10 … 55 |
| Dimensions (WxHxD) | mm | 96,5x61,0x25,4 |
| Mass (battery included) | kg | 0,15 |

**Connection**
Input: BNC neg.
Output: BNC neg.
Multimeter:
Banana jacks

Power:
Battery

**Characteristics**
Turn a digital multimeter into a hand-held relative vibration measurement system or verify sensor and cable integrity with this portable, low cost, battery-operated coupler.

**Application**
Transforms an ordinary digital voltmeter into a simple measuring tool, ideal for troubleshooting sensors, cable or vibration problems in an industrial environment for low impedance sensors.

**Accessories:**
Kit Type 5110S1 kit includes Type 5110, carrying case, mounting wax and 9 V battery

**Data sheet** 5110_000-329

## Piezotron® Low Impedance Coupler



| Technical data | | Type 5114 |
|---|---|---|
| Sensor excitation | VDC | 20 |
| Sensor excitation current | mA | 2 |
| Frequency response, ±5 % | Hz | 0,07 … 60 000 |
| Output voltage | $V_{pp}$ | 20 |
| Gain | | 1 |
| Power | Type | 9 V alkaline (IEC 6LR61) |
| Operating temperature range | °C | –10 … 55 |
| Dimensions (WxHxD) | mm | 81x36x150 |
| Mass (battery included) | kg | 0,25 |

**Connection**
BNC neg.

**Power**:
Battery

**Characteristics**
Provides constant current excitation, monitors condition of sensors and cables, 89 mm digital LCD display AC-DC or battery powered, CE compliant.

**Application**
Power and monitor Piezotron, low impedance sensors.

**Accessories**
AC-DC power adapter Type 5752 (120 V), Type 5757 (230 V)

**Specify Version**
Type 5114 supplied with 9 V alkaline battery
Type 5114S1 supplied with 9 V alkaline battery, 120 VAC power adapter and carrying case
Type 5114S1(E) same as S1 only with 230 VAC power adapter, 9 V alkaline battery

**Data sheet** 5114_000-330

# Signal Conditioner

## Piezotron® Coupler



| Technical data | | Type 5118B2 |
|---|---|---|
| Sensor supply current | mA | 2 |
| Frequency response, –5 % | Hz | 0,02 … 40 000 |
| Output voltage | $V_{pp}$ | 20 |
| Gain | | 1, 10, 100 |
| Power supply | Type | battery 4 x 1,5 V AA, alkaline |
| Operating temperature range | °C | –20 … 50 |
| Dimensions (WxHxD) | mm | 190x91x45 |
| Mass (battery included) | kg | 0,50 |

**Connection**
Input: BNC neg.
Output: BNC neg

Power:
Battery

**Characteristics**
Selectable gain and low pass plug-in filters, high pass filtering, panel selectable, exclusive "Rapid Zero" feature AC-DC or battery powered, CE compliant.

**Application**
Powering low impedance sensors where test conditions require flexible signal conditioning.

**Accessories**
AC-DC power adapter (120 VAC): Type 5752
AC-DC power adapter (230 VAC): Type 5757
Panel mounting kit Type 5702
Plug-in low pass filters Types 5326A..., 5327A...

**Data sheet** 5118B_000-331

## Piezotron® Coupler




| Technical data | | Type 5127B |
|---|---|---|
| Sensor excitation current | mA | 4 |
| Frequency response, –5 % | Hz | 0,1 … 30 000 |
| Output voltage | $V_{pp}$ | 20 |
| Gain | | 1, 10 |
| Power | mA<br>VDC | 50<br>22 … 30 |
| Operating temperature range | °C | 0 … 140 |
| Housing | material | Aluminum |
| Dimensions (WxHxD) | mm | 115x64x35 |
| Mass | kg | 0,27 |

**Connection**
Input: BNC neg. or cable strain relief
Output: 8 pole round connector DIN 45326

**Characteristics**
Built-in RMS converter and limit monitor, plug-in filter elements, rugged case, vibration-proof construction, CE compliant.

**Application**
Vibration and acoustic emission (AE) sensors.

**Accessories**
8 pole round connector Type 1500A57
Low/high pass filters

**Specify Version**
request data sheet below for all ordering options

**Data sheet** 5127_000-323

# Signal Conditioner

## 4-Channel Piezotron® Coupler



| Technical data | | Type 5134B… |
|---|---|---|
| Sensor excitation current | mA | 0 … 15 |
| Sensor excitation | VDC | 24 |
| Frequency response, ±5 % | Hz | 0,1 … 68 000 |
| Output voltage | V | ±5/±10 selectable |
| Gain (Vernier) | | 0,5 … 150 |
| Power | VAC | 115/230 |
| Operating temperature range | °C | 0 … 50 |
| Dimensions (WxHxD) | mm | 196x94x150 |
| Mass | kg | 1,8 |

**Connection**
4 BNC neg.

**Characteristics**
Multidrop USB 2.0 for remote control and monitoring. Front panel LEDs for fault/status of each channel, non volatile memory to store settings, vernier gain and selectable 4 pole low pass filters, TEDS compatible, CE compliant.

**Application**
General vibration lab use with single axis or triaxial accelerometers.

**Accessories**
With case Type 5134B1
Without case Type 5134B0

**Data sheet** 5134B_000-605

## 16-Channel Piezotron® Coupler



| Technical data | | Type 5148 |
|---|---|---|
| Sensor excitation current | mA | 2 |
| Sensor excitation | VDC | 24 |
| Frequency response, ±5 % | Hz | 0,05 … 50 000 |
| Output voltage | $V_{pp}$ | 20 |
| Gain | | 1 |
| Power, external (VDC 8-20 @ 6,2 W max.) | VAC | 115/230 |
| Operating temperature range | °C | 0 … 50 |
| Dimensions (WxHxD) | mm | 428x203x44 |
| Mass | kg | 2,5 |

**Connection**
16BNC neg.

**Characteristics**
Provides constant current excitation for Piezotron and voltage mode piezoelectric sensors, LED's indicate circuit integrity, convenient front/rear BNC connectors, standard rack mountable, CE compliant.

**Application**
Multi-channel low impedance sensor power at economical price per channel.

**Accessories**
AC-DC power adapter
Type 5754 (115 V)
Type 5764 (230 V)

**Data sheet** 5148_000-333

# Signal Conditioner

## External Impedance Converter




| Technical data | | Type 557 |
|---|---|---|
| Output voltage | $V_{pp}$ | 10 |
| Input voltage | $V_{pp}$ | 10 |
| Gain | | 0,97 |
| Excitation | VDC<br>mA | 20 … 30<br>4 |
| Capacitance, nom. | pF | 3 |
| Input resistance | Ω | $5 \times 10^{10}$ |
| Operating temperature range | °C | –55 … 120 |
| Degree of protection (EN60529) | | IP67 |
| Housing | material | stainless steel |
| Mounting | | on sensor |
| Dimensions (WxD) | mm | 15,9x6,4 |
| Mass | grams | 2,1 |

**Connection**
10-32 pos.
10-32 neg.

**Characteristics**
Compatible with high impedance, quartz sensors used with optional range capacitance (Type 571A...) to tailor the output signal. Requires constant current source for operation. Ideal for quartz sensors.

**Application**
Conversions of charge signals from quartz piezoelectric sensors into proportional voltage signals. Ideal for remote signal conditioning for high temperature, high impedance sensors.

**Accessoires**
Range capacitor Type 571A…

**Data sheet** 557_000-388

## External Impedance Converter




| Technical data | | Type 558 |
|---|---|---|
| Output voltage | $V_{pp}$ | 10 |
| Input voltage | $V_{pp}$ | 10 |
| Gain | | 0,97 |
| Excitation | VDC<br>mA | 20 … 30<br>4 |
| Capacitance, nom. | pF | 3 |
| Input resistance | Ω | $5 \times 10^{10}$ |
| Operating temperature range | °C | –55 … 120 |
| Degree of protection (EN60529) | | IP67 |
| Housing | material | stainless steel |
| Mounting | | in-line |
| Dimensions (WxD) | mm | 16,2x6,4 |
| Mass | grams | 2,6 |

**Connection**
10-32 neg.

**Characteristics**
Compatible with high impedance, quartz sensors used with optional range capacitance (Type 571A...) to tailor the output signal. Requires constant current source for operation. Ideal for quartz sensors.

**Application**
Conversions of charge signals from quartz piezoelectric sensors into proportional voltage signals. Ideal for remote signal conditioning for high temperature, high impedance sensors.

**Accessories**
Range capacitor Type 571A…

**Data sheet** 557_000-388

# Signal Conditioner

## K-Beam® Power Supply



| Technical data | | Type 5210 |
|---|---|---|
| Sensor excitation current | mA | 25 |
| Sensor excitation voltage | V | 9 |
| Frequency response | Hz | 0 … 750 |
| Output voltage | V | ±8 |
| Gain | | 1, 2, 10, 20 |
| Power | | 9 V battery |
| Operating temperature range | °C | –10 … 55 |
| External DC input | Type | jack 2,1 mm |
| Dimensions (WxHxD) | mm | 146x91,4x32,8 |
| Mass | kg | 0,26 |

**Connection**
Sensor: 4 pin, Microtech pos.

Output signal: BNC neg.

External DC input: 2,1 mm jack (tip +)

**Characteristics**
Adjustable offset control for higher resolution measurements, battery or external power, gain and filtering options, low battery indicator, complete kit available, CE compliant.

**Application**
Power single axis K-Beam accelerometer from a casual check to an in-depth study.

**Accessories**
AC-DC power adapter Type 5752 (120 V), Type 5757 (230 V)

**Specify version**
Type 5210 supplied with 9 V battery
Type 5210S1 supplied with 9 V battery, 120 V power adapter and carrying case
Type 5210S1(E) same as S1 only with 230 V power adapter
Type 5757, 9 V battery and carrying case

**Data sheet** 5210_000-334

# Ancillary Electronics

## Insulation Tester



| Technical data | | Type 5493 |
|---|---|---|
| Measuring range | Ω | $10^{11}$ … 4 x $10^{13}$ |
| Measuring voltage | V | 5 |
| Admissible input voltage, max. | V | 700 |
| Measurement display | | logarithmic |
| Battery power | VDC | 9 |
| Dimensions (WxHxD) | mm | 150x80x35 |
| Mass | kg | 0,3 |

**Connection**
BNC neg.

**Characteristics**
Small, robust, for measuring high insulation resistance on the spot; low measuring voltage of 5 V, logarithmic indication avoids the need for range switching, automatic switchoff, CE compliant.

**Application**
Measure insulation resistance of cables and equipment.

**Data sheet** 5493_000-354

# Vibration Switch

## K-Guard® Industrial Vibration Switch



| Technical data | | Type 8810 |
|---|---|---|
| Frequency range, –3 dB | Hz | 10 … 1 000 |
| Velocity range | mm/s | 100 |
| Setpoint range | mm/s | 2 … 50 |
| Setpoint accuracy | % | ±10 |
| Sensitivity | mV/mm/s | 50 |
| Operating temperature range | °C | 0 … 60 |
| Power supply | mA<br>VDC | 50<br>18 … 30 |
| Admissible humidity | % | 10 … 90 |
| Integral cable length | m | 3 |
| Dimensions (WxHxD) | mm | 115x64x34,5 |
| Mass | kg | 0,41 |

**Connection**
pigtails

**Characteristics**
A robust vibration monitor with velocity trip, monitor outputs, adjustable time delay, small size and lightweight, CE compliant.

**Application**
Vibration monitoring on cooling towers and machinery such as fans, motors, conveyers, motor/generator sets, centrifugal pumps, and other types of industrial machinery.

**Data sheet** 8810_000-268

# Accessories

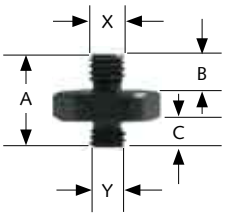
Common accessories extend the flexibility of the accelerometer families often adapting to less than optimal conditions.

For instance, the variety of adhesive mounting pads provide ground isolated while permitting a reasonable attachment in situations where tapping a threaded hole is unacceptable. A series of magnet mounts provides an alternate solution if the structure is a ferrous material. Also included in this section are a variety of conversion studs to accommodate a previous mounting site with a different accelerometer with different threads. Mounting cubes provide a means of obtaining accurate orthogonal measurements at a reasonable cost.



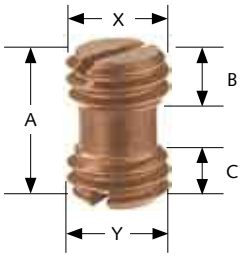
# Mounting

## Mounting Stud



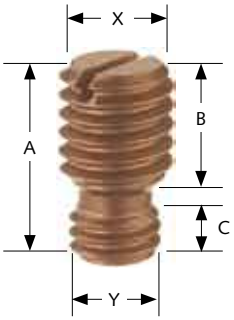

| Technical data | | Type 8400K01 |
|---|---|---|
| A | mm | 11,4 |
| B | mm | 4,8 |
| C | mm | 3,6 |
| Thread X | | 10-32 |
| Thread Y | | 10-32 |
| Material | | Al hard anodized |
| Recommended sensors | Type | 8202, 8203, 8284, 8286, 8702, 8703, 8704, 8705, 8770, 8774, 8786 |

## Mounting Stud



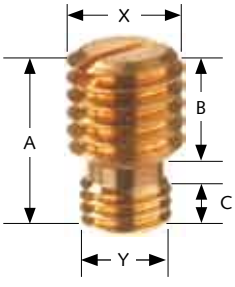

| Technical data | | Type 8402 | Type 8404 | Type 8410 |
|---|---|---|---|---|
| A | mm | 7,1 | 7,1 | 6,4 |
| B | mm | 2,5 | 2,5 | 3,3 |
| C | mm | 2,5 | 2,5 | 2 |
| Thread X | | 10-32 | 10-32 | 1/4-28 |
| Thread Y | | 10-32 | 10-32 | 10-32 |
| Material | | BeCu | stainless steel | BeCu |
| Recommended sensors | Type | 8202, 8290, 8638 8702, 8703, 8704, 8705, 8770, 8786, 8795 | 8044 | 8203 8712 |

## Mounting Stud




| Technical data | | Type 8411 | Type 8416 | Type 8418 | Type 8430K03 |
|---|---|---|---|---|---|
| A | mm | 10,9 | 6,6 | 7,1 | 6,4 |
| B | mm | 6,4 | 2,3 | 2,3 | 3,6 |
| C | mm | 3,3 | 3,3 | 3,8 | 22,9 |
| Thread X | | M6 | 5-40 | 5-40 | 6-32 |
| Thread Y | | 10-32 | 10-32 | M6 | 10-32 |
| Material | | BeCu | stainless steel | stainless steel | BeCu |
| Recommended sensors | Type | 8702, 8704, 8770, 8774, 8784, 8786, 8795 | 8636C | 8636C | 8766 |

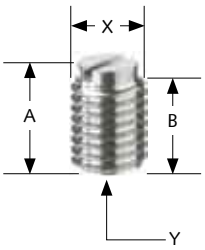
## Mounting Stud




| Technical data | | Type 8412 | Type 8420 | Type 8421 | Type 8451 |
|---|---|---|---|---|---|
| A | mm | 9,4 | 9,4 | 13,2 | 8,9 |
| B | mm | – | – | 6,4 | 5,1 |
| C | mm | – | – | 4,6 | 2,8 |
| Thread X | | 1/4-28 | 5-40 | M8 | 10-32 |
| Thread Y | | 1/4-28 | 5-40 | 1/4-28 | M5 |
| Material | | stainless steel | stainless steel | BeCu | BeCu |
| Recommended sensors | Type | 8203, 8710, 8712, 8752 | 8636, 8763 | 8203, 8712, 8752 | 8202, 8290, 8638, 8702, 8703, 8704, 8705, 8770, 8784, 8786, 8795 |

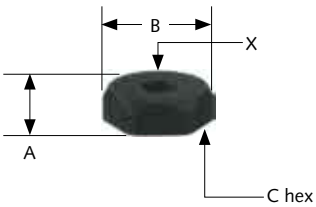
# Mounting

## Stud Converter



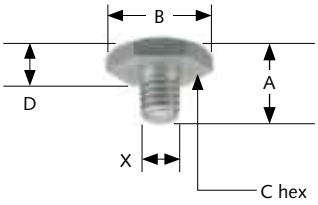

| Technical data | | Type 8414 | Type 8484 |
|---|---|---|---|
| A | mm | 8,9 | 6,4 |
| B | mm | 8,1 | 3,6 |
| Thread X (external) | | 1/4-28 | 10-32 |
| Thread Y (internal) | | 10-32 | 5-40 |
| Material | | stainless steel | stainless steel |
| Recommended sensors | Type | 8712, 8752A50 (adapts a 10-32 mounting stud into a 1/4-28 mounting hole) | 8763 |

## Adhesive Mounting



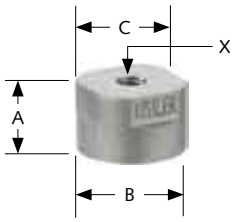

| Technical data | | Type 8434 | Type 8436 | Type 8438 |
|---|---|---|---|---|
| A | mm | 4,8 | 4,8 | 7,9 |
| B | mm | 12,5 | 15,7 | 21,1 |
| C | mm | 11,2 | 14,2 | 19,0 |
| Thread X | | 5-40 | 10-32 | 1/4-28 |
| Mass | grams | 1,3 | 2,0 | 5,8 |
| Material | | Al hard anodized | Al hard anodized | Al hard anodized |
| Recommended sensors | Type | 8702, 8704, 8774, 8786 | 8202, 8284, 8703, 8705, 8784 | 8203, 8710, 8712, 8752, 8795* (* with 8410 mounting stud) |

## Adhesive Mounting




| Technical data | | Type 8439 | Type 8440 |
|---|---|---|---|
| A | mm | 5,1 | 5,1 |
| B | mm | 7,1 | 7,1 |
| C | mm | 6,3 | 6,3 |
| D | mm | 1,5 | 1,5 |
| Thread X | | M3 | 4-40 |
| Mass | grams | 0,18 | 0,18 |
| Material | | Al hard anodized | Al hard anodized |
| Recommended sensors | Type | 8614 | 8614 |

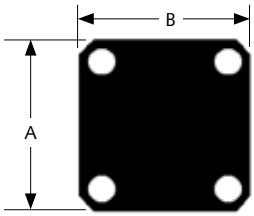
## Magnet Mounting




| Technical data | | Type 8450A | Type 8452A | Type 8456 |
|---|---|---|---|---|
| A | mm | 7,6 | 11,2 | 11,2 |
| B | mm | 12,7 | 17,8 | 24,9 |
| C | mm | 11,2 | 15,9 | – |
| Thread X | | 5-40 | 10-32 | 1/4-28 |
| Holding force | N | 26 | 53 | 133 |
| Mass | grams | 6 | 19 | 57 |
| Material | | stainless steel | stainless steel | stainless steel |
| Recommended sensors | Type | 8636, 8730 | 8202, 8702, 8703 8704, 8705, 8774, 8784, 8786, 8795 | 8203, 8712, 8752 |

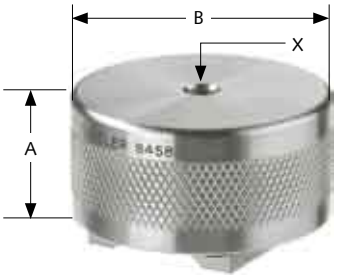
# Mounting

## Mounting Pad



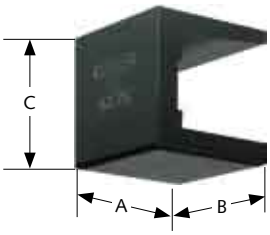

| Technical data | | Type 800M144 |
|---|---|---|
| A | mm | 16 |
| B | mm | 16 |
| Thread | | 4-40 UNC-2B |
| Mass | grams | 3 |
| Material | | Black Al hard anodized |
| Recommended sensors | Type | 8793, 8794 |

## Magnet Mounting



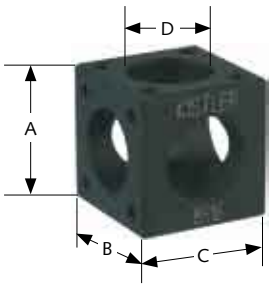

| Technical data | | Type 8458 |
|---|---|---|
| A | mm | 31,7 |
| B | mm | 47,0 |
| Thread X | | 1/4-28 |
| Holding force | N | 178 |
| Mass | grams | 102 |
| Material | | stainless steel |
| Recommended sensors | Type | 8203, 8712, 8752 |

## Mounting Clip




| Technical data | | Type 8474 | Type 8476 |
|---|---|---|---|
| A | mm | 19,5 | 25,4 |
| B | mm | 17,8 | 25,4 |
| C | mm | 18,5 | 25,4 |
| Mass | grams | 5 | 10 |
| Material | | Delrin® | Delrin® |
| Recommended sensors | Type | 8772 | 8690 |

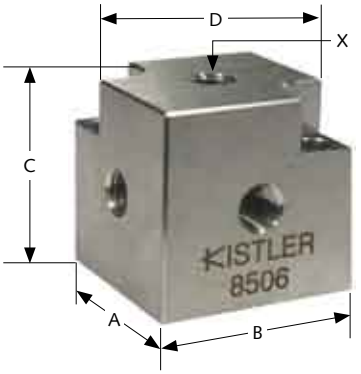
## K-Beam® Mounting



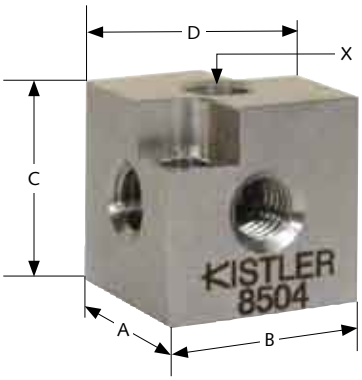

| Technical data | | Type 8516 | Type 8518A | Type 8530 |
|---|---|---|---|---|
| A | mm | 25,4 | 26,9 | 33,0 |
| B | mm | 25,4 | 26,9 | 33,0 |
| C | mm | 25,4 | 26,9 | 33,0 |
| D | mm | 15,1 | 15,1 | 22,1 |
| Thread | | 4-40 | 4-40 | 4-40 |
| Mass | grams | 20,0 | 26,3 | 38,0 |
| Material | | Aluminum | Aluminum | Aluminum |
| Recommended sensors | Type | 8305 | 8310, 8312 | 8330 |

## Mounting

### Triaxial Mounting Cube




| Technical data | | Type 8502 | Type 8504 | Type 8506 |
|---|---|---|---|---|
| A | mm | 25,4 | 14,5 | 28,7 |
| B | mm | 25,4 | 14,5 | 28,7 |
| C | mm | 25,4 | 14,5 | 28,7 |
| D | mm | 25,4 | 14 | 29,2 |
| Thread X | | 10-32 | 10-32 | 1/4-28 |
| Mass | grams | 117 | 20 | 158 |
| Material | | stainless steel | stainless steel | stainless steel |
| Recommended seonsors | Type | 8202, 8284, 8286, 8702, 8704, 8774, 8786 | 8044, 8742, 8743 8774 | 8203, 8710, 8712 |




| Technical data | | Type 8508 | Type 8510 | Type 8514 |
|---|---|---|---|---|
| A | mm | 6,4 | 14,5 | 17,3 |
| B | mm | 6,4 | 14,5 | 17,3 |
| C | mm | 6,4 | 14,5 | 17,3 |
| D | mm | – | 14,2 | 18,5 |
| Thread X | | – | 5-40 | 10-32 |
| Mass | grams | 2 | 19 | 35 |
| Material | | stainless steel | stainless steel | stainless steel |
| Recommended sensors | Type | 8614 | 8636, 8730 | 8202, 8702, 8704. 8774 |

| Technical data | | Type 8524 | Type 8526 |
|---|---|---|---|
| A | mm | 11,2 | 11,2 |
| B | mm | 11,2 | 11,2 |
| C | mm | 11,2 | 11,2 |
| Thread X | | 10-32 | |
| Mass | grams | 2,8 | 2,8 |
| Material | | Al hard anodized | Al hard anodized |
| Recommended sensors | Type | 8274, 8774, 8776 | 8276, 8776 |

## Cables



| Technical data | | Type 1511 |
|---|---|---|
| Connection | | BNC pos.<br>BNC pos. |
| Length | m | 1/sp* |
| Diameter | mm | 6,4 |
| Used for | | Charge amplifier and coupler output signals |



| Technical data | | Type 1576 |
|---|---|---|
| Connection | | 4 pin pos.<br>(3x) BNC pos. |
| Length | m | 0,20 |
| Diameter | mm | 1,8 |
| Used for | | Distribution cable Type 8694M1 |



| Technical data | | Type 1578 |
|---|---|---|
| Connection | | 4 pin pos.<br>4 pin neg. |
| Length | m | 2 |
| Diameter | mm | 2,5 |
| Used for | | Extension cable |



| Technical data | | Type 1592A |
|---|---|---|
| Connection | | 4 pin neg.<br>4 pin neg. |
| Length | m | 2/4/sp* |
| Diameter | mm | 2,5 |
| Used for | | Extension cable for K-Beam® sensors |



| Technical data | | Type 1601B |
|---|---|---|
| Connection | | BNC pos.<br>BNC pos. |
| Length | m | sp* |
| Diameter | mm | 6,35 |
| Used for | | High impedance charge mode cables, commonly used as extension cables |



| Technical data | | Type 1603B |
|---|---|---|
| Connection | | BNC neg.<br>BNC pos. |
| Length | m | sp* |
| Diameter | mm | 3 |
| Used for | | High impedance charge mode cables, commonly used as extension cables |

**Data sheet** 000-471
sp* = special length, according to customer specification

## Cables



| Technical data | | Type 1631C |
|---|---|---|
| Connection | | 10-32 pos.<br>BNC pos. |
| Length | m | 1/2/3/5/8/sp* |
| Diameter | mm | 2 |
| Used for | | High impedance charge mode cables |



| Technical data | | Type 1635C |
|---|---|---|
| Connection | | 10-32 pos.<br>10-32 pos. |
| Length | m | 1/2/3/5/8/sp* |
| Diameter | mm | 2 |
| Used for | | High impedance charge mode cables |



| Technical data | | Type 1641 |
|---|---|---|
| Connection | | 10-32 pos.<br>BNC pos. |
| Length | m | sp* |
| Diameter | mm | 2 |
| Used for | | High impedance charge mode cables |



| Technical data | | Type 1756B |
|---|---|---|
| Connection | | 4 pin neg.<br>(3x) BNC pos. |
| Length | m | 0,5/3/10/sp (10 m max.) |
| Diameter | mm | 1,8 |
| Used for | | Triaxial accelerometers:<br>Types 8690, 8692, 8793, 8794, 8795 |



| Technical data | | Type 1761B |
|---|---|---|
| Connection | | 10-32 pos.<br>BNC pos. |
| Length | m | 1/2/3/5/sp* |
| Diameter | mm | 2 |
| Used for | | Teflon® insulated, voltage mode cables |



| Technical data | | Type 1762B |
|---|---|---|
| Connection | | 10-32 pos.<br>10-32 pos. |
| Length | m | 1/2/3/5/sp* |
| Diameter | mm | 2 |
| Used for | | Teflon® insulated, voltage mode cables |

**Data sheet** 000-471
sp* = special length, according to customer specification

## Cables



| Technical data | | Type 1766AK01 |
|---|---|---|
| Connection | | 5-44 pos.<br>10-32 neg. |
| Length | m | sp* |
| Diameter | mm | 1,5 |
| Used for | | Type 8715 |



| Technical data | | Type 1770A |
|---|---|---|
| Connection | | MS3106 (MIL-C-5015)<br>BNC pos. |
| Length | m | 3/sp* |
| Diameter | mm | 6,35 |
| Used for | | Type 8752A..., Aluminum, with backshell and strain relief, for application below 120 °C |



| Technical data | | Type 1772A |
|---|---|---|
| Connection | | MS3106 (MIL-C-5015)<br>BNC pos. |
| Length | m | 3/sp* |
| Diameter | mm | 6,35 |
| Used for | | Type 8752A..., Aluminum, with backshell and strain relief, for application below 175 °C |



| Technical data | | Type 1776A |
|---|---|---|
| Connection | | MS3106 (MIL-C-5015)<br>BNC pos. |
| Length | m | 3/sp* |
| Diameter | mm | 6,35 |
| Used for | | Silicon, quick disconnect, splash proof for application, below 120 °C |



| Technical data | | Type 1778A |
|---|---|---|
| Connection | | MS3106 (MIL-C-5015)<br>BNC pos. |
| Length | m | 3/sp* |
| Diameter | mm | 6,35 |
| Used for | | Silicon, quick disconnect, splash proof for application, below 175 °C |



| Technical data | | Type 1784AK02 |
|---|---|---|
| Connection | | mini 4 pin neg.<br>4 pin pos. |
| Length | m | 0,50 |
| Diameter | mm | 1,5 |
| Used for | | Sensors with the Kistler Mini 4 pin connector (Types 8763, 8765) |

**Data sheet** 000-471
sp* = special length, according to customer specification

## Cables



| Technical data | | Type 1784AK03 |
|---|---|---|
| Connection | | mini 4 pin neg.<br>(3x) BNC pos. |
| Length | m | 1/3/5/10 |
| Diameter | mm | 1,5 |
| Used for | | Sensors with the Kistler Mini 4 pin connector (Types 8763, 8765), in triaxial applications |



| Technical data | | Type 1786C |
|---|---|---|
| Connection | | 4 pin neg.<br>(2x) Banana jacks for power, BNC pos. signal out put |
| Length | m | 2/5/10 |
| Diameter | mm | 2,67 |
| Used for | | Connection cable for Types 8310, 8312, 8838, 8840 |



| Technical data | | Type 1788A |
|---|---|---|
| Connection | | 4 pin neg.<br>(3x) Banana jacks for power, BNC pos. signal out put |
| Length | m | 2/5/10 |
| Diameter | mm | 2,67 |
| Used for | | Connection cable for Type 8330 |



| Technical data | | Type 1790A |
|---|---|---|
| Connection | | 9 pin micro D pos.<br>9 pin D-Sub pos. |
| Length | m | 2 |
| Diameter | mm | 4,45 |
| Used for | | Connecting cable Type 8393 |



| Technical data | | Type 1794A |
|---|---|---|
| Connection | | 9 pin D-Sub pos.<br>(2x) Banana jacks for power,<br>(3x) BNC pos. signal out put |
| Length | m | 2 |
| Diameter | mm | 2,67 |
| Used for | | Connecting cable for Type 8393 |

# Calibration

Kistler takes pride in its control and concern for the integrity and accuracy of our calibration system. Our system is compliant with ANSI/NCSL Z540-1-1994, MIL-STD-45662A, ISO 9001: 2000 and now is fully accredited to ISO/IEC 17025. Considerable resources in personnel and equipment have been devoted to the maintenance and management of this system and all primary and working standards used in calibration of our products.

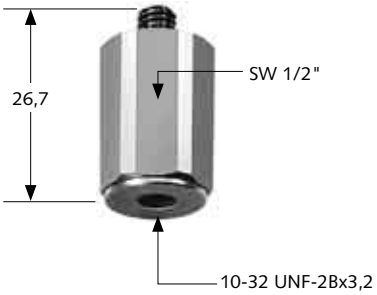
Kistler believes that, not only are you buying a technically superior product, guaranteed to meet or exceed your expectations, but you are also buying a calibration certificate attesting to the performance, accuracy and traceability of your device.

All Kistler products are calibrated using NIST traceable calibration standards, whose reliability and repeatability have been demonstrated through periodic verification and historical data. In fact, Kistler products are used as primary standards in many well known calibration laboratories throughout the world.



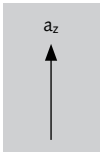
# Calibration: Calibration Standard Sensors

## Quartz Laboratory Primary Standard Accelerometer




| Technical data | | Type 8002K |
|---|---|---|
| Range | g | ±1 000 |
| Sensitivity, ±10 % | pC/g | –1 |
| Frequency response, –1 %, 5 % | Hz | ≈0 … 6 000 |
| Threshold, nom. | $g_{rms}$ | 0,02 |
| Transverse sensitivity, typ. | % | ≤2 |
| Non-linearity | %FSO | ±0,5 |
| Temp. coeff.: Sensitivity | %/°C | –0,03 |
| Operating temperature range | °C | –70 … 120 |
| Housing/base | material | stainless steel |
| Degree of protection (EN60529) | | IP67 |
| Mass | grams | 20 |
| Sensing element | Type | Compression quartz |

**Measuring diretion**




**Connection**
10-32 neg.

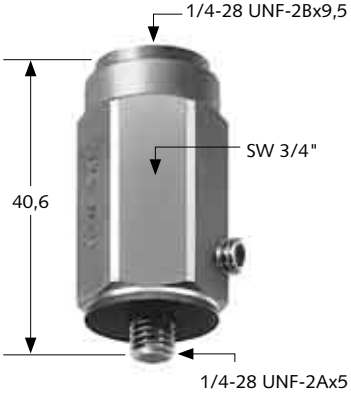
**Characteristics**
High impedance charge mode, quartz stability and repeatability, wide operating temperature range.

**Application**
Used with Type 5022 to form a complete calibration primary standard.

**Accessories**
Mounting stud Type 8402
Cable Type1631C...
Charge amplifier Type 5022

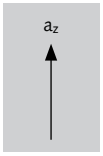
**Data sheet** 8002_000-205

## Quartz Vibration Standard Accelerometer




| Technical data | | Type 8076K |
|---|---|---|
| Range | g | ±1 000 |
| Sensitivity, ±10 % | pC/g | 1 |
| Frequency response, ±4 % | Hz | 0,5 … 5 000 |
| Threshold, nom. | $g_{rms}$ | 0,01 |
| Transverse sensitivity, typ. | % | ≤ 2 |
| Non-linearity | %FSO | ±0,5 |
| Temp. coeff.: Sensitivity | %/°C | 0,02 |
| Operating temperature range | °C | –20 … 65 |
| Housing/base | material | stainless steel |
| Degree of protection (EN60529) | | IP66 |
| Mass | grams | 80 |
| Sensing element | Type | Compression quartz |

**Measuring diretion**




**Connection**
10-32 neg.

**Characteristics**
High impedance charge mode, quartz accuracy and stability, rugged design, low base strain sensitivity, ground isolated. Low mass loading.

**Application**
Used with Type 5022 to form a complete back-to-back calibration transfer standard.

**Accessories**
Mounting stud Type 8410
Cable Type 1631C...
Charge amplifier Type 5022

**Data sheet** 8076K_000-210

# Calibration: Charge Amplifier

## Calibration System



| Technical data | | Type 8802A1 |
|---|---|---|
| Range | g | ±250 |
| Acceleration limit | g | ±1 000 |
| Threshold | $g_{rms}$ | 0,02 |
| Ref. voltage sensitivity (at 100 Hz, 25 °C ±10 $g_{rms}$) | mV/g | 10,00 ±0,01 |
| Frequency response, ±5 % | Hz | 10 … 10 000 |
| Transverse sensitivity (at 100 Hz) | % | 2 |
| Time constant | s | 1 |
| Non-linearity | % | ±0,5 |
| Operating temperature range | °C | 5 … 40 |
| Temp. coeff.: Sensitivity | %/°C | –0,03 |
| Output voltage FSO | V | ±2,5 |
| Ground isolated | | no |
| Output impedance | Ω | <15 |
| Power supply | VAC | 115/230 |
| Mass (sensor) | grams | 20 |

**Connection**
Type 8002K
10-32 neg.
Type 5022
BNC-neg.

**Characteristics**
This calibration system features unique stability, linearity and repeatability. The Type 8802 includes Type 8002K and Type 5022 charge ampplifier calibrated as a system.

**Application**
System for lab primary calibration.

**Data sheet** 8802_000-520

## Calibration System



| Technical data | | Type 8804A1 |
|---|---|---|
| Range | g | ±250 |
| Acceleration limit | g | ±1 000 |
| Threshold | $g_{rms}$ | 0,01 |
| Ref. voltage sensitivity (at 100 Hz, 25 °C ±10 $g_{rms}$) | mV/g | 10,00 ±0,01 |
| Frequency response, ±5 % | Hz | 10 … 10 000 |
| Transverse sensitivity (at 100 Hz) | % | 2 |
| Time constant | s | 1 |
| Non-linearity | % | ±0,5 |
| Operating temperature range | °C | 5 … 40 |
| Temp. coeff.: Sensitivity | %/°C | –0,03 |
| Output voltage FSO | V | ±2,5 |
| Ground isolated | | yes |
| Output impedance | Ω | <15 |
| Power supply | VAC | 115/230 |
| Mass (sensor) | grams | 80 |

**Connection**
Type 8076K:
10-32 neg.
Type 5022:
BNC-neg.

**Characteristics**
This calibration system features unique stability, linearity and repeatability. The Type 8804 includes Type 8076K and Type 5022 charge amp calibrated as a system.

**Application**
System for back-to-back calibration.

**Data sheet** 8804_000-521

## Calibration: Reference Shaker

### Reference Shaker



| Technical data | | Type 8921Y26 |
|---|---|---|
| Reference frequency | Hz (rad/s) | 159,15 (1 000) |
| Acceleration $_{rms}$, ±3 % | $m/s^2$ | 10 |
| Velocity $_{rms}$, ±3 % | mm/s | 10 |
| Displacement, ±3 % | µm | 10 |
| Max. load | g | 300 |
| Operating temperature range | °C | 10 … 40 |
| Power supply | mA<br>VDC | 300<br>12 |
| Battery | Type | built-in rechargeable |
| Mass | kg | 2 |
| Dimensions (WxHxD) | mm | 178x107x76 |

**Characteristics**
Test measurement system integrity, convenient self-contained and portable, rechargeable battery, tests sensors up to 300 grams,
CE compliant.

**Application**
The Type 8921 reference shaker can be used to confirm the sensitivity of acceleration, velocity, and displacement sensors.

**Accessories**
10-32 to M5 stud Type 8451
1/4-28 to M5 stud Type 8453

**Specify version**
Type 8921Y26 supplied with 120 VAC battery charger
Type 8921 supplied with 230 VAC battery charger

**Data sheet** 8921_000-362

# Piezoelectric Theory

## Piezoelectric Effect

Although the piezoelectric effect was discovered by Pierre and Jacques Curie in 1880, it remained a mere curiosity until the 1940's. The property of certain crystals to exhibit electrical charges under mechanical loading was of no practical use until very high input impedance amplifiers enabled engineers to amplify their signals. In the 1950's, electrometer tubes of sufficient quality became available and the piezoelectric effect was commercialized.

Walter P. Kistler patented the charge amplifier principle in 1950 and gained practical significance in the 1960's. The introduction of highly insulating materials such as Teflon® and Kapton® greatly improved performance and propelled the use of piezoelectric sensors into virtually all areas of modern technology and industry.

Piezoelectric measuring systems are active electrical systems. That is, the crystals produce an electrical output only when they experience a change in load. For this reason, they cannot perform true static measurements. However, it is a misconception that piezoelectric instruments are suitable for only dynamic measurements. Quartz transducers, paired with adequate signal conditioners, offer excellent quasi-static measuring capability. There are countless examples of applications where quartz based sensors accurately and reliably measure quasi-static phenomena for minutes and even hours.

## Applications of Piezoelectric Instruments

Piezoelectric measuring devices are widely used today in the laboratory, on the production floor and embedded within as original equipment. They are used in almost every conceivable application requiring accurate measurement and recording of dynamic changes in mechanical variables such as pressure, force and acceleration. The list of applications continues to grow and now includes:

- Aerospace: Modal testing, wind tunnel and shock tube instrumentation, landing gear hydraulics, rocketry, structures, ejection systems and cutting force research
- Ballistics: Combustion, explosion, detonation and sound pressure distribution
- Biomechanics: Multi-component force measurement for orthopedic gait and posturography, sports, ergonomics, neurology, cardiology and rehabilitation
- Engine Testing: Combustion, gas exchange and injection, indicator diagrams and dynamic stressing
- Engineering: Materials evaluation, control systems, reactors, building structures, ship structures, auto chassis structural testing, shock and vibration isolation and dynamic response testing
- Industrial/Factory: Machine systems, metal cutting, press and crimp force, automation of force-based assembly operations and machine health monitoring
- OEMs: Transportation systems, plastic molding, rockets, machine tools, compressors, engines, flexible structures, oil/gas drilling and shock/vibration testers.

## Piezoelectric Sensors (Quartz Based)

The vast majority of Kistler sensors utilize quartz as the sensing element. As discussed in other sections of this catalog, Kistler also manufactures sensors which utilize piezoceramic elements and micro machined silicon structures. However, the discussion in this section will be limited to quartz applications. Quartz piezoelectric sensors consist essentially of thin slabs or plates cut in a precise orientation to the crystal axes depending on the application. Most Kistler sensors incorporate a quartz element, which is sensitive to either compressive or shear loads. The shear cut is used for patented multi-component force and acceleration measuring sensors. Other specialized cuts include the transverse cut for some pressure sensors and the patented Polystable® cut for high temperature pressure sensors. See Fig. 1 and 2. Although the discussion which follows focuses on acceleration applications, the response function for force and pressure sensors has essentially the same form. In fact, many force applications are closely related to acceleration. On the other hand, pressure sensors are designed to minimize or eliminate (by direct compensation of the charge output) the vibration effect. Call Kistler directly for more information on this subject or refer to the inside back cover which lists available technical articles.

The finely lapped quartz elements are assembled either singularly or in stacks and usually preloaded with a spring sleeve. The quartz package generates a charge signal (measured in pico Coulombs) which is directly proportional to the sustained force. Each sensor type uses a quartz configuration which is optimized and ultimately calibrated for its particular application (force, pressure, acceleration or strain). Refer to the appropriate section for important design aspects depending on application.

Quartz sensors exhibit remarkable properties which justify their large scale use in research, development, production and testing. They are extremely stable, rugged and compact. Of the large number of piezoelectric materials available today, quartz is employed preferentially in sensor designs because of the following excellent properties:

- High material stress limit, approximately 150 N/mm$^2$
- Temperature resistance up to 500 °C
- Very high rigidity, high linearity and negligible hysteresis
- Almost constant sensitivity over a wide temperature range
- Ultra high insulation resistance

**High and Low Impedance**

Kistler supplies two types of piezoelectric sensors: high and low impedance. High impedance units have a charge output which requires a charge amplifier or external impedance converter for charge-to-voltage conversion. Low impedance types use the same piezoelectric sensing element as high impedance units and also incorporate a miniaturized built-in charge-to-voltage converter. Low impedance types require an external power supply coupler to energize the electronics and decouple the subsequent DC bias voltage from the output signal.

## Dynamic Behavior of Sensors

Piezoelectric sensors for measuring pressure, force and acceleration may be regarded as under-damped, spring mass systems with a signal degree of freedom. They are modeled by the classical second order differential equation whose solution is:

$$\frac{a_o}{a_b} \cong \frac{1}{\sqrt{\left[1-\left(\frac{f}{f_n}\right)^2\right]^2 + \left(\frac{1}{Q^2}\right)\left(\frac{f}{f_n}\right)^2}}$$

Where:

- $f_n$ undamped natural (resonant) frequency [Hz]
- $f$ frequency at any given point of the curve [Hz]
- $a_o$ output acceleration
- $a_b$ mounting base or reference acceleration ($f/f_n = 1$)
- $Q$ factor of amplitude increase at resonance

Quartz sensors have a Q of approximately 10 … 40 and therefore the phase angle can be written as:

$$\Delta\pi \cong \frac{60}{Q}\left(\frac{f}{f_n}\right) \text{ für } \frac{f}{f_n} \leq \frac{2}{5}$$

A typical frequency response curve is shown in Fig. 3. As shown, about 5 % amplitude rise can be expected at approximately 1/5 of the resonant frequency ($f_n$). Low-pass (LP) filtering can be used to attenuate the effects of this. Many Kistler signal conditioners (charge amplifiers and couplers) have plug-in filters for this purpose.

### Piezoelectric Theory

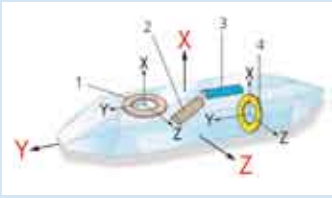



Fig. 1
Quartz bar

1 = compression cut
2 = Polystable® cut
3 = transverse cut
4 = shear cut

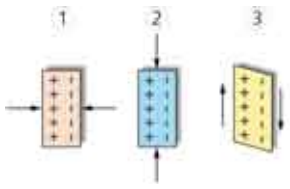



Fig. 2
Piezoelectric effect

1 = longitudinal effect
2 = transverse effect
3 = shear effect

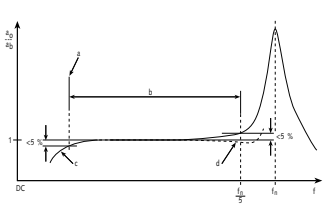



Fig. 3
Typical frequency response curve

a = low frequency limit determined by RC roll-off characteristics
b = useable range
c = HP filter
d = LP filter

# Piezoelectric Theory

## Charge Amplifiers

Basically the charge amplifier consists of a high-gain inverting voltage amplifier with a MOSFET or J-FET at its input to achieve high insulation resistance. A simplified model of the charge amplifier is shown in Fig. 4.

The effects of $R_t$ and $R_i$ will be discussed below. Neglecting their effects, the resulting output voltage becomes:

$$V_o = \frac{-q}{C_r} \times \frac{1}{1+\frac{1}{AC_r}(C_t + C_r + C_c)}$$

For sufficiently high open loop gain, the cable and sensor capacitance can be neglected and the output voltage depends only on the input charge and the range capacitance:

$$V_o = \frac{-q}{C_r}$$

In summary, the amplifier acts as a charge integrator which compensates the sensor's electrical charge with a charge of equal magnitude and opposite polarity and ultimately produces a voltage across the range capacitor. In effect, the purpose of the charge amplifier is to convert the high impedance charge input (q) into a useable output voltage ($V_o$).

**Time Constant and Drift**

Two of the more important considerations in the practical use of charge amplifiers are time constant and drift. The time constant is defined as the discharge time of an AC coupled circuit. In a period of time equivalent to one time constant, a step input will decay to 37 % of its original value.

Time Constant (TC) of a charge amplifier is determined by the product of the range capacitor ($C_r$) and the time constant resistor ($R_t$): Drift is defined as an undesirable change in output signal over time, which is not a function of the measured variable. Drift in a charge amplifier can be caused by low insulation resistance at the input ($R_j$) or by leakage current of the input MOSFET or J-FET.

Drift and time constant simultaneously affect a charge amplifier's output. One or the other will be dominant. Either the charge amplifier output will drift towards saturation (power supply) at the drift rate or it will decay towards zero at the time constant rate.

Many Kistler charge amplifiers have selectable time constants which are altered by changing the time constant resistor ($R_t$). Several of these charge amplifiers have a "Short", "Medium" or "Long" time constant selection switch. In the "Long" position, drift dominates any time constant effect. As long as the input insulation resistance ($R_i$) is maintained at greater than $10^{13}\ \Omega$, the charge amplifier (with MOSFET input) will drift at an approximate rate of 0,03 pC/s. Charge amplifiers with J-FET inputs are available for industrial applications but have an increased drift rate of about 0,3 pC/s.

In the "Short" and "Medium" positions, the time constant effect dominates normal leakage drift. The actual value can be determined by referring to the appropriate operation/instruction manual which is supplied with the unit. Kistler charge amplifiers without "Short", "Medium" or "Long" time constant selection, operate in the "Long" mode and drift at the rates listed above. Some of these units can be internally modified for shorter time constants to eliminate the effects of drift.

**Frequency and Time Domain Considerations**

When considering the effects of time constant, the user must think in terms of either frequency or time domain. The longer the nige time constant, the better the low-end frequency response and the longer the useable measuring time. When measuring vibration, time constant has the same effect as a single pole, highpass (HP) filter whose amplitude and phase are:

$$\frac{V_o}{V_{in}} = \frac{2\pi f\,(TC)}{\sqrt{1+(2\pi f\tau)^2}}$$

$$\Delta\pi = \arctan\frac{1}{2\pi f\tau} \cong 80\sqrt{\frac{V_{in}-V_o}{V_{in}}}$$

For example, the output voltage has declined approximately 5 % when f x (TC) equals 0,5 and the phase lead is 18 degrees.

When measuring events with wide (or multiple) pulse widths the time constant should be at least 100 times longer than the total event duration. Otherwise, the DC component of the output signal will decay towards zero before the event is completed.

**Selection Matrix**

Other design features incorporated into Kistler charge amplifiers include range normalization for whole number output, low-pass filters for attenuating sensor resonant effects, electrical isolation for minimizing ground loops and digital/computer control of setup parameters.

## Low Impedance Piezoelectric Sensors

Piezoelectric sensors with miniature, built-in charge-to-voltage converters are identified as low impedance units throughout this catalog. These units utilize the same types of piezoelectric sensing element(s) as their high impedance counterparts. Piezotron, Picotron, PiezoBeam, Ceramic Shear and K-Shear are all forms of Kistler low impedance sensors.

In 1966, Kistler developed the first commercially available piezoelectric sensor with internal circuitry. This internal circuit is a patented design called Piezotron. This circuitry employs a miniature MOSFET input stage followed by a bipolar transistor stage and operates as a source follower (unity gain). A monolithic integrated circuit is utilized which incorporates these circuit elements. This circuit has very high input impedance ($10^{14}\,\Omega$) and low output impedance (100 fA) which allows the charge generated by the quartz element to be converted into a useable voltage. The Piezotron design also has the great virtue of requiring only a single lead for power-in and signal-out. Power to the circuit is provided by a Kistler coupler (Power Supply), which supplies a source current (2 … 18 mA) and energizing voltage (20 … 30 VDC). Certain (extreme) combinations of other manufacture's supply current and energizing voltage (i.e. 20 mA and 18 VDC, respectively), together with actual bias level, may restrict operating temperature range and voltage output swing. Call Kistler for details. Connection is as shown in Fig. 5. A Kistler coupler and cable is all that is needed to operate a Kistler low impedance sensor.

The steady state output voltage is essentially the input voltage at the MOSFET gate plus any offset bias adjustment. The voltage sensitivity of a Piezotron unit can be approximated by:

$$V_o \cong \frac{q}{C_q + C_r + C_G}$$

Since its invention, the Piezotron® design has been adapted by manufactures worldwide and has become a widely used standard for design of sensors which measure acceleration, force and pressure. The concept has become known by many names besides Piezotron such as low impedance or voltage mode. Also, a number of "brand names" have emerged by other manufactures.

Picotron is a mini accelerometer whose circuitry is very similar to the Piezotron. PiezoBeam incorporates a bimorph ceramic element and a miniature hybrid charge amplifier for the charge-to-voltage conversion. K-Shear is the newest member of the Kistler low impedance family and utilizes a shear quartz element together with the Piezotron circuitry.

### Piezoelectric Theory

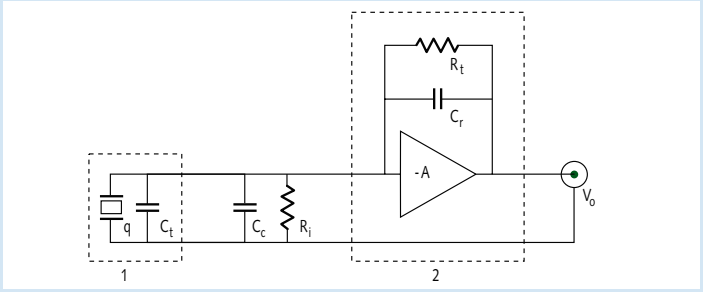



Fig. 4
Simplified charge amplifier model

1 = piezoelectric accelerometer
2 = charge amplifier
$V_0$ = output voltage
A = open loop gain
$C_t$ = sensor capacitance
$C_c$ = cable capacitance
$C_r$ = range (or feedback) capacitor
$R_i$ = insulation resistance of input circuit (cable and sensor)
q = charge generated by the sensor

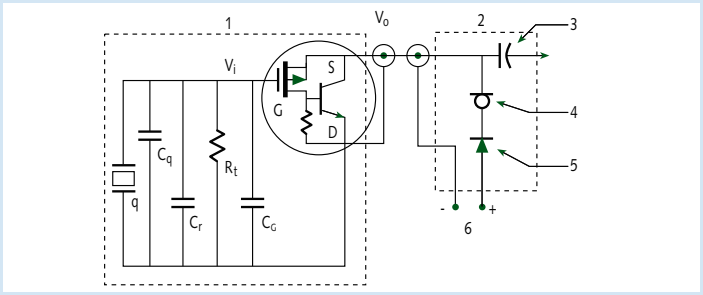



Fig. 5
Piezotron® circuit & coupler

1 = accelerometer
2 = coupler
3 = decoupling capacitor
4 = constant current diode
5 = reverse polarity protection diode
6 = DC source
q = charge generated by piezoelectric element
$V_i$ = input signal at gate
$V_0$ = output voltage (usually bias decoupled)
$C_q$ = sensor capacitance
$C_r$ = range capacitance
$C_G$ = MOSFET GATE capacitance
$R_t$ = time constant resistor

# Piezoelectric Theory

## Time Constant

The time constant of a Piezotron® or Picotron® sensor is:

$$\tau = R_t (C_q + C_r + C_G)$$

A PiezoBeam®'s time constant is the product of its hybrid charge amplifier's range capacitor and time constant resistor.

Time constant effects in low impedance sensors and in charge amplifiers are the same. That is, both act as a single pole, highpass filter as discussed previously.

**Low Impedance Power Supply (Coupler)**
All of the low impedance types mentioned earlier require similar excitation for their built-in electronics. A single two-wire coaxial cable and a Kistler power supply coupler is all that is needed. Both the power into and the signal out from the sensor are transmitted over this two-wire cable. The coupler provides the constant current excitation required for linear operation over a wide voltage range and also decouples the bias voltage from the output.

**Time Constant**
Bias decoupling methods can be categorized as AC or DC. DC methods of bias decoupling will not effect a low impedance sensor's time constant and therefore permit optimum low frequency response. An offset voltage adjust is used to "zero" the bias. AC decoupling methods, however, can shorten the low impedance sensor's time constant and degrade low frequency response. In low impedance systems, with AC bias decoupling, the system time constant can be approximated by taking the product of the sensor and coupler time constants and dividing by their sum. The resulting frequency response can be computed as before.

**Selection Matrix**
Many other performance features are incorporated into Kistler's line of power supply couplers. Included are versions with multi-channel inputs, 100x gain, plug-in filters and computer controlled set-up parameters.

**Dual Mode Charge Amplifiers**
Another method for powering low impedance sensors is to use a dual mode charge amplifier (high/low impedance). Dual mode units can be used as standard charge amplifiers with high impedance sensors or as couplers (with adjustable gain) for low impedance units.

## High and Low Impedance System Comparison

**Similarities**
Both systems utilize the same type of piezoelectric sensing element(s) and therefore are AC coupled systems with limited low frequency response or quasi-static measuring capability. Their respective time constants determine the useable frequency range.

**High Impedance Systems**
Usually high impedance systems are more versatile than low impedance. Time constant, gain, normalization and reset are all controlled via an external charge amplifier. In addition, the time constants are usually longer with high impedance systems allowing easy short-term static calibration. Because they contain no built-in electronics, they have a wider operating temperature range.

**Low Impedance Systems**
Generally, low impedance systems are tailored to a particular application. Since the low impedance sensor has an internally fixed range and time constant, it may limit use to their intended application. High impedance systems, with control of range and time constant via an external charge amplifier, have no such restriction. However, for applications with well-defined measuring frequency and temperature ranges, low impedance (Piezotron) systems offer a potentially lower cost (i.e. charge amplifier vs. coupler cost) alternative to high impedance systems. In addition, low impedance sensors can be used with general purpose cables in environments where high humidity/contamination could be detrimental to the high insulation resistance required for high impedance sensors. Also, longer cable lengths between sensor and signal conditioner and compatibility with a wide range of signal display devices are further advantages of low impedance sensors.

## External Impedance Converters

An alternative method for processing charge from high impedance sensors is to use an external impedance converter. This method is often used to exploit the high temperature range of high impedance sensors while implementing the convenience and cost effectiveness of the coupler.

External impedance converters incorporate the same circuitry as the Piezotron. The only difference is that the sensor cable capacitance must be added to the sensor capacitance ($C_q$).

## Sensor Quality/Calibration

Over the years, the Kistler name has become synonymous with quality. We at Kistler are dedicated to continuous improvement in all areas; design, manufacturing, quality control, quality assurance and calibration.

All Kistler products are manufactured in conformance with the requirements of ISO 9001 and MIL-I-45208A. Kistler's calibration system complies with the requirements of MIL-STD-45662A and ANSI/NCSL Z540. Calibrations performed at Kistler are traceable to the National Institute of Standards and Technology (NIST), or the Swiss Federal Office of Metrology. Kistler takes full advantage of the latest technology, performing computer controlled testing, calibration and data collection. Kistler products are used as primary standards for many of the world's leading test and national calibration laboratory facilities, including NIST.

## Kistler Calibration Techniques

**Force Sensors**
The calibration of force sensors is very similar to pressure sensors. The unit under test is calibrated against a standard force ring whose calibration is traceable to NIST. A hydraulic press is used to generate forces for this calibration.

**Accelerometers**
Kistler acceleration standards are periodically calibrated by an independent third party providing NIST traceability. These primary standards are used to calibrate a set of working standards at Kistler. The working standards are configured to accept direct mounting of the unit under test. "Back to Back" calibration technique minimizes errors. Calibration is performed on a sinusoidal motion shaker.

## Glossary and Technical References

A glossary of technical terms used throughout this catalog follows this section. Also, refer to the inside back cover for a comprehensive list of Kistler technical articles that have been compiled over the years by authorities in the field of piezoelectric instrumentation.



# Capacitive Accelerometer Theory

**The fundamental principle of operation for a capacitive accelerometer is the property that a repeatable change in capacitance exists when a sensing structure is deflected due to an imposed acceleration.**

The acceleration creates a force (F) acting on a suspended flexure of known mass (m). The flexure moves predictably and in a controlled manner dictated by its stiffness (k). A gas filled gap exists between surrounding electrodes as shown in Fig. 1. The inertial force can be calculated from Newton's Second Law of Motion as:

$$F = ma \qquad \text{[Gl. 1]}$$

Knowing the force, a displacement of the flexure can be estimated using a simple spring calculation:

$$x = F/k \qquad \text{[Gl. 2]}$$

However, in practice, Finite Element Analysis (FEA) is employed to model the complicated spring designs. This displacement alters the gaps on either side of the flexure in an equal but opposite proportion. The distance between the flexure and surrounding electrodes (l), is then the nominal [zero g] spacing (d) ± the spring deflection (x) or:

$$l_1 = d + x \;\; \& \;\; l_2 = d - x \qquad \text{[Gl. 3]}$$

Knowing the electrode area (A) and the permittivity constant of the gas (ε), the capacitance formed by the gaps can be determined from:

$$C_1 = A\,\varepsilon/l_1 \;\; \& \;\; C_2 = A\,\varepsilon/l_2 \qquad \text{[Gl. 4]}$$

This capacitance difference causes an imbalance in a bridge network of the internal electronic circuit. Internal signal conditioning incorporates AC excitation and synchronous demodulation. In addition, it provides power for the accelerometer element and outputs an analog voltage proportional to the acceleration signal.

The key operating principle of Fig. 2 is that a variable capacitive element unbalances a bridge relative to applied acceleration. The electronic action is summarized as follows:

- A voltage regulator stabilizes the accelerometer sensitivity and assures internal functions remain constant despite the supply voltage level
- A square wave generator produces excitation for the bridge circuit
- A capacitive bridge produces two signals with amplitudes relative to the applied acceleration
- The opposing signals are summed by the synchronous demodulator, to form a voltage proportional to applied acceleration
- A preamplifier provides gain
- A built-in low pass filter attenuates unwanted signals above the operating frequency range

## Capacitive Theory

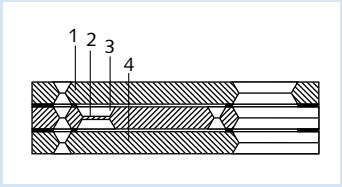



Fig. 1
Typical capacitive accelerometer arrangement

1 = top electrode
2 = spring
3 = mass
4 = bottom electrode

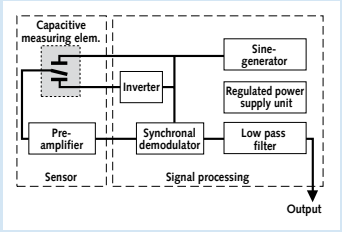



Fig. 2
Electrical schematic

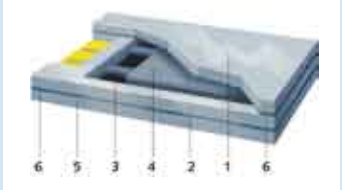



Fig. 3
MEMS variable capacitance accelerometer

1 = top electrode
2 = frame
3 = spring
4 = mass
5 = bottom electrode
6 = glass layer

## Capacitive Theory

Kistler micromachined K-Beam accelerometer sensing elements consist of very small inertial mass and flexure elements chemically etched from a single piece of silicon. The seismic mass is supported by flexure elements between two plates, which act as electrodes. As the mass deflects under acceleration, the capacitance between these plates changes. Under very large accelerations (or shocks), the motion of the mass is limited by the two stationary plates thereby limiting the stress placed on the suspension and preventing damage. The typical design is shown in Fig. 3.

The damping of the mass by an entrapped gas creates a "squeeze film" providing an optimized frequency response over a wide temperature range. Additionally, its differential capacitive design assures immunity to thermal transients. The affect of damping is shown in Fig. 4a and appropriate damping is tuned with a specific spring mass system to achieve optimal frequency response (Fig. 4b).

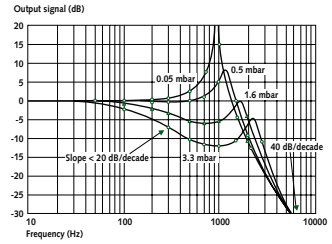



Fig. 4a
Effect of damping

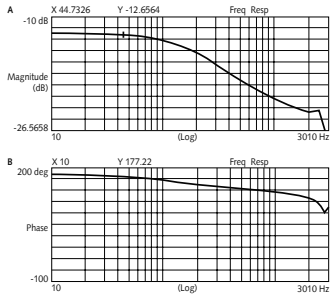



Fig. 4b
Tuned system



# Glossary

**Bias Voltage**
DC (no load or quiescent) output level of a low impedance sensor powered by constant current excitation.

**Ceramic Shear**
Kistler piezoelectric accelerometer family which utilizes ceramic shear sensing elements.

**Charge Amplifier**
Electronic unit which utilizes a high-gain voltage amplifier with negative, capacitive feedback for converting a charge from a piezoelectric sensor into a low impedance output voltage.

**Charge Output**
Output in Pico Coulombs (pC) from a piezoelectric sensor without a built-in charge-to-voltage converter (see High impedance).

**Circuit Integrity Indication**
A quick-look reference on couplers or dual mode charge amplifier for identifying whether a low impedance system has the proper bias voltage. Analogue meters and multi-color LEDs are the most commonly used indicators.

**Constant Current Excitation**
Method of powering low impedance sensors to insure minimal sensitivity variation over a wide voltage range.
A piezotron coupler or any other ICP type power supply may be used for this purpose.

**Coupler**
Electronic unit which supplies constant current excitation to low impedance sensors and decouples the subsequent bias voltage.

**Crosstalk**
Another term for cross axis or transverse sensitivity; used on Kistler multi-component force sensors to describe the output on one axis caused by inputs on the others.

**Drift**
An undesirable change in output signal, over time, which is not a function of the measurand.

**Dual Mode**
Refers to a charge amplifier which can be used either with high impedance, charge output or with low impedance, voltage output sensors.

**Ground Isolated**
The electrical resistance between the signal return/common and mounting ground of a sensor, or between an electrical connector shield and power ground of a charge amplifier/coupler.

**High Impedance**
Another term for a piezoelectric sensor with charge output (i.e. pC/mechanical unit).

**Hysteresis**
The maximum difference in output, at any measured value within the specified range when the value is approached first with increasing and then decreasing measurand.

**Impedance Converter**
A miniature electronic unit with MOSFET input and bipolar output for converting high impedance, charge outputs (from a sensor) into low impedance, voltage outputs. Impedance converters can be built into the sensor (see low impedance) or can be used externally for special application.

**Impedance Head**
Sensor that simultaneously measures both force and acceleration during modal analysis testing.

**Insulation Resistance**
The resistance of a high impedance sensor, cable or charge amplifier measured between the signal lead and connector ground.

**K-Beam®**
Kistler's solid-state, variable capacitance based line of accelerometers, which are suitable for measuring low frequencies or even steady-state conditions.

**K-Shear®**
Kistler's piezoelectric accelerometer family. Low impedance accelerometer, which utilizes quartz shear sensing element.

**Linearity**
The closeness of a calibration curve to a specified straight line. Kistler uses "Best straight line through zero" which is defined as follows: two parallels are sought, as close together as possible but enclosing the entire calibration curve. In addition, the median parallel must pass through zero (no measurand, no output signal). The slope of this median parallel is the sensitivity of the sensor. Half the interval between the two parallels, expressed as a percentage of Full-Scale Output (FSO), is the linearity.

**Low Impedance**
Another name for a piezoelectric sensor with a miniature, built-in charge to voltage converter. Output is typically in mV/mechanical unit. K-Shear, Piezotron, Picotron and PiezoBeam are all forms of low impedance sensors.

**Low Pass Filter**
An electronic network for passing low and attenuating high frequencies. Many plug-in types are available for Kistler charge amplifiers and power supply/couplers.

**Measurand**
A physical quantity, property or condition which is measured (i.e. pressure, force or acceleration).

**MEMS**
Micro Electro Mechanical Sensor.

**Multi-Component Force Sensor**
Kistler design utilizing compressive and shear quartz elements for measuring up to three force components and three moments.

**Natural Frequency**
The frequency of free (not forced) oscillations of the sensing element of a fully assembled sensor.

**pC (pico Coulomb)**
A unit of electrical charge equivalent ($1\ pC = 10^{-12}\ As$).

**Picotron**
Miniature accelerometer with Piezotron circuitry.

**PiezoBeam®**
Low impedance accelerometer. Incorporates a bimorph ceramic element charge when mechanically loaded.

**Piezoelectric Sensor**
Sensor with a sensing element that generates an electrical charge when mechanically loaded.

**Piezotron®**
Patented Kistler piezoelectric sensors with miniature, built-in impedance converters (see impedance converter).

**Polystable®**
Patented Kistler quartz element incorporated into pressure sensor designs for operating temperatures up to 350 °C.

**Quasistatic**
Term which denotes Kistler's ability to make short-term static or near DC measurements with high impedance sensors and charge amplifiers.

**Resonant Frequency**
The measurand frequency at which a sensor responds with maximum output amplitude.

**Rise Time**
The length of time for the output of a sensor to rise from 10 ... 90 % of its final value as a result of a step-change of measurand.

**Sensitivity**
The ratio of the change in sensor output to a change in the value of the measurand. Expressed in pC or mV per mechanical unit.

**TEDS**
Transducer Electronic Data Sheet. Characteristic data stored digitally internal to sensor, IEEE 1451.4 compliant.

**Temperature Coefficient of Sensitivity**
The change in sensitivity of a sensor at different (constant) operating temperatures. Typically expressed as a percent change per unit temperature change (%/°C).

**Time Constant**
(TC) Refers to the discharge time of an AC coupled circuit. In the time domain, a DC signal will decay to 37 % of its original value in a period of time equivalent to one time constant.

In high impedance systems, the time constant is the product of the charge amplifier's range capacitor and time constant resistor. In low impedance systems, the system time constant can be approximated by taking the product of sensor and coupler time constants and dividing by their sum.

In frequency domain, time constant can be related to a high pass filter network with a low frequency cutoff (–5 % point) equal to 0,5/TC.

**Threshold**
The smallest change in the measurand that will result in a measurable change in sensor output.
For charge output sensors, threshold denotes the equivalent noise level in a standard charge amplifier. For voltage output sensors, threshold denotes the equivalent noise level of its built-in charge to voltage converter.

**Transverse Sensitivity**
The output of an accelerometer caused by acceleration perpendicular to the measuring axis.

**Voltage Output**
Output from a piezoelectric sensor with a built-in charge-to-voltage converter (see low impedance).

# Kistler – Customer Service

The selection of services from Kistler is as comprehensive as the range of products.

We support our customers with a whole series of services to enable them to get the best possible results with our products.



## Technical Advice

Experienced specialists from every area of application are at the disposal of our customers. More particularly, Kistler consultation services include the identification and definition of each individual measurement task, the development of the solution, the selection of the appropriate measuring system and the planning of the installation.

## Test Equipment

Kistler provides its customers with proper equipment to help solve specific application problems.

## Repair Service

In the event of the failure of a measuring chain, Kistler specialists help to keep downtime of machinery or production lines to a minimum.

## Calibration

Kistler offers a calibration service for the periodic testing of measuring accuracy in accordance with ISO 17025.
If necessary, this service can be performed on site. Kistler keeps a comprehensive record to show which sensors have been calibrated, as well as when and how. Kistler also has a whole series of instruments for equipping calibration laboratories.

## Information

In order to keep customers constantly aware of the latest information, Kistler passes on its specialist knowledge at exhibitions, trade fairs, conferences, symposiums and seminars. Information in the form of data sheets, brochures, reprints, operating instructions and application descriptions is also available to our customers in printed or electronic form.

## Training

Kistler trains its engineers thoroughly at its own training center so that their knowledge corresponds to the latest state of the art. Kistler also holds regular seminars for customers on special subject areas.

### Customer Service



You can count on the support of experienced specialists



A highly effective repair service minimizes down time



A calibration service periodically checks measuring accuracy



Many Kistler products are available from stock



Kistler engineers are always abreast of the latest developments

# The Kistler Spectrum

With around 5 000 products, Kistler covers a broad spectrum.

## Acceleration

In addition to the field of acceleration measurement covered in this brochure, Kistler is involved in four other product areas.



## Force

Kistler sensors have been used for almost 50 years for dynamic and quasi-static measurements ranging from very small to very large forces. Kistler force sensors have proved their worth wherever precise results are needed and however extreme the conditions.

## Compression

Kistler sensors can be used to measure almost any pressure – from the gas pressure in internal combustion engines to the pressure in a plastic melt or a pressure drop in dialysis equipment. They also serve to supply precise process information under extreme conditions.

## Torque

Sensors and systems for analyzing the angular and time-based curves of torque are one of Kistler Group's key product lines. They demonstrate their versatility in a wide variety of applications – research and development, test rings, drives, handling systems, production and process monitoring, production instrumentation and quality assurance. Last but not least they allow documentation of process and quality data.

## Measurement and Analysis

Kistler technology serves to measure minute variations in pressure, force or acceleration, even under extreme conditions, and to display them on high-precision electronic instruments. Kistler also supplies the hardware and software needed to convert the raw data for measurement related process control.

### Applications



In the acceleration field, Kistler sensors measure changes in speed



Kistler sensors measure force, torque and strain



Kistler sensors can be used to measure almost any pressure



Kistler torque sensors can be used to measure almost any torque



Kistler supplies hardware and software for measurement related open-loop and closed-loop process control



# Kistler Applications

Kistler sensors are used
in application of all kinds.



## Engines

Kistler measuring technology helps engineers to optimize the operation of internal combustion engines, combining maximum efficiency with minimum exhaust pollution.

## Vehicles

Kistler sensors help to make automobiles safer and more comfortable and reduce the cost of road maintenance. They serve to measure forces of all kinds in the vehicle suspension, bodywork, and wheels, as well as the road surface.

## Manufacturing

To maintain the quality and reduce the costs of mass production, the manufacturing processes must first be determined and optimized in a series of tests and subsequently kept under constant monitoring. Kistler supplies the measuring technology for both applications.

## Instruments and Equipment

Kistler pressure, force and acceleration sensors are to be found in any number of machines and electrical equipment for industrial application. They support open-loop and closed-loop control of a wide variety of processes.

## Plastics Processing

Kistler pressure sensors and control technology make it possible to increase process quality in the manufacture of plastic components. Constant manufacturing quality reduces scrap and start-up losses and increases profitability.

## Biomechanics

Through high precision measurement of human gait, Kistler force plates help athletes to optimize their performance and physicians to understand the locomotor system and reduce stresses.

## Acceleration

A wide variety of accelerometers are offered to accommodate even the most demanding measurements. Miniature types provide minimal mass loading yet provide significant signal for analysis. High sensitivity types are available for testing of low amplitude motions down to steady state, DC. Our accelerometers have been optimized for the most common applications and custom solutions are readily available.

### Kistler Applications



Internal combustion engines become more economical and environmentally friendly



Cars become safer and more comfortable



Mass production becomes more cost effective



Industrial processes are precisely controlled and regulated



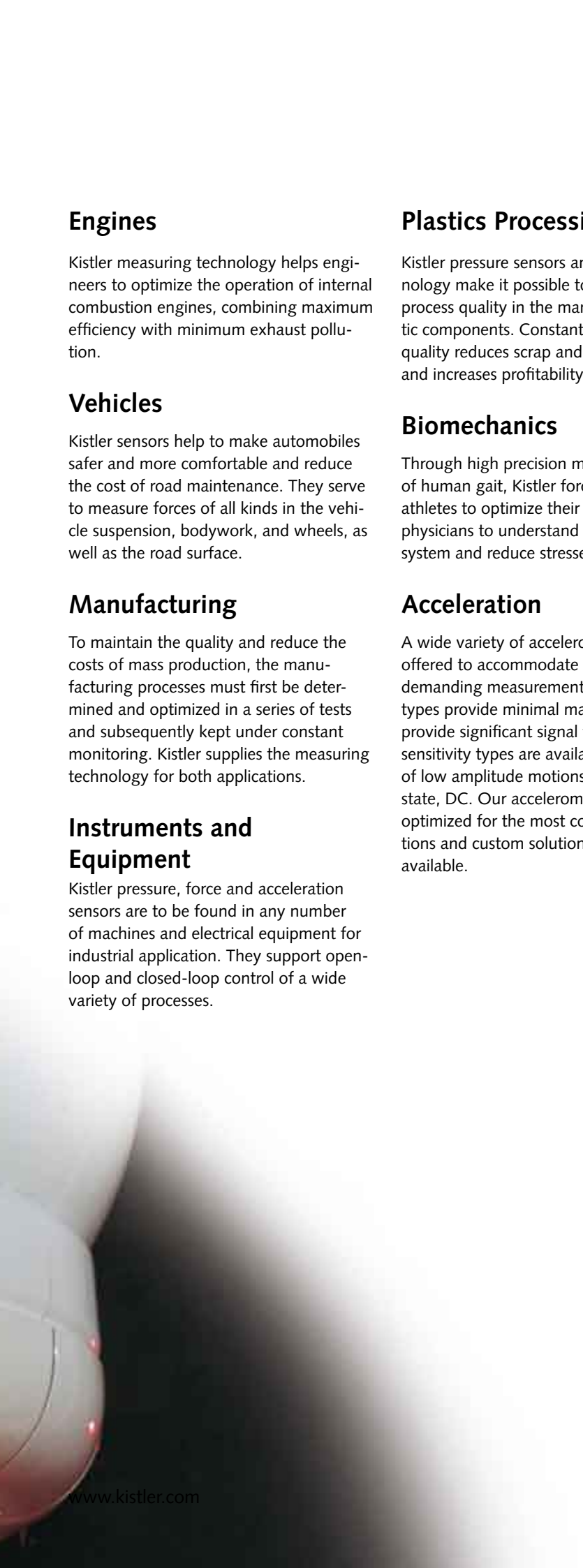
Process quality in the manufacture of plastic components is improved



Kistler force plates optimize performance in many sports



Ride quality of mass transit systems is optimized when tilt and sway are accurately measured and controlled



# Kistler in Brief

**Kistler enjoys a worldwide reputation as a leading supplier of measurement technology. Kistler sensors use the piezoelectric effect, piezoresistive or capacitive, to measure pressure, force and acceleration.**

## Our Aim

The top priority at Kistler is to satisfy the needs and requirements of our customers. This includes developing leading-edge products and helping our customers to obtain optimum results from their application.

## Our Philosophy

Our success is based on innovative technologies, precise knowledge of our markets and a comprehensive range of services.

## measure. analyze. innovate.

**measure.**
Our core strength is the use of sensors to measure physical changes.

**analyze.**
The physical changes measured have no intrinsic significance by themselves. It is only through analysis and evaluation of the measurements that a process can be understood. To this end, we supply our customers with all the necessary hardware and software to analyze these changes.

**innovate.**
The information obtained in this way constitutes the basis for innovative products and serves to open up new horizons.

## Successful Research

Over the years, Kistler's heavy investment in research and development has generated a number of revolutionary innovations:

- the world's first commercial quartz sensor
- the patented two-wire constant current technology constituting the basis for today's sensors with integrated microelectronic circuitry
- the first high-temperature pressure sensors up to 350 °C, polystable quartz cut
- the first three-component force measuring sensors
- own crystal growth capabilities for special high sensitivity and high temperature crystals

These innovations resulted in solutions to numerous measuring problems for the first time.

## Comprehensive Services

Kistler also supplies a comprehensive range of services, including technical advice for all application, calibration and repair services, as well as regular training.

## Kistler Today

Established in Winterthur (Switzerland) in 1959, Kistler currently employs 1 000 staff worldwide, around 15 % of whom are engaged in research and development.

In addition to its headquarters at Winterthur, Kistler is represented in over 50 countries and has group companies in the USA, Germany, Austria, Denmark, Finland, France, Italy, the Netherlands, Norway, Sweden, Czech Republic/Slovakia, the United Kingdom, Japan, the People's Republic of China, India, Korea, Singapore, Taiwan, Thailand and Australia.



## Our History

1957: Kistler Instruments established in Winterthur, Switzerland.

1958: First miniature quartz pressure sensor, a device which is to set the standard in pressure measuring technology.

1962: Kistler Instrument Corp. moves to its own facilities in Clarence, NY.

1963: Establishment of the German group company near Stuttgart.

1965: Kistler introduces the world's first quartz force sensor.

1966: Kistler moves into its new company building in Winterthur-Wülflingen.

1967: First charge amplifier with MOSFET.

1968: Kistler introduces another world innovation, three-component force sensors, capable of measuring all three components of a force and their exact direction.

1973: Kistler launches sensors based on the piezoresistive technology.

1974: Introduction of quartz sensors for temperatures above 350 °C.

1980: Introduction of the world's first quartz strain sensor, an instrument which, even today, offers unrivalled sensitivity.

1983: Introduction of Kistler's unique quartz wheel force dynamometer.

1986: Establishment of the Japanese group company in Tokyo.

1987: Introduced first Piezo Beam – low impedance accelerometer that incorporates a bimorph ceramic element and hybrid charge amp for ultra-high sensitivity in a small, rugged package.

1989: Another world first from Kistler – a high-temperature sensor with a diameter of only 5 mm for use in engine measuring technology.

1991: Kistler becomes an accredited calibration station ("SCS 049") for pressure, force, acceleration and electric charge.

1992: Introduced first K-Beam – solid-state, variable capacitance based line of accelerometers for measuring low frequency or steady-state conditions.

1997: Certified according to ISO 9001.

Introduced Ceramic Shear piezoelectric accelerometer which utilizes ceramic shear sensing elements.

2000: Major expansion of the production plant in Winterthur.

2002: Introduced ServoK-Beam – solid-state, variable capacitance based line of accelerometers designed to replace traditional servo accelerometers due to the exceptional performance, small size and inexpensive cost.

2004: Achieved ISO/IEC 17025 Accreditation. First PiezoSmart sensors for combustion engine measurements.

2005: Introduced PiezoStar accelerometers for ultra stable temperature performance.

2006: Kistler measures rotating torque, with the purchase of Staiger Mohilo.

## Kistler in Brief

Research efforts focused on one objective: ultra-modern, customer-oriented solutions



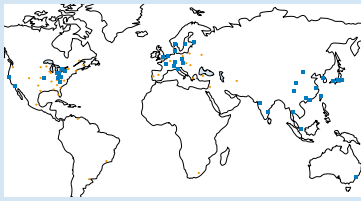
Kistler solutions are developed in close cooperation with the user



A world first: Kistler quartz sensors



Kistler is represented in over 50 countries worldwide



Kistler Instrumente AG, Winterthur, Switzerland



Kistler Instrument Corp., Amherst, NY



# Technical Literature

## Technical Publications and Application Brochures

### Documents Related to Acceleration

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| Modal Analysis | 700-321 |
| PiezoStar® Accelerometers | 700-340 |
| An Efficient Shuttle Modal Inspection System Test | 920-243 |
| Shear Mode Quartz Shock Sensors | 920-248 |
| Lightweight Capacitive Accelerometer | 920-250 |
| PiezoBeam® Accelerometers | 920-251 |
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| K-Beam® Capazitive Accelerometers | 920-254 |
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| Theory of Hammer Test Method | 920-256 |
| The Piezotron® Concept as a Practical Approach to Vibration Measurement | 920-259 |
| Frequency response of Piezoelectric Transducers a Practical Approach | 920-260 |
| Acceleration Measurements on a Free-Free Beam | 920-261 |
| The Art of Fabricating a Rotational Accelerometer | 920-262 |
| IEEE P1451.4: Measurement with Smart Transducers | 920-263 |
| A Novel Annular Shear Piezoceramic Accelerometer | 920-264 |
| Accelerometer Mounting Considerations | 920-265 |
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